



Gregory L. Geist
Director

June 30, 2022

Board of County Commissioners
Clackamas County

Members of the Board:

Approval of a Contract #5484 –BID#2022-25 between WES and R.L. Reimers Co. with the total contract value of \$2,794,940.00 paid through WES Capital Funds, for the Kellogg Creek Water Resource Recovery Aeration Basin Improvements Construction Project. No County General Funds are involved. – Procurement

Purpose/Outcomes	Approval of a Contract #5484 – BID#2022-25 between WES and R.L. Reimers Co. with the total contract value of \$2,794,940 paid through WES Capital Funds, for the Kellogg Creek Water Resource Recovery Aeration Basin Improvements Construction Project. No County General Funds are involved. – <i>Procurement</i>
Dollar Amount and Fiscal Impact	The Contract Price is \$2,794,940.00.
Funding Source	WES Funds Capital Improvement Funds. No County General Funds are involved.
Duration	The contract duration is 535 days to final completion following execution and issuance of a Notice to Proceed.
Previous Board Action	Prior discussions related to budget and Capital Improvements Plan. Award of a contract for engineering design services to Jacobs Engineering Group. This item was presented at issues on June 28, 2022.
Strategic Plan Alignment	<ol style="list-style-type: none"> 1. This project supports the County’s Strategic Plan of building a strong infrastructure that delivers services to customers and honors, utilizes, promotes and invests in our natural resources, by replacing aging equipment, increase efficiency and the potential to decrease power consumption. 2. This project supports the WES Strategic Plan goal to provide properly functioning infrastructure that supports healthy streams and reduces flooding by increasing the ability to finely tune the biological process, helping effluent requirements and improve the water quality of the discharge and repairing corroded concrete.
Counsel Review	Date of Counsel review: June 16, 2022 Name of County Counsel performing review: Amanda Keller
Procurement Review	Was this item reviewed by Procurement? Yes
Contact Person	Steven Rice, Senior Civil Engineer, 971-284-3710
Agreement No.	#5484

BACKGROUND:

WES has completed engineering design and bidding of the Kellogg Creek Water Resource Recovery Facility (KC WRRF) Aeration Basin Improvements project. The KC WRRF was constructed as a conventional secondary treatment facility in 1976. The facility recently underwent a project that included, in part, installation of new aeration blowers to provide air to the biological treatment process. To realize the full benefit of the new blowers, downstream aeration system improvements are needed. The project will provide new aeration system components including air control valves, actuators, flow meters, and dissolved oxygen sensors. The existing Programmable Logic Controller will be replaced with new hardware and SCADA programming for improved process control and reduction of wasted energy. The project also includes replacement of flow control gates in the aeration basins to enhance peak flow treatment. The aeration basin influent channel concrete is corroded, and the entire surface will be repaired. Spot surface and crack repairs will be conducted elsewhere in the basin.

PROCUREMENT PROCESS:

This project was advertised in accordance with ORS and LCRB Rules on March 17, 2022. A mandatory pre-bid conference was held at the WRRF site on March 24, 2022. Bids were opened on April 14, 2022. The District received three (3) bids: McLure and Sons, Orr, Inc., and R.L. Reimers. The apparent low bidder was R.L. Reimers, and subsequent review confirmed acceptability of the bid. A notice of intent to award the contract to R.L. Reimers was posted May 23, 2022.

Throughout the performance of the Work under this Contract, WES's Project Manager (Steven Rice) has been designated as the representative granted the authority to verbally authorize change orders in the field for an amount up to \$10,000.

RECOMMENDATION:

Staff recommends that the Board of County Commissioners of Clackamas County, acting as the governing body of Water Environment Services, approve and execute the Contract #5484 – BID#2022-25 between WES and R.L. Reimers Co. with the total contract value of \$2,794,940.00 paid through WES Capital Funds, for the Kellogg Creek Water Resource Recovery Aeration Basin Improvements Construction Project.

Respectfully submitted,



Greg Geist, Director
Water Environment Services

Attachments: Contract #5484

PROCUREMENT



RECORDING MEMO

New Agreement/Contract

Amendment/Change/Extension

Other: _____

Originating County Department: _____

Purchasing for: _____

Other party to contract/agreement: _____

Title from Business Meeting Agenda:

After recording please return to:

Clerk to the Board please complete below this line after Board approval _____

Board Agenda Date: _____

Agenda Item Number: _____

**WATER ENVIRONMENT SERVICES
AGREEMENT BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT**

CONTRACT#5484

This Agreement is entered into by and between Water Environment Services (“Owner”), an intergovernmental entity formed pursuant to Oregon Revised Statutes Chapter 190, and **R.L. Reimers Company** (“Contractor”).

Terms used in this Agreement have the meanings stated in the General Conditions and the Supplementary Conditions, both identified more specifically in Article 7 below. All references to General Conditions implicitly include a reference to any modifications made by the Supplementary Conditions to the same paragraph.

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

Improvements to four existing aeration basins at the Kellogg Creek Water Resource Recovery Facility, including structural concrete repair; replacement of existing flow control gates, air header actuated control valves, air flow meters, dissolved oxygen probes, spray water systems, and programmable logic controller; associated modifications to the control system; and miscellaneous other improvements to the existing facility as shown.

ARTICLE 2—THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows:

Kellogg Creek Water Resource Recovery Facility Aeration Basin Improvements

ARTICLE 3—ENGINEER

3.01 The Owner has retained Jacobs Engineering Group, Inc. (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.

3.02 The part of the Project that pertains to the Work has been designed by Engineer.

ARTICLE 4—CONTRACT TIMES

4.01 *Time is of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and final completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.03 *Contract Times: Days*

- A. The Work will be substantially complete within 505 days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 535 days after the date when the Contract Times commence to run.

4.04 *Milestones*

- A. Parts of the Work must be substantially completed on or before the following Milestone(s):
 - 1. Milestone 1: Parts of the Work that occur in 2022 requiring aeration basins to be out of service must be completed by September 30, 2022. All aeration basins must be returned to normal service by October 1, 2022 and remain in service through May 31, 2023.

4.05 *Liquidated Damages*

- A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):
 - 1. *Substantial Completion*: Contractor shall pay Owner \$1,400 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.
 - 2. *Completion of Remaining Work*: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner \$1,400 for each day that expires after such time until the Work is completed and ready for final payment.
 - 3. *Milestones*: Contractor shall pay Owner \$1,400 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for achievement of each Milestone, until each Milestone is achieved, or until the time specified for Substantial Completion is reached, at which time the rate indicated in Paragraph 4.05.A.1 will apply, rather than the Milestone rate.
 - 4. Liquidated damages for failing to timely attain Milestones, Substantial Completion, and Final Completion are not additive, and will not be imposed concurrently.

4.06 *National Pollutant Discharge Elimination System Permit Violations*

- A. Kellogg Creek WRRF must continuously be in compliance with its National Pollutant 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. 100983 \$ 10,000 per day for each violation

- C. The Owner may withhold from any payments owed to the Contractor the amount of such costs, and a Change Order shall be issued to reflect any such reduction.

ARTICLE 5—CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts that follow, subject to adjustment under the Contract:

- A. For all Work other than Unit Price Work, a lump sum of \$ 1,894,445.00 (“Lump Sum Amount”). All specific cash allowances are included in this price in accordance with Paragraph 13.02 of the General Conditions.
- B. For all Unit Price Work, an amount equal to the sum of the extended prices below (established for each separately identified item of Unit Price Work by multiplying the unit price times the actual quantity of that item).

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Vertical Concrete surface removal and repair - 5/8 to 1 inch removal depth and repair thickness	SF	2,720	\$ 19.75	\$ 53,720.00
2	Vertical Concrete surface removal and repair – 1-1/8 to 1-1/2 inch removal depth and repair thickness	SF	2,720	\$ 184.75	\$ 502,520.00
3	Overhead Concrete surface removal and repair - 5/8 to 1 inch removal depth and repair thickness	SF	430	\$ 66.00	\$ 28,380.00
4	Overhead Concrete surface removal and repair – 1-1/8 to 1-1/2 inch removal depth and repair thickness	SF	430	\$ 327.50	\$ 140,825.00
5	Horizontal Concrete surface removal and repair - 5/8 to 1 inch removal depth and repair thickness	SF	510	\$ 41.50	\$ 21,165.00
6	Horizontal Concrete surface removal and repair – 1-1/8 to 1-1/2 inch removal depth and repair thickness	SF	510	\$ 188.50	\$ 96,135.00

7	Aeration Basin Epoxy Injection Concrete Crack Repair (Greater than 0.010 inch width)	Feet	300	\$ 192.50	\$ 57,750.00
8 Total of All Unit Price Bid Items (Subtotal)					\$ 900,495.00

- C. Total of Lump Sum Amount and Unit Price Work (subject to final Unit Price adjustment) of \$2,794,940.00 ("Contract Price").

ARTICLE 6—PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on the basis of Contractor's Applications for Payment on or about 30 days following receipt of an Application for Payment during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.
1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.
 - a. Ninety-five (95) percent of the value of the Work completed (with the balance being retainage). Retainage will be held in 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 Contractor.
- B. Upon final completion, Owner shall pay an amount sufficient to increase total payments to Contractor to One-hundred (100) percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions.
- C. Alternatives to Retainage
1. In lieu of retainage, Contractor, with the approval of Owner, may deposit a surety bond for all or any portion of the retainage in a form acceptable to Owner. Such bond and any proceeds therefrom shall be made subject to all claims and liens as provided for in ORS 279C.550 to 279C.620.

6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.

6.04 *Consent of Surety*

- A. Owner will not make final payment, or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

ARTICLE 7 – CONTRACT DOCUMENTS

7.01 *Contents*

- A. The Contract Documents consist of all of the following:
 - 1. This Agreement.
 - 2. Bonds, attached hereto and incorporated herein as Exhibit B:
 - a. Performance bond (together with power of attorney).
 - b. Payment bond (together with power of attorney).
 - 3. General Conditions, attached hereto and incorporated herein as Exhibit C. The General Conditions that are made a part of this Contract are EJCDC® C 700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee (“General Conditions”), and Owner has plainly shown all modifications to the standard wording of such published document to the Contractor in the Supplementary Conditions.
 - 4. Supplementary Conditions, attached hereto and incorporated herein as Exhibit D.
 - 5. Specifications, attached hereto and incorporated as Exhibit E.
 - 6. Drawings, attached hereto and incorporated as Exhibit F.
 - 8. Addenda (numbers **1** to **3**, inclusive).
 - 9. Prevailing Wage Rates (not attached but incorporated by reference).
 - 10. Payroll and Certified Statement Form (not attached but incorporated by reference).
 - 12. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
 - a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.
 - d. Field Orders.
 - e. Warranty Bond, if any.
- B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement and incorporated herein (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 7.

- D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 Contractor's Representations

- A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:
1. Contractor has examined and carefully studied the Contract Documents, including Addenda.
 2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
 4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions, if any, at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
 5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
 6. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.
 7. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
 8. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
 9. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.
12. Contractor represents and warrants to Owner that (A) Contractor has the power and authority to enter into and perform this Contract; (B) this Contract, when executed and delivered, shall be a valid and binding obligation of Contractor enforceable in accordance with its terms; (C) Contractor shall at all times during the term of this Contract, be qualified, professionally competent, and duly licensed to perform the Work; (D) Contractor is an independent contractor as defined in ORS 670.600; and (E) the Work under this Contract shall be performed in a good and workmanlike manner and in accordance with the highest professional standards. The warranties set forth in this section are in addition to, and not in lieu of, any other warranties provided.
13. 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.

8.02 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:
 1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.
- B. Contractor shall furnish proof of required insurance in accordance with Paragraph 6.02 of the General Conditions and Supplemental General Conditions. Insurance certificates may be returned with the signed Agreement or may be emailed to Procurement@clackamas.us.

8.03 *Miscellaneous Terms*

- A. Change Order Authorization. Throughout the performance of the Work under this Agreement, the Owner's Designated Representative (identified on the signature page) 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 Designated 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 Designated 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 Designated 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 Designated Representative's ability to authorize change orders at any time for any reason.
- B. 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.
- C. Required Provisions. All provisions of state law required to be part of this Contract, whether listed in the General Conditions or Supplementary 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.
- D. Integration. 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.

Signature Page Follows

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on the last date of signature by the parties below (which is the Effective Date of the Contract).

Owner:
Water Environment Services

By: _____
(individual's signature)

Date: _____
(date signed)

Name: Tootie Smith
(typed or printed)

Title: Chair
(typed or printed)

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Address for giving notices:

ATTN: Steven Rice
150 Beaver Creek Road #430
Oregon City, OR 97045

Designated Representative:

Name: Steven Rice
(typed or printed)

Title: Senior Civil Engineer
(typed or printed)

Address:

150 Beaver Creek Road #430
Oregon City, OR 97045

Phone: 971-284-3710

Email: SRice@clackamas.us

Contractor:
R.L. Reimers Company
(typed or printed name of organization)

By: _____
(individual's signature)

Date: 6/7/2022
(date signed)

Name: Ronald Reimers
(typed or printed)

Title: President
(typed or printed)

Attest: _____
(individual's signature)

Title: Secretary
(typed or printed)

Address for giving notices:

3939 Old Salem Rd, Suite 200
Salem, OR 97321

Designated Representative:

Name: Ross Meyer
(typed or printed)

Title: Project Manager
(typed or printed)

Address:

3939 Old Salem Rd, Suite 200
Albany, OR 97321

Phone: 971-304-5661

Email: ross@rlreimers.com

License No.: 60891
(where applicable)

State: Oregon

APPROVED
By Amanda Keller at 11:45 am, Jun 16, 2022

EXHIBIT A
Contractors' Bid



CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT

BID FORM

PROJECT: #2022-25 Kellogg Creek Water Resource Recovery Facility Aeration Basin Improvements
BID CLOSING: April 14, 2022, 2:00 PM, Pacific Time
BID OPENING: April 14, 2022, 2:05 PM, Pacific Time

FROM: R.L. Reimers Company
Bidder's Name (must be full legal name, not ABN/DBA)

TO: Clackamas County
Procurement Division – procurement@clackamas.us

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

- a. An individual; or
- b. A partnership registered under the laws of the State of _____; or
- c. A corporation organized under the laws of the State of 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 Lump Sum Bid as follows:

one million four hundred and seventy three thousand,
nine hundred and seventy five dollars and no cents. Dollars (\$ 1,473,975.00)

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
- General Conditions
- Prevailing Wage Rates
- Plans, Specifications and Drawings
- Supplemental Instructions to Bidders
- Bid Form
- Performance Bond and Payment Bond
- Supplemental General Conditions
- Payroll and Certified Statement Form
- ADDENDA numbered 1 through 3, inclusive *(fill in blanks)*

2. The Undersigned proposes to add to the Lump Sum Bid indicated above the items or work relating to the following Unit Prices as designated in the Specifications, for which any adjustments in the Contract amount will be made in accordance with the General Conditions:

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Vertical Concrete surface removal and repair - 5/8 to 1 inch removal depth and repair thickness	SF	2,720	\$	\$
2	Vertical Concrete surface removal and repair - 1-1/8 to 1-1/2 inch removal depth and repair thickness	SF	2,720	\$	\$
3	Overhead Concrete surface removal and repair - 5/8 to 1 inch removal depth and repair thickness	SF	430	\$	\$
4	Overhead Concrete surface removal and repair - 1-1/8 to 1-1/2 inch removal depth and repair thickness	SF	430	\$	\$
5	Horizontal Concrete surface removal and repair - 5/8 to 1 inch removal depth and repair thickness	SF	510	\$	\$
6	Horizontal Concrete surface removal and repair - 1-1/8 to 1-1/2 inch removal depth and repair thickness	SF	510	\$	\$
7 Total of All Unit Price Bid Items (Subtotal)					\$

See form on next page per Addendum #2

The Undersigned acknowledges that:

1. each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and
2. estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

3. Total Base Bid Price (Lump Sum and Unit Prices):

Base Bid Summary: Enter Amount from Previous Subtotals

Lump Sum Bid Price	\$ 1,473,975.00
Total of All Unit Price Bid Items	\$ 1,320,965.00

TOTAL BASE BID PRICE (TOTAL OF ALL LUMP SUM AND UNIT PRICE BIDS):

two million, seven hundred ninety four thousand, nine hundred and forty dollars and no cents Dollars (\$ 2,794,940.00)

4. The successful Bidder agrees that the Work will be substantially complete and will be

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1	Vertical Concrete surface removal and repair - 5/8 to 1 inch removal depth and repair thickness	SF	2,720	\$ 134.75	\$ 366,520.00
2	Vertical Concrete surface removal and repair - 1-1/8 to 1-1/2 inch removal depth and repair thickness	SF	2,720	\$ 184.75	\$ 502,520.00
3	Overhead Concrete surface removal and repair - 5/8 to 1 inch removal depth and repair thickness	SF	430	\$ 180.00	\$ 77,400.00
4	Overhead Concrete surface removal and repair - 1-1/8 to 1-1/2 inch removal depth and repair thickness	SF	430	\$ 327.50	\$ 140,825.00
5	Horizontal Concrete surface removal and repair - 5/8 to 1 inch removal depth and repair thickness	SF	510	\$ 156.50	\$ 79,815.00
6	Horizontal Concrete surface removal and repair - 1-1/8 to 1-1/2 inch removal depth and repair thickness	SF	510	\$ 188.50	\$ 96,135.00
7	Aeration Basin Epoxy Injection Concrete Crack Repair (Greater than 0.010 inch width)	Feet	300	\$ 192.50	\$ 57,750
8	Total of All Unit Price Bid Items (Subtotal)				\$ 1,320,965.00

completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement. The Bidder accepts the provisions of the Agreement as to liquidated damages.

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:

The Hanover Insurance Company
(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, 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 **HAS**, **HAS NOT** (*check one*) paid unemployment or income taxes in Oregon within the past 12 months and **DOES**, **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 60891. 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 SAIF, Policy No. 812835, and that Contractor shall submit Certificates of Insurance as required.

14. Contractor's Key Individuals for this project (supply information as applicable):

Project Executive: Ross Meyer, Cell Phone: 971-304-5661,
Project Manager: Ross Meyer, Cell Phone: 971-304-5661,
Job Superintendent: RJ Langenfeld, Cell Phone: 541-420-5379,
Project Engineer: Brandon Hageman, Cell Phone: 541-223-2055.

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 R.L. Reimers Company
ADDRESS 3939 Old Salem Rd, Suite 200
Albany, OR 97321
TELEPHONE NO 541-926-7766
EMAIL ross@rlreimers.com
SIGNATURE 1) _____
Sole Individual
or 2) _____
Partner
or 3) 
Authorized Officer or Employee of Corporation

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



CLACKAMAS COUNTY
PUBLIC IMPROVEMENT CONTRACT

BID BOND

Project Name: # 2022-25 Kellogg Creek Water Resource Recovery Facility Aeration System improvements

We, R.L. Reimers Co. as "Principal," (Name of Principal)

and The Hanover Insurance Company, an New Hampshire Corporation, (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 Clackamas County ("Obligee") the sum of (\$ 10%)

Ten percent of amount bid 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 14th day of April, 2022.

Principal: R.L. Reimers Co.

Surety: The Hanover Insurance Company

By: Ron Reimers Signature, President Official Capacity

By: Todd Brem Attorney-in-fact, Name

Attest: Corporation Secretary

13810 SW 31st Ct. Address

Beaverton OR 97008 City State Zip, 503-671-9172 Phone 503-671-9172 Fax



THE HANOVER INSURANCE COMPANY
MASSACHUSETTS BAY INSURANCE COMPANY
CITIZENS INSURANCE COMPANY OF AMERICA

POWERS OF ATTORNEY
CERTIFIED COPY

KNOW ALL MEN BY THESE PRESENTS: That THE HANOVER INSURANCE COMPANY and MASSACHUSETTS BAY INSURANCE COMPANY, both being corporations organized and existing under the laws of the State of New Hampshire, and CITIZENS INSURANCE COMPANY OF AMERICA, a corporation organized and existing under the laws of the State of Michigan, do hereby constitute and appoint

Todd Brem and/or Carol Brem

of **Beaverton, OR** and each is a true and lawful Attorney(s)-in-fact to sign, execute, seal, acknowledge and deliver for, and on its behalf, and as its act and deed any place within the United States, or, if the following line be filled in, only within the area therein designated any and all bonds, recognizances, undertakings, contracts of indemnity or other writings obligatory in the nature thereof, as follows:

Any such obligations in the United States, not to exceed Thirty Million and No/100 (\$30,000,000) in any single instance

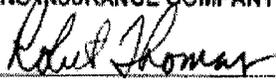
and said companies hereby ratify and confirm all and whatsoever said Attorney(s)-in-fact may lawfully do in the premises by virtue of these presents. These appointments are made under and by authority of the following Resolution passed by the Board of Directors of said Companies which resolutions are still in effect:

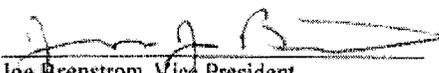
"RESOLVED, That the President or any Vice President, in conjunction with any Vice President, be and they are hereby authorized and empowered to appoint Attorneys-in-fact of the Company, in its name and as its acts, to execute and acknowledge for and on its behalf as Surety any and all bonds, recognizances, contracts of indemnity, waivers of citation and all other writings obligatory in the nature thereof, with power to attach thereto the seal of the Company. Any such writings so executed by such Attorneys-in-fact shall be as binding upon the Company as if they had been duly executed and acknowledged by the regularly elected officers of the Company in their own proper persons." (Adopted October 7, 1981 - The Hanover Insurance Company; Adopted April 14, 1982 - Massachusetts Bay Insurance Company; Adopted September 7, 2001 - Citizens Insurance Company of America)

IN WITNESS WHEREOF, THE HANOVER INSURANCE COMPANY, MASSACHUSETTS BAY INSURANCE COMPANY and CITIZENS INSURANCE COMPANY OF AMERICA have caused these presents to be sealed with their respective corporate seals, duly attested by two Vice Presidents, this **6th** day of **September 2013**.



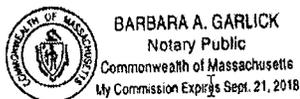
THE HANOVER INSURANCE COMPANY
MASSACHUSETTS BAY INSURANCE COMPANY
CITIZENS INSURANCE COMPANY OF AMERICA


Robert Thomas, Vice President


Joe Brenstrom, Vice President

THE COMMONWEALTH OF MASSACHUSETTS)
COUNTY OF WORCESTER) ss.

On this **6th** day of **September 2013** before me came the above named Vice Presidents of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America, to me personally known to be the individuals and officers described herein, and acknowledged that the seals affixed to the preceding instrument are the corporate seals of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America, respectively, and that the said corporate seals and their signatures as officers were duly affixed and subscribed to said instrument by the authority and direction of said Corporations.




Barbara A. Garlick, Notary Public
My Commission Expires September 21, 2018

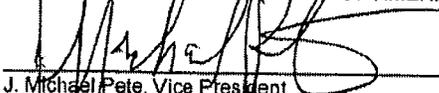
I, the undersigned Vice President of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America, hereby certify that the above and foregoing is a full, true and correct copy of the Original Power of Attorney issued by said Companies, and do hereby further certify that the said Powers of Attorney are still in force and effect.

This Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America.

"RESOLVED, That any and all Powers of Attorney and Certified Copies of such Powers of Attorney and certification in respect thereto, granted and executed by the President or any Vice President in conjunction with any Vice President of the Company, shall be binding on the Company to the same extent as if all signatures therein were manually affixed, even though one or more of any such signatures thereon may be facsimile." (Adopted October 7, 1981 - The Hanover Insurance Company; Adopted April 14, 1982 - Massachusetts Bay Insurance Company; Adopted September 7, 2001 - Citizens Insurance Company of America)

GIVEN under my hand and the seals of said Companies, at Worcester, Massachusetts, this 14th day of April 2022.

THE HANOVER INSURANCE COMPANY
MASSACHUSETTS BAY INSURANCE COMPANY
CITIZENS INSURANCE COMPANY OF AMERICA


J. Michael Pete, Vice President



INVITATION TO BID #2022-25
KELLOGG CREEK WRRF
AERATION BASIN IMPROVEMENTS
ADDENDUM NUMBER 1
March 24, 2022

On March 17, 2022, Clackamas County ("County") published Invitation to Bid #2022-25 ("BID"). The County has found that it is in its interest to amend the BID through the issuance of this Addendum #1. Except as expressly amended below, all other terms and conditions of the original BID and subsequent Addenda shall remain unchanged.

The following changes, additions, and/or deletions are hereby made a part of the Contract Documents for the construction of Kellogg Creek WRRF Aeration Basin Improvements dated February 2022 as fully and completely as if the same were fully set forth therein:

A. PART 1, PROCUREMENT REQUIREMENTS

1. No changes.

B. PART 2, CONTRACTING REQUIREMENTS

1. Insert attached General Conditions.

C. PART 3, SPECIFICATIONS

1. Section 03 01 32 Repair of Vertical and Overhead Concrete Surfaces

- a. Paragraph 2.01.C.2

DELETE "SikaRepair 226L" and REPLACE with "SikaCem 226 CI"

- b. Paragraph 3.01 A.1.

DELETE "7,000 psi minimum high-pressure, 16,000 psi maximum high-pressure water blasting machine," and Add "High-pressure water blasting will not be allowed for concrete removal."

- c. Paragraph 3.01 D.

DELETE "Roughen polished saw-cut edge by high-pressure water blasting." and REPLACE with "Roughen polished saw-cut edge with abrasive hand operated power tools."

- d. Paragraph 3.01 E.

DELETE "...free of dust, dirt, and water basting waste slurry." and REPLACE with "...free of dust and dirt."

2. Section 03 01 33 Repair of Horizontal Concrete Surfaces

a. Paragraph 1.03 C.1.

Delete "1,000 square feet" and replace with "400 square feet"

b. Paragraph 3.01 B.1.

DELETE "7,000 psi minimum, 16,000 psi maximum high-pressure water blasting machine, Add "High-pressure water blasting will not be allowed for concrete removal."

c. Paragraph 3.01 F.

DELETE "Roughen polished saw-cut edge by high-pressure water blasting" and REPLACE with "Roughen polished saw-cut edge with abrasive hand operated power tools"

d. Paragraph 3.01 G.

DELETE "...free of dust, dirt, and water basting waste slurry." and REPLACE with "...free of dust and dirt."

D. DRAWINGS

1. No changes.

All Bidders shall acknowledge receipt and acceptance of this Addendum No. 1 in the Bid Form or by submitting the Addendum with the bid package. Bid Forms submitted without acknowledgment or without this Addendum will be considered in nonconformance.

Appended hereto and part of Addendum No. 1:

A. General Conditions

END OF ADDENDUM



INVITATION TO BID #2022-25
KELLOGG CREEK WRRF
AERATION BASIN IMPROVEMENTS
ADDENDUM NUMBER 2
April 12, 2022

On March 17, 2022, Clackamas County ("County") published Invitation to Bid #2022-25 ("BID") and Addendum #1 on March 24, 2022. The County has found that it is in its interest to amend the BID through the issuance of this Addendum #2. Except as expressly amended below, all other terms and conditions of the original BID and subsequent Addenda shall remain unchanged.

1. 2. BID FORM

1. Insert attached Bid Schedule

All Bidders shall acknowledge receipt and acceptance of this Addendum No. 2 in the Bid Form or by submitting the Addendum with the bid package. Bid Forms submitted without acknowledgment or without this Addendum will be considered in nonconformance.

Appended hereto and part of Addendum No. 2:
BID SCHEDULE

End of Addendum#2



INVITATION TO BID #2022-25
KELLOGG CREEK WRRF
AERATION BASIN IMPROVEMENTS
ADDENDUM NUMBER 3
April 13, 2022

On March 17, 2022, Clackamas County ("County") published Invitation to Bid #2022-25 ("BID") and Addendum #1 on March 24, 2022, Addendum# 2 on April 12, 2022. The County has found that it is in its interest to amend the BID through the issuance of this Addendum #3. Except as expressly amended below, all other terms and conditions of the original BID and subsequent Addenda shall remain unchanged.

PROJECT INFORMATION, PLANS, SPECIFICATIONS AND DRAWINGS

A. Specifications

1. Section 01 64 00 Owner-Furnished Products - Paragraph 1.02.C.3

Delete "Between August 10, 2022, and September 21, 2022" and replace with "Between March 1, 2023, and April 12, 2023."

B. Drawings-Kellogg Creek WRRF Aeration Basin Improvements, February 2022 (55 pages)

1. Remove and replace pages 41 and 45 of drawing set with attached updated drawing pages.

All Bidders shall acknowledge receipt and acceptance of this Addendum No. 3 in the Bid Form or by submitting the Addendum with the bid package. Bid Forms submitted without acknowledgment or without this Addendum will be considered in nonconformance.

Appended hereto and part of Addendum No. 3:
Drawing pages 41, 45

End of Addendum#3

FIRST-TIER SUBCONTRACTOR DISCLOSURE FORM
PROJECT: 2022-25 Kellogg Creek Water Resource Recovery Facility Aeration Basin Improvements

BID OPENING: April 14, 2022, 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.

The Form may be mailed, hand-delivered or emailed to: Procurement@clackamas.us. It is the responsibility of Bidders to submit this Form and any additional sheets with the Project name clearly marked on the envelope or the subject line of the email.

Subcontractor lists may be submitted with the bid in the same envelope or email at the Bid Closing date and time. Subcontractor lists **MUST** 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 "**NONE**" 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.

	SUBCONTRACTOR NAME	DOLLAR VALUE	CATEGORY OF WORK
1.	<u>Team Electric</u>	<u>\$577,450.00</u>	<u>Electrical</u>
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____

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: R.L. Reimers Company

Bidder Signature:  Phone # 541-926-7766

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

Prime Contractor Name: R.L. Reimers Company

Total Contract Amount: ⁵ 2,794,940.00

Project Name: 2022-25 Kellogg Creek Water Resource Recovery Facility Aeration System Improvements

PRIME SELF-PERFORMING: Identify below ALL GFE Divisions of Work (DOW) to be self-performed. Good Faith Efforts are otherwise required.

<u>DOW BIDDER WILL SELF-PERFORM (GFE not required)</u>	
Demolition	Joint Sealants
Metals	Equipment Installation
Mechanical Piping	Concrete Repair
Bypass Pumping	

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. Hand delivery to Procurement, 2051 Kaen Road, Oregon City, OR 97045 or email to procurement@clackamas.us within 2 hours of the BID/Quote Closing Date/Time

<u>LIST ALL SUBCONTRACTORS BELOW</u> Use correct legal name of Subcontractor (No Assumed Business Names)	Division of Work (Painting, electrical, landscaping, etc.) List ALL DOW performed by Subcontractors	DOLLAR AMOUNT OF SUBCONTRACT	If Certified or self-reporting MBE/WBE/ESB Subcontractor Check box <input checked="" type="checkbox"/>		
			MBE	WBE	ESB
Name Team Electric Address 9400 SE Clackamas Rd City/St/Zip Clackamas, OR 97015 Phone# 503-577-7180 OCCB# 173043	Electrical	\$577,450.00	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name MJE Industrial, LLC Address PO Box 3434 City/St/Zip Gresham, OR 97030 Phone# 503-936-8934 OCCB# 227416	Painting & Coating	\$9,208.00	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> #12333
Name Address City/St/Zip Phone# OCCB#			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Name Address City/St/Zip Phone# OCCB#			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

Prime Contractor:

Project: 2022-25 Kellogg Creek Water Resource Recovery Facility Aeration System Improvements

Prime Contractor must contact or endeavor to contact at least 3 M/W/ESB Subcontractors for each Division of Work. Prime Contractor shall record its contacts with M/W/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.

NAME OF M/W/ESB SUBCONTRACTOR	Divisions of Work (Painting, electrical, landscaping, etc.)	Date Solicitation Letter / Fax Sent	PHONE CONTACT		BID ACTIVITY Check Yes or No			REJECTED BIDS (if bid received & not used)		Notes
			Date of Call	Person Receiving Call	Will Bid	Bid Received	Bid Used	Bid Amount	Reason Not Used (Price, Scope or Other. If Other, explain in Notes>>)	
US West Corporation	Electrical	4/5/2022	4/8/2022	Brandon Everett	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
La Londe LLC	Electrical	4/5/2022	4/8/2022	Sabrina LaLonde	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Wirenut Enterprises	Electrical	4/5/2022	4/8/2022	Michael Dutton	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
MJE Industrial	Painting	4/5/2022	4/8/2022	Scott Woodward	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	9,208.00		Used bid and will contract with them.
The Rodriguez Corp.	Painting	4/5/2022	4/8/2022	Fernando Rodriguez	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
Bratcher Painting Inc.	Painting	4/5/2022	4/8/2022	Cheryl Bratcher	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			
					<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No			

EXHIBIT B

Bonds



WATER ENVIRONMENT SERVICES
PUBLIC IMPROVEMENT CONTRACT

PERFORMANCE BOND

Bond No.: 109 43 40
Solicitation: 2022-25
Project Name: Kellogg Creek Water Resource Recovery Facility Aeration System Improvements

Table with 3 columns: Surety Name, Bond Amount No., and Amount. Includes entries for The Hanover Insurance Company (Surety #1), (Surety #2)*, and Total Penal Sum of Bond.

We, R.L. Reimers Co. 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) \$ 2,794,940.00 (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 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.

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 24th day of May, 2022.

PRINCIPAL: R.L. Reimers Co.

By: [Signature]
Ron Reimers Signature
President

Attest: [Signature] -Official Capacity
Corporation Secretary

SURETY: The Hanover Insurance Company
[Add signatures for each if using multiple bonds]

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

Todd Brem
[Signature] Name
Signature
13810 SW 31st Ct.
Address
Beaverton OR 97008
City State Zip
503-671-9172 503-671-9172
Phone Fax



THE HANOVER INSURANCE COMPANY
MASSACHUSETTS BAY INSURANCE COMPANY
CITIZENS INSURANCE COMPANY OF AMERICA

POWERS OF ATTORNEY
CERTIFIED COPY

KNOW ALL MEN BY THESE PRESENTS: That THE HANOVER INSURANCE COMPANY and MASSACHUSETTS BAY INSURANCE COMPANY, both being corporations organized and existing under the laws of the State of New Hampshire, and CITIZENS INSURANCE COMPANY OF AMERICA, a corporation organized and existing under the laws of the State of Michigan, do hereby constitute and appoint

Todd Brem and/or Carol Brem

of **Beaverton, OR** and each is a true and lawful Attorney(s)-in-fact to sign, execute, seal, acknowledge and deliver for, and on its behalf, and as its act and deed any place within the United States, or, if the following line be filled in, only within the area therein designated any and all bonds, recognizances, undertakings, contracts of indemnity or other writings obligatory in the nature thereof, as follows:

Any such obligations in the United States, not to exceed Thirty Million and No/100 (\$30,000,000) in any single instance

and said companies hereby ratify and confirm all and whatsoever said Attorney(s)-in-fact may lawfully do in the premises by virtue of these presents. These appointments are made under and by authority of the following Resolution passed by the Board of Directors of said Companies which resolutions are still in effect:

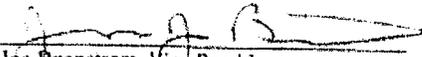
"RESOLVED, That the President or any Vice President, in conjunction with any Vice President, be and they are hereby authorized and empowered to appoint Attorneys-in-fact of the Company, in its name and as its acts, to execute and acknowledge for and on its behalf as Surety any and all bonds, recognizances, contracts of indemnity, waivers of citation and all other writings obligatory in the nature thereof, with power to attach thereto the seal of the Company. Any such writings so executed by such Attorneys-in-fact shall be as binding upon the Company as if they had been duly executed and acknowledged by the regularly elected officers of the Company in their own proper persons." (Adopted October 7, 1981 - The Hanover Insurance Company; Adopted April 14, 1982 - Massachusetts Bay Insurance Company; Adopted September 7, 2001 - Citizens Insurance Company of America)

IN WITNESS WHEREOF, THE HANOVER INSURANCE COMPANY, MASSACHUSETTS BAY INSURANCE COMPANY and CITIZENS INSURANCE COMPANY OF AMERICA have caused these presents to be sealed with their respective corporate seals, duly attested by two Vice Presidents, this 6th day of **September 2013**.



THE HANOVER INSURANCE COMPANY
MASSACHUSETTS BAY INSURANCE COMPANY
CITIZENS INSURANCE COMPANY OF AMERICA


Robert Thomas, Vice President


Joe Brenstrom, Vice President

THE COMMONWEALTH OF MASSACHUSETTS)
COUNTY OF WORCESTER) ss.

On this 6th day of **September 2013** before me came the above named Vice Presidents of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America, to me personally known to be the individuals and officers described herein, and acknowledged that the seals affixed to the preceding instrument are the corporate seals of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America, respectively, and that the said corporate seals and their signatures as officers were duly affixed and subscribed to said instrument by the authority and direction of said Corporations.



BARBARA A. GARLICK
Notary Public
Commonwealth of Massachusetts
My Commission Expires Sept. 21, 2018



Barbara A. Garlick, Notary Public
My Commission Expires September 21, 2018

I, the undersigned Vice President of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America, hereby certify that the above and foregoing is a full, true and correct copy of the Original Power of Attorney issued by said Companies, and do hereby further certify that the said Powers of Attorney are still in force and effect.

This Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of The Hanover Insurance Company, Massachusetts Bay Insurance Company and Citizens Insurance Company of America.

"RESOLVED, That any and all Powers of Attorney and Certified Copies of such Powers of Attorney and certification in respect thereto, granted and executed by the President or any Vice President in conjunction with any Vice President of the Company, shall be binding on the Company to the same extent as if all signatures therein were manually affixed, even though one or more of any such signatures thereon may be facsimile." (Adopted October 7, 1981 - The Hanover Insurance Company; Adopted April 14, 1982 - Massachusetts Bay Insurance Company; Adopted September 7, 2001 - Citizens Insurance Company of America)

GIVEN under my hand and the seals of said Companies, at Worcester, Massachusetts, this 24th day of May 2022.

THE HANOVER INSURANCE COMPANY
MASSACHUSETTS BAY INSURANCE COMPANY
CITIZENS INSURANCE COMPANY OF AMERICA

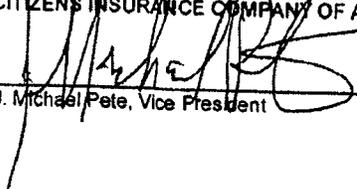

J. Michael Pete, Vice President

EXHIBIT C
General Conditions

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared By



Endorsed By



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National Society of Professional Engineers
1420 King Street, Alexandria, VA 22314-2794
(703) 684-2882
www.nspe.org

American Council of Engineering Companies
1015 15th Street N.W., Washington, DC 20005
(202) 347-7474
www.acec.org

American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400
(800) 548-2723
www.asce.org

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*
 - a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the

- requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.
- b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.
 - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
 - d. A demand for money or services by a third party is not a Claim.
11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
 12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.
 13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
 14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
 15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
 16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
 17. *Cost of the Work*—See Paragraph 13.01 for definition.
 18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
 19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
 20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
 21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.
23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.
 - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.
28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.
32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals.
36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.
39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers’ instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.
44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
46. *Technical Data*
- a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
 - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
 - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.
47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
48. *Unit Price Work*—Work to be paid for on the basis of unit prices.
49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:* The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:* The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:* The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - 1. does not conform to the Contract Documents;
 - 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - 3. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).
- E. *Furnish, Install, Perform, Provide*
 - 1. The word “furnish,” when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 - 2. The word “install,” when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 - 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.
 - 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

- F. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.
- G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

- A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
- C. *Evidence of Owner’s Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work

into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.
 - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 - 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 - 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.
 - 4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.
- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- G. Nothing in the Contract Documents creates:
 - 1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
 - 2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 *Reference Standards*

- A. *Standards Specifications, Codes, Laws and Regulations*
 - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 - 2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility

inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the

established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
 - 1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 - 2. Abnormal weather conditions;
 - 3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
 - 4. Acts of war or terrorism.

- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
 2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
 3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
1. The circumstances that form the basis for the requested adjustment;
 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
 5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.
- Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.
- F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
 - C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment

and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

- D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings*: The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
3. Technical Data contained in such reports and drawings.

- B. *Underground Facilities*: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

- C. *Reliance by Contractor on Technical Data*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

- D. *Limitations of Other Data and Documents*: Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;
 2. is of such a nature as to require a change in the Drawings or Specifications;
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in

Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
- a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;
 - b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice required by Paragraph 5.04.A.
3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.
- F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities*: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review:* Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
 2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
 3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
 4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
 - c. Contractor gave the notice required in Paragraph 5.05.B.
2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
 4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;
2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures

- of construction to be employed by Contractor, and safety precautions and programs incident thereto;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

Regulations, and must be issued and signed by a surety named in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual’s authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner’s termination rights under Article 16.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Alternative forms of insurance coverage, including but not limited to self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

- E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.
- F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.
- H. Contractor shall require:
 - 1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and
 - 2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
- I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
- K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 Contractor's Insurance

- A. *Required Insurance:* Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
- B. *General Provisions:* The policies of insurance required by this Paragraph 6.03 as supplemented must:
 - 1. include at least the specific coverages required;
 - 2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;
 - 3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;
 - 4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and
 - 5. include all necessary endorsements to support the stated requirements.
- C. *Additional Insureds:* The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:
 - 1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;
 - 2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;
 - 3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and
5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.
- C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.
- D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

- A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against

Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
 2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.
1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.
- C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.

- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.
- C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 *"Or Equals"*

- A. *Contractor's Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) has a proven record of performance and availability of responsive service; and
 - 4) is not objectionable to Owner.
- b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 Substitutes

- A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.
1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.
 2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:
 - a. will certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design;
 - 2) be similar in substance to the item specified; and
 - 3) be suited to the same use as the item specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from the item specified; and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

- E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
- B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.
- E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

- H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.09 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.11 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.
- C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

- 1. Before submitting a Shop Drawing or Sample, Contractor shall:
 - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
 - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
 - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
- 2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.
1. *Shop Drawings*
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.
 2. *Samples*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.
 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Engineer's Review of Shop Drawings and Samples*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.
 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will

document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. Resubmittal Procedures for Shop Drawings and Samples

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.
2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
 - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
 - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.
 - c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

- d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.
 2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03, 2.04, and 2.05.
- F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 Contractor's General Warranty and Guarantee

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.
- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
 2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
1. Observations by Engineer;
 2. Recommendation by Engineer or payment by Owner of any progress or final payment;
 3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. Use or occupancy of the Work or any part thereof by Owner;
 5. Any review and approval of a Shop Drawing or Sample submittal;
 6. The issuance of a notice of acceptability by Engineer;
 7. The end of the correction period established in Paragraph 15.08;
 8. Any inspection, test, or approval by others; or

9. Any correction of defective Work by Owner.
- E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 *Delegation of Professional Design Services*

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.
- C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

- D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
 - 1. Checking for conformance with the requirements of this Paragraph 7.19;
 - 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
 - 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.
- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. An itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. The extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

- A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.
 - 1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.
 - 2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.
- C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

- 9.05 *Lands and Easements; Reports, Tests, and Drawings*
- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
 - B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
 - C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.
- 9.06 *Insurance*
- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.
- 9.07 *Change Orders*
- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.
- 9.08 *Inspections, Tests, and Approvals*
- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.
- 9.09 *Limitations on Owner's Responsibilities*
- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- 9.10 *Undisclosed Hazardous Environmental Condition*
- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.
- 9.11 *Evidence of Financial Arrangements*
- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).
- 9.12 *Safety Programs*
- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
 - B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER’S STATUS DURING CONSTRUCTION

10.01 *Owner’s Representative*

- A. Engineer will be Owner’s representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner’s representative during construction are set forth in the Contract.

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor’s executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer’s efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer’s visits and observations are subject to all the limitations on Engineer’s authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer’s visits or observations of Contractor’s Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor’s means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Resident Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.
- B. If Owner designates an individual or entity who is not Engineer’s consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer’s Authority*

- A. Engineer has the authority to reject Work in accordance with Article 14.
- B. Engineer’s authority as to Submittals is set forth in Paragraph 7.16.
- C. Engineer’s authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner’s delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
- D. Engineer’s authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
 - 1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 - 2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 - 3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and
 - 4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

- A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

- B. If Owner has issued a Work Change Directive and:
 - 1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
 - 2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

- A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.
- B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
- B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.
- C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:

1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or
 3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit will be determined as follows:
1. A mutually acceptable fixed fee; or
 2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
 - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
 - c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
 - d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
 - f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

A. *Purpose and Content:* Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

B. *Change Proposal Procedures*

1. *Submittal:* Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
2. *Supporting Data:* The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.
 - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
 - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review:* Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
4. *Engineer's Full Review and Action on the Change Proposal:* Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change

Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS

12.01 *Claims*

- A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:
 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;
 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and
 4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge

and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

- C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.
 - 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 - 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.
 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.
 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
 5. Other costs consisting of the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are

consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

- 1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
 - 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work does not include any of the following items:

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
- 2. The cost of purchasing, renting, or furnishing small tools and hand tools.
- 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 6. Expenses incurred in preparing and advancing Claims.
- 7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*

- 1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
- 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

- E. *Documentation and Audit:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:* Contractor agrees that:
1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.
- C. *Owner's Contingency Allowance:* Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision

thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 3. by manufacturers of equipment furnished under the Contract Documents;
 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs,

losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work,

or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments*
 - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.
 - 2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work;
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

- b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. The Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. The Contract Price has been reduced by Change Orders;
 - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
 - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or
 - l. Other items entitle Owner to a set-off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without

significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

- d. a list of all duly pending Change Proposals and Claims; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.
- B. *Engineer's Review of Final Application and Recommendation of Payment:* If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due:* Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,

appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such adjacent areas;
 - 2. correct such defective Work;
 - 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects,

attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

- A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The

provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this article:
1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and
 2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this article, Owner or Contractor may:
1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;
 2. agree with the other party to submit the dispute to another dispute resolution process; or
 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
 3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

EXHIBIT D
Supplementary Conditions

SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

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SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract as indicated below. The General Conditions remain in full force and effect except as amended or supplemented.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof. As used in the Contract Documents, masculine pronouns refer to both masculine and feminine genders.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added.

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

SC-1.01 Delete and replace the following subsections in Paragraph 1.01.A:

5. *Bidder*: Any individual, partnership, corporation, joint venture, or other legal entity who submits a Bid to Owner for the Work contemplated and meets the standards set forth in Oregon Revised Statutes 279B.110.
16. *Contractor*: Person or entity identified as such in the Agreement and the Contractor's authorized representatives who are referred to throughout the Contract Documents as if singular in number.
22. *Engineer*: Person or entity identified as such in the Agreement and the Engineer's authorized representatives who are referred to throughout the Contract Documents as if singular in number.
30. *Owner*: The individual, entity, public body or authority identified as such in the Agreement and the Owner's authorized representatives who are referred to throughout the Contract Documents as if singular in number.

SC-1.01 Revise Paragraph 1.01.A.33 by replacing the word "Engineer" with "Owner" and adding the sentence "Synonymous with Construction Manager." to the end of the paragraph.

SC-1.01 Add the following language at the end of 1.01.A.42:

Substantial Completion is further defined as (i) that degree of completion of the Project's operating facilities or systems sufficient to provide Owner the full time, uninterrupted, and continuous beneficial operation of the Work; (ii) all required functional, performance, and acceptance or startup testing has been successfully demonstrated for all components, devices, equipment, and instrumentation and control to the satisfaction of Engineer in accordance with the requirements of the Specifications; (iii) all inspections required have been completed and identified critical defective Work has been replaced or corrected; and (iv) all appurtenant operations and maintenance features (i.e., hose bibs, drainage systems,

etc.) have been installed and are functional. See Paragraph SC-15.03.A for additional requirements.

SC-1.01 Add the following language to the end of the sentence in Paragraph 1.01.A.44:
“as further identified in the Agreement.”

SC-1.01 Add new paragraphs immediately following Paragraph 1.01.A.50:

51. *Latent Defect*: A defect in the Work of which the Owner has no knowledge.
52. *Specialist*: The term Specialist refers to a person, partnership, firm, or corporation of established reputation (or if newly organized, whose personnel have previously established a reputation in the same field), which is regularly engaged in, and which maintains a regular force of workers skilled in either (as applicable) manufacturing of fabricated items required by the Contract Documents, or otherwise performing Work required by the Contract Documents. Where the Specifications require the installation by a Specialist, that term shall also be deemed to mean either the manufacturer of the items, a person, partnership, firm, or corporation licensed by the manufacturer, or a person, partnership, firm, or corporation who will perform the Work under the manufacturer's direct supervision.
53. *Construction Manager*: Person or entity designated by the Owner to provide construction management services for the Project with duties, responsibilities, and limitations of the Engineer, unless stipulated otherwise. Synonymous with and having same meaning as Resident Project Representative.
54. *Equipment*:
 - a) Construction: All machinery and equipment, together with the necessary supplies for upkeep and maintenance, including tools and apparatus necessary for the proper construction and acceptable completion of the Work contemplated.
 - b) Installation: All material or articles used in equipping a facility or apparatus required to fulfill a functional design.
55. *Geotechnical Data Report (“GDR”)*: The factual report that collects and presents data regarding actual subsurface conditions at or adjacent to the Site, including Technical Data and other geotechnical data, prepared by or for Owner. The GDR's content may include logs of borings, trenches, and other site investigations, recorded measurements of subsurface water levels, the results of field and laboratory testing, and descriptions of the investigative and testing programs. The GDR does not include an interpretation of the data. If opinions, or interpretive or speculative non-factual comments or statements appear in a document that is labeled a GDR, such opinions,

comments, or statements are not operative parts of the GDR and do not have contractual standing. Subject to that exception, the GDR is a Contract Document.

- 56. ORS: Oregon Revised Statutes.
- 57. OAR: Oregon Administrative Rules.
- 58. Float: The number of days an activity can be delayed beyond its scheduled completion without delaying a succeeding or related activity or restricting the schedule of a preceding activity in the construction schedule.

ARTICLE 2—PRELIMINARY MATTERS

2.01 Delivery of Bonds and Evidence of Insurance

SC-2.01 Delete Paragraphs 2.01.B. and C. in their entirety and insert the following in their place:

- B. *Evidence of Contractor's Insurance:* When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner copies of the policies (including all endorsements, and identification of applicable self-insured retentions and deductibles) of insurance required to be provided by Contractor in this Contract. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- C. *Public Works Bond:* Before starting any work on the Project, Contractor and every Subcontractor performing work on the Project must have a public works bond filed with the Oregon Construction Contractors Board, as required by ORS 279C.830 and 279C.836, unless exempt under those provisions. Contractor must require that the Subcontractor have a public works bond filed with the Construction Contractors Board before starting work on the Project unless exempt under ORS 279C.836. Contractor shall include copies of both its public works bond and the public works bonds from its Subcontractors in the copies of the bonds required in Paragraph 2.01.A above. See SC-6.01.A for additional requirements related to the public works bond.

2.02 Copies of Documents

SC-2.02 Delete the first sentence of Paragraph 2.02.A in its entirety and replace with the following:

If requested, Owner shall furnish to Contractor up to four copies of the conformed Contract Documents (Specifications and half size Drawings and two copies of full-size Drawings) incorporating and integrating all Addenda and any amendments negotiated prior to the Effective Date of the Contract (including one fully executed counterpart of the Agreement) and one copy in electronic portable document format (PDF).

2.03 Before Starting Construction

SC-2.03 Add new paragraph immediately following Paragraph 2.03.A.3:

- 4. a preliminary schedule of payments showing projected cash flow.

SC-2.03 Add new paragraphs immediately following Paragraph 2.03.A:

- B. Before any Work at the Site is started, Contractor shall prepare and submit a written plan for the Project-specific safety precautions and programs. The safety plan shall identify Contractor's process for ensuring that safety is the highest priority on the Project and will be

complete with respect to procedures and actions that Contractor intends for Contractor and all others as provided in Paragraphs 7.13 and as required by all applicable Laws and Regulations. The submittal shall include a statement that the Contractor is solely responsible for safety on the Project, that it will conduct its operations in accordance with all applicable safety standards and requirements, and that it will continually review its operations to ensure that safe conditions are provided at all times. Contractor's plan for safety precautions and programs shall have been approved and endorsed by Contractor's designated safety representative required in Paragraph 7.13.B. Delivery of this plan will in no way reduce or obviate Contractor's obligation to comply with the safety obligations set forth in Section 7.13 of the General Conditions.

- C. *Contractor Drug Testing Program*: Before any Work at the site is started, Contractor shall provide evidence that it has an employee drug testing program in place that is administered and enforced by the Contractor in accordance with ORS 279C.505.
- D. Before any Work at the Site is started, Contractor shall prepare and submit a plan describing its Workplace Harassment Prevention Program. The program shall ensure all workers, regardless of their identity or status, are guaranteed a safe and respectful work environment. This applies, but is not limited to, a worker's race, ethnicity, color, national origin, gender identity, gender expression, sex, sexual orientation, religion, marital or familial status, age, mental or physical disability (as defined by the American's with Disabilities Act and Oregon state law), former incarceration, immigrant status, or veteran status.
 - 1. The program shall include in-person/virtual training for workers of all ranks and meaningful policies including procedures for aggrieved workers in need of recourse.
 - 2. Contractor shall post on the jobsite and make available a notice that rights of workers on the site include:
 - a. Participation in positive jobsite training.
 - b. Copies of policies about hate, intimidation or harassment including how to report and how to receive support. Contractor must provide these materials in languages inclusive of the workforce.
 - c. Contractor shall investigate incidents involving bullying or harassment in a prompt, thorough, and impartial manner.
- E. Contractor shall assume responsibility for every aspect of providing a safe and respectful workplace on the jobsite, including a safe and respectful workplace for and by Subcontractors, suppliers and other persons on the jobsite.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

SC-2.04 Add the following to the end of Paragraph 2.04.A:

The preconstruction conference will be scheduled by Contractor within five (5) days of the Notice to Proceed or as otherwise agreed to by the parties.

2.05 *Acceptance of Schedules*

SC-2.05 Add the following to the end of Paragraph 2.05.A:

5. Contractor's schedule of payments will be acceptable if it provides a reasonable projection of payments in relationship to the Progress Schedule and Schedule of Values.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

SC 3.01 Add the following to the end of Paragraph 3.01.A:

However, in the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following descending order of precedence:

1. Permits from outside agencies;
2. The Agreement including exhibits, and addenda and any amendments thereto, with those of later date having precedence over those of an earlier date;
3. Supplementary General Conditions;
4. Standard General Conditions of the Construction Contract, Engineers Joint Contract Documents Committee (EJCDC) 2018;
5. Specifications – Division 01;
6. Specifications – Divisions 02 - 49;
7. Drawings;
8. Design Details: Figure dimensions, and dimensions that can be computed, on plans shall take precedence over scale dimensions. The Drawings with the higher level of detail take precedence over less detailed Drawings.

Change Orders, Work Change Directives, Field Orders, Engineer's written interpretation and clarifications and Notice to Proceed, in precedence listed, will take precedence over all other Contract Document components referenced herein.

SC 3.01 Add the following paragraph immediately after Paragraph 3.01.G:

- H. Sections of Division 01, General Requirements, govern the execution of the Work of all sections of the Specifications.

3.03 *Reporting and Resolving Discrepancies*

SC 3.03 Delete Paragraph 3.03.B.1 in its entirety and replace with the following:

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and the provision of any standard specification, manual, reference standard, or code,

or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document).

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 Commencement of Contract Times; Notice to Proceed

SC 4.01 Delete the third sentence of Paragraph 4.01.A in its entirety.

4.04 Progress Schedule

SC 4.04 Add the following subparagraph immediately after Paragraph 4.04.A.2:

3. If, in the opinion of Engineer, Contractor falls behind the accepted Construction Schedule due to actions or neglect of Contractor or Contractor's agents, servants, employees, officers, Subcontractors, directors, or any party contracting to perform part or all of the Work or to supply any equipment or materials, Contractor shall take steps, including, but not limited to, increasing the number of personnel, shifts, and/or overtime operations, days of work, and/or amount of construction equipment until such time as the Work is back on schedule. Contractor shall also submit for review no later than the time of submittal of the next request for partial payment, such supplementary schedule or schedules as may be necessary to demonstrate the manner in which the acceptable rate of progress will be regained, all without additional cost to Owner.

ARTICLE 5—SITE, SUBSURFACE AND PHYSICAL CONDITIONS, HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 Availability of Lands

SC 5.01 Delete Paragraph 5.01.B in its entirety.

SC 5.01 Add the following paragraph immediately after Paragraph 5.01.c:

- D. Any work performed in public rights-of-way, in addition to conforming to the Contract Documents, shall be done in accordance with the requirements of the permit issued by the public agency in whose right-of-way the Work is located.

5.02 Use of Site and Other Areas

SC 5.02 Delete subparagraph 5.02.A.2 in its entirety and replace with the following:

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claims as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify Owner, Clackamas County and their officers, elected officials, directors, employees, agents, consultants, and subcontractors from and against any such claim, and against all costs (including attorney's fees), losses and damages arising out of or relating to any claim or action, legal or equitable, brought by any such owner

or occupant against Owner or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

5.03 *Subsurface and Physical Conditions*

SC-5.03 Add the following new paragraphs immediately after Paragraph 5.03.D:

- E. The following table lists the reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data, and specifically identifies the Technical Data in the report upon which Contractor may rely:

Report Title	Date of Report	Technical Data
None known to Owner		

- F. The following table lists the drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data, and specifically identifies the Technical Data upon which Contractor may rely:

Drawings Title	Date of Drawings	Technical Data
Kellogg Creek Water Pollution Control Plant (Original Plant Construction); CH2MHill	1974	None known to Owner
Kellogg Creek WRRF Improvements (Select Drawings); Brown and Caldwell	2018	None known to Owner

- G. Contractor may request copies from Engineer of reports and drawings identified in SC-5.03.E and SC-5.03.F that were not included with the Bidding Documents.

5.06 *Hazardous Environmental Conditions*

SC-5.06 Add the following new paragraphs immediately after Paragraph 5.06.A.3:

- 4. The following table lists the reports known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and the Technical Data (if any) upon which Contractor may rely:

Report Title	Date of Report	Technical Data
None known to Owner		

- 5. The following table lists the drawings known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and Technical Data (if any) contained in such Drawings upon which Contractor may rely:

Drawings Title	Date of Drawings	Technical Data
None known to Owner		

SC-5.06 Delete Paragraph 5.06.I and 506.J in their entirety and replace with the following:

- I. Subject to the limitations of the Oregon Constitution and the Oregon Tort Claims Act, Owner shall indemnify Contractor, and its officers, employees, and agents from and against all claims, costs losses and damages arising out of or relating to a Hazardous Environmental

Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work; and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify Owner and Clackamas County and their officers, elected officials, directors, employees, agents, consultants, and subcontractors from and against all claims, costs (including attorney's fees), losses, and damages arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

ARTICLE 6—BONDS AND INSURANCE

6.01 Performance, Payment, and Other Bonds

SC-6.01 Add the following paragraphs immediately after Paragraph 6.01.C:

The Contractor will submit the performance bond and payment bond on forms provided by the Owner.

SC-6.01 Delete Paragraph 6.01.B in its entirety and replace with the following:

- B. Before starting any work on the Project, the Contractor shall file with the Oregon 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. Contractor shall include copies of both its public works bond and the public works bonds from its Subcontractors in the copies of the bonds required in Paragraph 2.01.A above.

These bonds shall remain in effect until one year after date of final completion of the Project and acceptance by the Owner, except as provided otherwise by Laws or Regulations or by the Contract Documents.

SC-6.01 Add the following phrase to Paragraph 6.01.C after the word "Treasury":

or otherwise acceptable to Owner.

SC-6.01 Add the following sentence to the end of Paragraph 6.01.C:

The performance bond shall include, in part, provisions to indemnify Owner, and its officers, directors, elected officials, agents, and employees.

6.02 Insurance—General Provisions

SC-6.02 Delete paragraph 6.02.B. in its entirety and replace with the following:

- B. 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 Agreement. The certificate(s) will specify all of the parties who are additional insureds or loss payees for the Agreement, identified in SC-6.02.C. A renewal certificate shall be sent to Owner at least 10 days prior to coverage expiration.

Insurance coverage required under the Agreement 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. All companies that provide policies required under this Contract shall have a rating of not less than A-X in the most current edition of Best's Rating Guide, in addition to any other requirements specified herein. The Contractor shall be financially responsible for all deductibles, self-insured retentions and/or self-insurance 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.

SC-6.02 Add the following to the end of Paragraph 6.02.D:

The general liability insurance coverage, automobile liability, umbrella, and pollution liability if required, shall include the Owner (Water Environment Services), Clackamas County and Engineer (Jacobs Engineering Group, Inc.) as additional insureds, but only with respect to the Contractor's activities to be performed under the Contract Documents. 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 "Water Environment Services and Clackamas County, together with their elected officials, agents, officers, and employees" as scheduled insureds.

If Contractor cannot obtain an insurer to name the Owner and Engineer 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 and Engineer as additional insureds with not less than a \$4,000,000 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 Agreement.

SC-6.02 Delete all language in Paragraphs 6.02.E, I, and K and replace each with the word "Reserved."

SC-6.02 Delete from Paragraph 6.02.N "10 days" and replace with "60 days"

SC-6.02 Add the following new paragraphs in order after Paragraph 6.02.N.

- O. Compliance. Failure of the Contractor to fully comply with these requirements will be considered a material breach of Contract and shall be cause for immediate termination of the Contract at the option of Owner.

- P. 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 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 section, 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.
- Q. Upon Owner's approval, Contractor may obtain worker's compensation insurance from an insurance company that has not been rated by A.M. Best, provided that such company (a) is domiciled in the state in which the project is located, (b) is certified or authorized as a worker's compensation insurance provider by the appropriate state agency, and (c) has been accepted to provide worker's compensation insurance for similar projects by the state within the last 12 months.
- R. All insurance carried by Contractor under the Agreement shall be the primary coverage. The coverages indicated are minimums unless otherwise specified in the Contract Documents.

6.03 *Contractor's Insurance*

SC-6.03 Supplement Paragraph 6.03 with the following provisions after Paragraph 6.03.C:

- D. *Other Additional Insureds:* As a supplement to the provisions of Paragraph 6.03.C of the General Conditions, the commercial general liability, automobile liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies must include as additional insureds (in addition to Owner and Engineer) the following: None.
- E. *Workers' Compensation and Employer's Liability:* The Contractor is an independent contractor for purposes of the Oregon Workers' Compensation Law, as set forth in ORS Chapter 656 ("Workers' Comp Law") and is solely liable for any Workers' Compensation coverage under this Agreement. All employers, including Contractor, that employ subject workers who work under the Agreement 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 \$500,000 per accident for bodily injury or disease. 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. The Contractor will be solely responsible for payment of any local, state or federal taxes required as a result of these Contract Documents.

Workers' Compensation and Related Policies	Policy limits of not less than:
Workers' Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory
Employer's Liability	
Each accident	\$500,000

These Contract Documents are not intended to entitle the Contractor to any benefits generally granted to the District, officers, commissioners, agents or employees. Without limitation, but by way of illustration, the benefits not intended to be extended to the Contractor are vacation, holiday and sick leave, other leaves with pay, tenure, medical and dental coverage, life and disability insurance, overtime pay, Social Security, workers' compensation, unemployment compensation, or retirement benefits (except so far as benefits are required by law if the Contractor is presently a member of the Public Employees Retirement System).

- F. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:
1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,
 2. damages insured by reasonably available personal injury liability coverage, and
 3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- G. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage.
 - a. Such insurance must be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
 4. Underground, explosion, and collapse coverage.
 5. Personal injury coverage.

6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.
 7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 “Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured” or its equivalent.
- H. *Commercial General Liability—Excluded Content:* The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:
1. Any modification of the standard definition of “insured contract” (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
 2. Any exclusion for water intrusion or water damage.
 3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
 4. Any exclusion of coverage relating to earth subsidence or movement.
 5. Any exclusion for the insured’s vicarious liability, strict liability, or statutory liability (other than worker’s compensation).
 6. Any limitation or exclusion based on the nature of Contractor’s work.
 7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.
- I. *Commercial General Liability—Minimum Policy Limits*

Commercial General Liability	Policy limits of not less than:
General Aggregate	\$ 5,000,000
Products—Completed Operations Aggregate	\$ 2,000,000
Personal and Advertising Injury	\$ 1,000,000
Bodily Injury and Property Damage—Each Occurrence	\$ 4,000,000

- J. *Automobile Liability:* Contractor shall obtain, at Contractor's expense, and keep in effect during the term of the Agreement, 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 and its Subcontractors shall be responsible for ensuring that all non-owned vehicles maintain adequate Automobile Liability insurance while on Project Site. The Owner may adjust the Automobile Liability insurance amounts required under this provision at any time based upon institution specific risk assessments through the issuance of an amendment to the Agreement.

Automobile Liability	Policy limits of not less than:
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	\$ 2,000,000

- K. *Umbrella or Excess Liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	\$ 10,000,000
General Aggregate	\$ 10,000,000

- L. *Using Umbrella or Excess Liability Insurance to Meet CGL and Other Policy Limit Requirements:* Contractor may meet the policy limits specified for employer's liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policy's policy limits and partial attribution of the policy limits of an umbrella or excess liability policy that is at least as broad in coverage as that of the underlying policy, as specified herein. If such umbrella or excess liability policy was required under this Contract, at a specified minimum policy limit, such umbrella or excess policy must retain a minimum limit of \$3,000,000 after accounting for partial attribution of its limits to underlying policies, as allowed above.
- M. *Contractor's Pollution Liability Insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance must be maintained for no less than three years after final completion.

Contractor's Pollution Liability	Policy limits of not less than:
Each Occurrence/Claim	\$ 5,000,000
General Aggregate	\$ 10,000,000

- N. *Contractor's Professional Liability Insurance:* If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance must cover negligent acts, errors, or omissions in the performance of professional design or related services by the insured or others for whom the insured is legally liable. The insurance must be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. The retroactive date on the policy must pre-date the commencement of furnishing services on the Project.

Contractor's Professional Liability	Policy limits of not less than:
Each Claim	\$ 1,000,000

Contractor's Professional Liability	Policy limits of not less than:
Annual Aggregate	\$ 5,000,000

6.04 *Builder's Risk and Other Property Insurance*

SC-6.04 Supplement Paragraph 6.04 of the General Conditions with the following provisions:

F. *Builder's Risk Requirements:* The builder's risk insurance must:

1. be written on a builder's risk "all risk" policy form that at a minimum includes insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment stored and in transit, and must not exclude the coverage of the following risks: fire; windstorm; hail; flood; earthquake, volcanic activity, and other earth movement; lightning; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; and water damage (other than that caused by flood).
 - a. Such policy will include an exception that results in coverage for ensuing losses from physical damage or loss with respect to any defective workmanship, methods, design, or materials exclusions.
 - b. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake, volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance will be provided through other insurance policies acceptable to Owner and Contractor.
2. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
3. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of contractors, engineers, and architects).
4. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier). If this coverage is subject to a sublimit, such sublimit will be a minimum of \$100,000.
5. extend to cover damage or loss to insured property while in transit. If this coverage is subject to a sublimit, such sublimit will be a minimum of \$100,000.
6. allow for the waiver of the insurer's subrogation rights, as set forth in this Contract.

7. allow for partial occupancy or use by Owner by endorsement, and without cancellation or lapse of coverage.
8. include performance/hot testing and start-up, if applicable.
9. include as named insureds the Owner, Contractor, Subcontractors (of every tier), and any other individuals or entities required by this Contract to be insured under such builder's risk policy. For purposes of Paragraphs 6.04, 6.05, and 6.06 of the General Conditions, and this and all other corresponding Supplementary Conditions, the parties required to be insured will be referred to collectively as "insureds."

SC-6.04 Supplement Paragraph 6.04 of the General Conditions with the following provisions:

- G. *Coverage for Completion Delays:* The builder's risk policy will include, for the benefit of Owner, loss of revenue and soft cost coverage for losses arising from delays in completion that result from covered physical losses or damage. Such coverage will include, without limitation, fixed expenses and debt service for a minimum of 12 months with a maximum deductible of 30 days, plus engineering or other consultants' fees, if not otherwise covered.
- H. *Builder's Risk and Other Property Insurance Deductibles:* The purchaser of any required builder's risk, installation floater, or other property insurance will be responsible for costs not covered because of the application of a policy deductible.
 1. The builder's risk policy (or if applicable the installation floater) will be subject to a deductible amount of no more than \$50,000 for direct physical loss in any one occurrence, except the earthquake and flood deductible, which shall not exceed 2 percent of each loss or \$50,000, whichever is greater.
- I. A loss insured under the Builder's Risk insurance shall be 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 work directly with and settle a loss with insurers.

6.05 *Property Losses; Subrogation*

SC-6.05 Delete all language in Paragraphs 6.05.B and C and replace each with the word "Reserved."

6.06 *Receipt and Application of Property Insurance Proceeds*

SC-6.06 Delete Paragraph 6.06.A, B and C in their entirety and replace with the following paragraph:

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.02 *Supervision and Superintendence*

SC-7.02 Add the following immediately after the first sentence of Paragraph 7.02.B:

If a replacement is necessary, the replacement shall also be a competent resident superintendent and shall be subject to prior approval by Owner. The Contractor's superintendent shall be present at the Site at all times while Work is in progress and shall be available by phone for emergencies 24 hours per day, 7 days per week. If at any time the superintendent leaves the Project Site while Work is in progress, Owner and Engineer shall be notified and provided with the name of the Contractor's representative having responsible charge. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

7.03 *Labor; Working Hours*

SC-7.03 Add the following new subparagraphs immediately after Paragraph 7.03.C:

1. Regular working hours will be between 7:00 a.m. and 6:00 p.m. on weekdays, Monday through Friday, only. If change to these standard hours is desired, a written request must be placed with Owner and Engineer a minimum of five work days prior to the first day of altered hours.
2. Owner's legal holidays are:
 - New Year's Day (January 1)
 - Martin Luther King Jr. Day (third Monday in January)
 - President's Day (third Monday in February)
 - Memorial Day (last Monday in May)
 - Juneteenth National Independence Day (June 19)
 - Independence Day (July 4)
 - Labor Day (first Monday in September)
 - Veteran's Day (November 11)
 - Thanksgiving Day (fourth Thursday in November)
 - Christmas Day (December 25)

7.04 *Services, Materials, and Equipment*

SC-7.04 Add the following paragraphs immediately after Paragraph 7.04.C:

- D. Until Substantial Completion of the Work is acknowledged by Owner, Contractor shall have the responsible charge and care of the Work and of materials to be used herein, including materials for which Contractor has received partial payment or materials which have been furnished by Owner, and shall bear the risk of injury, loss, or damage to any part thereof by the action of the elements or from any other cause, whether arising from the execution of the Work or not.
- E. Contractor shall rebuild, repair, restore, and make good all injuries, losses, or damages to any portion of the Work or the materials occasioned by any cause before the Work's completion and acceptance and shall bear the expense thereof. Where necessary to protect the Work or materials from damage, Contractor shall, at Contractor's own expense, provide suitable drainage and erect such temporary structures or rent such structures as are necessary to protect the Work or materials from damage. The suspension of the Work

or the granting of an extension of time for any cause whatever shall not relieve Contractor of Contractor's responsibility for the Work and materials as specified herein.

- F. When the quality of a material, process, or article is not specifically set forth in the Contract Documents, the best available quality of the material, process, or article shall be provided.

7.06 *Substitutes*

- SC-7.06 Amend Paragraph 7.06.B by deleting the third sentence stating "Engineer will be the sole judge of acceptability."

7.07 *Concerning Subcontractors and Suppliers*

- SC-7.07 Add the following language directly following the last sentence of Paragraph 7.06.A:

Contractor shall perform with Contractor's own organization Work amounting to not less than 25 percent of the combined value of all items of the Work covered by the Contract.

- SC-7.07 Add the following new paragraphs immediately after Paragraph 7.07.M:

- N. Contractor shall ensure that any person entering into any subcontract to perform under the Contract is registered with the Secretary of State to do business in the State of Oregon, not prohibited from entering into a public contract by the Oregon Bureau of Labor and Industry, the Oregon Construction Contractors Board or Federal Excluded Party listings, and is a Responsible Proposer as defined by ORS 279C.
- O. Subcontractor Insurance: Unless a special type of insurance or special amount of coverage is required by the Owner for a specific subcontract or type of work, Contractor shall require all Subcontractors to provide and maintain insurance coverages with at least \$1,000,000/claim, \$2,000,000 aggregate for commercial general liability, \$500,000/claim for automobile liability, \$1,000,000/claim for professional liability (if applicable), and statutory limits for workers' compensation insurance. Contractor shall require certificates of insurance from all Subcontractors as evidence of coverage. Contractor shall provide copies of Subcontractor's certificates of insurance, if requested by Owner. This condition may be met through utilization of a Contractor Controlled Insurance Program.

7.08 *Patent Fees and Royalties*

- SC-7.08 Delete Paragraph 7.08.B and .C in their entirety and replace with the following:

- B. Subject to the limits of the Oregon Constitution, Owner shall indemnify Contractor, and its officers, employees, agents from and against all claims, costs (including attorney's fees), losses, and damages arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify Owner, Clackamas County and their officers, directors, elected officials, employees, agents, consultants and subcontractors of from and against all claims, costs (including attorney's fees), losses, and damages arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the

incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.09 *Permits*

SC-7.09 Add the following new paragraph immediately after Paragraph 7.09.A:

- B. Contractor will be responsible for obtaining all required permits and maintaining compliance with those permits throughout the course of the Work. Owner will pay the cost of obtaining all permits. The Contractor shall be responsible for any penalties or fines that result from Contractor's noncompliance with the terms of the permits.

7.11 *Laws and Regulations*

SC-7.11 Delete Paragraph 7.11.B in its entirety and replace with the following:

- B. If Contractor performs any Work or takes any other action knowing or having reason to know that is contrary to Laws and Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify Owner, Clackamas County, and their officers, directors, elected officials, employees, agents, consultants and subcontractors from and against all claims, costs (including attorney's fees), losses and damages arising out of or relating to such Work or other action. It is not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.

SC-7.11 Add the following new paragraph immediately after Paragraph 7.11.C:

- D. While not intended to be inclusive of all Laws or Regulations for which Contractor may be responsible under Paragraph 7.10, the following Laws or Regulations, as may be amended from time to time, are included as mandated by statute or for the convenience of Contractor:

1. Prevailing Wage Rates:

- a. 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 not less than the specified minimum hourly rate of wage, and shall include that requirements in all subcontracts.

PREVAILING WAGE RATES for Public Works Contracts in Oregon, January 1, 2022 which can be downloaded at the following web address:

http://www.oregon.gov/boli/whd/pwr/pages/pwr_state.aspx

- b. Owner will pay the Commissioner of the Bureau of Labor and Industries the fee required by ORS 279C.825.
- c. 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.

2. Discrimination: Contractor shall comply with all applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations, and:

- a. In accordance with ORS 279A.110, Contractor will 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 obtaining required subcontracts.

- b. Contractor shall maintain, in current and valid form, all licenses and certificates required by the applicable Laws, Regulations or the Contract when performing the work.
3. In accordance with ORS 279C.505, Contractor shall demonstrate to Owner that it has an employee drug testing program in place prior to commencement and at all times during the performance of the Work.
4. ORS 654.150 applies at the Construction Site. All costs incurred in complying with state statutes requiring sanitation facilities shall be borne by Contractor.
5. Payment by Contractor:
 - a. The Contractor shall promptly make full payment for labor, materials, supplies and provisions at such times as they become due and payable to all persons supplying the Contractor or their Subcontractor with labor, services, materials, supplies, or provisions for the prosecution of the Work provided for in the Contract. Contractor shall pay all contributions or amounts due the Industrial Accident Fund from such Contractor or Subcontractor incurred in the performance of the Work. The Contractor shall not permit any lien or claim to be filed or prosecuted against the Owner for or on account of any labor, services, materials, supplies, or provisions furnished. The Contractor shall pay to the Department of Revenue all sums withheld from employees pursuant to ORS 316.167.
 - b. In the event the Contractor fails, neglects, or refuses to make prompt and full payment of any claim for labor, services, materials, supplies or provisions furnished by any person in connection with the Work, whether the labor, services, materials, supplies, or provisions to be performed are furnished for the Contractor or for a Subcontractor, then and in such event, the Owner may withhold the amount of such claim by the person or persons furnishing such labor, services, materials, supplies, or provisions and deduct the amount of from funds due or to become due to the Contractor by reason of the Contract Documents. The deduction of any such amounts because of claims and the manner herein authorized will not, however, relieve the Contractor or his surety from their obligation with respect to any unpaid claims. Sums withheld for the purposes named herein will be paid to the Contractor upon certification that said claims have been paid. Notwithstanding the foregoing, Owner, in its discretion, may pay such claims and deduct or charge that amount of the payment against funds due or to become due the Contractor by reason of the Contract Documents.
 - c. If the Contractor or a first-tier Subcontractor fails, neglects or refuses to make payment to a party furnishing labor or materials in connection with the project within 30 days after receipt of payment from the Owner or Contractor, the Contractor or first-tier Subcontractor shall owe the party the amount due plus interest charges commencing at the end of the ten-day period that payment is due under ORS 279C.580(4) and any upon final payment unless payment is subject to a good-faith dispute as defined in ORS 279C.580. The rate of interest charge to the Contractor or first-tier Subcontractor and the amount due shall equal three times the discount rate on 90-day commercial paper in effect at the Federal Reserve Bank in the Federal Reserve District that includes Oregon on the date that is 30 days after the date when payment was received from the Owner or from the Contractor, but

the rate of interest shall not exceed 30 percent. The amount of interest may not be waived. Contractor shall incorporate this provision into all subcontracts.

- d. 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 Oregon Construction Contractor's Board unless payment is subject to a good-faith dispute as defined in ORS 279C.580. Resolution of such dispute and computation of amounts due plus interest and costs shall be as provided in that statute. Contractor shall incorporate this provision into any subcontract related to this project.
 - e. The payment of a claim in the manner authorized under this section shall not relieve the Contractor or the surety from any obligation with respect to any unpaid claims.
 - f. Contractor shall pay Subcontractor for satisfactory performance within ten days out of such amounts paid to Contractor by Owner, and shall at all times comply with ORS 279C.580, which is incorporated herein by reference.
 - g. The Contractor shall include in each subcontract for property or services entered into by the Contractor and a first-tier Subcontractor, including a materials 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 Contractor.
 - h. All employers, including Contractor, that employ subject workers who work under the Contract Documents in the State of Oregon shall comply with ORS 656.017 and provide the required Workers Compensation coverage, unless such employees are exempt under ORS 656.126. Contractor shall ensure that each of its subcontracts complies with these requirements.
 - i. 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.
6. Payroll Certification and Fee Requirements.
- a. In accordance with ORS 279C.845, the Contractor and every Subcontractor shall submit written certified statements to the Owner on the form prescribed by the Commissioner of 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 Documents, which certified and statement shall be verified by the oath of the Contractor or the Subcontractor 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 costs for

the prior week, including the name and address for 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 Subcontractor shall preserve the certified statements for a period of ten (10) years from the date of completion of the Work.

- b. Pursuant to ORS 279C.845(7), the Owner shall retain 25 percent of any amount earned by the Contractor, in addition to other retainage, on the Work until the Contractor has filed the certified statements required above. The Owner shall pay the Contractor the amount retained under this subsection within 14 business days after the Contractor files the required certified statements, regardless of whether a Subcontractor has failed to file certified statements.
 - c. 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 Subcontractor has filed with the Owner the certified statements required above. Before paying any amount required 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 has filed the certified statement, the Contractor shall pay the first-tier Subcontractor any amount retained under this subsection.
- 7 Subcontracts. Contractor shall include in each first-tier subcontract, and shall require that each first-tier Subcontractor include in each lower-tier subcontract; clauses for payments, interest penalties and conditions as required under ORS 279C.580, which is incorporated herein by reference. 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.
8. Environmental Pollution:
- a. In compliance with ORS 279C.525, lists of federal, state, and local agencies of which the Owner has knowledge that have enacted ordinances or regulations relating to environmental pollution and the preservation of natural resources that may affect the performance of the Contract are listed in the 2015 Oregon Department of Transportation Standard Specifications for Construction, Section 00170.01.
 - b. If Contractor is delayed or must undertake additional work by reason of existing regulation or ordinances of agencies not cited herein, or due to enactment of new or the amendment of existing statutes, ordinances or regulations occurring after the submission of the successful Proposal, Owner may grant a time extension, a reasonable adjustment in the Cost of Work by issuance of a Change Order setting forth the additional work that must be undertaken. Such Change Order, if any, shall not invalidate the Agreement and shall, as applicable, increase the Agreement price to compensate Contractor for all costs and expenses incurred, including overhead and profits, as reasonable compensation of any such delay or additional work.
9. In accordance with ORS 279C.510, Contractor shall salvage or recycle construction and demolition debris if feasible and cost effective.

10. Workers employed by Contractor shall not be able to collect for unpaid overtime unless a claim is filed in accordance with ORS 279C.545 with Contractor.
11. Person claiming not being paid in full for supplied labor or materials for performance of the Work has right to file notice of such claim. Notice shall be filed in accordance with ORS 279C.605.
12. As applicable, Contractor shall comply with Clackamas County Code and Water Environment Services Rules and Regulations.
13. Contractor agrees to comply with the following, as applicable and as may be amended from time to time: i) Title VI and VII of the Civil Rights Act of 1964; ii) Section 503 and 504 of the Rehabilitation Act of 1973; iii) the Health Insurance Portability and Accountability Act of 1996; iv) the Americans with Disabilities Act of 1990; v) ORS Chapter 659A; 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.
14. 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 952-001-0090. You may obtain copies of the rules by calling the center at (877) 668 4001.
15. Independent Contractor Status: The service or services performed under the Contract Documents 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.
16. 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 Agreement. Contractor will not be eligible for any benefits from these payments under the Agreement of federal Social Security, employment insurance, workers' compensation or the Public Employees' Retirement System, except as a self-employed individual. Unless 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.
17. Government Employment Status: The 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.
19. Failure to comply with any or all of the requirements of Section 7.11.D shall be a material breach of the Contract and constitute grounds for Contract termination. Any and all damages or costs resulting from such noncompliance shall be the responsibility of Contractor.

7.12 *Record Documents*

SC-7.12 Amend Paragraph 7.12.A by adding "and Owner" after the word "Engineer" in the third sentence.

7.13 *Safety and Protection*

SC-7.13 Add the following directly after the last sentence of Paragraph 7.13.E:

Contractor shall be aware that permit-required confined spaces exist in or near the Project Site. Entry to these spaces must be accomplished in compliance with the requirements of OAR 166-150-0190 (29 CFR 1910.146). Examples of permit-required confined spaces include but are not limited to the following:

- Open tanks beyond the handrails including clarifiers, aeration basins, channels, etc.
- Manholes.
- Flow control structures which have the potential to contain sewage.
- Enclosed tanks including digesters, clarifiers, grit basins, chemical tanks, etc.
- Wet well and dry wells of pump stations.
- Headworks channels.
- Electrical vaults.

The hazards associated with these confined spaces may include but are not limited to:

- Oxygen deficiency.
- Combustible vapors including methane.
- Slip hazards.
- Fall/retrieval hazard.
- Engulfment hazard.
- Lockout required of mechanical and electrical devices.
- Toxic or hazardous chemicals including hydrogen sulfide and process chemicals.
- Traffic hazards.
- Hot work and ignition sources.
- Potential for rapid changes in working conditions.
- Painting or coating application activities often pose temporary hazards.

Prior to beginning Work in permit-required confined spaces, Contractor shall provide Owner with a copy of Contractor's permit-required confined space entry plan/program including a copy of the permit forms that will be used by Contractor. Upon request by Contractor, Owner will review with Contractor, Owner's permit-required confined space program and specific procedures Owner would incorporate in spaces entered. Owner will coordinate any of its entries into the same spaces with Contractor. When the permit-required confined space Work is completed, Contractor shall inform Owner, in writing, of any hazards encountered or changes made resulting in different hazards within the space.

SC-7.13 Add the following new paragraphs immediately after Paragraph 7.13.J:

- K. Contractor shall revise Contractor's plan for safety precautions and programs at appropriate times to reflect changes in construction conditions, the Work, Contractor's means, methods, techniques, sequences, and procedures of construction. Contractor shall disseminate the original plan and revisions to all others indicated in Paragraphs 7.13.C.1.
- L. Contractor's plan for safety precautions and programs will not require more stringent safety requirements, training or other qualifications for all others than Contractor sets forth for comparable activity and responsibility of Contractor, Subcontractors and Suppliers and their respective employees.

7.15 *Emergencies*

SC-7.15 Amend Paragraph 7.15.A by adding the words “and Owner” immediately after the word “Engineer” in the second sentence.

7.17 *Contractor’s General Warranty and Guarantee*

SC-7.17 Add the following new paragraph after Paragraph 7.17.D.9:

10. any acceptance by Owner or any failure to do so.

SC-7.17 Add the following new paragraph after Paragraph 7.17.E:

- F. Contractor shall warrant the Work to be free of defects in materials and workmanship for a period of one year from the date of Substantial Completion by the Owner. The Contractor shall correct defective Work during the warranty period as described in the General Conditions.

7.18 *Indemnification*

SC-7.18 Delete Paragraph 7.18.A in its entirety and replace with the following:

- A. 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.

To the fullest extent permitted by law, Contractor shall indemnify and defend (with counsel approved by Owner) the Owner, Clackamas County, and their elected officials, officers, directors, agents, and employees (collectively "Indemnitees") from and against all liabilities, damages, losses, claims, expenses (including attorney’s fees), 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; (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.

In addition, Contractor shall indemnify the Owner, Clackamas County, and their elected officials, officers, directors, agents, and employees from and against any and all actions, claims, fines, costs or damages incurred by Owner as a result of a violation of the Owner’s National Pollutant Discharge Elimination System Permit, where such violations are the result of the acts or omissions of Contractor, Contractor’s agents, or anyone with whom Contractor has a right to control. The Owner may withhold from any payments owed to the Contractor the amount of such fines, and a Change Order shall be issued to reflect any such reduction.

However, neither Contractor nor any attorney engaged by Contractor shall defend the claim in the name of Owner or Clackamas County ("County"), purport to act as legal representative of Owner or County, nor settle any claim on behalf of Owner or County without the prior approval of the Clackamas County Counsel's Office. Owner or County may assume their own defense and settlement at their election and expense.

SC-7.18 Amend paragraph 7.18.B by removing "or Engineer" from the first sentence.

ARTICLE 8—OTHER WORK AT THE SITE

8.02 Coordination

SC-8.02 Add the following new Paragraph 8.02.C immediately after Paragraph 8.02.B:

- C. Other work anticipated to be performed at the Site by others that is not related to but coincides with the scheduled performance of the Work under these Contract Documents is described in Section 01 31 13, Project Coordination.

8.03 Legal Relationships

SC-8.03 Amend Paragraph 8.03.C by deleting both uses of the word "Engineer" from the first sentence.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.02 Replacement of Engineer

SC-9.02 Amend Paragraph 9.02.A by deleting the words "provided Contractor makes no reasonable objection to the replacement engineer."

9.05 Lands and Easements; Reports, Tests, and Drawings

SC-9.05 Delete Paragraph 9.05.C in its entirety and replace with the following:

- D. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site relating to existing surface or subsurface structures at the Site that have been utilized by Engineer in preparing the Contract Documents.

9.11 Evidence of Financial Arrangements

SC-9.11 Delete Paragraph 9.11.A in its entirety and replace with the following:

- A. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.03 Resident Project Representative

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.B:

- C. Resident Project Representative (RPR) will be furnished by the Engineer. The responsibilities, authority, and limitations of the RPR are limited to those of Engineer in accordance with Paragraph 10.08 and as set forth elsewhere in the Contract Documents and are further limited and described below. The RPR will:
1. *Schedules*: Review and monitor Progress Schedule, Schedule of Submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.
 2. *Conferences and Meetings*: Conduct or attend meetings with Contractor, such as preconstruction conferences, progress meetings, Work conferences and other Project related meetings.
 3. *Liaison*
 - a. Serve as Engineer's liaison with Contractor, working principally through Contractor's authorized representative, and assist in understanding the intent of the Contract Documents;
 - b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's onsite operations;
 - c. Assist in obtaining from Owner additional details or information when required for proper execution of the Work.
 4. *Interpretation of Contract Documents*: Inform Engineer and Owner when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor technical clarifications and interpretations as issued by Engineer, or non-technical clarifications and interpretations of the Contract Documents issued by Owner.
 5. *Submittals*: Receive submittals that are furnished at the Site by Contractor, and notify Engineer of availability for examination. Advise Engineer and Contractor of the commencement of any Work or arrival of materials and equipment at Site, when recognized, requiring a Shop Drawing or Sample if the submittal has not been approved by Engineer.
 6. *Modifications*: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and provide recommendations to Engineer; transmit to Contractor, in writing decisions as issued by Engineer.
 7. *Review of Work and Rejection of Defective Work*:
 - a. Conduct onsite observations of the Work in progress to assist Engineer in determining if the Work is, in general, proceeding in accordance with the Contract Documents.
 - b. Inform Engineer and Contractor whenever RPR believes that any Work is defective.
 - c. Advise Engineer whenever RPR believes that any Work will not produce a completed Project that conforms generally to the Contract Documents or will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, whenever RPR believes

Work should be uncovered for observation, or requires special testing, inspection, or approval.

- d. Monitor to ensure that tests, equipment and systems startups and operating and maintenance training are conducted in the presence of appropriate personnel, and that Contractor maintains adequate records thereof.
- e. Observe, record and report to Engineer appropriate details relative to the test procedures and startups.
- f. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the results of these inspections and report to the Engineer.

8. *Inspections, Tests, and System Startups:*

- a. Verify tests, equipment and systems startups and operating and maintenance training are conducted in the presence of appropriate personnel, and that Contractor maintains adequate records thereof.
- b. Observe, record, and report to Engineer appropriate details relative to the test procedures and system startups.
- c. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the results of these inspections, and report to Engineer.

9. *Records:*

- a. Maintain at the Site files for correspondence, conference records, Submittals including Shop Drawings and Samples, reproductions of original Contract Documents including all Addenda, the signed Agreement, Written Amendments, Work Change Directives, Change Orders, Field Orders, additional Drawings issued after the Effective Date of the Agreement, Engineer's written clarifications and interpretations, progress reports, and other Project related documents.
- b. Keep a record of pertinent Site conditions, activities, decisions and events.

10. *Reports:*

- a. Furnish Engineer periodic reports of progress of the Work and of Contractor's compliance with the Progress Schedule and Schedule of Submittals.
- b. Consult with Engineer in advance of scheduled major tests, inspections or start of important phases of the Work.
- c. Assist in drafting proposed Change Orders, Work Change Directives, and Field Orders, and obtain backup material from Contractor as appropriate.

11. *Payment Requests:* Review Applications for Payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

12. *Certificates, Operation and Maintenance Manuals:* During the course of the Work, verify materials and equipment certificates and operation and maintenance manuals

and other data required by Specifications to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and ensure these documents have been delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.

13. *Substantial Completion:*

- a. Conduct an inspection in the company of Engineer, Owner, and Contractor and prepare a list of items to be completed or corrected.
- b. Submit to Engineer a list of observed items requiring completion or correction.

14. *Final Completion:*

- a. Conduct final inspection in the company of Engineer, Owner, and Contractor.
- b. Notify Contractor and Engineer in writing of all particulars in which this inspection reveals that the Work is incomplete or defective.
- c. Observe that all items on final list have been completed, corrected, or accepted by Owner and make recommendations to Engineer concerning acceptance.

D. The RPR will not:

1. Have authority to authorize a deviation from Contract Documents or substitution of materials or equipment, unless authorized by Owner.
2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.
3. Undertake any of the responsibilities of Contractor, Subcontractors, Suppliers, or or Contractor's authorized representative.
4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction, unless such advice or directions are specifically required by the Contract Documents.
5. Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Owner.
7. Accept shop drawings or samples from anyone other than Contractor.
8. Authorize Owner to occupy the Project in whole or in part.
9. Take an action that would affect Owner's obligations related to scope or schedule of the Work.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

SC-10.06 Delete the last sentence of Paragraph 10.06.A and replace it with the following:

In rendering such decisions and judgments, Engineer will not show partiality to the Owner or Contractor. If a dispute, matter for interpretation or need for judgment arises that includes allegations against the Engineer, then the Engineer shall not be the party deciding that matter.

10.07 *Limitations on Engineer's Authority and Responsibilities*

SC-10.07 Add the following new paragraph immediately after Paragraph 10.07.E:

- F. Only the Owner has the authority to authorize modifications of the Contract Documents, additional Work, or changes the Contract Time or Contract Price.

ARTICLE 11—CHANGES TO THE CONTRACT

11.02 Change Orders

SC-11.02 Delete Paragraph 11.02.B in its entirety.

11.07 Change of Contract Price

SC-11.07 Amend Paragraph 11.07.C.2.a by replacing “15” with “10”.

SC-11.07 Amend Paragraph 11.07.C.2.c by replacing “15” with “10”.

SC-11.07 Add the following new paragraph immediately after Paragraph 11.07.C:

- E. In the event Contractor submits request for additional compensation as a result of a change or differing Site conditions, or as a result of delays, acceleration, or loss of productivity, Owner reserves right, upon written request, to audit and inspect Contractor’s books and records relating to the Project. Upon written request for an audit, Contractor shall make its books and records available within 14 days of request. Owner shall specifically designate the identity of the auditor. As part of audit, Contractor shall make available its books and records relating to the Project, including, but not limited to, Bidding Documents, cost reports, payroll records, material invoices, subcontracts, purchase orders, daily timesheets, and daily diaries. Audit shall be limited to those cost items that are sought by Contractor in a Change Order or Claim submission to Owner.

11.08 Change of Contract Times

SC-11.08 Add the following to Paragraph 11.08.B:

All requests for time extensions shall be supported by Schedule analysis showing the effect on the entire Project taking into account concurrent Work and the critical path, including Float. Partial demonstration of impact on particular operations only will not be acceptable to show the criticality of any event on the Project Schedule as a whole.

SC-11.08 Add the following new paragraphs immediately following Paragraph 11.08.B:

- C. *Use of Float:*
 1. A claim for an adjustment of Contract Times (or Milestones), otherwise allowable under the Contract Documents, shall be granted only when the time lost or gained exceeds the float for the activity at the time of the event giving rise to the claim. Float is jointly owned by both Owner and Contractor, whether expressly disclosed or implied in any manner.
 2. Contractor shall not use Float suppression techniques (including, but not limited to, preferential sequencing caused by late starts of follow-up trades, unreasonably small crews, extended durations, or imposed dates) in information provided to Owner or Engineer.

ARTICLE 12—CLAIMS

12.01 Claims

SC-12.01 Delete Paragraph 12.01.A.1 in its entirety and replace with the following:

1. Appeals by the Contractor of Owner's decisions regarding Change Proposals;

SC-12.01 Add the following language to the end of the sentence in Paragraph 12.01.D.3:

“for disputes involving the Owner and Contractor.”

ARTICLE 13—COST OF WORK; ALLOWANCES, UNIT PRICE WORK

13.01 Cost of the Work

SC-13.01 Amend Paragraph 13.01.B.1 by deleting the third sentence and replacing it with the following language:

Labor costs for employees in the direct employ of Contractor in the performance of the Work will be the actual cost for wages in accordance with the Oregon BOLI Prevailing Wage Rates for Public Works Contracts in Oregon (see SC-7.10.D.1.a for specific BOLI publication) for each craft or type of workers performing the Work at the time the Work is done, plus BOLI's established Fringe Rate for employer payments of payroll taxes, worker compensation insurance, liability insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State or local laws, as well as assessments or benefits required by lawful collective bargaining agreements. Labor costs for equipment operators and helpers will be paid only when such costs are not included in the invoice for equipment rental. The labor costs for foremen and superintendents shall be proportioned to all of their assigned Work and only that applicable to extra Work shall be paid.

SC-13.01 In Paragraph 13.01.B.4, delete the word “special” and replace with the word “technical,” and delete the parenthetical phrase “(including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants)” in its entirety.

SC-13.01 Delete Paragraph 13.01.B.5.c in its entirety and replace with the following:

- c. Rentals of construction equipment at the rental rate listed for such equipment specified in the current edition of the “Contractor's Equipment Cost Guide” as published by Equipment Watch (www.equipmentwatch.com), telephone number 800/699-3282, or from rate sheets from local rental companies. Such rental rate will be used to compute payments for equipment whether the equipment is under the Contractor's control through direct ownership, leasing, renting, or another method of acquisition. The rental rate to be applied for use of each item of equipment will be the rate resulting in the least total cost to the Owner for the total period of use. If it is deemed necessary by the Contractor to use the equipment not listed by the references specified herein, an equitable rental rate for the equipment will be established by the Engineer. The Contractor may furnish cost data which might assist the Engineer in the establishment of the rental rate. Payment shall be subject to the following:

- 1) Payment for equipment which is already on the Project Site and which is used in the completion of Work will not be allowed;

- 2) All equipment shall, in the opinion of the Engineer, be in good working condition and suitable for the purpose for which the equipment is to be used;
- 3) Before construction equipment is used on the extra Work, the Contractor shall plainly stencil or stamp an identifying number thereon at a conspicuous location, and shall furnish to the Engineer, in duplicate, a description of the equipment and its identifying number;
- 4) Unless otherwise specified, manufacturer's ratings and manufacturer approved modifications shall be used to classify equipment for the determination of applicable rental rates. Equipment which has no direct power unit shall be powered by a unit of at least minimum rating recommended by the manufacturer;
- 5) Individual pieces of equipment or tools having a replacement value of \$400 or less, whether or not consumed by use, will be considered to be small tools and no payment will be made therefore; and
- 6) Rental time will not be allowed while equipment is inoperative due to breakdowns.

The rental time to be paid for equipment at the Site will be the time the equipment is in productive operation on the Work being performed and, in addition, will include the time required to move the equipment to the location of the extra Work and return it to the original location or to another location; except, that moving time will not be paid if the equipment is used on other than the Work, even though located at the Site of the Work. Loading and transporting costs will be allowed, in lieu of moving time, when the equipment is moved by means other than its own power, except that no payment will be made for loading and transporting costs when the equipment is used at the Site of the Work on other than the Work related to the Change Order, Change proposal, Claim, set-off, or other adjustment in Contract Price. Rental time will not be allowed while equipment is inoperative due to breakdowns. The rental time of equipment on the Work Site will be computed subject to the following:

- 1) When hourly rates are listed, any part of an hour less than 30 minutes of operation will be considered to be one-half hour of operation, and any part of an hour in excess of 30 minutes will be considered 1 hour of operation;
- 2) When daily rates are listed, any part of a day less than 4 hours operation will be considered to be half-day of operation. When Owner -operated equipment is used to perform extra Work to be paid from on time and materials basis, the Contractor will be paid for the equipment and operator, as follows:
 - a) Payment for the equipment will be made in accordance with the provisions in Paragraph 13.01.B.5.c above;
 - b) Payment for the cost of labor and subsistence or travel allowance will be made at the rates established in Paragraph SC-13.01.B.1; and
 - c) The direct cost of equipment rental and labor, computed as provided herein, will be added the allowances for equipment rental and labor as provided in Section 00 72 00, General Conditions, Paragraph 13.01.D.

- SC-13.01 Add the following language to the end of Paragraph 13.01.B.5.h:
Express and courier services must be approved prior to use.
- SC-13.01 Supplement Paragraph 13.01.C.2 by adding the following sentence at the end of the existing language:
For purposes of this paragraph, “small tools and hand tools” means any tool or equipment whose current price if it were purchased new at retail would be less than \$500.
- SC-13.01 Amend Paragraph 13.01.E by deleting the word “three” in the third sentence and replacing it with “ten”.
- SC-13.01 Add the following to Paragraph 13.01.E:
Supporting data shall include but not be limited to daily submissions of timesheets indicating hours and trades worked, equipment and time equipment was employed, and materials expended. Also see SC-7.11.D.6.

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.

13.03 *Unit Price Work*

- SC-13.03 Delete Paragraph 13.03.E in its entirety.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.02 *Tests, Inspections, and Approvals*

- SC-14.02 Delete Paragraph 14.02.A in its entirety and replace with the following:
- A. Contractor shall notify Engineer 48 hours prior to the expected time for operations requiring inspection and laboratory testing services. Contractor shall cooperate with inspection and testing personnel and furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.
- SC-14.02 Add the following to the end of Paragraph 14.02.D:
Tests required by Contract Documents to be performed by Contractor that require test certificates be submitted to Owner or Engineer for acceptance shall be made by an independent testing laboratory or agency licensed or certified in accordance with Laws and Regulations and applicable state and local statutes. In the event state license or certification is not required, testing laboratories or agencies shall meet the following applicable requirements:
1. “Recommended Requirements for Independent Laboratory Qualification,” published by the American Council of Independent Laboratories.
 2. Basic requirements of ASTM E329, “Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction” as applicable.

3. Calibrate testing equipment at reasonable intervals by devices of accuracy traceable to either the National Bureau of Standards or accepted values of natural physical constants.

Prior to requesting a certificate of Substantial Completion, and allowing occupancy of facilities, Contractor shall provide an inspection by a state industrial safety representative, by an independent safety inspector certified by the state in the construction type being inspected, or a federal or state (OSHA) representative qualified in the construction type being inspected, to determine that the facilities provided are in compliance with the state and federal safety requirements. Signed copies of the inspection reports shall be submitted to the Engineer for Owner's files. Violations or deficiencies noted therein shall be resolved prior to occupancy of the facilities and before final payment will be made.

14.03 *Defective Work*

SC 14.03 Add the following language to Paragraph 14.07.C:

If the Owner is unable to use set-offs to recover the total amount owed under this provision, then Owner may use any and all available methods for recovering the remaining amounts from Contractor.

ARTICLE 15—PAYMENTS TO CONTRACTOR, SET OFFS; COMPLETIONS; CORRECTION PERIOD

15.01 *Progress Payments*

SC-15.01 Amend paragraph 15.01.A by adding the following after the last sentence:

The Owner will make progress payments in accordance with ORS 279C.570.

SC-15.01 Add the following subparagraphs after Paragraph 15.01.B.4:

5. **Stored Material and Equipment:** Payments for stored materials and equipment shall be based only upon the actual cost of the materials and equipment to Contractor and shall not include any overhead or profit to Contractor. Partial payments will not be made for undelivered materials or equipment.
6. **Schedule and Data:** During the progress of the Work, each Application for payment shall be accompanied by Contractors updated schedule of operations, or progress report, with Shop Drawings schedules, procurement schedules, and value of materials on had included in the application and other data specified in Section 01 33 00, Submittal Procedures, or reasonably required by Engineer.
7. Unless otherwise indicated in the Contract Documents, partial payment for Equipment shall be as follows:
 - a) 5 percent upon final approval of Shop Drawings by Engineer or Owner.
 - b) 55 percent upon delivery of goods.
 - c) 35 percent upon start-up and final acceptance by Engineer or Owner in accordance with Paragraph 15.04.
 - d) 5 percent upon delivery of operations and maintenance manuals.
8. Total price for mobilization shall not exceed 1.0 percent of the Contract Price. Total price for demobilization shall not be less than 2.0 percent of the Contract Price.

SC-15.01 Amend Paragraph 15.01.E.1 by adding the following at the end:
m. Any funds retained pursuant to SC-7.11.D.6, SC-7.18 and SC-15.03.B.

SC--15.01 Add the following new paragraph immediately after Paragraph 15.01.E:

- F. Subcontractor Payments. Contractor shall make payments to Subcontractors in accordance with SC-7.11.D.

15.03 *Substantial Completion*

SC-15.03. Amend Paragraph 15.03.A by adding the following:

Conditions precedent to Substantial Completion of the Work and Engineer's issuance of a Certificate of Substantial Completion shall include:

- a. Conformance with all training services requirements and deliverables.
- b. Submittal of current record documents to the Owner and Engineer.
- c. Submittals have been received and approved or accepted by Engineer including, but not limited to, the following:
 - i. Approved Shop Drawings;
 - ii. Electrical testing and wiring diagram;
 - iii. Equipment data forms;
 - iv. Manufacturer's certificates of proper installation;
 - v. Factory test reports;
 - vi. Commissioning, testing and startup reports;
 - vii. Final Operations and Maintenance Manuals;
 - viii. Extra materials (spare parts) (as specified).

SC-15.03 Add the following new subparagraph to Paragraph 15.03.B:

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, will be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under this Article 15.

15.06 *Final Payment*

SC-15.06 Add the following new paragraph immediately after Paragraph 15.06.A.2.e:

- f. In accordance with ORS 279A.120, when out of state Contractor is awarded a Contract, Contractor is required to report to the Department of Revenue the Contract Price, terms of payment, length of Contract, and other information as Department of Revenue

may require. Owner will verify Contractor has satisfied this requirement prior to issuing final payment.

15.07 *Waiver of Claims*

SC-15.07 Delete Paragraph 15.07.A in its entirety.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

SC-16.01 Amend Paragraph 16.01.A by adding the following language to the end of the third sentence:
“unless the cause for delay is due to the negligence of Contractor or anyone whom Contractor has the responsibility or right to control.”

16.02 *Owner May Terminate for Cause*

SC-16.02. Amend Paragraph 16.02.A by adding the following at the end of the sentence:
“in a manner consistent with ORS 279C.670.”

16.04 *Contractor May Stop Work or Terminate*

SC-16.04. Delete Paragraph 16.04 in its entirety.

ARTICLE 17—FINAL RESOLUTIONS OF DISPUTES

17.02 *Litigation*

SC-17.02 Add the following new paragraph immediately after Paragraph 17.01.

17.02 *Litigation*

- A. Any Claim between Owner and Contractor that arises from or relates to the Contract and that is not resolved through the Claims Review Process 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 Owner or Clackamas 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.

ARTICLE 18—MISCELLANEOUS

18.06 *Survival of Obligations*

SC-18.06. Amend Paragraph 18.06.A by adding the following directly after the last sentence:

All warranty and indemnification 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, shall survive final completion, final acceptance, or any termination of the Contract.

18.07 *Controlling Law*

SC-18.07 Delete Paragraph 18.07.A in its entirety and replace with the following:

- A. This Contract is governed by the laws of the State of Oregon without giving effect to the conflict of law provisions thereof.

18.11 *General Provisions*

SC-18.11 Add the following after Paragraph 18.10:

18.11 *General Provisions*

- A. 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.
- B. 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.
- C. 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.
- D. 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.
- E. 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.

EXHIBIT E
Specifications

CLACKAMAS WATER ENVIRONMENT SERVICES

MILWAUKIE, OREGON

CONTRACT DOCUMENTS

for the construction of the

KELLOGG CREEK WRRF
AERATION BASIN IMPROVEMENTS

WES Project No. P632314

JACOBS

Corvallis, Oregon

February 2022

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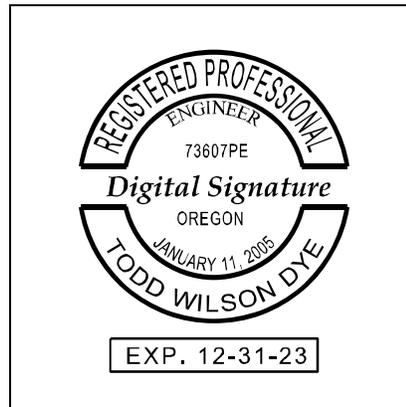
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Digitally Signed on

February 4, 2022

Todd Wilson Dye

KELLOGG CREEK WRRF
AERATION BASIN IMPROVEMENTS

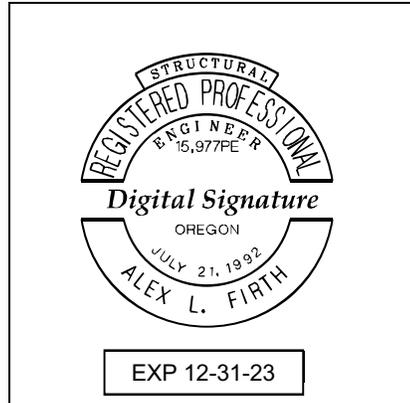
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February 4, 2022

Alex L. Firth

SPECIFICATIONS
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February 7, 2022
Morgan S. MacRostie

KELLOGG CREEK WRRF
AERATION BASIN IMPROVEMENTS

SPECIFICATIONS

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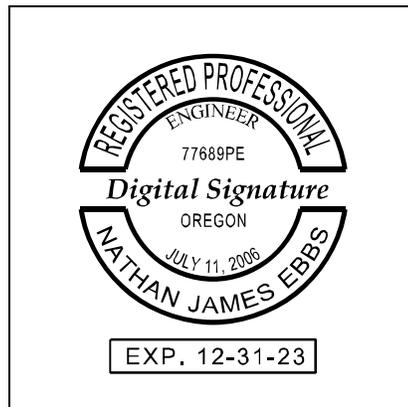
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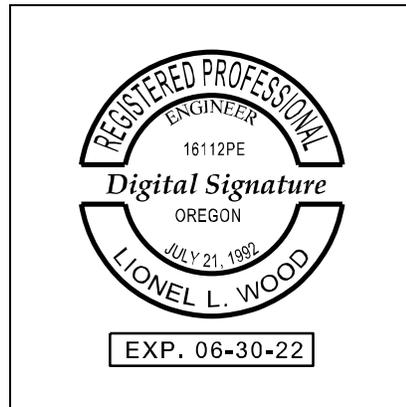
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Lionel L. Wood

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REFERENCE INFORMATION

END OF SECTION

SPECIFICATIONS

SECTION 01 11 00
SUMMARY OF WORK

PART 1 GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. The completed Work will provide Owner with construction of new facilities and modifications to existing facilities as follows:
1. Aeration Basins:
 - a. Repair cracks in existing concrete in aerations basins 1 through 4 and aeration basin influent channel.
 - b. Clean/repair/replace existing concrete joints and sealants in aeration basins 1 through 4 and aeration influent channel.
 - c. Repair substantial portions of existing aeration basin influent channel interior roof, walls and floor, by removing deteriorated concrete surface and providing new concrete repair products. Provide Contractor-designed bypass pumping system as specified to accommodate Work while maintaining minimum treatment capacity during construction.
 - d. Replace aeration basin influent channel hatch frames.
 - e. Repair aeration basin catwalk structural concrete.
 - f. Remove, clean, and re-seal sixteen existing weir opening covers.
 - g. Retain existing influent weir slide gates (WG-1 through WG-4) and provide remote OPEN/CLOSE capability and position feedback with existing Rotork actuators.
 - h. Replace main step feed gates in aeration basins 1 through 4, and provide electric actuators for each gate.
 - i. Replace step feed distribution Gate No. 3 in each basin and provide new electric actuator for each gate.
 - j. Provide and install one personnel davit base per basin and provide a single portable/shared mast/winch.
 - k. Replace W3 piping and spray nozzles.
 - l. Replace air header actuated control valves and provide new pneumatic actuators and associated air supply piping.
 - m. Modify existing RAS piping and add manual air vents at high points in existing RAS piping.
 - n. Replace existing PLC-2 with a new PLC in an existing panel through a phased sequence.
 - o. Replace thermal mass air flow meters at each aeration basin zone in basins 1 through 4.

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- p. Provide a radar level element/transmitter located in the common channel between aeration basins 3 and 4 to provide aeration basin level monitoring.
- q. Remove existing air flow meter and air flow control valve profibus equipment and replace with analog 4 mA to 20 mA.
- r. Replace DO probes and transmitters in aeration basins 1 through 4.
- s. Add air blast cleaning capability for new DO probes, including solenoids, fittings, air piping, and conduits.
- t. Provide electrical improvements as shown.

B. Alternates:

- 1. Only those alternates that were selected by the Owner, as evidenced in the Agreement, are made a part of this Contract.
- 2. Alternates that were Bid were as described below: None.

1.02 WORK NOT COVERED BY CONTRACT DOCUMENTS

- A. As shown.

1.03 PROVISIONS FOR FUTURE WORK

- A. Provisions for future construction are as shown.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 13
PROJECT COORDINATION

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational:

1. Work Sequence Plan: Submit within 30 days of Notice to Proceed.
2. Videotape survey, photographs, and other data of the preconstruction conditions shall be submitted to the Engineer for record purposes prior to, but not more than 3 weeks before, commencement of any construction activities.
3. A complete set of all photographs and survey data of the post-construction conditions shall be completed and submitted prior to final inspection by the Owner and Engineer.
4. Removal from Service Requests.
5. Temporary Power Plans.

1.02 RELATED WORK AT SITE

A. General:

1. Other work that is either directly or indirectly related to scheduled performance of the Work under these Contract Documents, listed henceforth, is anticipated to be performed at Site by others.
2. Coordinate the Work of these Contract Documents with work of others as specified in General Conditions.
3. Include sequencing constraints specified herein as a part of Progress Schedule.

B. Other Concurrent Work: The Owner and Owner's contractors are expected to be performing the following work during a period concurrent with the Work.

1. Influent Pump Station 2 and 4 Replacement Project.
2. Secondary Clarifier Rehabilitation Project.

C. Applications Software Development:

1. Engineer will perform programming of applications software for certain portions of Process Instrumentation and Control Subsystem (PICS).

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Refer to Section 40 90 00, Instrumentation and Control for Process Systems, for detailed information pertaining to Engineer programming.

- a. Sequencing: Include sequencing constraints specified herein as part of Progress Schedule.
 - b. Key activity for scheduling and coordination is the replacement of PLC-2. Allow a minimum of 60 days prior to scheduled PLC replacement for Engineer software development using Owner's spare PLC CPU. Include this activity in the project schedule.
2. Following Contractor completion of Function Test Part 1, specified in Section 40 90 00, Instrumentation and Control for Process Systems, allow 10 working days for Functional Test Part 2 for each PLC area.
- a. When applications software testing is delayed because of altered equipment interfaces, receipt of incorrect Shop Drawing information, failed equipment, or incomplete Functional Test Part 1 testing, duration of delay will be excluded from interruption allowance, unless notified otherwise by Engineer and Owner.

1.03 UTILITY NOTIFICATION AND COORDINATION

A. Coordinate the Work with various utilities within Project limits. Notify applicable utilities prior to commencing Work, if damage occurs, or if conflicts or emergencies arise during the Work.

1. Clackamas County Sheriff: (503) 655-8218.
2. Water Environment Services: (503) 742-4567.
3. Portland General Electric: (503) 228-6322.
4. Comcast: (800) 266-2278.
5. NW Natural: (503) 226-4211.
6. Qwest: (877) 348-9007.
7. Oregon Utility Notification Center: (800) 332-2344.

1.04 PROJECT MILESTONES

A. General: Include the Milestones specified herein as a part of the Progress Schedule required under Section 01 32 00, Construction Progress Documentation.

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B. Project Milestones:

1. Generally described in the Agreement Form. Following is a detailed description of each:

No.	Milestone	Substantial Completion (Calendars Days from Notice to Proceed)
1	Substantial Completion of Entire Contract	As specified in the Agreement
2	Final Completion of Entire Contract	As specified in the Agreement

1.05 EXISTING TREATMENT PLANT

- A. The Work shall be executed while the existing wastewater treatment facilities are in operation. Operation of the existing facility shall not be jeopardized nor shall the efficiency or volume of wastewater conveyance be reduced as a result of the execution of the Work. Impairing the operational capabilities of the treatment plant will result in serious environmental damage and monetary fines. Conduct work in a manner that will not impair the operational capabilities of essential elements of the treatment process or reduce the capacity of the entire treatment plant below levels sufficient to treat the quality of raw wastewater to the water quality limitations specified in the discharge permit. The status of the treatment plant shall be defined as “operational” when it is capable of treating the entire quantity of wastewater received to the water quality limits specified in the discharge permit.
- B. The construction sequence and constraints in this section do not include all items affecting the completion of the Work, but are intended to describe the sequence of critical events and associated constraints necessary to minimize disruption of the ongoing treatment plant processes and to ensure compliance with NPDES Permit requirements. It shall be understood and agreed by the Contractor that the critical events described are not all inclusive and that additional items of work not included may be required to minimize disruption and ensure compliance. Deviation from or modification of the suggested sequence is permitted if techniques and methods known to the Contractor will result in reducing disruption to the facility operation and maintaining treatment efficiency, avoiding violation of scheduling constraints, and if deviation is approved in advance by the Engineer.
- C. Maintain traffic on existing roads as specified in Section 01 50 00, Temporary Facilities and Controls.

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1.06 GENERAL WORK SEQUENCING CONSTRAINTS

- A. For the purposes of this Article General Work Sequencing Constraints, and the following Article Facility Operations and Work Sequence, terms, such as “...work...must be completed” and “...completed and in operation”, and “...in successful operation” are defined as meeting the terms of “Substantial Completion” and “Partial Substantial Completion” as defined in the General Conditions and Supplementary Conditions.
- B. Include the following work sequencing constraints in the Progress Schedule:
1. All aeration basins must remain in service from the period October 1 to May 31 annually.
 2. Work requiring aeration basins to be out of service, and all temporary bulkhead installations shall occur between June 1, and September 30 annually.
 3. A maximum of two aeration basins may be out of service at a time during the period between June 1 and September 30 annually.
 4. Air flow to in service aeration basins shall not be interrupted for a period longer than 30 minutes.
 5. Manual operation of blowers providing air flow to in service aeration basins shall not exceed a period of 8 hours. Periods of manual operation shall be scheduled for times when Owner’s Operations Personnel are present during their day shift.
 6. Provide and size pump(s) to transfer mixed liquor to or from an Aeration Basin to remove or return it to service within an 8 hour period. Wash down and clean the aeration basins and associated equipment as necessary to complete Work. Coordinate with Owner personnel on removal of aeration basins from service and return to service.
 7. Site civil work and plant utilities work will be conducted throughout the overall construction schedule, integrated into the project elements described above as specific areas of the Site are impacted.
 8. More detailed constraints are given in Article Facility Operations and Work Sequence below.
 9. Software Functional Testing (FT) of the Programmable Logic Controller (PLC) software is broken in to two parts and describe in Section 40 90 00, Instrumentation and Control for Process Systems:
 - a. FT Part 1 is performed by Contractor or PIC System Integrator without the PLC software. It is only considered complete when the entire facility is complete.
 - b. FT Part 2 can only commence after FT Part 1 is complete (per facility). FT Part 2 is performed by the Contractor or PIC System Integrator, as well as the Engineer with the PLC software.

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- c. Engineer's software programming requires up to 10 working days for FT Part 2 testing, Contractor shall allow 10 working days in their schedule for each unit process startup.

1.07 FACILITY OPERATIONS AND WORK SEQUENCE

- A. Continuous operation of Owner's facilities is of critical importance. Schedule and conduct activities to enable existing facilities to operate continuously, unless otherwise specified.
- B. Perform Work continuously during critical connections and changeovers, and as required to prevent interruption of Owner's operations.
- C. Provide safe access to Owner's existing facilities, including access for:
 - 1. Biosolids trucks.
 - 2. Chemical deliveries (including polymer, hypochlorite, and bisulfite).
 - 3. Fuel deliveries for generator re-fueling.
 - 4. Garbage pickup.
- D. When necessary, plan, design, and provide various temporary services, utilities, connections, temporary piping and heating, access, and similar items to maintain continuous operations of Owner's facility.
- E. Do not close pipes, open or close valves, or take other action which would affect the operation of existing systems, except as specifically required by the Contract Documents and after authorization by Owner and Engineer. Such authorization will be considered within 48 hours after receipt of Contractor's written request.
- F. Work Sequence:
 - 1. To meet the overall objectives of the Project, certain tasks and task elements should be generally performed, completed, or substantially completed in the herein-specified sequences. However, two or more of the tasks or task elements may be pursued simultaneously when consistent with the requirements specified herein; the requirements of Article Project Milestones, Article General Work Sequencing Constraints, Removal from Service (RFS) and Facility Shutdown, and the Project Schedule.
 - 2. The specified sequences and tasks are not all-inclusive. They are intended to convey overall constraints and suggested construction sequences. The Contractor shall plan the Work, relocate facilities, reroute utilities, and provide for temporary connections and terminations as necessary in an appropriate sequence of operation to perform the

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Work, while minimizing interferences with and providing for continuous operation of the Owner's existing wastewater facilities.

3. Task headings and descriptions set forth below are descriptive only and are not intended to define the scope of Work included therein.
4. Major tasks and sequences have been identified for the Owner's purposes. Although all Work is not listed herein, the tasks listed shall be understood to include all accompanying tasks such as, but not limited to, sitework, interconnecting utilities associated infrastructure, and applicable temporary provisions necessary to sequence the Work. Temporary provisions shall include pipeline endcaps, other utility terminations, and temporary utilities as necessary to allow operation of portions of the Work prior to completion of other portions of the Work, consistent with the Contractor's sequence of operations, although such provisions are not shown.
5. All existing Owner facilities shall remain in continuous operation except as specified herein.
6. Required Constraints and Suggested Task Sequencing:
 - a. Initial Sitework:
 - 1) Install erosion control measures.
 - 2) Install staging areas, separate Contractor entrance gates, and other site security measures.
 - 3) Relocate existing utilities as shown and specified.
 - b. Aeration Basin Improvements:
 - 1) Coordinate with Owner for removal from service.
 - 2) Install temporary, and quickly removable bulkheads in aeration basin influent channel to isolate and allow Contractor dewatering of channel.
 - 3) Install and commission temporary bypass pumping system as required to support primary influent channel rehabilitation.
 - 4) Transfer mixed liquor, dewater and wash down aeration basin.
 - 5) Demolish gates, piping, and other facilities as shown and specified.
 - 6) Clean and prepare concrete surfaces for rehabilitation.
 - 7) Perform crack repair, controlled concrete surface rehabilitation, concrete joint cleaning and resealing and weir opening plate cleaning and resealing. This structural repair Work may be performed as a separate aeration basin removal from service, or concurrently with mechanical, electrical, and I&C Work associated with the aeration basins, provided the aeration basins are returned to service within the timeframe provided herein.
 - 8) Install new gates, piping and pipe supports.

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- 9) Perform instrumentation and control upgrades, air header, and RAS piping improvements.
- 10) Perform Functional Testing Part 1 for all new equipment (see Section 40 90 00, Instrumentation and Control for Process Systems).
- 11) Provide support for Integrator of Record Software Testing and perform Functional Testing Part 2 (see Section 40 90 00, Instrumentation and Control for Process Systems).
 - a) The startup (including Functional Testing Part 2) of the aeration basins should be based on PLC program areas (listed below). An entire PLC program area shall be started up simultaneously (since these systems are tied together), but not at the same time as another area.
 - (1) Aeration Basin PLC-2 Area:
 - (a) Main influent gate and Step feed gate actuation.
 - (b) Air header actuated valves, pneumatic actuators, and thermal mass air flow meters.
 - (c) DO probes/transmitters and aeration basin level sensor.
 - b) Electrical and I&C Considerations for Aeration Basins and Related Facilities: Modifications of existing circuits require close coordination with Owner, documentation of removal from service request, and may require temporary power.
 - c) Once each aeration basin meets Substantial Completion requirements, the Owner will operate those facilities.
 - c. PLC-2 System Replacement:
 - 1) Take Aeration Basin 1 offline and do mechanical, electrical and I&C work. Aeration Basins 2, 3, and 4 are to remain continuously operable from existing PLC-2.
 - a) Install new valves, flow meters, flow conditioners, DO probes and DO transmitter.
 - b) Install new compressed air lines and solenoid valves.
 - c) Install new conduit as needed.
 - d) Install new power wiring.
 - e) Install new signal and control wiring back to PLC cabinet.
 - f) Install new terminals in PLC cabinet; terminate field wires for Aeration Basin 1 on new terminals. Existing

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- terminals for dissolved oxygen signals may be re-used.
- g) Test valves by simulating signals to, and from, new terminals with signal generating and testing equipment.
 - h) Document testing.
 - i) Aeration Basin 1 can be brought online for manual operation. Test flow and DO signals up to panel terminations.
- 2) Take Aeration Basin 2 offline and do mechanical, electrical and I&C work (this may be done partially or fully concurrent with Aeration Basin 1). Aeration Basins 3 and 4 remain operable from existing PLC.
- a) Same as Aeration Basin 1.
- 3) Remove existing power equipment in LCP-3 and install new PLC-2 Rack 0 hardware in existing panel LCP-3. Aeration Basins 1 and 2 may be operated manually during day shifts while this work is done. Keep existing PLC in operation for Aeration Basins 3 and 4.
- a) Remove existing power equipment and re-wire new power circuits.
 - b) Install new PLC Rack 0.
 - c) Install additional new terminals if and as needed for remainder of work, including for new gates.
 - d) Complete internal panel wiring for Rack 0.
 - e) Power up and test all PLC IO for Aeration Basins 1 and 2.
 - f) Test new PLC communications to existing plant wide SCADA/HMI.
 - g) Test software and HMI displays for Aeration Basins 1 and 2 in conjunction with the Owner and Engineer.
 - h) Test blower control.
 - i) Bring Aeration Basins 1 and 2 online running automatically from new PLC. Aeration Basins 3 and 4 will continue to operate from existing PLC.
 - j) Operate with the new PLC in service for a minimum of 48 hours before proceeding.
- 4) Take Aeration Basin 3 offline and do mechanical, electrical and I&C work. Aeration Basins 1 and 2 are operable from new PLC.
- a) Same as Aeration Basin 1.
 - b) Remove existing PLC.
 - c) Install new PLC Rack 1.
 - d) Complete internal panel wiring for Rack 1.

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- e) Power up and test all PLC IO for Aeration Basin 3.
 - f) Test software and HMI displays for Aeration Basin 3 in conjunction with the Owner and Engineer.
 - g) Aeration Basin 3 can be brought online for automatic operation from new PLC.
- 5) Take Aeration Basin 4 offline and do mechanical, electrical, and I&C work (this may be done partially or fully concurrent with Aeration Basin 3). Aeration Basins 1, 2, and 3 are operable from new PLC.
- a) Same as Aeration Basin 1.
 - b) Install new Level Transmitter.
 - c) Test all PLC IO for Aeration Basin 4.
 - d) Test software and HMI displays for Aeration Basin 4 in conjunction with the Owners Integrator of Record.
 - e) Aeration Basin 4 can be brought online for automatic operation from new PLC.
- 6) Complete any remaining work including testing and Performance Test requirements.
- d. Electrical Panels and Circuits: Replacement of corroded electrical cabinet, conduits, and circuits may occur at any time subject to other specified constraints.
- G. Site Electrical System: No work required outside of aeration basin facility.
- H. Removal from Service (RFS) and Facility Shutdown:
- 1. Unless indicated otherwise herein, removal from service (RFS) of existing treatment processes, facilities, or services (including connection of existing pipelines, electrical systems, or structures) shall be coordinated with the Owner and Engineer through a written RFS plan. RFS plans shall be submitted sufficiently in advance of the RFS period (minimum of 2 weeks) and in appropriate detail to be reviewed and approved in a dedicated meeting a minimum of 2 days prior to the requested RFS date. The RFS plan shall include the purpose, procedures, and schedules for shutdown and startup of the subject process, facilities, or service; and emergency procedures and appropriate staffing levels for prevention of an extended shutdown period.
 - 2. Contractor shall include the discussion of all current and expected RFS plans as part of the weekly construction meeting.
 - 3. All diversions and shutdowns to plant flows and processes shall be subject to actual process, flow, and weather conditions existing at the time of the requested RFS. Owner's determination regarding the acceptability of proceeding with a planned RFS shall be final.

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4. In addition to the RFS plan, incorporate the following constraints regarding plant flow manipulation, duration, and/or time of year:
 - a. Potable (City) Water (W1, W2), and Plant (Treated Effluent) Water (W3, W4, W5, W6): The maximum shutdown period is 2 hours. Plant staff will determine the time of day, and day of the week (Monday through Friday) that shutdown is acceptable. To maintain acceptable plant operation and fire protection, only one of these services may be shut down at a time.
 - b. Raw Wastewater (Headworks Flows), Primary Influent and Primary Effluent (PI and PE): No shutdowns permitted.
 - c. Primary Sludge and Scum (PS and SC): The maximum shutdown period is 4 hours.
 5. Instrument Air and Service Air (AI and AS): The Maximum Shutdown Period is 2 hours. Plant staff will determine the time of day that shutdown is acceptable.
 6. Power outages will be through the RFS process, with a minimum 2-week notice. Describe the reason, anticipated length of time, and areas affected by the outage. Provide temporary provisions for continuous power supply to critical facility components.
 - a. Anticipated power outages and durations for major electrical modifications are as specified in this section.
- I. Do not proceed with Work affecting a facility's operation without obtaining Owner's and Engineer's advance approval of the need for and duration of such Work.
- J. Relocation of Existing Facilities:
1. During construction, it is expected that minor relocations of Work will be necessary.
 2. Provide complete relocation of existing structures and Underground Facilities, including piping, utilities, equipment, structures, electrical conduit wiring, electrical duct bank, and other necessary items.
 3. Use only new materials for relocated facility. Match materials of existing facility, unless otherwise shown or specified.
 4. Perform relocations to minimize downtime of existing facilities.
 5. Install new portions of existing facilities in their relocated position prior to removal of existing facilities, unless otherwise accepted by Engineer.

1.08 ADJACENT FACILITIES AND PROPERTIES

A. Examination:

1. After Effective Date of the Agreement and before Work at Site is started, Contractor, Engineer, and affected property owners and utility owners shall make a thorough examination of pre-existing conditions including existing buildings, structures, and other improvements in vicinity of Work, as applicable, which could be damaged by construction operations.
2. Periodic reexamination shall be jointly performed to include, but not limited to, cracks in structures, settlement, leakage, and similar conditions.

B. Documentation:

1. Record and submit documentation of observations made on examination inspections in accordance with Article Construction Photographs and Article Audio-Video Recordings.
2. Such documentation shall be used as indisputable evidence in ascertaining whether and to what extent damage occurred as a result of Contractor's operations, and is for the protection of adjacent property owners, Contractor, and Owner.

1.09 CONSTRUCTION PHOTOGRAPHS

A. General:

1. Photographically document all phases of the Project, including preconstruction, construction progress, and post-construction.
2. Engineer shall have right to select subject matter and vantage point from which photographs are to be taken.
3. Digital Images: No post-session electronic editing of images is allowed. Stored image shall be actual image as captured without cropping or other edits.

B. Preconstruction and Post-Construction:

1. After Effective Date of the Agreement and before Work at Site is started, and again upon issuance of Substantial Completion, take photographs of Site and property adjacent to perimeter of Site.
2. Format: Digital, minimum resolution of 1680 pixels by 2240 pixels and 24-bit, millions of color.

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- C. Construction Progress Photos:
 - 1. Photographically demonstrate progress of construction, showing every aspect of Site and adjacent properties as well as interior and exterior of new or impacted structures.
 - 2. Weekly: Take photographs using digital, minimum resolution of 1680 pixels by 2240 pixels and 24-bit, millions of color.
 - 3. Monthly: Take photographs using digital, minimum resolution of 1680 pixels by 2240 pixels and 24-bit, millions of color.

- D. Documentation:
 - 1. Digital Images:
 - a. Electronic image shall have date taken embedded into image.
 - b. Archive using a commercially available photo management system that provides listing of photographs including date, keyword description, and direction of photograph.
 - c. Label file folders or database records with Project and Owner's name, and month and year images were produced.

1.10 AUDIO-VIDEO RECORDINGS

- A. Prior to beginning the Work on Site or of a particular area of the Work, and again within 10 days following date of Substantial Completion, videograph Site and property adjacent to Site.

- B. In the case of preconstruction recording, no work shall begin in the area prior to Engineer's review and approval of content and quality of video for that area.

- C. Particular emphasis shall be directed to physical condition of existing vegetation, structures, and pavements within Project area and areas adjacent to and within the right-of-way or easement, and on Contractor storage and staging areas.

- D. Engineer shall have right to select subject matter and vantage point from which videos are to be taken.

- E. Video Format and Quality:
 - 1. DVD format, with sound.
 - 2. Video:
 - a. Produce bright, sharp, and clear images with accurate colors, free of distortion and other forms of picture imperfections.

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- b. Electronically, and accurately display the month, day, year, and time of day of the recording.
- 3. Audio:
 - a. Audio documentation shall be done clearly, precisely, and at a moderate pace.
 - b. Indicate date, project name, and a brief description of the location of recording, including:
 - 1) Facility name.
 - 2) Street names or easements.
 - 3) Addresses of private property.
 - 4) Direction of coverage, including engineering stationing, if applicable.

F. Documentation:

- 1. DVD Label:
 - a. DVD number (numbered sequentially, beginning with 001).
 - b. Project name.
- 2. Date and time of coverage.
- 3. Project Video Log: Maintain an ongoing log that incorporates above noted label information for DVDs on Project.

1.11 REFERENCE POINTS AND SURVEYS

- A. Location and elevation of bench marks are shown on Drawings.
- B. Contractor's Responsibilities: Provide survey and layout required to layout the Work.

1.12 ELECTRONIC DOCUMENT MANAGEMENT SYSTEM

- A. The Owner and Contractor shall utilize an Owner provided electronic document management system (EDMS) similar to ProjectWise Construction Management (PWCM) system, Procore, or equal, for electronic submittal of all data and documents throughout the duration of the Contract. PWCM is a web-based electronic media site that is hosted by PWCM utilizing their PWCM web solution. The Owner furnished EDMS will be made available to all Contractors' Project personnel, subcontractor personnel, suppliers, consultants and the Designer of Record. The joint use of this system is to facilitate; electronic exchange of information, automation of key processes, and overall management of the Contract. The EDMS shall be the primary means of Project information submission and management. When required by the Owners representative, paper documents will also be provided. In the event of discrepancy between the electronic version and paper documents the

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paper documents will govern. ProjectWise Construction Management is a registered trademark of Bentley Systems, Incorporated.

- B. User Access Limitations:
1. The Owner's Representative will control the Contractor's access to the EDMS by allowing access and assigning user profiles to accepted Contractor personnel. User profiles will define levels of access into the system, determine assigned function-based authorizations (determines what can be seen), and user privileges (determines what they can do). Subcontractors and suppliers will be given access to the EDMS through the Contractor. Entry of information exchanged and transferred between the Contractor and its subcontractors and suppliers on the EDMS shall be the responsibility of the Contractor.
 2. Joint Ownership of Data: Data entered in a collaborative mode (entered with the intent to share as determined by permissions and workflows within the EDMS) by the Owner's Representative and the Contractor will be jointly owned.
- C. Automated System Notification and Audit Log Tracking: Review comments made (or lack thereof) by the Owner on Contractor submitted documentation shall not relieve the Contractor from compliance with requirements of the Contract Documents. The Contractor is responsible for managing, tracking, and documenting the Work to comply with the requirements of the Contract Documents. Owner's acceptance via automated system notifications or audit logs extends only to the face value of the submitted documentation and does not constitute validation of the Contractor's submitted information.
- D. Submittals: See Section 01 33 00, Submittal Procedures.
- E. Computer Requirements: The Contractor shall use computer hardware and software that meets the requirements of the Owner furnished EDMS as recommended by the EDMS supplier to access and utilize the EDMS. As recommendations are modified by the EDMS supplier, the Contractor will upgrade their system(s) to meet the recommendations or better. Upgrading of the Contractor's computer systems will not be justification for a cost or time modification to the Contract. The Contractor will ensure that connectivity to the EDMS (whether at the home office or jobsite) is accomplished through DSL, cable, T-1, or wireless communications systems. The minimum bandwidth requirements for using the system is 128 kb/s. It is recommended a faster connection be used when uploading pictures and files into the system. PWCM currently supports Mozilla's Firefox, Apple's Safari, Microsoft's Internet Explorer, and Google Chrome web browsers for accessing the application.

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- F. **Contractor Responsibility:** The Contractor shall be responsible for the validity of their information placed in the EDMS and for the abilities of their personnel. Accepted users shall be knowledgeable in the use of computers, including Internet browsers, email programs, CAD drawing applications, and Adobe Portable Document Format (PDF) document distribution program. The Contractor shall utilize the existing forms in the EDMS to the maximum extent possible. If a form does not exist in the EDMS, the Contractor must include a form of their own or provided by the Owner's Representative as an attachment to a submittal. Adobe PDF documents will be created through electronic conversion rather than optically scanned whenever possible. The Contractor is responsible for the training of their personnel in the use of the EDMS (outside what is provided by the Owner) and the other programs indicated above as needed.
- G. **User Access Administration:** Provide a list of Contractor's key EDMS personnel for the Owner's Representative acceptance. Contractor is responsible for adding and removing users from the system. The Owner's Representative reserves the right to perform a security check on all potential users. The Contractor will be allowed to add additional personnel and subcontractors to the EDMS.
- H. **Connectivity Problems:** The EDMS is a web-based environment and therefore subject to the inherent speed and connectivity problems of the Internet. The Contractor is responsible for its own connectivity to the Internet. The EDMS response time is dependent on the Contractor's equipment, including processor speed, Internet access speed, etc., and current traffic on the Internet. The Owner will not be liable for any delays associated from the usage of the EDMS including, but not limited to slow response time, downtime periods, connectivity problems, or loss of information. The Contractor will ensure that connectivity to the EDMS (whether at the home office or jobsite) is accomplished through DSL, cable, T-1, or wireless communications systems. The minimum bandwidth requirements for using the system is 128 kb/s. It is recommended a faster connection be used when uploading pictures and files into the system. Under no circumstances shall the usage, of the EDMS be grounds for a time extension or cost adjustment to the Contract.
- I. **Training:**
1. The Project Owner has arranged for the following training to be provided to the Contractor:
 - a. Up to two training sessions will be offered for Contractor and Subcontractor personnel to be coordinated at a time arranged by Contractor with Owner's Representative within 21 days of Notice

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to Proceed. Contractor participation in training is strongly encouraged and shall be considered incidental to the Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SALVAGE OF MATERIALS

- A. Materials to be Salvaged Include: None.

3.02 CUTTING, FITTING, AND PATCHING

- A. Cut, fit, adjust, or patch Work and work of others, including excavation and backfill as required, to make Work complete.
- B. Obtain prior written authorization of Engineer before commencing Work to cut or otherwise alter:
1. Structural or reinforcing steel, structural column or beam, elevated slab, trusses, or other structural member.
 2. Weather-resistant or moisture-resistant elements.
 3. Efficiency, maintenance, or safety of element.
 4. Work of others.
- C. Refinish surfaces to provide an even finish.
1. Refinish continuous surfaces to nearest intersection.
 2. Refinish entire assemblies.
 3. Finish restored surfaces to such planes, shapes, and textures that no transition between existing work and the Work is evident in finished surfaces.
- D. Restore existing work, Underground Facilities, and surfaces that are to remain in completed Work including concrete-embedded piping, conduit, and other utilities as specified and as shown on Drawings.
- E. Make restorations with new materials and appropriate methods as specified for new Work of similar nature; if not specified, use recommended practice of manufacturer or appropriate trade association.
- F. Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces and fill voids.
- G. Remove specimens of installed Work for testing when requested by Engineer.

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3.03 SUPPLEMENT

A. The supplement listed below, following “End of Section,” is part of this specification.

1. Removal from Service (RFS) Form.

END OF SECTION

Jacobs Removal from Service Form

Number: _____

ACTIVITY: _____

Date: _____

PROJECT: _____

WES PROJECT NO: _____

Contractor: _____

Trades involved: _____

Requested by: _____

Target Start Date: _____

Duration: _____

Regarding Drawing No. _____

Spec. Section: _____

Schedule: _____

The following work has been identified which will impact normal plant operations: (attach work procedures, systems affected, additional information, or drawings as necessary to fully describe work and impact)

<add information on additional pages as required>

Submitted by Contractor: _____

Date: _____

Review Comments:

Reviewed By Engineer: _____

Date: _____

Will work require initiation of Startup and Commissioning Checklist and Approval Sheet?

Yes No

Could this RFS Activity cause an odor release?

Yes No

(if yes, then notify Engineer and Owner prior to commencing activity)

Does work impact any of the following systems? If so, attach completed and approved Change Worksheet.

Digester Gas Digester Solids N/A

District Review Disposition:	Approved	Approved as Noted	Disapproved	N/A
HVAC _____ Date _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Instrumentation and Data _____ Date _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lab _____ Date _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maintenance _____ Date _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Operations _____ Date _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Administration _____ Date _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plant Engineer _____ Date _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Safety Captain _____ Date _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Pre-Start Meeting

Proceed? YES NO

LO/TO Complete

Proceed? YES NO

Activity:

Description of work

Location

Target Date and Time

Key Personnel

Activities Prior to the work.

Work Activities

Owner Involvement

Special Considerations

_____ Date
<Contractor Representative Name >Signature ; <Firm>

**SECTION 01 31 19
PROJECT MEETINGS**

PART 1 GENERAL

1.01 GENERAL

- A. Engineer will schedule physical arrangements for meetings throughout progress of the Work, prepare meeting agenda with regular participant input and distribute with written notice of each meeting, preside at meetings, record minutes to include significant proceedings and decisions, and reproduce and distribute copies of minutes within 5 days after each meeting to participants and parties affected by meeting decisions.

1.02 PARTNERING MEETINGS

- A. Attend and participate in partnering meetings as specified.

1.03 PRECONSTRUCTION CONFERENCE

- A. Contractor shall be prepared to discuss and present data on the following subjects, as a minimum:
 - 1. Required schedules.
 - 2. Preliminary Schedule of Submittals including dates for major submittals (Concrete surface repairs; Division 40, Process Interconnections, equipment; at minimum).
 - 3. Schedule of Values.
 - 4. First 60 days plan of operation and construction.
 - 5. Safety Plan.
 - 6. Status of Bonds and insurance.
 - 7. Sequencing of critical path work items.
 - 8. Progress payment procedures.
 - 9. Project changes and clarification procedures.
 - 10. Use of Site, access, office and storage areas, security and temporary facilities.
 - 11. Major product delivery and priorities.
 - 12. Contractor's safety plan and representative.
 - 13. Contractor's Workplace Harassment Prevention Program Plan.
- B. Attendees will include:
 - 1. Owner's representatives.
 - 2. Contractor's office representative.

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3. Contractor's resident superintendent.
4. Contractor's quality control representative.
5. Subcontractors' representatives whom Contractor may desire or Engineer may request to attend.
6. Engineer's representatives.
7. Others as appropriate.

1.04 PRELIMINARY SCHEDULES REVIEW MEETING

- A. As set forth in General Conditions and Section 01 32 00, Construction Progress Documentation.

1.05 PROGRESS MEETINGS

- A. Engineer will schedule regular progress meetings at Site, conducted weekly to review the Work progress, Progress Schedule, Schedule of Submittals, Application for Payment, contract modifications, and other matters needing discussion and resolution.
- B. Attendees will include:
 1. Owner's representative(s), as appropriate.
 2. Contractor, Subcontractors, and Suppliers, as appropriate.
 3. Engineer's representative(s).
 4. Others as appropriate.

1.06 QUALITY CONTROL MEETINGS

- A. In accordance with Section 01 45 16.13, Contractor Quality Control.
- B. Scheduled by Engineer on regular basis and as necessary to review test and inspection reports, and other matters relating to quality control of the Work and work of other Contractors.
- C. Attendees will include:
 1. Contractor.
 2. Contractor's designated quality control representative.
 3. Subcontractors and Suppliers, as necessary.
 4. Engineer's representatives.

1.07 PROCESS INSTRUMENTATION AND CONTROL SYSTEMS (PICS)
COORDINATION MEETINGS

- A. Engineer will schedule meetings at Site, conducted monthly to review specific requirements of PICS work.
- B. Attendees will include:
 - 1. Contractor.
 - 2. Owner.
 - 3. Owner's Integrator of Record.
 - 4. PICS Subcontractor/Installer.
 - 5. Engineer's representatives.

1.08 PREINSTALLATION MEETINGS

- A. When required in individual Specification sections, convene at Site prior to commencing the Work of that section.
- B. Require attendance of entities directly affecting, or affected by, the Work of that section.
- C. Notify Engineer 4 days in advance of meeting date.
- D. Provide suggested agenda to Engineer to include reviewing conditions of installation, preparation and installation or application procedures, and coordination with related Work and work of others.

1.09 FACILITY STARTUP MEETINGS

- A. Schedule and attend a minimum facility startup meetings.
 - 1. The first of such meetings shall be held prior to submitting Facility Startup Plan, as specified in Section 01 91 14, Equipment Testing and Facility Startup, and shall include preliminary discussions regarding such plan.
 - 2. Weekly meetings starting 2 months prior to the startup of: All new equipment.
- B. Agenda items shall include, but not be limited to, content of Facility Startup Plan, coordination needed between various parties in attendance, and potential problems associated with startup.

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C. Attendees will include:

1. Contractor.
2. Contractor's designated quality control representative.
3. Subcontractors and equipment manufacturer's representatives whom Contractor deems to be directly involved in facility startup.
4. Engineer's representatives.
5. Owner's operations personnel.
6. Owner's Integrator of Record.
7. Others as required by Contract Documents or as deemed necessary by Contractor.

1.10 OTHER MEETINGS

A. In accordance with Contract Documents and as may be required by Owner and Engineer.

1.11 SUPPLEMENT

A. The supplement listed below, following "End of Section," is part of this specification.

1. Site Specific Safety Plan Certification.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SITE SPECIFIC SAFETY PLAN CERTIFICATION

Contractor performs all operations in strict accordance with all applicable standards set by Oregon Occupational Safety and Health Division (OR-OSHA), including, but not limited to Oregon Administrative Rules (OAR) 437, Chapter 2, Sections 141 – 147 (29 CFR Part 1910, 29 CFR Part 1926).

Contractor creates and maintains a Site-Specific Safety Plan, which is require on-site through the entirety of the project. The Contractor's Safety Manager is trained and knowledgeable in all safety requirements and shall be responsible for the compliance with all applicable safety requirements. All job personnel are knowledgeable of and comply with the Site Specific Safety Plan requirements.

The Site-Specific Safety Plan includes the following basic elements:

- Policy or goals statement
- List of responsible persons, including 24 hour contact information
- Hazard identification and assessment (Job Hazard Analysis)
- Hazard controls and safe practices
- Emergency and accident response
- Confined Space Entry Plan, including the Rescue Plan
- Emergency Spill Response Plan
- Pollution Control Plan
- Employee training and communication
- Recordkeeping

Contractor acknowledges that they are solely and completely responsible for the safety of the construction site, including, but not limited to, the safety of all persons and property present at the site at any time until final completion and acceptance by District.

I, _____ (the undersigned Contractor), affirm that I comply with the above information.

Name of Firm

Signature

Printed Name

Title

SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Preliminary Progress Schedule: Submit within time specified in Paragraph 2.03 of the General Conditions.
2. Detailed Progress Schedule:
 - a. Submit initial Detailed Progress Schedule within 60 days after Effective Date of the Agreement.
 - b. Submit an Updated Progress Schedule at each update, in accordance with Article Detailed Progress Schedule.
3. Submit with Each Progress Schedule Submission:
 - a. Contractor's certification that Progress Schedule submission is actual schedule being used for execution of the Work.
 - b. Electronic file compatible with latest version of Microsoft Project.
 - c. Progress Schedule: Two legible copies (PDF format).
 - d. Narrative Progress Report: Same number of copies as specified for Progress Schedule.
4. Prior to final payment, submit a final Updated Progress Schedule.

1.02 PRELIMINARY PROGRESS SCHEDULE

- A. In addition to basic requirements outlined in General Conditions, show a detailed schedule, beginning with Notice to Proceed, for minimum duration of 120 days, and a summary of balance of Project through Final Completion.
- B. Show activities including, but not limited to the following:
 1. Notice to Proceed.
 2. Permits.
 3. Submittals, with review time. Contractor may use Schedule of Submittals specified in Section 01 33 00, Submittal Procedures.
 4. Early procurement activities for long lead equipment and materials.
 5. Initial Site work.
 6. Earthwork.
 7. Specified Work sequences and construction constraints.
 8. Contract Milestone and Completion Dates.
 9. Owner-furnished products delivery dates or ranges of dates.

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10. Major structural, mechanical, equipment, electrical, architectural, and instrumentation and control Work.
 11. System startup summary.
 12. Project close-out summary.
 13. Demobilization summary.
- C. Update Preliminary Progress Schedule monthly as part of progress payment process. Failure to do so may result in the Owner withholding all or part of the monthly progress payment until the Preliminary Progress Schedule is updated in a manner acceptable to Engineer.
- D. Format: In accordance with Article Progress Schedule—Critical Path Network.

1.03 DETAILED PROGRESS SCHEDULE

- A. In addition to requirements of General Conditions, submit Detailed Progress Schedule beginning with Notice to Proceed and continuing through Final Completion.
- B. Show the duration and sequences of activities required for complete performance of the Work reflecting means and methods chosen by Contractor.
- C. When accepted by Engineer, Detailed Progress Schedule will replace Preliminary Progress Schedule and become Baseline Schedule. Subsequent revisions will be considered as Updated Progress Schedules.
- D. Format: In accordance with Article Progress Schedule—Critical Path Network.
- E. Update monthly to reflect actual progress and occurrences to date, including weather delays.

1.04 PROGRESS SCHEDULE—CRITICAL PATH NETWORK

- A. General: Comprehensive computer-generated schedule using CPM, generally as outlined in Associated General Contractors of America (AGC) 580, “Construction Project Planning and Scheduling Guidelines.” If a conflict occurs between the AGC publication and this Specification, this Specification shall govern.
- B. Contents:
1. Schedule shall begin with the date of Notice to Proceed and conclude with the date of Final Completion.

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2. Identify Work calendar basis using days as a unit of measure.
3. Show complete interdependence and sequence of construction and Project-related activities reasonably required to complete the Work.
4. Identify the Work of separate stages and other logically grouped activities, and clearly identify critical path of activities.
5. Reflect sequences of the Work, restraints, delivery windows, review times, Contract Times and Project Milestones set forth in the Agreement and Section 01 31 13, Project Coordination.
6. Include as applicable, at a minimum:
 - a. Obtaining permits, submittals for early product procurement, and long lead time items.
 - b. Mobilization and other preliminary activities.
 - c. Initial Site work.
 - d. Specified Work sequences, constraints, and Milestones, including Substantial Completion date(s) Subcontract Work.
 - e. Major equipment design, fabrication, factory testing, and delivery dates.
 - f. Delivery dates for Owner-furnished products, as specified in Section 01 11 00, Summary of Work.
 - g. Sitework.
 - h. Concrete Work.
 - i. Structural steel Work.
 - j. Conveying systems Work.
 - k. Equipment Work.
 - l. Mechanical Work.
 - m. Electrical Work.
 - n. Instrumentation and control Work.
 - o. Interfaces with Owner-furnished equipment.
 - p. Other important Work for each major facility.
 - q. Equipment and system startup and test activities.
 - r. Project closeout and cleanup.
 - s. Demobilization.
7. No activity duration, exclusive of those for Submittals review and product fabrication/delivery, shall be less than 1 day nor more than 30 days, unless otherwise approved.
8. Activity duration for Submittal review shall not be less than review time specified unless clearly identified and prior written acceptance has been obtained from Engineer.

C. Network Graphical Display:

1. Formatted for not greater than 30 inches by 42 inches or smaller than 22 inches by 34 inches, unless otherwise approved.

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2. Title Block: Show name of Project, Owner, date submitted, revision or update number, and the name of the scheduler. Updated schedules shall indicate data date.
3. Identify horizontally across top of schedule the time frame by year, month, and day.
4. Identify each activity with a unique number and a brief description of the Work associated with that activity.
5. Indicate the critical path.
6. Show, at a minimum, the controlling relationships between activities.
7. Plot activities on a time-scaled basis, with the length of each activity proportional to the current estimate of the duration.
8. Plot activities on an early start basis unless otherwise requested by Engineer.
9. Provide a legend to describe standard and special symbols used.

D. Schedule Report:

1. Formatted for 8-1/2-inch by 11-inch white paper, unless otherwise approved.
2. List information for each activity in tabular format, including at a minimum:
 - a. Activity Identification Number.
 - b. Activity Description.
 - c. Original Duration.
 - d. Remaining Duration.
 - e. Early Start Date (Actual start on Updated Progress Schedules).
 - f. Early Finish Date (Actual finish on Updated Progress Schedules).
 - g. Late Start Date.
 - h. Late Finish Date.
 - i. Total Float.
3. Sort reports, in ascending order, as listed below:
 - a. Activity number sequence with predecessor and successor activity.
 - b. Activity number sequence.
 - c. Early-start.
 - d. Total float.

E. Cost-Loading:

1. Note the estimated cost to perform each Work activity, with the exception of Submittals or Submittal reviews, in the network in a tabular listing.
2. The sum of all activity costs shall equal the Contract Price. An unbalanced or front-end-loaded schedule will not be acceptable.

3. The accepted cost-loaded Progress Schedule shall constitute the Schedule of Values.

1.05 PROGRESS OF THE WORK

- A. Updated Progress Schedule shall reflect:
 1. Progress of Work to within 5 working days prior to submission.
 2. Approved changes in Work scope and activities modified since submission.
 3. Delays in Submittals or resubmittals, deliveries, or Work.
 4. Adjusted or modified sequences of Work.
 5. Other identifiable changes.
 6. Revised projections of progress and completion.
 7. Report of changed logic.
- B. Produce detailed subschedules during Project, upon request of Owner or Engineer, to further define critical portions of the Work such as facility shutdowns.
- C. If an activity is not completed by its latest scheduled completion date and this failure is anticipated to extend Contract Times (or Milestones), submit, within 7 days of such failure, a written statement as to how nonperformance will be corrected to return Project to acceptable current Progress Schedule. Actions by Contractor to complete the Work within Contract Times (or Milestones) will not be justification for adjustment to Contract Price or Contract Times.
- D. Owner may order Contractor to increase plant, equipment, labor force, or working hours if Contractor fails to:
 1. Complete a Milestone activity by its completion date.
 2. Satisfactorily execute Work as necessary to prevent delay to overall completion of Project, at no additional cost to Owner.

1.06 NARRATIVE PROGRESS REPORT

- A. Format:
 1. Organize same as Progress Schedule.
 2. Identify, on a cover letter, reporting period, date submitted, and name of author of report.

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B. Contents:

1. Number of days worked over the period, work force on hand, construction equipment on hand (including utility vehicles such as pickup trucks, maintenance vehicles, stake trucks).
2. General progress of Work, including a listing of activities started and completed over the reporting period, mobilization/demobilization of subcontractors, and major milestones achieved.
3. Contractor's plan for management of Site (for example, lay down and staging areas, construction traffic), use of construction equipment, buildup of trade labor, and identification of potential Contract changes.
4. Identification of new activities and sequences as a result of executed Contract changes.
5. Documentation of weather conditions over the reporting period, and any resulting impacts to the Work.
6. Description of actual or potential delays, including related causes, and the steps taken or anticipated to mitigate their impact.
7. Changes to activity logic.
8. Changes to the critical path.
9. Identification of, and accompanying reason for, any activities added or deleted since the last report.
10. Steps taken to recover the schedule from Contractor-caused delays.

1.07 SCHEDULE ACCEPTANCE

A. Engineer's acceptance will demonstrate agreement that:

1. Proposed schedule is accepted with respect to:
 - a. Contract Times, including Final Completion and all intermediate Milestones, are within the specified times.
 - b. Specified Work sequences and constraints are shown as specified.
 - c. Specified Owner-furnished Equipment or Material arrival dates, or range of dates, are included.
 - d. Access restrictions are accurately reflected.
 - e. Startup and testing times are as specified.
 - f. Submittal review times are as specified.
 - g. Startup testing duration is as specified and timing is acceptable.
2. In all other respects, Engineer's acceptance of Contractor's schedule indicates that, in Engineer's judgment, schedule represents reasonable plan for constructing Project in accordance with the Contract Documents. Engineer's review will not make any change in Contract requirements. Lack of comment on any aspect of schedule that is not in accordance with the Contract Documents will not thereby indicate acceptance of that change, unless Contractor has explicitly called the

nonconformance to Engineer's attention in submittal. Schedule remains Contractor's responsibility and Contractor retains responsibility for performing all activities, for activity durations, and for activity sequences required to construct Project in accordance with the Contract Documents.

- B. Unacceptable Preliminary Progress Schedule:
 - 1. Make requested corrections; resubmit within 10 days.
 - 2. Until acceptable to Engineer as Baseline Progress Schedule, continue review and revision process, including updating schedule on a monthly basis to reflect actual progress and occurrences to date.
- C. Unacceptable Detailed Progress Schedule:
 - 1. Make requested corrections; resubmit within 10 days.
 - 2. Until acceptable to Engineer as Baseline Progress Schedule, continue review and revision process.
- D. Narrative Report: All changes to activity duration and sequences, including addition or deletion of activities subsequent to Engineer's acceptance of Baseline Progress Schedule, shall be delineated in Narrative Report current with proposed Updated Progress Schedule.

1.08 ADJUSTMENT OF CONTRACT TIMES

- A. Reference General Conditions.
- B. Evaluation and reconciliation of Adjustments of Contract Times shall be based on the Updated Progress Schedule at the time of proposed adjustment or claimed delay.
- C. Float:
 - 1. Float time is a Project resource available to both parties to meet contract Milestones and Contract Times.
 - 2. Use of float suppression techniques such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and use of float time disclosed or implied by use of alternate float-suppression techniques shall be shared to proportionate benefit of Owner and Contractor.
 - 3. Pursuant to above float-sharing requirement, no time extensions will be granted nor delay damages paid until a delay occurs which (i) impacts Project's critical path, (ii) consumes available float or contingency time, and (iii) extends Work beyond contract completion date.

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D. Claims Based on Contract Times:

1. Where Engineer has not yet rendered formal decision on Contractor's Claim for adjustment of Contract Times, and parties are unable to agree as to amount of adjustment to be reflected in Progress Schedule, reflect an interim adjustment in the Progress Schedule as acceptable to Engineer.
2. It is understood and agreed that such interim acceptance will not be binding on either Contractor or Owner, and will be made only for the purpose of continuing to schedule Work until such time as formal decision has been rendered as to an adjustment, if any, of the Contract Times.
3. Revise Progress Schedule prepared thereafter in accordance with Engineer's formal decision.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 DEFINITIONS

- A. Action Submittal: Written and graphic information submitted by Contractor that requires Engineer's approval.
- B. Deferred Submittal: Information in accordance with 2018 IBC Section 107.3.4.1 submitted by Contractor for portions of design that are to be submitted to permitting agency for approval prior to installation of that portion of the Work, along with Engineer's review documentation that submittal has been found to be in general conformance with Project's design.
- C. Informational Submittal: Information submitted by Contractor that requires Engineer's review and determination that submitted information is in accordance with the Conditions of the Contract.

1.02 PROCEDURES

- A. Direct submittals to Engineer at the following, unless specified otherwise.
 - 1. Jacobs. Submit via Project's electronic document management system software (Bentley ProjectWise Construction Management software – PWCM, Procore, "or-equal"). See Section 01 31 13, Project Coordination, for description of this software and required use.
- B. Electronic Submittals: Submittals shall, unless specifically accepted, be made in electronic format.
 - 1. Each submittal shall be an electronic file in Adobe Acrobat Portable Document Format (PDF). Use the latest version available at time of execution of the Agreement.
 - 2. Electronic files that contain more than 10 pages in PDF format shall contain internal bookmarking from an index page to major sections of the document.
 - 3. PDF files shall be set to open "Bookmarks and Page" view.
 - 4. Add general information to each PDF file, including title, subject, author, and keywords.
 - 5. PDF files shall be set up to print legibly at 8.5-inch by 11-inch, 11-inch by 17-inch, or 22-inch by 34-inch. No other paper sizes will be accepted.

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6. Submit new electronic files for each resubmittal.
7. Include a copy of the Transmittal of Contractor's Submittal form, located at end of section, with each electronic file.
8. Engineer will reject submittal that is not electronically submitted, unless specifically accepted.
9. Provide Engineer with authorization to reproduce and distribute each file as many times as necessary for Project documentation.
10. Detailed procedures for handling electronic submittals will be discussed at the preconstruction conference.

C. Transmittal of Submittal:

1. Contractor shall:
 - a. Review each submittal and check for compliance with Contract Documents.
 - b. Stamp each submittal with uniform approval stamp before submitting to Engineer.
 - 1) Stamp to include Project name, submittal number, Specification number, Contractor's reviewer name, date of Contractor's approval, and statement certifying submittal has been reviewed, checked, and approved for compliance with Contract Documents.
 - 2) Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.
2. Complete, sign, and transmit with each submittal package, one Transmittal of Contractor's Submittal form attached at end of this section.
3. Identify each submittal with the following:
 - a. Numbering and Tracking System:
 - 1) Sequentially number each submittal.
 - 2) Resubmission of submittal shall have original number with sequential alphabetic suffix.
 - b. Specification section and paragraph to which submittal applies.
 - c. Project title and Engineer's project number.
 - d. Date of transmittal.
 - e. Names of Contractor, Subcontractor or Supplier, and manufacturer as appropriate.
4. Identify and describe each deviation or variation from Contract Documents.

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- D. Format:
1. Do not base Shop Drawings on reproductions of Contract Documents.
 2. Package submittal information by individual specification section. Do not combine different specification sections together in submittal package, unless otherwise directed in specification.
 3. Present in a clear and thorough manner and in sufficient detail to show kind, size, arrangement, and function of components, materials, and devices, and compliance with Contract Documents.
 4. Index with labeled tab dividers in orderly manner.
- E. Timeliness: Schedule and submit in accordance Schedule of Submittals, and requirements of individual specification sections.
- F. Processing Time:
1. Time for review shall commence on Engineer's receipt of submittal.
 2. Engineer will act upon Contractor's submittal and transmit response to Contractor not later than 30 days after receipt, unless otherwise specified.
 3. Resubmittals will be subject to same review time.
 4. No adjustment of Contract Times or Price will be allowed as a result of delays in progress of Work caused by rejection and subsequent resubmittals.
- G. Resubmittals: Clearly identify each correction or change made.
- H. Incomplete Submittals:
1. Engineer will return entire submittal for Contractor's revision if preliminary review deems it incomplete.
 2. When any of the following are missing, submittal will be deemed incomplete:
 - a. Contractor's review stamp; completed and signed.
 - b. Transmittal of Contractor's Submittal; completed and signed.
 - c. Insufficient number of copies.
- I. Submittals not required by Contract Documents:
1. Will not be reviewed and will be returned stamped "Not Subject to Review."
 2. Engineer will keep one copy and return submittal to Contractor.

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1.03 ACTION SUBMITTALS

- A. Prepare and submit Action Submittals required by individual specification sections.
- B. Shop Drawings:
 - 1. Copies: Electronic.
 - 2. Identify and Indicate:
 - a. Applicable Contract Drawing and Detail number, products, units and assemblies, and system or equipment identification or tag numbers.
 - b. Equipment and Component Title: Identical to title shown on Drawings.
 - c. Critical field dimensions and relationships to other critical features of Work. Note dimensions established by field measurement.
 - d. Project-specific information drawn accurately to scale.
 - 3. Manufacturer's standard schematic drawings and diagrams as follows:
 - a. Modify to delete information that is not applicable to the Work.
 - b. Supplement standard information to provide information specifically applicable to the Work.
 - 4. Product Data: Provide as specified in individual specifications.
 - 5. Deferred Submittal: See Drawings for list of deferred submittals.
 - a. Contractor-design drawings and product data related to permanent construction.
 - 1) Written and graphic information.
 - 2) Drawings.
 - 3) Cut sheets.
 - 4) Data sheets.
 - 5) Action item submittals requested in individual specification section.
 - b. Prior to installation of indicated structural or nonstructural element, equipment, distribution system, or component or its anchorage, submit required supporting data and drawings for review and acceptance by Engineer. Documentation of review and approval provided on Engineer's comment form, along with completed submittal, shall be filed with permitting agency by Contractor and approved by permitting agency prior to installation.
 - 6. Foreign Manufacturers: When proposed, include names and addresses of at least two companies that maintain technical service representatives close to Project.

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C. Samples:

1. Copies: Two, unless otherwise specified in individual specifications.
2. Preparation:
 - a. Mount, display, or package Samples in manner specified to facilitate review of quality. Attach label on unexposed side that includes the following:
 - 1) Manufacturer name.
 - 2) Model number.
 - 3) Material.
 - 4) Sample source.
3. Manufacturer's Color Chart: Units or sections of units showing full range of colors, textures, and patterns available.
4. Full-size Samples:
 - a. Size as indicated in individual specification section.
 - b. Prepared from same materials to be used for the Work.
 - c. Cured and finished in manner specified.
 - d. Physically identical with product proposed for use.

D. Action Submittal Dispositions:

1. Engineer will review, comment, stamp, and distribute as noted:
 - a. Approved:
 - 1) Contractor may incorporate product(s) or implement Work covered by submittal.
 - 2) Distribution: Electronic.
 - b. Approved as Noted:
 - 1) Contractor may incorporate product(s) or implement Work covered by submittal, in accordance with Engineer's notations.
 - 2) Distribution: Electronic.
 - c. Partial Approval, Resubmit as Noted:
 - 1) Make corrections or obtain missing portions, and resubmit.
 - 2) Except for portions indicated, Contractor may begin to incorporate product(s) or implement Work covered by submittal, in accordance with Engineer's notations.
 - 3) Distribution: Electronic.
 - d. Revise and Resubmit:
 - 1) Contractor may not incorporate product(s) or implement Work covered by submittal.
 - 2) Distribution: Electronic.

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1.04 INFORMATIONAL SUBMITTALS

A. General:

1. Copies: Electronic.
2. Refer to individual specification sections for specific submittal requirements.
3. Engineer will review each submittal. If submittal meets conditions of the Contract, Engineer will forward copy to appropriate parties. If Engineer determines submittal does not meet conditions of the Contract and is therefore considered unacceptable, Engineer will return with review comments to Contractor, and require that submittal be corrected and resubmitted.

B. Certificates:

1. General:
 - a. Provide notarized statement that includes signature of entity responsible for preparing certification.
 - b. Signed by officer or other individual authorized to sign documents on behalf of that entity.
2. Welding: In accordance with individual specification sections.
3. Installer: Prepare written statements on manufacturer's letterhead certifying installer complies with requirements as specified in individual specification section.
4. Material Test: Prepared by qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
5. Certificates of Successful Testing or Inspection: Submit when testing or inspection is required by Laws and Regulations or governing agency or specified in individual specification sections.
6. Manufacturer's Certificate of Compliance: In accordance with Section 01 61 00, Common Product Requirements.
7. Manufacturer's Certificate of Proper Installation: In accordance with Section 01 43 33, Manufacturers' Field Services.

C. Construction Photographs and Video: In accordance with Section 01 31 13, Project Coordination, and as may otherwise be required in Contract Documents.

D. Closeout Submittals: In accordance with Section 01 77 00, Closeout Procedures.

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- E. Contractor-design Data (related to temporary construction):
 - 1. Written and graphic information.
 - 2. List of assumptions.
 - 3. List of performance and design criteria.
 - 4. Summary of loads or load diagram, if applicable.
 - 5. Calculations.
 - 6. List of applicable codes and regulations.
 - 7. Name and version of software.
 - 8. Information requested in individual specification section.

- F. Deferred Submittals: See Drawings for list of deferred submittals.
 - 1. Contractor-design data related to permanent construction:
 - a. List of assumptions.
 - b. List of performance and design criteria.
 - c. Summary of loads or load diagram, if applicable.
 - d. Calculations.
 - e. List of applicable codes and regulations.
 - f. Name and version of design software.
 - g. Factory test results.
 - h. Informational submittals requested in individual specification section.
 - 2. Prior to installation of indicated structural or nonstructural element, equipment, distribution system, or component or its anchorage, submit calculations and test results of Contractor-designed components for review by Engineer. Documentation of review and indication of compliance with general design intent and Project criteria provided on Engineer's comment form as meets conditions of the Contract, along with completed submittal, shall be filed with permitting agency by Contractor and approved by permitting agency prior to installation.

- G. Manufacturer's Instructions: Written or published information that documents manufacturer's recommendations, guidelines, and procedures in accordance with individual specification section.

- H. Operation and Maintenance Data: As required in Section 01 78 23, Operation and Maintenance Data.

- I. Quality Control Documentation: As required in Section 01 45 16.13, Contractor Quality Control.

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- J. Schedules:
1. Schedule of Submittals: Prepare separately or in combination with Progress Schedule as specified in Section 01 32 00, Construction Progress Documentation.
 - a. Show for each, at a minimum, the following:
 - 1) Specification section number.
 - 2) Identification by numbering and tracking system as specified under Paragraph Transmittal of Submittal.
 - 3) Estimated date of submission to Engineer, including reviewing and processing time.
 - b. On a monthly basis, submit updated Schedule of Submittals to Engineer if changes have occurred or resubmittals are required.
 2. Progress Schedules: In accordance with Section 01 32 00, Construction Progress Documentation.
- K. Special Guarantee: Supplier's written guarantee as required in individual specification sections.
- L. Statement of Qualification: Evidence of qualification, certification, or registration as required in Contract Documents to verify qualifications of professional land surveyor, engineer, materials testing laboratory, specialty Subcontractor, trade, Specialist, consultant, installer, and other professionals.
- M. Submittals Required by Laws, Regulations, and Governing Agencies:
1. Promptly submit promptly notifications, reports, certifications, payrolls, and otherwise as may be required, directly to the applicable federal, state, or local governing agency or their representative.
 2. Transmit to Engineer for Owner's records one copy of correspondence and transmittals (to include enclosures and attachments) between Contractor and governing agency.
- N. Test, Evaluation, and Inspection Reports:
1. General: Shall contain signature of person responsible for test or report.
 2. Factory:
 - a. Identification of product and specification section, type of inspection or test with referenced standard or code.
 - b. Date of test, Project title and number, and name and signature of authorized person.
 - c. Test results.
 - d. If test or inspection deems material or equipment not in compliance with Contract Documents, identify corrective action necessary to bring into compliance.

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- e. Provide interpretation of test results, when requested by Engineer.
 - f. Other items as identified in individual specification sections.
3. Field:
- a. As a minimum, include the following:
 - 1) Project title and number.
 - 2) Date and time.
 - 3) Record of temperature and weather conditions.
 - 4) Identification of product and specification section.
 - 5) Type and location of test, Sample, or inspection, including referenced standard or code.
 - 6) Date issued, testing laboratory name, address, and telephone number, and name and signature of laboratory inspector.
 - 7) If test or inspection deems material or equipment not in compliance with Contract Documents, identify corrective action necessary to bring into compliance.
 - 8) Provide interpretation of test results, when requested by Engineer.
 - 9) Other items as identified in individual specification sections.

O. Testing and Startup Data: In accordance with Section 01 91 14, Equipment Testing and Facility Startup.

P. Training Data: In accordance with Section 01 43 33, Manufacturers' Field Services.

1.05 SUPPLEMENT

A. The supplement listed below, following "End of Section," is part of this specification.

- 1. Transmittal of Contractor's Submittal.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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TRANSMITTAL OF CONTRACTOR'S SUBMITTAL (ATTACH TO EACH SUBMITTAL)			
DATE: _____			
TO: _____ _____ _____ _____ _____ FROM: _____ <div style="text-align: center;">Contractor</div> _____ _____ _____	Submittal No.: _____ <input type="checkbox"/> New Submittal <input type="checkbox"/> Resubmittal Project: _____ Project No.: _____ Specification Section No.: _____ (Cover only one section with each transmittal) Schedule Date of Submittal: _____		
SUBMITTAL TYPE:	<input type="checkbox"/> Shop Drawing	<input type="checkbox"/> Sample	<input type="checkbox"/> Informational
	<input type="checkbox"/> Deferred		

The following items are hereby submitted:

Number of Copies	Description of Item Submitted (Type, Size, Model Number, Etc.)	Spec. and Para. No.	Drawing or Brochure Number	Contains Variation to Contract	
				No	Yes

Contractor hereby certifies that (i) Contractor has complied with the requirements of Contract Documents in preparation, review, and submission of designated Submittal and (ii) the Submittal is complete and in accordance with the Contract Documents and requirements of laws and regulations and governing agencies.

By: _____
Contractor (Authorized Signature)

SECTION 01 42 13
ABBREVIATIONS AND ACRONYMS

PART 1 GENERAL

1.01 REFERENCE TO STANDARDS AND SPECIFICATIONS OF TECHNICAL SOCIETIES

- A. Reference to standards and specifications of technical societies and reporting and resolving discrepancies associated therewith shall be as provided in Article 3 of the General Conditions, and as may otherwise be required herein and in the individual specification sections.
- B. Work specified by reference to published standard or specification of government agency, technical association, trade association, professional society or institute, testing agency, or other organization shall meet requirements or surpass minimum standards of quality for materials and workmanship established by designated standard or specification.
- C. Where so specified, products or workmanship shall also meet or exceed additional prescriptive or performance requirements included within Contract Documents to establish a higher or more stringent standard of quality than required by referenced standard.
- D. Where two or more standards are specified to establish quality, product and workmanship shall meet or exceed requirements of most stringent.
- E. Where both a standard and a brand name are specified for a product in Contract Documents, proprietary product named shall meet or exceed requirements of specified reference standard.
- F. Copies of standards and specifications of technical societies:
 - 1. Copies of applicable referenced standards have not been bound in these Contract Documents.
 - 2. Where copies of standards are needed by Contractor, obtain a copy or copies directly from publication source and maintain in an orderly manner at the Site as Work Site records, available to Contractor's personnel, Subcontractors, Owner, and Engineer.

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1.02 ABBREVIATIONS

A. Abbreviations for trade organizations and government agencies: Following is a list of construction industry organizations and government agencies to which references may be made in the Contract Documents, with abbreviations used.

1.	AA	Aluminum Association
2.	AABC	Associated Air Balance Council
3.	AAMA	American Architectural Manufacturers Association
4.	AASHTO	American Association of State Highway and Transportation Officials
5.	ABMA	American Bearing Manufacturers' Association
6.	ACI	American Concrete Institute
7.	AEIC	Association of Edison Illuminating Companies
8.	AGA	American Gas Association
9.	AGMA	American Gear Manufacturers' Association
10.	AI	Asphalt Institute
11.	AISC	American Institute of Steel Construction
12.	AISI	American Iron and Steel Institute
13.	AITC	American Institute of Timber Construction
14.	ALS	American Lumber Standards
15.	AMCA	Air Movement and Control Association
16.	ANSI	American National Standards Institute
17.	APA	APA – The Engineered Wood Association
18.	API	American Petroleum Institute
19.	APWA	American Public Works Association
20.	AHRI	Air-Conditioning, Heating, and Refrigeration Institute
21.	ASA	Acoustical Society of America
22.	ASABE	American Society of Agricultural and Biological Engineers
23.	ASCE	American Society of Civil Engineers
24.	ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
25.	ASME	American Society of Mechanical Engineers
26.	ASNT	American Society for Nondestructive Testing
27.	ASSE	American Society of Sanitary Engineering
28.	ASTM	ASTM International
29.	AWI	Architectural Woodwork Institute
30.	AWPA	American Wood Preservers' Association
31.	AWPI	American Wood Preservers' Institute
32.	AWS	American Welding Society
33.	AWWA	American Water Works Association

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34.	BHMA	Builders Hardware Manufacturers' Association
35.	CBM	Certified Ballast Manufacturer
36.	CCSD	Clackamas County Sewer District
37.	CDA	Copper Development Association
38.	CGA	Compressed Gas Association
39.	CISPI	Cast Iron Soil Pipe Institute
40.	CMAA	Crane Manufacturers' Association of America
41.	CRSI	Concrete Reinforcing Steel Institute
42.	CS	Commercial Standard
43.	CSA	Canadian Standards Association
44.	CSI	Construction Specifications Institute
45.	DIN	Deutsches Institut für Normung e.V.
46.	DIPRA	Ductile Iron Pipe Research Association
47.	EIA	Electronic Industries Alliance
48.	EJCDC	Engineers Joint Contract Documents' Committee
49.	ETL	Electrical Test Laboratories
50.	FAA	Federal Aviation Administration
51.	FCC	Federal Communications Commission
52.	FDA	Food and Drug Administration
53.	FEMA	Federal Emergency Management Agency
54.	FIPS	Federal Information Processing Standards
55.	FM	FM Global
56.	Fed. Spec.	Federal Specifications (FAA Specifications)
57.	FS	Federal Specifications and Standards (Technical Specifications)
58.	GA	Gypsum Association
59.	GANA	Glass Association of North America
60.	HI	Hydraulic Institute
61.	HMI	Hoist Manufacturers' Institute
62.	IBC	International Building Code
63.	ICBO	International Conference of Building Officials
64.	ICC	International Code Council
65.	ICEA	Insulated Cable Engineers' Association
66.	IFC	International Fire Code
67.	IEEE	Institute of Electrical and Electronics Engineers, Inc.
68.	IESNA	Illuminating Engineering Society of North America
69.	IFI	Industrial Fasteners Institute
70.	IGMA	Insulating Glass Manufacturer's Alliance
71.	IMC	International Mechanical Code
72.	INDA	Association of the Nonwoven Fabrics Industry
73.	IPC	International Plumbing Code

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74.	ISA	International Society of Automation
75.	ISO	International Organization for Standardization
76.	ITL	Independent Testing Laboratory
77.	JIC	Joint Industry Conferences of Hydraulic Manufacturers
78.	KCWRRF Facility	Kellogg Creek Water Resource Recovery
79.	MIA	Marble Institute of America
80.	MIL	Military Specifications
81.	MMA	Monorail Manufacturers' Association
82.	MSS	Manufacturer's Standardization Society
83.	NAAMM	National Association of Architectural Metal Manufacturers
84.	NACE	NACE International
85.	NBGQA	National Building Granite Quarries Association
86.	NEBB	National Environmental Balancing Bureau
87.	NEC	National Electrical Code
88.	NECA	National Electrical Contractor's Association
89.	NEMA	National Electrical Manufacturers' Association
90.	NESC	National Electrical Safety Code
91.	NETA	International Electrical Testing Association
92.	NFPA	National Fire Protection Association
93.	NHLA	National Hardwood Lumber Association
94.	NICET	National Institute for Certification in Engineering Technologies
95.	NIST	National Institute of Standards and Technology
96.	NRCA	National Roofing Contractors Association
97.	NRTL	Nationally Recognized Testing Laboratories
98.	NSF	NSF International
99.	NSPE	National Society of Professional Engineers
100.	NTMA	National Terrazzo and Mosaic Association
101.	NWWDA	National Wood Window and Door Association
102.	OSHA	Occupational Safety and Health Act (both Federal and State)
103.	PCI	Precast/Prestressed Concrete Institute
104.	PEI	Porcelain Enamel Institute
105.	PPI	Plastic Pipe Institute
106.	PS	Product Standards Section-U.S. Department of Commerce
107.	PWCM	ProjectWise® Construction Management
108.	RMA	Rubber Manufacturers' Association
109.	RUS	Rural Utilities Service

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110. SAE	SAE International
111. SDI	Steel Deck Institute
112. SDI	Steel Door Institute
113. SJI	Steel Joist Institute
114. SMACNA	Sheet Metal and Air Conditioning Contractors National Association
115. SPI	Society of the Plastics Industry
116. SSPC	The Society for Protective Coatings
117. STI/SPFA	Steel Tank Institute/Steel Plate Fabricators Association
118. SWI	Steel Window Institute
119. TEMA	Tubular Exchanger Manufacturers' Association
120. TCA	Tile Council of North America
121. TCWRRF	Tri-City Water Resource Recovery Facility
122. TIA	Telecommunications Industry Association
123. UBC	Uniform Building Code
124. UFC	Uniform Fire Code
125. UL	Underwriters Laboratories Inc.
126. UMC	Uniform Mechanical Code
127. USBR	U.S. Bureau of Reclamation
128. WCLIB	West Coast Lumber Inspection Bureau
129. WES	Water Environment Services
130. WI	Wood Institute
131. WRRF	Water Resource Recovery Facility
132. WWPA	Western Wood Products Association

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 43 33
MANUFACTURERS' FIELD SERVICES

PART 1 GENERAL

1.01 DEFINITIONS

- A. Person-Day: One person for 8 hours within regular Contractor working hours.

1.02 SUBMITTALS

- A. Informational Submittals:
1. Training Schedule: Submit, in accordance with requirements of this Specification, not less than 21 days prior to start of equipment installation and revise as necessary for acceptance.
 2. Lesson Plan: Submit, in accordance with requirements of this Specification, proposed lesson plan not less than 21 days prior to scheduled training and revise as necessary for acceptance.

1.03 QUALIFICATION OF MANUFACTURER'S REPRESENTATIVE

- A. Authorized representative of the manufacturer, factory trained, and experienced in the technical applications, installation, operation, and maintenance of respective equipment, subsystem, or system, with full authority by the equipment manufacturer to issue the certifications required of the manufacturer. Additional qualifications may be specified in the individual specification section.
- B. Representative subject to acceptance by Engineer. No substitute representatives will be allowed unless prior written approval by such has been given.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 FULFILLMENT OF SPECIFIED MINIMUM SERVICES

- A. Furnish manufacturers' services, when required by an individual specification section, to meet the requirements of this section.
- B. Where time is necessary in excess of that stated in the Specifications for manufacturers' services, or when a minimum time is not specified, time required to perform specified services shall be considered incidental.

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- C. Schedule manufacturer' services to avoid conflict with other onsite testing or other manufacturers' onsite services.
- D. Determine, before scheduling services, that conditions necessary to allow successful testing have been met.
- E. Only those days of service approved by Engineer will be credited to fulfill specified minimum services.
- F. When specified in individual specification sections, manufacturer's onsite services shall include:
 - 1. Assistance during product (system, subsystem, or component) installation to include observation, guidance, instruction of Contractor's assembly, erection, installation or application procedures.
 - 2. Inspection, checking, and adjustment as required for product (system, subsystem, or component) to function as warranted by manufacturer and necessary to furnish Manufacturer's Certificate of Proper Installation.
 - 3. Providing, on a daily basis, copies of manufacturers' representatives field notes and data to Engineer.
 - 4. Revisiting the Site as required to correct problems and until installation and operation are acceptable to Engineer.
 - 5. Resolution of assembly or installation problems attributable to or associated with respective manufacturer's products and systems.
 - 6. Assistance during functional and performance testing, and facility startup and evaluation.
 - 7. Training of Owner's personnel in the operation and maintenance of respective product as required.

3.02 MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

- A. When specified, a Manufacturer's Certificate of Proper Installation form, a copy of which is attached to this section, shall be completed and signed by equipment manufacturer's representative.
- B. Such form shall certify signing party is a duly authorized representative of manufacturer, is empowered by manufacturer to inspect, approve, and operate their equipment and is authorized to make recommendations required to ensure equipment is complete and operational.

3.03 TRAINING

A. General:

1. Furnish manufacturers' representatives for detailed classroom and hands-on training to Owner's personnel on operation and maintenance of specified product (system, subsystem, component) and as may be required in applicable specifications.
2. Furnish trained, articulate personnel to coordinate and expedite training, to be present during training coordination meetings with Owner, and familiar with operation and maintenance manual information specified in Section 01 78 23, Operation and Maintenance Data.
3. Manufacturer's representative shall be familiar with facility operation and maintenance requirements as well as with specified equipment.
4. Furnish complete training materials, to include operation and maintenance data, to be retained by each trainee.

B. Training Schedule:

1. List specified equipment and systems that require training services and show:
 - a. Respective manufacturer.
 - b. Estimated dates for installation completion.
 - c. Estimated training dates.
2. Allow for multiple sessions when several shifts are involved.
3. Adjust schedule to ensure training of appropriate personnel as deemed necessary by Owner, and to allow full participation by manufacturers' representatives. Adjust schedule for interruptions in operability of equipment.
4. Coordinate with Section 01 32 00, Construction Progress Documentation, and Section 01 91 14, Equipment Testing and Facility Startup.

C. Lesson Plan:

1. When manufacturer or vendor training of Owner personnel is specified, prepare a lesson plan for each required course containing the following minimum information:
 - a. Title and objectives.
 - b. Recommended attendees (such as, managers, engineers, operators, maintenance).
 - c. Course description, outline of course content, and estimated class duration.
 - d. Format (such as, lecture, self-study, demonstration, hands-on).

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- e. Instruction materials and equipment requirements.
- f. Resumes of instructors providing training.

D. Prestartup Training:

- 1. Coordinate training sessions with Owner's operating personnel and manufacturers' representatives, and with submission of operation and maintenance manuals in accordance with Section 01 78 23, Operation and Maintenance Data.
- 2. Complete at least 14 days prior to beginning of facility startup.

E. Post-startup Training: If required in Specifications, furnish and coordinate training of Owner's operating personnel by respective manufacturer's representatives.

F. Recording of Training Sessions: Provided by Owner. Coordinate with Owner's designated video production representative, to facilitate appropriate audio and video recording of prestartup and post-startup instruction sessions, including manufacturers' representatives' hands-on equipment instruction and classroom sessions.

3.04 SUPPLEMENT

A. The supplement listed below, following "End of Section," is part of this specification.

- 1. Manufacturer's Certificate of Proper Installation.

END OF SECTION

MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

OWNER _____ EQPT SERIAL NO: _____
EQPT TAG NO: _____ EQPT/SYSTEM: _____
PROJECT NO: _____ SPEC. SECTION: _____

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

- Installed in accordance with Manufacturer's recommendations.
- Inspected, checked, and adjusted.
- Serviced with proper initial lubricants.
- Electrical and mechanical connections meet quality and safety standards.
- All applicable safety equipment has been properly installed.
- Functional tests.
- System has been performance tested, and meets or exceeds specified performance requirements (When complete system of one manufacturer).

Note: Attach any performance test documentation from manufacturer.

Comments: _____

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate their equipment and (iii) authorized to make recommendations required to ensure equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____, 20____

Manufacturer: _____

By Manufacturer's Authorized Representative: _____
(Authorized Signature)

SECTION 01 45 16.13
CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. ASTM International (ASTM):
 - a. D3740, Evaluation of Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
 - b. E329, Use in the Evaluation of Testing and Inspection Agencies as Used in Construction.

1.02 DEFINITIONS

- A. Contractor Quality Control (CQC): The means by which Contractor ensures that the construction, to include that performed by subcontractors and suppliers, complies with the requirements of the Contract.

1.03 SUBMITTALS

- A. Informational Submittals:
1. CQC Plan: Submit, not later than 30 days after receipt of Notice to Proceed.
 2. CQC Report: Submit, weekly, an original and one copy in report form.

1.04 OWNER'S QUALITY ASSURANCE

- A. All Work is subject to Owner's quality assurance inspection and testing at all locations and at all reasonable times before acceptance to ensure strict compliance with the terms of the Contract Documents.
- B. Owner's quality assurance inspections and tests are for the sole benefit of Owner and do not:
1. Relieve Contractor of responsibility for providing adequate quality control measures;
 2. Relieve Contractor of responsibility for damage to or loss of the material before acceptance;

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3. Constitute or imply acceptance; or
 4. Affect the continuing rights of Owner after acceptance of the completed Work.
- C. The presence or absence of a quality assurance inspector does not relieve Contractor from any Contract requirement.
- D. Promptly furnish all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by Engineer.
- E. Owner may charge Contractor for any additional cost of inspection or test when Work is not ready at the time specified by Contractor for inspection or test, or when prior rejection makes re-inspection or retest necessary. Quality assurance inspections and tests will be performed in a manner that will not unnecessarily delay the Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Maintain an adequate inspection system and perform such inspections as will ensure that the Work conforms to the Contract Documents.
- B. Maintain complete inspection records and make them available at all times to Owner and Engineer.
- C. The quality control system shall consist of plans, procedures, and organization necessary to produce an end product that complies with the Contract Documents. The system shall cover all construction and demolition operations, both onsite and offsite, including Work by subcontractors, fabricators, suppliers and purchasing agents, and shall be keyed to the proposed construction sequence.

3.02 COORDINATION MEETING

- A. After the Preconstruction Conference, but before start of construction, and prior to acceptance of the CQC Plan, schedule a meeting with Engineer and Owner to discuss the quality control system.

- B. Develop a mutual understanding of the system details, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite Work, and the interrelationship of Contractor's management and control with the Owner's Quality Assurance.
- C. There may be occasions when subsequent conferences may be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures that may require corrective action by Contractor.

3.03 QUALITY CONTROL ORGANIZATION

A. CQC System Manager:

1. Designate an individual within Contractor's organization who will be responsible for overall management of CQC and have the authority to act in CQC matters for the Contractor.
2. CQC System Manager shall be an experienced construction person, with a minimum of 3 years' construction experience on similar type Work.
3. CQC System Manager shall report to the Contractor's project manager or someone higher in the organization. Project manager in this context shall mean the individual with responsibility for the overall quality and production management of the Project.
4. CQC System Manager shall be onsite during construction; periods of absence may not exceed 2 weeks at any one time.
5. Identify an alternate for CQC System Manager to serve with full authority during the System Manager's absence. The requirements for the alternate will be the same as for designated CQC System Manager.

B. CQC Staff:

1. Designate a CQC staff, available at the Site at all times during progress, with complete authority to take any action necessary to ensure compliance with the Contract. CQC staff members shall be subject to acceptance by Engineer.
2. CQC staff shall take direction from CQC System Manager in matters pertaining to QC.
3. CQC staff must be of sufficient size to ensure adequate QC coverage of Work phases, work shifts, and work crews involved in the construction. These personnel may perform other duties, but must be fully qualified by experience and technical training to perform their assigned QC responsibilities and must be allowed sufficient time to carry out these responsibilities.

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4. The actual strength of the CQC staff may vary during any specific Work period to cover the needs of the Project. Add additional staff when necessary for a proper CQC organization.
- C. Organizational Changes: Obtain Engineer's acceptance before replacing any member of the CQC staff. Requests for changes shall include name, qualifications, duties, and responsibilities of the proposed replacement.

3.04 QUALITY CONTROL PHASING

- A. CQC shall include at least three phases of control to be conducted by CQC System Manager for all definable features of Work, as follows:
 1. Preparatory Phase:
 - a. Notify Owner at least 48 hours in advance of beginning any of the required action of the preparatory phase.
 - b. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The CQC System Manager shall instruct applicable CQC staff as to the acceptable level of workmanship required in order to meet Contract requirements.
 - c. Document the results of the preparatory phase meeting by separate minutes prepared by the CQC System Manager and attached to the QC report.
 - d. Perform prior to beginning Work on each definable feature of Work:
 - 1) Review applicable Contract Specifications.
 - 2) Review applicable Contract Drawings.
 - 3) Verify that all materials and/or equipment have been tested, submitted, and approved.
 - 4) Verify that provisions have been made to provide required control inspection and testing.
 - 5) Examine the Work area to verify that all required preliminary Work has been completed and is in compliance with the Contract.
 - 6) Perform a physical examination of required materials, equipment, and sample Work to verify that they are on hand, conform to approved Shop Drawing or submitted data, and are properly stored.
 - 7) Review the appropriate activity hazard analysis to verify safety requirements are met.
 - 8) Review procedures for constructing the Work, including repetitive deficiencies.

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- 9) Document construction tolerances and workmanship standards for that phase of the Work.
 - 10) Check to verify that the plan for the Work to be performed, if so required, has been accepted by Engineer.
2. Initial Phase:
- a. Accomplish at the beginning of a definable feature of Work:
 - 1) Notify Owner at least 48 hours in advance of beginning the initial phase.
 - 2) Perform prior to beginning Work on each definable feature of Work:
 - a) Review minutes of the preparatory meeting.
 - b) Check preliminary Work to verify compliance with Contract requirements.
 - c) Verify required control inspection and testing.
 - d) Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Comparison with sample panels is appropriate.
 - e) Resolve all differences.
 - f) Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
 - 3) Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the QC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.
 - 4) The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.
3. Follow-up Phase:
- a. Perform daily checks to verify continuing compliance with Contract requirements, including control testing, until completion of the particular feature of Work.
 - b. Daily checks shall be made a matter of record in the CQC documentation and shall document specific results of inspections for all features of Work for the day or shift.
 - c. Conduct final follow-up checks and correct all deficiencies prior to the start of additional features of Work that will be affected by the deficient Work. Constructing upon or concealing nonconforming Work will not be allowed.
4. Additional Preparatory and Initial Phases: Additional preparatory and initial phases may be conducted on the same definable features of Work as determined by Owner if the quality of ongoing Work is unacceptable; or if there are changes in the applicable QC staff or in the onsite

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production supervision or work crew; or if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.05 CONTRACTOR QUALITY CONTROL PLAN

A. General:

1. Plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used.
2. An interim plan for the first 30 days of operation will be considered.
3. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of Work to be started.
4. Work outside of the features of Work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of Work to be started.

B. Content:

1. Plan shall cover the intended CQC organization for the entire Contract and shall include the following, as a minimum:
 - a. Organization: Description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff will implement the three-phase control system (see Paragraph Quality Control Phasing) for all aspects of the Work specified.
 - b. CQC Staff: The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a QC function.
 - c. Letters of Authority: A copy of a letter to the CQC System Manager signed by an authorized official of the firm, describing the responsibilities and delegating sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop Work which is not in compliance with the Contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities and responsibilities. Copies of these letters will also be furnished to Owner.
 - d. Submittals: Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers and purchasing agents.

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- e. Testing: Control, verification and acceptance testing procedures for each specific test to include the test name, frequency, specification paragraph containing the test requirements, the personnel and laboratory responsible for each type of test, and an estimate of the number of tests required.
 - f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests, including documentation.
 - g. Procedures for tracking deficiencies from identification through acceptable corrective action. These procedures will establish verification that identified deficiencies have been corrected.
 - h. Reporting procedures, including proposed reporting formats; include a copy of the CQC report form.
- C. Acceptance of Plans: Acceptance of the Contractor's basic and addendum CQC plans is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. Owner reserves the right to require Contractor to make changes in the CQC plan and operations including removal of personnel, as necessary, to obtain the quality specified.
- D. Notification of Changes: After acceptance of the CQC plan, Contractor shall notify Engineer, in writing, a minimum of 7 calendar days prior to any proposed change. Proposed changes are subject to acceptance by Engineer.

3.06 CONTRACTOR QUALITY CONTROL REPORT

- A. As a minimum, prepare and submit a CQC report for every 7 calendar days. Account for all days throughout the life of the Contract. Reports shall be signed and dated by CQC System Manager. Include copies of test reports and copies of reports prepared by QC staff.
- B. Maintain current records of quality control operations, activities, and tests performed, including the Work of subcontractors and suppliers.
- C. Records shall be on an acceptable form and shall be a complete description of inspections, the results of inspections, daily activities, tests, and other items, including but not limited to the following:
 - 1. Contractor/subcontractor and their areas of responsibility.
 - 2. Operating plant/equipment with hours worked, idle, or down for repair.
 - 3. Work performed today, giving location, description, and by whom. When a network schedule is used, identify each phase of Work performed each day by activity number.

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4. Test and/or control activities performed with results and references to specifications/plan requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.
5. Material received with statement as to its acceptability and storage.
6. Identify submittals reviewed, with Contract reference, by whom, and action taken.
7. Offsite surveillance activities, including actions taken.
8. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
9. List instructions given/received and conflicts on Drawings and/or Specifications.
10. Contractor's verification statement.
11. Indicate a description of trades working on the Project; the number of personnel working; weather conditions encountered; and any delays encountered.
12. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in file work and workmanship comply with the Contract.

3.07 SUBMITTAL QUALITY CONTROL

- A. Submittals shall be as specified in Section 01 33 00, Submittal Procedures. The CQC organization shall be responsible for certifying that all submittals are in compliance with the Contract requirements. Owner will furnish copies of test report forms upon request by Contractor. Contractor may use other forms as approved.

3.08 TESTING QUALITY CONTROL

- A. Testing Procedure:
 1. Perform tests specified or required to verify that control measures are adequate to provide a product which conforms to Contract requirements. Procure services of a licensed testing laboratory. Perform the following activities and record the following data:
 - a. Verify testing procedures comply with contract requirements.
 - b. Verify facilities and testing equipment are available and comply with testing standards.
 - c. Check test instrument calibration data against certified standards.
 - d. Verify recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

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- e. Documentation:
 - 1) Record results of all tests taken, both passing and failing, on the CQC report for the date taken.
 - 2) Include specification paragraph reference, location where tests were taken, and the sequential control number identifying the test.
 - 3) Actual test reports may be submitted later, if approved by Engineer, with a reference to the test number and date taken.
 - 4) Provide directly to Engineer an information copy of tests performed by an offsite or commercial test facility. Test results shall be signed by an engineer registered in the state where the tests are performed.
 - 5) Failure to submit timely test reports, as stated, may result in nonpayment for related Work performed and disapproval of the test facility for this Contract.

- B. Testing Laboratories: Laboratory facilities, including personnel and equipment, utilized for testing soils, concrete, asphalt and steel shall meet criteria detailed in ASTM D3740 and ASTM E329, and be accredited by the American Association of Laboratory Accreditation (AALA), National Institute of Standards and Technology (NIST), National Voluntary Laboratory Accreditation Program (NVLAP), the American Association of State Highway and Transportation Officials (AASHTO), or other approved national accreditation authority. Personnel performing concrete testing shall be certified by the American Concrete Institute (ACI).

3.09 COMPLETION INSPECTION

- A. CQC System Manager shall conduct an inspection of the Work at the completion of all Work or any milestone established by a completion time stated in the Contract.
- B. Punchlist:
 - 1. CQC System Manager shall develop a punchlist of items which do not conform to the Contract requirements.
 - 2. Include punchlist in the CQC report, indicating the estimated date by which the deficiencies will be corrected.
 - 3. CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected and so notify the Owner.

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4. These inspections and any deficiency corrections required will be accomplished within the time stated for completion of the entire Work or any particular increment thereof if the Project is divided into increments by separate completion dates.

END OF SECTION

SECTION 01 45 33
SPECIAL INSPECTION AND TESTING

PART 1 GENERAL

1.01 SUMMARY

- A. This section covers requirements for Special Inspection and Testing required in accordance with Chapter 17 of the 2018 International Building Code and as listed herein.

1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Society of Civil Engineers (ASCE): 7, Minimum Design Loads for Buildings and Other Structures.
 2. International Code Council (ICC):
 - a. International Building Code (IBC).
 - b. Evaluation Service (ICC-ES) Reports and Legacy Reports.

1.03 DEFINITIONS

- A. Agencies and Personnel:
1. Agency Having Jurisdiction (AHJ): Permitting building agency; may be a federal, state, local, or other regional department, or individual including building official, fire chief, fire marshal, chief of a fire prevention bureau, labor department, or health department, electrical inspector; or others having statutory authority. AHJ may be Owner when authorized to be self-permitting by governmental permitting agency or when no governmental agency has authority.
 2. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved.
 3. Registered Design Professional in Responsible Charge: An individual who is registered or licensed to practice their respective design profession as defined by statutory requirements of professional registration laws of state or jurisdiction in which Project is to be constructed.
 4. Special Inspector: Qualified person employed by Owner who will demonstrate competence to the satisfaction of AHJ for inspection of a particular type of construction or operation requiring Special Inspection.

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- B. Nonstructural Components:
 - 1. Electrical Component Supports: Structural members or assemblies which transmit loads and forces from electrical equipment to structure, including braces, frames, legs, pedestals, and tethers, as well as elements forged or cast as part of component for anchorage.
 - 2. Mechanical Component Supports: Structural members or assemblies which transmit loads and forces from mechanical equipment to structure, including braces, frames, skirts, legs, saddles, pedestals, snubbers, and tethers, as well as elements forged or cast as part of component for anchorage.
- C. Professional Observation: Does not include or waive responsibility for required Special Inspection or inspections by building official.
- D. Special Inspection:
 - 1. Special Inspection: Inspection required of materials, installation, fabrication, erection, or placement of components and connections requiring special expertise to ensure compliance with approved Contract Documents and referenced standards.
 - 2. Special Inspection, Continuous: Full-time observation of Work requiring Special Inspection by an approved Special Inspector who is present in area where the Work is being performed.
 - 3. Special Inspection, Periodic: Part-time or intermittent observation of the Work requiring Special Inspection by an approved Special Inspector who is present in area where the Work has been or is being performed, and at completion of the Work.

1.04 SUBMITTALS

- A. Informational Submittals:
 - 1. Contractor's Statement of Responsibility: Form shall be completed by entity responsible for construction of seismic-resisting component listed in Statement of Special Inspections. Refer to Article Supplement located at End of Section.

1.05 STATEMENT OF SPECIAL INSPECTIONS REQUIREMENTS

- A. Statement of Special Inspections:
 - 1. As included herein and in support of building permit application, Project-specific requirements were prepared by Registered Design Professional in Responsible Charge. The following identifies elements

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of inspection, observation, and testing program to be followed in construction of the Work:

- a. Special Inspection and testing required by IBC Section 1705 and other applicable sections and referenced standards therein.
 - b. Type and frequency of Special Inspection required.
 - c. Type and frequency of testing required.
 - d. Required frequency and distribution of testing and Special Inspection reports to be distributed by Special Inspector to Engineer, Contractor, building official, and Owner.
- B. Items Requiring Special Inspection and Frequency of Inspection:
1. Anchorage:
 - a. Anchorage of mechanical, electrical, or structural items as required by Section 01 88 15, Anchorage and Bracing, require special inspection.
 - b. Inspection for anchorage shall be continuous during the installation of the anchorage.
 - c. Anchor installation shall conform to ACI 318, 17.8.2.4 and International Code Council Evaluation Service (ICC-ES) Evaluation Reports.
- C. Special Inspection and associated testing of shop fabrication and field construction will be performed by an approved accredited independent agency or by Authority Having Jurisdiction's (AHJ) approved, qualified inspection staff. Owner will secure and pay for services of agency to perform Special Inspection and associated testing.
- D. Code required Special Inspection with associated testing is for benefit of Owner and does not:
1. Relieve Contractor of responsibility for providing adequate quality control measures.
 2. Relieve Contractor of responsibility for damage to or loss of material before acceptance.
 3. Constitute or imply acceptance.
 4. Affect continuing rights of Owner after acceptance of completed Work.
- E. The presence or absence of code required Special Inspector does not relieve Contractor from Contract requirements.
- F. Contractor is responsible for additional costs associated with Special Inspection and Testing when Work is not ready at time identified by Contractor and Special Inspectors and Professional Observer are onsite, but not able to provide contracted services.

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- G. Contractor is responsible for associated costs for additional Special Inspection and Testing by Special Inspectors required because of rejection of materials of in-place Work that cannot be made compliant to Contract Document without additional inspections and observation and testing.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Requirements of the Statement of Special Inspections are provided by the Owner. All other testing and inspections, unless noted otherwise, are provided by Contractor.
- B. Provide access to shop or Site for Special Inspection and Testing requirements.
- C. Notify Engineer in advance of required Special Inspection no later than 48 hours prior to date of Special.
- D. Provide access for Special Inspector to construction documents.
- E. Retain special inspection records on-site to be readily available for review.
- F. Cooperate with Special Inspector and provide safe access to the Work to be inspected.
- G. Provide reasonable auxiliary services as requested by the Special Inspector. Auxiliary services required include, but not limited to:
 - 1. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests to assist the Special Inspector in performing test/inspections.
 - 2. Providing storage space for the Special Inspector's exclusive use, such as for storing and curing concrete test samples and delivery of samples to testing laboratories.
 - 3. Providing the Special Inspector with access to all approved submittals.
 - 4. Providing security and protection of samples and test equipment at the Project Site.
 - 5. Provide samples of materials to be tested in required quantities.
- H. Materials and systems shall be inspected during placement where Continuous Special Inspection is required.

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- I. Where Periodic Special Inspection is indicated:
 - 1. Schedule inspections for either during or at completion of their placement or a combination or both.
 - 2. Schedule periodically inspected Work (either inspected during or after its placement) so that corrections can be completed and re-inspected before Work is inaccessible.
 - 3. Sampling a portion of the Work is not allowed. Schedules shall provide for inspection of all Work requiring periodic inspection.

3.02 SUPPLEMENT

- A. The supplement listed below, following “End of Section,” is a part of this specification:
 - 1. Contractor’s Statement of Responsibility.

END OF SECTION

CONTRACTOR'S STATEMENT OF RESPONSIBILITY

(Project)

(Name of Contracting Company)

(Business Address)

(_____) _____ (_____) _____
(Telephone) (Fax)

I, (We) hereby certify that I am (we are) aware of the Special Inspection and Testing requirements contained in Contract Documents for this Project for components including architectural, mechanical, and electrical components, as listed in herein, and that:

1. I, (We) aware of the systems and the requirements of the special inspection and acknowledge our responsibility in the implementation of the Statement of Special Inspections for the construction of the following systems:

Facility	Specification	Lateral Force-Resisting System
210 – Existing Aeration Basins	N/A	Miscellaneous structural, mechanical, and electrical anchorage.

2. Control of this Work will be exercised to obtain conformance with Contract Documents approved by building official.
3. Procedures within the Contractor's organization to be used for exercising control of the Work, method and frequency of reporting, and distribution of reports required under Statement of Special Inspections for Project are attached to this statement.
4. I, (We) will provide 48-hour notification to Engineer and approved inspection agency as required for structural tests and Special Inspection for Project.

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6. The following person is hereby identified as exercising control over requirements of this section for the Work designated above:

Name: _____

Qualifications: _____

(Print name and official title of person signing this form)

Signed by: _____

Date: _____

Project Name: _____

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Association of Nurserymen (AAN): American Standards for Nursery Stock.
 2. Federal Emergency Management Agency (FEMA).
 3. National Fire Prevention Association (NFPA): 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.
 4. Telecommunications Industry Association (TIA); Electronic Industries Alliance (EIA): 568B, Commercial Building Telecommunications Cabling Standard.
 5. U.S. Department of Agriculture (USDA): Urban Hydrology for Small Watersheds.
 6. U.S. Weather Bureau: Rainfall-Frequency Atlas of the U.S. for Durations from 30 Minutes to 24 Hours and Return Periods from 1 Year to 100 Years.

1.02 SUBMITTALS

- A. Informational Submittals:
1. Copies of permits and approvals for construction as required by Laws and Regulations and governing agencies.
 2. Temporary Utility Submittals:
 - a. Electric power supply and distribution plans.
 - b. Water supply and distribution plans.
 - c. Sanitary.
 3. Temporary Construction Submittals:
 - a. Access Roads: Routes, cross-sections, and drainage facilities.
 - b. Parking area plans.
 - c. Contractor's field office, storage yard, and storage building plans, including gravel surfaced area.
 - d. Fencing and protective barrier locations and details.
 - e. Staging area location plan.
 - f. Traffic and Pedestrian Control and Routing Plans: As specified herein, and proposed revisions thereto.
 - g. Plan for maintenance of existing plant operations.

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4. Temporary Control Submittals:
 - a. Dust control plan.
 - b. Noise control plan.
 - c. Waste management plan.

1.03 MOBILIZATION

- A. Mobilization includes, but is not limited to, these principal items:
 1. Obtaining required permits.
 2. Moving Contractor's field office and equipment required for first month operations onto Site.
 3. Installing temporary construction power, wiring, and lighting facilities.
 4. Providing onsite internet service and telephones.
 5. Providing onsite sanitary facilities and potable water facilities as specified and as required by Laws and Regulations, and governing agencies.
 6. Arranging for and erection of Contractor's work and storage yard.
 7. Posting OSHA required notices and establishing safety programs and procedures.
 8. Having Contractor's superintendent at Site full time.
- B. Use area designated for Contractor's temporary facilities as shown on Drawings.
- C. Upon written request, Owner will provide connection to internet outside of a single Contractor office trailer. No internet network infrastructure will be provided by Owner. Owner will make this connection available to Contractor at no cost. Contractor shall be responsible for providing Contractor's own internet services at no additional cost to Owner should the Owner-provided internet connection be unsatisfactory to Contractor or otherwise fail to meet Contractor's needs.

1.04 PROTECTION OF WORK AND PROPERTY

- A. Comply with Owner's safety rules while on Owner's property.
- B. Keep Owner informed of serious onsite accidents and related claims.
- C. Use of Explosives: No blasting or use of explosives will be allowed onsite.

1.05 VEHICULAR TRAFFIC

A. Traffic Control Plan:

1. Adhere to traffic control plan reviewed and accepted by Engineer. Changes to this plan shall be made only by written approval of Engineer. Secure approvals for necessary changes so as not to delay progress of the Work.
2. Maintain traffic lanes wide enough or located to include an allowable travel path for semitrailer trucks to access for biosolids trucks, chemical deliveries, fuel deliveries and garbage pickup.

- B. Traffic Routing Plan: Show sequences of construction affecting use of roadways, time required for each phase of the Work, provisions for decking over excavations and phasing of operations to provide necessary access, and plans for signing, barricading, and striping to provide passages for pedestrians and vehicles.

PART 2 PRODUCTS

2.01 TEMPORARY BYPASS PUMPING SYSTEM

- A. Provide temporary bypass pumping system to allow bypassing of existing primary effluent influent channel at aeration basins as show on Drawings and as specified in Section 01 50 10, Bypass Pumping.

2.02 ENGINEER'S FIELD OFFICES

- A. Owner will furnish Engineer's Field Offices.

2.03 PROJECT SIGN

- A. Refer to Division 00, Procurement and Contracting Requirements, for project signage requirements. Provide and maintain one, 8-foot-wide by 4-foot-high sign constructed of 3/4-inch exterior high density overlaid plywood. Sign shall bear name of Project, Owner, Contractor, and Engineer. Lettering shall be black applied on white background by an experienced sign painter. Provide exterior type enamel paint. Information to be included and logo graphic will be provided by Engineer.

PART 3 EXECUTION

3.01 ENGINEER'S FIELD OFFICE

- A. No work by Contractor for Engineers field office.

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3.02 BYPASS PUMPING SYSTEM

- A. As specified in Section 01 50 10, Bypass Pumping.

3.03 TEMPORARY UTILITIES

A. Power:

1. Electric power will be available at or near Site. Determine type and amount available and make arrangements for obtaining temporary electric power service, metering equipment, and pay costs for electric power used during Contract period, except for portions of the Work designated in writing by Engineer as substantially complete.
2. Cost of electric power will be borne by Contractor.

- B. Lighting: Provide temporary lighting to meet applicable safety requirements to allow erection, application, or installation of materials and equipment, and observation or inspection of the Work.

C. Heating, Cooling, and Ventilating:

1. Provide as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for installation of materials, and to protect materials, equipment, and finishes from damage because of temperature or humidity. Costs for temporary heat shall be borne by Contractor responsible for constructing structure or building as specified in Section 01 11 00, Summary of Work.
2. Provide adequate forced air ventilation of enclosed areas to cure installed materials, to dispense humidity, and to prevent hazardous accumulations of dust, fumes, vapors, or gases.
3. Pay costs of installation, maintenance, operation, removal, and fuel consumed.
4. Provide portable unit heaters, complete with controls, oil- or gas-fired, and suitably vented to outside as required for protection of health and property.
5. If permanent natural gas piping is used for temporary heating units, do not modify or reroute gas piping without approval of utility company. Provide separate gas metering as required by utility.

D. Water:

1. Hydrant Water:
 - a. Is available from nearby hydrants. Secure written permission for connection and use from water utility and meet requirements for

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- use, including any and all fees for use of water. Notify fire department before obtaining water from fire hydrants.
- b. Use only special hydrant-operating wrenches to open hydrants. Make certain hydrant valve is open full, since cracking valve causes damage to hydrant. Repair damaged hydrants and notify appropriate agency as quickly as possible. Hydrants shall be completely accessible to fire department at all times.
2. Include costs to connect and transport water to construction areas in Contract Price.
 3. Nonpotable Water: Owner will provide a place of temporary connection for non-potable (W3) water at Site as shown on Drawings. Provide temporary facilities and piping to bring water to point of use and remove when no longer needed. Availability of W3 water is subject to timing and maximum flow rate restrictions to be coordinated with the Owner.
- E. Sanitary and Personnel Facilities:
1. Provide and maintain facilities for Contractor's employees, Subcontractors, and other onsite employers' employees. Service, clean, and maintain facilities and enclosures.
 2. Obtain Owner's permission before allowing construction personnel to use existing sanitary facilities at Site. Use of Owner's existing sanitary facilities by construction personnel will not be allowed.
 3. Sanitary Sewer Connection: Owner will provide a place of temporary connection for sanitary sewer at Site. Provide temporary facilities and piping to bring sanitary sewer from Contractor's field office to point of use and remove when no longer needed.
- F. Telephone Service:
1. Contractor: Arrange and provide onsite telephone service for Contractor's use during construction. Pay costs of installation and monthly bills.
 2. Engineer: Provided by Owner. No Contractor work required.
 3. No incoming calls allowed to Owner's plant telephone system.
- G. Fire Protection: Furnish and maintain on Site adequate firefighting equipment capable of extinguishing incipient fires. Comply with applicable parts of NFPA 241.

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3.04 PROTECTION OF WORK AND PROPERTY

A. General:

1. Perform Work within right-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
2. No access shall be cut off from vehicular traffic for a period exceeding 1 hour unless special arrangements have been made.
3. Where completion of the Work requires temporary or permanent removal or relocation of existing utility, coordinate activities with owner of said utility and perform Work to their satisfaction.
4. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
5. Keep fire hydrants and water control valves free from obstruction and available for use at all times.
6. In areas where Contractor's operations are adjacent to or near a utility, such as gas, telephone, television, electric power, water, sewer, or irrigation system, and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection have been made by Contractor.
7. Notify property owners and utility offices that may be affected by construction operation at least 2 days in advance. Before exposing a utility, obtain utility Owner's permission. Should service of utility be interrupted due to Contractor's operation, notify proper authority immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.
8. Do not impair operation of existing sewer system. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures.
9. Maintain original Site drainage wherever possible.

B. Site Security:

1. Erect a temporary security fence. Maintain fence throughout construction period. Obtain Engineer's written permission before removal of temporary security fencing.
2. Provide and maintain additional temporary security fences as necessary to protect the Work and Contractor-furnished products not yet installed.

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C. Trees and Plantings:

1. Protect from damage and preserve trees, shrubs, and other plants outside limits of the Work and within limits of the Work, which are designated on Drawings to remain undisturbed.
 - a. Where practical, tunnel beneath trees when on or near line of trench.
 - b. Employ hand excavation as necessary to prevent tree injury.
 - c. Do not stockpile materials or permit traffic within drip lines of trees.
 - d. Provide and maintain temporary barricades around trees.
 - e. Water vegetation as necessary to maintain health.
 - f. Cover temporarily exposed roots with wet burlap, and keep burlap moist until soil is replaced around roots.
 - g. No trees, except those specifically shown on Drawings to be removed, shall be removed without written approval of Engineer.
 - h. Dispose of removed trees in a legal manner off the Site.
2. Balling and burlapping of trees indicated for replacement shall conform to recommended specifications set forth in the American Standards for Nursery Stock, published by American Association of Nurserymen. Balls shall be firm and intact and made-balls will not be accepted. Handle ball and burlap trees by ball and not by top.
3. In event of damage to bark, trunks, limbs, or roots of plants that are not designated for removal, treat damage by corrective pruning, bark tracing, application of a heavy coating of tree paint, and other accepted horticultural and tree surgery practices.
4. Replace each plant that dies as a result of construction activities.

D. Existing Structures:

1. Where Contractor contemplates removal of small structures, such as signposts and culverts that interfere with Contractor's operations, obtain approval of property owner and Engineer.
2. Replace items removed in their original location and a condition equal to or better than original.

E. Finished Construction: Protect finished floors and concrete floors exposed as well as those covered with composition tile or other applied surfacing.

F. Waterways: Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.

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- G. Dewatering: Construct, maintain, and operate cofferdams, channels, flume drains, sumps, pumps, or other temporary diversion and protection works. Furnish materials required, install, maintain, and operate necessary pumping and other equipment for the environmentally safe removal and disposal of water from the various parts of the Work. Maintain foundations and parts of the Work free from water.
- H. Archaeological Finds:
1. General: Should finds of an archaeological or paleontological nature be made within Site limits, immediately notify Owner and Engineer and proceed in accordance with General Conditions. Continue the Work in other areas without interruption.
 2. Archaeological Finds: Evidence of human occupation or use of an area within contract limits prior to the Year 1840. Evidence may consist of skeletons, stone, or other utensils, or evidence of habitations or structures.
 3. Paleontological Finds: Evidence of prehistoric plant or animal life, such as skeletons, bones, fossils, or casts and other indications such as pictographs.
 4. Owner may order the Work stopped in other areas if, in Owner's opinion, find is more extensive than may appear from uncovered material.
 5. Protection of Finds:
 - a. Cover, fence, or otherwise protect finds until notice to resume the Work is given.
 - b. Cover finds with plastic film held in place by earth, rocks, or other weights placed outside the find. Should additional backfilling be necessary for safety or to prevent caving, place backfill material loosely over plastic film.
 - c. Sheet or shore as necessary to protect excavations underway. Place temporary fence to prevent unauthorized access.
 - d. Dewater finds made below water table as necessary to protect construction Work underway. Divert groundwater or surface runoff away from find by ditching or other acceptable means.
 6. Removal of Finds:
 - a. Finds are property of Owner. Do not remove or disturb finds without Owner's written authorization.
 - b. Should Owner elect to have a find removed, provide equipment, labor, and material to permit safe removal of find without damage. Provide transportation for delivery to individuals, institutions, or other places as Owner may find desirable, expedient, or required by law.

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I. Endangered and Threatened Species:

1. Take precautions necessary and prudent to protect native endangered and threatened flora and fauna.
2. Notify Engineer of construction activities that might threaten endangered and threatened species or their habitats.
3. Engineer will mark areas known as habitats of endangered and threatened species prior to commencement of onsite activities.
4. Additional areas will be marked by Engineer as other habitats of endangered and threatened species become known during construction.

3.05 TEMPORARY CONTROLS

A. Air Pollution Control:

1. Minimize air pollution from construction operations.
2. Burning of waste materials, rubbish, or other debris will not be permitted on or adjacent to Site.
3. Conduct operations of dumping rock and of carrying rock away in trucks to cause a minimum of dust. Give unpaved streets, roads, detours, or haul roads used in construction area a dust-preventive treatment or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention.
4. Provide and maintain temporary dust-tight partitions, bulkheads, or other protective devices during construction to permit normal operation of existing facilities. Construct partitions of plywood, insulating board, plastic sheets, or similar material. Construct partitions in such a manner that dust and dirt from demolition and cutting will not enter other parts of existing building or facilities. Remove temporary partitions as soon as need no longer exists.

B. Noise Control:

1. Provide acoustical barriers so noise emanating from tools or equipment will not exceed legal noise levels.
2. Noise Control Ordinance: As described in the City of Milwaukie Municipal Code.
3. Noise Control Plan: Propose plan to mitigate construction noise and to comply with noise control ordinances, including method of construction, equipment to be used, and acoustical treatments.

C. Water Pollution Control:

1. Divert sanitary sewage and nonstorm waste flow interfering with construction and requiring diversion to sanitary sewers. Do not cause or

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- permit action to occur which would cause an overflow to existing waterway.
2. Prior to commencing excavation and construction, obtain Engineer's agreement with detailed plans showing procedures intended to handle and dispose of sewage, groundwater, and dewatering pump discharges.
 3. Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner in storm or sanitary drains. Disposal of wastes into streams or waterways is prohibited. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.
 4. Concrete Repair and Surface Preparation Waste Stream Disposal:
 - a. Do not discharge high pH process water or wastewater (nonstormwater) that is generated onsite, including water generated during concrete grinding, rubblizing, washout, and hydrodemolition activities, to waters of the State of Oregon or United States, including wetlands. Wastewater from hydrodemolition operations, if used, may be disposed at the Kellogg Creek WRRF after pre-treatment (by Contractor).
 - b. Pre-treatment shall consist of filtration, solids settling, and pH adjustment at a minimum.
 - c. Water shall be pre-treated to the following limits:
 - 1) pH: Between 6 and 9.
 - 2) Total Suspended Solids: 250 mg/L
 - d. Collect samples at a minimum frequency as follows:
 - 1) Batch Discharge: One sample per treatment batch
 - 2) Continuous Discharge: Two samples per week during continuous discharge period.
 - e. Areas for treatment equipment are as shown on Drawings.
 - f. Coordinate with Owner for point of discharge into treatment plant.
 5. Use best management practices (BMPs) to prevent or minimize stormwater exposure to pollutants from spills; vehicle and equipment fueling, maintenance, and storage; other cleaning and maintenance activities; and waste handling activities. These pollutants include fuel, hydraulic fluid, and other oils from vehicles and machinery, as well as debris, leftover paints, solvents, and glues from construction operations. Implement the following BMPs when applicable:
 - a. Written spill prevention and response procedures.
 - b. Employee training on spill prevention and proper disposal procedures.
 - c. Spill kits in all vehicles.
 - d. Regular maintenance schedule for vehicles and machinery.
 - e. Material delivery and storage controls.
 - f. Training and signage.
 - g. Covered storage areas for waste and supplies.

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- D. Erosion, Sediment, and Flood Control: Provide, maintain, and operate temporary facilities to control erosion, sediment releases and non-stormwater pollution, and to protect the Work and existing facilities from flooding during construction period. Note that certain portions of the Site including portions of Contractor staging areas are located within the 100-year floodplain. Activities shall conform to the Clackamas County Erosion Prevention and Sediment Control Planning Manual. Engineer may require additional temporary control measures if it appears pollution or erosion may result from weather, nature of materials, or progress on the Work.
- E. Waste Management and Disposal:
1. Handle, store, package, label, transport, and dispose all waste streams in accordance with federal, state, and local regulations for waste transport and disposal at facilities permitted for the type of waste disposed.
 - a. Non-hazardous solid waste shall be transported to an approved facility meeting Resource Conservation and Recovery Act (RCRA) Subtitle D Landfill requirements (40 CFR 258).
 - b. Hazardous solid waste shall be transported to an approved facility meeting RCRA Subtitle C Landfill requirements (40 CFR 264).
 2. Segregate recyclable materials from waste streams (such as, metal, cardboard, paper, plastic) to minimize waste disposal volume.
 3. Waste Management Plan:
 - a. Prior to commencing construction, obtain Engineer's agreement with detailed plans showing procedures intended to package, handle, label, transport and dispose of solid and liquid waste streams generated during construction. The waste management plan shall include:
 - 1) Proposed on-site waste storage and management areas including inspection and labeling of stored wastes.
 - 2) Intended haul routes and vehicle type.
 - 3) Waste transporter names, contact information, licenses, and EPA ID numbers.
 - 4) Procedures for packaging and transporting wastes including lining and tarping procedures to prevent leakage or spread of contamination during transport.
 - 5) Proposed permitted disposal facilities for each waste stream.
 - 6) Procedures for waste stream characterization samples and proposed analytical laboratories.
 4. Collect waste stream characterization samples for solid and hazardous constituents to establish a waste profile with a permitted disposal facility. Sampling analyses and frequency shall be as required to meet disposal facility acceptance criteria for each type of waste.

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5. Hazardous waste generated shall be transported to an approved hazardous waste treatment, storage and disposal facility within 90 days of the accumulation start date on each container.

3.06 STORAGE YARDS AND BUILDINGS

- A. Coordinate requirements with Section 01 61 00, Common Product Requirements.
- B. Temporary Storage Yards: Construct temporary storage yards for storage of products that are not subject to damage by weather conditions.
- C. Temporary Storage Buildings:
 1. Provide environmental control systems that meet recommendations of manufacturers of equipment and materials stored.
 2. Arrange or partition to provide security of contents and ready access for inspection and inventory.
 3. Store combustible materials (paints, solvents, fuels) in a well-ventilated and remote building meeting safety standards.

3.07 ACCESS ROADS

- A. Construct or maintain access roads as shown and within easements, rights-of-way, or Project limits. Use existing roads where shown. Alignments for new routes shall be approved by Engineer.
- B. Maintain drainage ways. Install and maintain culverts to allow water to flow beneath access roads. Provide corrosion-resistant culvert pipe of adequate strength to resist construction loads.
- C. Provide gravel, crushed rock, or other stabilization material to permit access by all motor vehicles at all times.
- D. Maintain road grade and crown to eliminate potholes, rutting, and other irregularities that restrict access.
- E. Coordinate with Engineer detours and other operations affecting traffic and access. Provide at least 72 hours' notice to Engineer of operations that will alter access to Site.
- F. Upon completion of construction, restore ground surface disturbed by access road construction to original grade. Replace damaged or broken culverts with new culvert pipe of same diameter and material.

3.08 PARKING AREAS

- A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner's operations, or construction operations.
- B. Provide parking facilities for personnel working on Project. No employee or equipment parking will be permitted on Owner's existing paved areas.
- C. Use area designated on Drawings for parking of Contractor's and Contractor's employees' vehicles.

3.09 VEHICULAR TRAFFIC

- A. Comply with Laws and Regulations regarding closing or restricting use of public streets or highways. No public or private road shall be closed, except by written permission of proper authority. Ensure the least possible obstruction to traffic and normal commercial pursuits.
- B. Conduct the Work to interfere as little as possible with public travel, whether vehicular or pedestrian.
- C. Whenever it is necessary to cross, close, or obstruct roads, driveways, and walks, whether public or private, provide and maintain suitable and safe bridges, detours, or other temporary expedients for accommodation of public and private travel.
- D. Road Closures: Maintain satisfactory means of exit for persons residing or having occasion to transact business along route of the Work. If it is necessary to close off roadway or alley providing sole vehicular access to property for periods greater than 2 hours, provide written notice to each owner so affected 3 days prior to such closure. In such cases, closings of up to 4 hours may be allowed. Closures of up to 10 hours may be allowed if a week's written notice is given and undue hardship does not result.
- E. Maintenance of traffic is not required if Contractor obtains written permission from Owner and tenant of private property, or from authority having jurisdiction over public property involved, to obstruct traffic at designated point.
- F. In making street crossings, do not block more than one-half the street at a time. Whenever possible, widen shoulder on opposite side to facilitate traffic flow. Provide temporary surfacing on shoulders as necessary.

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- G. Maintain top of backfilled trenches before they are paved, to allow normal vehicular traffic to pass over. Provide temporary access driveways where required. Cleanup operations shall follow immediately behind backfilling.
- H. When flaggers and guards are required by regulation or when deemed necessary for safety, furnish them with approved orange wearing apparel and other regulation traffic control devices.
- I. Provide snow removal to facilitate normal vehicular traffic on Site roads affected by construction. Perform snow removal promptly and efficiently by means of suitable equipment whenever necessary for safety, and as may be directed by proper authority.
- J. Notify fire department and police department before closing street or portion thereof. Notify said departments when streets are again passable for emergency vehicles. Do not block off emergency vehicle access to consecutive arterial crossings or dead-end streets, in excess of 300 linear feet, without written permission from fire department. Conduct operations with the least interference to fire equipment access, and at no time prevent such access. Furnish Contractor's night emergency telephone numbers to police department.
- K. Coordinate traffic routing with that of others working in same or adjacent areas.

3.10 CLEANING DURING CONSTRUCTION

- A. In accordance with General Conditions, as may be specified in other specification sections, and as required herein.
- B. Wet down exterior surfaces prior to sweeping to prevent blowing of dust and debris. At least weekly, sweep floors (basins, tunnels, platforms, walkways, roof surfaces), and pick up and dispose of debris.
- C. Provide approved containers for collection and disposal of waste materials, debris, and rubbish. At least weekly, dispose of such waste materials, debris, and rubbish offsite.
- D. At least weekly, brush sweep entry drive, roadways, and other streets and walkways affected by the Work and where adjacent to the Work.

END OF SECTION

**SECTION 01 50 10
BYPASS PUMPING**

PART 1 GENERAL

1.01 GENERAL

- A. Conditions that require bypass facilities include, but are not limited to:
1. Normal construction sequencing activities required to complete Project.
 2. Inclement weather during temporary shutdowns that require increased treatment or containment capacity.
- B. Provide bypass pumping system including, but not limited to, equipment, piping, appurtenances, and controls, required to intercept, convey, and discharge flow to be controlled. Include standby and emergency equipment. Bypass pumping system shall:
1. Protect water resources, wetlands, and other natural resources.
 2. Conform to regulatory requirements.
 3. Temporary flow control shall be done in a manner that will not damage private or public property, or create a nuisance or public menace.
 4. Flow shall be conveyed in enclosed pipes that are adequately protected from traffic or other hazards.
- C. Type and locations of bypass and temporary facilities may include, but are not limited to:
1. Plugging the primary effluent pipe.
 2. Diverting flow to the Flow Management Diversion Structure and Parshall Flume. Provide temporary overflow weir in the Parshall Flume as shown on Drawings.
 3. Pumping from the Flow Management Diversion Parshall Flume to the aeration basin anoxic zones when repairing concrete in the aeration basin influent channel. Flow shall be determined by level in the parshall flume and shall be split equally between online aeration basins using flow meters to verify flow.

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- D. Bypassing of untreated or partially treated sewage to surface waters or drainage courses is strictly prohibited during construction. In the event accidental bypassing is caused by the Contractor's operations, the Owner shall immediately be entitled to employ others to stop the bypassing and costs incurred there from, including any regulatory agency fines resulting there from, will be deducted from the Contractor's construction progress payments. If accidental bypass occurs, the Contractor shall immediately inform the Construction Manager.

1.02 DEFINITIONS

- A. Bypass Pumping: Temporary flow control method to ensure continuous flow of wastewater around any wastewater treatment component, using one or more pumps.

1.03 PERFORMANCE REQUIREMENTS

- A. Flows are pumped from the Flow Management Diversion Parshall Flume into the Aeration Basin 1 to 4 anoxic zones. It is essential to the operation of the Kellogg Creek Water Resource Recovery Facility (WRRF) that there be no restriction of flow for the duration of the Project.
- B. Bypass pumping performance requirements flow ranges are as follows:
 - 1. Primary Influent Flow: 1.5 mgd to 8.5 mgd.
 - 2. Historical Daily Average Flow: 6.2 mgd.
- C. N+1 redundancy must be maintained for equipment (pumping system meets firm capacity with largest unit out of service).

1.04 SUBMITTALS

- A. Informational Submittals:
 - 1. Flow Control Plan:
 - a. Estimated Schedule of Work.
 - b. Drawings locating bypass pumps, fuel storage, and pipelines; temporary plugs, bulkheads, or weirs shall be indicated where required for bypass pumping.
 - c. Locations where flow will be intercepted and discharged.
 - d. Control Scheme for Bypass Pumping:
 - 1) Control wiring diagrams.
 - 2) Control narratives and setpoints.

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- e. Equipment List:
 - 1) Bypass pump size and capacities, number of each pump size, and power requirements including standby equipment.
 - 2) Bypass pumping piping size and materials.
 - 3) Fuel storage size, capacity, and containment.
 - 4) Noise enclosures and noise attenuation.
 - f. Operation plan for 24-hour, 7 days per week, including holidays, as required to maintain treatment through the plant.
 - g. Other information to completely describe temporary flow control facilities and conformance to specified requirements.
 - h. Detailed emergency procedures and response time for equipment failure.
 - i. Plan shall be designed and sealed by a Professional Engineer licensed in the State of Oregon.
2. Emergency Cleanup Plan:
- a. Procedures for removal of water.
 - b. Procedures for determining nature and extent of damage.
 - c. Implement for bypass pumping.

1.05 SEQUENCING AND SCHEDULING

- A. Protection of the Environment: Conform to the applicable requirements of Section 01 50 00, Temporary Facilities and Controls.

PART 2 PRODUCTS

2.01 BYPASS PUMPING SYSTEM SUPPLIER

- A. Qualifications: The bypass pumping system supplier shall have at least 5 years' experience in the design, application, and supply of bypass pumping systems including at least three reference projects exceeding 7,500 gpm firm system capacity in municipal sewage treatment works application.
- B. The system shall be provided with a minimum two duty diesel driven pumps to provide firm capacity and one standby diesel driven pump.
- C. The following system suppliers are believed to be able to meet the qualification requirements of this section:
 - 1. Rain for Rent; Portland, Oregon.
 - 2. Xylem Portland; Tualatin, Oregon.

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3. “Or-equal” system suppliers will be considered as specified in Instructions to Bidders and the General Conditions. “Or-equal” manufacturers for equipment of this section shall meet the minimum experience qualifications specified in this section. “Or-equal” manufactures that fail to demonstrate the minimum experience qualifications will not be considered equal.

2.02 GENERAL

- A. Provide, install, maintain, and operate temporary bypass facilities, including pumps and temporary components such as dams, plugs, weirs, and bulkheads required to keep Owner’s Water Resource Recovery Facility operations online.
- B. Materials and equipment may be new or used at Contractor’s option.

2.03 BYPASS PUMPING

- A. Bypass Pumps:
 1. Fully automatic, self-priming units that do not require foot valves or vacuum pumps in priming system.
 2. Solids handling design with ability to pump minimum 3-inch diameter sphere.
 3. Able to run dry or recirculate flow for long periods of time to accommodate cyclical nature of flows.
 4. Diesel Engine: Whisper quiet pump enclosures equipped to minimize noise. Noise levels shall not exceed limits set in Milwaukie Municipal Code 8.08.090 – Maximum Permissible Environmental Noise and Sound Levels. Provide sound attenuating enclosures as required, to meet noise limits.
 5. Standby Pump: Firm capacity shall be met with largest pump out of service.
- B. Provide adequate equipment capacity and size to handle the range of flows at the treatment plant.
- C. Bypass pumping facilities shall utilize variable flow pumping to prevent rapid changes in flow and match plant flow fluctuations.
- D. Pumped flow shall be measured via a flowmeter.

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2.04 PIPING

- A. Temporary piping shall be AWWA C900, or AWWA C905, or HDPE per AWWA C906.

2.05 BULKHEADS

- A. Temporary Bulkheads: Provide with ability to remove quickly and without damaging the basin.
- B. Designed for the hydraulic loading.
- C. Suggested locations shown on Drawings.

2.06 PIPE PLUGS

- A. Pneumatic Plug: Provide with taps for connection of pressure gauges and air hoses, and flow-through capability.
- B. Pipe Diameters 24 Inches and Smaller: Use mechanical plugs with rubber gaskets or pneumatic plugs with rubber boots.
- C. Pipe Diameters Larger than 24 Inches:
 - 1. Use inflatable bag stoppers made in two or more pieces or pneumatic plugs.
 - 2. Manufacturers:
 - a. Lansas.
 - b. Cherne Industries.

PART 3 EXECUTION

3.01 GENERAL

- A. Notify Owner at least 7 days prior to implementing bypass pumping.
- B. Install temporary systems and maintain flow around Work area in a manner that will not cause property damage, restrict site access, or prevent access to equipment and unaffected Work areas.
- C. Operate and maintain temporary systems 24 hours per day, 7 days per week, including without limitation, holidays, as required to control and treat flows.
- D. Promptly remove from site all bypass pumping equipment and materials as soon as they are no longer needed.

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3.02 EQUIPMENT AND MATERIALS

- A. Install and/or locate temporary equipment, appurtenances, and piping required for bypass pumping to maintain treatment through the Kellogg Creek WRRF.
- B. Provide all fuel to run and operate bypass pumping.

3.03 FIELD QUALITY CONTROL

- A. Notify Owner 24 hours prior to testing.
- B. Hydrostatic Pressure Test for Pump Bypass System: Prior to initiating bypass pump(s), test piping with maximum pressure equal to 1.5 times maximum operating pressure of system.
- C. Bypass Pump: Prior to interrupting flow through the plant, operate bypass pumping system for 48 hours and verify pump and controls operate as specified.

END OF SECTION

SECTION 01 61 00
COMMON PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 DEFINITIONS

A. Products:

1. New items for incorporation in the Work, whether purchased by Contractor or Owner for the Project, or taken from previously purchased stock, and may also include existing materials or components required for reuse.
2. Includes the terms material, equipment, machinery, components, subsystem, system, hardware, software, and terms of similar intent and is not intended to change meaning of such other terms used in Contract Documents, as those terms are self-explanatory and have well recognized meanings in construction industry.
3. Items identified by manufacturer's product name, including make or model designation, indicated in manufacturer's published product literature, that is current as of the date of the Contract Documents.

1.02 DESIGN REQUIREMENTS

A. Where Contractor design is specified, design of installation, systems, equipment, and components, including supports and anchorage, shall be in accordance with provisions of latest edition of International Building Code (IBC) by International Code Council.

1. Wind: As shown in the General Structural Notes on Drawings.
2. Snow Load: As shown in the General Structural Notes on Drawings.
3. Seismic: As shown in the General Structural Notes on Drawings.

1.03 ENVIRONMENTAL REQUIREMENTS

A. Altitude: Provide materials and equipment suitable for installation and operation under rated conditions at 100 feet above sea level.

B. Provide equipment and devices installed outdoors or in unheated enclosures capable of continuous operation within an ambient temperature range of 0 degree F to 105 degrees F.

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1.04 PREPARATION FOR SHIPMENT

- A. When practical, factory assemble products. Mark or tag separate parts and assemblies to facilitate field assembly. Cover machined and unpainted parts that may be damaged by the elements with strippable protective coating.
- B. Package products to facilitate handling and protect from damage during shipping, handling, and storage. Mark or tag outside of each package or crate to indicate its purchase order number, bill of lading number, contents by name, name of Project and Contractor, equipment number, and approximate weight. Include complete packing list and bill of materials with each shipment.
- C. Extra Materials, Special Tools, Test Equipment, and Expendables:
 - 1. Furnish as required by individual specifications.
 - 2. Schedule:
 - a. Ensure that shipment and delivery occurs concurrent with shipment of associated equipment.
 - b. Transfer to Owner shall occur immediately subsequent to Contractor's acceptance of equipment from Supplier.
 - 3. Packaging and Shipment:
 - a. Package and ship extra materials and special tools to avoid damage during long term storage in original cartons insofar as possible, or in appropriately sized, hinged-cover, wood, plastic, or metal box.
 - b. Prominently displayed on each package, the following:
 - 1) Manufacturer's part nomenclature and number, consistent with Operation and Maintenance Manual identification system.
 - 2) Applicable equipment description.
 - 3) Quantity of parts in package.
 - 4) Equipment manufacturer.
 - 4. Deliver materials to Site.
 - 5. Notify Engineer upon arrival for transfer of materials to Owner.
 - 6. Replace extra materials and special tools found to be damaged or otherwise inoperable at time of transfer to Owner.
- D. Request a minimum 7-day advance notice of shipment from manufacturer. Upon receipt of manufacturer's advance notice of shipment, promptly notify Engineer of anticipated date and place of arrival.
- E. Factory Test Results: Reviewed and accepted by Engineer before product shipment as required in individual specification sections.

1.05 DELIVERY AND INSPECTION

- A. Deliver products in accordance with accepted current Progress Schedule and coordinate to avoid conflict with the Work and conditions at Site. Deliver anchor bolts and templates sufficiently early to permit setting prior to placement of structural concrete.
- B. Deliver products in undamaged condition, in manufacturer's original container or packaging, with identifying labels intact and legible. Include on label, date of manufacture and shelf life, where applicable.
- C. Unload products in accordance with manufacturer's instructions for unloading or as specified. Record receipt of products at Site. Promptly inspect for completeness and evidence of damage during shipment.
- D. Remove damaged products from Site and expedite delivery of identical new undamaged products, and remedy incomplete or lost products to provide that specified, so as not to delay progress of the Work.

1.06 HANDLING, STORAGE, AND PROTECTION

- A. Handle and store products in accordance with manufacturer's written instructions and in a manner to prevent damage. Store in approved storage yards or sheds provided in accordance with Section 01 50 00, Temporary Facilities and Controls. Provide manufacturer's recommended maintenance during storage, installation, and until products are accepted for use by Owner.
- B. Manufacturer's instructions for material requiring special handling, storage, or protection shall be provided prior to delivery of material.
- C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to ensure that products are maintained under specified conditions, and free from damage or deterioration. Keep running account of products in storage to facilitate inspection and to estimate progress payments for products delivered, but not installed in the Work.
- D. Store electrical, instrumentation, and control products, and equipment with bearings in weather-tight structures maintained above 60 degrees F. Protect electrical, instrumentation, and control products, and insulate against moisture, water, and dust damage. Connect and operate continuously space heaters furnished in electrical equipment.

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- E. Store fabricated products above ground on blocking or skids, and prevent soiling or staining. Store loose granular materials in well-drained area on solid surface to prevent mixing with foreign matter. Cover products that are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.
- F. Store finished products that are ready for installation in dry and well-ventilated areas. Do not subject to extreme changes in temperature or humidity.
- G. After installation, provide coverings to protect products from damage due to traffic and construction operations. Remove coverings when no longer needed.
- H. Hazardous Materials: Prevent contamination of personnel, storage area, and Site. Meet requirements of product specification, codes, and manufacturer's instructions.

PART 2 PRODUCTS

2.01 GENERAL

- A. Provide manufacturer's standard materials suitable for service conditions, unless otherwise specified in the individual specifications.
- B. Where product specifications include a named manufacturer, with or without model number, and also include performance requirements, named manufacturer's products must meet the performance specifications.
- C. When manufacturer's product model has been superseded by another commercially-available product model from same manufacturer, provide the latest model of product.
- D. Like items of products furnished and installed in the Work shall be end products of one manufacturer and of the same series or family of models to achieve standardization for appearance, operation and maintenance, spare parts and replacement, manufacturer's services, and implement same or similar process instrumentation and control functions in same or similar manner.
- E. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
- F. Provide interchangeable components of the same manufacturer, for similar components, unless otherwise specified.

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- G. Equipment, Components, Systems, and Subsystems: Design and manufacture with due regard for health and safety of operation, maintenance, and accessibility, durability of parts, and shall comply with applicable OSHA, state, and local health and safety regulations.
- H. Regulatory Requirement: Coating materials shall meet federal, state, and local requirements limiting the emission of volatile organic compounds and for worker exposure.
- I. Safety Guards: Provide for all belt or chain drives, fan blades, couplings, or other moving or rotary parts. Cover rotating part on all sides. Design for easy installation and removal. Use 16-gauge or heavier; galvanized steel, aluminum coated steel, or galvanized or aluminum coated 1/2-inch mesh expanded steel. Provide galvanized steel accessories and supports, including bolts. For outdoors application, prevent entrance of rain and dripping water.
- J. Authority Having Jurisdiction (AHJ):
 - 1. Provide the Work in accordance with NFPA 70, National Electrical Code (NEC). Where required by the AHJ, material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ in order to provide a basis for approval under NEC.
 - 2. Materials and equipment manufactured within the scope of standards published by UL shall conform to those standards and shall have an applied UL listing mark.
- K. Equipment Finish:
 - 1. Provide manufacturer's standard finish and color, except where specific color is indicated.
 - 2. If manufacturer has no standard color, provide equipment with gray finish as approved by Engineer.
- L. Special Tools and Accessories: Furnish to Owner, upon acceptance of equipment, all accessories required to place each item of equipment in full operation. These accessory items include, but are not limited to, adequate oil and grease (as required for first lubrication of equipment after field testing), light bulbs, fuses, hydrant wrenches, valve keys, handwheels, chain operators, special tools, and other spare parts as required for maintenance.
- M. Lubricant: Provide initial lubricant recommended by equipment manufacturer in sufficient quantity to fill lubricant reservoirs and to replace consumption during testing, startup, and operation until final acceptance by Owner.

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- N. Components and Materials in Contact with Water for Human Consumption: Comply with the requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements. Provide certification by manufacturer or an accredited certification organization recognized by the Authority Having Jurisdiction that components and materials comply with the maximum lead content standard in accordance with NSF/ANSI 61 and NSF/ANSI 372.
1. Use or reuse of components and materials without a traceable certification is prohibited.

2.02 FABRICATION AND MANUFACTURE

A. General:

1. Manufacture parts to U.S.A. standard sizes and gauges.
2. Two or more items of the same type shall be identical, by the same manufacturer, and interchangeable.
3. Design structural members for anticipated shock and vibratory loads.
4. Use 1/4-inch minimum thickness for steel that will be submerged, wholly or partially, during normal operation.
5. Modify standard products as necessary to meet performance specifications.

B. Lubrication Systems:

1. Require no more than weekly attention during continuous operation.
2. Convenient and accessible; oil drains with bronze or stainless steel valves and fill-plugs easily accessible from the normal operating area or platform. Locate drains to allow convenient collection of oil during oil changes without removing equipment from its installed position.
3. Provide constant-level oilers or oil level indicators for oil lubrication systems.
4. For grease type bearings, which are not easily accessible, provide and install stainless steel tubing; protect and extend tubing to convenient location with suitable grease fitting.

2.03 SOURCE QUALITY CONTROL

- A. Where Specifications call for factory testing to be witnessed by Engineer, notify Engineer not less than 14 days prior to scheduled test date, unless otherwise specified.

- B. Calibration Instruments: Bear the seal of a reputable laboratory certifying instrument has been calibrated within the previous 12 months to a standard endorsed by the National Institute of Standards and Technology (NIST).
- C. Factory Tests: Perform in accordance with accepted test procedures and document successful completion.

PART 3 EXECUTION

3.01 INSPECTION

- A. Inspect materials and equipment for signs of pitting, rust decay, or other deleterious effects of storage. Do not install material or equipment showing such effects. Remove damaged material or equipment from the Site and expedite delivery of identical new material or equipment. Delays to the Work resulting from material or equipment damage that necessitates procurement of new products will be considered delays within Contractor's control.

3.02 MANUFACTURER'S CERTIFICATE OF COMPLIANCE

- A. When so specified, a Manufacturer's Certificate of Compliance, a copy of which is attached to this section, shall be completed in full, signed by entity supplying the product, material, or service, and submitted prior to shipment of product or material or execution of the services.
- B. Engineer may permit use of certain materials or assemblies prior to sampling and testing if accompanied by accepted certification of compliance.
- C. Such form shall certify proposed product, material, or service complies with that specified. Attach supporting reference data, affidavits, and certifications as appropriate.
- D. May reflect recent or previous test results on material or product, if acceptable to Engineer.

3.03 INSTALLATION

- A. Equipment drawings show general locations of equipment, devices, and raceway, unless specifically dimensioned.
- B. No shimming between machined surfaces is allowed.
- C. Install the Work in accordance with NECA Standard of Installation, unless otherwise specified.
- D. Repaint painted surfaces that are damaged prior to equipment acceptance.

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- E. Do not cut or notch any structural member or building surface without specific approval of Engineer.
- F. Handle, install, connect, clean, condition, and adjust products in accordance with manufacturer's instructions, and as may be specified. Retain a copy of manufacturers' instruction at Site, available for review at all times.
- G. For material and equipment specifically indicated or specified to be reused in the Work:
 - 1. Use special care in removal, handling, storage, and reinstallation to assure proper function in the completed Work.
 - 2. Arrange for transportation, storage, and handling of products that require offsite storage, restoration, or renovation. Include costs for such Work in the Contract Price.

3.04 FIELD FINISHING

- A. In accordance with Section 09 90 00, Painting and Coating, and individual specification sections.

3.05 ADJUSTMENT AND CLEANING

- A. Perform required adjustments, tests, operation checks, and other startup activities.

3.06 LUBRICANTS

- A. Fill lubricant reservoirs and replace consumption during testing, startup, and operation prior to acceptance of equipment by Owner.

3.07 SUPPLEMENT

- A. The supplement listed below, following "End of Section," is part of this specification.
 - 1. Manufacturer's Certificate of Compliance.

END OF SECTION

MANUFACTURER'S CERTIFICATE OF COMPLIANCE

OWNER: _____ PRODUCT, MATERIAL, OR SERVICE
PROJECT NAME: _____ SUBMITTED: _____
PROJECT NO: _____

Comments: _____

I hereby certify that the above-referenced product, material, or service called for by the Contract for the named Project will be furnished in accordance with all applicable requirements. I further certify that the product, material, or service are of the quality specified and conform in all respects with the Contract requirements, and are in the quantity shown.

Date of Execution: _____, 20__

Manufacturer: _____

Manufacturer's Authorized Representative (*print*): _____

(Authorized Signature)

SECTION 01 64 00
OWNER-FURNISHED PRODUCTS

PART 1 GENERAL

1.01 DEFINITIONS

- A. Seller: The party under separate contract with Owner to furnish the products or special services specified herein.

1.02 OWNER-FURNISHED PRODUCTS

A. Aeration Basin Main Step Feed Gates:

1. Quantity: Four.
2. Point of Receipt: Contractor's designated laydown yard, as shown.
3. Estimated Date of Arrival: Between September 1, 2022, and October 30, 2022.
4. Equipment or Facility Necessary for Receipt and Unloading of Product: To be determined by Contractor.
5. Estimated Weight of Product: Approximately 3,000 pounds each.
6. Special Handling or Storage Instructions: Follow manufacturer's printed instructions.
7. Associated Special Services to be Provided by Owner:
 - a. Coordination of process operation and shutdowns.
 - b. Manufacturer's Certification of proper installation.
 - c. Functional testing assistance.
 - d. Performance testing assistance.
 - e. Training of Owner's personnel.

B. Aeration Basin Step Feed Gate 3:

1. Quantity: Four.
2. Point of Receipt: Contractor's designated laydown yard, as shown.
3. Estimated date of arrival: Between September 1, 2022, and October 30, 2022.
4. Equipment or Facility Necessary for Receipt and Unloading of Product: To be determined by Contractor.
5. Estimated Weight of Product: Approximately 3,000 pounds each.
6. Special Handling or Storage Instructions: Follow manufacturer's printed instructions.
7. Associated Special Services to be Provided by Owner:
 - a. Coordination of process operation and shutdowns.
 - b. Manufacturer's Certification of proper installation.

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- c. Functional testing assistance.
- d. Performance testing assistance.
- e. Training of Owner's personnel.

C. Air Valve (Type V514) and Vane Type Actuator:

- 1. Quantity:
 - a. 6-Inch: Thirteen.
 - b. 8-Inch: Five.
- 2. Point of Receipt: Contractor's designated laydown yard, as shown.
- 3. Estimated Date of Arrival: Between August 10, 2022, and September 21, 2022.
- 4. Equipment or facility necessary for receipt and unloading of product: To be determined by Contractor.
- 5. Estimated Weight of Product: Approximately 300 pounds each.
- 6. Special Handling or Storage Instructions:
 - a. Follow manufacturer's printed instructions.
 - b. Associated Special Services to be Provided by Owner:
 - 1) Coordination of process operation and shutdowns.
 - 2) Manufacturer's Certification of proper installation.
 - 3) Functional testing assistance.
 - 4) Performance testing assistance.
 - 5) Training of Owner's personnel.

D. Process Instrumentation and Control System Components:

- 1. Programmable Logic Controller (PLC) Hardware:
 - a. Processor:
 - 1) Simatic CPU 1515-2 PN, 6ES7515-2AM02-0AB0.
 - 2) Memory Card: 256 Mbyte.
 - 3) Quantity:
 - a) Rack 0: One.
 - b. Interface Module:
 - 1) For Expansion Rack, ET 200MP, IM 155-5 PN ST, 6ES7155-5AA01-0AB0:
 - a) Quantity:
 - (1) Rack 1: One.
 - c. Analog Input (AI) Module:
 - 1) S7-1500 8-point current and voltage, 6ES7531-7NF10-0AB0.
 - 2) Front Connector: One per AI module, Screw Type 40-pin.
 - 3) Quantity:
 - a) Rack 0: Four.
 - b) Rack 1: Four.

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- d. Analog Output (AO) Module:
 - 1) S7-1500 8-point current and voltage, 6ES7532-5HF00-0AB0.
 - 2) Front Connector: One per AO module, Screw Type 40-pin.
 - 3) Quantity:
 - a) Rack 0: One.
 - b) Rack 1: Two.
- e. Discrete Input (DI) Module:
 - 1) S7-1500 16-point, 24V to 125V ac/dc, 6ES7521-7EH00-0AB0.
 - 2) Front Connector: One per DI module, Screw Type 40-pin.
 - 3) Quantity:
 - a) Rack 0: Three.
 - b) Rack 1: Four.
- f. Discrete Output (DO) Module:
 - 1) S7-1500 16-point, 120/240V ac, 6ES7522-5FH00-0AB0.
 - 2) Front Connector: One per DO module, Screw Type 40-pin.
 - 3) Quantity:
 - a) Rack 0: Two.
 - b) Rack 1: None.
- g. Power Supply, 120/230V ac/dc: 6ES7507-0RA00-0AB0.
 - 1) Quantity:
 - a) Rack 0: One.
 - b) Rack 1: One.
- h. Mounting Rail:
 - 1) 19-Inch: S7-1500 mounting rail, 6ES7590-1AE80-0AA0.
 - 2) 20.9-Inch: S7-1500 mounting rail, 6ES7590-1AF30-0AA0.
 - 3) Other lengths if and as required for module count and placement.
 - 4) Quantity:
 - a) Rack 0: One 20.9-inch.
 - b) Rack 1: One 19-inch.
- 2. Point of Receipt: Contractor's designated laydown yard, as shown.
- 3. Estimated Date of Arrival: July 15, 2022.
- 4. Special Handling or Storage Instructions:
 - a. Follow manufacturer's printed instructions.
 - b. Associated Special Services to be Provided by Owner:
 - 1) Coordination of process operation and shutdowns.
 - 2) Manufacturer's Certification of proper installation.
 - 3) Functional testing assistance.
 - 4) Performance testing assistance.
 - 5) Training of Owner's personnel.

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- E. Parts of the Process Instrumentation and Control System (PICS) applications software programming will be performed by integrator of record. Refer to Section 01 31 13, Project Coordination.

1.03 INFORMATION FURNISHED BY OWNER

- A. Shop Drawings related to Owner-furnished products will be made available for Contractor's use in performing the work under this section.
- B. Manufacturer's installation, operation, and maintenance instructions for Owner-furnished products will be made available.

1.04 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings:
 - a. Show layout, location, and identification of materials provided by Contractor for installation of Owner-furnished products.
 - b. Include pipe, fittings, valves, specialties, hangers, supports, equipment, and required specialties.
 - c. Accurately show openings in floors, walls, and other parts of structure.
 - d. Provide electrical and instrumentation diagrams to indicate connecting and interconnecting electrical and control work.
 - e. Submit complete list of materials to be furnished, and include data necessary to allow Owner to determine their fitness for the Work.
- B. Informational Submittals:
 - 1. Service records for maintenance performed during construction.
 - 2. Routine maintenance requirements prior to Facility Startup.
 - 3. Manufacturer's Certificate of Proper Installation in accordance with Section 01 43 33, Manufacturers' Field Services.

1.05 TRANSFER OF PRODUCTS

- A. Unless indicated otherwise, items will be furnished f.o.b. the Project Site.
- B. Upon delivery, conduct with Owner or Engineer a joint inspection for the purpose of identifying product, general verification of quantities, and observation of apparent condition. Such inspection will not be construed as final or as receipt of any product that, as a result of subsequent inspections and tests, are determined to be nonconforming.

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- C. Damaged or incomplete products to be returned for replacement will not be unloaded, except as necessary to expedite return shipment. Owner will submit claims for transportation damage.
- D. Indicate signed acceptance of delivery on a copy of the invoice.
- E. If Contractor is not prepared to accept delivery of Owner-furnished products by either the specified Estimated Date of Arrival or such Owner-confirmed delivery date, as specified herein, associated costs incurred by Owner shall be borne by Contractor. Such costs may include, but not be limited to, demurrage, interest, insurance costs, additional administrative and engineering costs, additional factory and field technical support, additional storage and reshipping costs, cost escalation, and extended warranty costs due.

1.06 UNLOADING, STORAGE AND MAINTENANCE

- A. Subsequent to transfer, Contractor shall have complete responsibility for unloading Owner-furnished products. Unload product in accordance with manufacturers' instructions, or as specified.
- B. Store, protect, and maintain product to prevent damage until final acceptance of completed work. Damage to or loss of products after date of transfer to Contractor shall be repaired to original condition, or replaced with new identical products, at the discretion of Engineer.
- C. Maintain complete inventory of all Owner-furnished products after their transfer to Contractor.

1.07 SCHEDULING AND SEQUENCING

- A. Include sequencing constraints specified herein as part of Progress Schedule.
- B. Owner will keep Contractor informed of probable delivery date changes.
- C. Owner will confirm delivery date with Contractor 10 days prior to scheduled delivery, and within 24 hours of expected delivery time.
- D. Where a preinstallation meeting is required by this section, provide a minimum of 10 days' advance written notice to Owner of the proposed date for starting installation.
- E. Provide a minimum of 10 days' notice to Owner that Owner-furnished product is ready for all special services listed herein to be furnished by Owner through its contract with seller. Contractor shall bear the cost of all damages assessed to Owner by seller resulting from delays caused by Contractor.

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1.08 EXTRA MATERIALS

- A. Unless otherwise specified, Owner will take acceptance of, and be responsible for storing associated extra materials and special tools upon delivery.

1.09 PREINSTALLATION MEETING

- A. Arrange and attend a preinstallation meeting with the Engineer, Owner to review general procedures, erection and installation instructions, and installation sequence.
- B. Additional meetings prior to installation may be required, as determined by Owner, to transmit Owner's installation instructions to Contractor.

1.10 INSURANCE REQUIREMENTS

- A. Maintain insurance to protect Owner from loss should Owner Furnished equipment or materials be damaged. Provide itemized insurance policy with the valuation listed.
 - 1. Aeration Basin Main Step Feed Gates: \$180,000 (four at \$45,000 each with actuator).
 - 2. Aeration Basin Step Feed Gate 3: \$180,000 (four at \$45,000 each with actuator).
 - 3. Air Valve (Type V514) and Vane Type Actuator:
 - a. 6 Inches: \$168,000 (twelve at \$14,000 each).
 - b. 8 Inches: \$68,000 (four at \$17,000 each).
- B. Process Instrumentation and Control System Components:
 - 1. Programmable Logic Controller (PLC) Hardware:
 - a. Processor:
 - 1) Simatic CPU 1515-2 PN, 6ES7515-2AM02-0AB0: One at \$4,000.
 - 2) Memory Card: 256 Mbyte: One at \$500.
 - b. Interface Module:
 - 1) For Expansion Rack, ET 200MP, IM 155-5 PN ST, 6ES7155-5AA01-0AB0: One at \$700.
 - c. Analog Input (AI) Modules:
 - 1) S7-1500 8-point current and voltage, 6ES7531-7NF10-0AB0: \$10,400 (eight at \$1,300 each).
 - d. Analog Output (AO) Modules:
 - 1) S7-1500 8-point Current and Voltage, 6ES7532-5HF00-0AB0: \$3,900 (three at \$1,300 each).

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- e. Discrete Input (DI) Modules:
 - 1) S7-1500 16-point, 24V to 125V ac/dc,
6ES7521-7EH00-0AB0: \$6,300 (seven at \$900 each).
- f. Discrete Output (DO) Modules:
 - 1) S7-1500 16-point, 120/240V ac, 6ES7522-5FH00-0AB0:
\$1,400 (two at \$700 each).
- g. Power Supplies, 120/230V ac/dc:
 - 1) 6ES7507-0RA00-0AB0: \$1,600 (two at \$800 each).
- h. Mounting Rail:
 - 1) 19-Inch: S7-1500 mounting rail, 6ES7590-1AE80-0AA0:
One at \$50.
 - 2) 20.9-Inch: S7-1500 mounting rail, 6ES7590-1AF30-0AA0:
One at \$50.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in conformance with Owner-furnished product Shop Drawings and installation instructions.
- B. Provide all interconnecting structures, equipment, piping, electrical and instrumentation work, finish painting, and appurtenances to achieve a complete and functional system.
- C. Provide foundation pads for Owner-furnished products as shown. Verify exact dimensions and configuration of all pads, including penetrations, with Owner-furnished product Shop Drawings.
- D. Anchor Bolts:
 - 1. Where required, provide anchor bolts, fasteners, washers, and templates needed for installation of Owner-furnished equipment.
 - 2. Size and locate anchor bolts in accordance with Owner-furnished product Shop Drawings and installation instructions.
- E. Mechanical and electrical equipment shall be properly aligned, plumb and level, with no stresses on connecting piping or conduit.
- F. Verify direction of motor rotation before starting equipment drives.

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- G. Programmable Logic Controller (PLC) Hardware:
 - 1. Install in existing panel LCP-3 as shown on Drawings. Remove existing hardware as indicated to make space for new hardware. Deliver existing hardware to the Owner.
 - 2. Sequence the panel work to allow sequenced work in the Aeration Basins, as specified in Section 01 31 13, Project Coordination. Keep existing PLC operational for first half of construction sequence.
 - 3. Perform panel work meeting requirements of Section 40 90 00, Instrumentation and Control for Process Systems.
- H. Verify operability and safety of electrical system needed to operate equipment. Check electrical system for continuity, phasing, grounding, and proper functions.

3.02 FIELD FINISHING

- A. Products will be delivered with prime and finish coat(s) applied.
 - 1. Touch up or repair damage to coatings resulting from unloading, storage, installation, testing, and startup.
 - 2. If finish coats are damaged extensively after transfer, completely repaint.
 - 3. Touch up, repair, or complete repainting shall match color of original paint, and shall be fully compatible with applied primers and finish.

3.03 PRODUCT PROTECTION

- A. Immediately after installation, lubricate components in accordance with manufacturer's instructions.
- B. Follow manufacturer's instructions for protection and maintenance during storage, after installation but prior to testing and startup, and after startup but prior to acceptance.
- C. Furnish incidental supplies including lubricants, cleaning fluids, and similar products as needed for protecting and maintaining the Owner-furnished products.

3.04 TESTS AND INSPECTION

- A. Perform tests and inspections of installed products in accordance with requirements shown herein, Section 01 91 14, Equipment Testing and Facility Startup, and manufacturer's instructions.
1. Functional Test: Section 01 91 14, Equipment Testing and Facility Startup.
 2. Performance Test: Section 01 91 14, Equipment Testing and Facility Startup.

END OF SECTION

**SECTION 01 77 00
CLOSEOUT PROCEDURES**

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Submit prior to application for final payment:
 - a. Record Documents: As required in General Conditions.
 - b. Approved Shop Drawings and Samples: As required in the General Conditions.
 - c. Special bonds, Special Guarantees, and Service Agreements.
 - d. Consent of Surety to Final Payment: As required in General Conditions.
 - e. Releases or Waivers of Liens and Claims: As required in General Conditions.
 - f. Releases from Agreements.
 - g. Final Application for Payment: Submit in accordance with procedures and requirements stated in Article 15 of the General Conditions.
 - h. Extra Materials: As required by individual specification sections.
 - i. Documentation required to Support Owner's reporting requirements to Energy Trust of Oregon, related to incentive funding for portions of the Work.

1.02 RECORD DOCUMENTS

A. Quality Assurance:

1. Furnish qualified and experienced person, whose duty and responsibility shall be to maintain record documents.
2. Accuracy of Records:
 - a. Coordinate changes within record documents, making legible and accurate entries on each sheet of Drawings and other documents where such entry is required to show change.
 - b. Purpose of Project record documents is to document factual information regarding aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive Site measurement, investigation, and examination.
3. Make entries within 24 hours after receipt of information that a change in the Work has occurred.

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4. Prior to submitting each request for progress payment, request Engineer's review and approval of current status of record documents. Failure to properly maintain, update, and submit record documents may result in a deferral by Engineer to recommend whole or any part of Contractor's Application for Payment, either partial or final.

1.03 RELEASES FROM AGREEMENTS

- A. Furnish Owner written releases from property owners or public agencies where side agreements or special easements have been made, or where Contractor's operations have not been kept within the Owner's construction right-of-way.
- B. In the event Contractor is unable to secure written releases:
 1. Inform Owner of the reasons.
 2. Owner or its representatives will examine the Site, and Owner will direct Contractor to complete the Work that may be necessary to satisfy terms of the side agreement or special easement.
 3. Should Contractor refuse to perform this Work, Owner reserves right to have it done by separate contract and deduct cost of same from Contract Price, or require Contractor to furnish a satisfactory bond in a sum to cover legal Claims for damages.
 4. When Owner is satisfied that the Work has been completed in agreement with Contract Documents and terms of side agreement or special easement, right is reserved to waive requirement for written release if: (i) Contractor's failure to obtain such statement is due to grantor's refusal to sign, and this refusal is not based upon any legitimate Claims that Contractor has failed to fulfill terms of side agreement or special easement, or (ii) Contractor is unable to contact or has had undue hardship in contacting grantor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 MAINTENANCE OF RECORD DOCUMENTS

- A. General:
 1. Promptly following commencement of Contract Times, secure from Engineer at no cost to Contractor, one complete set of Contract Documents. Drawings will be full size.
 2. Label or stamp each record document with title, "RECORD DOCUMENTS," in neat large printed letters.

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3. Record information concurrently with construction progress and within 24 hours after receipt of information that change has occurred. Do not cover or conceal Work until required information is recorded.

B. Preservation:

1. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
2. Make documents and Samples available at all times for observation by Engineer.

C. Making Entries on Drawings:

1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe change by graphic line and note as required.
 - a. Color Coding:
 - 1) Green when showing information deleted from Drawings.
 - 2) Red when showing information added to Drawings.
 - 3) Blue and circled in blue to show notes.
 2. Date entries.
 3. Call attention to entry by “cloud” drawn around area or areas affected.
 4. Legibly mark to record actual changes made during construction including, but not limited to:
 - a. Depths of various elements of foundation in relation to finished first floor data if not shown or where depth differs from that shown.
 - b. Horizontal and vertical locations of existing and new Underground Facilities and appurtenances, and other underground structures, equipment, or Work. Reference to at least two measurements to permanent surface improvements.
 - c. Location of internal utilities and appurtenances concealed in the construction referenced to visible and accessible features of the structure.
 - d. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.
 - e. Changes made by Addenda and Field Orders, Work Change Directive, Change Order, and Engineer’s written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.

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5. Dimensions on Schematic Layouts: Show on Record Drawings, by dimension, the centerline of each run of items such as are described in previous subparagraph above.
 - a. Clearly identify the item by accurate note such as “cast iron drain,” “galv. water,” and the like.
 - b. Show, by symbol or note, vertical location of item (“under slab,” “in ceiling plenum,” “exposed,” and the like).
 - c. Make identification so descriptive that it may be related reliably to Specifications.

3.02 FINAL CLEANING

- A. At completion of the Work or of a part thereof and immediately prior to Contractor’s request for certificate of Substantial Completion; or if no certificate is issued, immediately prior to Contractor’s notice of completion, clean entire Site or parts thereof, as applicable.
 1. Leave the Work and adjacent areas affected in a cleaned condition satisfactory to Owner and Engineer.
 2. Remove grease, dirt, dust, paint or plaster splatter, stains, labels, fingerprints, and other foreign materials from exposed surfaces.
 3. Repair, patch, and touch up marred surfaces to specified finish and match adjacent surfaces.
 4. Broom clean exterior paved driveways and parking areas.
 5. Hose clean sidewalks, loading areas, and others contiguous with principal structures.
- B. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.

END OF SECTION

SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Detailed information for the preparation, submission, and Engineer's review of Operations and Maintenance (O&M) Data, as required by individual specification sections.

1.02 DEFINITIONS

- A. Final Data: Engineer-accepted data, submitted as specified herein.
- B. Maintenance Operation: As used on Maintenance Summary Form is defined to mean any routine operation required to ensure satisfactory performance and longevity of equipment. Examples of typical maintenance operations are lubrication, belt tensioning, adjustment of pump packing glands, and routine adjustments.
- C. Preliminary Data: Initial and subsequent submissions for Engineer's review.

1.03 SEQUENCING AND SCHEDULING

- A. Equipment and System Data:
 - 1. Preliminary Data:
 - a. Do not submit until Shop Drawing for equipment or system has been reviewed and approved by Engineer.
 - b. Submit prior to shipment date.
 - c. Submit preliminary data for all equipment and systems prior to 50 percent point of completion of the Work.
 - 2. Final Data: Submit Instructional Manual Formatted data not less than 30 days prior to installation of equipment or system field functional testing. Submit Compilation Formatted and Electronic Media Formatted data prior to Substantial Completion of Project.
- B. Materials and Finishes Data:
 - 1. Preliminary Data: Submit at least 15 days prior to request for final inspection.
 - 2. Final Data: Submit within 10 days after final inspection.

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1.04 DATA FORMAT

- A. Prepare preliminary and final data in the form of an instructional manual. Prepare final data in data compilation format and on electronic media.
- B. Instructional Manual Format:
 - 1. Binder: Commercial quality, permanent, three-ring or three-post binders with durable plastic cover.
 - 2. Size: 8-1/2 inches by 11 inches, minimum.
 - 3. Cover:
 - a. Identify manual with typed or printed title "OPERATION AND MAINTENANCE DATA" and list:
 - 1) Project title.
 - 2) Designate applicable system, equipment, material, or finish.
 - 3) Identity of separate structure as applicable.
 - 4) Identify volume number if more than one volume.
 - 5) Identity of general subject matter covered in manual.
 - 6) Identity of equipment number and specification section.
 - 4. Spine:
 - a. Project title.
 - b. Identify volume number if more than one volume.
 - 5. Title Page:
 - a. Contractor name, address, and telephone number.
 - b. Subcontractor, Supplier, installer, or maintenance contractor's name, address, and telephone number, as appropriate.
 - 1) Identify area of responsibility of each.
 - 2) Provide name and telephone number of local source of supply for parts and replacement.
 - 6. Table of Contents:
 - a. Neatly typewritten and arranged in systematic order with consecutive page numbers.
 - b. Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.
 - 7. Paper: 20-pound minimum, white for typed pages.
 - 8. Text: Manufacturer's printed data, or neatly typewritten.
 - 9. Three-hole punch data for binding and composition; arrange printing so that punched holes do not obliterate data.
 - 10. Material shall be suitable for reproduction, with quality equal to original. Photocopying of material will be acceptable, except for material containing photographs.

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C. Data Compilation Format:

1. Compile all Engineer-accepted preliminary O&M data into a hard-copy, hard-bound set.
2. Each set shall consist of the following:
 - a. Binder: Commercial quality, permanent, three-ring or three-post binders with durable plastic cover.
 - b. Cover:
 - 1) Identify each volume with typed or printed title “OPERATION AND MAINTENANCE DATA, VOLUME NO. ___ OF ___”, and list:
 - a) Project title.
 - b) Contractor’s name, address, and telephone number.
 - c) If entire volume covers equipment or system provided by one Supplier include the following:
 - (1) Identity of general subject matter covered in manual.
 - (2) Identity of equipment number and specification section.
 - c. Provide each volume with title page and typed table of contents with consecutive page numbers. Place contents of entire set, identified by volume number, in each binder.
 - d. Table of contents neatly typewritten, arranged in a systematic order:
 - 1) Include list of each product, indexed to content of each volume.
 - 2) Designate system or equipment for which it is intended.
 - 3) Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.
 - e. Section Dividers:
 - 1) Heavy, 80-pound cover weight, tabbed with numbered plastic index tabs.
 - 2) Fly-Leaf:
 - a) For each separate product, or each piece of operating equipment, with typed description of product and major component parts of equipment.
 - b) List with Each Product:
 - (1) Name, address, and telephone number of Subcontractor, Supplier, installer, and maintenance contractor, as appropriate.
 - (2) Identify area of responsibility of each.
 - (3) Provide local source of supply for parts and replacement.
 - c) Identity of separate structure as applicable.

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- f. Assemble and bind material, as much as possible, in same order as specified in the Contract Documents.

D. Electronic Media Format:

1. Portable Document Format (PDF):
 - a. Provide all PDF files with searchable text. Perform Optical Character Recognition (OCR) process on PDF files as required to provide searchable function. Perform de-speckle, de-skew, page rotation and other pre-processing actions as may be required to convert data to searchable text.
 - b. After all preliminary data has been found to be acceptable to Engineer, submit Operation and Maintenance data in PDF format on CD.
 - c. Files to be exact duplicates of Engineer-accepted preliminary data. Arrange by specification number and name.
 - d. Files to be fully functional and viewable in most recent version of Adobe Acrobat.
2. Manufacturers' standard electronic format.

1.05 SUBMITTALS

A. Informational:

1. Data Outline: Submit electronic copies of a detailed outline of proposed organization and contents of Final Data prior to preparation of Preliminary Data.
2. Equipment Inventory Data:
 - a. See Supplement "Equipment Inventory Template". Owner will use this data to populate Owner's computerized maintenance management system.
 - b. Obtain digital (MS Excel) version of this template from Owner.
 - c. Prepare and submit digital (MS Excel) data for all equipment, valves, and instruments.
 - d. Continuously maintain current Equipment Inventory Data, following receipt of approved submittals for each equipment.
 - e. Submit final Equipment Inventory Data for each unit process concurrent with Manufacturer's Certificate of Proper Installation (as applicable) and prior to Functional Testing Part 1 for the related unit process.
3. Preliminary Data:
 - a. Submit for Engineer's review.
 - b. If data meets conditions of the Contract, Engineer will respond noting such condition.

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- c. If data does not meet conditions of the Contract:
 - 1) Submittal will be returned to Contractor with Engineer's comments for revision.
 - 2) Resubmit revised in accordance with Engineer's comments.
- 4. Final Data: Submit two copies and two CDs or DVDs in format specified herein.

1.06 DATA FOR EQUIPMENT AND SYSTEMS

A. Content for Each Unit (or Common Units) and System:

- 1. Product Data:
 - a. Include only those sheets that are pertinent to specific product.
 - b. Clearly annotate each sheet to:
 - 1) Identify specific product or part installed.
 - 2) Identify data applicable to installation.
 - 3) Identify or cross out references to inapplicable information.
 - c. Function, normal operating characteristics, and limiting conditions.
 - d. Performance curves, engineering data, nameplate data, and tests.
 - e. Complete nomenclature and commercial number of replaceable parts.
 - f. Original manufacturer's parts list, illustrations, detailed assembly drawings showing each part with part numbers and sequentially numbered parts list, and diagrams required for maintenance.
 - g. Spare parts ordering instructions.
 - h. Where applicable, identify installed spares and other provisions for future work (such as: reserved panel space, unused components, wiring, terminals).
- 2. As-installed, color-coded piping diagrams.
- 3. Charts of valve tag numbers, with the location and function of each valve.
- 4. Drawings:
 - a. Supplement product data with Drawings as necessary to clearly illustrate:
 - 1) Format:
 - a) Provide reinforced, punched, binder tab; bind in with text.
 - b) Reduced to 8-1/2 inches by 11 inches, or 11 inches by 17 inches folded to 8-1/2 inches by 11 inches.
 - c) Where reduction is impractical, fold and place in 8-1/2-inch by 11-inch envelopes bound in text.
 - d) Identify specification section and product on Drawings and envelopes.

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- b. Relations of component parts of equipment and systems.
 - c. Control and flow diagrams.
 - d. Coordinate Drawings with Project Record Documents to assure correct illustration of completed installation.
5. Instructions and Procedures: Within text, as required to supplement product data.
- a. Format:
 - 1) Organize in consistent format under separate heading for each different procedure.
 - 2) Provide logical sequence of instructions for each procedure.
 - 3) Provide information sheet for Owner's personnel, including:
 - a) Proper procedures in event of failure.
 - b) Instances that might affect validity of guarantee or Bond.
 - b. Installation Instructions: Including alignment, adjusting, calibrating, and checking.
 - c. Operating Procedures:
 - 1) Startup, break-in, routine, and normal operating instructions.
 - 2) Test procedures and results of factory tests where required.
 - 3) Regulation, control, stopping, and emergency instructions.
 - 4) Description of operation sequence by control manufacturer.
 - 5) Shutdown instructions for both short and extended duration.
 - 6) Summer and winter operating instructions, as applicable.
 - 7) Safety precautions.
 - 8) Special operating instructions.
 - d. Maintenance and Overhaul Procedures:
 - 1) Routine maintenance.
 - 2) Guide to troubleshooting.
 - 3) Disassembly, removal, repair, reinstallation, and re-assembly.
6. Guarantee, Bond, and Service Agreement: In accordance with Section 01 77 00, Closeout Procedures.
- B. Content for Each Electric or Electronic Item or System:
- 1. Description of Unit and Component Parts:
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data, nameplate data, and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 - d. Interconnection wiring diagrams, including control and lighting systems.

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2. Circuit Directories of Panelboards:
 - a. Electrical service.
 - b. Control requirements and interfaces.
 - c. Communication requirements and interfaces.
3. List of electrical relay settings, and control and alarm contact settings.
4. Electrical interconnection wiring diagram, including as applicable, single-line, three-line, schematic and internal wiring, and external interconnection wiring.
5. As-installed control diagrams by control manufacturer.
6. Operating Procedures:
 - a. Routine and normal operating instructions.
 - b. Startup and shutdown sequences, normal and emergency.
 - c. Safety precautions.
 - d. Special operating instructions.
7. Maintenance Procedures:
 - a. Routine maintenance.
 - b. Guide to troubleshooting.
 - c. Adjustment and checking.
 - d. List of relay settings, and control and alarm contact settings.
8. Manufacturer's printed operating and maintenance instructions.
9. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

C. Maintenance Summary:

1. Compile individual Maintenance Summary for each applicable equipment item, respective unit or system, and for components or sub-units.
2. Format:
 - a. Use Maintenance Summary Form bound with this section or electronic facsimile of such.
 - b. Each Maintenance Summary may take as many pages as required.
 - c. Use only 8-1/2-inch by 11-inch size paper.
 - d. Complete using typewriter or electronic printing.
3. Include detailed lubrication instructions and diagrams showing points to be greased or oiled; recommend type, grade, and temperature range of lubricants and frequency of lubrication.
4. Recommended Spare Parts:
 - a. Data to be consistent with manufacturer's Bill of Materials/Parts List furnished in O&M manuals.
 - b. "Unit" is the unit of measure for ordering the part.
 - c. "Quantity" is the number of units recommended.
 - d. "Unit Cost" is the current purchase price.

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D. Equipment Inventory Data:

1. Compile individual Equipment Inventory Data for each applicable equipment item, respective unit or system, and for components or sub-units.
2. Format:
 - a. See attached supplement.
 - b. Complete digitally using MS Excel 2010 or newer.
3. Coordinate with Owner to review required data format prior to initial submittal.

1.07 DATA FOR MATERIALS AND FINISHES

A. Content for Architectural Products, Applied Materials, and Finishes:

1. Manufacturer's data, giving full information on products:
 - a. Catalog number, size, and composition.
 - b. Color and texture designations.
 - c. Information required for reordering special-manufactured products.
2. Instructions for Care and Maintenance:
 - a. Manufacturer's recommendation for types of cleaning agents and methods.
 - b. Cautions against cleaning agents and methods that are detrimental to product.
 - c. Recommended schedule for cleaning and maintenance.

B. Content for Moisture Protection and Weather Exposed Products:

1. Manufacturer's data, giving full information on products:
 - a. Applicable standards.
 - b. Chemical composition.
 - c. Details of installation.
2. Instructions for inspection, maintenance, and repair.

1.08 SUPPLEMENTS

A. The supplements listed below, following "End of Section," are part of this Specification.

1. Maintenance Summary Form.
2. Equipment Inventory Template.

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PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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MAINTENANCE SUMMARY FORM

PROJECT: Kellogg Creek WRRF Aeration Improvements CONTRACT NO.: _____

1. EQUIPMENT ITEM _____

2. MANUFACTURER _____

3. EQUIPMENT/TAG NUMBER(S) _____

4. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS) _____

5. NAMEPLATE DATA (hp, voltage, speed, etc.) _____

6. MANUFACTURER'S LOCAL REPRESENTATIVE _____

a. Name _____ Telephone No. _____

b. Address _____

7. MAINTENANCE REQUIREMENTS

Maintenance Operation Comments	Frequency	Lubricant (If Applicable)
List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable. (Reference to manufacturer's catalog or sales literature is not acceptable.)	List required frequency of each maintenance operation.	Refer by symbol to lubricant required.

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8. LUBRICANT LIST

Reference Symbol	Valvoline	Exxon Mobil	Chevron Texaco	Petro-Canada	Or-Equal
List symbols used in No. 7 above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				

9. RECOMMENDED SPARE PARTS FOR OWNER’S INVENTORY

Part No.	Description	Unit	Quantity	Unit Cost
Note: Identify parts provided by this Contract with two asterisks.				

EQUIPMENT INVENTORY TEMPLATE																					
Field Title	Equipment Classification	Equipment Type	Operating Status	Plant	Area	System	Make	Model	Serial Number	Model Year	Size	Valve Operator	Asbuilt Drawing	AsBuilt ID	Purchase Amount	Purchase Date	Warranty Number/Description	Installed By	Start Date	Service Life	General Comment
EXAMPLE	Pumps	Centrifugal	Operational	Kellogg	Aeration Basins	Aeration	ABS Pumps Inc.	ABC123	923874	2021	100 HP	Not Applicable	X-XX-123	Pump-101	\$1,234	11/18/2021	No. 1234; 1-year from startup	Contractor	11/19/2021	15 years	

SECTION 01 88 15
ANCHORAGE AND BRACING

PART 1 GENERAL

1.01 SUMMARY

- A. This section covers requirements for anchorage and bracing of equipment, distribution systems, and other nonstructural components required in accordance with the ICC 2018 International Building Code (IBC), for seismic, wind, gravity, soil, and operational loads.

1.02 DEFINITIONS

- A. Authority Having Jurisdiction (AHJ): Permitting building agency; may be a federal, state, local, or other regional department, or individual, including building official, fire chief, fire marshal, chief of a fire prevention bureau, labor department, or health department, electrical inspector; or others having statutory authority. AHJ may be Owner when authorized to be self-permitting by governmental permitting agency or when no governmental agency has authority.
- B. Designated Seismic System: Architectural, electrical, and mechanical system or their components for which component importance factor is greater than 1.0.

1.03 DESIGN AND PERFORMANCE REQUIREMENTS

- A. General:
 - 1. Anchorage and bracing systems shall be designed by a qualified professional engineer registered in the State of Oregon.
 - 2. Design anchorage into concrete, including embedment in accordance with ACI 318; Chapter 17 (or other industry standard approved by Engineer), and Project Specifications.
 - a. Unless otherwise noted, design for cracked concrete condition.
 - 3. Design anchorage and bracing of architectural, mechanical, and electrical components and systems in accordance with this section, unless a design is specifically provided within Contract Documents or where exempted hereinafter.
 - 4. Design attachments, braces, and anchors for equipment, components, and distribution systems to structure for gravity, seismic, wind, and operational loading.

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5. Design seismic anchorage and bracing for modified existing mechanical, or electrical systems where code requirements would dictate design for similar new components.
6. Anchor and brace piping and ductwork, whether exempt or not exempt for this section, so that lateral or vertical displacement does not result in damage or failure to essential architectural, mechanical, or electrical equipment.
7. Provide supplementary framing where required to transfer anchorage and bracing loads to structure.
8. Adjust equipment pad sizes or provide additional anchorage confinement reinforcing to provide required anchorage capacities.
9. Design anchorage and bracing for:
 - a. Equipment and components that weigh more than 400 pounds and are mounted 4 feet or less above adjacent finished floor.
 - b. Equipment weighing more than 20 pounds that is mounted more than 4 feet above adjacent finished floor.
 - c. Distribution systems that weigh more than 5 pounds per foot that are mounted more than 4 feet above adjacent finished floor.
10. For components exempted from design requirements of this section, provide bolted, welded, or otherwise positively fastened attachments to supporting structure.

B. Design Loads:

1. Gravity: Design anchorage and bracing for self-weight and superimposed loads on components and equipment.
2. Wind: Design anchorage and bracing for wind criteria provided on General Structural Notes on Drawings for exposed architectural components and exterior and wind-exposed mechanical and electrical equipment. Alternately, manufacturer certification may be provided for components such as roofing and flashing to verify attachments meet Project-specific design criteria.
3. Operational:
 - a. For loading supplied by equipment manufacturer for IBC required load cases.
 - b. Loads may include equipment vibration, torque, thermal effects, effects of internal contents (weight and sloshing), water hammer, and other load-inducing conditions.
 - c. Locate braces to minimize vibration to or movement of structure.
4. Seismic:
 - a. In accordance with 2018 IBC, Section 1613, and Chapter 13 of ASCE 7.

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- b. Design anchorage and bracing for design criteria listed on General Structural Notes on Drawings.
- c. Design forces for anchors in concrete or masonry shall be in accordance with ASCE 7, Section 13.4.2, or IBC Section 1905.1.9 as applicable for Project Seismic Design Category.

C. Seismic Design Requirements:

- 1. Analyze local region of body of nonstructural component for load transfer of anchorage attachment if component $I_p = 1.5$.
- 2. Provide support drawings and calculations for electrical distribution components if any of the following conditions apply:
 - a. Conduit diameter is greater than 2.5-inch trade size.
 - b. Total weight of bus duct, cable tray, or conduit supported by trapeze assemblies exceeds 10 pounds per foot.
- 3. Existing components, systems, and equipment in their final condition that are modified by Project requirements and are not exempted by above paragraph require the same anchorage and bracing drawing and calculation submittals as new equipment. Field verify existing conditions.
- 4. Other seismic design and detailing information identified in ASCE 7, Chapter 13, is required to be provided for new and modified or noted mechanical and electrical components, systems, or equipment.

1.04 SUBMITTALS

A. Action Submittals:

- 1. Shop Drawings:
 - a. List of architectural, mechanical, and electrical equipment requiring Contractor-designed anchorage and bracing, unless specifically exempted.
 - b. Manufacturers' engineered seismic and non-seismic hardware product data.
 - c. Attachment assemblies' drawings including seismic attachments; include connection hardware, braces, and anchors or anchor bolts for nonexempt components, equipment, and systems.
 - d. List of existing architectural, mechanical, and electrical equipment or components to be modified in Project requiring Contractor-designed anchorage and bracing in final retrofitted condition.
 - e. Submittal will be rejected if proposed anchorage method would create excessive stress to supporting member. Revise anchorages and strengthen structural support to eliminate overstressed condition.

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B. Informational Submittals:

1. Anchorage and Bracing Calculations: For attachments, braces, and anchorages, include IBC and Project-specific criteria as noted on General Structural Notes on Drawings, in addition to manufacturer's specific criteria used for design; sealed by a civil engineer registered in the State of Oregon.
2. Manufacturer's hardware installation requirements.

1.05 SOURCE QUALITY CONTROL

- A. Contractor and supplier responsibilities to accommodate Owner-furnished shop fabrication related special inspections and testing are provided in Project's Statement of Special Inspections on Drawings, and Section 01 45 33, Special Inspection and Testing.
- B. Provide all other specified, regulatory required, or required repair verification inspection and testing that is not listed in Statement of Special Inspections in accordance with Section 01 45 16.13, Contractor Quality Control.

PART 2 PRODUCTS

2.01 GENERAL

- A. Design and construct attachments and supports transferring seismic and non-seismic loads to structure of materials and products suitable for application and in accordance with design criteria shown on Drawings and nationally recognized standards.
- B. Provide anchor bolts of the size, minimum embedment, and spacing designated in calculations submitted by Contractor and accepted by Engineer.
- C. Provide post-installed concrete and masonry anchors for anchorage of equipment to concrete or masonry in accordance with Section 05 05 19, Post-Installed Anchors. Provide post-installed anchors of the size, minimum embedment, and spacing designated in calculations submitted by Contractor and accepted by Engineer.
- D. Do not use powder-actuated fasteners or sleeve anchors for seismic attachments and anchorage where resistance to tension loads is required. Do not use expansion anchors, other than undercut anchors, for nonvibration isolated mechanical equipment rated over 10 hp.

PART 3 EXECUTION

3.01 GENERAL

- A. Make attachments, bracing, and anchorage in such a manner that component lateral force is transferred to lateral force resisting system of structure through a complete load path.
- B. Design, provide, and install overall seismic anchorage system to provide restraint in all directions, including vertical, for each component or system so anchored.
- C. Provide snubbers in each horizontal direction and vertical restraints for components mounted on vibration isolation systems where required to resist overturning.
- D. Provide piping anchorage that maintains design flexibility and expansion capabilities at flexible connections and expansion joints.
 - 1. Piping and ductwork suspended more than 12 inches below supporting structure shall be braced for seismic effects to avoid significant bending of hangers and their attachments.
- E. Anchor tall and narrow equipment such as motor control centers and telemetry equipment at base and within 12 inches from top of equipment, unless approved otherwise by Engineer.
- F. Do not attach architectural, mechanical, or electrical components to more than one element of a building structure at a single restraint location where such elements may respond differently during a seismic event. Do not make such attachments across building expansion and contraction joints.

3.02 INSTALLATION

- A. Do not install components or their anchorages or restraints prior to review and acceptance by Engineer and AHJ.
- B. Notify Engineer upon completion of installation of seismic restraints in accordance with Section 01 45 33, Special Inspection and Testing.

3.03 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

- A. In accordance with Section 05 05 19, Post-Installed Anchors.

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- B. Owner-Furnished Quality Assurance, in accordance with IBC Chapter 17 requirements, is provided in Statement of Special Inspections Plan on Drawings. Contractor responsibilities and related information are included in Section 01 45 33, Special Inspection and Testing.
- C. Provide any other specified, regulatory required, or required repair verification inspection and testing that is not listed in Statement of Special Inspections in accordance with Section 01 45 16.13, Contractor Quality Control.

END OF SECTION

SECTION 01 91 14
EQUIPMENT TESTING AND FACILITY STARTUP

PART 1 GENERAL

1.01 DEFINITIONS

- A. Facility: Entire Project, or an agreed-upon portion, including all of its unit processes.
- B. Facility Performance Demonstration:
 - 1. A demonstration, conducted by Contractor, with assistance of Owner, to demonstrate and document the performance of the entire operating facility, both manually and automatically (if required), based on criteria developed in conjunction with Owner and as accepted by Engineer.
 - 2. Such demonstration is for the purposes of (i) verifying to Owner entire facility performs as a whole, and (ii) documenting performance characteristics of completed facility for Owner's records. Neither the demonstration nor the evaluation is intended in any way to make performance of a unit process or entire facility the responsibility of Contractor, unless such performance is otherwise specified.
- C. Functional Test: Test or tests in presence of Engineer and Owner to demonstrate that installed equipment meets manufacturer's installation, calibration, and adjustment requirements and other requirements as specified.
- D. Performance Test: Test or tests performed after any required functional test in presence of Engineer and Owner to demonstrate and confirm individual equipment meets performance requirements specified in individual sections.
- E. Unit Process: As used in this section, a unit process is a portion of the facility that performs a specific process function, such as anaerobic digestion, or biosolids dewatering.

1.02 SUBMITTALS

- A. Informational Submittals:
 - 1. Facility Startup and Performance Demonstration Plan.
 - 2. Functional and performance test results.
 - 3. Completed Unit Process Startup Form for each unit process.
 - 4. Completed Facility Performance Demonstration/Certification Form.

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1.03 FACILITY STARTUP AND PERFORMANCE DEMONSTRATION PLAN

- A. Develop a written plan for review by Engineer and Owner's operations personnel; to include the following:
1. Step-by-step instructions for startup of each unit process and the complete facility.
 2. Unit Process Startup Form (sample attached), to minimally include the following:
 - a. Description of the unit process, including equipment numbers/nomenclature of each item of equipment and all included devices.
 - b. Detailed procedure for startup of the unit process, including valves to be opened/closed, order of equipment startup, etc.
 - c. Startup requirements for each unit process, including water, power, chemicals, etc.
 - d. Space for evaluation comments.
 3. Facility Performance Demonstration/Certification Form (sample attached), to minimally include the following:
 - a. Description of unit processes included in the facility startup.
 - b. Sequence of unit process startup to achieve facility startup.
 - c. Description of computerized operations, if any, included in the facility.
 - d. Contractor certification facility is capable of performing its intended function(s), including fully automatic operation.
 - e. Signature spaces for Contractor and Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Facility Startup Meetings: Schedule, in accordance with requirements of Section 01 31 19, Project Meetings, to discuss test schedule, test methods, materials, chemicals and liquids required, facilities operations interface, and Owner involvement.
- B. Contractor's Testing and Startup Representative:
1. Designate and furnish one or more personnel to coordinate and expedite testing and facility startup.
 2. Representative(s) shall be present during startup meetings and shall be available at all times during testing and startup.

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- C. Provide temporary valves, gauges, piping, test equipment and other materials and equipment required for testing and startup.
- D. Provide Subcontractor and equipment manufacturers' staff adequate to prevent delays. Schedule ongoing work so as not to interfere with or delay testing and startup.
- E. Owner will:
 - 1. Provide water, power, chemicals, and other items as required for startup, unless otherwise indicated.
 - 2. Operate process units and facility with support of Contractor.
 - 3. Provide labor and materials as required for laboratory analyses.

3.02 EQUIPMENT TESTING

- A. Preparation:
 - 1. Complete installation before testing.
 - 2. Furnish qualified manufacturers' representatives, when required by individual specification sections.
 - 3. Obtain and submit from equipment manufacturer's representative Manufacturer's Certificate of Proper Installation Form, in accordance with Section 01 43 33, Manufacturers' Field Services, when required by individual specification sections.
 - 4. Equipment Test Report Form:
 - a. Provide written test report for each item of equipment to be tested, to include the minimum information:
 - 1) Owner/Project Name.
 - 2) Equipment or item tested.
 - 3) Date and time of test.
 - 4) Type of test performed (Functional or Performance).
 - 5) Test method.
 - 6) Test conditions.
 - 7) Test results.
 - 8) Signature spaces for Contractor and Engineer as witness.
 - 5. Cleaning and Checking:
 - a. Prior to beginning functional testing:
 - 1) Calibrate testing equipment in accordance with manufacturer's instructions.
 - 2) Inspect and clean equipment, devices, connected piping, and structures to ensure they are free of foreign material.
 - 3) Lubricate equipment in accordance with manufacturer's instructions.

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- 4) Turn rotating equipment by hand when possible to confirm that equipment is not bound.
 - 5) Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.
 - 6) Check power supply to electric-powered equipment for correct voltage.
 - 7) Adjust clearances and torque.
 - 8) Test piping for leaks.
6. Ready-to-test determination will be by Engineer based at least on the following:
- a. Acceptable Operation and Maintenance Data.
 - b. Notification by Contractor of equipment readiness for testing.
 - c. Receipt of Manufacturer's Certificate of Proper Installation, if so specified.
 - d. Adequate completion of work adjacent to, or interfacing with, equipment to be tested.
 - e. Availability and acceptability of manufacturer's representative, when specified, to assist in testing of respective equipment.
 - f. Satisfactory fulfillment of other specified manufacturer's responsibilities.
 - g. Equipment and electrical tagging complete.
 - h. Delivery of all spare parts and special tools.

B. Functional Testing:

1. Conduct as specified in individual specification sections.
2. Notify Owner and Engineer in writing at least 10 days prior to scheduled date of testing.
3. Prepare Equipment Test Report summarizing test method and results.
4. When, in Engineer's opinion, equipment meets functional requirements specified, such equipment will be accepted for purposes of advancing to performance testing phase, if so required by individual specification sections. Such acceptance will be evidenced by Engineer/Owner's signature as witness on Equipment Test Report.

C. Performance Testing:

1. Conduct as specified in individual specification sections.
2. Notify Engineer and Owner in writing at least 10 days prior to scheduled date of test.
3. Performance testing shall not commence until equipment has been accepted by Engineer as having satisfied functional test requirements specified.
4. Type of fluid, gas, or solid for testing shall be as specified.

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5. Unless otherwise indicated, furnish labor, materials, and supplies for conducting the test and taking samples and performance measurements.
6. Prepare Equipment Test Report summarizing test method and results.
7. When, in Engineer's opinion, equipment meets performance requirements specified, such equipment will be accepted as conforming to Contract requirements. Such acceptance will be evidenced by Engineer's signature on Equipment Test Report.

3.03 STARTUP OF UNIT PROCESSES

- A. Prior to unit process startup, equipment within unit process shall be accepted by Engineer as having met functional and performance testing requirements specified.
- B. Startup sequencing of unit processes shall be in the order specified in Section 01 31 13, Project Coordination.
- C. Make adjustments, repairs, and corrections necessary to complete unit process startup.
- D. Startup shall be considered complete when, in opinion of Engineer, unit process has operated in manner intended for 5 continuous days without significant interruption. This period is in addition to functional or performance test periods specified elsewhere.
- E. Significant Interruption:
 1. May include any of the following events:
 - a. Failure of Contractor to provide and maintain qualified onsite startup personnel as scheduled.
 - b. Failure to meet specified functional operation for more than 2 consecutive hours.
 - c. Failure of any critical equipment or unit process that is not satisfactorily corrected within 5 hours after failure.
 - d. Failure of any noncritical equipment or unit process that is not satisfactorily corrected within 8 hours after failure.
 - e. As determined by Engineer.
- F. A significant interruption will require startup then in progress to be stopped. After corrections are made, startup test period to start from beginning again.

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3.04 FACILITY PERFORMANCE DEMONSTRATION

- A. When, in the opinion of Engineer, startup of all unit processes has been achieved, sequence each unit process to the point that facility is operational.
- B. Demonstrate proper operation of required interfaces within and between individual unit processes.
- C. After facility is operating, complete performance testing of equipment and systems not previously tested.
- D. Document, as defined in Facility Startup and Performance Demonstration Plan, the performance of the facility including its computer system, until all unit processes are operable and under control of computer system.
- E. Certify, on the Facility Performance Demonstration/Certification Form, that facility is capable of performing its intended function(s), including fully automatic and computerized operation.

3.05 SUPPLEMENTS

- A. Supplements listed below, following “End of Section,” are a part of this Specification:
 - 1. Unit Process Startup Form.
 - 2. Facility Performance Demonstration/Certification Form.

END OF SECTION

UNIT PROCESS STARTUP FORM

OWNER: _____ **PROJECT:** _____

Unit Process Description: (Include description and equipment number of all equipment and devices):

Startup Procedure (Describe procedure for sequential startup and evaluation, including valves to be opened/closed, order of equipment startup, etc.):

Startup Requirements (Water, power, chemicals, etc.): _____

Evaluation Comments: _____

FACILITY PERFORMANCE DEMONSTRATION/CERTIFICATION FORM

OWNER: _____ **PROJECT:** _____

Unit Processes Description (List unit processes involved in facility startup):

Unit Processes Startup Sequence (Describe sequence for startup, including computerized operations, if any):

Contractor Certification that Facility is capable of performing its intended function(s), including fully automatic operation:

Contractor: _____ **Date:** _____, 20__

Engineer: _____ **Date:** _____, 20__
(Authorized Signature)

**SECTION 02 41 00
DEMOLITION**

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. Air-Conditioning, Heating, and Refrigeration Institute (AHRI): Guideline K, Containers for Recovered Non-flammable Fluorocarbon Refrigerants.
 2. American National Standards Institute (ANSI): A10.6, Safety Requirements for Demolition Operations.
 3. Environmental Protection Agency (EPA), U.S. Code of Federal Regulations (CFR), Title 40:
 - a. Part 61—National Emission Standards for Hazardous Air Pollutants.
 - b. Part 82—Protection of Stratospheric Ozone.
 - c. Part 273—Standards for Universal Waste Management.
 4. Occupational Safety and Health Administration (OSHA), U.S. Code of Federal Regulations (CFR) Title 29 Part 1926—Occupational Safety and Health Regulations for Construction.

1.02 DEFINITIONS

- A. ACM: Asbestos-containing material.
- B. Demolition: Dismantling, razing, destroying, or wrecking of any fixed building or structure or any part thereof. Demolition also includes removal of pipes, manholes tanks, conduit, and other underground facilities, whether as a separate activity or in conjunction with construction of new facilities.
- C. Modify: Provide all necessary material and labor to modify an existing item to the condition indicated or specified.
- D. Relocate: Remove, protect, clean and reinstall equipment, including electrical, instrumentation, and all ancillary components required to make the equipment fully functional, to the new location identified on Drawings.
- E. Renovation: Altering a facility or one or more facility components in any way.

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- F. Salvage/Salvageable: Remove and deliver, to the specified location(s), the equipment, building materials, or other items so identified to be saved from destruction, damage, or waste; such property to remain that of Owner. Unless otherwise specified, title to items identified for demolition shall revert to Contractor.
- G. Universal Waste Lamp: In accordance with 40 CFR 273, the bulb or tube portion of an electric lighting device, examples of which include, but are not limited to, fluorescent, high-intensity discharge, neon, mercury vapor, high-pressure sodium, and metal halide lamps.
- H. Universal Waste Thermostat: A temperature control device that contains metallic mercury in an ampule attached to a bimetal sensing element, and mercury-containing ampules that have been removed from these temperature control devices in compliance with the requirements of 40 CFR 273.

1.03 SUBMITTALS

- A. Informational Submittals:
 - 1. Submit proposed Demolition/Renovation Plan, in accordance with requirements specified herein, for approval before such Work is started.
 - 2. Submit copies of any notifications, authorizations and permits required to perform the Work.
 - 3. Submit a shipping receipt or bill of lading for all containers of ozone depleting substance (ODS) shipped.
 - 4. Submit a shipping receipt or bill of lading for all containers of ACM shipped.
 - 5. Submit a shipping receipt or bill of lading for all universal waste shipped.

1.04 REGULATORY AND SAFETY REQUIREMENTS

- A. When applicable, demolition Work shall be accomplished in strict accordance with 29 CFR 1926-Subpart T.
- B. Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the General Conditions, Contractor's safety requirements shall conform to ANSI A10.6.
- C. Furnish timely notification of this demolition/renovation project to applicable federal, state, regional, and local authorities in accordance with 40 CFR 61-Subpart M.

1.05 DEMOLITION/RENOVATION PLAN

- A. Demolition/Renovation Plan shall provide for safe conduct of the Work and shall include:
 - 1. Detailed description of methods and equipment to be used for each operation.
 - 2. The Contractor's planned sequence of operations, including coordination with other work in progress.
 - 3. Procedures for removal and disposition of materials specified to be salvaged.
- B. Include statements affirming Contractor inspection of the existing roof deck, floors, walls, and framing members, and their suitability to perform as a safe working platform or, if inspection reveals a safety hazard to workers, state provisions for securing the safety of the workers throughout the performance of the Work.

1.06 SEQUENCING AND SCHEDULING

- A. The Work of this Specification shall not commence until Contractor's Demolition/Renovation Plan has been approved by Engineer.
- B. Include the Work of this Specification in the progress schedule, as specified in Section 01 32 00, Construction Progress Documentation.
- C. Areas in which the Work is to be accomplished will be available in accordance with the Required Constraints and Task Sequencing in Section 01 31 13, Project Coordination.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXISTING FACILITIES TO BE DEMOLISHED OR RENOVATED

- A. Facilities:
 - 1. Facilities: Portions of facilities and other areas scheduled for selective demolition, partial demolition, and renovation Work are as shown.
- B. Structures:
 - 1. Existing above-grade structures indicated shall be removed as shown on Drawings.
 - 2. Partition walls shall be removed as shown.

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C. Utilities and Related Equipment:

1. Notify Owner or appropriate utilities to turn off affected services at least 48 hours before starting demolition or renovation activities.
2. Remove existing utilities as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by Engineer.
3. When utility lines are encountered that are not indicated on Drawings, notify Owner prior to further work in that area.

D. Concrete:

1. Core drill corners of new opening to avoid overcutting adjacent reinforcing in existing concrete to remain. Saw concrete along straight lines to a depth of not less than 2 inches. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provided that the broken area is concealed in the finished Work, and the remaining concrete is sound.
2. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete. Repair exposed rebar ends and embeds as shown on Drawings.
3. Where new concrete adjoins existing concrete, thoroughly clean and mechanically roughen existing concrete surfaces to roughness profile of 3/16 inch. Rebar and small embeds at existing concrete may be required to be left to engage new concrete. Saturate surface with water for 24 hours prior to placing new concrete. The new Work shall tie into the existing construction as shown on Drawings.
4. At submerged locations not to receive new concrete, paint exposed rebar or metal embed ends with System No. 19a at wastewater surfaces per Section 09 90 00, Painting and Coating.

E. Patching:

1. Where removals leave holes and damaged surfaces exposed in the finished Work, patch and repair to match adjacent finished surfaces as to texture and finish.
2. Where new Work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new Work.
3. Patching shall be as specified and indicated, and shall include:
 - a. Fill holes and depressions left as a result of removals in existing concrete walls with an approved patching material, applied in accordance with the manufacturer's printed instructions.

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- F. Cylinders and Canisters: Remove all fire suppression system cylinders and canisters and dispose as specified in Paragraph Ozone Depleting Substances (ODS).
- G. Door Locksets: Remove all locksets from all doors indicated to be removed and disposed of. Turn locksets over to Owner immediately after their removal.
- H. Electrical:
 - 1. Cut off concealed or embedded conduit, boxes, or other materials a minimum of 3/4 inch below final finished surface.
 - 2. When removing designated equipment, conduit and wiring may require rework to maintain service to other equipment.
 - 3. Rework existing circuits, or provide temporary circuits as necessary during renovation to maintain service to existing lighting and equipment not scheduled to be renovated. Existing equipment and circuiting shown are based upon limited field surveys. Verify existing conditions, make all necessary adjustments, and record the Work on the Record Drawings. This shall include, but is not limited to, swapping and other adjustments to branch circuits and relocation of branch circuit breakers within panelboards as required to accomplish the finished work.
 - 4. Reuse of existing luminaires, devices, conduits, boxes, or equipment will be permitted only where specifically indicated.
 - 5. Raceways and cabling not scheduled for reuse.
 - 6. Inaccessibly Concealed: Cut off and abandon in place.
 - 7. Exposed or Concealed Above Accessible Ceilings: Remove.
 - 8. Raceways and Cabling Scheduled for Future Use: Cap/seal and tag.
 - 9. Relocating Equipment: Extend existing wiring or run new wiring from the source.
 - 10. Where the existing raceway is concealed, the outlet box shall be cleaned, and a blank cover plate installed.
 - 11. Where the concealed raceway is uncovered remove raceway (or extended to new location if appropriate).
 - 12. Provide new typewritten panelboard circuit directory cards.
- I. Universal Waste Lamps and Thermostats: Manage, contain, package, and label in strict accordance with 40 CFR 273.

3.02 PROTECTION

- A. Dust and Debris Control:
 - 1. Prevent the spread of dust and debris to occupied portions of the building and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or

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- objectionable conditions such as, but not limited to, ice, flooding, or pollution.
2. Vacuum and dust the Work area daily.
 3. Sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage potential to vehicular traffic.
- B. Traffic Control Signs: Where pedestrian and driver safety is endangered in the area of removal Work, use traffic barricades with flashing lights.
- C. Existing Work:
1. Survey the Site and examine the Drawings and Specifications to determine the extent of the Work before beginning any demolition or renovation.
 2. Take necessary precautions to avoid damage to existing items scheduled to remain in place, to be reused, or to remain the property of Owner; any Contractor-damaged items shall be repaired or replaced as directed by Engineer.
 3. Provide temporary weather protection during interval between removal of existing exterior surfaces and installation of new to ensure that no water leakage or damage occurs to structure or interior areas of existing building.
 4. Ensure that structural elements are not overloaded as a result of or during performance of the Work. Responsibility for additional structural elements or increasing the strength of existing structural elements as may be required as a result of any Work performed under this Contract shall be that of the Contractor. Repairs, reinforcement, or structural replacement must have Engineer approval.
 5. Do not overload pavements to remain.
- D. Weather Protection: For portions of the building scheduled to remain, protect building interior and materials and equipment from weather at all times. Where removal of existing roofing is necessary to accomplish the Work, have materials and workmen ready to provide adequate and temporary covering of exposed areas so as to ensure effectiveness and to prevent loss.
- E. Trees: Protect trees within the Site that might be damaged during demolition and are indicated to be left in place, by a 6-foot-high fence. The fence shall be securely erected a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Any tree designated to remain that is damaged during the Work shall be replaced in kind, as approved by the Engineer.

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F. Facilities:

1. Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities.
2. Floors, roofs, walls, columns, pilasters, and other structural elements that are designed and constructed to stand without lateral support or shoring, and are determined by Contractor to be in stable condition, shall remain standing without additional bracing, shoring, or lateral support until demolished, unless directed otherwise by the Engineer.
3. Protect all facility elements not scheduled for demolition.
4. Provide interior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities.

G. Protection of Personnel:

1. During demolition, continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site.
2. Provide temporary barricades and other forms of protection to protect Owner's personnel and the general public from injury due to demolition Work.
3. Provide protective measures as required to provide free and safe passage of Owner's personnel and the general public to occupied portions of the structure.

3.03 BURNING

- A. The use of burning at the Site for the disposal of refuse and debris will not be permitted.

3.04 RELOCATIONS

- A. Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Clean all items to be relocated prior to reinstallation, to the satisfaction of Engineer. Repair items to be relocated which are damaged or replace damaged items with new undamaged items as approved by Engineer.

3.05 TITLE TO MATERIALS

- A. All items designated to be removed shall become the property of Contractor.

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- B. Title to equipment and materials resulting from demolition renovation is vested in the Contractor upon approval by Engineer of Contractor's Demolition/Renovation Plan, and the resulting authorization by Engineer to begin the Work.

3.06 DISPOSITION OF MATERIAL

- A. Do not remove equipment and materials without approval of Contractor's Demolition/Renovation Plan by Engineer.
- B. Salvage equipment and material to the maximum extent possible.
- C. Owner will not be responsible for the condition or loss of, or damage to, such property after Engineer's authorization to begin work.
- D. Store salvaged items as approved by Engineer and remove them from Owner's property before completion of the Contract. Materials and equipment shall not be either viewed by prospective purchasers or sold on the Site.

3.07 REUSE OF MATERIALS AND EQUIPMENT

- A. Remove and store materials and equipment listed in Article Title To Materials to be reused or relocated to prevent damage, and reinstall as the Work progresses.
- B. Properly store and maintain equipment and materials in same condition as when removed.
- C. Store equipment and material designated to be reused in a location designated by Owner.
- D. Equipment and material designated to be reused shall be cleaned, serviced and checked for proper operability before being put back into service.
- E. Engineer will determine condition of equipment and materials prior to removal.

3.08 SPECIALIZED SALVAGE

- A. Ozone Depleting Substances (ODS):
 - 1. Class I and Class II ODS are defined in Section 602(a) and (b), of The Clean Air Act. Prevent discharge of Class I and Class II ODS to the atmosphere. Place recovered ODS in cylinders meeting AHRI Guideline K suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling.

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2. Dispose of all Class I and Class II ODS refrigerants in accordance with the Clean Air Act Amendment of 1990.
 3. Products, equipment and appliances containing ODS in a sealed, self-contained system (e.g., residential refrigerators and window air conditioners) shall be disposed of in accordance with 40 CFR 82.
- B. Fire Suppression Containers: Fire suppression system cylinders and canisters with electrical charges or initiators shall be deactivated prior to shipment. Also, safety caps shall be used to cover exposed actuation mechanisms and discharge ports on these special cylinders.

3.09 UNSALVAGEABLE MATERIAL

- A. Concrete, masonry, and other noncombustible material, except concrete permitted to remain in place, shall be disposed of in accordance with local and state law.
- B. Universal Waste Lamps and Thermostats: Dispose of in strict accordance with 40 CFR 273.

3.10 CLEANUP

- A. Debris and rubbish shall be removed from basement and similar excavations. Debris and rubbish shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

END OF SECTION

SECTION 03 01 32
REPAIR OF VERTICAL AND OVERHEAD CONCRETE SURFACES

PART 1 GENERAL

1.01 DEFINITIONS

- A. Abrasive Blasting: Surface preparation method that uses compressed air intermixed with an abrasive medium to clean surface of substrate concrete, exposed steel, and steel reinforcement. Compressed air and abrasive medium is projected at high speed through a nozzle directly at the surface. Method is used to remove corrosion by-products, laitance, or other materials that may inhibit bond of repair concrete.
- B. High-Pressure Water Blasting: Sometimes referred to as hydro-demolition. Uses water that may contain an abrasive medium, projected under high pressure and high velocity. Used for demolition, cutting, partial or full depth removal, cleaning, scarifying, or roughening of concrete surfaces, or removing existing coatings, for preparation of substrate concrete surfaces.
- C. Low-Pressure Spray Mortar: Mortar suitable to be applied by low-pressure spraying, and in small areas may be applied by hand troweling.

1.02 SUBMITTALS

- A. Action Submittals: Product data sheets for each material supplied.
- B. Informational Submittals:
 - 1. Repair Mortar System: Manufacturer's preparation and installation instructions.
 - 2. Written description of equipment proposed for concrete removal and surface preparation.
 - 3. Statements of Qualification: Repair mortar system applicator.
 - 4. Field and laboratory test reports.

1.03 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Repair Mortar System Applicator: For Repair System B – Low-Pressure Spray Mortar, in lieu of recognition or certification, demonstrate application of repair mortar manufacturer's system and obtain Certification of Proper Installation.

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B. Pre-repair Conference:

1. Required Meeting Attendees:
 - a. Contractor.
 - b. Repair Subcontractor.
 - c. Engineer.
2. Agenda shall include, but not limited to:
 - a. Review of field conditions. Conduct field observations of Work to be performed.
 - b. Based on above observations, confirm material selection and make Project-specific repair method recommendations.
 - c. Review proposed surface preparation, material application, consolidation, finishing, curing, and protection of repair material from weather conditions.
 - d. Other specified requirements requiring coordination.

C. Mockups:

1. Required for repair mortar systems over 1,000 square feet in area.
2. Before proceeding with Work under this section, finish one complete space or item of each repair mortar system showing colors, finish texture, materials, quality of work, and applicable special details.
3. Provide one mockup for each repair mortar system.
4. Mockup components will vary, depending on the repair mortar system. All components of the repair mortar system, including surface preparation, must be exposed in the mockup.
5. Example Mockup Procedure:
 - a. Prepare surface and apply repair mortar to one section of concrete, measuring 100 square feet, at a location mutually agreed upon by the Subcontractor and Engineer. Use a “step” down mockup as follows:
 - 1) Perform surface preparation using approved methods to demonstrate removal to specified depth.
 - 2) Upon approval of surface preparation and depth of concrete removal, continue with mortar repair systems.
 - 3) Leave one-half of the surface exposed to allow observation of the surface preparation.
 - 4) Apply repair mortar to one-half of the remaining surface.
6. After Engineer and Manufacturer review and approval, sample spaces or items shall serve as a standard for similar work throughout the Project.
7. Leave mockup in place to serve as a reference and standard for the remaining work.

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8. At completion of Project, clean and prepare all surfaces that are not complete and finish applying repair mortar to the mockup area for incorporation into the Work.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Package repair mortar system products in moisture-resistant bags, pails, or moisture-resistant bulk bags.
- B. Deliver, store, and handle repair materials in accordance with manufacturer's printed instructions.

1.05 MEASUREMENT AND PAYMENT

- A. Measurement for vertical and overhead concrete surface removal and repair pay items shall be determined per the following procedure:
 1. Prior to removal of existing concrete, install 1/4-inch diameter Type 316, stainless steel rods into face of existing walls (at right angle to wall) in a vertical row at 25 feet on center horizontally. Each vertical row shall consist of three anchor rods equally spaced. The rods shall be located 12 inches below top of wall, mid-height of the wall, and 12 inches above bottom of wall. Drill and epoxy these stainless steel rods a minimum of 3 inches into the existing wall.
 2. After installation of steel rods, cut rods flush with the face of existing concrete. Rods will subsequently be used for measurement purposes. Contractor shall prepare for Engineer's approval (prior to rod placement) a rod layout grid with grid naming convention to allow uniform reference to each area of concrete repair. All measurement and payment shall follow this rod layout and naming convention.
 3. Remove existing concrete as indicated herein.
 4. Following removal of existing concrete, install additional, new 1/4-inch diameter x minimum 6-inch-long Type 316 stainless steel rods 12 inches away from and adjacent to all existing rods. Cover rod ends with rubber bulb to reduce risk of accidental injury after installed. Drill and epoxy new rods a minimum of 3 inches beyond face of demolished concrete. String a steel piano wire between the new rods at the depth of the original existing concrete surface (i.e. with piano wire just touching end of rods placed flush with original concrete surface) and to meet the tolerances listed herein.
 5. Screed final product as indicated to original existing concrete surface profile unless a maximum of 1/2 inch of additional build out is required to provide a minimum of 2 inches of clearance over exposed reinforcing.

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6. Payment for removal will be based upon measured thickness of removed concrete at rods. The thickness will be determined by averaging the measured depth of removal over each 100 square foot area to determine total quantities for each pay item.
7. Payment for installation of repair will be based upon the measured thickness determined for removal of each 100 square foot area plus any anticipated build out (to provide clearance over exposed reinforcing as described in this section). The thickness will be determined by averaging the measured depth of application over each 100-square-foot area to determine total quantity for payment.
8. Pay Items and Unit of Measurement:
 - a. Vertical Concrete Surface Removal and Repair; Square Foot:
 - 1) 0 to 1/2 Inch Removal Depth and Repair Layer Thickness: Lump Sum.
 - 2) 5/8 to 1 Inch Removal Depth and Repair Layer Thickness: Unit Price.
 - 3) Greater than 1 Inch to 1-1/2 Inches Removal Depth and Repair Layer Thickness: Unit Price.
 - b. Overhead Concrete Surface Removal and Repair; Square Foot:
 - 1) 0 to 1/2 Inch Removal Depth and Repair Layer Thickness: Lump Sum.
 - 2) 5/8 to 1 Inch Removal Depth and Repair Layer Thickness: Unit Price.
 - 3) Greater than 1 inch to 1-1/2 inches removal depth and repair layer thickness.

PART 2 PRODUCTS

2.01 REPAIR SYSTEM B – LOW-PRESSURE SPRAY MORTAR

- A. One or two-component, cement based, fiber reinforced, shrinkage compensated, gray in color, with a minimum 30-minute working time.
- B. Cured materials mixed in accordance with manufacturer's instructions shall conform to the following criteria:
 1. Compressive Strength, ASTM C109/C109M at 28 Days: 6,000 psi minimum.
 2. Flexural Strength, ASTM C348 at 28 Days: 1,100 psi minimum.
 3. Slant Shear Bond Strength, ASTM C882/C882M Test Method Modified with No Bonding Agent, at 28 Days: 3,000 psi minimum.
 4. Splitting Tensile Strength, ASTM C496/C496M at 28 Days: 600 psi minimum.

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5. Drying Shrinkage, ASTM C157/C157M Modified at 28 Days or ASTM C531: 0.1 percent maximum.
6. Chloride Ion Permeability Based on Charge Passed, ASTM C1202: 1,000 coulombs maximum.
7. System shall not produce a vapor barrier.
8. Sprayable, extremely low permeability, sulfate resistant, easy to use and requiring only addition of water.
9. Free of chlorides and other chemicals causing corrosion.

C. Manufacturers and Products:

1. BASF Construction Chemicals, LLC - Building Systems, Shakopee, MN; MasterEmaco S 488CI.
2. Sika Corp., Lyndhurst, NJ; SikaRepair 226L.
3. Euclid Chemical Co., Cleveland, OH; Tamms Structural Mortar.

2.02 WATER

- A. Clean and free from oil, acid, alkali, organic matter, or other deleterious substances, meeting federal drinking water standards.

PART 3 EXECUTION

3.01 PREPARATION

- A. Remove unsound, honeycombed, deteriorated, or otherwise defective areas of concrete from work areas.
1. Use 7,000 psi minimum high-pressure, 16,000 psi maximum water blasting machine, abrasive blasting, or scabbler as required to achieve concrete removal.
 2. Abrade substrate concrete surfaces provide a Concrete Surface Profile (CSP) 8 per the International Concrete Repair Institute (ICRI).
 3. For existing structures, extent of concrete removal as shown on Drawings and described herein.
 4. Remove existing concrete depth a minimum of 1/2 inch , not to exceed a tolerance of 1/8 inch deeper.
 5. Measure pH every 100 square feet to determine if a pH 11 or above is achieved.
 6. Where pH is less than 11, perform exploratory concrete removal and perform additional pH to identify areas and depths of concrete removal required to achieve a concrete surface with pH 11.

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7. Remove concrete in areas identified in exploratory testing by determined depths, not to exceed a maximum existing concrete depth of 1-1/2 inches. If the maximum depth of removal is achieved and the concrete still measures a pH below 11, consult the Engineer.
 8. Depth of concrete removal shall not exceed 1-1/2 inches, without approval from Engineer. Cost for concrete removal, disposal of waste streams and debris, and repair mortar system for greater than approved depths shall be borne by the Contractor.
 9. Where existing reinforcing is encountered, clean and coat reinforcing with corrosion inhibitor compatible with repair material, as recommended by manufacturer of repair material and approved by Engineer.
- B. Do not use power-driven jackhammers, or chipping hammers unless water blasting or abrasive blasting is not permitted or practical because of Site conditions, or may cause other damage to equipment or facilities.
- C. Following removal of unsound or deteriorated concrete, check substrate concrete surface by sounding techniques to identify unsound concrete remaining or resulting from use of scabbler.
- D. Square edges of patch areas by sawing or chipping to avoid tapered shoulders or featheredges. Avoid cutting embedded steel reinforcement. Roughen polished saw-cut edge by high-pressure water blasting.
- E. Keep areas from which concrete has been removed free of dirt, dust, and water blasting waste slurry. Remove laitance and other bond inhibiting contaminants from prepared areas.
- F. Dampen repair areas at least 6 inches beyond area to receive repair mortar for at least 24 hours to provide saturated surface dry (SSD) condition without standing water at time of application of mortar as required by and in accordance with repair mortar manufacturer's printed instructions.
- G. Collect and dispose of spent water, overshot repair material, and concrete debris from repair operations offsite in manner and location acceptable to Owner.

3.02 PROTECTION

- A. Protect adjacent surfaces, and equipment, from being damaged by overshooting, rebound, and dust, as applicable for repair mortar system used, from low-pressure spray mortar.

3.03 REPAIR SYSTEM B – LOW-PRESSURE SPRAY MORTAR PLACEMENT

- A. Mix mortar in accordance with manufacturer’s printed instructions.
- B. After priming prepared substrate concrete surface per manufacturer’s recommendations, apply mortar by low-pressure spraying equipment, unless noted otherwise.
- C. Bonding Agent:
 - 1. Use bonding agent when manufacture required for hand applied areas, in accordance with repair mortar manufacturer’s instructions.
 - 2. Application of repair mortar over bonding agent shall be completed within time frame recommended by bonding agent manufacturer.
 - 3. Consult with manufacturer for optimum and minimum acceptable degrees of surface tackiness of coat.
- D. Work mortar firmly and quickly into repair area.
- E. Finish repair mortar to a smooth, steel-troweled finish as demonstrated on the mock-up panel. Final finished interior channel dimensions shall match original design drawings to a dimension of plus or minus 1/2 inch. If existing reinforcing is exposed, provide a minimum of 2 inches of cover over existing reinforcing. Consult Engineer for areas where reinforcing is exposed.
- F. Cure as specified in Article Curing.

3.04 CURING

- A. Prior to curing, apply water fog to repair mortar system in accordance with repair mortar system manufacturer’s printed instructions.
- B. Cure in accordance with repair mortar manufacturer’s printed instructions.
- C. Where permitted by repair mortar manufacturer’s printed instructions, commence water curing after repair mortar system application and when curing will not cause erosion of mortar.
- D. Continuously water cure repair mortar system for a period of 7 days.
- E. Do not cure using curing compound or membrane, unless method is part of repair mortar system manufacturer’s printed instructions and approval is obtained from Engineer.

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- F. Cure intermediate layers of repair mortar in accordance with repair mortar manufacturer's printed instructions.
- G. Where curing compound is permitted by repair mortar system manufacturer, apply curing compound.

3.05 FIELD QUALITY CONTROL

A. Concrete pH Testing:

- 1. Test pH every 100 square feet.
- 2. Test pH of existing concrete per pH test material manufacturer's recommendations.
 - a. Clean exposed surface with distilled water.
 - b. Check pH with approved testing material.
 - c. Record data.
- 3. pH Test Material:
 - a. Hydrion Insta-chek 0-13; Mechanical pH Pencil.
 - b. "Or-equal."

B. Sounding for Hollow Areas:

- 1. Light hammer tap repaired areas listening for hollow sound to determine areas that have not properly bonded to substrate concrete.
- 2. Mark hollow areas for removal and replacement.

C. Direct Tension Bond Test:

- 1. In Situ Bond Testing: Perform tension bond test in accordance with ASTM C1583/C1583M.
- 2. Record locations on in situ bond tests on each type of applied repair mortar.

D. Testing laboratory retained by Contractor will provide the following:

- 1. Compression Strength Test:
 - a. Testing will follow a "modified" ASTM C109/C109M.
 - b. A minimum of three production samples of mixed material will be obtained from each 1,000 square feet of mortar repair, and a minimum of three samples in total, whichever is greater, for testing at 7 days, and 28 days.
 - c. Record location where repair mortar is being applied at time production samples are obtained.

- E. Retest mortar repairs that do not meet test requirements.
- F. Repair and fill holes using same repair mortar where core samples have been removed.

3.06 MORTAR REPAIR FAILED TEST

- A. Remove and replace unacceptable Work.
- B. Hollow Sounding Areas: Saw cut hollow sounding areas to a new square edge. Remove unsound mortar repair. Prepare substrate surface and reapply repair mortar as specified herein above.
- C. Failed Compression Strength Test: Remove affected areas of repair mortar represented by failed compression strength test results. Prepare substrate surface and reapply repair mortar as specified herein above.
- D. Failed Bond Tests: Remove affected areas of repair mortar represented by failed bond test results. Prepare substrate surface and reapply repair mortar as specified herein above.
- E. Retest areas where repair mortar was removed and replaced, in accordance with test requirements specified herein above.

3.07 CLEANING

- A. Remove overshot low-pressure spray, Repair System B repair mortar and rebound materials as the Work proceeds. Remove waste materials, unsound material from concrete surfaces, material chipped from structure, and water used in preparation of or repair areas, finishing, and curing, and dispose offsite at an approved disposal site as specified in Section 01 50 00, Temporary Facilities and Controls.

END OF SECTION

SECTION 03 01 33
REPAIR OF HORIZONTAL CONCRETE SURFACES

PART 1 GENERAL

1.01 DEFINITIONS

- A. Abrasive Blasting: Surface preparation method that uses compressed air intermixed with an abrasive medium to clean surface of substrate concrete, exposed steel, and steel reinforcement. Compressed air and abrasive medium is projected at high speed through a nozzle directly at the surface. Method is used to remove corrosion by-products, laitance, or other materials that may inhibit bond of repair concrete.
- B. High-Pressure Water Blasting (sometimes referred to as hydro-demolition): Uses water that may contain an abrasive medium, projected under high pressure and high velocity. Used for demolition, cutting, partial or full depth removal, cleaning, scarifying, or roughening of concrete surfaces, or removing existing coatings, for preparation of substrate concrete surfaces.

1.02 SUBMITTALS

- A. Action Submittals: Product data sheets for each material supplied.
- B. Informational Submittals:
 - 1. Repair Mortar System: Manufacturer's preparation and installation instructions.
 - 2. Written description of equipment proposed for concrete removal and surface preparation.
 - 3. Statements of Qualification: Repair mortar system applicator.
 - 4. Field and laboratory test results.

1.03 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Repair Mortar System Applicator: Trained and experienced applicator endorsed by repair mortar system manufacturer.
- B. Pre-repair Conference:
 - 1. Required Meeting Attendees:
 - a. Contractor.

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- b. Repair Subcontractor.
- c. Engineer.
2. Schedule and conduct prior to incorporation of respective products into Project. Notify Engineer of location and time.
3. Agenda shall include, but not limited to:
 - a. Review of field conditions. Conduct field observations of the Work to be performed.
 - b. Based on above observations, confirm material selection and make Project specific repair method recommendations.
 - c. Review proposed surface preparation, material application, consolidation, finishing, curing, and protection of repair material from weather conditions.
 - d. Other specified requirements requiring coordination.

C. Mockups:

1. Required for repair mortar systems over 1,000 square feet in area.
2. Before proceeding with Work under this section, finish one complete space or item of each repair mortar system showing colors, finish texture, materials, quality of work, and applicable special details.
3. Provide one mockup for each repair mortar system.
4. Mockup components will vary, depending on the repair mortar system. All components of the repair mortar system, including surface preparation, must be exposed in the mockup.
5. Example Mockup Procedure:
 - a. Prepare and apply repair mortar to one section of concrete, measuring 100 square feet, at a location mutually agreed upon by the Subcontractor and Engineer. Use a “step” down mockup as follows:
 - 1) Perform surface preparation using approved methods to demonstrate removal to specified depth.
 - 2) Upon approval of surface preparation and depth of concrete removal, continue with mortar repair systems.
 - 3) Leave one-half of the surface exposed to allow observation of the surface preparation.
 - 4) Apply repair mortar to one-half of the remaining surface.
6. After Engineer and Manufacturer review and approval, sample spaces or items shall serve as a standard for similar work throughout the Project.
7. Leave mockup in place to serve as a reference and standard for the remaining work.
8. At completion of Project, clean and prepare all surfaces that are not complete and finish applying repair mortar to the mockup area for incorporation into the Work.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Package repair mortar system products in moisture-resistant bags, pails, or moisture-resistant bulk bags.
- B. Deliver, store, and handle repair materials in accordance with manufacturer's printed instructions.

1.01 MEASUREMENT AND PAYMENT

- A. Measurement for horizontal concrete surface removal and repair pay items shall be determined per the following procedure:
 - 1. Prior to removal of existing concrete, install 1/4-inch diameter Type 316, stainless steel rods into top of existing slab (at right angle to wall) at 25 feet on center horizontally and a minimum of 3 per width of channel. The outer rods shall be located 12 inches from face of wall, and the middle rod shall be centered on the slab. Drill and epoxy these stainless steel rods a minimum of 3 inches into the existing slab.
 - 2. After installation of steel rods, cut rods flush with the face of existing concrete. Rods will subsequently be used for measurement purposes. Contractor shall prepare for Engineer's approval (prior to rod placement) a rod layout grid with grid naming convention to allow uniform reference to each area of concrete repair. All measurement and payment shall follow this rod layout and naming convention.
 - 3. Remove existing concrete as indicated herein.
 - 4. Following removal of existing concrete, install additional, new 1/4-inch diameter x minimum 6 inches long Type 316 stainless steel rods 12 inches away from and adjacent to all existing rods. Cover rod ends with rubber bulb to reduce risk of accidental injury after installed. Drill and epoxy new rods a minimum of 3 inches beyond face of demolished concrete. String a steel piano wire between the new rods at the depth of the original existing concrete surface (i.e. with piano wire just touching end of rods placed flush with original concrete surface) and to meet the equipment tolerances listed herein.
 - 5. Screed final product as indicated to original existing concrete surface profile unless a maximum of 1/2 inch of additional build out is required for equipment installation or to provide a minimum of 2 inches of clearance over exposed reinforcing.
 - 6. Payment for removal will be based upon measured thickness of removed concrete at rods. The thickness will be determined by averaging the measured depth of removal over a 100 square foot area to determine total quantity for payment.

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7. Payment for installation of repair will be based upon the measured thickness determined for removal of each 100 square foot area plus any anticipated build out. The thickness will be determined by averaging the measured depth of application over each 100 square foot area to determine total quantity for payment.
8. Pay Items and Unit of Measurement:
 - a. Horizontal Concrete Surface Removal and Repair; Square Foot:
 - 1) 0 to 1/2 Inch Removal Depth and Repair Layer Thickness: Lump Sum.
 - 2) 5/8 to 1 Inch Removal Depth and Repair Layer Thickness: Unit Price.
 - 3) Greater than 1 Inch to 1-1/2 Inches Removal Depth and Repair Layer Thickness: Unit Price.

PART 2 PRODUCTS

2.01 REPAIR MORTAR SYSTEM NO. 3—SHRINKAGE COMPENSATED REPAIR MORTAR

- A. One or two-component cement-based, flowable, shrinkage compensated repair mortar system.
- B. Compressive Strength, ASTM C109/C109M:
 1. 1 Day: 2,500 psi minimum.
 2. 7 Days: 6,000 psi minimum.
 3. 28 Days: 8,000 psi minimum.
- C. Flexural Strength, ASTM C348 at 28 Days: 770 psi minimum.
- D. Modulus of Elasticity, ASTM C469 at 28 Days: 5.9 by 10⁶ psi minimum.
- E. Slant Shear Bond Strength, ASTM C882/C882M Modified:
 1. 7 Days: 2,150 psi minimum.
 2. 28 Days: 3,000 psi minimum.
- F. Freeze-thaw Resistance, ASTM C666/C666M, Procedure A, at 300 Cycles: 97.0 percent RDM.
- G. Chloride Ion Permeability Based on Charge Passed, ASTM C1202 at 28 Days: 650 coulombs maximum.
- H. Sulfate Resistance, ASTM C1012/C1012M after 6 Months: 0.01 percent length change maximum.

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I. Manufacturers and Products:

1. BASF Construction Chemicals, LLC - Building Systems, Shakopee, MN; MasterEmaco S 466 CI.
2. Euclid Chemical Co., Cleveland, OH; Eucocrete Supreme.

2.02 REPAIR MORTAR SYSTEM NO. 5—POLYMER MODIFIED REPAIR MORTAR

A. One or two-component, fast-setting, polymer modified cementitious based repair mortar system.

B. Compressive Strength, ASTM C109/C109M:

1. 1 Day: 2,500 psi minimum.
2. 7 Days: 5,000 psi minimum.
3. 28 Days: 7,000 psi minimum.

C. Flexural Strength, ASTM C348 at 28 Days: 1,500 psi minimum.

D. Slant Shear Bond Strength, ASTM C882/C882M Modified at 28 Days: 2,000 psi minimum.

E. Splitting Tensile Strength, ASTM C496/C496M at 28 Days: 600 psi minimum.

F. Abrasion Resistance Depth of Wear, ASTM C779/C779M, Procedure A, at 60 Minutes: 0.033 inch maximum.

G. Drying Shrinkage, ASTM C157/C157M Modified, at 28 Days: 0.09 percent maximum.

H. Rapid Chloride Ion Permeability Based on Charge Passed, ASTM C1202:

1. 28 Days: Under 850 coulombs maximum.

I. Manufacturers and Products:

1. BASF Construction Chemicals, LLC - Building Systems, Shakopee, MN; MasterEmaco T 310 CI.
2. Euclid Chemical Co., Cleveland, OH; Duraltop Flowable Mortar.
3. Sika Corp., Lyndhurst, NJ; SikaTop 111 PLUS.

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2.03 WATER

- A. Clean and free from oil, acid, alkali, organic matter, or other deleterious substances, meeting federal drinking water standards.

2.04 EPOXY BONDING AGENT

- A. Two-component, moisture insensitive, 100 percent solids epoxy resin.
- B. Tensile Strength, ASTM D638, at 14 Days: 4,400 psi minimum.
- C. Elongation at Break, ASTM D638: 1.49 percent minimum.
- D. Compressive Strength, ASTM D695, at 28 Days for Application Temperature of 73 Degrees F to 77 Degrees F: 8,000 psi minimum.
- E. Bond Strength, ASTM C882/C882M, at 14 Days: 1,800 psi minimum.
- F. Pot Life, at 73 Degrees F to 77 Degrees F: 75 minutes minimum.
- G. Manufacturer and Product: BASF Construction Chemicals, LLC - Building Systems, Shakopee, MN; MasterEmaco ADH 326 when ambient temperature is 73 degrees F or higher.

PART 3 EXECUTION

3.01 PREPARATION

- A. Identify unsound and deteriorated concrete by sounding techniques, or as directed by Engineer. Review proposed extent of repair with Engineer.
- B. Remove unsound, deteriorated, or otherwise defective areas of concrete from Work areas.
 - 1. Use 7,000 psi minimum, 16,000 psi maximum high-pressure water blasting machine, abrasive blasting, or scabber as required to achieve concrete removal.
 - 2. Abrade substrate concrete surfaces to provide a Concrete Surface Profile (CSP) 8 per the International Concrete Repair Institute (ICRI).
 - 3. For existing structures, extent of concrete removal as shown on Drawings.
 - 4. Remove existing concrete depth a minimum of 1/2 inch, not to exceed a tolerance of 1/8 inch deeper.
 - 5. Measure pH every 100 square feet to determine if a pH 11 or above is achieved.

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6. Where pH is less than 11, perform exploratory concrete removal and perform additional pH tests to identify areas and depths of concrete removal required to achieve a concrete surface with pH 11.
 7. Remove concrete in areas identified in exploratory testing by determined depths, not to exceed a maximum existing concrete depth of 1-1/2 inches. If the maximum depth of removal is achieved and the concrete still measures a pH below 11, consult the Engineer.
 8. Depth of concrete removal shall not exceed 1-1/2 inches, without approval from Engineer. Cost for concrete removal, disposal of waste streams and debris, and repair mortar system for greater than approved depths shall be borne by the Contractor.
 9. Where existing reinforcing is encountered, clean and coat reinforcing with corrosion inhibitor compatible with repair material, as recommended by manufacturer of repair material and approved by Engineer.
 10. Where final surface is required to be flush with existing adjacent surface, remove existing concrete depth as required for application of minimum thickness of repair mortar.
- C. Do not use power-driven jackhammers or chipping hammers unless water blasting is not permitted or practical because of Site conditions, or may cause other damage to equipment or facilities.
- D. Following removal of unsound or deteriorated concrete, check substrate concrete surface by sounding techniques to identify unsound concrete remaining or resulting from use of scabbler.
- E. Remove unsound concrete to satisfaction of Engineer.
- F. Square edges of patch areas by sawing or chipping to avoid tapered shoulders or featheredges. Avoid cutting embedded steel reinforcement. Roughen polished saw-cut edge by high-pressure water blasting.
- G. Keep areas from which concrete has been removed free of dirt, dust, and water blasting waste slurry. Remove laitance and other bond inhibiting contaminates from prepared areas.
- H. Preparation of Substrate Concrete Surface in Areas to Receive Repair Mortar System No. 3, and No. 5: Dampen repair areas at least 6 inches beyond area to receive repair mortar for at least 24 hours to provide saturated surface dry (SSD) condition without standing water at time of application of mortar, as required by and in accordance with repair mortar manufacturer's printed instructions.

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I. Spalled Joints:

1. Saw cut edge 1 inch deep and 6 inches back from old joint.
2. Remove unsound concrete and concrete between saw cut and joint.
3. Place wood or fiber spacer to thickness of joint at joint line.

J. Overlays:

1. Square cut edges to a minimum of 1/4 inch deep.
2. Do not feather edge area.
3. Perform special preparation recommended by mortar manufacturer.

K. Collect and dispose of spent water and concrete debris from removal operations offsite in manner and location acceptable to Owner.

3.02 PROTECTION

- A. If cementitious coating or bonding agent is used, protect adjacent surfaces from over application. Promptly remove bonding agent applied beyond repair area.
- B. Protect adjacent surfaces, and equipment from spillage of repair mortar and dust, as applicable for repair mortar system used.

3.03 PLACEMENT

A. Repair Mortar System No. 3 and No. 5:

1. Remove standing and free water from prepared area.
2. Apply bond scrub coat of mortar to prepared surface in accordance with manufacturer's instructions. Do not apply more scrub coat of mortar than can be covered with repair mortar before scrub coat begins drying.
3. Immediately place mixed repair mortar into prepared area from one side to the other side.
4. Work material firmly into bottom and sides of patch to ensure a good continuous bond.
5. Level repair mortar and screed to elevation of existing concrete.
6. Finish to same texture as existing concrete around patch.
7. Repair Mortar System No. 5 screed or use self-leveling mixture to obtain a uniform and plane surface.
8. Final finished interior channel dimensions shall match original design drawings to a dimension of plus or minus 1/2 inch. If existing reinforcing is exposed, provide a minimum of 2 inches of cover over existing reinforcing. Consult Engineer for areas where reinforcing is exposed.

B. Joint Repair:

1. Remove joint spacer when repair mortar is hard enough that a pointed trowel will penetrate surface less than 1/2 inch.
2. When repair mortar is cured and ready for use, fill joint in accordance with repair mortar system manufacturer's instructions.

3.04 FINISHING

- A. Spray full strength evaporation retardant on fresh concrete to prevent rapid drying during hot and windy weather.

3.05 CURING

- A. Repair Mortar System No. 3 or No. 5: Apply curing compound in accordance with Manufacturer's instructions.

3.06 FIELD QUALITY CONTROL

A. Concrete pH Testing:

1. Test pH every 100 square feet.
2. Test pH of existing concrete per pH test material manufacturer's recommendations.
 - a. Clean exposed surface with distilled water.
 - b. Check pH with approved testing material.
 - c. Record data.
3. pH Test Material:
 - a. Hydriion Insta-chek 0-13; Mechanical pH Pencil.
 - b. "Or-equal."

B. Sounding for Hollow Areas:

1. Chain drag or light hammer tap repaired areas listening for hollow sound to determine areas that have not properly bonded to substrate concrete.
2. Mark hollow areas for removal and replacement.

C. Compression Strength Test:

1. Test in accordance with ASTM C109/C109M, except modified by making samples using repair mortar.
2. Obtain production samples of mixed materials from mixer during construction for compliance with Specifications.

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3. Provide minimum of three samples for each 1,000 square feet of mortar repair, and a minimum of three samples in total, whichever is greater for testing.
 4. Record location where repair mortar is being applied at time production samples are obtained.
- D. Direct Tension Bond Test:
1. In Situ Bond Testing: Perform tension bond test in accordance with ASTM C1583/C1583M.
 2. Record locations on in situ bond tests on each type of applied repair mortar.
- E. Testing laboratory retained by Contractor will provide the following:
1. Compression Strength Test:
 - a. Testing will follow a “modified” ASTM C109/C109M.
 - b. A minimum of three production samples of mixed material will be obtained from each 1,000 square feet of mortar repair, and a minimum of three samples in total, whichever is greater, for testing at 7 days and 28 days.
 - c. Record location where repair mortar is being applied at time production samples are obtained.
- F. Retest mortar repairs that do not meet test requirements.
- G. Repair and fill holes using same repair mortar where core samples have been removed.

3.07 MORTAR REPAIR FAILED TEST

- A. Remove and replace unacceptable Work.
- B. Hollow Sounding Areas: Saw cut hollow sounding areas to a new square edge, remove unsound mortar repair. Prepare substrate surface and reapply repair mortar as specified herein above.
- C. Failed Compression Strength Test: Remove affected areas of repair mortar represented by failed compression strength test results. Prepare substrate surface and reapply repair mortar as specified herein above.

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- D. Failed Bond Tests: Remove affected areas of repair mortar represented by failed bond test results. Prepare substrate surface and reapply repair mortar as specified herein above.
- E. Retest areas where repair mortar was removed and replaced, in accordance with test requirements specified herein above.

3.08 CLEANING

- A. Remove excess repair mortar materials as the Work proceeds. Remove waste materials, unsound material from concrete surfaces, material chipped from structure, and water used in preparation of repair areas, finishing, and curing, and dispose offsite at approved disposal site as specified in Section 01 50 00, Temporary Facilities and Controls.

END OF SECTION

SECTION 03 15 00
CONCRETE JOINTS AND ACCESSORIES

PART 1 GENERAL

1.01 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Waterstops.
 - b. Premolded joint fillers.
 - c. Pourable joint fillers.
 - d. Accessories not specified in other sections.

1.02 DELIVERY, STORAGE, AND HANDLING

- A. Acceptance at Site: Verify delivered materials are in accordance with Specifications, regulatory agencies, and Manufacturer's product data sheets prior to unloading and storing onsite.
- B. Storage: Store materials under tarps to protect from oil, dirt, and sunlight or as required by Manufacturer.

PART 2 PRODUCTS

2.01 HYDROPHILIC WATERSTOP

- A. For use at construction joints only, where new concrete is placed against existing concrete and as shown on Drawings.
- B. Material shall be a nonbentonite hydrophilic rubber compound.
- C. Manufacturers and Products:
 - 1. Greenstreak Plastic Products, St. Louis, MO; Hydrotite CJ-1020-2K with Leakmaster LV-1 adhesive and sealant.
 - 2. Adeka Ultra Seal, JLM Associates, Spearfish, SD; MC-2010M with 3M-2141 adhesive and P-201 sealant.

2.02 PREMOLDED JOINT FILLER

- A. Bituminous Type: ASTM D994 or ASTM D1751.

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B. Sponge Rubber:

1. Neoprene, closed-cell, expanded; ASTM D1056, Type 2C5, with compression deflection, 25 percent deflection (limits), 119 kPa to 168 kPa (17 psi to 24 psi) minimum. Use in joints for potable and nonpotable water containment structures.
2. Manufacturer and Product: Monmouth Rubber and Plastics, Corp, Long Branch, NJ; Durafoam DK5151.

2.03 POURABLE JOINT FILLERS

A. General: Although product is a sealant, it is being specified as a filler to prevent debris accumulation and allow expansion and contraction under shrinkage and thermal loads. It does not need to meet proportional sealant geometry requirements.

B. Filler for Potable or Non-Potable Water Containment Structures:

1. Multicomponent sealant, self-leveling or nonsag as required for level, sloping, or vertical joints.
2. Color: White.
3. Manufacturer and Product: Sika Corp., Lyndhurst, NJ; Sikaflex-2c SL.

C. Filler for Nonpotable Water Containment Structures Only:

1. Pourable, two-component, cold-applied compound meeting ASTM C920, Type M, Grade P, Class 25, Use T.
2. Color: Black.
3. Manufacturer and Product: W.R. Meadows, Inc., Elgin, IL; Gardox.

2.04 ACCESSORIES

A. Joint Sealant:

1. One-Part Polyurethane, Immersible:
 - a. Polyurethane base, single-component, moisture curing; ASTM C920, Type S, Grade NS or P, Class 25.
 - b. Capable of being continuously immersed in water.
 - c. Manufacturers and Products for Nonsag:
 - 1) Sika Chemical Corp.; Sikaflex-1a.
 - 2) Tremco; Vulkem 116.
 - d. Manufacturers and Products for Self-leveling:
 - 1) BASF; Sonneborn, SL-1.
 - 2) Tremco; Vulkem 45.
 - 3) Sika Chemical Corp.; Sikaflex 1c SL.

PART 3 EXECUTION

3.01 INSTALLATION OF WATERSTOPS

A. Hydrophilic Waterstop:

1. Install in accordance with manufacturer's written instructions.
2. Provide minimum of 2-1/2 inches of concrete cover over waterstop. When structure has two layers of steel reinforcement, locate centered between layers of steel or as shown.
3. Apply adhesive to concrete surface and allow to dry for specified time before applying waterstop strip.
4. Lap ends of waterstop strip together at splices and corners and join with sealant.
5. Verify that waterstop is anchored firmly in place before placing concrete. Do not allow vibrator to come into contact with waterstop.
6. Lap hydrophilic waterstop 2 feet minimum with intersecting plastic waterstops.

END OF SECTION

**SECTION 03 62 00
GROUTING**

PART 1 GENERAL

1.01 SUBMITTALS

A. Action Submittals:

1. Product data of grouts.
2. Proposed method for keeping existing concrete surfaces wet prior to placing nonshrink grout.
3. Forming method for fluid grout placements.
4. Curing method for grout.

B. Informational Submittals:

1. Manufacturer's Written Instructions:
 - a. Adding fiber reinforcing to batching.
 - b. Mixing of grout.
2. List of Contractor's equipment installation staff trained by grout manufacturer's representative in:
 - a. Nonshrink grout installation and curing.
 - b. Epoxy grout installation and curing.

PART 2 PRODUCTS

2.01 NONSHRINK GROUT AND EPOXY GROUT SCHEDULE

- A. Furnish nonshrink grout (Category I, II, and III) and epoxy grout for applications as indicated in the following schedule:

Application	Temperature Range	Max. Placing Time	
	40 deg F to 100 deg F	20 Min.	Greater Than 20 Min.
Blockouts	I or II		II
Machine bases 25 hp or less	II	II	II
Baseplates	II	II	II

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Application	Temperature Range	Max. Placing Time	
	40 deg F to 100 deg F	20 Min.	Greater Than 20 Min.
Baseplates and/or soleplates with vibration, thermal movement, etc.	III or Epoxy Grout	III or Epoxy Grout	III or Epoxy Grout

2.02 NONSHRINK GROUT

A. Category I:

1. Nonmetallic and nongas-liberating.
2. Prepackaged natural aggregate grout requiring only the addition of water.
3. Test in accordance with ASTM C1107/C1107M:
 - a. Grout shall have flowable consistency.
 - b. Flowable for 15 minutes.
4. Grout shall not bleed at maximum allowed water.
5. Minimum strength of flowable grout, 3,000 psi at 3 days, 5,000 psi at 7 days, and 7,000 psi at 28 days.
6. Manufacturers and Products:
 - a. BASF Building System, Inc., Shakopee, MN; MasterFlow 100.
 - b. Euclid Chemical Co., Cleveland, OH; NS Grout.
 - c. Dayton Superior Corp., Miamisburg, OH; 1107 Advantage Grout.
 - d. US MIX Co., Denver, CO; US SPEC GP Grout.
 - e. Five Star Products Inc., Fairfield, CT; Five Star Grout.

B. Category II:

1. Nonmetallic, nongas-liberating.
2. Prepackaged natural aggregate grout requiring only the addition of water.
3. Aggregate shall show no segregation or settlement at fluid consistency at specified times or temperatures.
4. Test in accordance with ASTM C1107/C1107M:
 - a. Fluid consistency 20 seconds to 30 seconds in accordance with ASTM C939.
 - b. Temperatures of 40 degrees F, 80 degrees F, and 90 degrees F.
5. 1 hour after mixing, pass fluid grout through flow cone with continuous flow.
6. Minimum strength of fluid grout, 3,500 psi at 1 day, 4,500 psi at 3 days, and 7,500 psi at 28 days.

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7. Maintain fluid consistency when mixed in 1-yard to 9-yard loads in ready-mix truck.
8. Manufacturers and Products:
 - a. BASF Building Systems, Inc., Shakopee, MN; MasterFlow 928.
 - b. Five Star Products, Inc., Fairfield, CT; Five Star Fluid Grout 100.
 - c. Euclid Chemical Co., Cleveland, OH; Hi Flow Grout.
 - d. Dayton Superior Corp., Miamisburg, OH; Sure Grip High Performance Grout.
 - e. US MIX Co., Denver, CO; US SPEC MP Grout.

C. Category III:

1. Metallic and nongas-liberating.
2. Prepackaged aggregate grout requiring only the addition of water.
3. Aggregate shall show no segregation or settlement at fluid consistency at specified times or temperatures.
4. Test in accordance with ASTM C1107/C1107M:
 - a. Fluid consistency 20 seconds to 30 seconds in accordance with ASTM C939.
 - b. Temperatures of 40 degrees F and 100 degrees F.
5. 1 hour after mixing, pass fluid grout through flow cone with continuous flow.
6. Minimum strength of fluid grout, 4,000 psi at 1 day, 5,000 psi at 3 days, and 9,000 psi at 28 days.
7. Maintain fluid consistency when mixed in 1-yard to 9-yard loads in ready-mix truck.
8. Manufacturers and Products:
 - a. BASF Building Systems, Inc., Shakopee, MN; MasterFlow 885.
 - b. Euclid Chemical Co, Cleveland, OH; Hi-Flow Metallic Grout.

2.03 EPOXY GROUT

- A. High-strength, nonshrink, high-temperature epoxy grouting material developed for the support of heavy equipment with vibratory loads.
- B. Three-component mixture of a two-component epoxy resin system (100 percent solids) with a graded, precision aggregate blend.
- C. Premeasured, prepackaged system.
- D. Flowable.
- E. Minimum compressive strength in accordance with ASTM C579 Method B, 9,500 psi at 75 degrees F at 7 days, 11,000 psi at post cure.

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- F. Maximum creep resistance in accordance with ASTM C1181 at 600 psi, 140 degrees F; $6.0 \text{ by } 10^{-3} \text{ in/in}$.
- G. Minimum bond strength in accordance with ASTM C882, 2,000 psi.
- H. Minimum tensile strength in accordance with ASTM C307, 2,000 psi.
- I. Maximum coefficient of thermal expansion in accordance with ASTM C531 at 73 degrees F to 210 degrees F, $23.0 \text{ by } 10^{-6} \text{ in/in/degrees F}$.
- J. Working Time: Minimum 2 hours at 50 degrees F; 1.5 hours at 70 degrees F; 50 minutes at 90 degrees F.
- K. Good chemical resistance.
- L. Good effective bearing area.
- M. Noncorrosive.
- N. Moisture insensitive.
- O. Modify resin and aggregate content where recommended by epoxy grout manufacturer to provide desired epoxy grout flow properties.
- P. Manufacturers and Products:
 - 1. BASF Building System, Inc., Shakopee MN; MasterFlow 648.
 - 2. Euclid Chemical Co., Cleveland, OH; E³-G.
 - 3. Dayton Superior Corp., Miamisburg, OH; Pro-Poxy 2000 Normal Set.
 - 4. Five Star Products, Inc., Fairfield, CT; DP Epoxy Grout.

PART 3 EXECUTION

3.01 GROUT

- A. General: Mix, place, and cure grout in accordance with grout manufacturer's representative's training instructions.
- B. Epoxy Grout: Concrete slab shall be fully cured for 28 days to ensure excess water has evaporated. Test concrete surface for moisture in accordance with ASTM D4263 before epoxy grout is placed.

3.02 GROUTING MACHINERY

- A. Block out original concrete or finish off at distance shown below bottom of machinery base with grout. Prepare concrete surface by sandblasting, chipping, or by mechanical means to remove any soft material. Surface roughness in accordance with manufacturer's written instructions.
- B. Clean metal surfaces of all paint, oil, grease, loose rust, and other foreign material that will be in contact with grout.
- C. Sandblast to bright metal all metal surfaces in contact with epoxy grout in accordance with manufacturer's written instructions.
- D. Set machinery in position and wedge to elevation with steel wedges, or use cast-in leveling bolts. Remove wedges after grout is set and pack void with grout.
- E. Form with watertight forms at least 2 inches higher than bottom of plate.
- F. Fill space between bottom of machinery base and original concrete in accordance with manufacturer's representative's training instructions.
- G. If grout cannot be placed from one edge and flowed to the opposite edge, air vents shall be provided through the plate to prevent air entrapment.
- H. Radius all corners of grout pad.
- I. Install expansion joints for epoxy grout placement in accordance with manufacturer's written instructions.

3.03 FIELD QUALITY CONTROL

- A. General:
 - 1. Performed by Project representative's inspection staff.
 - 2. Perform the following quality control inspections. The grout manufacturer's representative shall accompany the Project representative's inspection staff on the first installation of each size and type of equipment.
- B. Evaluation and Acceptance of Nonshrink Grout:
 - 1. Inspect the surface preparation of concrete substrates onto which nonshrink grout materials are to be applied, for conformance to the specified application criteria including, but not limited to, substrate profile, degree of cleanliness, and moisture.

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2. Inspect preparation and application of nonshrink grout form work for conformance to the manufacturer's recommendations.
3. Conduct a final review of completed nonshrink grout installation for conformance to these Specifications.
4. Provide a flow cone and cube molds with restraining plates onsite. Continue tests during Project as demonstrated by grout manufacturer's representative.
5. Perform flow cone and bleed tests, and make three 2-inch by 2-inch cubes for each 25 cubic feet of each type of nonshrink grout used. Use restraining caps for cube molds in accordance with ASTM C1107/C1107M.
6. For large grout applications, make three additional cubes and one more flow cone test. Include bleed test for each additional 25 cubic feet of nonshrink grout placed.
7. Consistency: As specified in Article Nonshrink Grout. Flow cone test in accordance with ASTM C939. Grout with consistencies outside range requirements shall be rejected.
8. Segregation: As specified in Article Nonshrink Grout. Grout when aggregate separates shall be rejected.
9. Nonshrink grout cubes shall test equal to or greater than minimum strength specified.
10. Strength Test Failures: Nonshrink grout work failing strength tests shall be removed and replaced.
11. Perform bleeding test in accordance with ASTM C940 to demonstrate grout will not bleed.
12. Store cubes at 70 degrees F.
13. Independent testing laboratory shall prepare, store, cure, and test cubes in accordance with ASTM C1107/C1107M.
14. All grout, already placed, which fails to meet the requirements of these Specifications, is subject to removal and replacement at no additional cost to the Owner.

C. Evaluation and Acceptance of Epoxy Grout:

1. Inspect ambient conditions during various phases of epoxy grouting installation for conformance with the epoxy grout manufacturer's requirements.
2. Inspect the surface preparation of concrete substrates onto which epoxy grout materials are to be applied, for conformance to the specified application criteria including, but not limited to, substrate profile, degree of cleanliness, and moisture.
3. Inspect the surface preparation of the metallic substrates onto which the epoxy primer is to be applied.
4. Inspect the epoxy-primed metallic substrate for coverage and adhesion.

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5. Inspect preparation and application of epoxy grout form work for conformance to the manufacturer's recommendation.
6. Verify consistency obtained is sufficient for the proper field placement at the installed temperatures.
7. Inspect and record that the "pot life" of epoxy grout materials is not exceeded during the installation.
8. Inspect epoxy grout for cure.
9. Inspect and record that localized repairs made to grout voids are in conformance with the specification requirements.
10. Conduct a final review of completed epoxy grout installation for conformance to these Specifications.
11. Compression tests and fabrication of specimens for epoxy grout shall be made in accordance to ASTM C579, Method B, at intervals during construction as selected by the Project representative. A set of three specimens shall be made for testing at 7 days, and each earlier time period as appropriate.
12. Independent testing laboratory shall prepare, store, cure, and test cubes in accordance with ASTM C579.
13. All grout, already placed, which fails to meet the requirements of these Specifications, is subject to removal and replacement at no additional cost to the Owner.

END OF SECTION

SECTION 05 05 19
POST-INSTALLED ANCHORS

PART 1 GENERAL

1.01 DEFINITIONS

- A. Corrosive Area: Containment area or area exposed to delivery, storage, transfer, or use of chemicals.
- B. Exterior Area: Location not protected from weather by a building or other enclosed structure to include buried roof structures.
- C. Interior Dry Area: Location inside building or structure where floor is not subject to liquid spills or wash down, and where wall or roof slab is not common to a water-holding or earth-retaining structure.
- D. Interior Wet Area: Location inside building or structure where floor is sloped to floor drains or gutters and is subject to liquid spills or wash down, or where wall, floor, or roof slab is common to a water-holding or earth-retaining structure.
- E. Submerged: Location at or below top of wall of open water-holding structure, such as a basin or channel, or wall, ceiling, or floor surface inside a covered water-holding structure, or exterior belowgrade wall or roof surface of water-holding structure, open or covered.

1.02 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings: Specific instructions for concrete anchor installation, including drilled hole size and depth, preparation, placement, procedures, and instructions for safe handling of anchoring systems.
- B. Informational Submittals:
 - 1. Concrete Anchors:
 - a. Manufacturer's product description and installation instructions.
 - b. Current ICC-ES or IAPMO-UES Report for each type of post-installed anchor to be used.
 - c. Adhesive Anchor Installer Certification.

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2. Passivation method for stainless steel members.
3. Hot-Dip Galvanizing: Certificate of Compliance signed by galvanizer, with description of material processed and ASTM standard used for coating.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Installers of adhesive anchors horizontally or upwardly inclined to support sustained tension loads shall be certified by an applicable certification program. Certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Installer Certification Program or equivalent.
2. Galvanized Coating Applicator: Company specializing in hot-dip galvanizing after fabrication and following procedures of Quality Assurance Manual of the American Galvanizers Association.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Package stainless steel items in a manner to provide protection from carbon impregnation.
- B. Protect hot-dip galvanized finishes from damage as a result of metal banding and rough handling.

PART 2 PRODUCTS

2.01 GENERAL

- A. Unless otherwise indicated, meet the following requirements:

Item	ASTM Reference
Stainless Steel:	
Threaded Rods	F593, AISI Type 316, Condition CW
Nuts*	F594, AISI Type 316, Condition CW
Carbon Steel:	
Threaded Rods	F1554, Grade 36 or F568M Class 5.8
Flat and Beveled Washers (Hardened)	F436
Nuts*	A194/A194M, Grade 2H

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Item	ASTM Reference
Galvanized Steel:	
All	A153/A153M
*Nuts of other grades and styles having specified proof load stresses greater than specified grade and style are also suitable. Nuts must have specified proof load stresses equal to or greater than minimum tensile strength of specified threaded rod.	

- B. Bolts, Washers, and Nuts: Use stainless steel, hot-dip galvanized steel, and zinc-plated steel material types as indicated in Fastener Schedule at end of this section.

2.02 POST-INSTALLED CONCRETE ANCHORS

A. General:

1. AISI Type 316 stainless, hot-dip galvanized or zinc-plated steel, as shown in Fastener Schedule at end of this section.
2. Post-installed anchor systems used in concrete shall be approved by ICC Evaluation Services Report or equivalent for use in cracked concrete and for short-term and long-term loads including wind and earthquake.
3. Mechanical Anchors: Comply with the requirements of ICC-ES AC193 or ACI 355.2.
4. Adhesive Anchors: Comply with the requirements of ICC-ES AC308 or ACI 355.4.

B. Torque-Controlled Expansion Anchors (Wedge Anchors):

1. Manufacturers and Products:
 - a. DeWalt/Powers Fasteners, Brewster, NY; Power-Stud +SD1, +SD2, +SD4, or +SD6 Anchors (ESR-2502 and ESR-2818).
 - b. Hilti, Inc., Tulsa, OK; Kwik-Bolt-TZ (KB-TZ) Anchors (ESR-1917).
 - c. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Strong-Bolt 2 Anchors (ESR-1771 and ESR-3037).

C. Undercut Anchors:

1. Manufacturers and Products:
 - a. USP Structural Connectors, Burnsville, MN; DUC Undercut Anchor (ESR-1970).
 - b. Hilti, Inc., Tulsa, OK; HDA Undercut Anchor (ESR-1546).

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- c. Simpson Strong-Tie Co., Inc., Pleasanton, CA; TORQ-CUT Self-Undercutting Anchor (ESR-2705).
- d. DeWalt/Powers Fasteners, Brewster, NY; Atomic+ Undercut Anchor (ESR-3067).

D. Self-Tapping Concrete Screw Anchors:

- 1. Manufacturers and Products:
 - a. DeWalt/Powers Fasteners, Brewster, NY; Wedge-Bolt+ (ESR-2526).
 - b. DeWalt/Powers Fasteners, Brewster, NY; Vertigo+ Rod Hanger Screw Anchor (ESR-2989).
 - c. DeWalt/Powers Fasteners, Brewster, NY; Snake+ Flush Mount Screw Anchor (ESR-2272).
 - d. Hilti, Inc., Tulsa, OK; HUS-EZ Screw Anchor (ESR-3027).
 - e. Simpson Strong-Tie Co., Inc., Pleasanton, CA; Titen HD Screw Anchor (ESR-2713).

E. Adhesive Anchors:

- 1. Threaded Rod:
 - a. Diameter as shown on Drawings.
 - b. Length as required to provide minimum depth of embedment indicated and thread projection required.
 - c. Clean and free of grease, oil, or other deleterious material.
- 2. Adhesive:
 - a. Two-component, insensitive to moisture, designed to be used in adverse freeze/thaw environments.
 - b. Cure Temperature, Pot Life, and Workability: Compatible for intended use and anticipated environmental conditions.
- 3. Packaging and Storage:
 - a. Disposable, self-contained system capable of dispensing both components in proper mixing ratio and fitting into a manually or pneumatically operated caulking gun.
 - b. Store adhesive on pallets or shelving in a covered storage area.
 - c. Package Markings: Include manufacturer's name, product name, batch number, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.
 - d. Dispose of When:
 - 1) Shelf life has expired.
 - 2) Stored other than in accordance with manufacturer's instructions.

4. Manufacturers and Products:
 - a. DeWalt/Powers Fasteners, Brewster NY; Pure 110+ Epoxy adhesive anchor system (ESR-3298).
 - b. Hilti, Inc., Tulsa, OK; HIT Doweling Anchor System, HIT RE 500 V3 (ESR-3814), or HIT-HY 200 (ESR-3187).
 - c. Simpson Strong-Tie Co., Inc., Pleasanton, CA; SET-XP Epoxy Adhesive Anchors (ESR-2508), or AT-XP Adhesive Anchors (IAPMO UES-263).

PART 3 EXECUTION

3.01 CONCRETE ANCHORS

- A. Begin installation only after concrete to receive anchors has attained design strength.
- B. Locate existing reinforcing with Ground Penetrating Radar or other method approved by Engineer prior to drilling. Coordinate with Engineer to adjust anchor locations where installation would result in hitting reinforcing.
- C. Install in accordance with written manufacturer's instructions.
- D. Provide minimum embedment, edge distance, and spacing as indicated on Drawings.
- E. Use only drill type and bit type and diameter recommended by anchor manufacturer.
- F. Clean hole of debris and dust per manufacturer's requirements.
- G. When unidentified embedded steel, rebar, or other obstruction is encountered in drill path, slant drill to clear obstruction. If drill must be slanted more than indicated in manufacturer's installation instructions to clear obstruction, notify Engineer for direction on how to proceed.
- H. Adhesive Anchors:
 1. Unless otherwise approved by Engineer and adhesive manufacturer:
 - a. Do not install adhesive anchors when temperature of concrete is below 40 degrees F or above 100 degrees F.
 - b. Do not install prior to concrete attaining an age of 21 days.
 - c. Remove any standing water from hole with oil-free compressed air. Inside surface of hole shall be dry.

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- d. Do not disturb anchor during recommended curing time.
- e. Do not exceed maximum torque as specified in manufacturer's instructions.

3.02 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

- A. Owner-Furnished Quality Assurance, in accordance with IBC Chapter 17 requirements, is provided in the Statement of Special Inspections Plan on Drawings. Contractor responsibilities and related information are included in Section 01 45 33, Special Inspection and Testing.
- B. Contractor-Furnished Quality Control: Inspection and testing as required in Section 01 45 16.13, Contractor Quality Control.

3.03 MANUFACTURER'S SERVICES

- A. Adhesive and Mechanical Anchors: Conduct Site training of installation personnel for proper installation, handling, and storage of adhesive anchor system. Notify Engineer of time and place for sessions.

3.04 FASTENER SCHEDULE

- A. Unless indicated otherwise on Drawings, provide fasteners as follows:

Service Use and Location	Product	Remarks
1. Post-Installed Anchors for Metal Components to Cast-in-Place Concrete (such as, Ladders, Handrail Posts, Electrical Panels, Platforms, and Equipment)		
Interior Dry Areas	Stainless steel adhesive or mechanical anchors	Verify product acceptability and manufacturer's requirements if anchor installation will occur in an overhead application.
Submerged, Exterior, Interior Wet, and Corrosive Areas	Stainless steel adhesive anchors	Verify product acceptability and manufacturer's requirements if anchor installation will occur in an overhead application.
2. All Others		
All service uses and locations	Stainless steel fasteners	

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- B. Antiseizing Lubricant: Use on all stainless steel threads.
- C. Provide bolt insulating kit where bolt material and fastened equipment are dissimilar materials.
- D. Do not use adhesive anchors to support fire-resistive construction or where ambient temperature will exceed 120 degrees F.

END OF SECTION

**SECTION 09 90 00
PAINTING AND COATING**

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. Environmental Protection Agency (EPA).
 2. NACE International (NACE): SP0188, Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
 3. National Association of Pipe Fitters (NAPF): NAPF 500-03, Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings.
 4. Occupational Safety and Health Act (OSHA).
 5. The Society for Protective Coatings (SSPC):
 - a. PA 2, Procedure for Determining Conformance to Dry Coating Thickness Requirements.
 - b. PA 10, Guide to Safety and Health Requirements for Industrial Painting Projects.
 - c. SP 1, Solvent Cleaning.
 - d. SP 2, Hand Tool Cleaning.
 - e. SP 3, Power Tool Cleaning.
 - f. SP 5, White Metal Blast Cleaning.
 - g. SP 6, Commercial Blast Cleaning.
 - h. SP 7, Brush-Off Blast Cleaning.
 - i. SP 10, Near-White Metal Blast Cleaning.
 - j. SP 11, Power Tool Cleaning to Bare Metal.
 - k. SP 16, Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals.
 - l. Guide 15, Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates.

1.02 DEFINITIONS

- A. Terms used in this section:
1. Coverage: Total minimum dry film thickness in mils or square feet per gallon.
 2. FRP: Fiberglass Reinforced Plastic.
 3. HCl: Hydrochloric Acid.
 4. MDFT: Minimum Dry Film Thickness, mils.

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5. MDFTPC: Minimum Dry Film Thickness per Coat, mils.
6. Mil: Thousandth of an inch.
7. PPDS: Paint Product Data Sheet.
8. PSDS: Paint System Data Sheet.
9. PVC: Polyvinyl Chloride.
10. SFPG: Square Feet per Gallon.
11. SFPGPC: Square Feet per Gallon per Coat.
12. SP: Surface Preparation.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
 - a. Data Sheets:
 - 1) For each product, furnish a Paint Product Data Sheet (PPDS), the manufacturer's technical data sheets, and paint colors available (where applicable). The PPDS form is appended to the end of this section.
 - 2) For each paint system, furnish a Paint System Data Sheet (PSDS). The PSDS form is appended to the end of this section.
 - 3) Technical and performance information that demonstrates compliance with specification.
 - 4) Furnish copies of paint system submittals to the coating applicator.
 - 5) Indiscriminate submittal of only manufacturer's literature is not acceptable.
 - b. Detailed chemical and gradation analysis for each proposed abrasive material.
2. Samples:
 - a. Paint:
 - 1) Unless otherwise specified, before painting work is started, prepare minimum 8-inch by 10-inch sample with type of paint and application specified on similar substrate to which paint is to be applied.
 - 2) Furnish additional samples as required until colors, finishes, and textures are approved.
 - 3) Approved samples to be the quality standard for final finishes.

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B. Informational Submittals:

1. Applicator's Qualification: List of references substantiating experience.
2. Coating manufacturer's Certificate of Compliance, in accordance with Section 01 43 33, Manufacturers' Field Services.
3. Factory Applied Coatings: Manufacturer's certification stating factory applied coating system meets or exceeds requirements specified.
4. Manufacturer's written verification that submitted material is suitable for the intended use.
5. If the manufacturer of finish coating differs from that of shop primer, provide finish coating manufacturer's written confirmation that materials are compatible.
6. Manufacturer's written instructions and special details for applying each type of paint.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Minimum 5 years' experience in application of specified products.

B. Regulatory Requirements:

1. Meet federal, state, and local requirements limiting the emission of volatile organic compounds.
2. Perform surface preparation and painting in accordance with recommendations of the following:
 - a. Paint manufacturer's instructions.
 - b. SSPC PA 10.
 - c. Federal, state, and local agencies having jurisdiction.

C. Mockup:

1. Before proceeding with Work under this section, finish one complete space or item of each color scheme required showing selected colors, finish texture, materials, quality of work, and special details.
2. After Engineer approval, sample spaces or items shall serve as a standard for similar work throughout the Project.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Shipping:

1. Where precoated items are to be shipped to the Site, protect coating from damage. Batten coated items to prevent abrasion.

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2. Protect shop painted surfaces during shipment and handling by suitable provisions including padding, blocking, and use of canvas or nylon slings.

B. Storage:

1. Store products in a protected area that is heated or cooled to maintain temperatures within the range recommended by paint manufacturer.
2. Primed surfaces shall not be exposed to weather for more than 2 months before being top coated, or less time if recommended by coating manufacturer.

1.06 PROJECT CONDITIONS

A. Environmental Requirements:

1. Do not apply paint in temperatures or moisture conditions outside of manufacturer's recommended maximum or minimum allowable.
2. Do not perform final abrasive blast cleaning whenever relative humidity exceeds 85 percent, or whenever surface temperature is less than 5 degrees F above dew point of ambient air.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Nationally recognized manufacturers of paints and protective coatings who are regularly engaged in the production of such materials for essentially identical service conditions.
- B. Minimum of 5 years' verifiable experience in manufacture of specified product.
- C. Each of the following manufacturers is capable of supplying most of the products specified herein:
 1. Akzo Nobel (International; Devoe).
 2. Carboline.
 3. PPG.
 4. Sherwin-Williams.
 5. Tnemec.

2.02 ABRASIVE MATERIALS

- A. Select abrasive type and size to produce surface profile that meets coating manufacturer’s recommendations for specific primer and coating system to be applied.

2.03 PAINT MATERIALS

A. General:

1. Manufacturer’s highest quality products suitable for intended service.
2. Compatibility: Only compatible materials from a single manufacturer shall be used in the Work. Particular attention shall be directed to compatibility of primers and finish coats.
3. Thinners, Cleaners, Driers, and Other Additives: As recommended by coating manufacturer.

B. Products:

Product	Definition
Acrylic Latex	Single-component, finish as required.
Bituminous Paint	Single-component, coal-tar pitch based.
Epoxy Primer— Ferrous Metal	Anticorrosive, converted epoxy primer containing rust-inhibitive pigments.
Epoxy Primer— Other	Epoxy primer, high-build, as recommended by coating manufacturer for specific galvanized metal, copper, or nonferrous metal alloy to be coated.
Fusion Bonded Coating 100% Solids Epoxy	100% solids, thermosetting, fusion bonded, dry powder epoxy, suitable for the intended service.
High Build Epoxy	Amine or novolac cured epoxy, minimum 69% volume solids, capability of 4 to 8 MDFT per coat, suitable for exposure to primary wastewater.
Polyurethane Enamel	Two-component, aliphatic or acrylic based polyurethane; high gloss finish.

2.04 MIXING

A. Multiple-Component Coatings:

1. Prepare using each component as packaged by paint manufacturer.

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2. No partial batches will be permitted.
 3. Do not use multiple-component coatings that have been mixed beyond their pot life.
 4. Furnish small quantity kits for touchup painting and for painting other small areas.
 5. Mix only components specified and furnished by paint manufacturer.
 6. Do not intermix additional components for reasons of color or otherwise, even within the same generic type of coating.
- B. Colors: Formulate paints with colorants free of lead, lead compounds, or other materials that might be affected by presence of hydrogen sulfide or other gas likely to be present at Site.

2.05 SHOP FINISHES

- A. Shop Blast Cleaning: Reference Paragraph Shop Coating Requirements.
- B. Surface Preparation: Provide Engineer minimum 7 days' advance notice to start of shop surface preparation work and coating application work.
- C. Shop Coating Requirements:
1. When required by equipment specifications, such equipment shall be primed and finish coated in shop by manufacturer and touched up in field with identical material after installation.
 2. Where manufacturer's standard coating is not suitable for intended service condition, Engineer may approve use of a tie-coat to be used between manufacturer's standard coating and specified field finish. In such cases, tie-coat shall be surface tolerant epoxy as recommended by manufacturer of specified field finish coat. Coordinate details of equipment manufacturer's standard coating with field coating manufacturer.
- D. Pipe:
1. Ductile Iron Pipe:
 - a. Use the NAPF 500-03 standards as a guide for desired prepared surface. Follow recommendations of pipe and coating manufacturers for means and methods to achieve the surface conditions specified in these standards.
 - b. The surface preparation and application of the primer and finish coats shall be performed by pipe manufacturer.

- c. For high performance (epoxy) coatings, follow additional recommendations of pipe and coating manufacturers.
 - d. Prior to blast cleaning, grind smooth surface imperfections including, but not limited to, delaminating metal or oxide layers.
2. Steel Pipe:
- a. Surface preparation and application of primer and finish coats shall be performed by pipe manufacturer.
 - b. For pipe with epoxy lining, do not place end cap seals until pipe lining material has sufficiently dried.

PART 3 EXECUTION

3.01 GENERAL

- A. Provide Engineer minimum 7 days' advance notice to start of field surface preparation work and coating application work.
- B. Perform the Work only in presence of Engineer, unless Engineer grants prior approval to perform the Work in Engineer's absence.
- C. Schedule inspection of cleaned surfaces and all coats prior to succeeding coat in advance with Engineer.

3.02 EXAMINATION

- A. Factory Finished Items:
 - 1. Schedule inspection with Engineer before repairing damaged factory-finished items delivered to Site.
 - 2. Repair abraded or otherwise damaged areas on factory-finished items as recommended by coating manufacturer. Carefully blend repaired areas into original finish. If required to match colors, provide full finish coat in field.
- B. Surface Preparation Verification: Inspect and provide substrate surfaces prepared in accordance with these Specifications and printed directions and recommendations of paint manufacturer whose product is to be applied. The more stringent requirements shall apply.

3.03 PROTECTION OF ITEMS NOT TO BE PAINTED

- A. Remove, mask, or otherwise protect hardware, lighting fixtures, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not specified elsewhere to be painted.

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- B. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces.
- C. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting process.
- D. Mask openings in motors to prevent paint and other materials from entering.
- E. Protect surfaces adjacent to or downwind of Work area from overspray.

3.04 SURFACE PREPARATION

- A. Field Abrasive Blasting:
 - 1. Perform blasting for items and equipment where specified and as required to restore damaged surfaces previously shop or field blasted and primed or coated.
 - 2. Refer to coating systems for degree of abrasive blasting required.
 - 3. Where the specified degree of surface preparation differs from manufacturer's recommendations, the more stringent shall apply.
- B. Metal Surface Preparation:
 - 1. Where indicated, meet requirements of SSPC Specifications summarized below:
 - a. SP 1, Solvent Cleaning: Removal of visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants by cleaning with solvent.
 - b. SP 2, Hand Tool Cleaning: Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, using nonpower hand tools.
 - c. SP 3, Power Tool Cleaning: Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, using power-assisted hand tools.
 - d. SP 5, White Metal Blast Cleaning: Removal of visible oil, grease, dust, dirt, mill scale, rust, coatings, oxides, corrosion products, and other foreign matter by blast cleaning.
 - e. SP 6, Commercial Blast Cleaning: Removal of visible oil, grease, dust, dirt, mill scale, rust, coatings, oxides, corrosion products, and other foreign matter, except for random staining limited to no more than 33 percent of each unit area of surface which may consist of light shadows, slight streaks, or minor discolorations caused by stains of rust, stains of mill scale, or stains of previously applied coatings.

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- f. SP 7, Brush-Off Blast Cleaning: Removal of visible rust, oil, grease, soil, dust, loose mill scale, loose rust, and loose coatings. Tightly adherent mill scale, rust, and coating may remain on surface.
 - g. SP 10, Near-White Metal Blast Cleaning: Removal of visible oil, grease, dust, dirt, mill scale, rust, coatings, oxides, corrosion products, and other foreign matter, except for random staining limited to no more than 5 percent of each unit area of surface which may consist of light shadows, slight streaks, or minor discolorations caused by stains of rust, stains of mill scale, or stains of previously applied coatings.
 - h. SP 11, Power Tool Cleaning to Bare Metal: Removal of visible oil, grease, dirt, dust, mill scale, rust, paint, oxide, corrosion products, and other foreign matter using power-assisted hand tools capable of producing suitable surface profile. Slight residues of rust and paint may be left in lower portion of pits if original surface is pitted.
 - i. SP 16, Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals: A brush-off blast cleaned non-ferrous metal surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, metal oxides (corrosion products), and other foreign matter. Intact, tightly adherent coating is permitted to remain. A coating is considered tightly adherent if it cannot be removed by lifting with a dull putty knife. Bare metal substrates shall have a minimum profile of 19 micrometers (0.75 mil).
- 2. The words “solvent cleaning”, “hand tool cleaning”, “wire brushing”, and “blast cleaning”, or similar words of equal intent in these Specifications or in paint manufacturer’s specification refer to the applicable SSPC Specification.
 - 3. Where OSHA or EPA regulations preclude standard abrasive blast cleaning, wet or vacu-blast methods may be required. Coating manufacturers’ recommendations for wet blast additives and first coat application shall apply.
 - 4. Ductile Iron Pipe Supplied with Asphaltic Varnish Finish: Remove asphaltic varnish finish prior to performing specified surface preparation.
 - 5. Hand tool clean areas that cannot be cleaned by power tool cleaning.
 - 6. Round or chamfer sharp edges and grind smooth burrs, jagged edges, and surface defects.
 - 7. Welds and Adjacent Areas:
 - a. Prepare such that there is:
 - 1) No undercutting or reverse ridges on weld bead.

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- 2) No weld spatter on or adjacent to weld or any area to be painted.
 - 3) No sharp peaks or ridges along weld bead.
 - b. Grind embedded pieces of electrode or wire flush with adjacent surface of weld bead.
 8. Pre-blast Cleaning Requirements:
 - a. Remove oil, grease, welding fluxes, and other surface contaminants prior to blast cleaning.
 - b. Cleaning Methods: Steam, open flame, hot water, or cold water with appropriate detergent additives followed with clean water rinsing.
 - c. Clean small, isolated areas as above or solvent clean with suitable solvent and clean cloth.
 9. Blast Cleaning Requirements:
 - a. Type of Equipment and Speed of Travel: Design to obtain specified degree of cleanliness. Minimum surface preparation is as specified herein and takes precedence over coating manufacturer's recommendations.
 - b. Select type and size of abrasive to produce surface profile that meets coating manufacturer's recommendations for particular primer to be used.
 - c. Use only dry blast cleaning methods.
 - d. Do not reuse abrasive, except for designed recyclable systems.
 - e. Meet applicable federal, state, and local air pollution and environmental control regulations for blast cleaning, confined space entry (if required), and disposition of spent aggregate and debris.
 10. Post-Blast Cleaning and Other Cleaning Requirements:
 - a. Clean surfaces of dust and residual particles from cleaning operations by dry (no oil or water vapor) air blast cleaning or other method prior to painting. Vacuum clean enclosed areas and other areas where dust settling is a problem and wipe with a tack cloth.
 - b. Paint surfaces the same day they are blasted. Re-blast surfaces that have started to rust before they are painted.
- C. Galvanized Metal, Copper, and Nonferrous Metal Alloy Surface Preparation:
1. Remove soil, cement spatter, and other surface dirt with appropriate hand or power tools.
 2. Brush blast in accordance with SSPC SP 16.
 3. Obtain and follow coating manufacturer's recommendations for additional preparation that may be required.

D. Plastic and FRP Surface Preparation:

1. Hand sand plastic surfaces to be coated with medium grit sandpaper to provide tooth for coating system.
2. Large areas may be power sanded or brush-off blasted, provided sufficient controls are employed so surface is roughened without removing excess material.

3.05 SURFACE CLEANING

A. Brush-off Blast Cleaning:

1. Equipment, procedure, and degree of cleaning shall meet requirements of SSPC SP 7.
2. Abrasive: Either wet or dry blasting sand, grit, or nutshell.
3. Select various surface preparation parameters, such as size and hardness of abrasive, nozzle size, air pressure, and nozzle distance from surface such that surface is cleaned without pitting, chipping, or other damage.
4. Verify parameter selection by blast cleaning a trial area that will not be exposed to view.
5. Engineer will review acceptable trial blast cleaned area and use area as a representative sample of surface preparation.
6. Repair or replace surface damaged by blast cleaning.
 - a. Rinse immediately to avoid formation on the surface of salts that are difficult to remove.
 - b. Thoroughly rinse to remove any residual acid surface condition that may impair adhesion.
7. Ensure surface is completely dry before application of coating.

B. Solvent Cleaning:

1. Consists of removal of foreign matter such as oil, grease, soil, drawing and cutting compounds, and any other surface contaminants by using solvents, emulsions, cleaning compounds, steam cleaning, or similar materials and methods that involve a solvent or cleaning action.
2. Meet requirements of SSPC SP 1.

3.06 APPLICATION

A. General:

1. The intention of these Specifications is for existing and new, interior, and exterior metal and submerged metal surfaces to be coated, whether specifically mentioned or not, except as specified otherwise. Plastic

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items in atmospheric exposures are intended to receive coatings. Do not paint exterior concrete surfaces, unless specifically indicated.

2. Extent of Coating (Immersion): Coatings shall be applied to internal vessel and pipe surfaces, nozzle bores, flange gasket sealing surfaces, carbon steel internals, and stainless steel internals, unless otherwise specified.
3. For coatings subject to immersion, obtain full cure for completed system. Consult coatings manufacturer's written instructions for these requirements. Do not immerse coating until completion of curing cycle.
4. Apply coatings in accordance with these Specifications and paint manufacturers' printed recommendations and special details. The more stringent requirements shall apply. Allow sufficient time between coats to assure thorough drying of previously applied paint.
5. Fusion Bonded Coatings Method Application: Electrostatic, fluidized bed, or flocking.
6. Coat units or surfaces to be bolted together or joined closely to structures or to one another prior to assembly or installation.
7. On pipelines, terminate coatings along pipe runs to 1 inch inside pipe penetrations.
8. Keep paint materials sealed when not in use.
9. Where more than one coat is applied within a given system, alternate colors to provide a visual reference showing required number of coats have been applied.

B. Galvanized Metal, Copper, and Nonferrous Metal Alloys:

1. Concealed galvanized, copper, and nonferrous metal alloy surfaces (behind building panels or walls) do not require painting, unless specifically indicated herein.
2. Prepare surface and apply primer in accordance with System No. 10 specification.
3. Apply intermediate and finish coats of the coating system appropriate for the exposure.

C. Film Thickness and Coverage:

1. Number of Coats:
 - a. Minimum required without regard to coating thickness.
 - b. Additional coats may be required to obtain minimum required paint thickness, depending on method of application, differences in manufacturers' products, and atmospheric conditions.

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2. Application Thickness:
 - a. Do not exceed coating manufacturer’s recommendations.
 - b. Measure using a wet film thickness gauge to ensure proper coating thickness during application.
3. Film Thickness Measurements and Electrical Inspection of Coated Surfaces:
 - a. Perform with properly calibrated instruments.
 - b. Recoat and repair as necessary for compliance with specification.
 - c. Coats are subject to inspection by Engineer and coating manufacturer’s representative.
4. Visually inspect metal and plastic surfaces to ensure proper and complete coverage has been attained.
5. Give particular attention to edges, angles, flanges, and other similar areas, where insufficient film thicknesses are likely to be present, and ensure proper millage in these areas.
6. Apply additional coats as required to achieve complete hiding of underlying coats. Hiding shall be so complete that additional coats would not increase the hiding.

3.07 PROTECTIVE COATINGS SYSTEMS AND APPLICATION SCHEDULE

- A. Unless otherwise shown or specified, paint surfaces in accordance with the following application schedule. In the event of discrepancies or omissions in the following, request clarification from Engineer before starting work in question.
- B. As shown on Drawings and on the Piping Schedule.
- C. System No. 2 Submerged Metal—Domestic Sewage:

Surface Prep.	Paint Material	Min. Coats, Cover
SP 5, White Metal Blast Cleaning	Prime in accordance with manufacturer’s recommendations	2 coats, 16 MDFT
	High Build Epoxy	

1. Use on the following items or areas:
 - a. Metal surfaces new and existing below a plane 1 foot above maximum liquid surface, metal surfaces above maximum liquid surface that are a part of immersed equipment, concrete embedded surfaces of metallic items, such as wall pipes, pipes, pipe sleeves, access manholes, gate guides and thimbles, and structural steel.

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D. System No. 4 Exposed Metal—Highly Corrosive:

Surface Prep.	Paint Material	Min. Coats, Cover
Steel: SP 10, Near-White Blast Cleaning.	Epoxy Primer— Ferrous Metal	1 coat, 2.5 MDFT
Ductile Iron: NAPF 500-03.	High Build Epoxy	1 coat, 4 MDFT
	Polyurethane Enamel	1 coat, 3 MDFT

1. Use on the following items or areas:
 - a. Exposed metal surfaces, new and existing, located inside or outside of structures and exposed to weather.
 - b. Apply surface preparation and primer to surfaces prior to installation. Finish coats need only be applied to surfaces exposed after completion of construction.
 - c. Exposed CLDI RAS Piping.
 - d. For galvanized steel items coated with System No. 10 primer, finish coat with Polyurethane Enamel only.

E. System No. 7 Concrete Encased Metal:

Surface Prep.	Paint Material	Min. Coats, Cover
SP 6, Commercial Blast Cleaning	High Build Epoxy	2 coats, 16 MDFT

1. Use on the following items or areas:
 - a. Use on concrete encased ferrous metals including wall pipes, pipe sleeves, access manholes, gate guides, and thimbles.

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F. System No. 10 Galvanized Metal, Copper, and Nonferrous Metal Alloy Conditioning:

Surface Prep.	Paint Material	Min. Coats, Cover
In accordance with Paragraph Galvanized Metal, Copper, and Nonferrous Metal Alloy Surface Preparation	Epoxy Primer—Other	As recommended by coating manufacturer Remaining coats as required for exposure

1. Use on the following items or areas:
 - a. Galvanized and other non-ferrous metal surfaces requiring painting, as indicated in other specification sections.
 - b. After application of System No. 10, apply finish coats as required for exposure.
 - c. For exposed galvanized pipe supports, finish coat with Polyurethane Enamel per System No. 4.

G. System No. 25 Exposed FRP, PVC:

Surface Prep.	Paint Material	Min. Coats, Cover
In accordance with Paragraph Plastic and FRP Surface Preparation	Acrylic Latex Semigloss	2 coats, 320 SFPGPC

1. Use on the following items or areas:
 - a. All exposed-to-view PVC and CPVC surfaces, and FRP surfaces without integral UV-resistant gel coat.
 - b. Exposed PVC RAS piping.

H. System No. 27 Aluminum and Dissimilar Metal Insulation:

Surface Prep.	Paint Material	Min. Coats, Cover
Solvent Clean (SP 1)	Prime in accordance with manufacturer's recommendations	
	Bituminous Paint	1 coat, 10 MDFT

1. Use on aluminum surfaces embedded or in contact with concrete.

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I. System No. 29 Fusion Bonded Coating:

Surface Prep.	Paint Material	Min. Coats, Cover
SP 10, Near-White Blast Cleaning	Fusion Bonded Coating 100% Solids Epoxy	1 or 2 coats, 7 MDFT

1. For steel pipe and fittings, meet all requirements of AWWA C213.

3.08 COLORS

A. Provide as selected by Owner.

B. Proprietary identification of colors is for identification only. Selected manufacturer may supply matches.

C. Equipment Colors:

1. Equipment includes the machinery or vessel itself plus the structural supports and fasteners and attached electrical conduits.
2. Paint equipment and piping one color as selected.
3. Paint nonsubmerged portions of equipment the same color as the piping it serves, except as itemized below:
 - a. Dangerous Parts of Equipment and Machinery: OSHA Orange.
 - b. Fire Protection Equipment and Apparatus: OSHA Red.
 - c. Radiation Hazards: OSHA Purple.
 - d. Physical hazards in normal operating area and energy lockout devices, including, but not limited to, electrical disconnects for equipment and equipment isolation valves in air and liquid lines under pressure: OSHA Yellow.

D. Pipe Identification Painting:

1. Color code nonsubmerged metal piping, except electrical conduit. Paint fittings and valves the same color as pipe, except equipment isolation valves.
2. Pipe Color Coding: As selected by Owner.
3. On exposed stainless steel piping, apply color 24 inches in length along pipe axis at connections to equipment, valves, or branch fittings, at wall boundaries, and at intervals along piping not greater than 9 feet on center.
4. Pipe Supports: As selected by Owner.

5. Fiberglass reinforced plastic (FRP) pipe, polyvinylidene fluoride (PVDF), and polyvinyl chloride (PVC) pipe located inside of buildings and enclosed structures will not require painting, except as noted or scheduled.

3.09 FIELD QUALITY CONTROL

A. Testing Equipment:

1. Provide calibrated electronic type dry film thickness gauge to test coating thickness specified in mils.
2. Provide low-voltage wet sponge electrical holiday detector to test completed coating systems, 20 mils dry film thickness or less, except zinc primer, high-build elastomeric coatings, and galvanizing, for pinholes, holidays, and discontinuities. Unit as recommended by coating manufacturer.
3. Provide high-voltage spark tester to test completed coating systems in excess of 20 mils dry film thickness. Unit as recommended by coating manufacturer.

B. Testing:

1. Thickness and Continuity Testing:
 - a. Measure coating thickness specified in mils with an electronic type, dry film thickness gauge, in accordance with SSPC PA 2. Check each coat for correct millage. Do not make measurement before a minimum of 8 hours after application of coating, or as recommended by the coating manufacturer.
 - b. Test finished coating system on 100 percent of all submerged surfaces for holidays and discontinuities. All holidays and discontinuities shall be repaired to achieve a monolithic and pinhole free coating system:
 - 1) Holiday detect coatings 20 mils thick or less, except zinc primer and galvanizing, with low voltage wet sponge electrical holiday detector in accordance with NACE SP0188.
 - 2) Holiday detect coatings in excess of 20 mils dry with high voltage spark tester as recommended by coating manufacturer and in accordance with NACE SP0188.
 - c. After repaired and recoated areas have dried sufficiently, retest each repaired area. Final tests may also be conducted by Engineer.

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- C. Inspection: Leave staging and lighting in place until Engineer has inspected surface or coating. Replace staging removed prior to approval by Engineer. Provide additional staging and lighting as requested by Engineer.
- D. Unsatisfactory Application:
 - 1. If item has an improper finish color or insufficient film thickness, clean surface and topcoat with specified paint material to obtain specified color and coverage. Obtain specific surface preparation information from coating manufacturer.
 - 2. Evidence of runs, bridges, shiners, laps, or other imperfections is cause for rejection.
 - 3. Repair defects in accordance with written recommendations of coating manufacturer.
- E. Damaged Coatings, Pinholes, and Holidays:
 - 1. All damaged coatings, pinholes, and holidays shall have the edges feathered and repaired in accordance with the recommendations of the manufacturer, to achieve pinhole free, monolithic coating systems.
 - 2. Hand or power sand visible areas of chipped, peeled, or abraded paint, and feather edges. Follow with primer and finish coat. Depending on extent of repair and appearance, a finish sanding and topcoat may be required.
 - 3. Remove rust and contaminants from metal surface. Provide surface cleanliness and profile in accordance with surface preparation requirements for specified paint system.
 - 4. Feather edges and repair in accordance with recommendations of paint manufacturer.
 - 5. Apply finish coats, including touchup and damage-repair coats in a manner that will present a uniform texture and color-matched appearance.

3.10 MANUFACTURER'S SERVICES

- A. In accordance with Section 01 43 33, Manufacturers' Field Services, coating manufacturer's representative shall be present at Site as follows:
 - 1. On first day of application of any coating system.
 - 2. A minimum of two additional Site inspection visits, each for a minimum of 4 hours, in order to provide Manufacturer's Certificate of Proper Installation.

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3. As required to resolve field problems attributable to or associated with manufacturer's product.
4. To verify full cure of coating prior to coated surfaces being placed into immersion service.

3.11 CLEANUP

- A. Place cloths and waste that might constitute a fire hazard in closed metal containers or destroy at end of each day.
- B. Upon completion of the Work, remove staging, scaffolding, and containers from Site or destroy in a legal manner.
- C. Remove paint spots, oil, or stains upon adjacent surfaces and floors and leave entire job clean.

3.12 SUPPLEMENTS

- A. The supplements listed below, following "End of Section," are a part of this specification:
 1. Paint System Data Sheet (PSDS).
 2. Paint Product Data Sheet (PPDS).

END OF SECTION

PAINT SYSTEM DATA SHEET (PSDS)

Complete this PSDS for each coating system, include all components of the system (surface preparation, primer, intermediate coats, and finish coats). Include all components of a given coating system on a single PSDS.

Paint System Number (from Spec.):		
Paint System Title (from Spec.):		
Coating Supplier:		
Representative:		
Surface Preparation (from Spec.):		
Paint Material (Generic)	Product Name/Number (Proprietary)	Min. Coats, Coverage

PAINT PRODUCT DATA SHEET (PPDS)

Complete and attach manufacturer's Technical Data Sheet to this PPDS for each product submitted. Provide manufacturer's recommendations for the following parameters at temperature (F)/relative humidity:

Temperature/RH	50/50	70/30	90/25
Induction Time			
Pot Life			
Shelf Life			
Drying Time			
Curing Time			
Min. Recoat Time			
Max. Recoat Time			

Provide manufacturer's recommendations for the following:

Mixing Ratio: _____

Maximum Permissible Thinning: _____

Ambient Temperature Limitations: min.: _____ max.: _____

Surface Temperature Limitations: min.: _____ max.: _____

Surface Profile Requirements: min.: _____ max.: _____

Attach additional sheets detailing manufacturer's recommended storage requirements and holiday testing procedures.

SECTION 26 05 01
ELECTRICAL

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Association of State Highway Transportation Officials (AASHTO).
 2. ASTM International (ASTM):
 - a. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - b. A240/A240M, Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
 - c. A1011/A1011M, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - d. B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
 - e. C857, Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
 3. Electronic Industries Association (EIA/TIA): 569, Commercial Building Standard for Telecommunications Pathways and Spaces.
 4. Federal Specifications (FS):
 - a. W-C-596, Connector, Electrical, Power, General Specification for.
 - b. W-S-896, Switch, Toggle (Toggle and Lock), Flush Mounted (General Specification).
 5. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. C62.41, Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
 - b. PC62.41.1, Draft Guide on the Surge Environment in Low-Voltage (1000 V and less) AC Power Circuits.
 - c. 112, Standard Test Procedure for Polyphase Induction Motors and Generators.
 - d. 114, IEEE Standard Test Procedure for Single-Phase Induction Motors.
 6. International Electrical Testing Association (NETA): ATS, Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

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7. National Electrical Contractor's Association, Inc. (NECA): 1, Standard Practices for Good Workmanship in Electrical Contracting.
8. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
 - b. C80.1, Rigid Steel Conduit-Zinc Coated.
 - c. C80.3, Electrical Metallic Tubing-Zinc Coated.
 - d. C80.6, Intermediate Metal Conduit-Zinc Coated (IMC).
 - e. CC1, Electrical Power Connectors for Substations.
 - f. ICS 1, Industrial Control and Systems: General Requirements.
 - g. ICS 2, Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated Not More Than 2000 Volts AC or 750 Volts DC.
 - h. ICS 2.3, Industrial Control and Systems: Instructions for the Handling, Installation, Operation and Maintenance of Motor Control Centers.
 - i. MG 1, Motors and Generators.
 - j. PB 1, Panelboards.
 - k. RN 1, Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - l. ST 20, Dry Type Transformers for General Applications.
 - m. TC 2, Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
 - n. TC 3, PVC Fittings for Use with Rigid PVC Conduit and Tubing.
 - o. WC 55, Instrumentation Cables and Thermocouple Wire.
 - p. WC 70, Standard for Non-Shielded Power Cables Rated 2000 V or Less for the Distribution of Electrical Energy.
 - q. WC 71, Standard for Non-Shielded Cables Rated 2001-5000 Volts for use in the Distribution of Electrical Energy.
 - r. WC 74, 5-46 KV Shielded Power Cable for use in the Transmission and Distribution of Electric Energy.
 - s. WD 1, General Color Requirements for Wiring Devices.
9. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
10. UL:
 - a. 1, Flexible Metal Conduit.
 - b. 6, Electrical Rigid Metal Conduit—Steel.
 - c. 13, Power-Limited Circuit Cables.
 - d. 44, Thermoset Insulated Wires and Cables.
 - e. 62, Flexible Cord and Fixture Wire.
 - f. 67, Panelboards.
 - g. 98, Enclosed and Dead-Front Switches.
 - h. 198C, High Interrupting Capacity Fuses, Current Limiting Types.
 - i. 198E, Class R Fuses.
 - j. 360, Liquid-Tight Flexible Steel Conduit.

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- k. 486A, Wire Connectors and Soldering Lugs for Use with Copper Conductors.
- l. 486C, Splicing Wire Connectors.
- m. 489, Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures.
- n. 508, Industrial Control Equipment.
- o. 510, Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape.
- p. 514B, Fittings for Cable and Conduit.
- q. 651, Schedule 40 and 80 PVC Conduit.
- r. 674, Electric Motors And Generators for use in Division 1 Hazardous (Classified) Locations.
- s. 797, Electrical Metallic Tubing.
- t. 854, Service-Entrance Cables.
- u. 870, Wireways, Auxiliary Gutters, and Associated Fittings.
- v. 943, Ground-Fault Circuit Interrupters.
- w. 1059, Terminal Blocks.
- x. 1242, Intermediate Metal Conduit.
- y. 1277, Electrical Power and Control Tray Cables with Optional Optical-Fibre Members.
- z. 1449, Transient Voltage Surge Suppressors.
- aa. 1561, Dry-Type General Purpose and Power Transformers.
- bb. 2111, Overheating Protection for Motors.

1.02 DEFINITIONS

- A. AHJ: Authority Having Jurisdiction.

1.03 SUBMITTALS

- A. Action Submittals:

- 1. Junction and pullboxes.
- 2. Circuit breakers and non-fused switches.
- 3. Control devices, terminal blocks, and relays.
- 4. Support and framing channels.
- 5. Nameplates and nameplate schedule.
- 6. Conduit, fittings, and accessories.
- 7. Wireways.
- 8. Conductors, cable, and accessories.
- 9. Grounding materials.
- 10. Seismic anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Anchorage and Bracing.

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B. Informational Submittals:

1. Seismic anchorage and bracing calculations as required by Section 01 88 15, Anchorage and Bracing.
2. Component and attachment testing seismic certificate of compliance as required by Section 01 45 33, Special Inspection and Testing.
3. Factory test reports.
4. Field test reports.
5. Signed permits indicating Work is acceptable to regulatory authorities having jurisdiction.
6. Operation and Maintenance Data:
 - a. As specified in Section 01 78 23, Operation and Maintenance Data.
 - b. Provide for all equipment, as well as each device having features that can require adjustment, configuration, or maintenance.
 - c. Minimum information shall include manufacturer's preprinted instruction manual, one copy of the approved submittal information for the item, tabulation of any settings, and copies of any test reports.

1.04 APPROVAL BY AUTHORITY HAVING JURISDICTION

- A. Provide the Work in accordance with NFPA 70, National Electrical Code (NEC). Where required by the Authority Having Jurisdiction (AHJ), material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ, in order to provide a basis for approval under the NEC.
- B. Materials and equipment manufactured within the scope of standards published by UL shall conform to those standards and shall have an applied UL listing mark or label.

PART 2 PRODUCTS

2.01 GENERAL

- A. Products shall comply with all applicable provisions of NFPA 70.
- B. Like Items of Equipment: End products of one manufacturer in order to achieve standardization for appearance, operation, maintenance, spare parts, and manufacturer's service.
- C. Equipment and Devices Installed Outdoors or in Unheated Enclosures: Capable of continuous operation within ambient temperature range of 0 degrees F to 104 degrees F.

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- D. Hazardous Areas: Products shall be acceptable to the regulatory authority having jurisdiction for the class, division, and group of hazardous area indicated.
- E. Equipment Finish:
 - 1. Manufacturer's standard finish color, except where specific color is indicated.
 - 2. If manufacturer has no standard color, finish equipment in accordance with Section 09 90 00, Painting and Coating.

2.02 JUNCTION AND PULL BOXES

- A. Conduit Bodies Used as Junction Boxes: As specified under Article Conduit and Fittings.

2.03 NONFUSED SWITCH, INDIVIDUAL, 0 VOLTS TO 600 VOLTS

- A. NEMA KS 1.
- B. Quick-make, quick-break, motor rated, load-break, heavy-duty (HD) type with external markings clearly indicating ON/OFF positions.
- C. Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.
- D. Enclosure: As specified under Execution.
- E. Interlock: Enclosure and switch to prevent opening cover with switch in the ON position.
- F. Manufacturers:
 - 1. Eaton.
 - 2. Square D Co.

2.04 SUPPORT AND FRAMING CHANNELS

- A. Extruded Aluminum Framing Channel:
 - 1. Material: Extruded from Type 6063-T6 aluminum alloy.
 - 2. Fittings fabricated from Alloy 5052-H32.

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- B. Manufacturers:
 - 1. B-Line Systems, Inc.
 - 2. Unistrut Corp.

2.05 NAMEPLATES

- A. Material: Laminated plastic.
- B. Attachment: Adhesive.
- C. Color: Black, engraved to a white core, or as shown.
- D. Engraving:
 - 1. Devices and Equipment: Name or tag shown, or as required.
 - 2. Panelboards:
 - a. Designation.
 - b. Service voltage.
 - c. Phases.
 - 3. Minimum Requirement: Label metering and power distribution equipment, local control panels, junction boxes, motor controls, and transformers.
- E. Letter Height:
 - 1. Pushbuttons, Selector Switches, and Other Devices: 1/8 inch.
 - 2. Equipment and Panelboards: 1/4 inch.

2.06 CONDUIT AND FITTINGS

- A. Rigid Aluminum Conduit:
 - 1. Meet requirements of NEMA C80.5 and UL 6A.
 - 2. Material: Type 6063, copper-free aluminum alloy.
- B. Flexible Metal, Liquid-Tight Conduit:
 - 1. UL 360 listed for 105 degrees C insulated conductors.
 - 2. Material: Galvanized steel, with an extruded PVC jacket.
- C. Fittings:
 - 1. Provide bushings, grounding bushings, conduit hubs, conduit bodies, couplings, unions, conduit sealing fittings, drain seals, drain/breather fittings, expansion fittings, and cable sealing fittings, as applicable.

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2. Rigid Aluminum Conduit:
 - a. General:
 - 1) Meet requirements of UL 514B.
 - 2) Type: Threaded, copper-free. Set screw fittings not permitted.
 - b. Insulated Bushing:
 - 1) Material: Cast aluminum, with integral insulated throat, rated for 150 degrees C.
 - 2) Manufacturer and Product:
 - a) O-Z/Gedney; Type AB.
 - b) "Or-equal."
 - c. Grounding Bushing:
 - 1) Material: Cast aluminum with integral insulated throat, rated for 150 degrees, with solderless lugs.
 - 2) Manufacturer and Product:
 - a) O-Z/Gedney; Type ABLG.
 - b) "Or-equal."
 - d. Conduit Hub:
 - 1) Material: Cast aluminum, with insulated throat.
 - 2) UL listed for use in wet locations.
 - 3) Manufacturers and Products:
 - a) O-Z/Gedney; Type CHA.
 - b) Thomas & Betts; Series 370AL.
 - c) Meyers; Series SA.
 - e. Conduit Bodies:
 - 1) Manufacturers and Products:
 - a) Appleton; Form 85 threaded unilets.
 - b) Crouse-Hinds; Mark 9 or Form 7-SA threaded condulets.
 - c) Killark; Series O electrolets.
 - f. Couplings: As supplied by conduit manufacturer.
 - g. Conduit Sealing Fitting:
 - 1) Manufacturers and Products:
 - a) Appleton; Type EYF-AL or Type EYM-AL.
 - b) Crouse-Hinds; Type EYS-SA or Type EZS-SA.
 - c) Killark; Type EY or Type EYS.
 - h. Drain Seal:
 - 1) Manufacturers and Products:
 - a) Appleton; Type EYDM-A.
 - b) Crouse-Hinds; Type EYD-SA or Type EZD-SA.
 - i. Drain/Breather Fitting:
 - 1) Manufacturers and Products:
 - a) Appleton; Type ECDB.
 - b) Crouse-Hinds; ECD.

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- j. Expansion Fitting:
 - 1) Manufacturers and Products:
 - a) Deflection/Expansion Movement: Steel City; Type DF-A.
 - b) Expansion Movement Only: Steel City; Type AF-A.
- k. Cable Sealing Fittings:
 - 1) To form watertight nonslip cord or cable connection to conduit.
 - 2) Bushing: Neoprene at connector entry.
 - 3) Manufacturer and Product:
 - a) Appleton; CG-S.
 - b) "Or-equal."
- 3. Flexible Metal, Liquid-Tight Conduit:
 - a. Metal insulated throat connectors with integral nylon or plastic bushing rated for 105 degrees C.
 - b. Insulated throat and sealing O-rings.
 - c. Manufacturers and Products:
 - 1) Thomas & Betts; Series 5331.
 - 2) O-Z/Gedney; Series 4Q.

2.07 CONDUCTORS AND CABLES

A. Conductors 600 Volts and Below:

- 1. Conform to applicable requirements of NEMA WC 71, WC 72, and WC 74.
- 2. Conductor Type: Stranded copper.
- 3. Insulation: Type XHHW-2.

B. 300-VOLT RATED CABLE

- 1. General:
 - a. Type PLTC, meeting requirements of UL 13 and NFPA 70, Article 725.
 - b. Permanently and legibly marked with manufacturer's name, maximum working voltage for which cable was tested, type of cable, and UL listing mark.
 - c. Suitable for installation in open air, in cable trays, or conduit.
 - d. Minimum Temperature Rating: 105 degrees C.
 - e. Passes Vertical Tray Flame Test.
 - f. Outer Jacket: PVC, flame-retardant, sunlight- and oil-resistant.

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2. Type 19, 18 AWG, Twisted, Shielded Pair Instrumentation Cable:
Single pair, designed for noise rejection for process control, computer, or data log applications meeting NEMA WC 57.
 - a. Outer Jacket: 35-mil nominal.
 - b. Individual Pair Shield: 1.35-mil, double-faced aluminum/synthetic polymer, overlapped to provide 100 percent coverage.
 - c. Dimension: 0.23-inch nominal OD.
 - d. Conductors:
 - 1) Bare soft annealed copper, Class B, seven-strand concentric, ASTM B8.
 - 2) 20 AWG, seven-strand tinned copper drain wire.
 - 3) Insulation: 15-mil PVC.
 - 4) Color Code: Pair conductors black and white.
 - e. Manufacturers:
 - 1) Okonite Co.
 - 2) Alpha Wire Corp.

C. Accessories:

1. Tape:
 - a. General Purpose, Flame Retardant: 7 mils, vinyl plastic, Scotch Brand 33, rated for 90 degrees C minimum, meeting requirements of UL 510.
 - b. Flame Retardant, Cold and Weather Resistant: 8.5 mils, vinyl plastic, Scotch Brand 88.
 - c. Arc and Fireproofing:
 - 1) 30 mils, elastomer.
 - 2) Manufacturers and Products:
 - a) 3M; Scotch Brand 77, with Scotch Brand 69 glass cloth tapebinder.
 - b) Plymount; Plyarc 53, with Plyglas 77 glass cloth tapebinder.
2. Identification Devices:
 - a. Sleeve-type, permanent, PVC, yellow or white, with legible machine-printed black markings.
 - b. Manufacturer and Products: Raychem; Type D-SCE or ZH-SCE.
3. Connectors and Terminations:
 - a. Nylon, Self-Insulated Crimp Connectors:
 - 1) Manufacturers and Products:
 - a) Thomas & Betts; Sta-Kon.
 - b) Burndy; Insulug.
 - c) ILSCO.

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4. Self-Insulated, Freespring Wire Connector (Wire Nuts):
 - a. Plated steel, square wire springs.
 - b. UL Standard 486C.
 - c. Manufacturers and Products:
 - 1) Thomas & Betts.
 - 2) Ideal; Twister.
5. Cable Lugs:
 - a. In accordance with NEMA CC 1.
 - b. Rated 600 volts of same material as conductor metal.
 - c. Uninsulated Crimp Connectors and Terminators:
 - 1) Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.
 - 2) Manufacturers and Products:
 - a) Thomas & Betts; Color-Keyed.
 - b) Burndy; Hydent.
 - c) ILSCO.
 - d. Uninsulated, Bolted, Two-Way Connectors and Terminators:
 - 1) Manufacturers and Products:
 - a) Thomas & Betts; Locktite.
 - b) Burndy; Quiklug.
 - c) ILSCO.
6. Cable Ties:
 - a. Nylon, adjustable, self-locking, and reusable.
 - b. Manufacturer and Product: Thomas & Betts; TY-RAP.
7. Heat Shrinkable Insulation:
 - a. Thermally stabilized, crosslinked polyolefin.
 - b. Manufacturer and Product: Thomas & Betts; SHRINK-KON.

2.08 GROUNDING

- A. Ground Conductors: As specified in Article Conductors and Cable.

PART 3 EXECUTION

3.01 GENERAL

- A. Install materials and equipment in accordance with manufacturer's instructions and recommendations.
- B. Work shall comply with all applicable provisions of NECA 1.
- C. Install materials and equipment in hazardous areas in a manner acceptable to regulatory authority having jurisdiction for the class, division, and group of hazardous areas shown.

- D. Electrical Drawings show general locations of equipment, devices, and raceway, unless specifically dimensioned.

3.02 DEMOLITION

A. General Demolition:

1. Where shown, de-energize and disconnect nonelectrical equipment for removal by others.
2. Where shown, de-energize, disconnect, and remove electrical equipment.
3. Remove affected circuits and raceways back to serving panelboard or control panel. Where affected circuits are consolidated with others, remove raceways back to first shared conduit or box. Where underground or embedded raceways are to be abandoned, remove raceway to 1 inch below surface of structure or 12 inches belowgrade and restore existing surface.

3.03 PROTECTION FOLLOWING INSTALLATION

- A. Protect materials and equipment from corrosion, physical damage, and effects of moisture on insulation.
- B. Cap conduit runs during construction with manufactured seals.
- C. Close openings in boxes or equipment during construction.
- D. Energize space heaters furnished with equipment.

3.04 JUNCTION AND PULL BOXES

- A. Install where shown and where necessary to terminate, tap-off, or redirect multiple conduit runs.
- B. Install pull boxes where necessary in raceway system to facilitate conductor installation.
- C. Install in conduit runs at least every 150 feet or after the equivalent of three right-angle bends.
- D. Use conduit bodies as junction and pull boxes where no splices are required and their use is allowed by applicable codes.
- E. Installed boxes shall be accessible.
- F. Do not install on finished surfaces.

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- G. Install plumb and level.
- H. Support boxes independently of conduit by attachment to building structure or structural member.
- I. Mounting Hardware: Stainless Steel.
- J. Location/Type: Select per Environmental Conditions and material application table located on Drawings.

3.05 SUPPORT AND FRAMING CHANNELS

- A. Install where required for mounting and supporting electrical equipment and raceway systems.
- B. Channel Type: Select per Environmental Conditions and material application table located on Drawings.

3.06 NAMEPLATES

- A. Provide identifying nameplate on all equipment.

3.07 CONDUIT AND FITTINGS

- A. General:
 - 1. Crushed or deformed raceways not permitted.
 - 2. Maintain raceway entirely free of obstructions and moisture.
 - 3. Immediately after installation, plug or cap raceway ends with watertight and dust-tight seals until time for pulling in conductors.
 - 4. Aluminum Conduit: Do not install in direct contact with concrete. Install in PVC sleeve or cored hole through concrete walls and slabs.
 - 5. Sealing Fittings: Provide drain seal in vertical raceways where condensate may collect above sealing fitting.
 - 6. Avoid moisture traps where possible. When unavoidable in exposed conduit runs, provide junction box and drain fitting at conduit low point.
 - 7. Group raceways installed in same area.
 - 8. Follow structural surface contours when installing exposed raceways. Avoid obstruction of passageways.
 - 9. Run exposed raceways parallel or perpendicular to walls, structural members, or intersections of vertical planes.
 - 10. Block Walls: Do not install raceways in same horizontal course with reinforcing steel.
 - 11. Install watertight fittings in outdoor, underground, or wet locations.

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12. Paint threads and cut ends, before assembly of fittings, galvanized conduit, PVC-coated galvanized conduit, or IMC installed in exposed or damp locations with zinc-rich paint or liquid galvanizing compound.
 13. Metal conduit to be reamed, burrs removed, and cleaned before installation of conductors, wires, or cables.
 14. Do not install raceways in concrete equipment pads, foundations, or beams.
 15. Horizontal raceways installed under floor slabs shall lie completely under slab, with no part embedded within slab.
 16. Install concealed, embedded, and buried raceways so that they emerge at right angles to surface and have no curved portion exposed.
 17. Install conduits for fiber optic cables, telephone cables, and Category 5 data cables in strict conformance with the requirements of EIA/TIA 569.
- B. Conduit Application: Select per Environmental Conditions and material application table located on Drawings.
- C. Connections:
1. For equipment where flexible connection is required to minimize vibration:
 - a. General: Flexible metal, liquid-tight conduit.
 - b. Length: 18 inches minimum, 60 inches maximum, sufficient to allow movement or adjustment of equipment.
 2. Outdoor areas, process areas exposed to moisture, and areas required to be oiltight and dust-tight: Flexible metal, liquid-tight conduit.
- D. Penetrations:
1. Make at right angles, unless otherwise shown.
 2. Notching or penetration of structural members, including footings and beams, not permitted.
 3. Concrete Walls, Floors, or Ceilings (Aboveground): Provide nonshrink grout dry-pack.
- E. Support:
1. Support from structural members only, at intervals not exceeding NFPA 70 requirements, and in any case not exceeding 10 feet. Do not support from piping, pipe supports, or other raceways.
 2. Application/Type of Conduit Strap: Select per Environmental Conditions and material application table located on Drawings.

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3. Provide and attach wall brackets, strap hangers, or ceiling trapeze as follows:
 - a. Concrete or Brick: Expansion shields, or threaded studs driven in by powder charge, with lock washers and nuts.
 - b. Steelwork: Machine screws.

F. Bends:

1. Install concealed raceways with a minimum of bends in the shortest practical distance.
2. Make bends and offsets of longest practical radius.
3. Install with symmetrical bends or cast metal fittings.
4. Avoid field-made bends and offsets, but where necessary, make with acceptable hickey or bending machine. Do not heat metal raceways to facilitate bending.
5. Make bends in parallel or banked runs from same center or centerline with same radius so that bends are parallel.
6. Factory elbows may be installed in parallel or banked raceways if there is change in plane of run and raceways are same size.
7. Flexible Conduit: Do not make bends that exceed allowable conductor bending radius of cable to be installed or that significantly restricts conduit flexibility.

G. PVC-Coated Rigid Aluminum Conduit:

1. Install in accordance with manufacturer's instructions.
2. All tools and equipment used in the cutting, bending, threading, and installation of PVC-coated rigid steel conduit shall be designed to limit damage to the PVC coating.
3. Provide PVC boot to cover all exposed threading.

H. Termination at Enclosures:

1. Cast Metal Enclosure: Provide manufacturer's premolded insulating sleeve inside metallic conduit terminating in threaded hubs.
2. Nonmetallic, Cabinets, and Enclosures: Terminate conduit in threaded conduit hubs, maintaining enclosure integrity.
3. Sheet Metal Boxes, Cabinets, and Enclosures:
 - a. General:
 - 1) Install insulated bushing on ends of conduit where grounding is not required.
 - 2) Provide insulated throat when conduit terminates in sheet metal boxes having threaded hubs.

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- 3) Utilize sealing locknuts or threaded hubs on sides and bottom of NEMA 3R and NEMA 12 enclosures.
 - 4) Terminate conduits at threaded hubs at the tops of NEMA 3R and NEMA 12 boxes and enclosures.
 - 5) Terminate conduits at threaded conduit hubs at NEMA 4 and NEMA 4X boxes and enclosures.
- b. Aluminum Conduit:
- 1) Provide one lock nut each on inside and outside of enclosure.
 - 2) Install grounding bushing at source enclosure.
 - 3) Provide bonding jumper from grounding bushing to equipment ground bus or ground pad.
- c. Flexible Metal Conduit: Provide two-screw type, insulated, malleable iron connectors.
- d. PVC-Coated Rigid Aluminum Conduit: Provide PVC-coated, liquid-tight, metallic connector.

3.08 CONDUCTORS AND CABLES

- A. Conductor storage, handling, and installation shall be in accordance with manufacturer's recommendations.
- B. Do not exceed manufacturer's recommendations for maximum pulling tensions and minimum bending radii.
- C. Conduit system shall be complete prior to drawing conductors. Lubricate prior to pulling into conduit. Lubrication type shall be as approved by conductor manufacturer.
- D. Terminate all conductors and cables, unless otherwise shown.
- E. Do not splice conductors, unless specifically indicated or approved by Engineer.
- F. Bundling: Where single conductors and cables in manholes, handholes, vaults, cable trays, and other indicated locations are not wrapped together by some other means, bundle conductors from each conduit throughout their exposed length with cable ties placed at intervals not exceeding 12 inches.
- G. Wiring within Equipment and Local Control Panels: Remove surplus wire, dress, bundle, and secure.

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H. Power Conductor Color Coding:

1. No. 6 AWG and Larger: Apply general purpose, flame retardant tape at each end, and at accessible locations wrapped at least six full overlapping turns, covering an area 1-1/2 inches to 2 inches wide.
2. No. 8 AWG and Smaller: Provide colored conductors.
3. Colors:
 - a. Neutral Wire: White.
 - b. Live Wires, 120/240-Volt, Single-Phase System: Black, red.
 - c. Ground Wire: Green.

I. Circuit Identification:

1. Circuits Appearing in Circuit Schedules: Identify power, instrumentation, and control conductor circuits, using circuit schedule designations, at each termination and in accessible locations, such as manholes, handholes, panels, switchboards, motor control centers, pull boxes, and terminal boxes.
2. Circuits Not Appearing in Circuit Schedules: Assign circuit name based on device or equipment at load end of circuit. Where this would result in same name being assigned to more than one circuit, add number or letter to each otherwise identical circuit name to make it unique.
3. Method: Identify with sleeves. Taped-on markers or tags relying on adhesives not permitted.

J. Connections and Terminations:

1. Install wire nuts only on solid conductors.
2. Install nylon self-insulated crimp connectors and terminators for instrumentation and control circuit conductors.
3. Tape insulate all uninsulated connections.
4. Install crimp connectors and compression lugs with tools approved by connector manufacturer.

3.09 GROUNDING

- A. Grounding shall be in compliance with NFPA 70 and as shown.
- B. Bond together system neutrals, service equipment enclosures, exposed noncurrent-carrying metal parts of electrical equipment, metal raceways, ground conductor in raceways and cables, receptacle ground connections, and metal piping systems.

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- C. Shielded Instrumentation Cables:
 - 1. Ground shield to ground bus at power supply for analog signal.
 - 2. Expose shield minimum 1 inch at termination to field instrument and apply heat shrink tube.
 - 3. Do not ground instrumentation cable shield at more than one point.
- D. Equipment Grounding Conductors: Provide in all conduits containing power conductors and control circuits above 50 volts.

3.10 FIELD QUALITY CONTROL

- A. Tests shall be performed in accordance with the requirements of Section 01 91 14, Equipment Testing and Facility Startup.
- B. General:
 - 1. Test equipment shall have an operating accuracy equal to, or greater than, requirements established by NETA ATS.
 - 2. Test instrument calibration shall be in accordance with NETA ATS.
 - 3. Perform inspection and electrical tests after equipment has been installed.
 - 4. Perform tests with apparatus de-energized whenever feasible.
 - 5. Inspection and electrical tests on energized equipment are to be:
 - a. Scheduled with Owner prior to de-energization.
 - b. Minimized to avoid extended period of interruption to the operating plant equipment.
- C. Tests and inspection shall establish that:
 - 1. Electrical equipment is operational within industry and manufacturer's tolerances.
 - 2. Installation operates properly.
 - 3. Equipment is suitable for energization.
 - 4. Installation conforms to requirements of Contract Documents and NFPA 70.
- D. Perform inspection and testing in accordance with NETA ATS, industry standards, and manufacturer's recommendations.
- E. Adjust mechanisms and moving parts for free mechanical movement.
- F. Adjust adjustable relays and sensors to correspond to operating conditions, or as recommended by manufacturer.

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- G. Verify nameplate data for conformance to Contract Documents.
- H. Realign equipment not properly aligned and correct unlevelness.
- I. Properly anchor electrical equipment found to be inadequately anchored.
- J. Tighten accessible bolted connections, including wiring connections, with calibrated torque wrench to manufacturer's recommendations, or as otherwise specified.
- K. Clean contaminated surfaces with cleaning solvents as recommended by manufacturer.
- L. Provide proper lubrication of applicable moving parts.
- M. Investigate and Repair or Replace:
 - 1. Electrical items that fail tests.
 - 2. Active components not operating in accordance with manufacturer's instructions.
 - 3. Damaged electrical equipment.
- N. Electrical Enclosures:
 - 1. Remove foreign material and moisture from enclosure interior.
 - 2. Vacuum and wipe clean enclosure interior.
 - 3. Remove corrosion found on metal surfaces.
 - 4. Repair or replace, as determined by Engineer, door and panel sections having damaged surfaces.
 - 5. Replace missing or damaged hardware.
- O. Provide certified test report(s) documenting the successful completion of specified testing. Include field test measurement data.
- P. Test the following equipment and materials:
 - 1. Conductors: Insulation resistance, No. 4 and larger only.
 - 2. Panelboards, switches, and circuit breakers.
 - 3. Motor controls.
 - 4. Grounding electrodes.
 - 5. Motors.

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Q. Controls:

1. In accordance with Section 01 31 13, Project Coordination and Section 40 90 00, Instrumentation and Control for Process Systems.
2. Test control and signal wiring for proper termination and function.
3. Test local control panels and other control devices for proper terminations, configuration and settings, and functions.
4. Demonstrate control, monitoring, and indication functions in presence of Owner and Engineer.

R. Balance electrical load between phases on panelboards and mini-power centers after installation.

END OF SECTION

SECTION 35 20 16.24
FULL-APERTURE SEALING SLIDE GATES

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. American Water Works Association (AWWA): C561, Fabricated Stainless Steel Slide Gates.
 - 2. National Electrical Manufacturers Association (NEMA): 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
- B. Submittals and O&M's for Owner-Furnished Gates and Actuators.

1.02 SUBMITTALS

- A. Informational Submittals:
 - 1. Service records for maintenance performed during construction.
 - 2. Manufacturer's Certificate of Proper Installation, in accordance with Section 01 43 33, Manufacturers' Field Services.
 - 3. Functional and performance test documentation.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 INSTALLATION OF OWNER FURNISHED EQUIPMENT

- A. In accordance with Section 01 64 00, Owner -Furnished Products, and manufacturer's written instructions.
- B. Accurately place anchor bolts using templates furnished by manufacturer and as specified in Section 05 05 19, Post-Installed Anchors.
- C. Grease threads above stem nut prior to placing gate in operation.

3.02 FIELD QUALITY CONTROL

- A. Functional Tests: Conduct on each gate and associated operator.

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B. Performance Test:

1. Conduct on each gate in accordance with manufacturer's written instruction and AWWA C561.
2. Perform under actual or approved simulated operating conditions.
3. Test for a continuous 30-minute period without malfunction.
4. Adjust, realign, or modify units and retest if necessary.

3.03 MANUFACTURER'S SERVICES

- A. See Section 01 43 33, Manufacturers' Field Services.
- B. Support manufacturer's representative at Site in accordance with Section 01 43 33, Manufacturers' Field Services, for installation assistance, inspection and certification of proper installation, equipment testing, startup assistance, and training of Owner's personnel for specified component, subsystem, equipment, or system.

3.04 SUPPLEMENT

- A. The supplement listed below, following "End of Section," is a part of this Specification and provided for reference.
1. Full-Aperture Sealing Slide Gates Schedule.

END OF SECTION

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FULL-APERTURE SEALING SLIDE GATES SCHEDULE						
Gate Identification No. and Location	Assembly Style	Wall Opening (width/height inches)	Gate Height (inches)	Flow Stream	Design Operating Head (feet) Seating/Unseating Condition	Operator
SFG-6001 Aeration Basin 1 Main Step Feed Gate	Wall thimble mounted	30" DIA	30"	PE	7/0	Electric
SFG-6001-3 Aeration Basin 1 Step Feed Gate 3	Pipe flange mounted	30" DIA	30"	PE	18/18	Electric
SFG-6002 Aeration Basin 2 Main Step Feed Gate	Wall thimble mounted	30" DIA	30"	PE	7/0	Electric
SFG-6002-3 Aeration Basin 2 Step Feed Gate 3	Pipe flange mounted	30" DIA	30"	PE	18/18	Electric
SFG-6003 Aeration Basin 3 Main Step Feed Gate	Wall thimble mounted	30" DIA	30"	PE	7/0	Electric
SFG-6003-3 Aeration Basin 3 Step Feed Gate 3	Pipe flange mounted	30" DIA	30"	PE	18/18	Electric
SFG-6004	Wall thimble mounted	30" DIA	30"	PE	7/0	Electric

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FULL-APERTURE SEALING SLIDE GATES SCHEDULE						
Gate Identification No. and Location	Assembly Style	Wall Opening (width/height inches)	Gate Height (inches)	Flow Stream	Design Operating Head (feet) Seating/Unseating Condition	Operator
Aeration Basin 1 Main Step Feed Gate						
SFG-6004-3 Aeration Basin 4 Step Feed Gate 3	Pipe flange mounted	30" DIA	30"	PE	18/18	Electric
Notes: PE = Primary Effluent						

SECTION 40 05 15
PIPING SUPPORT SYSTEMS

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Society of Civil Engineers (ASCE): 7, Minimum Design Loads for Buildings and Other Structures.
 2. American Society of Mechanical Engineers (ASME): B31.1, Power Piping.
 3. ASTM International (ASTM):
 - a. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - b. A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
 - c. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 4. International Code Council (ICC):
 - a. International Building Code (IBC).
 - b. International Mechanical Code (IMC).
 5. Manufacturers' Standardization Society (MSS):
 - a. SP 58, Pipe Hangers and Supports—Materials, Design and Manufacture.
 - b. SP 127, Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, and Application.

1.02 DEFINITIONS

- A. Wetted or Submerged:
1. Zone Below Elevation Of: Top face of aeration basin walkways, top of channel wall, or in other damp locations.

1.03 SUBMITTALS

- A. Action Submittals:
1. Catalog information and drawings of piping support system, locating each support, sway brace, seismic brace, hanger, guide, component, and

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anchor for piping 6 inches and larger. Identify support, hanger, guide, and anchor type by catalog number and Shop Drawing detail number.

2. Revisions to support systems resulting from changes in related piping system layout or addition of flexible joints.

- B. Informational Submittals: Maintenance information on piping support system.

1.04 DESIGN REQUIREMENTS

- A. General:

1. Piping supports systems have been designed for all piping.
2. Meet requirements of MSS SP 58 and ASME B31.3 or as modified by this section.

- B. Pipe Support Systems:

1. Maximum Support Spacing and Minimum Rod Size: In accordance MSS SP 58 Table 3 and Table 4 and as shown below.
 - a. W3: 7 feet.
 - b. AHP: 7 feet.
 - c. V: 7 feet.
 - d. Ductile-iron Pipe: Support as Shown on Drawings.

- C. Anchoring Devices: Size, and space support anchoring devices, including anchor bolts, inserts, and other devices used to anchor support as shown.

- D. Existing Support Systems: Use existing supports systems as shown.

PART 2 PRODUCTS

2.01 GENERAL

- A. When specified items are not available, fabricate pipe supports of correct material and to general configuration indicated.
- B. Special support and hanger details may be required for cases where standard catalog supports are not applicable.
- C. Materials: In accordance with Table 1, attached as a Supplement at end of section.

2.02 WALL BRACKETS, SUPPORTS, AND GUIDES

- A. Channel Type:
1. Unistrut.
 2. Anvil; Power-Strut.
 3. B-Line; Strut System.

2.03 PIPE SADDLES

- A. Provide 90-degree to 120-degree pipe saddle for pipe 6 inches and larger with baseplates drilled for anchor bolts.
1. In accordance with Standard Detail 4005-515.
 2. Sizes 20 Inches Through 60 Inches: Piping Technology & Products, Inc.; Fig. 2000.
- B. Saddle Supports, Pedestal Type:
1. Minimum standard weight pipe stanchion, saddle, and anchoring flange.
 2. Nonadjustable Saddle: MSS SP, Type 37 with U-bolt.
 - a. Anvil; Figure 259, sizes 4 inches through 36 inches with Figure 63C base.
 - b. B-Line; Figure B3095, sizes 1 inch through 36 inches with B3088S base.
 3. Adjustable Saddle: MSS SP 58, Type 38 without clamp.
 - a. Anvil; Figure 264, sizes 2-1/2 inches through 36 inches with Figure 62C base.
 - b. B-Line; Figure B3092, sizes 3/4 inch through 36 inches with Figure B3088S base.

2.04 CHANNEL TYPE SUPPORT SYSTEMS

- A. Channel Size: 12-gauge, 1-5/8-inch wide minimum steel.
- B. Manufacturers and Products:
1. B-Line; Strut System.
 2. Unistrut.
 3. Anvil; Power-Strut.

2.05 ELBOW AND FLANGE SUPPORTS

- A. Flange Support with Adjustable Base: Sizes 2 inches through 24 inches, Standon; Model S89.

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2.06 INTERMEDIATE PIPE GUIDES

- A. Type: Hold down pipe guide.
 - 1. Manufacturer and Product: B-Line; Figure B3552, 1-1/2 inches through 30 inches.
- B. Type: U-bolts with double nuts to provide nominal 1/8-inch to 1/4-inch clearance around pipe; MSS SP 58, Type 24.
 - 1. Anvil; Figure 137 and Figure 137S.
 - 2. B-Line; Figure B3188 and Figure B3188NS.

2.07 PIPE ANCHORS

- A. Type: Anchor chair with U-bolt strap.
- B. Manufacturer and Product: B-Line; Figure B3147A or Figure B3147B.

2.08 ACCESSORIES

- A. Anchor Bolts:
 - 1. Size and Material: Sized by Contractor for required loads, 1/2-inch minimum diameter, and as specified in Section 05 05 19, Post-Installed Anchors.
 - 2. Bolt Length (Extension Above Top of Nut):
 - a. Minimum Length: Flush with top of nut preferred. If not flush, shall be no more than one thread recessed below top of nut.
 - b. Maximum Length: No more than a full nut depth above top of nut.
- B. Dielectric Barriers:
 - 1. Plastic coated hangers, isolation cushion, or tape.
 - 2. Manufacturer and Products:
 - a. B-Line; B1999 Vibra Cushion.
 - b. B-Line; Iso Pipe, Isolation Tape.

PART 3 EXECUTION

3.01 INSTALLATION

- A. General:
 - 1. Install support systems in accordance with MSS SP 58, unless shown otherwise.

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2. Install pipe hanger rods plumb, within 4 degrees of vertical during shut down, start up or operations.
3. Support piping connections to equipment by pipe support and not by equipment.
4. Support large or heavy valves, fittings, and appurtenances independently of connected piping.
5. Support no pipe from pipe above it.
6. Support pipe at changes in direction or in elevation, adjacent to flexible joints and couplings, and where shown.
7. Do not use adhesive anchors for attachment of supports to ceiling or walls.
8. Do not install pipe supports and hangers in equipment access areas or bridge crane runs.
9. Brace hanging pipes against horizontal movement by both longitudinal and lateral sway bracing and to reduce movement after startup.
10. Install pipe anchors where required to withstand expansion thrust loads and to direct and control thermal expansion.
11. Repair mounting surfaces to original condition after attachments are completed.

B. Standard Pipe Supports:

1. Horizontal Suspended Piping:
 - a. Single Pipes: Clevis hangers or adjustable swivel split-ring.
 - b. Grouped Pipes: Trapeze hanger system.
2. Horizontal Piping Supported from Walls:
 - a. Single Pipes: Wall brackets, or attached to wall, or to wall mounted framing with anchors.
 - b. Stacked Piping: Wall mounted framing system and “J” hangers acceptable for pipe smaller than 3-inch.
 - c. Pipe clamp that resists axial movement of pipe through support is not acceptable. Use pipe rollers supported from wall bracket.
3. Horizontal Piping Supported from Floors:
 - a. Saddle Supports:
 - 1) Pedestal Type, elbow and flange.
 - 2) Provide minimum 1-1/2-inch grout beneath baseplate.
 - b. Floor Mounted Channel Supports:
 - 1) Use for pipe smaller than 3-inch running along floors and in trenches at pipe elevations lower than can be accommodated using pedestal pipe supports.
 - 2) Attach channel framing to floors with baseplate on minimum 1-1/2-inch nonshrink grout and with anchor bolts.
 - 3) Attach pipe to channel with clips or pipe clamps.

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- c. Concrete Cradles: Use for pipe larger than 3 inches along floor and in trenches at pipe elevations lower than can be accommodated using stanchion type.
 - 4. Vertical Pipe: Support with wall bracket and elbow support, or riser clamp on floor penetration.
- C. Standard Attachments:
 - 1. Existing Concrete Ceilings:
 - a. Channel type support with minimum of two anchor points, concrete attachment plates or concrete anchors as limited below:
 - 1) Single point attachment to ceiling is allowed only for 3/4-inch rod and smaller (8 inches and smaller pipe).
 - 2. Concrete Walls: Concrete inserts or brackets or clip angles with concrete anchors.
 - 3. Concrete Beams: Concrete inserts, or if inserts are not used attach to vertical surface similar to concrete wall. Do not drill into beam bottom.
- D. Saddles for Steel Pipe: Provide 90-degree to 120-degree pipe saddle for pipe sizes 6 inches and larger when installed on top of steel or concrete beam or structure, pipe rack, trapeze, or where similar concentrated point supports would be encountered.
- E. Accessories:
 - 1. Dielectric Barrier:
 - a. Provide between painted or galvanized carbon steel members and copper or stainless steel pipe or between stainless steel supports and nonstainless steel ferrous metal piping.
 - b. Install rubber wrap between submerged metal pipe and oversized clamps.

3.02 FIELD FINISHING

- A. Paint atmospheric exposed surfaces hot-dip galvanized steel components as specified in Section 09 90 00, Painting and Coating.

3.03 SUPPLEMENT

- A. The supplement listed below, following “End of Section,” is part of this specification:
 - 1. Table 1: Support Materials.

END OF SECTION

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Table 1 Support Materials	
Exposure Conditions	Support Material
Submerged	Stainless steel
Exposed	Hot-dipped galvanized

Notes:

1. Precoated steel to be fusion bonded epoxy or vinyl copolymer (Plastisol).
2. Stainless steel to be Type 316.
3. Galvanized steel to be per ASTM A653/A653M, Class G90, or hot-dip galvanized after fabrication to ASTM A123/A123M.

SECTION 40 27 00
PROCESS PIPING—GENERAL

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section and any supplemental Data Sheets:
1. American Society of Mechanical Engineers (ASME):
 - a. Boiler and Pressure Vessel Code, Section IX, Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.
 - b. B1.20.1, Pipe Threads, General Purpose (Inch).
 - c. B16.1, Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250.
 - d. B16.5, Pipe Flanges and Flanged Fittings NPS 1/2 through NPS 24 Metric/Inch Standard.
 - e. B16.9, Factory-Made Wrought Buttwelding Fittings.
 - f. B16.11, Forged Fittings, Socket-Welding and Threaded.
 - g. B16.21, Nonmetallic Flat Gaskets for Pipe Flanges.
 - h. B16.25, Buttwelding Ends.
 - i. B16.42, Ductile Iron Pipe Flanges and Flanged Fittings Classes 150 and 300.
 - j. B31.3, Process Piping.
 - k. B36.10M, Welded and Seamless Wrought Steel Pipe.
 2. American Society for Nondestructive Testing (ASNT): SNT-TC-1A, Recommended Practice for Personal Qualification and Certification in Nondestructive Testing.
 3. American Water Works Association (AWWA):
 - a. C104/A21.4, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
 - b. C110/A21.10, Ductile-Iron and Gray-Iron Fittings.
 - c. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - d. C115/A21.15, Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 - e. C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast.
 - f. C153/A21.53, Ductile-Iron Compact Fittings.
 - g. C207, Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm).
 - h. C606, Grooved and Shouldered Joints.

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4. American Welding Society (AWS):
 - a. Brazing Handbook.
 - b. A5.8M/A5.8, Specification for Filler Metals for Brazing and Braze Welding.
 - c. D1.1/D1.1M, Structural Welding Code - Steel.
 - d. QC1, Standard for AWS Certification of Welding Inspectors.
5. ASTM International (ASTM):
 - a. A47/A47M, Standard Specification for Ferritic Malleable Iron Castings.
 - b. A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - c. A105/A105M, Standard Specification for Carbon Steel Forgings for Piping Applications.
 - d. A135/A135M, Standard Specification for Electric-Resistance-Welder Steel Pipe.
 - e. A139/A139M, Standard Specification for Electro-Fusion (Arc)-Welded Steel Pipe (NPS 4 Inches and Over).
 - f. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - g. A181/A181M, Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.
 - h. A193/A193M, Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
 - i. A276, Standard Specification for Stainless Steel Bars and Shapes.
 - j. A269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - k. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
 - l. A312/A312M, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
 - m. A320/A320M, Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service.
 - n. A403/A403M, Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings.
 - o. A536, Standard Specification for Ductile Iron Castings.
 - p. A563, Standard Specification for Carbon and Alloy Steel Nuts.
 - q. A774/A774M, Standard Specification for As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures.
 - r. A778, Standard Specification for Welded, Unannealed Austenitic Stainless Steel Tubular Products.
 - s. B43, Standard Specification for Seamless Red Brass Pipe, Standard Sizes.

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- t. B61, Standard Specification for Steam or Valve Bronze Castings.
 - u. B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
 - v. B75/B75M, Standard Specification for Seamless Copper Tube.
 - w. B88, Standard Specification for Seamless Copper Water Tube.
 - x. D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - y. D413, Standard Test Methods for Rubber Property-Adhesion to Flexible Substrate.
 - z. D1330, Standard Specification for Rubber Sheet Gaskets.
 - aa. F436, Standard Specification for Hardened Steel Washers.
 - bb. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- 6. FM Global (FM).
 - 7. Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS): SP-43, Wrought and Fabricated Butt-Welding Fittings for Low-Pressure, Corrosion Resistant Applications.
 - 8. NSF International (NSF):
 - a. ANSI 61: Drinking Water System Components - Health Effects.
 - b. ANSI 372: Drinking Water System Components - Lead Content.
 - 9. National Electrical Manufacturers Association (NEMA): LI 1, Industrial Laminating Thermosetting Products.
 - 10. National Fire Protection Association (NFPA): 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

1.02 DEFINITIONS

A. Submerged or Wetted:

- 1. Zone Below Elevation Of: Top face of aeration basin walkways, top of channel wall, or in other damp locations.

1.03 DESIGN REQUIREMENTS

A. Where pipe diameter, thickness, pressure class, pressure rating, or thrust restraint is not shown or specified, design piping system in accordance with the following:

- 1. Process Piping: ASME B31.3, normal fluid service unless otherwise specified.
- 2. Thrust Restraints: Design for test pressure shown in Piping Schedule.

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1.04 SUBMITTALS

A. Action Submittals:

1. Shop Fabricated Piping:
 - a. Detailed pipe fabrication or spool drawings showing special fittings and bends, dimensions, coatings, and other pertinent information.
 - b. Layout drawing showing location of each pipe section and each special length; number or otherwise designate laying sequence on each piece.
2. Pipe Wall Thickness: Identify wall thickness and rational method or standard applied to determine wall thickness for each size of each different service including exposed, submerged, buried, and concrete-encased installations for Contractor-designed piping.

B. Informational Submittals:

1. Manufacturer's Certification of Compliance, in accordance with Section 01 61 00, Common Product Requirements.
2. Flanged Pipe and Fittings: Manufacturer's product data sheets for gaskets including torquing requirements and bolt tightening procedures.
3. Qualifications:
 - a. AWS QC1 Certified Welding Inspector: Submit evidence of current certification prior to commencement of welding activities.
 - b. Welders:
 - 1) Continuity log for welders and welding operators.
 - 2) Welder qualification test records conducted by Contractor or manufacturer.
4. Welding Procedures: Qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX for weld type(s) and base metal(s).
5. Test logs.
6. Pipe coating applicator certification.
7. CWI inspection records.
8. Component and attachment testing seismic certificate of compliance as required by Section 01 45 33, Special Inspection and Testing.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Independent Inspection and Testing Agency:
 - a. Ten years' experience in field of welding and welded pipe and fittings' testing required for this Project.

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- b. Calibrated instruments and equipment, and documented standard procedures for performing specified testing.
 - c. Certified in accordance with ASNT SNT-TC-1A for testing procedures required for this Project.
 - d. Testing Agency: Personnel performing tests shall be NDT Level II certified in accordance with ASNT SNT-TC-1A.
 - e. Verification Welding Inspector: AWS QC1 Certified.
2. Welding Procedures: In accordance with ASME BPVC SEC IX (Forms QW-482 and QW-483) or AWS D1.1/D1.1M (Annex N Forms).
 3. Welder Qualifications: In accordance ASME BPVC SEC IX (Form QW-484) or AWS D1.1/D1.1M (Annex N Forms).
 4. Contractor's CWI: Certified in accordance with AWS QC1, and having prior experience with specified welding codes. Alternate welding inspector qualifications require approval by Engineer.
- B. Quality Assurance: Provide services of independent inspection agency for welding operations.
1. Note, the presence of Owner's Special Inspector or Verification CWI does not relieve Contractor from performing own quality control, including 100 percent visual inspection of welds.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. In accordance with Section 01 61 00, Common Product Requirements, and:
1. Flanges: Securely attach metal, hardboard, or wood protectors over entire gasket surface.
 2. Threaded or Socket Welding Ends: Fit with metal, wood, or plastic plugs or caps.
 3. Linings and Coatings: Prevent excessive drying.
 4. Cold Weather Storage: Locate products to prevent coating from freezing to ground.
 5. Handling: Use heavy canvas or nylon slings to lift pipe and fittings.

PART 2 PRODUCTS

2.01 GENERAL

- A. Components and Materials in Contact with Water for Human Consumption: Comply with the requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements. Provide certification by manufacturer or an accredited certification organization recognized by the Authority Having Jurisdiction that components and materials comply with the

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maximum lead content standard in accordance with NSF/ANSI 61 and NSF/ANSI 372.

1. Use or reuse of components and materials without a traceable certification is prohibited.

2.02 PIPING

A. As specified on Piping Data Sheet(s) and Piping Schedule located at the end of this section as Supplement.

B. Diameters Shown:

1. Standardized Products: Nominal size.
2. Fabricated Steel Piping (Except Cement-Lined): Outside diameter, ASME B36.10M.
3. Cement-Lined Steel Pipe: Lining inside diameter.

2.03 JOINTS

A. Grooved End System:

1. Rigid type.
2. Use of flexible grooved joints allowed where shown on Drawings or with prior approval by Engineer.
3. Flanges: When required, furnish with grooved type flange adapters of same manufacturer as grooved end couplings.

B. Flanged Joints:

1. Flat-faced, carbon steel, or alloy flanges when mating with flat-faced cast or ductile iron flanges.
2. Higher pressure rated flanges as required to mate with equipment when equipment flange is of higher pressure rating than required for piping.

C. Threaded Joints: NPT taper pipe threads in accordance with ASME B1.20.1.

D. Flexible Mechanical Compression Joint Coupling:

1. Stainless steel, ASTM A276, Type 305 bands.
2. Manufacturers:
 - a. Pipeline Products Corp.
 - b. Fernco Joint Sealer Co.

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- E. Mechanical connections of high-density polyethylene pipe to auxiliary equipment, such as valves, pumps, tanks, and other piping systems shall be through-flanged connections consisting of the following:
1. Polyethylene stub end thermally butt-fused to end of pipe.
 2. ASTM A240/A240M, Type 304 stainless steel backing flange, 125-pound, ASME B16.1 standard. Use insulating flanges where shown.
 3. Bolts and nuts of sufficient length to show a minimum of three complete threads when joint is made and tightened to manufacturer's standard. Retorque nuts after 4 hours.
 4. Gaskets as specified on Data Sheet.

2.04 GASKET LUBRICANT

- A. Lubricant shall be supplied by pipe manufacturer and no substitute or "or-equal" will be allowed.

2.05 PIPE CORROSION PROTECTION

- A. Coatings: See Section 09 90 00, Painting and Coating, for details of coating requirements.
- B. Insulating Flanges, Couplings, and Unions:
1. Materials:
 - a. In accordance with applicable piping material specified in Pipe Data Sheet. Complete assembly shall have ASME B31.3 working pressure rating equal to or higher than that of joint and pipeline.
 - b. Galvanically compatible with piping.
 - c. Resistant for intended exposure, operating temperatures, and products in pipeline.
 2. Union Type, 2 Inches and Smaller:
 - a. Screwed or solder-joint.
 - b. O-ring sealed with molded and bonded insulation to body.
 3. Manufacturers:
 - a. Dielectric Flanges and Unions:
 - 1) GPT, Houston, TX.
 - 2) Lamons, Houston, TX.

2.06 FABRICATION

- A. Mark each pipe length on outside with the following:
1. Size or diameter and class.

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2. Manufacturer's identification and pipe serial number.
 3. Location number on laying drawing.
 4. Date of manufacture.
- B. Code markings according to approved Shop Drawings.
- C. Shop fabricate flanged pipe in shop, not in field, and delivered to Site with flanges in place and properly faced. Threaded flanges shall be individually fitted and machine tightened on matching threaded pipe by manufacturer.

2.07 FINISHES

- A. Factory prepare, prime, and finish coat in accordance with Pipe Data Sheet(s) and Piping Schedule.
- B. Galvanizing:
1. Hot-dip applied, meeting requirements of ASTM A153/A153M.
 2. Electroplated zinc or cadmium plating is unacceptable.
 3. Stainless steel components may be substituted where galvanizing is specified.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify size, material, joint types, elevation, horizontal location, and pipe service of existing pipelines to be connected to new pipelines or new equipment.
- B. Inspect size and location of structure penetrations to verify adequacy of wall pipes, sleeves, and other openings.

3.02 PREPARATION

- A. See Piping Schedule and Section 09 90 00, Painting and Coating, for additional requirements.
- B. Notify Engineer at least 2 weeks prior to field fabrication of pipe or fittings.
- C. Inspect pipe and fittings before installation, clean ends thoroughly, and remove foreign matter and dirt from inside.
- D. Damaged Coatings and Linings: Repair using original coating and lining materials in accordance with manufacturer's instructions, except for damaged glass-lined pipe that is to be promptly removed from Site.

3.03 WELDING

- A. Perform in accordance with Section IX, ASME Boiler and Pressure Vessel Code and ASME B31.3 for Pressure Piping, as may be specified on Piping Data Sheets, and if recommended by piping or fitting manufacturer.
- B. Weld Identification: Keep paper record of which welder welded each joint.
- C. Pipe End Preparation:
 - 1. Machine Shaping: Preferred.
 - 2. Oxygen or Arc Cutting: Smooth to touch, true, and slag removal by chipping or grinding.
 - 3. Beveled Ends for Butt Welding: ASME B16.25.
- D. Surfaces:
 - 1. Clean and free of paint, oil, rust, scale, slag, or other material detrimental to welding.
 - 2. Clean stainless steel joints with stainless steel wire brushes or stainless steel wool prior to welding.
 - 3. Thoroughly clean each layer of deposited weld metal, including final pass, prior to deposition of each additional layer of weld metal with a power-driven wire brush.
- E. Alignment and Spacing:
 - 1. Align ends to be joined within existing commercial tolerances on diameters, wall thicknesses, and out-of-roundness.
 - 2. Root Opening of Joint: As stated in qualified welding procedure.
 - 3. Minimum Spacing of Circumferential Butt Welds: Minimum four times pipe wall thickness or 1 inch, whichever is greater.
- F. Climatic Conditions:
 - 1. Do not perform welding if there is impingement of any rain, snow, sleet, or wind exceeding 5 mph on the weld area, or if ambient temperature is below 32 degrees F.
 - 2. Stainless Steel and Alloy Piping: If ambient is less than 32 degrees F, local preheating to a temperature warm to the hand is required.
- G. Tack Welds: Performed by qualified welder using same procedure as for completed weld, made with electrode similar or equivalent to electrode to be used for first weld pass, and not defective. Remove those not meeting requirements prior to commencing welding procedures.

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- H. Surface Defects: Chip or grind out those affecting soundness of weld.
- I. Weld Quality: Meet requirements of governing welding codes.

3.04 INSTALLATION—GENERAL

- A. Join pipe and fittings in accordance with manufacturer's instructions, unless otherwise shown or specified.
- B. Remove foreign objects prior to assembly and installation.
- C. Flanged Joints:
 - 1. Install perpendicular to pipe centerline.
 - 2. Bolt Holes: Straddle vertical centerlines, aligned with connecting equipment flanges or as shown.
 - 3. Use torque-limiting wrenches to ensure uniform bearing and proper bolt tightness.
 - 4. Plastic Flanges: Install annular ring filler gasket at joints of raised-face flange.
 - 5. Grooved Joint Flange Adapters: Include stainless steel washer plates as required for mating to serrated faces and lined valves and equipment.
 - 6. Raised-Face Flanges: Use flat-face flange when joining with flat-faced ductile or cast iron flange.
 - 7. Verify compatibility of mating flange to adapter flange gasket prior to selecting grooved adapter flanging.
 - 8. Flange fillers are to be avoided, but if necessary, may be used to make up for small angles up to 6 degrees and for filling gaps up to 2 inches between flanges. Stacked flange fillers shall not be used.
 - 9. Threaded flanged joints shall be shop fabricated and delivered to Site with flanges in-place and properly faced.
 - 10. Manufacturer: Same as pipe manufacturer or grooved joint flange adapter manufacturer.
- D. Threaded and Coupled Joints:
 - 1. Conform to ASME B1.20.1.
 - 2. Produce sufficient thread length to ensure full engagement when screwed home in fittings.
 - 3. Countersink pipe ends, ream and clean chips and burrs after threading.
 - 4. Make connections with not more than three threads exposed.
 - 5. Lubricate male threads only with thread lubricant or tape as specified on Piping Data Sheets.

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E. Grooved-End Joints:

1. Piping shall be grooved in accordance with manufacturer's latest published instructions and shall be accurately cut with tools conforming to coupling manufacturer's standards and to AWWA C606.
2. Install grooved joint couplings and gaskets in accordance with manufacturer's latest published installation instructions.

F. Soldered Joints:

1. Use only solder specified for particular service.
2. Cut pipe ends square and remove fins and burrs.
3. After thoroughly cleaning pipe and fitting of oil and grease using solvent and emery cloth, apply noncorrosive flux to the male end only.
4. Wipe excess solder from exterior of joint before hardened.
5. Before soldering, remove stems and washers from solder joint valves.

G. PVC and CPVC Piping:

1. Provide Schedule 80 threaded nipple where necessary to connect to threaded valve or fitting.
2. Use strap wrench for tightening threaded plastic joints. Do not overtighten fittings.
3. Do not thread Schedule 40 pipe.

H. Ductile Iron Piping:

1. Cutting Pipe: Cut pipe with milling type cutter, rolling pipe cutter, or abrasive blade cutter. Do not flame cut.
2. Dressing Cut Ends:
 - a. General: As required for the type of joint to be made.
 - b. Rubber Gasketed Joints: Remove sharp edges or projections.
 - c. Push-On Joints: Bevel, as recommended by pipe manufacturer.
 - d. Flexible Couplings, Flanged Coupling Adapters, and Grooved End Pipe Couplings: As recommended by the coupling or adapter manufacturer.

3.05 INSTALLATION—EXPOSED PIPING

A. Piping Runs:

1. Parallel to building or column lines and perpendicular to floor, unless shown otherwise.
2. Piping upstream and downstream of flow measuring devices shall provide straight lengths as required for accurate flow measurement.

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- B. Supports: As specified in Section 40 05 15, Piping Support Systems.
- C. Group piping wherever practical at common elevations; install to conserve building space and not interfere with use of space and other work.
- D. Unions or Flanges: Provide at each piping connection to equipment or instrumentation on equipment side of each block valve to facilitate installation and removal.
- E. Install piping so that no load or movement in excess of that stipulated by equipment manufacturer will be imposed upon equipment connection; install to allow for contraction and expansion without stressing pipe, joints, or connected equipment.
- F. Piping clearance, unless otherwise shown:
 - 1. Over Walkway and Stairs: Minimum of 7 feet 6 inches, measured from walking surface or stair tread to lowest extremity of piping system including flanges, valve bodies or mechanisms, insulation, or hanger/support systems.
 - 2. Between Equipment or Equipment Piping and Adjacent Piping: Minimum 3 feet, measured from equipment extremity and extremity of piping system including flanges, valve bodies or mechanisms, insulation, or hanger/support systems.
 - 3. From Adjacent Work: Minimum 1 inch from nearest extremity of completed piping system including flanges, valve bodies or mechanisms, insulation, or hanger/support systems.
 - 4. Do not route piping in front of or to interfere with access ways, ladders, stairs, platforms, walkways, openings, doors, or windows.
 - 5. Headroom in front of openings, doors, and windows shall not be less than the top of the opening.
 - 6. Do not install piping containing liquids or liquid vapors in transformer vaults or electrical equipment rooms.
 - 7. Do not route piping over, around, in front of, in back of, or below electrical equipment including controls, panels, switches, terminals, boxes, or other similar electrical work.

3.06 PIPE CORROSION PROTECTION

- A. Ductile Iron Pipe:
 - 1. Exposed: As specified in Section 09 90 00, Painting and Coating, and as shown in Piping Schedule.

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B. Piping Accessories:

1. Exposed:
 - a. Field paint black and galvanized steel, brass, copper, and bronze piping components as specified in Section 09 90 00, Painting and Coating, as applicable to base metal material.
 - b. Accessories include, but are not limited to, pipe hangers, supports, expansion joints, pipe guides, flexible couplings, vent and drain valves, and fasteners.

C. Insulating Flanges, Couplings, and Unions:

1. Applications:
 - a. Dissimilar metal piping connections.
 - b. Where required for electrically insulated connection.
2. Pipe Installation: Align and install insulating joints as shown on Drawings and according to manufacturer's recommendations. Bolt lubricants that contain graphite or other metallic or electrically conductive components that can interfere with the insulating capabilities of the completed flange shall not be used.

3.07 SLAB, FLOOR, WALL, AND ROOF PENETRATIONS

- A. Application and Installation: As specified in Section 40 27 01, Process Piping Specialties.

3.08 BRANCH CONNECTIONS

- A. Do not install branch connections smaller than 1/2-inch nominal pipe size, including instrument connections, unless shown otherwise.
- B. When line of lower pressure connects to a line of higher pressure, requirements of Piping Data Sheet for higher pressure rating prevails up to and including first block valve in the line carrying the lower pressure, unless otherwise shown.
- C. Threaded Pipe Tap Connections:
1. Ductile Iron Piping: Connect only with service saddle or at tapping boss of a fitting, valve body, or equipment casting.
 2. Welded Steel or Alloy Piping: Connect only with welded threadolet or half-coupling as specified on Piping Data Sheet.
 3. Limitations: Threaded taps in pipe barrel are unacceptable.

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3.09 FIELD FINISHING

- A. Notify Engineer at least 3 days prior to start of surface preparation or coating application work.
- B. As specified in Section 09 90 00, Painting and Coating.

3.10 PIPE IDENTIFICATION

- A. As specified in Section 09 90 00, Painting and Coating.

3.11 FIELD QUALITY CONTROL

- A. Pressure Leakage Testing: As specified in Section 40 80 01, Process Piping Leakage Testing.
- B. Minimum Duties of Welding Inspector:
 - 1. Job material verification and storage.
 - 2. Qualification of welders.
 - 3. Certify conformance with approved welding procedures.
 - 4. Maintenance of records and preparation of reports in a timely manner.
 - 5. Notification to Engineer of unsatisfactory weld performance within 24 hours of weld test failure.
- C. Required Weld Examinations:
 - 1. Perform examinations in accordance with Piping Code ASME B31.3 for Normal Fluid Service.
 - 2. Perform examinations for every pipe thickness and for each welding procedure, progressively, for piping covered by this section.
 - 3. Examine at least one of each type and position of weld made by each welder or welding operator.
 - 4. For each weld found to be defective under the acceptance standards or limitations on imperfections contained in the applicable Piping Code, examine two additional welds made by the same welder that produced the defective weld. Such additional examinations are in addition to the minimum required above. Examine, progressively, two additional welds for each tracer examination found to be unsatisfactory.

3.12 CLEANING

- A. Following assembly and testing, and prior to final acceptance, flush pipelines, except as stated below, with water at 2.5 fps minimum flushing velocity until foreign matter is removed.

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- B. Blow clean of loose debris instrument air lines with compressed air at 4,000 fpm; do not flush with water.
- C. Immediately after cleaning service piping, dry to minus 40 degrees F dew point with dry compressed instrument air or compressed commercial grade nitrogen.
- D. If impractical to flush large diameter pipe at 2.5 fps or blow at 4,000 fpm velocity, clean in-place from inside by brushing and sweeping, then flush or blow line at lower velocity.
- E. Insert cone strainers in flushing connections to attached equipment and leave in-place until cleaning is complete.
- F. Remove accumulated debris through drains 2 inches and larger or by removing spools and valves from piping.

3.13 SUPPLEMENTS

- A. The supplements listed below, following “End of Section,” are a part of this Specification:
 - 1. Piping Schedule.
 - 2. Data Sheets.

Number	Title
40 27 00.01	Cement-Mortar and Glass-Lined Ductile Iron Pipe and Fittings
40 27 00.07	Galvanized Steel Pipe and Fittings
40 27 00.08	Stainless Steel Pipe and Fittings—General Service
40 27 00.10	Polyvinyl Chloride (PVC) Pipe and Fittings

END OF SECTION

PIPING SCHEDULE LEGEND

SERVICE

AHP	Air-High Pressure
ALP	Air-Low Pressure
RAS	Return Activated Sludge
V	Vent
W3	Water-Non-Potable (Plant Effluent)

EXPOSURE

ALL	All
BUR	Buried
EXP	Exposed
SUB	Submerged

MATERIAL

CLDI	Cement-Lined Ductile Iron
GSP	Galvanized Steel Pipe
PVC	Polyvinyl Chloride
SST	Stainless Steel

JOINT TYPE

FCF	Flareless Compression Fitting
FL	Flanged
GR	Grooved
PRJ	Proprietary Restrained
RM	Restrained Mechanical

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THR Threaded

W Welded (including glue, solvent, and fusion)

PRESSURE TEST

H Hydrostatic

P Pneumatic

NA Not Applicable

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PIPING SCHEDULE										
Flow Stream	Service	Size(s) (In.) ¹	Exposure	Piping Material	Specification Section	Joint Type	Lining/ Coating ³	Test Pressure and Type (psig/x), x = Type indicated in Legend	Pipe Color and Label	Remarks
AHP	Air High Pressure	< 3/4	ALL	SST	40 27 00.08	FCF	NONE/NONE	150/P	NA	Tubing
		>=3/4				THR				
ALP	Air Low Pressure	ALL	EXP	SST	40 27 00.08	W, F	NONE/NONE	15/P	NA	Note 4
RAS	Return Activated Sludge	< 3	EXP	SST	40 27 00.08	FL, THR	NONE/NONE	50/H	NA	Drain, vent piping.
				PVC	40 27 00.10	W, FL	NONE/SYS NO. 25		Note 5	Downstream of drain valve or vent valve only.
		>= 4		CLDI	40 27 00.01	FL, GR	CEMENT/SYS NO. 4		Note 5	
W3	Non-potable water (service)	ALL	EXP	GSP	40 27 00.07	THR	NONE/NONE	125/H	NA	
V	Vent	--	--	--	--	--	--	--	--	Note 2

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PIPING SCHEDULE										
Flow Stream	Service	Size(s) (In.) ¹	Exposure	Piping Material	Specification Section	Joint Type	Lining/Coating ³	Test Pressure and Type (psig/x), x = Type indicated in Legend	Pipe Color and Label	Remarks
AHP	Air High Pressure	< 3/4	ALL	SST	40 27 00.08	FCF	NONE/NONE	150/P	NA	Tubing
		>=3/4				THR				
<p>NOTES:</p> <ol style="list-style-type: none"> 1. "All" refers to All Sizes ">" Greater Than "<" Less Than "<=" Less Than or Equal To ">=" Greater Than or Equal To <ol style="list-style-type: none"> 2. Where pipe carries two or more designations not listed as a single flow stream, the piping material shall conform to the material of the first service listed. 3. Coating system number as specified in Section 09 90 00, Painting and Coating, and as specified in Article Pipe Corrosion Protection. 4. Test downstream of new flow control valves using bubble test during operation. 5. Match existing RAS piping color. 										

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AERATION BASIN IMPROVEMENTS

SECTION 40 27 00.01 CEMENT-MORTAR AND GLASS-LINED DUCTILE IRON PIPE AND FITTINGS	
Item	Description
General	<p>Materials in contact with potable water shall conform to NSF 61 acceptance.</p> <p>Pipe manufacturer shall submit certification that source manufacturing facility has been producing ductile iron pipe of specified diameters, dimensions, and standards for a period of not less than 10 years. Testing of pipe required by AWWA C151/A21.51 shall be conducted in testing and laboratory facilities located in the USA and operating under USA laws and regulations. Pipe shall be handled during manufacture and shipped without nesting (without insertion of one pipe inside another).</p>
Pipe	Exposed Pipe Using Grooved End and Flange Joints: AWWA C115/A21.15, thickness Class 53 minimum, 250 psi minimum working pressure.
Lining	<p>Cement-mortar: AWWA C104/A21.4.</p> <p>Glass: ASTM B1000.</p>
Joints	<p>Mechanical: 250 psi minimum working pressure.</p> <p>Grooved End: Rigid type radius cut conforming to AWWA C606, 250 psi minimum working pressure; Victaulic.</p> <p>Flange: Dimensions per AWWA C110/A21.10 flat face ductile iron, threaded conforming to AWWA C115/A21.15. Gray cast iron will not be allowed.</p> <p>Branch connections 3 inches and smaller, except from glass-lined pipe, shall be made with service saddles as specified in Section 40 27 01, Process Piping Specialties. Branch connections, 3 inches and smaller from glass-lined pipe shall be made with glass-lined tee with a flanged branch for adapting to branch piping.</p>
Fittings	<p>Lined and coated same as pipe.</p> <p>Mechanical: AWWA C110/A21.10, AWWA C111/A21.11, and AWWA C153/A21.53 ductile iron, 250 psi minimum working pressure. Follower glands shall be ductile iron.</p> <p>Grooved End: AWWA C606 and AWWA C110/A21.10, ductile iron, 250 psi minimum working pressure; Victaulic.</p> <p>Flange: AWWA C110/A21.10 ductile iron, faced and drilled, Class 125 flat face. Gray cast iron will not be allowed.</p>

KELLOGG CREEK WRRF
AERATION BASIN IMPROVEMENTS

SECTION 40 27 00.01 CEMENT-MORTAR AND GLASS-LINED DUCTILE IRON PIPE AND FITTINGS	
Item	Description
Couplings	<p>Grooved End: 250 psi minimum working pressure, malleable iron per ASTM A47/A47M or ductile iron per ASTM A536; Victaulic.</p> <p>Grooved End Adapter Flanges: 250 psi minimum working pressure, malleable iron per ASTM A47/A47M or ductile iron per ASTM A536; Victaulic.</p>
Bolting	<p>Flanged: ASTM A307, Grade B carbon steel heavy hex head or stud bolts, ASTM A563, Grade A carbon steel heavy hex head nuts and ASTM F436 hardened steel washers at nuts and bolt heads. Stud bolts are not allowed when bolting to tapped flanges. Torque bolts per gasket manufacturer recommendations.</p> <p>Flanged Joints in Sumps, Wet Wells, and Submerged and Wetted Installations: Type 316 stainless steel, ASTM A320/A320M, Grade B8M heavy hex head or stud bolts; ASTM A194/A194M, Grade 8M heavy hex nuts and ASTM F436 Type 3 alloy washers at nuts and bolt heads. Stud bolts are not allowed when bolting to tapped flanges. Torque bolts per gasket manufacturer recommendations.</p>
Gaskets	<p>General: Gaskets in contact with potable water shall be NSF ANSI 61 certified.</p> <p>Grooved End Joints: Halogenated butyl conforming to ASTM D2000 and AWWA C606.</p> <p>Flanged, Water, Sewage Services: 1/8-inch-thick, homogeneous black rubber (EPDM), hardness 60-80 (Shore A), rated to 275 degrees F, conforming to ASME B16.21 and ASTM D2000.</p> <p>Full face for flat-faced flanges, flat-ring type for raised-face flanges. Blind flanges shall be epoxy-lined in accordance with the system specified above.</p> <p>Gasket pressure rating to equal or exceed the system hydrostatic test pressure.</p>
Joint Lubricant	Manufacturer's standard.

END OF SECTION

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SECTION 40 27 00.07 GALVANIZED STEEL PIPE AND FITTINGS		
Item	Size	Description
Pipe	2" & smaller	Galvanized carbon steel, ASTM A106/A106M, Grade B seamless or ASTM A53, Grade B seamless or ERW. Standard weight.
Joints	1-1/2" & smaller	Threaded or flanged at valves and equipment, or grooved end meeting requirements of AWWA C606.
	2" & larger	Flanged at valves and equipment, or grooved end meeting requirements of AWWA C606.
Fittings	1-1/2" & smaller	Threaded: 150-pound, ASTM A197A197M or ASTM A47/A47M, dimensions in accordance with ASME B16.3.
	2" & larger	Grooved End: Malleable iron ASTM A47/A47M or ductile iron ASTM A536, 250 psi working pressure, grooved ends to accept couplings without field preparation. Victaulic; Anvil International, Inc., Gruvlok.
Branch Connections	1-1/2" & smaller	Tee or reducing tee in conformance with Fittings above, galvanized 2,000-pound WOG threadolet or welding boss; galvanize after welding.
	2" & larger	Branch Same Size as Run: Grooved end tee in accordance with Fittings above. Branch One or More Sizes Smaller Than Run: Grooved end reducing tee in accordance with Fittings above.

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SECTION 40 27 00.07 GALVANIZED STEEL PIPE AND FITTINGS		
Item	Size	Description
Flanges	1-1/2" & smaller	Galvanized, forged carbon steel, ASTM A105/A105M, Grade II, ASME B16.5 Class 150 or Class 300, socket-weld or threaded, 1/16-inch raised face.
	2" & larger	Butt-Welded Systems Standard Flange (RFDN): Galvanized, forged carbon steel, ASTM A105/A105M, ASME B16.5 Class 150 or Class 300 slip-on or welding neck, 1/8-inch raised face; weld neck bore to match pipe internal diameter. Use weld neck flanges when abutting butt-weld fittings. Weld slip-on flanges inside and outside.
Unions		Threaded malleable iron, ASTM A197/A197M or ASTM A47/A47M, 300-pound WOG, brass to iron seat, meeting the requirements of ASME B16.3.
Plugs		Forged carbon steel, ASTM A181/A181M, Grade II, round head, threaded, galvanized.
Bolting		Grooved End Couplings: Carbon steel, ASTM A183 bolts and nuts, 110,000 psi minimum tensile strength.
		Flanges: Carbon steel ASTM A307, Grade B heavy hex head or stud bolts and ASTM A563, Grade A heavy hex head nuts. Torque bolts per gasket manufacturer's recommendations.

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AERATION BASIN IMPROVEMENTS

SECTION 40 27 00.07 GALVANIZED STEEL PIPE AND FITTINGS		
Item	Size	Description
Gaskets	All flanges	<p>Flanged, Water and Sewage Service: 1/8-inch thick, homogeneous black rubber (EPDM), hardness 60 (Shore A), rated to 250 degrees F. continuous and conforming to ASME B16.21, ASTM D1330, Steam Grade.</p> <p>Blind Flanges: Gasketed covering entire inside face with gasket cemented to blind flange.</p> <p>Insulating Gasket ASME B16.21 and ASME 16.5, fabric reinforced phenolic neoprene faced gasket, sleeves, washers, CL150, 1/8-inch thick, 175 degrees F Step-Ko Type 'E' DW, "or-equal."</p>
Thread Lubricant	1-1/2" & smaller	Teflon tape or joint compound that is insoluble in water.

END OF SECTION

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AERATION BASIN IMPROVEMENTS

SECTION 40 27 00.08 STAINLESS STEEL PIPE AND FITTINGS—GENERAL SERVICE		
Item	Size	Description
Pipe	2" & smaller	Schedule 40S: ASTM A312/A312M, Type 316 seamless, pickled, and passivated.
Tubing	All	ASTM A269, Type 316 stainless steel, seamless, fully annealed hydraulic tubing, 0.065-inch wall thickness minimum.
Joints	2" & smaller	Threaded or flanged at equipment as required or shown.
Tubing Joints	All	Flareless compression fitting.
Fittings	2" & smaller	Threaded: Forged 1,000 CWP minimum, ASTM A182/A182M, Grade F316 or cast Class 150, ASTM A351/A351M, Grade CF8M/316.
Tubing Fittings	All	Flareless Compression Type Forged: ASTM A182/A182M, Grade F316, Parker-Hannifin Ferulok, Flodar BA Series.
Branch Connections	2" & smaller	Tee or reducing tee in conformance with fittings above.
Flanges	All	Forged Stainless Steel: ASTM A182/A182M, Grade F316L, ASME B16.5 Class 150, slip-on weld neck or raised face. Weld slip-on flanges inside and outside.
Gaskets	All Flanges	Flanged, Low Pressure Air Services: 1/8 inch thick, homogeneous black rubber (EPDM), hardness 60 (Shore A), rated to 250 degrees F, continuous and conforming to ASME B16.21 and ASTM D1330, Steam Grade.
Bolting	All	Forged Flanges: Type 316 stainless steel, ASTM A320/A320M Grade B8M heavy hex head bolts, ASTM A194/A194M Grade 8M hex head nuts and ASTM F436 Type 3 alloy washers at nuts and bolt heads. Torque bolts per gasket manufacturer's recommendations.

KELLOGG CREEK WRRF
 AERATION BASIN IMPROVEMENTS

SECTION 40 27 00.08 STAINLESS STEEL PIPE AND FITTINGS—GENERAL SERVICE		
Item	Size	Description
Tubing Branch Connections	All	Compression type tees or reducing tees in accordance with Tubing Fittings above.
Unions	2" & smaller	Threaded Forged: ASTM A182/A182M, Grade F316, 2,000-pound or 3,000-pound WOG, integral ground seats, AAR design meeting the requirements of ASME B16.11, bore to match pipe.
Thread Lubricant	2" & smaller	General Service: 100 percent virgin PTFE Teflon tape.

END OF SECTION

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SECTION 40 27 00.10 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS		
Item	Size	Description
General	All	Materials in contact with potable water shall conform to NSF 61 acceptance.
Pipe	All	Schedule 80 PVC: Type I, Grade I or Class 12454-B conforming to ASTM D1784 and ASTM D1785. Pipe shall be manufactured with titanium dioxide for ultraviolet protection. Threaded Nipples: Schedule 80 PVC.
Fittings	All	Schedule to Match Pipe Above: ASTM D2466 and ASTM D2467 for socket weld type and Schedule 80 ASTM D2464 for threaded type. Fittings shall be manufactured with titanium dioxide for ultraviolet protection.
Joints	All	Solvent socket weld except where connection to threaded valves and equipment may require future disassembly.
Flanges	All	One-piece, molded hub type PVC flat face flange in accordance with Fittings above, ASME B16.1, Class 125 drilling.
Bolting	All	Flat Face Mating Flange and In Corrosive Areas: ASTM A193/A193M, Type 316 stainless steel Grade B8M hex head bolts, ASTM A194/A194M Grade 8M hex head nuts and ASTM F436 Type 3 alloy washers at nuts and bolt heads. Torque to gasket manufacturer's recommendations. With Raised Face Mating Flange: Carbon steel ASTM A307 Grade B square head bolts, ASTM A563 Grade A heavy hex head nuts and ASTM F436 hardened steel washers at nuts and bolt heads. Torque to gasket manufacturer's recommendations.

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AERATION BASIN IMPROVEMENTS

SECTION 40 27 00.10 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS		
Item	Size	Description
Gaskets	All	Flat Face Mating Flange: Full faced 1/8-inch-thick ethylene propylene (EPR) rubber. Raised Face Mating Flange: Flat ring 1/8-inch ethylene propylene (EPR) rubber, with filler gasket between OD of raised face and flange OD to protect the flange from bolting moment.
Solvent Cement	All	Socket type joints shall be made employing solvent cement that meets or exceeds the requirements of ASTM D2564 and primer that meets or exceeds requirements of ASTM F656, chemically resistant to the fluid service, and as recommended by pipe and fitting manufacturer Solvent cement and primer shall be listed by NSF 61 for contact with potable water.
Thread Lubricant	All	Teflon Tape.

END OF SECTION

SECTION 40 27 01
PROCESS PIPING SPECIALTIES

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Society of Mechanical Engineers (ASME):
 - a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings (Classes 25, 125, and 250).
 - b. B16.5, Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.
 2. American Water Works Association (AWWA):
 - a. C110/A21.10, Ductile-Iron and Gray-Iron Fittings.
 - b. C153/A21.53, Ductile-Iron Compact Fittings for Water Service.
 - c. C210, Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.
 - d. C213, Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.
 - e. C219, Bolted, Sleeve-Type Couplings for Plain-End Pipe.
 - f. Manual M11, Steel Pipe—A Guide for Design and Installation.
 3. ASTM International (ASTM):
 - a. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - b. A276, Standard Specification for Stainless Steel Bars and Shapes.
 4. NSF International (NSF):
 - a. NSF/ANSI 61, Drinking Water System Components - Health Effects.
 - b. NSF/ANSI 372, Drinking Water System Components - Lead Content.

1.02 SUBMITTALS

- A. Action Submittals: Manufacturer's data on materials, construction, end connections, ratings, overall lengths, and live lengths (as applicable).
- B. Operation and Maintenance Data: As specified in Section 01 78 23, Operation and Maintenance Data.

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PART 2 PRODUCTS

2.01 GENERAL

- A. Provide required piping specialty items, whether shown or not shown on Drawings, as required by applicable codes and standard industry practice.
- B. Rubber ring joints, mechanical joints, flexible couplings, and proprietary restrained ductile iron pipe joints are considered flexible joints; welded, screwed, and flanged pipe joints are not considered flexible.

2.02 COUPLINGS

A. General:

- 1. Coupling linings for use in potable water systems shall be in conformance with NSF/ANSI 61.
- 2. Couplings shall be rated for working pressure not less than indicated in Piping Schedule for the service and not less than 150 psi.
- 3. Couplings shall be lined and coated with fusion-bonded epoxy in accordance with AWWA C213.
- 4. Unless thrust restraint is provided by other means, couplings shall be harnessed in accordance with requirements of AWWA Manual M11 or as shown on Drawings.
- 5. Sleeve type couplings shall conform to AWWA C219 and shall be hydraulically expanded beyond minimum yield for accurate sizing and proofing of tensile strength.

B. Restrained Flange Adapter:

- 1. Pressure Rating:
 - a. Minimum Working Pressure Rating: Not less than 150 psi.
 - b. Safety Factor: Not less than two times working pressure and shall be supported by manufacturer's proof testing.
- 2. Thrust Restraint:
 - a. Provide hardened steel wedges that bear against and engage outer pipe surface, and allow articulation of pipe joint after assembly while wedges remain in their original setting position on pipe surface.
 - b. Products employing set screws that bear directly on pipe will not be acceptable.
- 3. Manufacturer and Product: EBAA Iron Sales Co.; Mega-Flange.

2.03 SERVICE SADDLES

- A. Double-Strap Iron:
 - 1. Pressure Rating: Capable of withstanding 150 psi internal pressure without leakage or over stressing.
 - 2. Run Diameter: Compatible with outside diameter of pipe on which saddle is installed.
 - 3. Taps: Iron pipe threads.
 - 4. Materials:
 - a. Body: Malleable or ductile iron.
 - b. Straps: Galvanized steel.
 - c. Hex Nuts and Washers: Steel.
 - d. Seal: Rubber.
 - 5. Manufacturers and Products:
 - a. Smith-Blair; Series 313 or Series 366.
 - b. Dresser; Style 91.

2.04 OUTLET/TAPPING SADDLES

- A. Materials:
 - 1. Straps: Alloy steel with 3/4-inch threaded ends.
 - 2. Seal: O-Ring SBR rubber gasket.
 - 3. Compatible with ductile iron pipe.
- B. Connection: As shown.
- C. Pressure Rating: Capable of withstanding 250 psi internal pressure without leakage over stressing.
- D. Manufacturer and Product: American Ductile Iron; Outlet/Tapping Saddle.

2.05 PERSONNEL DAVIT CRANE

- A. Quantity: One.
- B. Unit to be designed for personnel riding. Equipment must meet ANSI Z359.1-2007, ANSI Z359.4-2007, ANSI Z117.1-2009, and local, state, and federal (OSHA) requirements.
- C. Crane Construction: Powder coated carbon steel.

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- D. Adjustable Boom: Telescoping to four different length positions and adjustable to different boom angle positions with screw jack. Reach range of 30 inches to 42 inches. Anchor point height range of 81.5 inches to 99.5 inches.
- E. Provide with two-speed manual winch, sealed SRL, and a backup fall arrest connection.
- F. Manufacturer and Product:
 - 1. DBI-SALA; Crane Model 8518386.
 - 2. "Or-equal."

2.06 PERSONNEL DAVIT CRANE BASE

- A. Quantity: Four.
- B. Materials: Type 316 stainless steel.
- C. Unit to be designed for personnel riding. Equipment must meet ANSI Z359.1-2007, ANSI Z359.4-2007, ANSI Z117.1-2009, and local, state, and federal (OSHA) requirements.
- D. Connectors and the mounting surface must be rated for 5,000 pounds static loading.
- E. Manufacturer and Product:
 - 1. DBI-SALA; Center Mount Sleeve Davit Base 8516563.
 - 2. "Or-equal."

PART 3 EXECUTION

3.01 GENERAL

- A. Provide accessibility to piping specialties for control and maintenance.

3.02 PIPING EXPANSION

- A. Piping Installation: Allow for thermal expansion due to differences between installation and operating temperatures.

- B. Expansion Joints:
 - 1. Grooved Joint and Flanged Piping Systems: Elastomer bellows expansion joint.
 - 2. Nonmetallic Pipe: Teflon bellows expansion joint.
 - 3. Screwed and Soldered Piping Systems: Copper or galvanized and black steel pipe expansion compensator, as applicable.
 - 4. Air and Water Service Above 120 Degrees F: Metal bellows expansion joint.
 - 5. Pipe Run Offset: Flexible metal hose.
- C. Anchors: Install as specified in Section 40 05 15, Piping Support Systems, to withstand expansion joint thrust loads and to direct and control thermal expansion.

3.03 SERVICE SADDLES

- A. Ferrous Metal Piping (Except Stainless Steel): Double-strap iron.
- B. Plastic Piping: Nylon-coated iron.

3.04 OUTLET/TAPPING SADDLE

- A. Install in accordance with manufacturer's written instructions.

3.05 COUPLINGS

- A. General:
 - 1. Install in accordance with manufacturer's written instructions.
 - 2. Before coupling, clean pipe holdback area of oil, scale, rust, and dirt.
 - 3. Remove pipe coating if necessary to present smooth surface.
 - 4. Application:
 - a. Metallic Piping Systems: Flexible couplings, transition couplings, and flanged coupling adapters.
 - b. Concrete Encased Couplings: Flexible coupling.

3.06 SLAB, FLOOR, WALL AND ROOF PENETRATIONS

- A. Applications:
 - 1. Watertight and Below Ground Penetrations:
 - a. Wall pipes with thrust collars.
 - b. Provide taps for stud bolts in flanges to be set flush with wall face.

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2. Nonwatertight Penetrations: Pipe sleeves with seep ring.
3. Existing Walls: Rotary drilled holes.
4. Fire-Rated or Smoke-Rated Walls, Floors or Ceilings: Insulated and encased pipe sleeves.

END OF SECTION

SECTION 40 27 02
PROCESS VALVES AND OPERATORS

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Society of Mechanical Engineers (ASME):
 - a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
 - b. B16.44, Manually Operated Metallic Gas Valves for Use in Above Ground Piping Systems up to 5 psi.
 2. American Water Works Association (AWWA):
 - a. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - b. C500, Metal-Seated Gate Valves for Water Supply Service.
 - c. C504, Rubber-Seated Butterfly Valves, 3 In. (75 mm) Through 72 In. (1,800 mm).
 - d. C541, Hydraulic and Pneumatic Cylinder and Vane-Type Actuators for Valves and Slide Gates.
 - e. C550, Protective Interior Coatings for Valves and Hydrants.
 - f. C606, Grooved and Shouldered Joints.
 3. ASTM International (ASTM):
 - a. A276, Standard Specification for Stainless Steel Bars and Shapes.
 - b. A351/A351M, Standard Specification for Castings, Austenitic, for Pressure-Containing Parts.
 - c. A380, Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
 - d. A564/A564M, Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes.
 - e. B61, Standard Specification for Steam or Valve Bronze Castings.
 - f. B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
 - g. B98/B98M, Standard Specification for Copper-Silicon Alloy Rod, Bar, and Shapes.
 - h. B127, Standard Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip.
 - i. B139/B139, Standard Specification for Phosphor Bronze Rod, Bar and Shapes.
 - j. B164, Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire.

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- k. B194, Standard Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar.
- l. B584, Standard Specification for Copper Alloy Sand Castings for General Applications.
- m. D429, Standard Test Methods for Rubber Property-Adhesion to Rigid Substrates.
- n. D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
- 4. FM Global (FM).
- 5. Manufacturers Standardization Society (MSS):
 - a. SP-80, Bronze Gate, Globe, Angle, and Check Valves.
 - b. SP-85, Gray Iron Globe and Angle Valves, Flanged and Threaded Ends.
 - c. SP-110, Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
- 6. National Electrical Manufacturers Association (NEMA): 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
- 7. UL.
- 8. USC Foundation for Cross-Connection Control and Hydraulic Research.

1.02 SUBMITTALS

A. Action Submittals:

- 1. Shop Drawings:
 - a. Product data sheets for each make and model. Indicate valve Type Number, applicable Tag Number, and facility name/number or service where used.
 - b. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
 - c. Power and control wiring diagrams, including terminals and numbers.
 - d. Sizing calculations for open-close/throttle and modulating valves.

B. Informational Submittals:

- 1. Manufacturer's Certificate of Compliance, in accordance with Section 01 61 00, Common Product Requirements, for:
 - a. Butterfly valves; full compliance with AWWA C504.
- 2. Tests and inspection data.

3. Operation and Maintenance Data: As specified in Section 01 78 23, Operation and Maintenance Data.
4. Manufacturer's Certificate of Proper Installation, in accordance with Section 01 43 33, Manufacturers' Field Services.

PART 2 PRODUCTS

2.01 GENERAL

- A. Valves to include operator, actuator, handwheel, chain wheel, extension stem, floor stand, operating nut, chain, wrench, and accessories to allow a complete operation from the intended operating level.
- B. Valve to be suitable for intended service. Renewable parts not to be of a lower quality than specified.
- C. Valve same size as adjoining pipe, unless otherwise called out on Drawings or in Supplements.
- D. Valve ends to suit adjacent piping.
- E. Resilient seated valves shall have no leakage (drip-tight) in either direction at valve rated design pressure. All other valves shall have no leakage (drip-tight) in either direction at valve rated design pressure, unless otherwise allowed for in this section or in stated valve standard.
- F. Size operators and actuators to operate valve for full range of pressures and velocities.
- G. Valve to open by turning counterclockwise, unless otherwise specified.
- H. Factory mount operator, actuator, and accessories.

2.02 MATERIALS

- A. Bronze and brass valve components and accessories that have surfaces in contact with water to be alloys containing less than 16 percent zinc and 2 percent aluminum.
 1. Approved alloys are of the following ASTM designations:
 - a. B61, B62, B98/B98M (Alloy UNS No. C65100, C65500, or C66100), B139/B139M (Alloy UNS No. C51000), B584 (Alloy UNS No. C90300 or C94700), B164, B194, and B127.
 2. Stainless steel Alloy 18-8 may be substituted for bronze.

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- B. Valve materials in contact with or intended for drinking water service to meet the following requirements:
 - 1. Materials to comply with requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements.
 - 2. Coatings materials to be formulated from materials deemed acceptable to NSF/ANSI 61.

2.03 FACTORY FINISHING

- A. General:
 - 1. Interior coatings for valves and hydrants shall be in accordance with AWWA C550, unless otherwise specified.
 - 2. Exterior coating for valves and hydrants shall be in accordance with Section 09 90 00, Painting and Coating.
 - 3. Material in contact with potable water shall conform to NSF/ANSI 61.
 - 4. Exposed safety isolation valves and lockout valves with handles, handwheels, or chain wheels shall be “safety yellow.”
- B. Where epoxy lining and coating are specified, factory finishing shall be as follows:
 - 1. In accordance with AWWA C550.
 - 2. Either two-part liquid material or heat-activated (fusion) material except only heat-activated material if specified as “fusion” or “fusion bonded” epoxy.
 - 3. Minimum 7-mil dry film thickness except where limited by valve operating tolerances.

2.04 VALVES

- A. Ball Valves:
 - 1. Type V301 Ball Valve 2 Inches and Smaller for General Water and Air Service:
 - a. Two-piece, full port, NPT threaded ends, bronze body and end piece, hard chrome-plated solid bronze, RTFE seats and packing, blowout-proof stem, adjustable packing gland, zinc-coated steel hand lever operator with vinyl grip, rated 600-pound WOG, 150-pound SWP, complies with MSS SP-110.
 - b. Manufacturers and Products:
 - 1) Threaded:
 - a) Conbraco Apollo; 77-100.
 - b) Nibco; T-585-70.

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2. Type V303 Ball Valve 3/4 Inch to 2 Inches for Instrument Air System Shutoff:
 - a. Two-piece, NPT threaded ends, bronze body and end piece, hard chrome-plated solid bronze or brass ball, RTFE seats and packing, blowout-proof stem, adjustable packing gland, 125 psig rated, safety exhaust port to exhaust downstream side when valve is in closed position, zinc-coated steel locking handle with vinyl grip.
 - b. Meets OSHA Regulation 29 CFR Part 1910.147 requirements.
 - c. Manufacturers and Products:
 - 1) Conbraco Apollo; 75-100-41.
 - 2) Nibco; T-580-70-SV/T-585-70-SV.
3. Type V306 Stainless Steel Ball Valve 2 Inches and Smaller:
 - a. Two-piece, full port, ASTM A276 GR 316 or ASTM A351/A351M GR CF8M stainless steel body and end piece, NPT threaded ends, ASTM A276 Type 316 stainless steel ball, reinforced PTFE seats, seals, and packing, adjustable packing gland, blowout proof stainless steel stem, stainless steel lever operator with vinyl grip or tee handle for buried service, rated 1,000 psig CWP, complies with MSS SP-110.
 - b. Manufacturers and Products:
 - 1) Conbraco Apollo; 76F-100 Series.
 - 2) Nibco; T-585-S6-R-66-LL.
4. Type V309 Instrument Air Shutoff Valve 1/8 Inch to 1/2 Inch:
 - a. Stainless steel body ball valve, nylon handle, tube fitting ends, PTFE seats and seals, panel nut, rated 1,500 psi minimum.
 - b. Manufacturers and Products:
 - 1) Swagelok; 40 Series.
 - 2) Parker Hannifin; B Series.

B. Solenoid Valves

1. Type V940 Solenoid Valve 1/4 Inch to 2 Inches:
 - a. Two-way internal pilot operated diaphragm type, stainless steel body, resilient seat suitable for air or water, solenoid coil molded epoxy, NEMA insulation Class F, 120 volts ac, 60-Hz, unless otherwise indicated. Solenoid enclosure NEMA 250, Type 4 unless otherwise indicated. Size and normal position (when de-energized) as indicated on Solenoid Valve Schedule on Drawings.
 - b. Minimum operating pressure differential no greater than 5 psig, maximum operating pressure differential not less than 125 psig.
 - c. Manufacturers and Products:
 - 1) ASCO; Red Hat 2/2 Series 8210.
 - 2) Skinner.

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2.05 OPERATORS AND ACTUATORS

A. Manual Operators:

1. General:

- a. For AWWA valves, operator force not to exceed requirements of applicable valve standard. Provide gear reduction operator when force exceeds requirements.
- b. For non-AWWA valves, operator force not to exceed applicable industry standard or 80 pounds, whichever is less, under operating condition, including initial breakaway. Provide gear reduction operator when force exceeds requirements.
- c. Operator self-locking type or equipped with self-locking device.
- d. Position indicator on quarter-turn valves.
- e. Worm and gear operators one-piece design, worm-gears of gear bronze material. Worm of hardened alloy steel with thread ground and polished. Traveling nut type operator's threaded steel reach rod with internally threaded bronze or ductile iron nut.

2. Exposed Operator:

- a. Galvanized and painted handwheel.
- b. Cranks on gear type operator.
- c. Chain wheel operator with tieback, extension stem, floor stand, and other accessories to permit operation from normal operation level.
- d. Valve handles to take a padlock, and wheels a chain and padlock.

2.06 ACCESSORIES

- A. Tagging: 1-1/2-inch diameter heavy brass or stainless steel tag attached with No. 16 solid brass or stainless steel jack chain for each valve, bearing valve tag number shown on Drawings.

PART 3 EXECUTION

3.01 INSTALLATION OF OWNER-FURNISHED EQUIPMENT

- A. Install and test Owner-Furnished valves in accordance with Section 01 64 00, Owner-Furnished Products, and this section.
- B. Install per manufacturer's recommendations.

3.02 INSTALLATION

A. Flange Ends:

1. Flanged valve bolt holes shall straddle vertical centerline of pipe.
2. Clean flanged faces, insert gasket and bolts, and tighten nuts progressively and uniformly.

B. Screwed Ends:

1. Clean threads by wire brushing or swabbing.
2. Apply joint compound.

C. Valve Installation and Orientation:

1. General:

- a. Install valves so handles operate from fully open to fully closed without encountering obstructions.
- b. Install valves in location for easy access for routine operation and maintenance.
- c. Install valves per manufacturer's recommendations.

2. Ball Valves:

- a. Install operating stem vertical when valve is installed in horizontal runs of pipe having centerline elevations 4 feet 6 inches or less above finished floor, unless otherwise shown.
- b. Install operating stem horizontal in horizontal runs of pipe having centerline elevations greater than 4 feet 6 inches above finish floor, unless otherwise shown.

3. Butterfly Valves:

- a. Unless otherwise restricted or shown on Drawings, install valve a minimum of 8 diameters downstream of a horizontal elbow or branch tee with shaft in horizontal position.
- b. For vertical elbow or branch tee immediately upstream of valve, install valve with shaft in vertical position.
- c. For horizontal elbow or branch tee immediately upstream of valve, install valve with shaft in horizontal position.
- d. When installed immediately downstream of swing check, install valve with shaft perpendicular to swing check shaft.
- e. For free inlet or discharge into basins and tanks, install valve with shaft in vertical position.

4. Solenoid Valves: Install in accordance with manufacturer's instructions.

D. Install line size ball valve and union upstream of each solenoid valve, in-line flow switch, or other in-line electrical device, excluding magnetic flowmeters, for isolation during maintenance.

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- E. Install safety isolation valves on compressed air.
- F. Locate valve to provide accessibility for control and maintenance. Install access doors in finished walls and plaster ceilings for valve access.
- G. Extension Stem for Operator: Where depth of valve operating nut is 3 feet or greater below finish grade, furnish operating extension stem with 2-inch operating nut to bring operating nut to a point within 6 inches of finish grade.
- H. Torque Tube: Where operator for quarter-turn valve is located on floor stand, furnish extension stem torque tube of a type properly sized for maximum torque capacity of valve.
- I. Floor Box and Stem: Steel extension stem length shall locate operating nut in floor box.

3.03 TESTS AND INSPECTION

- A. Valve may be either tested while testing pipelines, or as a separate step.
- B. Test that valves open and close smoothly under operating pressure conditions. Test that two-way valves open and close smoothly under operating pressure conditions from both directions.
- C. Count and record number of turns to open and close valve; account for discrepancies with manufacturer's data.

3.04 MANUFACTURER'S SERVICES

- A. Valve(s) as listed below require manufacturer's field services:
 - 1. See Section 01 64 00, Owner-Furnished Products.
- B. See Section 01 43 33, Manufacturers' Field Services, and Section 01 91 14, Equipment Testing and Facility Startup.

END OF SECTION

SECTION 40 80 01
PROCESS PIPING LEAKAGE TESTING

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Testing Plan:
 - a. Submit prior to testing and include at least the information that follows.
 - 1) Testing dates.
 - 2) Piping systems and section(s) to be tested.
 - 3) Test type.
 - 4) Method of isolation.
 - 5) Calculation of maximum allowable leakage for piping section(s) to be tested.
2. Certifications of Calibration: Testing equipment.
3. Certified Test Report.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PREPARATION

- A. Notify Engineer in writing 5 days in advance of testing. Perform testing in presence of Engineer.
- B. Pressure Piping:
 1. Install temporary thrust blocking or other restraint as necessary to protect adjacent piping or equipment and make taps in piping prior to testing.
 2. Wait 5 days minimum after concrete thrust blocking is installed to perform pressure tests. If high-early strength cement is used for thrust blocking, wait may be reduced to 2 days.
 3. Prior to test, remove or suitably isolate appurtenant instruments or devices that could be damaged by pressure testing.
 4. New Piping Connected to Existing Piping: Isolate new piping with grooved-end pipe caps, spectacle blinds, blind flanges, or as acceptable to Engineer.
 5. Test Pressure: As indicated on Piping Schedule.

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- C. Test section may be filled with water and allowed to stand under low pressure prior to testing.
- D. Gravity Piping:
 - 1. Perform testing after service connections, manholes, and backfilling have been completed between stations to be tested.
 - 2. Determine groundwater level at time of testing by exploratory holes or other method acceptable to Engineer.
 - 3. Pipe 42 Inches Diameter and Larger: Joint testing device may be used to isolate and test individual joints.

3.02 HYDROSTATIC TEST FOR PRESSURE PIPING

- A. Fluid: Clean water of such quality to prevent corrosion of materials in piping system.
- B. Exposed Piping:
 - 1. Perform testing on installed piping prior to application of insulation.
 - 2. Maximum Filling Velocity: 0.25 foot per second, applied over full area of pipe.
 - 3. Vent piping during filling. Open vents at high points of piping system or loosen flanges, using at least four bolts, or use equipment vents to purge air pockets.
 - 4. Maintain hydrostatic test pressure continuously for 30 minutes, minimum, and for such additional time as necessary to conduct examinations for leakage.
 - 5. Examine joints and connections for leakage.
 - 6. Correct visible leakage and retest as specified.

3.03 PNEUMATIC TEST FOR PRESSURE PIPING

- A. Do not perform on:
 - 1. PVC or CPVC pipe.
 - 2. Piping larger than 18 inches.
 - 3. Buried and other non-exposed piping.
- B. Fluid: Oil-free, dry air.

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- C. Procedure:
1. Apply preliminary pneumatic test pressure of 25 psig maximum to AHP and 5 psig maximum to ALP piping system prior to final leak testing, to locate visible leaks. Apply soap bubble mixture to joints and connections; examine for leakage.
 2. Correct visible leaks and repeat preliminary test until visible leaks are corrected.
 3. Gradually increase pressure in system to half of specified test pressure. Thereafter, increase pressure in steps of approximately one-tenth of specified test pressure until required test pressure is reached.
 4. Maintain pneumatic test pressure continuously for minimum of 10 minutes and for such additional time as necessary to conduct soap bubble examination for leakage.
 5. Correct visible leakage and retest as specified.
- D. Allowable Leakage: Piping system, exclusive of possible localized instances at pump or valve packing, shall show no visual evidence of leakage.
- E. After testing and final cleaning, purge with nitrogen those lines that will carry flammable gases to assure no explosive mixtures will be present in system during filling process.
- F. Defective Piping Sections: Replace or test and seal individual joints, and retest as specified.

3.04 FIELD QUALITY CONTROL

- A. Test Report Documentation:
1. Test date.
 2. Description and identification of piping tested.
 3. Test fluid.
 4. Test pressure.
 5. Remarks, including:
 - a. Leaks (type, location).
 - b. Repair/replacement performed to remedy excessive leakage.
 6. Signed by Contractor and Engineer to represent that test has been satisfactorily completed.

END OF SECTION

**SECTION 40 90 00
INSTRUMENTATION AND CONTROL
FOR PROCESS SYSTEMS**

PART 1 GENERAL

1.01 SUMMARY

- A. This section gives general requirements for Process Instrumentation and Control (PIC). The following PIC subsections expand on requirements of this section:
1. Section 40 91 00, Instrumentation and Control Components.
- B. Major Work Items: Includes, but is not limited to, engineering, furnishing, installing, calibrating, adjusting, testing, documenting, starting up, and training for complete PIC.
1. Process instrumentation including primary elements, transmitters, and control devices.
 2. Programmable Controller: Replace existing Programmable Controller PLC-2 in existing control panel, including updated panel wiring diagrams. Install new Owner-Furnished PLC hardware.
 3. Develop and submit a detailed switchover plan in conjunction with Section 01 31 13, Project Coordination. The switchover plan shall account for the specified scheduling and shutdown constraints, and all requirements shown on Drawings and specified herein. Make field verification of existing panel and equipment installation to aid in developing the switchover plan.
 4. Interface with existing control system, and with Owner-Furnished valve and gate actuators.
 5. Coordination with Application Software. Owner's Software Integrator will provide Application Software for PLC programming, and SCADA HMI displays and functions. Contractor is responsible for coordinating PLC input and output assignments, scheduling, testing, and startup. Assist with onsite software testing to verify proper equipment operation.

1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section and other PIC subsections:
1. American National Standards Institute (ANSI).

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2. ASTM International (ASTM):
 - a. A182/A182M, Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
 - b. A276, Standard Specification for Stainless Steel Bars and Shapes.
 - c. A312/A312M, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
 - d. B32, Standard Specification for Solder Metal.
 - e. B88, Standard Specification for Seamless Copper Water Tube.
3. Deutsche Industrie-Norm (DIN): VDE 0611, Specification for modular terminal blocks for connection of copper conductors up to 1,000V ac and up to 1,200V dc.
4. Institute of Electrical and Electronics Engineers, Inc. (IEEE): C62.41, Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
5. International Society of Automation (ISA):
 - a. RP12.06.01, Recommended Practice for Wiring Methods for Hazardous (Classified) Locations Instrumentation Part 1: Intrinsic Safety.
 - b. S5.1, Instrumentation Symbols and Identification.
 - c. S5.4, Instrument Loop Diagrams.
 - d. S50.1, Compatibility of Analog Signals for Electronic Industrial Process Instruments.
 - e. TR20.00.01, Specification Forms for Process Measurement and Control Instruments, Part 1: General.
6. International Conference on Energy Conversion and Application (ICECA).
7. National Electrical Code (NEC).
8. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
 - b. ICS 1, Industrial Control and Systems General Requirements.
9. National Fire Protection Association (NFPA): 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities.
10. NSF International (NSF):
 - a. NSF/ANSI 61, Drinking Water System Components - Health Effects.
 - b. NSF/ANSI 372, Drinking Water System Components - Lead Content.
11. UL: 508A, Standard for Safety, Industrial Control Panels.

1.03 DEFINITIONS

A. Abbreviations:

1. HMI: Human-Machine Interface.
2. I&C: Instrumentation and Control.
3. I/O: Input and Output.
4. LCP: Local Control Panel.
5. MCC: Motor Control Center.
6. O&M: Operation and Maintenance.
7. P&ID: Process and Instrument Diagram.
8. PIC: Process Instrumentation and Control.
9. PLC: Programmable Logic Controller.
10. SCADA: Supervisory Control and Data Acquisition.

B. Application Software:

1. Software to provide functions unique to this Project and that are not provided by standard software alone including, but not limited to:
 - a. Configuring databases, tables, displays, historians, reports, parameter lists, ladder logic, function block, and control strategies required to implement functions unique to this Project.
 - b. Programming in any programming or scripting language.

C. Enclosure: Control panel, console, cabinet, or instrument housing.

D. Instructor Day: Eight hours of actual instruction time.

E. Rising/Falling: Define action of discrete devices about their setpoint.

1. Rising: Contacts close when an increasing process variable rises through setpoint.
2. Falling: Contacts close when a decreasing process variable falls through setpoint.

F. Signal Types:

1. Analog Signal, Current Type:
 - a. 4 mA dc to 20 mA dc signals conforming to ISA S50.1.
 - b. Unless otherwise indicated for specific PIC subsection components, use the following ISA S50.1 options:
 - 1) Transmitter Type: Number 2, two-wire.
 - 2) Transmitter Load Resistance Capacity: Class L.
 - 3) Fully isolated transmitters and receivers.

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2. Analog Signal, Voltage Type: 1V dc to 5V dc within panel where common high precision dropping resistor is used.
 3. Discrete signals, two-state logic signals using dc or 120V ac sources as indicated.
 4. Special Signals: Other types of signals used to transmit analog and digital information between field elements, transmitters, receivers, controllers, and digital devices.
- G. Standard Software: Software packages that are independent of Project on which they are used. Standard software includes system software, supervisory control, and data acquisition (SCADA) software.
1. System Software: Application independent (non-project specific) software developed by digital equipment manufacturers and software companies. Includes, but is not limited to, operating systems; network support, programming languages (C, C++, Visual C++, BASIC, and Visual Basic); Office Suites (word processor, spreadsheet, and database); e-mail; security (firewall, antivirus; spam, and spyware) debugging aids; and diagnostics.
 2. SCADA Software: Software packages independent of specific process control project on which they are used. Includes, but is not limited to, providing configuring and run-time capability for, data acquisition (I/O driver, and OPC servers), monitoring, alarming, human-machine interface, supervisory control, data collection, data retrieval, trending, report generation, control, and diagnostics.
 3. Controller Programming Software: Software packages for the configuring of PLCs and other programmable control devices.

1.04 SYSTEM DESCRIPTION

A. Design Requirements:

1. Complete detailed design of PIC components and PIC drawings, including replacement of new PLC in existing control panel.
2. Provide consistent hardware functions for PIC.
3. PIC design as shown and specified includes:
 - a. Functional requirements, performance requirements, and component specifications.
 - b. P&IDs.
 - c. Typical drawings for installation details, control panel layouts, control panel schedules, and PLC I/O module wiring diagrams.

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- B. Use a qualified PIC System Integrator for at least the following work:
1. For PIC Equipment and Ancillaries:
 - a. Completing detail design.
 - b. Submittals.
 - c. Equipment, enclosures, and ancillaries.
 - d. Instructions, details, and recommendations to, and coordination with Contractor for Certificate of Proper Installation.
 - e. Verify readiness for operation.
 - f. Verify correctness of final power and signal connections (lugging and connecting).
 - g. Adjusting and calibrating.
 - h. Starting up.
 - i. Testing and coordination of testing.
 - j. Training.
 - k. Assist Engineer with Functional Test Part 2 as defined in Article Field Quality Control.
 2. Verify following Work not by PIC System Integrator is provided:
 - a. Correct type, size, and number of signal wires with their raceways.
 - b. Correct electrical power circuits and raceways.
 - c. Correct size, type, and number of PIC-related pipes, valves, fittings, and tubes.
 - d. Correct size, type, materials, and connections of process mechanical piping for in-line primary elements.
 3. NonPIC Equipment Directly Connected to PIC Equipment:
 - a. Obtain from Contractor, manufacturers' information on installation, interface, function, and adjustment.
 - b. Coordinate with Contractor to allow required interface and operation with PIC.
 - c. For operation and control, verify installations, interfacing signal terminations, and adjustments have been completed in accordance with manufacturer's recommendations.
 - d. Test to demonstrate required interface and operation with PIC.
 - e. Examples of items in this category, but not limited to the following:
 - 1) Valve operators, position switches, and controls.
 - 2) Motor control centers.
 - 3) Adjustable speed and adjustable frequency drive systems.

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1.05 SUBMITTALS

A. Action Submittals:

1. General:
 - a. Shop Drawings, full-scaled details, wiring diagrams, catalog cuts, and descriptive literature.
 - b. Identify proposed items and options. Identify installed spares and other provisions for future work (for example, reserved panel space; unused components, wiring, and terminals).
 - c. Legends and Abbreviation Lists: Complete definition of symbols and abbreviations used on this Project (for example, engineering units, flow streams, instruments, structures, and other process items used in nameplates, legends, and data sheets).
2. Bill of Materials: List of required equipment.
 - a. Group equipment items as follows:
 - 1) PIC Components: By component identification code.
 - 2) Other Equipment: By equipment type.
 - b. Data Included:
 - 1) Equipment tag number.
 - 2) Description.
 - 3) Manufacturer, complete model number and all options not defined by model number.
 - 4) Quantity supplied.
 - 5) Component identification code where applicable.
3. Catalog Cuts:
 - a. I&C components, electrical devices, and mechanical devices:
 - 1) Catalog information, marked to identify proposed items and options.
 - 2) Descriptive literature.
 - 3) External power and signal connections.
 - 4) Scaled drawings showing exterior dimensions and locations of electrical and mechanical interfaces.
4. Component Data Sheets: Data sheets for I&C components.
 - a. Format and Level of Detail: Similar to ISA TR20.00.01.
 - b. Content:
 - 1) Specific features and configuration data for each component, including but not limited to:
 - a) Tag Number.
 - b) Component type identification code and description.
 - c) Location or service.
 - d) Service conditions.
 - e) Manufacturer and complete model number.
 - f) Size and scale range.

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- g) Setpoints.
 - h) Materials of construction.
 - i) Options included.
 - j) Power requirements.
 - k) Signal interfaces.
 - l) Name, address, and telephone number of manufacturer's local office, representative, distributor, or service facility.
5. Panel Construction Drawings (new panels and existing panels):
- a. Scale Drawings: Show dimensions and locations of panel-mounted devices, doors, louvers, subpanels, internal and external.
 - b. Bill of Materials: List devices mounted on or within panel. Include tag number, description, manufacturer, and model number.
 - c. Construction Details: NEMA rating, materials, material thickness, structural stiffeners, and brackets, lifting lugs, mounting brackets and tabs, door hinges and latches, and welding and other connection callouts and details.
 - d. Construction Notes: Finishes, wire color schemes, wire ratings, wire, terminal block numbering, and labeling scheme.
6. Panel Wiring Diagrams (new panels and existing panels):
- a. Show wiring within a panel including, but not limited to, instrumentation, control, power, and communications, and digital networks.
 - b. Objectives: For use in wiring panels, making panel connections, and future panel trouble shooting.
 - c. Diagram Type:
 - 1) Ladder or loop diagrams where applicable in a format similar to those shown on Drawings. Include devices that are mounted in or on the panel that require electrical connections.
 - 2) Schematic drawings for wiring of circuits that cannot be well represented by ladder diagrams.
 - d. Item Identification: Identify each item with attributes listed.
 - 1) Wires: Wire number and color. Cable number if part of multiconductor cable.
 - 2) Terminals: Location (enclosure number, terminal junction box number, or MCC number), terminal strip number, and terminal block number.
 - 3) Components:
 - a) Tag number, terminal numbers, and location ("FIELD", enclosure number, or MCC number).

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- b) Switching action (open or close on rising or falling process variable), setpoint value and units, and process variable description (for example, Sump Level High).
- 4) I/O Points: PLC unit number, I/O tag number, I/O address, terminal numbers, and terminal strip numbers.
- 5) Relay Coils:
 - a) Tag number and its function.
 - b) On right side of run where coil is located, list contact location by ladder number and sheet number.
Underline normally closed contacts.
- 6) Relay Contacts: Coil tag number, function, and coil location (ladder rung number and sheet number).
- 7) Analog Circuits: Terminal numbers, dc power supply connections, fused terminals with fuse size, signal cable shield connections, and shield ground.
- 8) Communications and Networks: Network type, address or node identification, port or channel number, and type of connector.
- e. Show each circuit individually. No “typical” diagrams or “typical” wire lists will be allowed.
- f. Ground wires, surge protectors, and connections.
- g. Wire and Cable Names: Show names and wire color for circuits entering and leaving a panel. Refer to Division 26, Electrical.
- 7. Installation Details: Include modifications or further details required and define installation of I&C components.
- 8. Spares, expendables, and test equipment.
- 9. Configuration Documentation:
 - a. For instruments and control devices, including Owner-Furnished valve and gate actuators:
 - 1) Complete configuration documentation for microprocessor based programmable devices.
 - 2) For each device, include list of default settings, and any changes to default settings made to accommodate project requirements.

B. Informational Submittals:

- 1. Statements of Qualification:
 - a. PIC System Integrator.
 - b. PIC System Integrator’s site representative.
 - c. Resume for each PIC System Integrator’s onsite startup and testing team member (engineers, technicians, and software/configuring personnel).

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2. Detailed Switchover Plan: For PLC-2 replacement, in accordance with Section 01 31 13, Project Coordination. The switchover plan shall account for the specified scheduling and shutdown constraints, and all requirements shown on Drawings and specified herein.
3. Operation and Maintenance Data:
 - a. In accordance with Section 01 78 23, Operation and Maintenance Data, and in addition the following:
 - 1) Provide sufficient detail to allow operation, removal, installation, adjustment, calibration, maintenance and purchasing replacements for PIC components.
 - 2) Final versions of Legend and Abbreviation Lists.
 - 3) Process and Instrumentation Diagrams: Marked up copy of revised P&ID to reflect as-built PIC design.
 - 4) Provide the following items as defined under heading Action Submittals:
 - a) Bill of materials.
 - b) Catalog cuts.
 - c) Component data sheets.
 - d) Panel construction drawings.
 - e) Panel wiring diagrams.
 - 5) Manufacturer's O&M manuals for components, electrical devices, and mechanical devices:
 - a) Content for Each O&M Manual:
 - (1) Table of Contents.
 - (2) Operations procedures.
 - (3) Installation requirements and procedures.
 - (4) Maintenance requirements and procedures.
 - (5) Troubleshooting procedures.
 - (6) Calibration procedures.
 - (7) Internal schematic and wiring diagrams.
 - (8) Component Calibration Sheets from field quality control calibrations.
 - 6) List of spares, expendables, test equipment and tools provided.
 - 7) List of additional recommended spares, expendables, test equipment, and tools.
4. Provide Manufacturer's Certificate of Proper Installation where specified.
5. Testing Related Submittals:
 - a. Functional Test:
 - 1) Preliminary Test Procedures: Outline of proposed tests, forms, and checklists.
 - 2) Final Test Procedures: Proposed test procedures, forms, and checklists.

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- 3) Test Documentation:
 - a) Copy of signed-off test results.
 - b) Completed component calibration sheets.
- b. Performance Test:
 - 1) Preliminary Test Procedures: Outline of proposed tests, forms, and checklists.
 - 2) Final Test Procedures: Proposed test procedures, forms, and checklists.
 - 3) Test Documentation: Copy of signed-off test results.
6. Owner Training Plan: In accordance with Section 01 43 33, Manufacturers' Field Services.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. PIC System Integrator: Minimum of 5 years' experience providing, integrating, installing, and starting up similar systems as required for this Project.
2. PIC System Integrator's Site Representative: Minimum of 5 years' experience installing systems similar to PIC required for this Project.

B. PIC Coordination Meetings:

1. General: Refer to Section 01 31 19, Project Meetings, for PIC coordination meetings.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. In accordance with Section 01 61 00, Common Product Requirements.
- B. Prior to shipment, include corrosive inhibitive vapor capsules in shipping containers, and related equipment as recommended by capsule manufacturer.
- C. Prior to installation, store items in dry indoor locations. Provide heating in storage areas for items subject to corrosion under damp conditions.
- D. Cover panels and other elements that are exposed to dusty construction environments.

1.08 SEQUENCING AND SCHEDULING

- A. Refer to Section 01 31 13, Project Coordination, for Contractor's scheduling requirements for applications software testing and PLC-2 replacement.

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B. Prerequisite Activities and Lead Times:

1. Do not start following key Project activities until prerequisite activities and lead times listed below have been completed and satisfied:
 - a. Shop Drawing Reviews by Engineer:
 - 1) Prerequisite: Engineer acceptance of Schedule of Values and Progress Schedule.
 - 2) Schedule: In accordance with completed schedule of Shop Drawing and Sample submittals specified in Section 01 33 00, Submittal Procedures.
 - b. Test Prerequisite: Associated test procedures Submittals completed.
 - c. Training Prerequisite: Associated training plan Submittal completed.
 - d. PLC and HMI Applications Software Configuring and Testing by Owner's Software Integrator.
 - 1) Prerequisite: PLC Input and Output assignments complete and documented.
 - 2) Duration: 6 weeks.
 - e. PLC-2 Rack 0 Installation Prerequisites:
 - 1) Existing panel site assessment complete and associated Switchover Plan completed.
 - 2) Revised drawings to existing panel submitted and approved.
 - 3) Upgrades to first two Aeration Basins complete and ready to operate from new PLC.
 - f. PLC-2 Rack 1 Installation Prerequisites:
 - 1) PLC-2 Rack 0 installation completed.
 - 2) Upgrades to final two Aeration Basins complete and ready to operate from new PLC.
 - g. Functional Test Part 1 Prerequisite: PLC installation complete.
 - h. Functional Test Part 2 Prerequisite: Functional Test Part 1 completed.
 - i. Performance Test Prerequisite: Functional Test Part 2 completed and facility started up.

1.09 EXTRA MATERIALS

- A. In computing spare parts quantities based on specified percentages, round up to nearest whole number.

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B. Spare Parts:

Description	Percent of Each Type and Size Used	No Less Than
dc power supplies	20	1
Fuses	20	5
Relays	20	3
Terminal Blocks	10	10

C. Expendables:

1. For following items, provide manufacturer's recommended 2-year supply, unless otherwise noted:
 - a. Chemical for analyzers.
 - b. Corrosion-inhibiting vapor capsules.

PART 2 PRODUCTS

2.01 GENERAL

- A. Provide PIC functions shown on Drawings and required in PIC subsections for each system and loop. Furnish equipment items required in PIC subsections. Furnish materials, equipment, and software (except for Owner provided applications software), whether indicated or not, necessary to effect required system and loop performance.
- B. First Named Manufacturer: PIC design is based on first named manufacturers of equipment, materials, and software.
 1. If an item is proposed from other than first named manufacturer, obtain approval from Engineer for such changes in accordance with the General Conditions.
 2. If proposed item requires, but not limited to, different installation, wiring, raceway, enclosures, intrinsically safe barriers, and accessories, provide such equipment and work.

C. Like Equipment Items:

1. Use products of one manufacturer and of the same series or family of models to achieve standardization for appearance, operation, maintenance, spare parts, and manufacturer's services.
2. Implement same or similar functions in same or similar manner. For example, control logic, sequence controls, and display layouts.

2.02 I&C COMPONENTS

- A. Specifications: Refer to Section 40 91 00, Instrumentation and Control Components, for specifications for I&C components.
- B. Components for Each Loop: Major components for each loop are listed in Instrument List referenced in Article Supplements. Furnish equipment that is necessary to achieve required loop performance.
- C. Control Panels: Reference Control Panel Schedule in Article Supplements.

2.03 PROGRAMMABLE LOGIC CONTROLLERS

- A. General:
 1. Reference P&IDs and Control Panel Wiring Diagrams for additional requirements.
 2. Hardware matching Owner's standard manufacturer for integration into existing Plant Control System.
- B. Programmable Logic Controller (PLC) Hardware: Owner-furnished, as specified in Section 01 64 00, Owner-Furnished Products.
- C. Existing Panel LCP-3 PLC Replacement Configuration: As shown on Drawings.

2.04 SERVICE CONDITIONS

- A. Standard Service Conditions:
 1. The following defines certain types of environments. PIC subsections refer to these definitions by name to specify the service conditions for individual equipment units. Design equipment for continuous operation in these environments:
 - a. Inside:
 - 1) Temperature: 40 degrees F to 85 degrees F.

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- 2) Relative Humidity: 10 percent to 95 percent noncondensing.
- 3) NEC Classification: Nonhazardous.
- b. Outside:
 - 1) Temperature: Minus 10 degrees F to 104 degrees F.
 - 2) Relative Humidity: 10 percent to 100 percent, rain, snow, freezing rain.
 - 3) NEC Classification: Nonhazardous.
2. Standard Service Conditions for Panels and Consoles:
 - a. Unless otherwise noted, in Instrument List and Control Panel Schedule located in Article Supplements at End of Section, design equipment for continuous operation in these environments:
 - 1) Freestanding Panel and Consoles including existing Control Panel:
 - a) Inside: NEMA 12.
 - 2) Smaller Panels and Assemblies (That Are Not Freestanding):
 - a) Inside: NEMA 12.
 - b) All Other Locations: Outside, NEMA 4X.
 - 3) Field Elements: Outside, NEMA 4X.

2.05 NAMEPLATES AND TAGS

- A. Panel Nameplates: Enclosure identification located on enclosure face.
 1. Location and Inscription: Panel description and tag number.
 2. Materials: Laminated plastic attached to panel with stainless steel screws.
 3. Letters: 1/2-inch-high, white on black background, unless otherwise noted.
- B. Component Nameplates, Back of Panel: Component identification located on or near component inside of enclosure.
 1. Inscription: Component tag number.
 2. Materials: Adhesive-backed, laminated plastic.
 3. Letters: 3/16-inch-high, white on black background, unless otherwise noted.
- C. Legend Plates for Panel Mounted Pushbuttons, Lights, and Switches.
 1. Inscription: Refer to P&IDs on Drawings.
 2. Materials: Stainless steel, keyed legend plates. Secured to panel by mounting nut for pushbutton, light, or switch.
 3. Letters: Black on gray or white background.

- D. Service Legends: Component identification nameplate located on face of component.
 - 1. Inscription: As noted or shown.
 - 2. Materials: Adhesive-backed, laminated plastic.
 - 3. Letters: 3/16-inch-high, white on black background, unless otherwise noted.

- E. Nametags: Component identification for field devices.
 - 1. Inscription: Component tag number.
 - 2. Materials: 16-gauge, Type 304 stainless steel.
 - 3. Letters: 1/4-inch-high, engraved.
 - 4. Mounting: Affix to component with 16-gauge or 18-gauge stainless steel wire or stainless steel screws.

2.06 MECHANICAL SYSTEM COMPONENTS

- A. Reference Section 40 91 00, Instrumentation and Control Components.

2.07 FUNCTIONAL REQUIREMENTS FOR CONTROL LOOPS

- A. Shown on Drawings, in panel control diagrams, and Process and Instrumentation Diagrams (P&ID). P&ID format and symbols are in accordance with ISA S5.1, except as specified or shown on Drawings.
- B. Supplemented by Control Loop Descriptions that describe requirements not obvious on P&IDs or panel control diagrams.
- C. Supplemented by standard functional requirements in PIC subsections.

2.08 CONTROL LOOP DESCRIPTIONS

- A. See Article Supplements located at End of Section.
- B. Organization: By unit process and loop number.
- C. Loop Subheadings:
 - 1. Local: Clarifies functional performance of loop for local and hardwired control, for example in MCCs and control panels.
 - 2. Auto: Specifies nonstandard PLC functions.
 - 3. HMI: Specifies nonstandard HMI functions.

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2.09 ELECTRICAL REQUIREMENTS

- A. Electrical Raceways: As specified in Section 26 05 01, Electrical.
- B. Wiring External to PIC Equipment:
 - 1. Special Control and Communications Cable: Provided by PIC System Integrator as noted in Component Specifications and PIC subsections.
 - 2. Other Wiring and Cable: As specified in Section 26 05 01, Electrical.
- C. I&C and electrical components, terminals, wires, and enclosures UL recognized or UL listed.
- D. Wires within Enclosures:
 - 1. ac Circuits:
 - a. Type: 600-volt, Type MTW stranded copper.
 - b. Size: For current to be carried, but not less than No. 18 AWG.
 - 2. Analog Signal Circuits:
 - a. Type: 600-volt stranded copper, twisted shielded pairs or triad with a 100 percent, aluminum-polyester shield, rated 60 degrees C.
 - b. Panels with Circuits Less Than 600 Volts: Rated at 600 volts. Belden No. 18 AWG Type 9341, Triad Beldon No. 1121A.
 - c. Size: No. 18 AWG, minimum.
 - 3. Other dc Circuits.
 - a. Type: 600-volt, Type MTW stranded copper.
 - b. Size: For current carried, but not less than No. 18 AWG.
 - 4. Special Signal Circuits: Use manufacturer's standard cables.
 - 5. Wire Identification: Numbered and tagged at each termination.
 - a. Wire Tags: Machine printed, heat shrink.
 - b. Manufacturers:
 - 1) Brady Perma Sleev.
 - 2) Tyco Electronics.
- E. Terminate and identify wires entering or leaving enclosures as follows:
 - 1. Analog and discrete signal, terminate at numbered terminal blocks.
 - 2. Special signals terminated using manufacturer's standard connectors.
 - 3. Identify wiring in accordance with requirements in Section 26 05 01, Electrical.

F. Terminal Blocks for Enclosures:

1. Quantity:
 - a. Accommodate present and spare indicated needs.
 - b. Wire spare PLC I/O points to terminal blocks.
 - c. One wire per terminal for field wires entering enclosures.
 - d. Maximum of two wires per terminal for internal enclosure wiring.
 - e. Spare Terminals: 10 percent of connected terminals.
2. Terminal Block Types: Reference Section 40 91 00, Instrumentation and Control Components, Part 2, Article Electrical Components.

G. Grounding of Enclosures:

1. Provide grounding terminals for signal and shield ground connections.
2. Ground equipment in accordance with National Electrical Code requirements.
3. Single Point Ground for Each Analog Loop:
 - a. Locate shield ground at same panel as loop power source.
 - b. Use to ground wire shields for loop.
 - c. Group and ground wire shields in following locations:
 - 1) LCP-3.
4. Ground terminal block rails.

H. Analog Signal Isolators:

1. Furnish signal isolation for analog signals that are sent from one enclosure to another.
2. Do not wire in series instruments on different panels, cabinets, or enclosures.

I. Wiring Interface: Terminate and identify wiring entering or leaving enclosures.

1. Analog and Discrete Signal Wires: Terminate at numbered terminal blocks matching approved wiring diagrams.
2. Wiring for Special Signals: Terminate communications, digital data, and multiplexed signals using manufacturer's standard connectors for the device to which the signals terminate.

J. Electrical Transient Protection:

1. General:
 - a. Function: Protect elements of PIC against damage due to electrical transients induced in interconnecting lines by lightning and nearby electrical systems.

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- b. Provide, install, coordinate, and inspect grounding of surge suppressors at: Connection of ac power to PIC control panels.
2. Surge Suppressor Types: Reference Section 40 91 00, Instrumentation and Control Components, Part 2, Paragraph Surge Suppressors.
3. Installation and Grounding of Suppressors: Grounding equipment, installation of grounding equipment, and terminations for field mounted devices are provided under Division 26, Electrical.

2.10 PANEL FABRICATION

A. General:

1. Nominal Panel Dimensions: Reuse Existing Panel LCP-3.
2. Equipment Arrangements: Refer to Drawings.
3. Panel Construction and Interior Wiring: In accordance with the National Electrical Code (NEC), state and local codes, and applicable sections of NEMA, ANSI, UL, and ICECA.
4. Fabricate PLC hardware on rack with wiring harness on each I/O module, at PIC System Integrator's facility. Prepare PLC as much as possible prior to decommissioning and removal of existing PLC, to minimize downtime during PLC replacement.
5. Electrical Work: In accordance with the applicable requirements of Division 26, Electrical.

B. Freestanding Panel Construction:

1. Materials:
 - a. Sheet steel, unless otherwise shown on Drawings.
 - b. Minimum Thickness: 10-gauge, unless otherwise noted.
2. Panel Front:
 - a. Fabricated from a single piece of sheet steel, unless otherwise shown on Drawings.
 - b. No seams or bolt heads visible when viewed from front.
 - c. Panel Cutouts: Smoothly finished with rounded edges.
 - d. Stiffeners: Steel angle or plate stiffeners or both on back of panel face to prevent panel deflection under instrument loading or operation.
3. Internal Framework:
 - a. Structural steel for instrument support and panel bracing.
 - b. Permit panel lifting without racking or distortion.
4. Lifting rings to allow simple, safe rigging and lifting of panel during installation.
5. Adjacent Panels: Securely bolted together so front faces are parallel.

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6. Door:
 - a. Full height, fully gasketed access door where shown on Drawings.
 - b. Latch: Three-point, Southco Type 44.
 - c. Handle: "D" ring, foldable type.
 - d. Hinges: Full-length, continuous, piano-type, steel hinges with stainless steel pins.
 - e. Rear Access: Extend no further than 24 inches beyond panel when opened to 90-degree position.
 - f. Front and Side Access Doors: As shown on Drawings.

- C. Nonfreestanding Panel Construction:
 1. Based on environmental design requirements, provide the following unless otherwise noted:
 - a. Panels listed as inside, air conditioned:
 - 1) Enclosure Type: NEMA 12.
 - 2) Materials: Steel.
 - b. Other Panels:
 - 1) Enclosure Type: NEMA 4X.
 - 2) Materials: Type 316 stainless steel.
 2. Metal Thickness: 14-gauge, minimum.
 3. Doors:
 - a. Rubber-gasketed with continuous hinge.
 - b. Stainless steel lockable quick-release clamps.
 4. Manufacturers:
 - a. Hoffman Engineering Co.
 - b. H. F. Cox.

- D. Breather and Drains:
 1. Furnish with NEMA 250, Type 4 and Type 4X panels:
 - a. Manufacturer and Product: Cooper Crouse-Hinds; ECD Type 4X Drain and Breather; Drain Model ECD1-N4D, Breather Model ECD1-N4B.

- E. Control Panel Electrical:
 1. Power Distribution within Panels:
 - a. Feeder Circuits:
 - 1) One or more 120V ac, 60-Hz feeder circuits as shown on Drawings.
 - 2) Make provisions for feeder circuit conduit entry.
 - 3) Furnish terminal block for termination of wires.

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- b. Power Distribution: Furnish main circuit breaker and circuit breaker on each individual branch circuit distributed from power panel.
 - 1) Locate to provide clear view of and access to breakers when door is open.
 - 2) Breaker Sizes: Coordinate such that fault in branch circuit will trip only branch breaker, but not trip main breaker.
 - a) Branch Circuit Breakers: 15 amps at 250V ac.
 - c. Circuit Wiring:
 - 1) P&IDs and Control Diagrams on Drawings show wiring diagrams that use the following rules for circuit wiring:
 - a) Devices on Single Circuit: 20, maximum.
 - b) Multiple Units Performing Parallel Operations: To prevent failure of any single branch circuit from shutting down entire operation, do not group all units on same branch circuit.
 - c) Branch Circuit Loading: 12 amperes continuous, maximum.
 - d) Panel Lighting and Service Outlets: Put on separate 15 amp, 120V ac branch circuit.
 - e) Provide 120V ac plugmold for panel components with line cords.
2. Signal Distribution:
- a. Signal Wiring: Separate analog signal cables from power and control within a panel and cross at right angles where crossing is necessary.
 - b. Isolated 4 mA dc to 20 mA dc only.
 - c. Signal Wiring: Twisted shielded pairs.
3. Relay Types: Reference Section 40 91 00, Instrumentation and Control Components, Part 2, Article Electrical Components.
4. Internal Panel Lights for Freestanding Panels:
- a. Type: Switched 40-watt fluorescent or LED back-of-panel lights.
 - b. Quantity: One light for every 4 feet of panel width.
 - c. Mounting: Inside and in the top of back-of-panel area.
5. Service Outlets for Freestanding Panels:
- a. Type: Three-wire, 120-volt, 15-ampere, GFCI GFCI duplex receptacles.
 - b. Quantity: One per panel.
 - c. Mounting: Evenly spaced along back-of-panel area.
6. Standard Pushbutton Colors and Inscriptions:
- a. Use following unless otherwise noted in Instrument List:
 - 1) EMERGENCY STOP: Red.
 - 2) All Others: Black.

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7. Standard Light Colors and Inscriptions:
 a. Use following color code and inscriptions for service legends and lens colors for indicating lights, unless otherwise noted in Instrument List:

Tag Function	Inscription(s)	Color
ON	ON	Red
OFF	OFF	Green
OPEN	OPEN	Red
CLOSED	CLOSED	Green
LOW	LOW	Amber
FAIL	FAIL	Amber
HIGH	HIGH	Amber

F. PIC Enclosure Internal Wiring:

1. Work in existing control panels to match existing wiring conventions.
2. Restrain by plastic ties or ducts or metal raceways.
3. Hinge Wiring: Secure at each end so bending or twisting will be around longitudinal axis of wire. Protect bend area with sleeve.
4. Arrange wiring neatly, cut to proper length, and remove surplus wire.
5. Provide abrasion protection for wire bundles that pass through holes or across edges of sheet metal.
6. Connections to Screw Type Terminals:
 - a. Locking-fork-tongue or ring-tongue lugs.
 - b. Use manufacturer's recommended tool with required sized anvil to make crimp lug terminations.
 - c. Wires terminated in a crimp lug, maximum of one.
 - d. Lugs installed on a screw terminal, maximum of two.
7. Connections to Compression Clamp Type Terminals:
 - a. Strip, prepare, and install wires in accordance with terminal manufacturer's recommendations.
 - b. Wires installed in a compression screw and clamp, maximum of one for field wires entering enclosure, otherwise maximum of two.
8. Splicing and tapping of wires, allowed only at device terminals or terminal blocks.
9. Terminate 24V dc and analog signal circuits on separate terminal block from ac circuit terminal blocks.

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10. Separate analog and dc circuits by at least 4 inches from ac power and control wiring, except at unavoidable crossover points and at device terminations.
 11. Arrange wiring to allow access for testing, removal, and maintenance of circuits and components.
 12. Plastic Wire Duct Fill: Do not exceed manufacturer's recommendations.
 13. Conductors Carrying Foreign Voltages within a Panel:
 - a. Route foreign voltage conductors into panel and land on a circuit blade disconnect type terminal block.
 - b. Use wire with yellow (ac) or purple (dc) insulation to identify foreign voltage circuits within panel from terminal block on. Do not use wires with pink insulation for any other purpose.
 14. Harness Wiring:
 - a. 120V ac: No. 14 AWG, MTW.
 - b. 24V dc: No. 16 AWG, MTW where individual conductors are used and Type TC shielded tray cable where shielded wire is used.
 - c. 4 mA to 20 mA Analog Signals: No. 18 twisted-shielded pair cable with tinned drain wire.
 15. Plastic Wire Ducts Color:
 - a. 120V ac: White.
 - b. 24V dc: Gray.
 - c. Communications Cables and Fiber Optic Jumpers: Orange.
 16. Provide a communications plastic wire duct for communications cables and fiber optic cables between the communications devices in control panel and communications raceways. Design plastic wire duct design to take into account the minimum bending radius of the communications cable.
 17. Make plastic wire ducts the same depth.
 18. Provide a minimum of 1-1/2 inches between plastic wire ducts and terminal blocks.
- G. Factory Finishing:
1. Furnish materials and equipment with manufacturer's standard finish system in accordance with Section 09 90 00, Painting and Coating.
 2. Use specific color if indicated. Otherwise use manufacturer's standard finish color, or light gray if manufacturer has no standard color.
 3. Stainless Steel and Aluminum: Not painted.
 4. Nonmetallic Panels: Not painted.
 5. Steel Panels: Painted, Manufacturer's standard color.

2.11 CORROSION PROTECTION

A. Corrosion-Inhibiting Vapor Capsules:

1. Areas Where Required: Refer to Part 3, Article Protection.
2. Manufacturers and Products:
 - a. Northern Instruments; Model Zerust VC.
 - b. Hoffmann Engineering; Model A-HCI.

2.12 SOURCE QUALITY CONTROL

A. General:

1. Engineer may actively participate in many of the tests.
2. Engineer reserves right to test or retest specified functions.
3. Engineer's decision will be final regarding acceptability and completeness of testing.
4. Procedures, Forms, and Checklists:
 - a. Except for Unwitnessed Factory Test, conduct tests in accordance with, and documented on, Engineer accepted procedures, forms, and checklists.
 - b. Describe each test item to be performed.
 - c. Have space after each test item description for sign off by appropriate party after satisfactory completion.
5. Required Test Documentation: Test procedures, forms, and checklists signed by Engineer and Contractor.
6. Conducting Tests:
 - a. Provide special testing materials and equipment.
 - b. Wherever possible, perform tests using actual process variables, equipment, and data.
 - c. If not practical to test with real process variables, equipment, and data provide suitable means of simulation.
 - d. Define simulation techniques in test procedures.
 - e. Test Format: Cause and effect.
 - 1) Person conducting test initiates an input (cause).
 - 2) Specific test requirement is satisfied if correct result (effect), occurs.

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PART 3 EXECUTION

3.01 EXAMINATION

- A. For equipment not provided by PIC System Integrator, but that directly interfaces with PIC, verify the following conditions:
 - 1. Proper installation.
 - 2. Calibration and adjustment of positioners and I/P transducers.
 - 3. Correct control action.
 - 4. Switch settings and dead bands.
 - 5. Opening and closing speeds and travel stops.
 - 6. Input and output signals.

3.02 INSTALLATION

- A. Material and Equipment Installation: Follow manufacturers' installation instructions, unless otherwise indicated or directed by Engineer.
- B. Wiring connected to PIC components and assemblies, including power wiring in accordance with requirements in Section 26 05 01, Electrical.
- C. Electrical Raceways: As specified in Section 26 05 01, Electrical.
- D. Mechanical Systems:
 - 1. Copper and Stainless Steel Tubing Support: Continuously supported by aluminum tubing raceway system.
 - 2. Plastic Tubing Support: Except as shown on Drawings, provide continuous support in conduit or by aluminum tubing raceway system.
 - 3. Install conduit for plastic tubing and tubing raceways parallel with, or at right angles to, structural members of buildings. Make vertical runs straight and plumb.
 - 4. Tubing and Conduit Bends:
 - a. Tool-formed without flattening, and of same radius.
 - b. Bend Radius: Equal to or larger than conduit and tubing manufacturer's recommended minimum bend radius.
 - c. Slope instrument connection tubing in accordance with installation details.
 - d. Do not run liquid filled instrument tubing immediately over or within a 3-foot plan view clearance of electrical panels, motor starters, or mechanical mounting panel without additional protection. Where tubing must be located in these zones, shield electrical device to prevent water access to electrical equipment.

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- e. Straighten coiled tubing by unrolling on flat surface. Do not pull to straighten.
 - f. Cut tubing square with sharp tubing cutter. Deburr cuts and remove chips. Do not gouge or scratch surface of tubing.
 - g. Blow debris from inside of tubing.
 - h. Make up and install fittings in accordance with manufacturer's recommendations. Verify make up of tube fittings with manufacturer's inspection gauge.
 - i. Use lubricating compound or TFE tape on stainless steel threads to prevent seizing or galling.
 - j. Run tubing to allow but not limited to, clear access to doors, controls, and control panels; and to allow for easy removal of equipment.
 - k. Provide separate support for components in tubing runs.
 - l. Supply expansion loops and use adapters at pipe, valve, or component connections for proper orientation of fitting.
 - m. Keep tubing and conduit runs at least 12 inches from hot pipes.
 - n. Locate and install tubing raceways in accordance with manufacturer's recommendations. Locate tubing to prevent spillage, overflow, or dirt from above.
 - o. Securely attach tubing raceways to building structural members.
5. Enclosure Lifting Rings: Remove rings following installation and plug holes.

E. Field Finishing: Refer to Section 09 90 00, Painting and Coating.

3.03 FIELD QUALITY CONTROL

A. General:

- 1. Coordinate PIC testing with Owner and affected Subcontractors.
- 2. Notify Engineer of Performance Test schedule 4 weeks prior to start of test.
- 3. Engineer may actively participate in tests.
- 4. Engineer reserves right to test or retest specified functions.
- 5. Engineer's decision will be final regarding acceptability and completeness of testing.

B. Onsite Supervision:

- 1. Require PIC System Integrator to observe PIC equipment installation to extent required in order to provide Certificates of Proper Installation.

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2. Require PIC site representative to supervise and coordinate onsite PIC activities.
 3. Require PIC site representative to be onsite while onsite work covered by this section and PIC subsystems is in progress.
- C. Leak Tests: During Functional Test Part 1, conduct leak tests in accordance with Section 40 80 01, Process Piping Leakage Testing.
- D. Testing Sequence:
1. Provide Functional Tests and Performance Tests for facilities as required to support staged construction and startup of plant.
 2. Refer to Section 01 31 13, Project Coordination, for project constraints and sequencing.
 3. Refer to Section 01 91 14, Equipment Testing and Facility Startup, for overall testing requirements.
 4. Completion: When tests (except Functional Test) have been completed and required test documentation has been accepted.
- E. Testing:
1. Prior to Facility Startup and Performance Evaluation period for each facility, inspect, test, and document that associated PIC equipment is ready for operation. Divide Functional Test for each facility into two parts.
 2. Functional Test Part 1: Performed by Contractor, PIC System Integrator, and Engineer, to test and document PIC, excluding Owner-provided applications software, is ready for operation.
 - a. Loop/Component Inspections and Tests:
 - 1) These inspections and tests do not require witnessing.
 - 2) Check PIC for proper installation, calibration, and adjustment on loop-by-loop and component-by-component basis.
 - 3) Provide space on forms for signoff by PIC System Integrator.
 - 4) Use loop status report to organize and track inspection, adjustment, and calibration of each loop and include the following:
 - a) Project name.
 - b) Loop number.
 - c) Tag number for each component.
 - d) Checkoffs/Signoffs for Each Component:
 - (1) Tag/identification.
 - (2) Installation.

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- (3) Termination wiring.
 - (4) Termination tubing.
 - (5) Calibration/adjustment.
 - e) Checkoffs/Signoffs for the Loop:
 - (1) Panel interface terminations.
 - (2) I/O interface terminations with PLCs.
 - f) I/O Signals for PLCs are Operational: Received/sent, processed, adjusted.
 - g) Total loop operational.
 - h) Space for comments.
- 5) Component calibration sheet for each active I&C component (except simple hand switches, lights, gauges, and similar items) and each PLC I/O module and include the following:
 - a) Project name.
 - b) Loop number.
 - c) Component tag number or I/O module number.
 - d) Component code number for I&C elements.
 - e) Manufacturer for I&C elements.
 - f) Model number/serial number for I&C elements.
 - g) Summary of Functional Requirements; For Example:
 - (1) Indicators scale ranges.
 - (2) Transmitters/converters, input, and output ranges.
 - (3) Switching elements, unit range, differential (fixed or adjustable), reset (AUTO or MANUAL).
 - (4) I/O Modules: Input or output.
 - h) Calibrations, for example, but not limited to:
 - (1) Analog Devices: Actual inputs and outputs at 0, 10, 50, and 100 percent of span, rising and falling.
 - (2) Discrete Devices: Actual trip points and reset points.
 - (3) I/O Modules: Actual inputs or outputs of 0, 10, 50, and 100 percent of span, rising and falling.
 - (4) Space for comments.
- b. Maintain loop status reports, valve adjustment sheets, and component calibration sheets at Site, and make them available to Engineer at all times.
- c. Forms: See Loop Status Report, Instrument Calibration Sheet, and I&C Valve Adjustment Sheet referenced in Article Supplements.

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3. Functional Test Part 2: Combined effort between Contractor, PIC System Integrator, Engineer, and Owner's Software Integrator to confirm PIC, including applications software, is ready for operation.
 - a. Prerequisite: Completion of Functional Test Part 1.
 - b. Joint test with Owner's Software Integrator. Test using real field sensors and equipment. Plant interlocking and communications with PLCs and HMI tested on loop-by-loop basis.
 - c. Test procedures provided by Owner's Software Integrator based on Functional Test Part 1 and on factory application software tests.
 - d. Completed when Functional Test has been conducted and Engineer has spot-checked associated test forms and checklists in field.
4. Functional Test:
 - a. Scope: Confirm PIC, including applications software, is ready for operation.
 - b. Completed when Functional Test has been conducted and Engineer has spot-checked associated test forms and checklists in field.
5. Required Test Documentation: Test procedures, forms, and checklists. Signed by Engineer and Contractor except for Functional Test items signed only by Contractor.

F. Performance Test During and After Facility Startup:

1. Once a facility's Functional Test has been completed and that facility has been started up, perform jointly with Owner's Software Integrator Performance Test on associated PIC equipment to demonstrate that it is operating as required by Contract Documents. Demonstrate each required function on a loop-by-loop basis.
2. Entire installed PIC tested using actual process variables and functions demonstrated.
3. Perform local and manual tests for each loop before proceeding to remote and automatic modes.
4. Where possible, verify test results using visual confirmation of process equipment and actual process variable. Unless otherwise directed, exercise and observe devices supplied by others, as needed to verify correct signals to and from such devices and to confirm overall system functionality. Test verification by means of disconnecting wires or measuring signal levels is acceptable only where direct operation of plant equipment is not possible.
5. Make updated versions of documentation required for Performance Test available to Engineer at Site, both before and during tests.

6. Make O&M data available to Engineer at Site both before and during testing.
7. Determination of Ready for Operation: When Performance Testing has been completed.
8. Refer to examples of Performance Test procedures and forms in Article Supplements.

3.04 MANUFACTURER'S SERVICES

- A. Manufacturer's Representative: As required by each PIC subsection.
- B. Specialty Equipment: For certain components or systems provided under this section, but not manufactured by PIC System Integrator, provide services of qualified manufacturer's representative during installation, startup, demonstration testing, and training. Provide original equipment manufacturer's services for air flow meters.
- C. See Section 01 43 33, Manufacturers' Field Services and Section 01 91 14, Equipment Testing and Facility Startup.

3.05 TRAINING

- A. General:
 1. Provide an integrated training program for Owner's personnel.
 2. Perform training to meet specific needs of Owner's personnel.
 3. Include training sessions, classroom, and field, for administrators, operators, and maintenance personnel.
 4. Provide instruction on one working shift(s) as needed to accommodate the Owner's personnel schedule.
 5. Owner reserves the right to reuse videotapes of training sessions.
- B. Operations and Maintenance Training:
 1. General:
 - a. Include review of O&M data.
 - b. Use equipment similar to that provided.
 2. Operations Training: For Owner's operations personnel on operation of I&C components.
 - a. Training Session Duration: One instructor day.
 - b. Number of Training Sessions: One.
 - c. Location: Project Site.
 - d. Course Objective: Develop skills needed to use I&C components and functions to monitor and control the plant on a day-to-day basis.

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- e. Content: Conduct training on loop-by-loop basis.
 - 1) Loop Functions: Understanding of loop functions.
 - 2) Loop Operation: For example, LOCAL/REMOTE control transfer, LOCAL and REMOTE control, and alarm resetting.
- 3. Maintenance Training:
 - a. Training Session Duration: One instructor day.
 - b. Number of Training Sessions: One.
 - c. Location: Project Site.
 - d. Provide training suitable for instrument technicians with at least a 2-year associate engineering or technical degree, or equivalent education and experience in electronics, instrumentation, or digital systems.
 - e. Course Objective: Develop skills needed for routine maintenance of PIC.
 - f. Content: Provide training for each type of component and function provided.
 - 1) Loop Functions: Understanding details of each loop and how they function.
 - 2) Component calibration.
 - 3) Adjustments: For example, switch trip points, automatic instrument cleaning scheduling, and similar items.
 - 4) Troubleshooting and diagnosis for equipment and software.
 - 5) Replacing lamps, chart paper, and fuses.
 - 6) I&C components removal and replacement.
 - 7) Periodic preventive maintenance.

3.06 CLEANING

- A. Upon completion of Work, remove materials, scraps, and debris from interior and exterior of equipment.

3.07 PROTECTION

- A. Use corrosion-inhibiting vapor capsules in enclosures to protect electrical, instrumentation, and control devices, including spare parts, from corrosion.
- B. Periodically replace capsules based on capsule manufacturer's recommendations.

3.08 SUPPLEMENTS

- A. Supplements listed below, follows “End of Section,” are part of this Specification.
1. Control Panel Schedule.
 2. Preparation for Testing and Functional Test Forms:
 - a. Loop Status Report: Each sheet shows status of instruments on a loop. Also, gives functional description for loop.
 - b. Instrument Calibration Sheet: Shows details on each instrument (except simple hand switches, lights, and similar items).
 - c. I&C Valve Adjustment Sheet: Shows details for installation, adjustment, and calibration of a given valve.
 3. Performance Test Sheet: Describe Performance Test for a given loop.
 - a. List requirements of the loop.
 - b. Briefly describe test.
 - c. Cite expected results.
 - d. Provide space for checkoff by witness.
 4. Instrument List.
 5. Control Loop Descriptions:
 - a. Aeration Basin Gates.
 - b. Aeration Basin Air Distribution.
 - c. Aeration Basin Effluent Level.

END OF SECTION

KELLOGG CREEK WRRF
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CONTROL PANEL SCHEDULE

Panel No.	Service	Mounting	NEMA	Dimensions			FDT	Space Heater	Serv. Lights, Outlets	Environment	SS
				H	W	D					
LCP-3	Existing at Aeration Basins	Freestanding	12	72	48	24	No			Inside	
Column Descriptions: FDT: Factory Demonstration test required. Dimensions: Maximum space available for panel. SS: Stainless Steel.											

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JACOBS

LOOP STATUS REPORT—EXAMPLE FORMAT

Rev.06.05.92

Project Name: <i>Newport News WTP</i>						Project No. <i>WDC23456.C1</i>	
FUNCTIONAL REQUIREMENTS:							
<i>1. Measure, locally indicate, and transmit RAS flow to LP-10.</i>							
<i>2. At LP-10 indicate flow and provide flow control by modulation of FCV-10-2.</i>							
<i>3. Provide high RAS flow alarm on LP-10.</i>							
COMPONENT STATUS (Check and initial each item when complete)							
Tag Number	Delivered	Tag ID Checked	Installation	Termination Wiring	Termination Tubing	Calibration	
<i>FE/FIT-10-2</i>	<i>Jan-12-90 DWM</i>	<i>Jan-12-90 DWM</i>	<i>Feb-7-90 DWM</i>	<i>Mar-5-90 DWM</i>	<i>N.A.</i>	<i>May-6-90 VDA</i>	
<i>FIC-10-2</i>	<i>Jan-12-90 DWM</i>	<i>Jan-12-90 DWM</i>	<i>Mar-5-90 DWM</i>	<i>Apr-4-90 DWM</i>		<i>May-4-90 VDA</i>	
<i>FSH-10-2</i>	<i>Jan-12-90 DWM</i>	<i>Jan-12-90 DWM</i>	<i>Mar-5-90 DWM</i>	<i>Apr-4-90 DWM</i>		<i>May-7-90 VDA</i>	
<i>FAH-10-2</i>	<i>Jan-12-90 DWM</i>	<i>Jan-12-90 DWM</i>	<i>Mar-5-90 DWM</i>	<i>Apr-4-90 DWM</i>		<i>May-7-90 VDA</i>	
<i>FCV-10-2</i>	<i>Mar-2-90 DWM</i>	<i>Mar-2-90 DWM</i>	<i>Apr-20-90 DWM</i>	<i>Apr-30-90 DWM</i>		<i>May-16-90 VDA</i>	
REMARKS: None.							
Loop Ready for Operation			By: <i>D.W. Munzer</i>		Date: <i>May-18-90</i>		Loop No.: <i>10-2</i>

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JACOBS

I&C VALVE ADJUSTMENT SHEET—EXAMPLE

Rev.06.05.92

PARTS	Project Name: <i>SFO SEWPCP</i>		Project Number: <i>SFO10145.G2</i>		
Body	Type: <i>Vee-Ball</i>		Mfr: <i>Fisher Controls</i>		
	Size: <i>4-inch</i>		Model: <i>1049763-2</i>		
	Line Connection: <i>159 # ANSI Flanges</i>		Serial #: <i>1003220</i>		
Operator	Type: <i>Pneumatic Diaphragm</i>		Mfr: <i>Fisher Controls</i>		
	Action: <i>Linear – Modulated</i>		Model: <i>4060D</i>		
	Travel: <i>3-inch</i>		Serial #: <i>2007330</i>		
Positioner	Input Signal: <i>3-15 psi</i>		Mfr: <i>Fisher Controls</i>		
	Action: <i>Direct - air to open</i>		Model: <i>20472T</i>		
	Cam: <i>Equal percentage</i>		Serial #: <i>102010</i>		
Pilot Solenoid	Action:		Mfr:		
	Rating: <i>None</i>		Model:	Serial #:	
I/P Converter	Input: <i>4-20 mA dc</i>		Mfr: <i>Taylor</i>		
	Output: <i>3-15 psi</i>		Model: <i>10-T-576-3</i>		
	Action: <i>Direct</i>		Serial #: <i>1057-330</i>		
Position Switch	Settings: <i>Closed / Open 5 deg, rising</i>		Mfr: <i>National Switch</i>		
	Contacts: <i>Close / Close</i>		Model: <i>1049-67-3</i>		
			Serial #: <i>156 & 157</i>		
Power Supply	Type: <i>Pneumatic</i>		Air Set Mfr: <i>Air Products</i>		
	Potential: <i>40 psi</i>		Model: <i>3210D</i>		
			Serial #: <i>1107063</i>		
ADJUSTMENTS	Initial	Date	VERIFICATION	Initial	Date
Air Set	<i>JDS</i>	<i>Jun-06-92</i>	Valve Action	<i>JDS</i>	<i>Jun-03-92</i>
Positioner	<i>JDS</i>	<i>Jun-06-92</i>	Installation	<i>JDS</i>	<i>Jun-03-92</i>
Position Switches	<i>JDS</i>	<i>Jun-06-92</i>	Wire Connection	<i>JDS</i>	<i>Jun-04-92</i>
I/P Converter	<i>JDS</i>	<i>Jun-07-92</i>	Tube Connection	<i>JDS</i>	<i>Jun-04-92</i>
Actual Speed	<i>JDS</i>	<i>Jun-07-92</i>			
REMARKS: <i>Valve was initially installed backwards.</i>				Valve Ready for Start-up	
<i>Observed to be correctly installed May-25-92</i>				By: <i>J.D. Sewell</i>	
				Date: <i>Jun-07-92</i>	
				Tag No.: <i>FCV-10-2-1</i>	

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JACOBS PERFORMANCE TEST SHEET - EXAMPLE Rev.06.05.92

Project Name: <i>SFO SEWPCP Plant Expansion</i>		Project No.: <i>SFO12345.C1</i>	
Demonstration test(s): For each functional Requirement of the loop: (a) List and number the requirement. (b) Briefly describe the demonstration test. (c) Cite the results that will verify the required performance. (d) Provide space for signoff.			
<i>1. MEASURE EFFLUENT FLOW</i>			
<i>1.a With no flow, water level over weir should be zero and</i>			
<i>FIT indicator should read zero.</i>		<i>Jun-20-92 BDG</i>	
<i>2. FLOW INDICATION AND TRANSMISSION TO LP & CCS</i>			
<i>With flow, water level and FIT indicator should be related by expression</i>			
<i>$Q(\text{MGD}) = 429 \cdot H^{2/3}$ ($H = \text{height in inches of water over weir}$).</i>			
<i>Vary H and observe that following.</i>			
<i>2.a Reading of FIT indicator.</i>		<i>Jun-6-92 BDG</i>	
<i>2.b Reading is transmitted to FI on LP-521-1</i>		<i>Jun-6-92 BDG</i>	
<i>2.c Reading is transmitted and displayed to CCS.</i>		<i>Jun-6-92 BDG</i>	
<i>H(measured)</i>	<i>0</i>	<i>5</i>	<i>10</i> <i>15</i>
<i>Q(computed)</i>	<i>0</i>	<i>47.96</i>	<i>135.7</i> <i>251.7</i>
<i>Q(FIT indicator)</i>	<i>0</i>	<i>48.1</i>	<i>137</i> <i>253</i>
<i>Q(LI on LP-521-1)</i>	<i>0</i>	<i>48.2</i>	<i>138</i> <i>254</i>
<i>Q(display by CCS)</i>	<i>0</i>	<i>48.1</i>	<i>136.2</i> <i>252.4</i>
Forms/Sheets Verified	By	Date	Loop Accepted By Owner
Loop Status Report	<i>J.D. Sewell</i>	<i>May-18-92</i>	By: <i>J.D. Smith</i>
Instrument Calibration Sheet	<i>J.D. Sewell</i>	<i>May-18-92</i>	Date: <i>Jun-6-92</i>
I&C Valve Calibration Sheet	<i>N.A.</i>		
Performance Test	By	Date	
Performed	<i>J. Blow MPSDC Co.</i>	<i>Jun-6-92</i>	
Witnessed	<i>B. DeGlanville</i>	<i>Jun-6-92</i>	Loop No.: <i>30-12</i>

INSTRUMENT LIST

LOOP DESCRIPTION	TAG NUMBER	INSTRUMENT DESCRIPTION	P&ID	NOTES	DETAIL
AERATION BASIN 1 ZONE 1 DISSOLVED OXYGEN	AE-6001-1	A20 Dissolved Oxygen Element, Luminescent	N-101	Range: 0.0 - 3.0 mg/L	
AERATION BASIN 1 ZONE 2 DISSOLVED OXYGEN	AE-6001-2	A20 Dissolved Oxygen Element, Luminescent	N-101	Range: 0.0 - 3.0 mg/L	
AERATION BASIN 1 ZONE 3 DISSOLVED OXYGEN	AE-6001-3	A20 Dissolved Oxygen Element, Luminescent	N-101	Range: 0.0 - 3.0 mg/L	
AERATION BASIN 1 ZONE 4 DISSOLVED OXYGEN	AE-6001-4	A20 Dissolved Oxygen Element, Luminescent	N-101	Range: 0.0 - 3.0 mg/L	
AERATION BASIN 1 DISSOLVED OXYGEN	AIT-6001	A150 Analytical Indicating Transmitter, Multi-Channel	N-101	Function: Dissolved Oxygen Channel Count: Four	
AERATION BASIN 1 ZONE 1 AIR FLOW	FIT-6001-1	F51 Flow Element and Transmitter, Thermal Mass	N-101	Pipe Size: 8 inch Range: 0 - 1200 scfm	
AERATION BASIN 1 ZONE 2 AIR FLOW	FIT-6001-2	F51 Flow Element and Transmitter, Thermal Mass	N-101	Pipe Size: 6 inch Range: 0 - 800 scfm	
AERATION BASIN 1 ZONE 3 AIR FLOW	FIT-6001-3	F51 Flow Element and Transmitter, Thermal Mass	N-101	Pipe Size: 6 inch Range: 0 - 800 scfm	
AERATION BASIN 1 ZONE 4 AIR FLOW	FIT-6001-4	F51 Flow Element and Transmitter, Thermal Mass	N-101	Pipe Size: 6 inch Range: 0 - 800 scfm	

KELLOGG CREEK WRRF
AERATION BASIN IMPROVEMENTS

INSTRUMENT LIST

LOOP DESCRIPTION	TAG NUMBER	INSTRUMENT DESCRIPTION	P&ID	NOTES	DETAIL
AERATION BASIN 2 ZONE 1 DISSOLVED OXYGEN	AE-6002-1	A20 Dissolved Oxygen Element, Luminescent	N-102	Range: 0.0 - 3.0 mg/L	
AERATION BASIN 2 ZONE 2 DISSOLVED OXYGEN	AE-6002-2	A20 Dissolved Oxygen Element, Luminescent	N-102	Range: 0.0 - 3.0 mg/L	
AERATION BASIN 2 ZONE 3 DISSOLVED OXYGEN	AE-6002-3	A20 Dissolved Oxygen Element, Luminescent	N-102	Range: 0.0 - 3.0 mg/L	
AERATION BASIN 2 ZONE 4 DISSOLVED OXYGEN	AE-6002-4	A20 Dissolved Oxygen Element, Luminescent	N-102	Range: 0.0 - 3.0 mg/L	
AERATION BASIN 2 DISSOLVED OXYGEN	AIT-6002	A150 Analytical Indicating Transmitter, Multi-Channel	N-102	Function: Dissolved Oxygen Channel Count: Four	
AERATION BASIN 2 ZONE 1 AIR FLOW	FIT-6002-1	F51 Flow Element and Transmitter, Thermal Mass	N-102	Pipe Size: 8 inch Range: 0 - 1200 scfm	
AERATION BASIN 2 ZONE 2 AIR FLOW	FIT-6002-2	F51 Flow Element and Transmitter, Thermal Mass	N-102	Pipe Size: 6 inch Range: 0 - 800 scfm	
AERATION BASIN 2 ZONE 3 AIR FLOW	FIT-6002-3	F51 Flow Element and Transmitter, Thermal Mass	N-102	Pipe Size: 6 inch Range: 0 - 800 scfm	
AERATION BASIN 2 ZONE 4 AIR FLOW	FIT-6002-4	F51 Flow Element and Transmitter, Thermal Mass	N-102	Pipe Size: 6 inch Range: 0 - 800 scfm	

INSTRUMENT LIST

LOOP DESCRIPTION	TAG NUMBER	INSTRUMENT DESCRIPTION	P&ID	NOTES	DETAIL
AERATION BASIN 3 ZONE 1 DISSOLVED OXYGEN	AE-6003-1	A20 Dissolved Oxygen Element, Luminescent	N-103	Range: 0.0 - 3.0 mg/L	
AERATION BASIN 3 ZONE 2 DISSOLVED OXYGEN	AE-6003-2	A20 Dissolved Oxygen Element, Luminescent	N-103	Range: 0.0 - 3.0 mg/L	
AERATION BASIN 3 ZONE 3 DISSOLVED OXYGEN	AE-6003-3	A20 Dissolved Oxygen Element, Luminescent	N-103	Range: 0.0 - 3.0 mg/L	
AERATION BASIN 3 ZONE 4 DISSOLVED OXYGEN	AE-6003-4	A20 Dissolved Oxygen Element, Luminescent	N-103	Range: 0.0 - 3.0 mg/L	
AERATION BASIN 3 DISSOLVED OXYGEN	AIT-6003	A150 Analytical Indicating Transmitter, Multi-Channel	N-103	Function: Dissolved Oxygen Channel Count: Four	
AERATION BASIN 3 ZONE 1 AIR FLOW	FIT-6003-1	F51 Flow Element and Transmitter, Thermal Mass	N-103	Pipe Size: 8 inch Range: 0 - 1200 scfm	
AERATION BASIN 3 ZONE 2 AIR FLOW	FIT-6003-2	F51 Flow Element and Transmitter, Thermal Mass	N-103	Pipe Size: 6 inch Range: 0 - 800 scfm	
AERATION BASIN 3 ZONE 3 AIR FLOW	FIT-6003-3	F51 Flow Element and Transmitter, Thermal Mass	N-103	Pipe Size: 6 inch Range: 0 - 800 scfm	
AERATION BASIN 3 ZONE 4 AIR FLOW	FIT-6003-4	F51 Flow Element and Transmitter, Thermal Mass	N-103	Pipe Size: 6 inch Range: 0 - 800 scfm	

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INSTRUMENT LIST

LOOP DESCRIPTION	TAG NUMBER	INSTRUMENT DESCRIPTION	P&ID	NOTES	DETAIL
AERATION BASIN 4 ZONE 1 DISSOLVED OXYGEN	AE-6004-1	A20 Dissolved Oxygen Element, Luminescent	N-104	Range: 0.0 - 3.0 mg/L	
AERATION BASIN 4 ZONE 2 DISSOLVED OXYGEN	AE-6004-2	A20 Dissolved Oxygen Element, Luminescent	N-104	Range: 0.0 - 3.0 mg/L	
AERATION BASIN 4 ZONE 3 DISSOLVED OXYGEN	AE-6004-3	A20 Dissolved Oxygen Element, Luminescent	N-104	Range: 0.0 - 3.0 mg/L	
AERATION BASIN 4 ZONE 4 DISSOLVED OXYGEN	AE-6004-4	A20 Dissolved Oxygen Element, Luminescent	N-104	Range: 0.0 - 3.0 mg/L	
AERATION BASIN 4 DISSOLVED OXYGEN	AIT-6004	A150 Analytical Indicating Transmitter, Multi-Channel	N-104	Function: Dissolved Oxygen Channel Count: Four	
AERATION BASIN 4 ZONE 1 AIR FLOW	FIT-6004-1	F51 Flow Element and Transmitter, Thermal Mass	N-104	Pipe Size: 8 inch Range: 0 - 1200 scfm	
AERATION BASIN 4 ZONE 2 AIR FLOW	FIT-6004-2	F51 Flow Element and Transmitter, Thermal Mass	N-104	Pipe Size: 6 inch Range: 0 - 800 scfm	
AERATION BASIN 4 ZONE 3 AIR FLOW	FIT-6004-3	F51 Flow Element and Transmitter, Thermal Mass	N-104	Pipe Size: 6 inch Range: 0 - 800 scfm	
AERATION BASIN 4 ZONE 4 AIR FLOW	FIT-6004-4	F51 Flow Element and Transmitter, Thermal Mass	N-104	Pipe Size: 6 inch Range: 0 - 800 scfm	
AERATION BASIN EFFLUENT LEVEL	LET-6004	L29 Level Element and Transmitter, Radar	N-104	Range: 0 - 6 feet Mount Height: Element Face at EL 37.48 Zero Reference: Channel Bottom EL 31.48	

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AERATION BASIN IMPROVEMENTS

Control Loop Description		Aeration Basin Gates	
Overview:			
Process Description:			
Each of the four aeration basins control primary effluent into the basin via three gates with actuators:			
<ol style="list-style-type: none"> 1. The main influent weir gate. 2. Step feed main gate. 3. Step feed gate 3. 			
These gates are operated manually, either locally or from SCADA HMI.			
Reference Drawing(s):		P&IDs: N-101, N-102, N-103, N-104	
Last Update/Review:		Approved By:	
Equipment			
Unit Equipment:			
	Tag No.	Description	Notes
	WG-6001	AB1 Main Influent Weir Gate	
	SFG-6001	AB1 Main Step Feed Gate	
	SFG-6001-3	AB1 Main Step Feed Gate 3	
	WG-6002	AB2 Main Influent Weir Gate	
	SFG-6002	AB2 Main Step Feed Gate	
	SFG-6002-3	AB2 Main Step Feed Gate 3	
	WG-6003	AB3 Main Influent Weir Gate	
	SFG-6003	AB3 Main Step Feed Gate	
	SFG-6003-3	AB3 Main Step Feed Gate 3	
	WG-6004	AB4 Main Influent Weir Gate	
	SFG-6004	AB4 Main Step Feed Gate	
	SFG-6004-3	AB4 Main Step Feed Gate 3	
Instrumentation:			
	Tag No.	Description	Notes

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Control Strategies
<p>The gates are operated manually.</p> <p>The main influent weir gate is open to pass primary effluent in the basin.</p> <p>When step feed operation is desired, both the main step feed gate and step feed gate 3 are opened. These gates are closed when step feed is not used.</p> <p>Step feed gates 1 and 2 do not have actuators; these gates can be open by handwheel if needed.</p>
All Modes
Local Control Operation and Alarm Reset
VFD Control Panel
NA
Motor Control Center
NA
MFR Control Center
NA
Local Control Station
<ul style="list-style-type: none"> • LOCAL/REMOTE handswitch • OPEN/CLOSE pushbuttons for LOCAL operation • OPEN/CLOSED indication
SCADA Control Operation and Alarm Reset
SCADA Manual
When the Local Control is selected for REMOTE: SCADA Pushbuttons for Gate OPEN and CLOSE.
SCADA Auto
NA
SCADA Display
Status and Process Display
<p>The HMI will use WES plant standard face plate HMI graphics and corresponding PLC function blocks.</p> <p>Gate OPEN and CLOSED status. Gate TRAVEL status.</p>

Operator Entries
NA
SCADA Alarms and Resets
ALARMS 1. For each gate: a. FAIL TO OPEN b. FAIL TO CLOSE
Hard-Wired Interlocks
None
Software Interlocks
NA
Historical Trending and Run-time Counters
NA
Equipment (Auto/Manual) Restart After Power Interruption
NA
Equipment Automatic Failover Sequence
NA
Equipment (Auto/Manual) Restart After Power Interruption
TBD
IO Points

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Control Loop Description		Aeration Basin Air Distribution	
Overview:			
Process Description:			
<p>Each of the four aeration basins control air distribution into each of four basin zones. Each zone includes an air flow meter to measure flow to the zone diffusers. The dissolved oxygen is measured in each zone.</p> <p>Air flow is modulated to maintain a setpoint dissolved oxygen in each zone.</p>			
Reference Drawing(s):		P&IDs: N-101, N-102, N-103, N-104	
Last Update/Review:		Approved By:	
Equipment			
Unit Equipment:			
	Tag No.	Description	Notes
	CV-6001-1	AB1 Zone 1 Control Valve	Pneumatic Actuator
	CV-6001-2	AB1 Zone 2 Control Valve	Pneumatic Actuator
	CV-6001-3	AB1 Zone 3 Control Valve	Pneumatic Actuator
	CV-6001-4	AB1 Zone 4 Control Valve	Pneumatic Actuator
	CV-6002-1	AB2 Zone 1 Control Valve	Pneumatic Actuator
	CV-6002-2	AB2 Zone 2 Control Valve	Pneumatic Actuator
	CV-6002-3	AB2 Zone 3 Control Valve	Pneumatic Actuator
	CV-6002-4	AB2 Zone 4 Control Valve	Pneumatic Actuator
	CV-6003-1	AB3 Zone 1 Control Valve	Pneumatic Actuator
	CV-6003-2	AB3 Zone 2 Control Valve	Pneumatic Actuator
	CV-6003-3	AB3 Zone 3 Control Valve	Pneumatic Actuator
	CV-6003-4	AB3 Zone 4 Control Valve	Pneumatic Actuator
	CV-6004-1	AB4 Zone 1 Control Valve	Pneumatic Actuator
	CV-6004-2	AB4 Zone 2 Control Valve	Pneumatic Actuator
	CV-6004-3	AB4 Zone 3 Control Valve	Pneumatic Actuator
	CV-6004-4	AB4 Zone 4 Control Valve	Pneumatic Actuator
Instrumentation:			
	Tag No.	Description	Notes
	FIT-6001-1	AB1 Zone 1 Air Flow Meter	
	FIT-6001-2	AB1 Zone 2 Air Flow Meter	
	FIT-6001-3	AB1 Zone 3 Air Flow Meter	
	FIT-6001-4	AB1 Zone 4 Air Flow Meter	
	AE-6001-1	AB1 Zone 1 Dissolved Oxygen Element	
	AE-6001-2	AB1 Zone 2 Dissolved Oxygen Element	

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Tag No.	Description	Notes
AE-6001-3	AB1 Zone 3 Dissolved Oxygen Element	
AE-6001-4	AB1 Zone 4 Dissolved Oxygen Element	
AE-6001	AB1 Dissolved Oxygen Transmitter	
FIT-6002-1	AB2 Zone 1 Air Flow Meter	
FIT-6002-2	AB2 Zone 2 Air Flow Meter	
FIT-6002-3	AB2 Zone 3 Air Flow Meter	
FIT-6002-4	AB2 Zone 4 Air Flow Meter	
AE-6002-1	AB2 Zone 1 Dissolved Oxygen Element	
AE-6002-2	AB2 Zone 2 Dissolved Oxygen Element	
AE-6002-3	AB2 Zone 3 Dissolved Oxygen Element	
AE-6002-4	AB2 Zone 4 Dissolved Oxygen Element	
AE-6002	AB2 Dissolved Oxygen Transmitter	
FIT-6003-1	AB3 Zone 1 Air Flow Meter	
FIT-6003-2	AB3 Zone 2 Air Flow Meter	
FIT-6003-3	AB3 Zone 3 Air Flow Meter	
FIT-6003-4	AB3 Zone 4 Air Flow Meter	
AE-6003-1	AB3 Zone 1 Dissolved Oxygen Element	
AE-6003-2	AB3 Zone 2 Dissolved Oxygen Element	
AE-6003-3	AB3 Zone 3 Dissolved Oxygen Element	
AE-6003-4	AB3 Zone 4 Dissolved Oxygen Element	
AE-6003	AB3 Dissolved Oxygen Transmitter	
FIT-6004-1	AB4 Zone 1 Air Flow Meter	
FIT-6004-2	AB4 Zone 2 Air Flow Meter	
FIT-6004-3	AB4 Zone 3 Air Flow Meter	
FIT-6004-4	AB4 Zone 4 Air Flow Meter	
AE-6004-1	AB4 Zone 1 Dissolved Oxygen Element	
AE-6004-2	AB4 Zone 2 Dissolved Oxygen Element	
AE-6004-3	AB4 Zone 3 Dissolved Oxygen Element	
AE-6004-4	AB4 Zone 4 Dissolved Oxygen Element	
AE-6004	AB4 Dissolved Oxygen Transmitter	

Control Strategies

For each zone (cell), a PID controller for dissolved oxygen (D.O.) controls air flow to the zone. The output of the controller is a flow setpoint used for cascade control to a PID controller for air flow. The air flow controller modulates the control valve for that zone. As the D.O. increases, the air flow is reduced, and as D.O. drops, the air flow is raised.

The positions of each control valve in all online basins are monitored and compared. The highest percent open (most open) valve is compared to a most open valve setpoint. If the most open valve is above the setpoint (indicating more air needed) then the blower pressure setpoint is raised a small amount. If the most open valve is below the setpoint minus deadband (indicating less air needed) then the blower pressure setpoint is lowered a small amount After each adjustment to pressure

setpoint the system is given time to stabilize before another adjustment is made.
All Modes
Local Control Operation and Alarm Reset
VFD Control Panel
NA
Motor Control Center
NA
MFR Control Center
NA
Local Control Station
<ul style="list-style-type: none"> • Control valve handwheel
SCADA Control Operation and Alarm Reset
SCADA Manual
<p>For each basin air control valve:</p> <ol style="list-style-type: none"> 1. SCADA adjustment of valve position.
SCADA Auto
<p>For each zone (cell), a PID controller for dissolved oxygen (D.O.) controls air flow to the zone. The output of the controller is a flow setpoint used for cascade control to a PID controller for air flow. The air flow controller modulates the control valve for that zone. As the D.O. increases, the air flow is reduced, and as D.O. drops, the air flow is raised.</p> <p>The positions of each control valve in all online basins are monitored and compared. The highest percent open (most open) valve is compared to a most open valve setpoint. If the most open valve is above the setpoint (indicating more air needed) then the blower pressure setpoint is raised a small amount. If the most open valve is below the setpoint minus deadband (indicating less air needed) then the blower pressure setpoint is lowered a small amount After each adjustment to pressure setpoint the system is given time to stabilize before another adjustment is made.</p>
SCADA Display
Status and Process Display
<p>The HMI will use WES plant standard face plate HMI graphics and corresponding PLC function blocks.</p> <p>For each Basin Zone:</p> <ol style="list-style-type: none"> 1. Dissolved Oxygen. 2. Dissolved Oxygen Controller.

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<ol style="list-style-type: none"> 3. Air Flow. 4. Air Flow Controller. 5. Valve Position
Operator Entries
<p>For each Basin Zone:</p> <ol style="list-style-type: none"> 1. D.O. Setpoint <p>Most Open Valve Control:</p> <ol style="list-style-type: none"> 1. ENABLE/DISABLE selection. 2. Most open valve setpoint
SCADA Alarms and Resets
<p>ALARMS</p> <p>For each basin zone (disable when basin is offline):</p> <ol style="list-style-type: none"> 1. LOW Dissolved Oxygen 2. LOW Air Flow 3. HIGH Air Flow
Hard-Wired Interlocks
None
Software Interlocks
Interlock basin logic with main influent gate so that when gate is fully closed, the basin is considered offline.
Historical Trending and Run-time Counters
<p>For each Basin Zone:</p> <ol style="list-style-type: none"> 1. Dissolved Oxygen. 2. Air Flow. 3. Air Control Valve Position.
Equipment (Auto/Manual) Restart After Power Interruption
Valves to restart in the same position as prior to the power interruption
Equipment Automatic Failover Sequence
NA
Equipment (Auto/Manual) Restart After Power Interruption
IO Points

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Control Loop Description	Aeration Basin Effluent Level		
Overview:			
Process Description:			
The aeration basins share a common effluent channel. Normally the effluent level is below the basins' effluent weir. During wet weather the effluent can surcharge causing the level to rise. A level transmitter in the common channel measures the level to give indication of surcharge conditions.			
Reference Drawing(s):	P&IDs: N-104		
Last Update/Review:		Approved By:	
Equipment			
Unit Equipment:			
	Tag No.	Description	Notes
Instrumentation:			
	Tag No.	Description	Notes
	LET-6004	Aeration Basins Effluent Channel Level Element and Transmitter	
Control Strategies			
When the level in the effluent channel rises above the basin effluent weir, calculate the amount of surcharge as the measured level minus the top of weir level (EL 35.0).			
Use the surcharge level to adjust the blower pressure setpoint. Convert the level to equivalent psi and add to the pressure setpoint, but do not exceed the blower maximum rated operating pressure.			
All Modes			
Local Control Operation and Alarm Reset			
VFD Control Panel			
NA			
Motor Control Center			
NA			
MFR Control Center			
NA			

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Local Control Station
NA
SCADA Control Operation and Alarm Reset
SCADA Manual
NA
SCADA Auto
<p>When the level in the effluent channel rises above the basin effluent weir, calculate the amount of surcharge as the measured level minus the top of weir level (EL 35.0).</p> <p>When surcharge level control is ENABLED, use the surcharge level to adjust the blower pressure setpoint. Convert the level to equivalent psi and add to the pressure setpoint, but do not exceed the blower maximum rated operating pressure.</p>
SCADA Display
Status and Process Display
<p>The HMI will use WES plant standard face plate HMI graphics and corresponding PLC function blocks.</p> <p style="text-align: center;">1. Aeration Basin Effluent Level.</p>
Operator Entries
<p>Aeration Basin Surcharge Level Control:</p> <p style="text-align: center;">1. ENABLE/DISABLE selection.</p>
SCADA Alarms and Resets
<p>ALARMS:</p> <p style="text-align: center;">1. HIGH Effluent Channel Level</p>
Hard-Wired Interlocks
None
Software Interlocks
Historical Trending and Run-time Counters
1. Aeration Basin Effluent Level.
Equipment (Auto/Manual) Restart After Power Interruption
NA

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Equipment Automatic Failover Sequence
NA
Equipment (Auto/Manual) Restart After Power Interruption
IO Points

SECTION 40 91 00
INSTRUMENTATION AND CONTROL COMPONENTS

PART 1 GENERAL

1.01 SUMMARY

- A. This section gives general requirements for instrumentation and control components.

1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. NSF International (NSF):
 - a. NSF/ANSI 61, Drinking Water System Components - Health Effects.
 - b. NSF/ANSI 372, Drinking Water System Components - Lead Content.

PART 2 PRODUCTS

2.01 GENERAL

- A. Article Mechanical Systems Components covers requirements of mechanical PIC components that are not specifically referenced by Section 40 90 00, Instrumentation and Control for Process Systems, Instrument Lists.
- B. Article Electrical Components covers requirements for electrical PIC components that are not specifically referenced by Section 40 90 00, Instrumentation and Control for Process Systems, Instrument Lists.
- C. All other Part 2 articles cover components that are referenced by Instrument Lists in Section 40 90 00, Instrumentation and Control for Process Systems, or by specific component numbers in other PIC subsections.

2.02 MECHANICAL SYSTEMS COMPONENTS

- A. Pressure Gauge: For other than process variable measurement.
1. Dial Size: Nominal 2-inch dial size.
 2. Accuracy: 2 percent of span.
 3. Scale Range: Such that normal operating pressure lies between 50 percent and 80 percent of scale range.
 4. Connection: 1/4-inch NPT through bottom, unless otherwise noted.

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5. Manufacturers and Products:
 - a. Ashcroft Utility; Gauge Series 1000.
 - b. Marsh; Standard Gauge Series.
 - c. Ametek U.S.; Gauge Series P500.
 - d. Acculite; Series 2000.
- B. Valve, Needle:
 1. Materials: Brass, stainless steel, PVC, or CPCV, as recommended by manufacturer for designated service, unless otherwise shown on Drawings.
 2. Size: 0.020-inch orifice.
 3. Manufacturers and Products:
 - a. Whitey; Model 21RF2.
 - b. Hoke; 3700 Series.
- C. ON/OFF Valves:
 1. Type: Ball valve.
 2. Materials: Brass, stainless steel, PVC, or CPCV, as recommended by manufacturer for designated service, unless otherwise shown on Drawings.
 3. Manufacturers and Products:
 - a. Whitey; Series 41 through Series 43.
 - b. Hoke; Flomite 7100 Series.
- D. Regulating Valves:
 1. Type: Needle valves, with regulating stems and screwed bonnets.
 2. Materials: Brass, stainless steel, PVC, or CPCV, as recommended by manufacturer for designated service, unless otherwise shown on Drawings.
 3. Manufacturers and Products:
 - a. Whitey; Catalog No. RF or No. RS.
 - b. Hoke; 3100 through 3300 Series.
- E. Solenoid Valve, Two-Way:
 1. Type: Globe valve directly actuated by solenoid and not requiring minimum pressure differential for operation.
 2. Materials:
 - a. Body: Brass or stainless steel globe valves as recommended by manufacturer for designated service, unless otherwise shown on Drawings.
 - b. Valve Seat: Buna-N.

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3. Size: Normally closed or opened, as noted.
 4. Coil: 115V ac, unless noted otherwise.
 5. Solenoid Enclosure: NEMA 4.
 6. Manufacturer and Product: ASCO; Red Hat Series 8260.
- F. Pressure Regulator, Air:
1. Provide air at reduced pressures, as shown, constant to within plus or minus 10 percent for flows from 0 scfh to 300 scfh with 100 psi supply pressure.
 2. Setscrew for outlet pressure adjustment.
 3. Integral filter and relief valve.
 4. Manufacturers and Products:
 - a. Masoneilan; Series 77-4.
 - b. Fisher; Series 67FR.
- G. Test Tap:
1. Manufacturers and Products:
 - a. Imperial-Eastman; quick-disconnect couplings No. 292-P and caps No. 259-P.
 - b. Crawford Fitting Co.; Swagelok quick-connects Series QC4 and caps QC4-DC.
 - c. Parker; CPI Series precision quick couplings.
- H. Plastic Tubing and Fittings:
1. Tubing:
 - a. Polyethylene capable of withstanding 190 psig at 175 degrees F.
 - b. Manufacturers and Products:
 - 1) Dekoron; Type P.
 - 2) Imperial Eastman; Poly-Flo black instrument tubing.
 2. Fittings:
 - a. Type: Brass compression.
 - b. Manufacturers and Products:
 - 1) Imperial Eastman; Poly-Flo tube fittings.
 - 2) Dekoron; E-Z fittings.
- I. Stainless Steel Tubing: ASTM A312/A312M, Type 316, 0.065-inch wall, seamless, soft annealed, as shown on Drawings.

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- J. Stainless Steel Fittings:
1. Compression Type:
 - a. Materials: Type 316 stainless steel, ASTM A182/A182M forged bodies or ASTM A276 barstock bodies, flareless.
 - b. Manufacturers and Products:
 - 1) Parker Flodar; BA Series.
 - 2) Swagelok tube fittings.
 - 3) Parker CPI tube fittings; Parker A-LOK dual ferrule tube fittings.
 2. Socket Weld Type:
 - a. Materials: Type 316 stainless steel, ASTM A182/A182M forged bodies or ASTM A276 barstock bodies, 3,000 psi maximum working pressure, safety factor 4:1.
 - b. Manufacturers:
 - 1) Cajon.
 - 2) Swagelok.
 - 3) Parker WELDLOK.
- K. Air Set: Consists of a shutoff valve, pressure regulator, discharge pressure gauge, and interconnecting tubing.

2.03 ELECTRICAL COMPONENTS

- A. Terminal Blocks for Enclosures:
1. General:
 - a. Connection Type: Screw compression clamp.
 - b. Compression Clamp:
 - 1) Complies with DIN-VDE 0611.
 - 2) Hardened steel clamp with transversal grooves that penetrate wire strands providing a vibration-proof connection.
 - 3) Guides strands of wire into terminal.
 - c. Screws: Hardened steel, captive, and self-locking.
 - d. Current Bar: Copper or treated brass.
 - e. Insulation:
 - 1) Thermoplastic rated for minus 55 degrees C to plus 110 degrees C.
 - 2) Two funneled shaped inputs to facilitate wire entry.
 - f. Mounting:
 - 1) Standard DIN rail.

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- 2) Terminal block can be extracted from an assembly without displacing adjacent blocks.
 - 3) End Stops: Minimum of one at each end of rail.
 - g. Wire Preparation: Stripping only permitted.
 - h. Jumpers: Allow jumper installation without loss of space on terminal or rail.
 - i. Marking System:
 - 1) Terminal number shown on both sides of terminal block.
 - 2) Allow use of preprinted and field marked tags.
 - 3) Terminal strip numbers shown on end stops.
 - 4) Mark terminal block and terminal strip numbers as shown on panel control diagrams and loop diagrams.
 - 5) Fuse Marking for Fused Terminal Blocks: Fuse voltage and amperage rating shown on top of terminal block.
2. Terminal Block, General Purpose:
 - a. Rated Voltage: 600V ac.
 - b. Rated Current: 30 amp.
 - c. Wire Size: 24 AWG to 10 AWG.
 - d. Rated Wire Size: 10 AWG.
 - e. Color: Gray body.
 - f. Spacing: 0.25 inch, maximum.
 - g. Test Sockets: One screw test socket 0.079-inch diameter.
 - h. Manufacturer and Product: Entrelec; Type M4/6.T.
 3. Terminal Block, Ground:
 - a. Wire Size: 24 AWG to 10 AWG.
 - b. Rated Wire Size: 10 AWG.
 - c. Color: Green and yellow body.
 - d. Spacing: 0.25 inch, maximum.
 - e. Grounding: Electrically grounded to mounting rail.
 - f. Manufacturer and Product: Entrelec; Type M4/6.P.
 4. Terminal Block, Blade Disconnect Switch:
 - a. Rated Voltage: 600V ac.
 - b. Rated Current: 10 amp.
 - c. Wire Size: 22 AWG to 10 AWG.
 - d. Rated Wire Size: 10 AWG.
 - e. Color: Gray body, orange switch.
 - f. Spacing: 0.25 inch, maximum.
 - g. Manufacturer and Product: Entrelec; Type M4/6.SNT.
 5. Terminal Block, Fused, 24V dc:
 - a. Rated Voltage: 600V dc.
 - b. Rated Current: 25 amp.
 - c. Wire Size: 22 AWG to 10 AWG.
 - d. Rated Wire Size: 10 AWG.
 - e. Color: Gray body.

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- f. Fuse: 0.25 inch by 1.25 inches.
 - g. Indication: LED diode 24V dc.
 - h. Spacing: 0.512 inch, maximum.
 - i. Manufacturer and Product: Entrelec; Type ML10/13.SFD.
6. Terminal Block, Fused, 120V ac:
- a. Rated Voltage: 600V ac.
 - b. Rated Current: 25 amp.
 - c. Wire Size: 22 AWG to 10 AWG.
 - d. Rated Wire Size: 10 AWG.
 - e. Color: Gray body.
 - f. Fuse: 0.25 inch by 1.25 inches.
 - g. Indication: Neon lamp, 110V ac.
 - h. Leakage Current: 1.8 mA, maximum.
 - i. Spacing: 0.512 inch, maximum.
 - j. Manufacturer and Product: Entrelec; Type ML10/13.SFL.
7. Terminal Block, Fused, 120V ac, High Current:
- a. Rated Voltage: 600V ac.
 - b. Rated Current: 35 amps.
 - c. Wire Size: 18 AWG to 8 AWG.
 - d. Rated Wire Size: 8 AWG.
 - e. Color: Gray.
 - f. Fuse: 13/32 inch by 1.5 inches.
 - g. Spacing: 0.95 inch, maximum.
 - h. Manufacturer and Product: Entrelec; Type MB10/24.SF.

B. Relays:

- 1. General:
 - a. Relay Mounting: Plug-in type socket.
 - b. Relay Enclosure: Furnish dust cover.
 - c. Socket Type: Screw terminal interface with wiring.
 - d. Socket Mounting: Rail.
 - e. Provide holddown clips.
- 2. PLC Interface Relay:
 - a. Type: Narrow design for high density and direct connection of field wiring to relay terminals.
 - b. Function: Covert PLC output voltage to dry contact for isolated discrete signal interface.
 - c. Relay Mounting: Plug into terminal block style socket.
 - d. Socket Mounting: DIN rail.
 - e. Socket Width: 0.25 inch nominal.
 - f. Coil Voltage: 120V ac.
 - g. Coil Power: 0.5 VA.
 - h. Expected Mechanical Life: 10,000,000 operations.

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- i. Operating Indicator: LED lights when coil is energized.
 - j. Contact Arrangement: One Form C, SPDT contact.
 - k. Contact Rating: 5A, at 24V dc and 250V ac.
 - l. Connection Type: Screw compression clamp.
 - m. Terminal Marking: Numbered with preprinted or field-marked tags.
 - n. Manufacturers and Products:
 - 1) Phoenix Contact; PLC-RSC-120UC.
 - 2) Allen-Bradley; Bulletin 700-HL Terminal Block Relays.
 - 3) Idec; RV8H series.
3. Control Circuit Switching Relay, Nonlatching:
- a. Type: Compact general purpose plug-in.
 - b. Contact Arrangement: 3 Form C contacts.
 - c. Contact Rating: 10A at 28V dc or 120V ac, and 6.6A at 240V ac.
 - d. Contact Material: Silver cadmium oxide alloy.
 - e. Coil Voltage: As noted or shown.
 - f. Coil Power: 1.8 watts (dc), 2.7VA (ac).
 - g. Expected Mechanical Life: 10,000,000 operations.
 - h. Expected Electrical Life at Rated Load: 100,000 operations.
 - i. Indication Type: Neon or LED indicator lamp.
 - j. Push-to-test button.
 - k. Manufacturer and Product: Potter and Brumfield; Series KUP.
4. Control Circuit Switching Relay, Time Delay:
- a. Type: Adjustable time delay relay.
 - b. Contact Arrangement: 2 Form C contacts.
 - c. Contact Rating: 10A at 30V dc or 277V ac.
 - d. Contact Material: Silver cadmium oxide alloy.
 - e. Coil Voltage: As noted or shown.
 - f. Operating Temperature: Minus 10 degrees C to 55 degrees C.
 - g. Repeatability: Plus or minus 2 percent.
 - h. Delay Time Range: Select range such that time delay setpoint fall between 20 percent to 80 percent of range.
 - i. Time Delay Setpoint: As noted or shown.
 - j. Mode of Operation: As noted or shown.
 - k. Adjustment Type: Integral potentiometer with knob external to dust cover.
 - l. Manufacturer and Products: Potter and Brumfield; Series CB for 0.1-second to 100-minute delay time ranges, Series CK for 0.1-second to 120-second delay time ranges.

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C. Surge Suppressors:

1. General:
 - a. Construction: First-stage, high-energy metal oxide varistor and second-stage, bipolar silicon avalanche device separated by series impedance; includes grounding wire, stud, or terminal.
 - b. Response: 5 nanoseconds maximum.
 - c. Recovery: Automatic.
 - d. Temperature Range: Minus 20 degrees C to plus 85 degrees C.
 - e. Enclosure Mounted: Encapsulated inflame retardant epoxy.
2. Suppressors on 120V ac Power Supply Connections:
 - a. Occurrences: Tested and rated for a minimum of 50 occurrences of IEEE C62.41 Category B test waveform.
 - b. First-Stage Clamping Voltage: 350 volts or less.
 - c. Second-Stage Clamping Voltage: 210 volts or less.
 - d. Power Supplies for Continuous Operation: Minimum 30 amps at 130V ac.
3. Manufacturer and Product:
 - a. 120V ac Lines: Emerson; Edco HSP-121.

D. Power Supplies:

1. Power instruments requiring external dc power, including PLC modules, two-wire transmitters, and dc relays.
2. Provide dual power supplies with redundancy module.
3. Convert 120V ac, 60-Hz power to dc power of appropriate voltage(s) with sufficient voltage regulation and ripple control to assure that instruments being supplied can operate within their required tolerances.
4. Provide output over voltage and over current protective devices to:
 - a. Protect instruments from damage due to power supply failure.
 - b. Protect power supply from damage due to external failure.
5. Enclosures: NEMA 1.
6. Mount such that dissipated heat does not adversely affect other components.
7. Fuses: For each dc supply line to each individual two-wire transmitter.
 - a. Type: Indicating.
 - b. Mount so fuses can be easily seen and replaced.

2.04 I&C COMPONENTS

- A. Components for Each Loop: Major components for each loop are listed in Instrument List referenced in Section 40 90 00, Instrumentation and Control for Process Systems. Furnish equipment that is necessary to achieve required loop performance.

2.05 ANALYTICAL COMPONENTS

A. A20 Dissolved Oxygen Element, Luminescent (LDO):

1. General:
 - a. Function: Continuous measurement of dissolved oxygen (DO) concentration of process fluid.
 - b. Type: Luminescent optical sensor.
 - c. Parts: Element (sensor), interconnecting cable, and noted accessories.
 - d. Transmitter: One multi-channel transmitter for each group of analytic probes as noted or shown.
2. Performance:
 - a. Measuring Range: 0 mg/L to 20 mg/L.
 - b. Sensor Accuracy: Plus or minus 0.1 mg/L.
 - c. Response Time: Less than 80 seconds to 90 percent of value upon step change.
3. Element:
 - a. Type: Luminescent optical digital sensor.
 - b. Process Temperature Range: 32 degrees F to 140 degrees F.
 - c. Submersion Depth: 300 feet.
 - d. Surge Protection: Integral overvoltage protection.
 - e. Sensor Cable: Integral cable, length as required.
4. Transmitter: Refer to Component Code A150 Analytical Indicating Transmitter, Multi-Channel.
5. Accessories:
 - a. Air Cleaning Head: For electrode cleaning air connection.
 - b. Mounting Hardware: Submersion mounting hardware with handrail swing and swivel mounting kit and associated hardware.
 - 1) PVC immersion tube, length as required for application.
 - 2) Pipe protection cap.
 - 3) Cross clamp handrail assembly.
 - 4) 45-degree probe connecting pipe.
 - 5) Sensor connection adapter.
 - 6) Immersion pipe maintenance tray, handrail mount.
 - c. Junction Box: Field termination box, mount near sensor location.
 - d. Cable: Lengths as required for wiring probe to junction box, and from junction box to transmitter, locations as shown on Drawings.
6. Manufacturers and Products:
 - a. Endress + Hauser; COS61D with CYA112 handrail assembly.
 - b. Xylem YSI; FDO 701 IQ H.

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- B. A150 Analytical Indicating Transmitter, Multi-Channel:
1. General:
 - a. Function: Interface with analytical probes provided by same vendor. Provide local indication, configuration, calibration, and output of probe measurements.
 2. Transmitter System:
 - a. Ambient Conditions:
 - 1) Temperature minus 20 degrees C to 55 degrees C (minus 4 degrees F to 131 degrees F).
 - 2) Humidity: 0 percent to 95 percent, relative, noncondensing.
 - b. Display: Graphic LCD, with LED backlighting.
 - 1) Display primary readout of probe data in engineering units.
 - 2) Auxiliary Readout:
 - a) Temperature.
 - b) Diagnostic warnings.
 - c) Error messages.
 - d) Probe configuration.
 - e) Other information.
 - c. Controller:
 - 1) Function: Communicate with probes. Maintain system configuration.
 - 2) Signal Interface:
 - a) Number of Channels: Four.
 - b) Analog Output: 4 mA dc to 20 mA dc with HART for each channel.
 - c) Discrete Output: Relay contact for each channel, for control of automatic air blast cleaning.
 - 3) Analytical Probe Measurement: As noted.
 - 4) Quantity: As shown. Each system supports up to four probes.
 - 5) Probe Detection: Automatic plug-and-play detection of connected probe.
 - 6) Probe Connection: Provide cable for each probe, length as required to suit installation.
 - d. Enclosures: NEMA 4X/IP66 polycarbonate/aluminum.
 - e. Mounting: Handrail mount, unless otherwise shown.
 - f. Mounting Hardware:
 - 1) General: Type 316 stainless steel hardware.
 - 2) Handrail mounting kit.
 - g. Power Requirements: 110V ac plus or minus 10 percent, 50/60-Hz.

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3. Accessories:
 - a. Sun shield.
 - b. Stainless steel equipment tags.
4. Manufacturers and Products:
 - a. Endress + Hauser; CM444.
 - b. Xylem YSI; System 2020 3G.

2.06 FLOW COMPONENTS

A. F51 Flow Element and Transmitter, Thermal Mass Flow:

1. General:
 - a. Function: Directly measure, indicate, and transmit mass flow of gas in pipe.
 - b. Type: Insertion type, thermal dispersion detection probe using platinum resistance temperature detectors (RTD).
 - c. Parts: Flow conditioner, elements, transmitter, and interconnecting cable.
2. Performance:
 - a. Process Gas: Low pressure process air.
 - b. Range for Air at minus 40 degrees F to 266 degrees F.
 - c. Calibrated Span: As noted.
 - d. Accuracy:
 - 1) Flow: Plus or minus 1 percent of reading plus 0.5 percent full scale.
 - 2) Temperature: Plus or minus 2 degrees F.
 - e. Repeatability:
 - 1) Flow: Plus or minus 0.4 percent of reading.
 - 2) Temperature: Plus or minus 1 degree F.
 - f. Temperature, Operating:
 - 1) Flow Element: Minus 40 degrees F to plus 266 degrees F, unless otherwise noted.
 - 2) Transmitter Housing: Minus 40 degrees F to plus 140 degrees F.
 - g. Pressure, Operating, Flow Element: Up to 290 psig, unless otherwise noted.
3. Flow Element:
 - a. Features:
 - 1) Insertion Length: As noted or manufacturer's recommendation for pipe diameter.
 - 2) Wetted Surfaces Materials: Type 316 stainless steel with nickel braze, unless otherwise noted.

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- b. Process Connection:
 - 1) Line Size: As indicated.
 - 2) Connection Type: Insertion.
 - 3) Connection Material: Type 316 stainless steel.
- c. Sensor Enclosure:
 - 1) Type: Aluminum, NEMA 4X, unless otherwise noted.
- 4. Transmitter:
 - a. Features: Four line by 20-character LCD, keypad programmable.
 - b. Nonvolatile memory.
 - c. Mounting Type: Integral.
 - d. Signal Interface:
 - 1) Outputs:
 - a) Analog: Two isolated 4 mA dc to 20 mA dc for maximum 600-ohm load, with HART.
 - b) Discrete:
 - (1) 10 amps at 115V ac or 24V dc.
 - (2) Configurable as high or low flow or process temperature.
 - e. Power: 100V ac to 240V ac.
 - f. Electrical Connection: 1/2-inch NPT.
 - g. Transmitter Enclosure: NEMA 4X, unless otherwise noted.
- 5. Accessories:
 - a. Flow Conditioner:
 - 1) Mounting: In upstream pipe.
 - 2) Size: As noted.
 - 3) Function: Improve meter accuracy and repeatability for installation with reduced upstream straight approach.
 - b. Sun Shield.
- 6. Cables:
 - a. Length: As required.
 - b. Cable Jacket: PVC rated for 220 degrees F, unless otherwise noted.
- 7. Manufacturers and Products:
 - a. Endress + Hauser, Inc. Flow Measuring System; Proline t-mass I300.
 - b. Kurz.

2.07 LEVEL COMPONENTS

A. L29 Level Element and Transmitter, Radar:

- 1. General:
 - a. Function: Continuous level measurement.
 - b. Type: Radar; Noncontacting.

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- c. Loop-powered.
- d. Parts: Element/integral transmitter and accessories as noted.
- 2. Service:
 - a. Operating Temperature Range:
 - 1) Outside Ambient: Minus 40 degrees F to plus 176 degrees F.
- 3. Performance:
 - a. Process Range: As noted.
 - b. Zero Reference: As noted.
 - c. Frequency: 26 GHz
 - d. Method: Time of Flight.
 - e. Accuracy:
 - 1) 30 mm (1.2 inch) from face of element to 0.5 meters (1.64 feet).
 - 2) 5 mm (0.2 inch) from 0.5 meters (1.64 feet) to full range.
 - f. Medium Suitability: Noncontacting element for medium with dielectric constant greater than 1.6.
 - g. Blanking Distance: Zero.
- 4. Element/Integral Transmitter:
 - a. Enclosure Rating:
 - 1) NEMA 4X/IP67 watertight.
 - 2) NEMA 6/IP68.
 - b. Enclosure Material: PVDF.
 - c. Lens Antenna:
 - 1) Lens Antenna Material: PVDF.
 - 2) Process Connection:
 - a) 1-inch NPT, unless otherwise noted.
 - b) Material: PVDF.
 - 3) Process Seal/Gasket: As required.
 - d. Beam Angle: 12 degrees.
 - e. Approvals: CSA, Class I, Division 2, Groups A, B, C, D, and T4.
- 5. Signal Interface:
 - a. Analog: 4 mA to 20 mA dc (HART) with maximum impedance of 550 ohms and nominal 24V dc power supply.
 - b. Digital, HART.
- 6. Electrical Connection: Integral cable with cable gland.
- 7. Accessories:
 - a. Mounting: Wall mount bracket and 23-inch cantilever mounting arm.
 - b. Weather protection cover.
 - c. Stainless steel tag.
 - d. Others: As noted.

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8. Manufacturer and Product:
 - a. Endress+Hauser; FMR20.
 - b. "Or-equal."

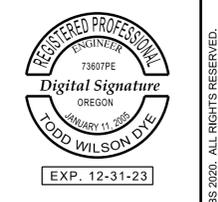
PART 3 EXECUTION (NOT USED)

END OF SECTION

EXHIBIT F

Drawings

L	LOS LOCKOUT STOP LOCK-OUT STOP PUSHBUTTON LIGHT POLE, LIGHTING PANELBOARD LPS LOW PRESSURE STEAM LPT LOW POINT LR LATCHING RELAY, LOCAL-REMOTE, LONG RADIUS LS LABORATORY SINK, LOW SPEED LT LEFT LTF LIQUID TIGHT FLEX LTG, LTS LIGHTS OR LIGHTING LTPU LONG TIME PICK-UP LT(S) LIGHT(S) LTX LIGHTING TRANSFORMER LV LOW VOLTAGE LV-E EXISTING LOW VOLTAGE LWL LOW WATER LEVEL	O	O2 OXYGEN OA OUTSIDE AIR OBD OPPOSED BLADE DAMPER OC, O.C. ON CENTER, OPEN-CLOSE (D), OPEN-CLOSE (O) OCA OPEN-CLOSE-AUTO OCR OPEN-CLOSE-REMOTE OD OUTSIDE DIAMETER, OVERFLOW DRAIN O.F. OUTSIDE FACE OFCI OWNER FURNISHED, CONTRACTOR INSTALLED OFOI OWNER FURNISHED, OWNER INSTALLED OG OBSCURE OL OVERLOAD RELAY OO ON-OFF OOA ON-OFF-AUTO OOR ON-OFF-REMOTE OP OPAQUE PANEL, OUTLET PROTECTION OPER OPERATOR OPNG OPENING OPP OPPOSITE ORP OXIDATION REDUCTION POTENTIAL OS OCCUPANCY SWITCH OSC OPEN-STOP-CLOSE OSD OPEN SITE DRAIN OTOO OUT TO OUT OWSJ OPEN WEB STEEL JOIST OZ OUNCE	Q	QAA AVERAGE FLOW QMM MAXIMUM 30 DAY FLOW QPI PEAK INSTANTANEOUS FLOW QPP PEAK PUMPING FLOW QT QUARRY TILE QTY QUANTITY	R	R RISER, RED R OR RAD RADIUS RA RETURN AIR RC REINFORCED CONCRETE RCC REINFORCED CONCRETE CYLINDER PIPE RCP REINFORCED CONCRETE PIPE RCPT RECEPTACLE RD ROAD, ROOF DRAIN, ROUND RDCR REDUCER RDW REDWOOD R.E. RESIDENT ENGINEER RECIR RECIRCULATION REF REFER OR REFERENCE REFR REFRIGERATE, REFRIGERANT REINF REINFORCED, REINFORCING, REINFORCE REQD REQUIRED REQM REQUIREMENT(S) RESIL RESILIENT RFS ROLL-UP FIRE SHUTTER RG REFLECTIVE RGS RIGID GALVANIZED STEEL RH RIGHT HAND RODHO RODHOLE RHR RIGHT HAND REVERSE RIO REMOTE I/O UNIT RJ RESTRAINED JOINT RL RAIN LEADER, REFRIGERANT LIQUID RLS RUBBER LINED STEEL ROOM ROOM RM-X REMOTE MULTIPLEXING MODULE NO. X RMP PUMPED CONDENSATE ROL RAISE-OFF-LOWER RPM REVOLUTIONS PER MINUTE RPZ RPT PROTECTION ZONE RR RIPRAP RRUB RADIAL RUBBER RS RIGID STEEL, REFRIGERANT SUCTION, RIGID STEEL CONDUIT REINFORCING STEEL	S	S I-BEAM SA SLOPE, SOUTH, SWITCH SATC SUPPLY AIR, SURGE ARRESTOR SB SUSPENDED ACCUSTICAL TILE CEILING SC SEDIMENT BASIN SCADA SHOWER CURTAIN, SOLID CORE WOOD SUPERVISORY CONTROL AND DATA ACQUISITION SCC SOLID CORE SCCR SHORT CIRCUIT CURRENT RATING SCFM STANDARD CUBIC FEED PER MINUTE SCH, SCHED SCHEDULE SCU SPEED CONTROL UNIT SD SILO DIGESTER, SMOKE DETECTOR, SOAP DISPENSOR, STORM DRAIN SDMH STORM DRAIN MANHOLE SDP SUB-DISTRIBUTION PANEL SDWK SIDEWALK SEC SECONDARY SECT SECTION SED SEDIMENTATION SEP SEPTAGE SEW SEWAGE S.F. SQUARE FEET SF SUPPLY FAN, SLOWER-FASTER SG LAMINATED SAFETY GLASS, SAFETY SGWB SUSPENDED GYPSUM WALL BOARD SH SHEET SHA SURFACE HARDENING AGENT SHS SOLIDS HANDLING SYSTEM SHTG SHEATHING SIM SIMILAR SK SINK SLR SEALER SMLS SEAMLESS EPOXY S/N SOLID NEUTRAL SOG SLAB ON GRADE SOI SPRAY-ON INSULATION SOLN SOLUTION	SOP	SOP STANDARD OPERATION PROCEDURE SP SPACE OR SPACES, SPANDREL PANEL, STORMPROOF SPEED SPD SPECIFICATIONS SPD SUMP PUMP DISCHARGE SPG SPACING SPLY SUPPLY SQ SQUARE SQ FT SQUARE FOOT, FEET SQ IN SQUARE INCH SR SHORT RADIUS SS START-STOP, SANITARY SEWER SSC SUPERVISORY SET POINT CONTROL SSMH SANITARY SEWER MANHOLE SST, SS STAINLESS STEEL ST STRAIGHT, SHUNT TRIP STA STATUS STD STANDARD STIF STIFFENER STIRR STIRRUP STL STEEL STRL STRUCTURAL STRUCT STRUCTURE SUBFL SUBFLOOR SUSP SUSPENDED SV SOLENOID VALVE SVIN SHEET VINYL SW SWITCH SWBD SWITCHBOARD SWG SIDE-WALL GRILL SWGR SWITCHGEAR SYMM SYMMETRICAL	T	T THERMOSTAT, TREAD, THICKNESS, TRANSFORMER T&B TOP AND BOTTOM T&G TONGUE AND GROOVE TA TRANSFER AIR TAN TANGENT TB TERMINAL BOARD TBD TO BE DETERMINED TBG TUBING TC TIME TO CLOSE, TOP OF CURB, TOP OF CONCRETE TCAD TIME CLOSE AFTER DE-ENERGIZATION TCAE TIME CLOSE AFTER ENERGIZATION TCL2 TOTAL CHLORINE RESIDUAL TCU TERMINAL CONTROL UNIT TD TEMPERATURE DETECTOR RELAY TDH TOTAL DYNAMIC HEAD TDR TIME DELAY RELAY TECH TECHNICAL TEFC TOTALLY ENCLOSED FAN COOLED MOTOR TEL TELEPHONE TEMP TEMPORARY, TEMPERATURE TF TOP FACE TFG TEMPERED FLOAT GLASS TG TEMPERED TH TOP-HINGED THD THREAD THK THICKNESS THRU THROUGH TJB TERMINAL JUNCTION BOX TL TEFLON LINED PIPE, TWIST LOCK T.O. 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M	M MOTOR, MAGNETIC CONTACTOR COIL MA MANUAL-AUTO MAS MASONRY MATL MATERIAL MAU MAKEUP AIR UNIT MAX MAXIMUM MB MACHINE BOLT MBH THOUSAND BTU PER HOUR MC MASONRY CLEARANCE, MODULATE-CLOSE MCC MOTOR CONTROL CENTER MCC-X MOTOR CONTROL CENTER NO. X MD MOTORIZED DAMPER MDO MEDIUM DENSITY OVERLAY MDP MAIN DISTRIBUTION PANEL MECH MECHANICAL MEP MECHANICAL, ELECTRICAL, PLUMBING MFD MANUFACTURED MFR MANUFACTURER MGD MILLION GALLONS PER DAY MH MANHOLE, MOUNTING HEIGHT, METAL HALIDE MIN MINIMUM MISC MISCELLANEOUS MJ MECHANICAL JOINT MLO MAIN LUGS ONLY MMDW DRY WEATHER MAXIMUM MONTH MMP MECHANICAL MOUNTING PANEL MMWW WET WEATHER MAXIMUM MONTH MO MANUAL OPERABLE, MASONRY OPENING, MOTOR OPERATOR MP METAL PANEL MPU MULTIPURPOSE UNIT MS MANUFACTURER'S STANDARD, MOTOR STARTER MSB MAIN SWITCHBOARD MSC MANUFACTURER SUPPLIED CABLE MSR GROUPED MOTOR CONTROL MT MOUNT MTD, MT(D) MOUNTED, MOUNT(ED) MTG MOUNTING MTS MANUAL TRANSFER SWITCH MTS MILL TYPE STEEL PIPE MU MULCHING MV MERCURY VAPOR MWS MAXIMUM WATER SURFACE M15D MAXIMUM 15-DAY M30D MAXIMUM 30-DAY	P	P PROJECTED, PILASTER, PIPE PAVT PAVER TILE PB PUSHBUTTON SWITCH, PROCESS BUILDING, PULLBOX PC5 PRIMARY CLARIFIER 5 PC POINT OF CURVE, PHOTOCCELL, PRECAST CONCRETE PANEL, POWER CABLE, POWER CENTER PUMPED CONDENSATE PCC POINT OF COMMON COUPLING PCCP PRECAST CONCRETE CYLINDER PIPE PCD PERFORATED CEILING DIFFUSER PCV PRESSURE CONTROL VALVE PD PANCAKE DIGESTER PE PLAIN END PED PEDESTAL, PEDESTRIAN PEP POLYETHYLENE PIPE PEN. PENETRATION PERP PERPENDICULAR PF POWER FACTOR PFC POUNDS PER CUBIC FOOT PH PENTHOUSE, PHASE pH HYDROGEN ION CONCENTRATION PHF RUBBER CUSHIONED FLOORING PI PASSIVE HARMONIC FILTER PI POINT OF INTERSECTION PIT PILOT TUBE TEST STATION PJF PREMOULDED JOINT FILLER PL PLATE (STEEL), PROPERTY LINE PLAM PLASTIC LAMINATE PLAS PLASTER, PLASTIC PLC PROGRAMMABLE LOGIC CONTROLLER PMR PHASE MONITOR RELAY PLYWD PLYWOOD PNL PANEL PP POWER POLE P-P PUSH-PULL PPK POWER PACK PPL POLYPROPYLENE LINED PR PAIR PRC POINT OF REVERSE CURVE PRCST PRECAST PREFAB PREFABRICATION PRES PRESSURE PRI PRIMARY PRM PERMANENT REFERENCED MARKER PROJ PROJECTION PROP PROPERTY PRV PRESSURE REDUCING VALVE PS PRESSURE SWITCH, PLASTIC SHEET, POLYCARBONATE SHEET, PAINT SYSTEM PSF POUNDS PER SQUARE FOOT PSI POUNDS PER SQUARE INCH PSIG POUNDS PER SQUARE INCH, GAUGE PT POTENTIAL TRANSFORMER, POINT, POINT OF TANGENCY, PRESSURE TREATED PTD PAPER TOWEL DISPENSER PTN PARTITION PV PLUG VALVE PVC POLYVINYL CHLORIDE, POLYVINYL CHLORIDE CONDUIT PVI POINT OF VERTICAL CURVE PVMT PAVEMENT PVT POINT OF VERTICAL TANGENCY PW1 POTABLE WATER PW2 INDUSTRIAL WATER PW3 PLANT WATER	Q	QAA AVERAGE FLOW QMM MAXIMUM 30 DAY FLOW QPI PEAK INSTANTANEOUS FLOW QPP PEAK PUMPING FLOW QT QUARRY TILE QTY QUANTITY	R	R RISER, RED R OR RAD RADIUS RA RETURN AIR RC REINFORCED CONCRETE RCC REINFORCED CONCRETE CYLINDER PIPE RCP REINFORCED CONCRETE PIPE RCPT RECEPTACLE RD ROAD, ROOF DRAIN, ROUND RDCR REDUCER RDW REDWOOD R.E. 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APVD	BY	APVD	B FULLER
APVD	CHK	APVD	B FULLER
APVD	DR	APVD	S BRENNWALD
APVD	DGN	APVD	T DYE

Clackamas Water Environment Services

 Milwaukee, Oregon

 Kellogg Creek Water Resource Recovery Facility

 Aeration Basin Improvements

 Clackamas Water Environment Services

GENERAL

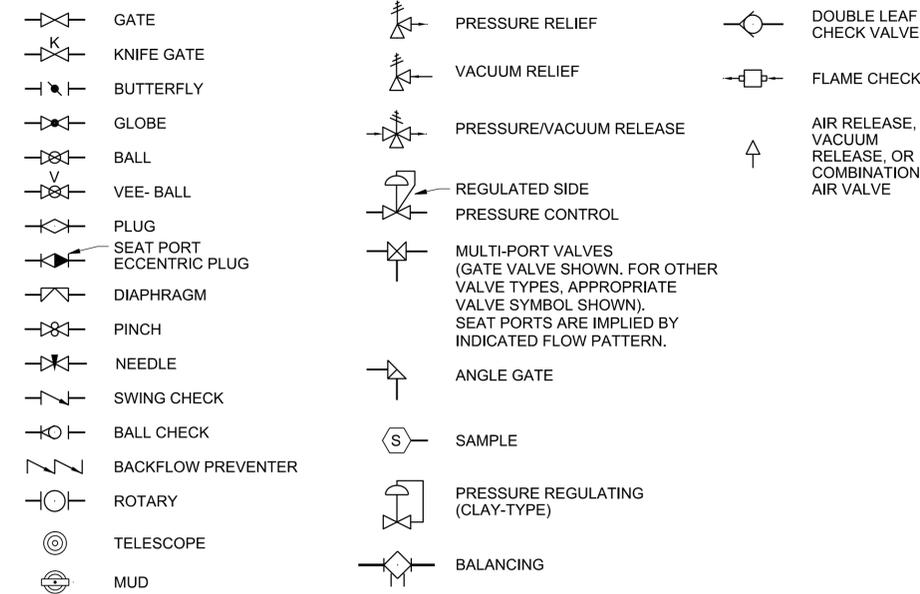
ABBREVIATIONS - 2

SCALE: AS SHOWN
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
DATE FEBRUARY 2022
PROJ D3518800
DWG G-004
SHEET 4 of 53

- GENERAL NOTES**
- THIS IS A STANDARD LEGEND SHEET. THEREFORE, NOT ALL OF THE INFORMATION SHOWN MAY BE USED ON THIS PROJECT.
 - FOR ADDITIONAL ABBREVIATIONS AND SYMBOLS OF OTHER DIVISIONS, SEE OTHER LEGENDS.
 - CONTACT ENGINEER FOR ABBREVIATIONS USED BUT NOT SHOWN ON THIS DRAWING.
 - FOR PIPING CALLOUTS AND FLOW STREAM IDENTIFICATION, SEE INSTRUMENTATION AND CONTROL LEGEND.

ISSUED FOR CONSTRUCTION

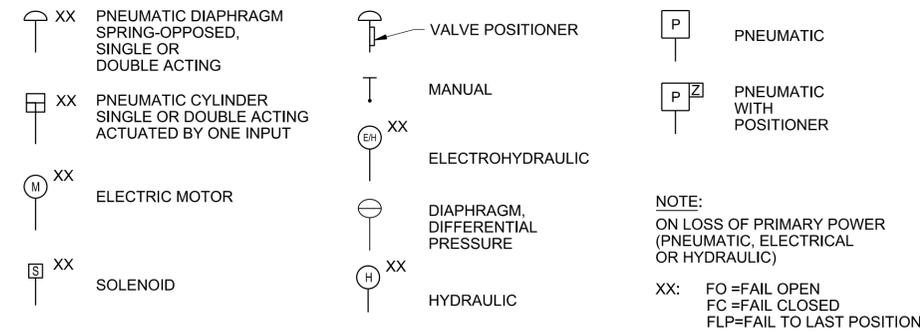
VALVE SYMBOLS



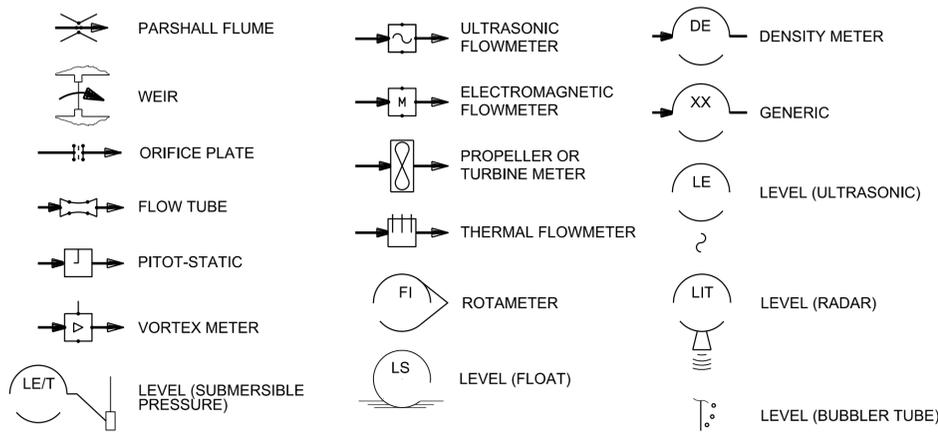
GATE SYMBOLS



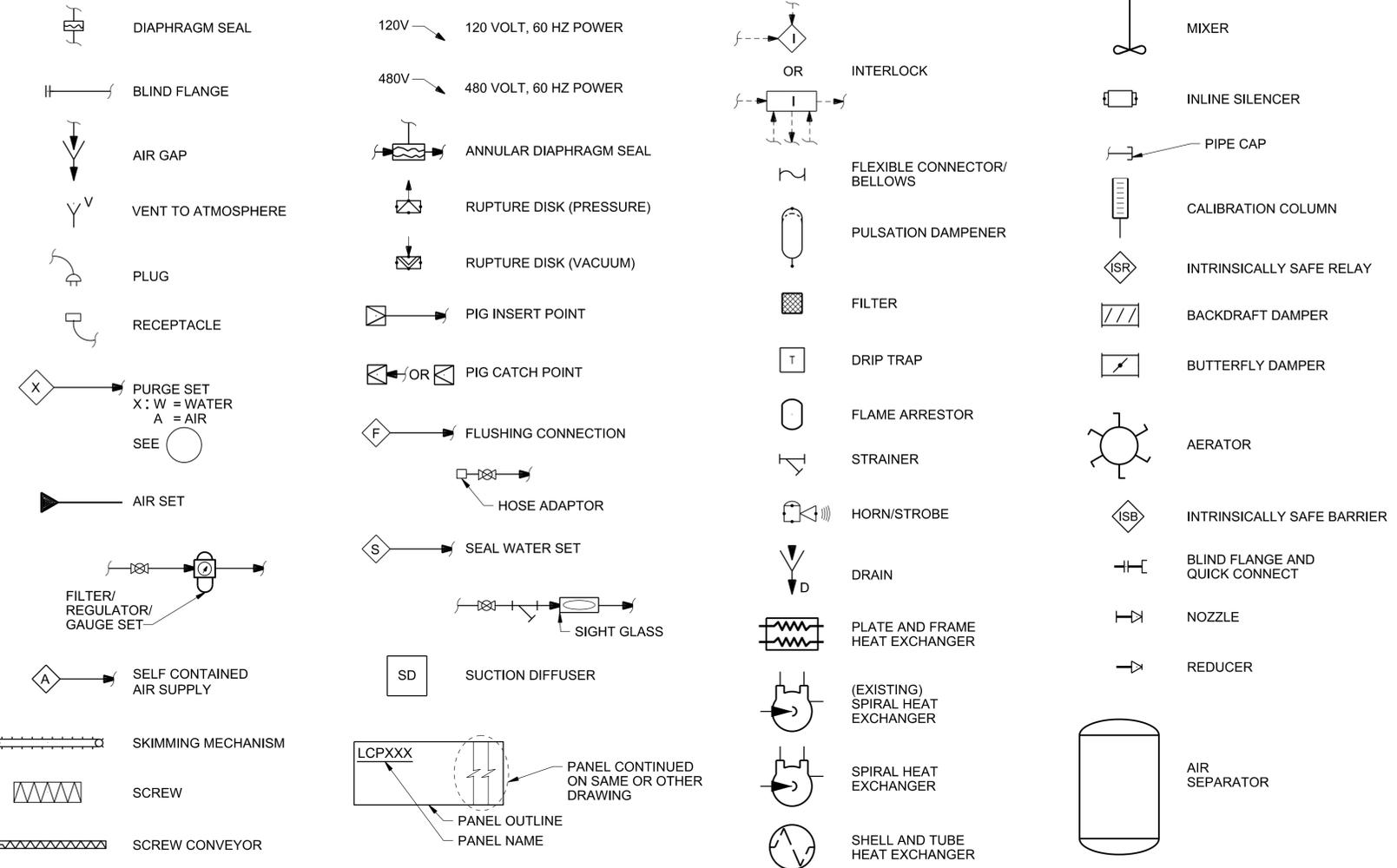
ACTUATOR SYMBOLS



PRIMARY ELEMENT SYMBOLS



MISCELLANEOUS SYMBOLS



NO.	DATE	DSGN	J. NORDAL	DR	J. BOSS	REVISION	CHK	APVD	L. WOOD	BY	APVD	B. FULLER
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Kellogg Creek Water Resource Recovery Facility

 Aeration Basin Improvements

 Clackamas Water Environment Services

 Milwaukie, Oregon

GENERAL

INSTRUMENTATION AND CONTROL

LEGEND 2

SCALE:	AS SHOWN
VERIFY SCALE:	
DATE:	FEBRUARY 2022
PROJ:	D3518800
DWG:	G-007
SHEET:	7 of 53

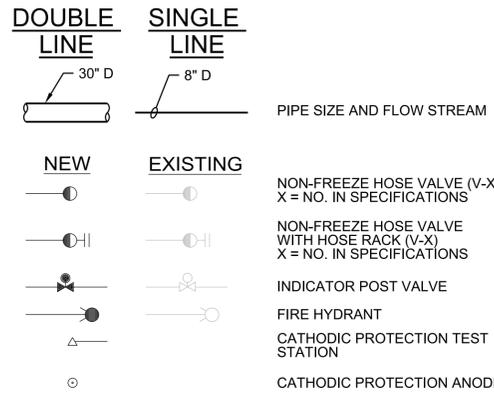
REUSE OF DOCUMENTS: THIS DOCUMENT AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF JACOBS AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF JACOBS. © JACOBS 2020. ALL RIGHTS RESERVED.

MECHANICAL LEGEND AND NOTES

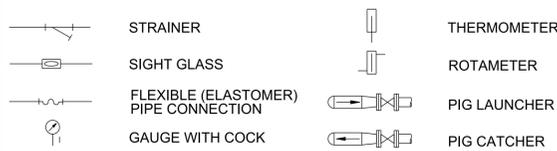
GENERAL PIPING NOTES

- LAY PIPE TO UNIFORM GRADE BETWEEN INDICATED ELEVATION POINTS.
- SIZE OF FITTINGS SHOWN ON PLANS SHALL CORRESPOND TO ADJACENT STRAIGHT RUN OF PIPE, UNLESS OTHERWISE INDICATED. TYPE OF JOINT AND FITTING MATERIAL SHALL BE THE SAME AS SHOWN FOR ADJACENT STRAIGHT RUN OF PIPE.
- LOCATION AND NUMBER OF PIPE HANGERS AND PIPE SUPPORTS SHOWN IS ONLY APPROXIMATE. MAXIMUM SPACING SHALL BE AS SPECIFIED.
- ALL JOINTS SHALL BE WATERTIGHT. WALL PIPES SHALL BE USED WHEREVER PIPING PASSES FROM A STRUCTURE TO BACKFILL UNLESS OTHERWISE SHOWN.
- ALL FLEXIBLE CONNECTORS OR FLANGED COUPLING ADAPTERS SHALL BE PROVIDED WITH THRUST TIES, OR ANCHORS, UNLESS OTHERWISE NOTED. THRUST PROTECTION SHALL BE ADEQUATE FOR TEST PRESSURES SPECIFIED.
- SYMBOLS, LEGENDS, AND PIPE USE IDENTIFICATIONS SHOWN SHALL BE FOLLOWED THROUGHOUT THE PLANS, WHEREVER APPLICABLE. NOT ALL OF THE VARIOUS PIPING COMPONENTS ARE NECESSARILY USED IN THE PROJECT.
- NUMBER AND LOCATION OF UNIONS SHOWN ON PLANS IS ONLY APPROXIMATE. PROVIDE ALL UNIONS NECESSARY TO FACILITATE CONVENIENT REMOVAL OF VALVES AND MECHANICAL EQUIPMENT.
- WHERE A GROOVED END COUPLING IS SHOWN, IT SHALL BE THE RIGID JOINT TYPE, UNLESS OTHERWISE SPECIFIED. WHERE A FLANGED COUPLING ADAPTER IS SHOWN, A STANDARD FLANGE
- LOCATE REINFORCING IN WALL AND FLOOR PRIOR TO INSTALLATION OF PIPE PENETRATION. PROVIDE ENGINEER WITH LOCATION OF REINFORCING AND EXPECTED BARS TO BE DISTURBED DURING INSTALLATION. COORDINATE FINAL LOCATION AND PENETRATION DETAIL REQUIREMENTS WITH ENGINEER.

YARD PIPING LEGEND



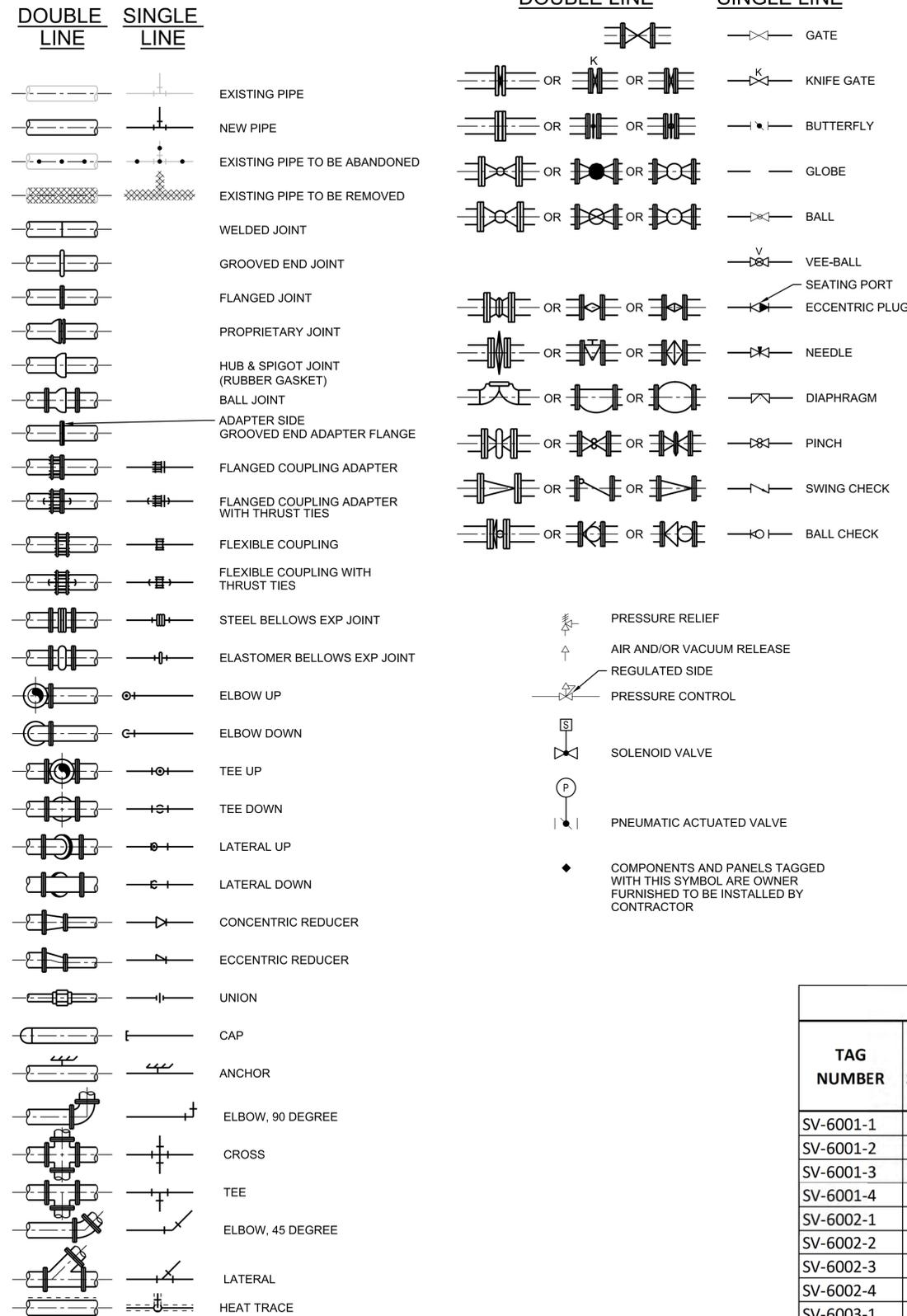
MISCELLANEOUS PIPING SYMBOLS



NOTES:

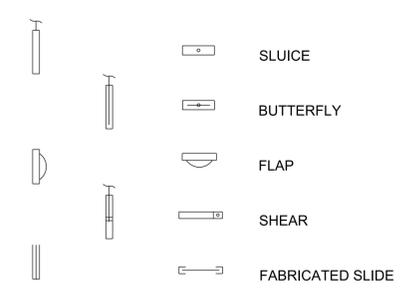
- THIS IS A STANDARD LEGEND SHEET. THEREFORE, NOT ALL OF THE INFORMATION SHOWN MAY BE USED ON THIS PROJECT.
- FOR ADDITIONAL ABBREVIATIONS AND SYMBOLS OF OTHER DIVISIONS, SEE OTHER LEGENDS.
- FOR PIPING CALLOUTS AND FLOW STREAM IDENTIFICATION, SEE PIPE SCHEDULE.
- ONLY FLANGED END CONNECTIONS ARE SHOWN HERE FOR DOUBLE LINE FITTINGS. FITTINGS WITH OTHER END PATTERNS ARE SHOWN SIMILARLY ON THE CONSTRUCTION DRAWINGS. ALSO SEE PIPING SPECIFICATIONS.
- SYMBOLS SHOWN HERE FOR SINGLE LINE FITTINGS ARE GENERIC ONLY. REFER TO PIPING SPECIFICATIONS FOR SPECIFIC END CONNECTIONS FOR SINGLE LINE PIPE AND FITTINGS.
- EXISTING PIPE AND EQUIPMENT IS SHOWN LIGHT-LINED AND/OR SCREENED AND IS NOTED AS EXISTING. NEW PIPING AND EQUIPMENT IS SHOWN DARK-LINED.

PIPE, FITTING AND VALVE SYMBOLS

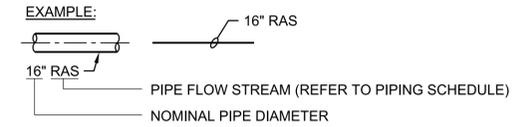


GATE SYMBOLS

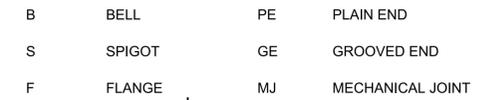
EL. VIEW PLAN VIEW



PIPING DESIGNATION

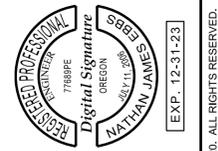


PIPE AND FITTING END PATTERNS



SOLENOID VALVE SCHEDULE

TAG NUMBER	FLOW STREAM	VALVE TYPE	SIZE (IN)	MAXIMUM OPERATING PRESSURE (PSIG)	MAXIMUM PRESSURE DIFFERENTIAL (PSID)	FAIL POSITION (NOTE 1)	SUPPLY VOLTAGE (VOLTS)	ACTUATOR TYPE
SV-6001-1	AHP	V940	1/2	125	125	FAIL CLOSE	120	SOLENOID
SV-6001-2	AHP	V940	1/2	125	125	FAIL CLOSE	120	SOLENOID
SV-6001-3	AHP	V940	1/2	125	125	FAIL CLOSE	120	SOLENOID
SV-6001-4	AHP	V940	1/2	125	125	FAIL CLOSE	120	SOLENOID
SV-6002-1	AHP	V940	1/2	125	125	FAIL CLOSE	120	SOLENOID
SV-6002-2	AHP	V940	1/2	125	125	FAIL CLOSE	120	SOLENOID
SV-6002-3	AHP	V940	1/2	125	125	FAIL CLOSE	120	SOLENOID
SV-6002-4	AHP	V940	1/2	125	125	FAIL CLOSE	120	SOLENOID
SV-6003-1	AHP	V940	1/2	125	125	FAIL CLOSE	120	SOLENOID
SV-6003-2	AHP	V940	1/2	125	125	FAIL CLOSE	120	SOLENOID
SV-6003-3	AHP	V940	1/2	125	125	FAIL CLOSE	120	SOLENOID
SV-6003-4	AHP	V940	1/2	125	125	FAIL CLOSE	120	SOLENOID
SV-6004-1	AHP	V940	1/2	125	125	FAIL CLOSE	120	SOLENOID
SV-6004-2	AHP	V940	1/2	125	125	FAIL CLOSE	120	SOLENOID
SV-6004-3	AHP	V940	1/2	125	125	FAIL CLOSE	120	SOLENOID
SV-6004-4	AHP	V940	1/2	125	125	FAIL CLOSE	120	SOLENOID



NO.	DATE	BY	APVD
DR	S BAAR	S BRENNWALD	N LEBBS
REVISION	CHK	APVD	B FULLER

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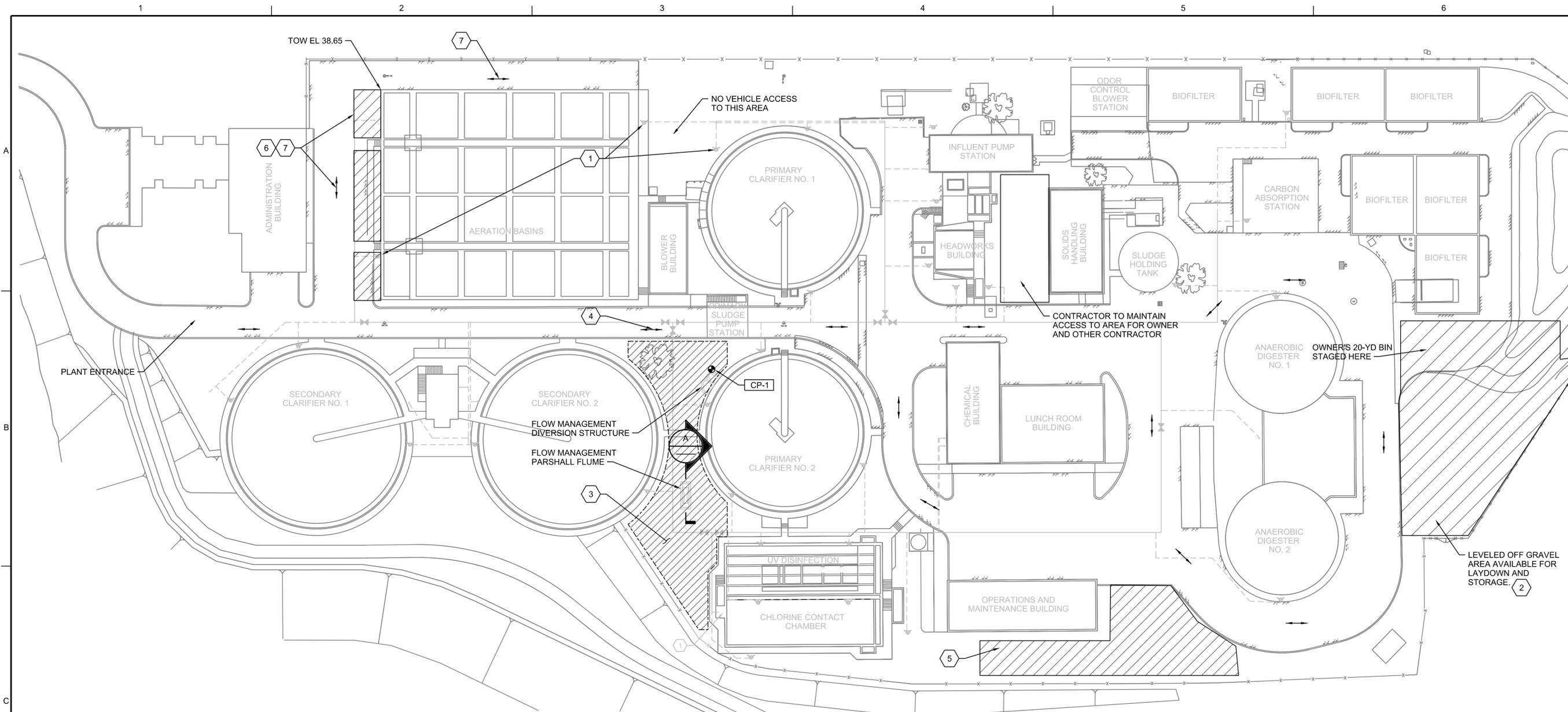
GENERAL PROCESS MECHANICAL LEGEND

SCALE: AS SHOWN

VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING.

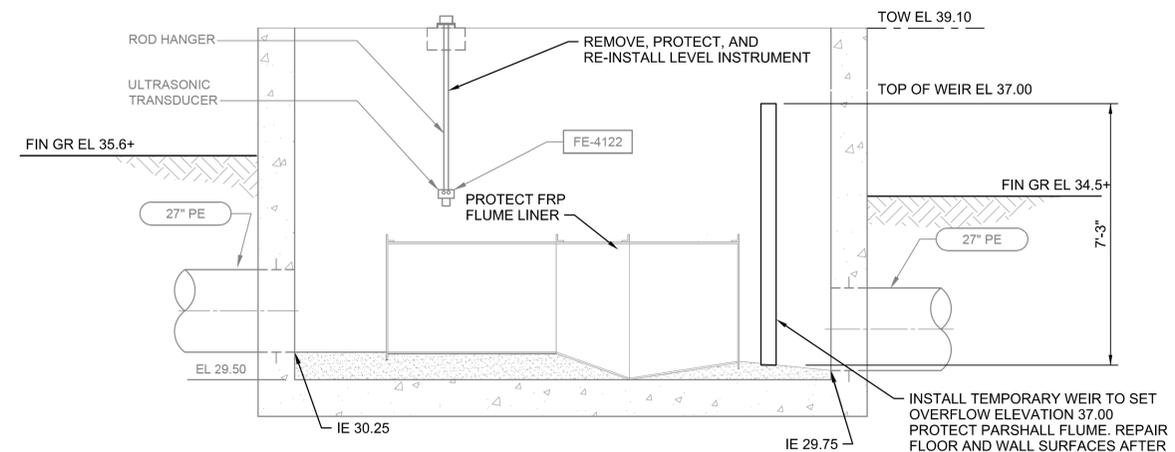
DATE: FEBRUARY 2022
PROJ: D3518800
DWG: G-008
SHEET: 8 of 53



CONTROL POINT TABLE				
POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
CP-1	-792.6669	2116.6734	39.75	NE CORNER FLOW MANAGEMENT DIVERSION STRUCTURE



STAGING PLAN
1"=30'



NOTE:
1. PARSHALL FLUME IS 4'-0" WIDE

A BYPASS PUMPING SECTION
NTS

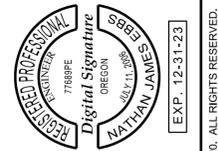
GENERAL SHEET NOTES

- PROVIDE TEMPORARY FENCING AS NECESSARY TO MAINTAIN SECURITY AT ALL TIMES.
- CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTING AND MAINTAINING EROSION CONTROL DEVICES DURING CONSTRUCTION.
- CONTRACTOR SHALL TAKE ALL OTHER MEASURES TO POSITIVELY PRECLUDE EROSION MATERIALS OR OTHER POLLUTANTS FROM LEAVING THE SITE.
- NO STAGING, STORAGE OF MATERIALS, OR PARKING SHALL BE ALLOWED WITHIN PUBLIC ROAD RIGHTS-OF-WAY, OR EXISTING PLANT ACCESS ROADS OR PARKING.

SHEET KEYNOTES

- W3 (PLANT EFFLUENT) HYDRANTS.
- CONTRACTOR TO COORDINATE PARKING AND STAGING WITH OWNER.
- STAGING AREA FOR BYPASS PUMPING.
- PROVIDE RAMPS RATED FOR SLUDGE HAULING TRUCKS FOR ALL BYPASS PIPING CROSSING THE ROAD. MAINTAIN ACCESS FOR SLUDGE HAULING TRUCKS DURING CONSTRUCTION.
- AREA AVAILABLE FOR CONTRACTOR CONSTRUCTION TRAILER. 110 V POWER, POTABLE WATER SUPPLY, AND DRAIN AVAILABLE NEAR THIS AREA.
- CONTRACTOR TO COORDINATE STAGING OF MATERIALS AND EQUIPMENT NORTH OF AERATION BASINS WITH OWNER.
- CONTRACTOR TO MAINTAIN ACCESS FOR OWNER TO FUEL DIESEL STANDBY GENERATOR.

- LEGEND:
- 2-INCH YARD HYDRANT FREEZE PROOF
 - 6-INCH ISOLATION VALVE



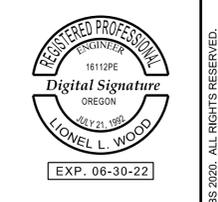
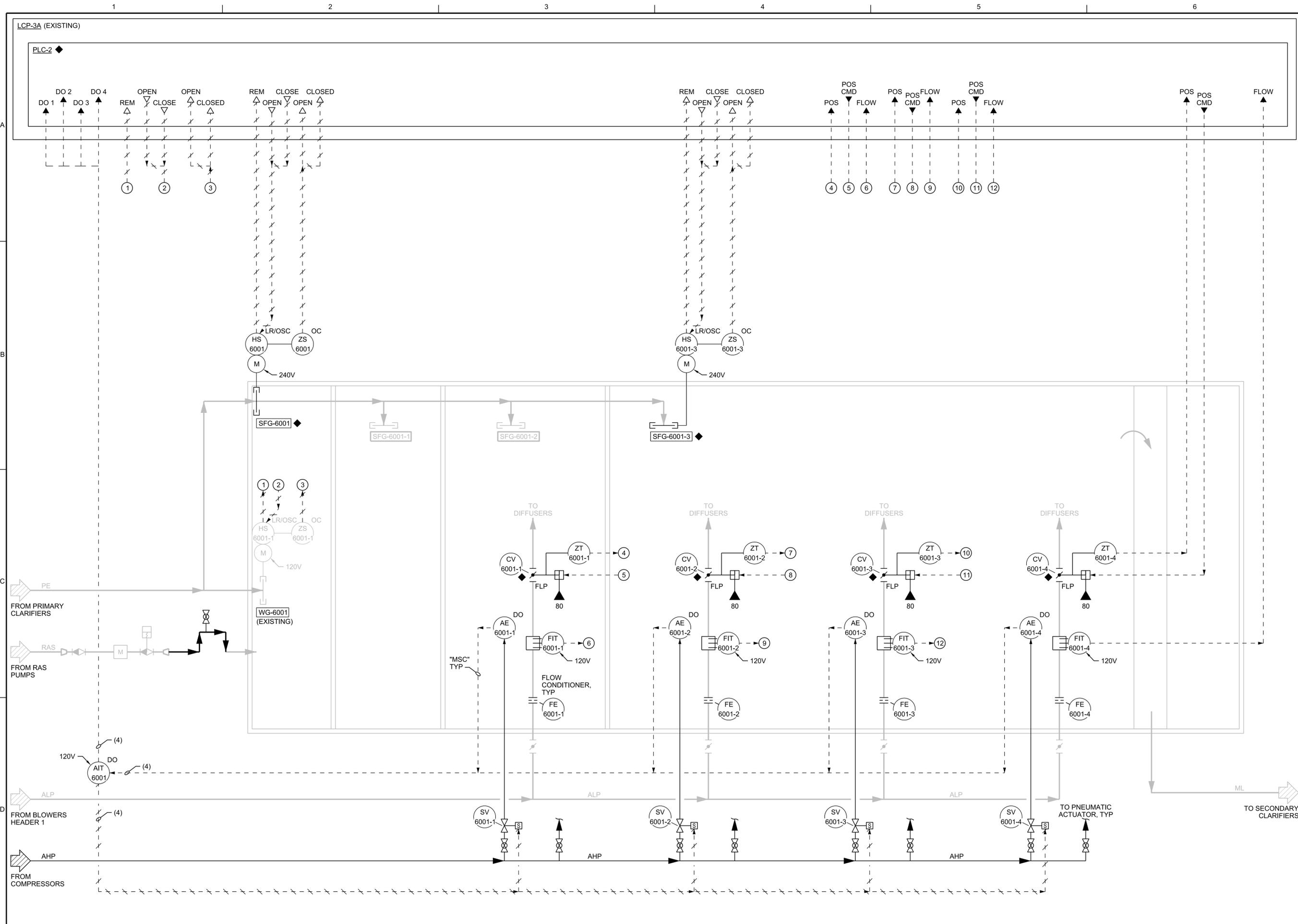
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							N LEBES

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CIVIL
OVERALL STAGING PLAN

SCALE: AS SHOWN
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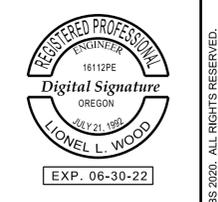
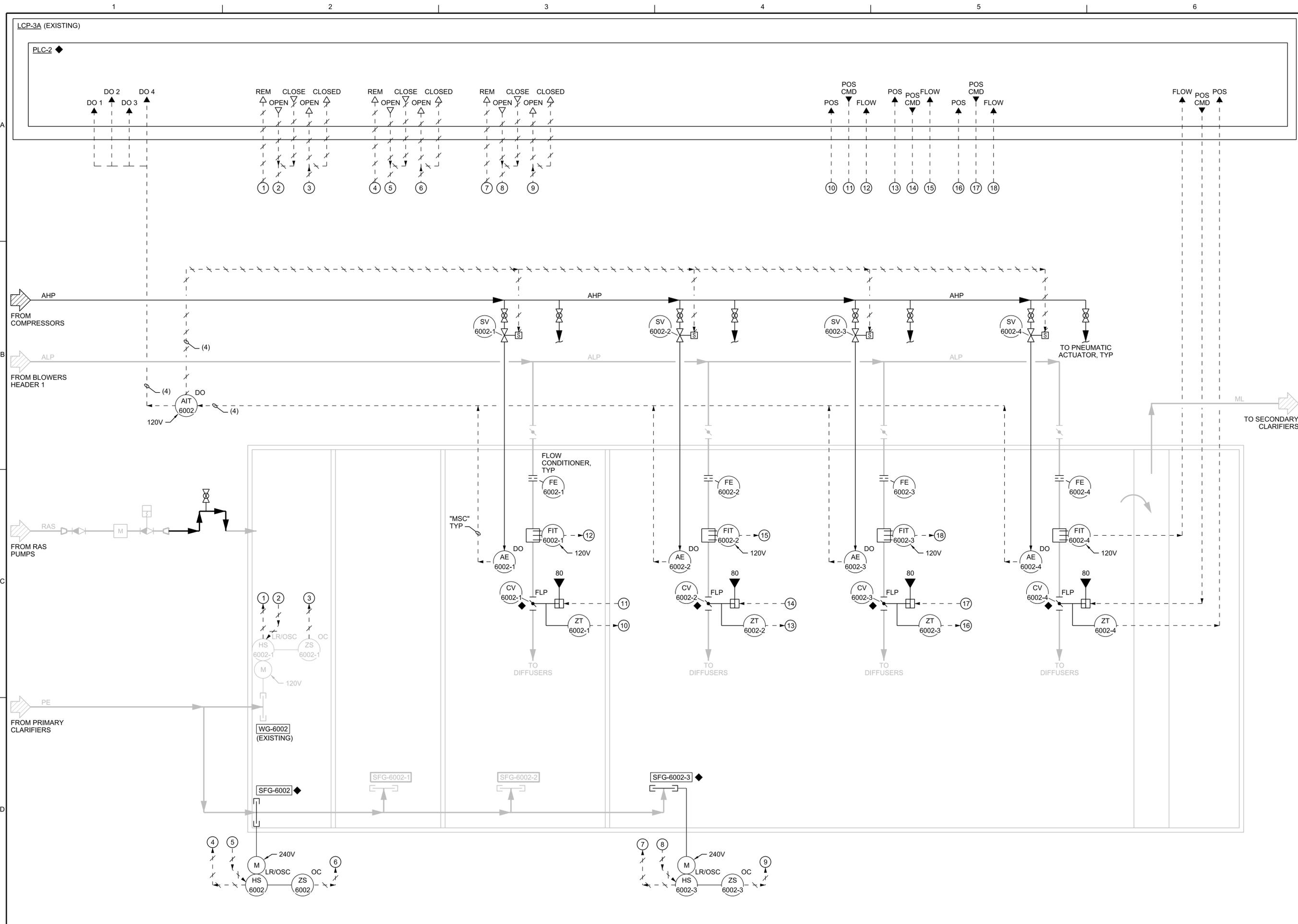
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 INSTRUMENTATION AND CONTROL
AERATION BASIN 1
P&ID

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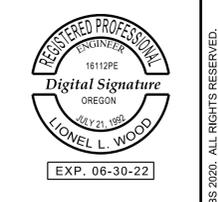
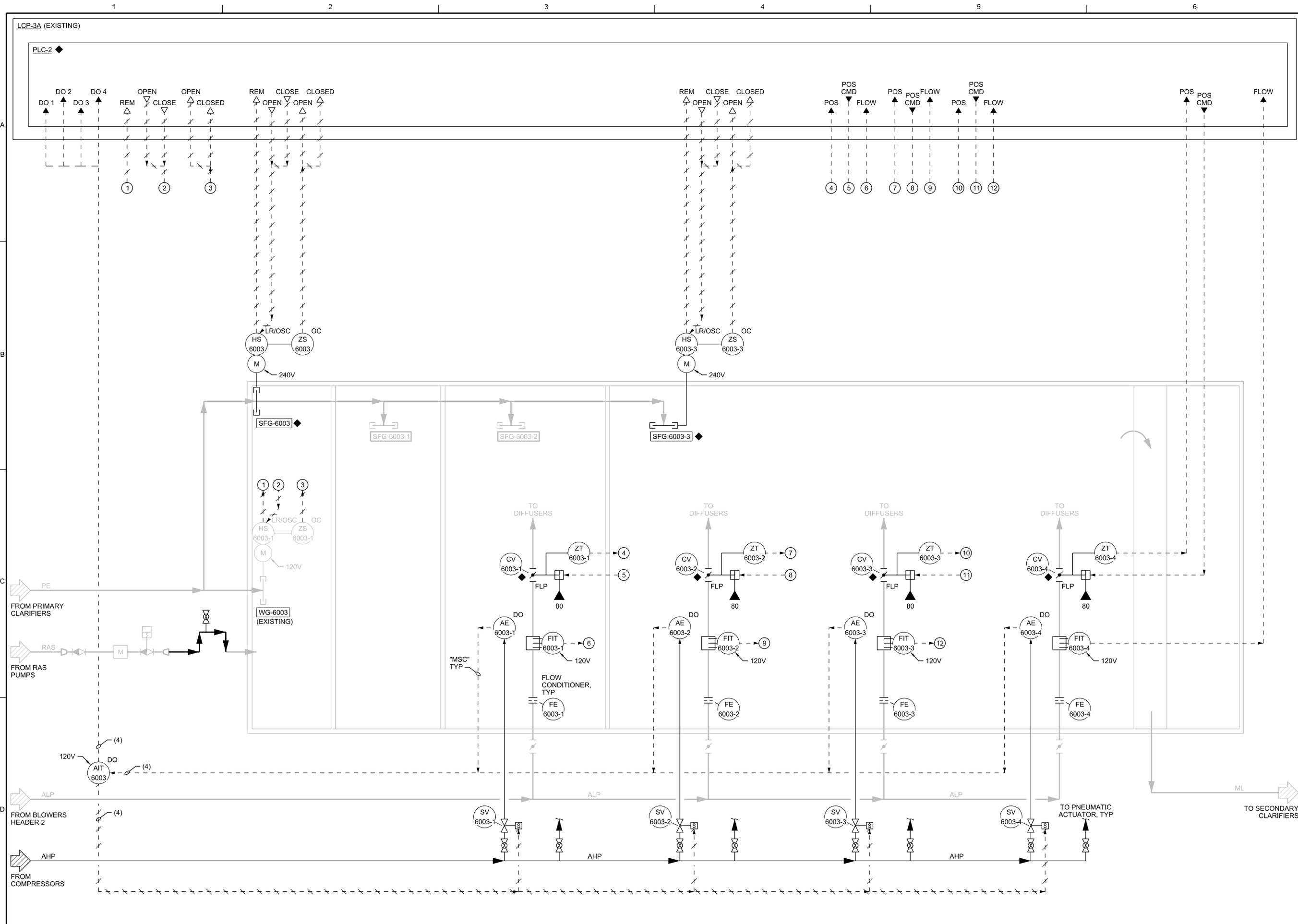
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		J. NORDAL	J. BOSS	L. WOOD	B. FULLER
REVISION				APVD	

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 INSTRUMENTATION AND CONTROL
AERATION BASIN 2
 P&ID

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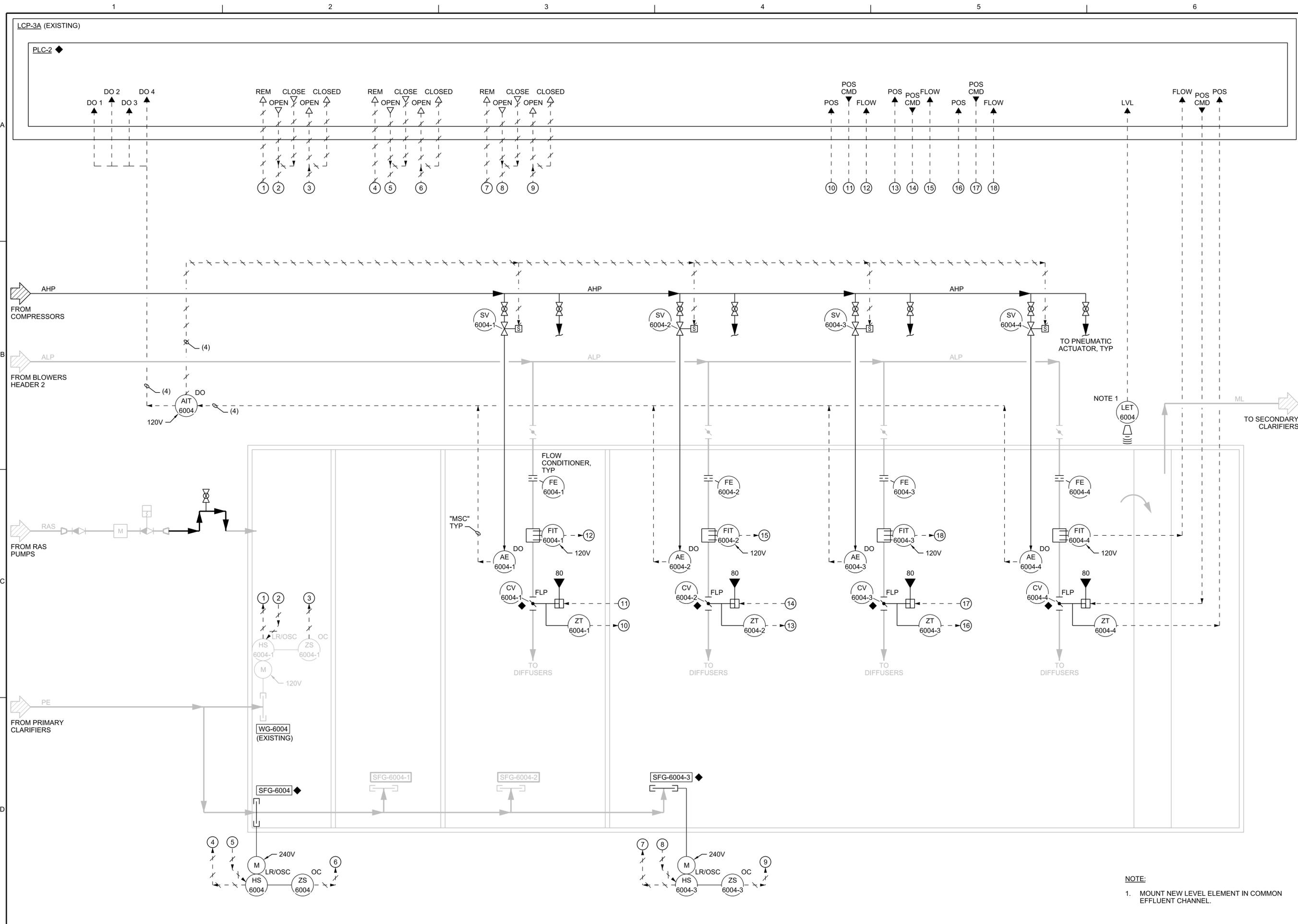
NO.	DATE	DSGN	DR	CHK	APVD	BY	APVD
			J. NORDAL	J. BOSS	L. WOOD	B. FULLER	

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 Milwaukie, Oregon

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AERATION BASIN 3
P&ID

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DATE:	FEBRUARY 2022
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DWG:	N-103
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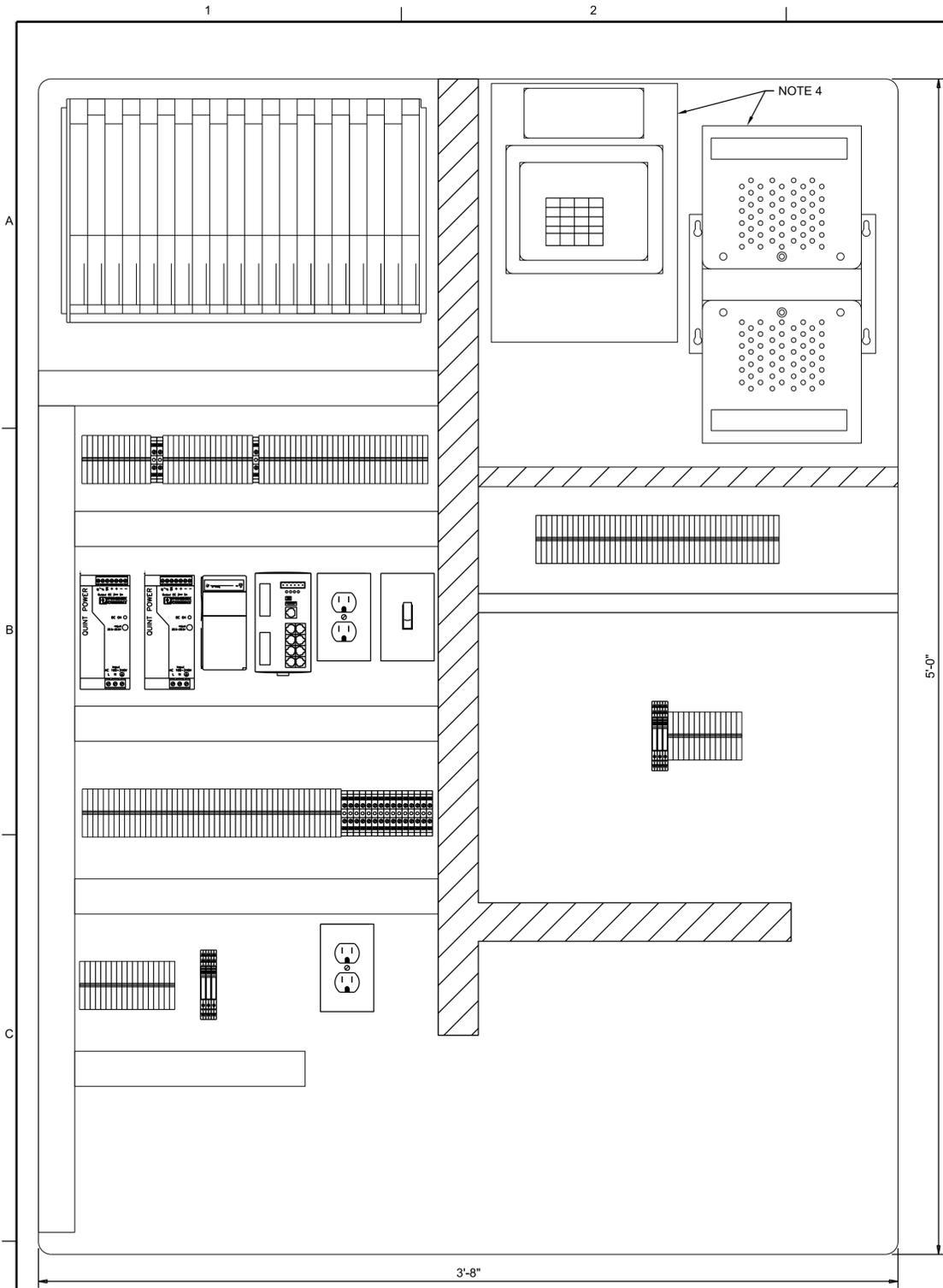
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 INSTRUMENTATION AND CONTROL
AERATION BASIN 4
 P&ID

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DWG:	N-104
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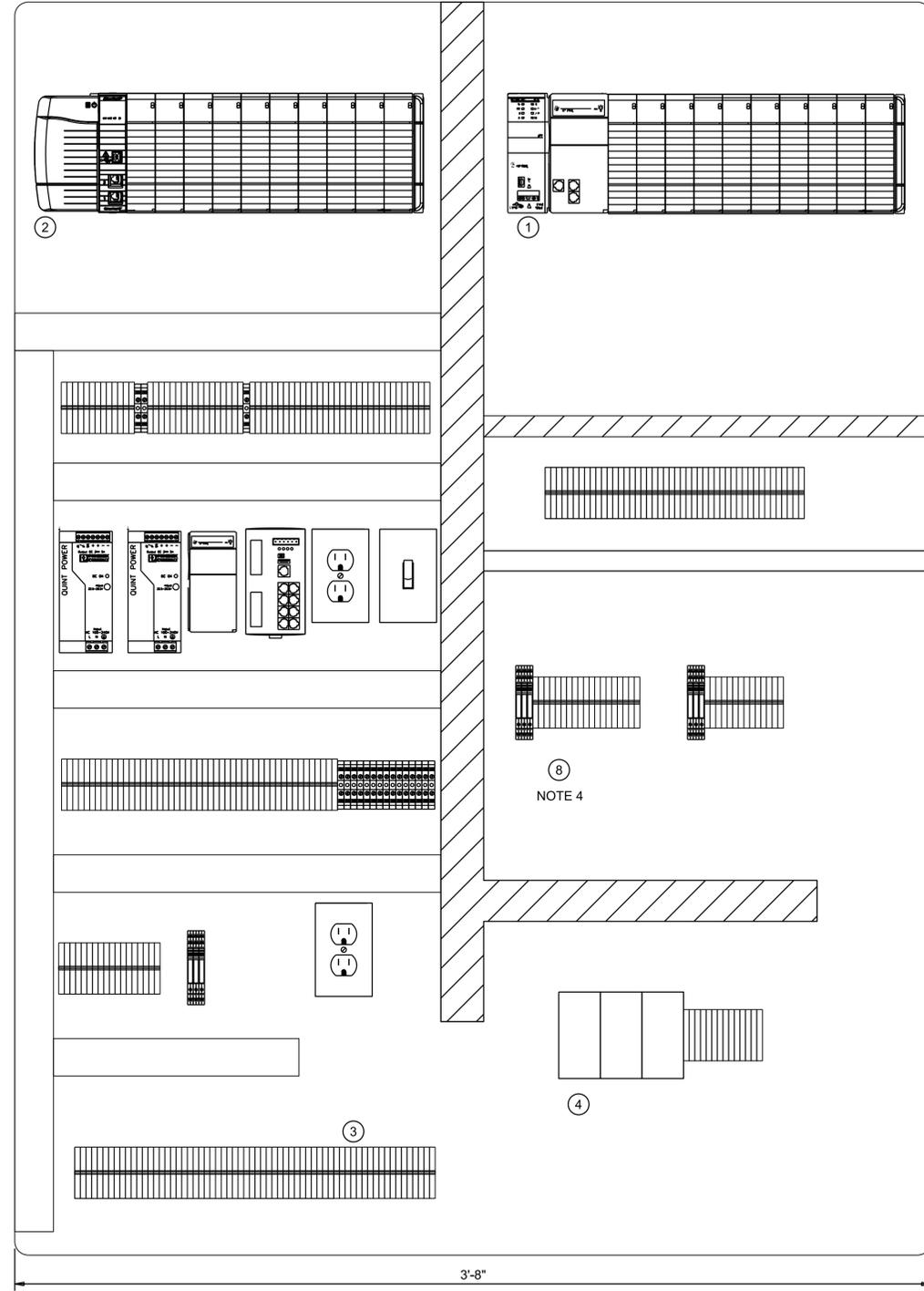
NOTE:
 1. MOUNT NEW LEVEL ELEMENT IN COMMON EFFLUENT CHANNEL.

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LCP-3 EXISTING PANEL LAYOUT
NTS

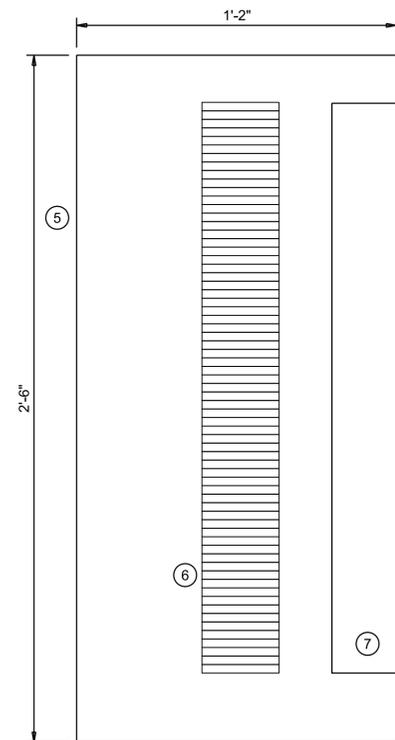
ITEM	DESCRIPTION
1	PLC RACK 0
2	PLC RACK 1
3	ANALOG TERMINALS
4	24VDC POWER SUPPLIES AND TERMINALS
5	SIDE PANEL 30H 14W
6	DISCRETE TERMINALS AND RELAYS
7	WIREWAY
8	120V AC POWER TERMINALS



LCP-3 NEW PANEL LAYOUT
NTS

NOTES:

- OBTAIN EXISTING PANEL DRAWINGS FROM OWNER AND CONFIRM AS-BUILT CONDITION. COORDINATE AND SCHEDULE WITH OWNER FOR RECEIPT OF OWNER-FURNISHED PLC HARDWARE.
- LAYOUT SHOWN FOR NEW PLC HARDWARE AND TERMINALS SHOWS GENERAL LOCATIONS. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFICATION OF AVAILABLE SPACE AND DIMENSIONS OF EXISTING AND NEW EQUIPMENT. MAKE ADJUSTMENTS TO LAYOUT TO ACCOMMODATE FIELD CONDITIONS.
- SCHEDULE AND PERFORM WORK WITHIN THE SPECIFIED CONSTRAINTS FOR PROCESS SHUTDOWNS AND OPERATION OF AERATION BASINS AND RELATED PROCESSES.
- REMOVE EXISTING 120VAC PANELBOARD AND POWER CONDITIONER. REWIRE POWER FROM MCC-2, PANELBOARD 2M-4, TO NEW POWER DISTRIBUTION CIRCUIT BREAKERS AND TERMINALS. RECONNECT EXISTING 120V CIRCUITS AND ADD NEW 120V CIRCUITS.
- ARRANGE AND SECURE EXISTING AND NEW WIRING NEATLY IN WIREWAY OR WITH WIRE TIES WHERE THERE IS NO SPACE FOR WIREWAY.



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							L. WOOD

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LCP-3 PANEL LAYOUT

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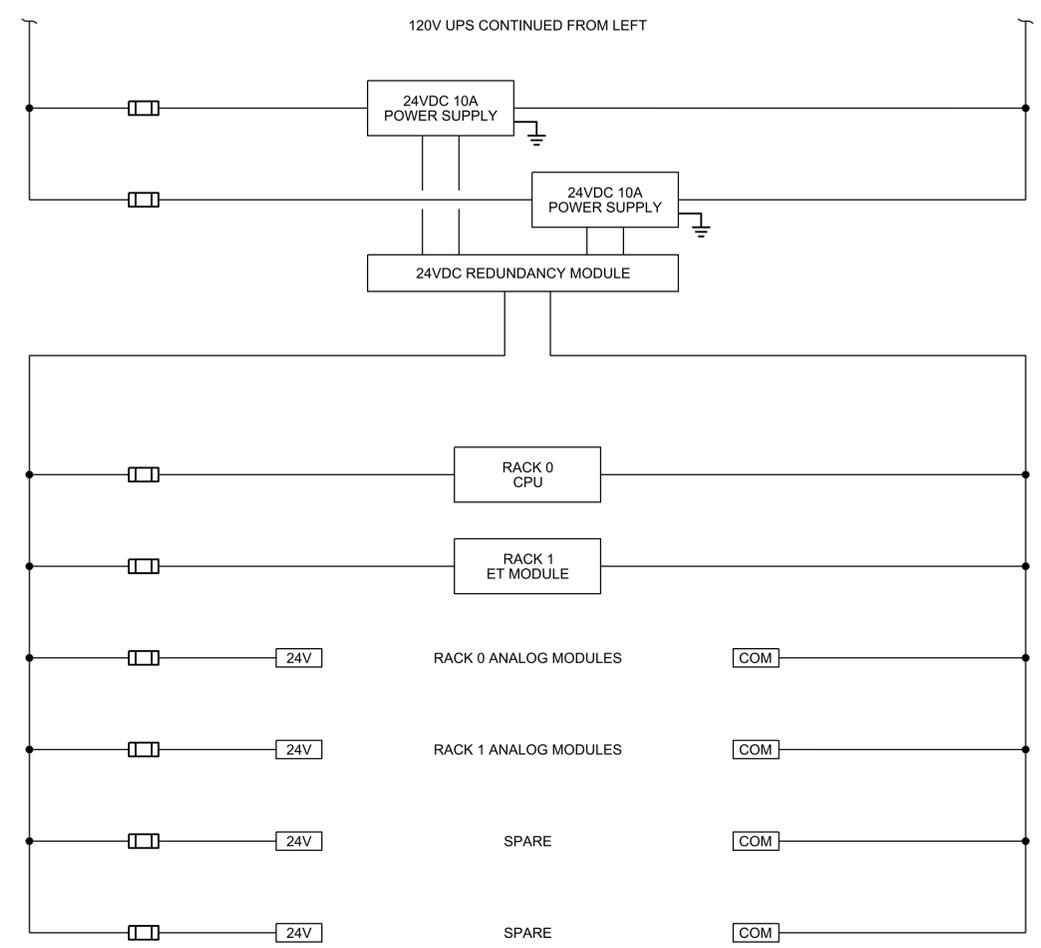
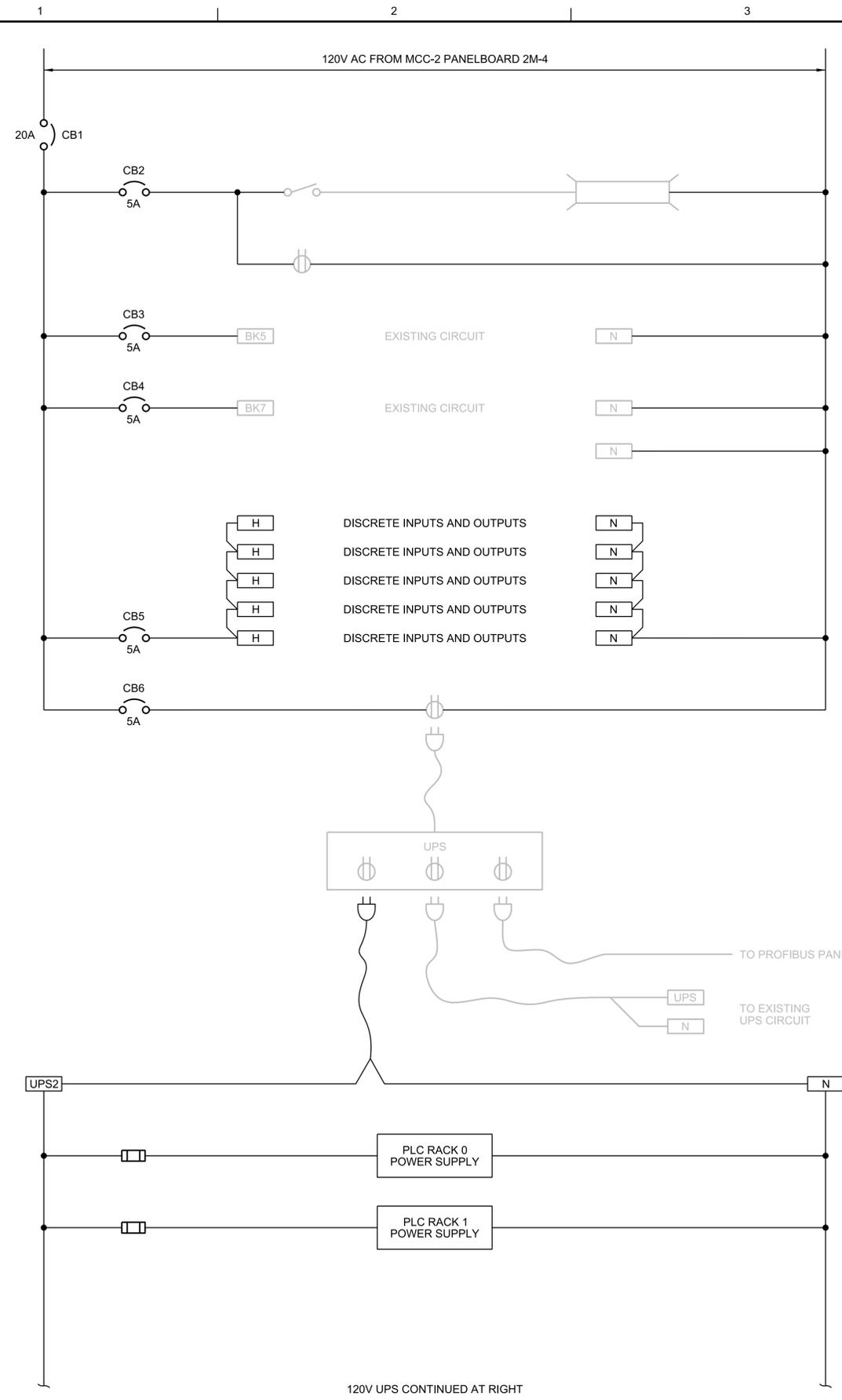
DWG N-200

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- NOTES:**
1. REWIRE PANEL POWER TO FEED ALL EXISTING AND NEW CIRCUITS AS SHOWN. VERIFY CIRCUIT QUANTITIES AND TERMINAL BLOCK REQUIREMENTS AND PROVIDE EQUIPMENT AS NEEDED FOR A COMPLETE AND OPERATIONAL INSTALLATION.
 2. COORDINATE POWER SHUTDOWNS WITH OWNER, WHEN REQUIRED TO PERFORM WORK. PLAN WORK TO KEEP FACILITY IN OPERATION DURING SHUTDOWN.
 3. EXCEPT FOR TEMPORARY SHUTDOWN, MAINTAIN POWER TO EXISTING PLC-2 FOR CONTINUED OPERATION UNTIL SCHEDULE IS READY TO INSTALL NEW PLC RACK 1.



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				APVD

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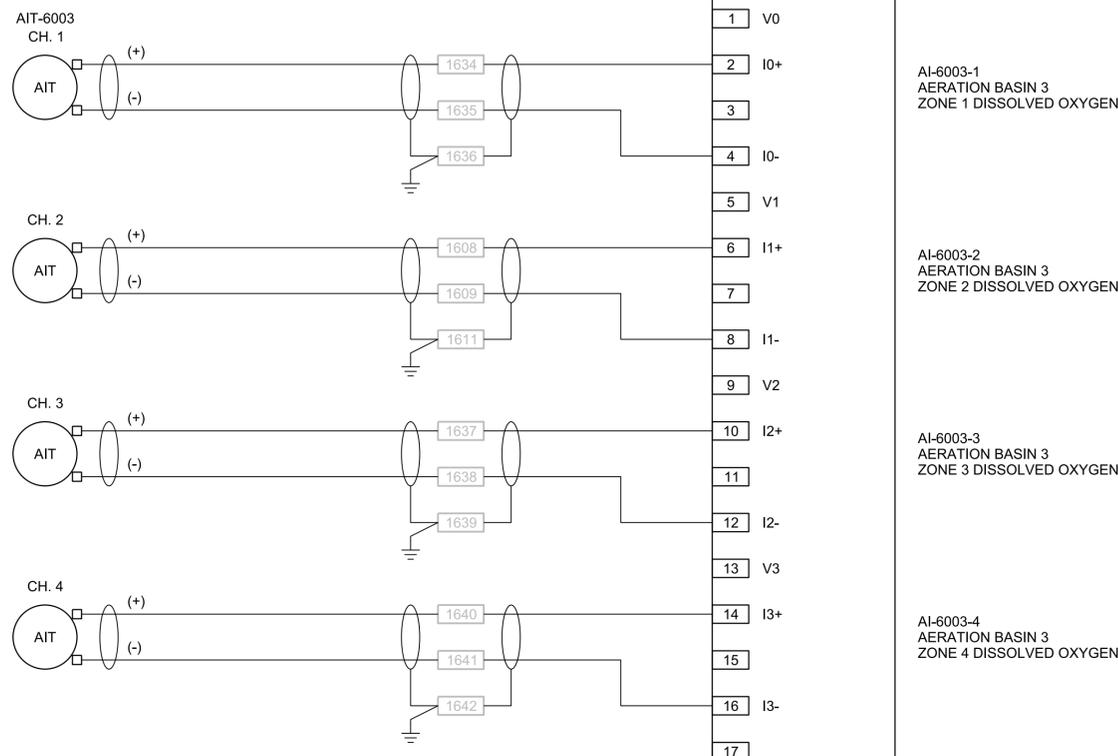
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 INSTRUMENTATION AND CONTROL
LCP-3 WIRING DIAGRAM POWER

SCALE: AS SHOWN	
VERIFY SCALE	
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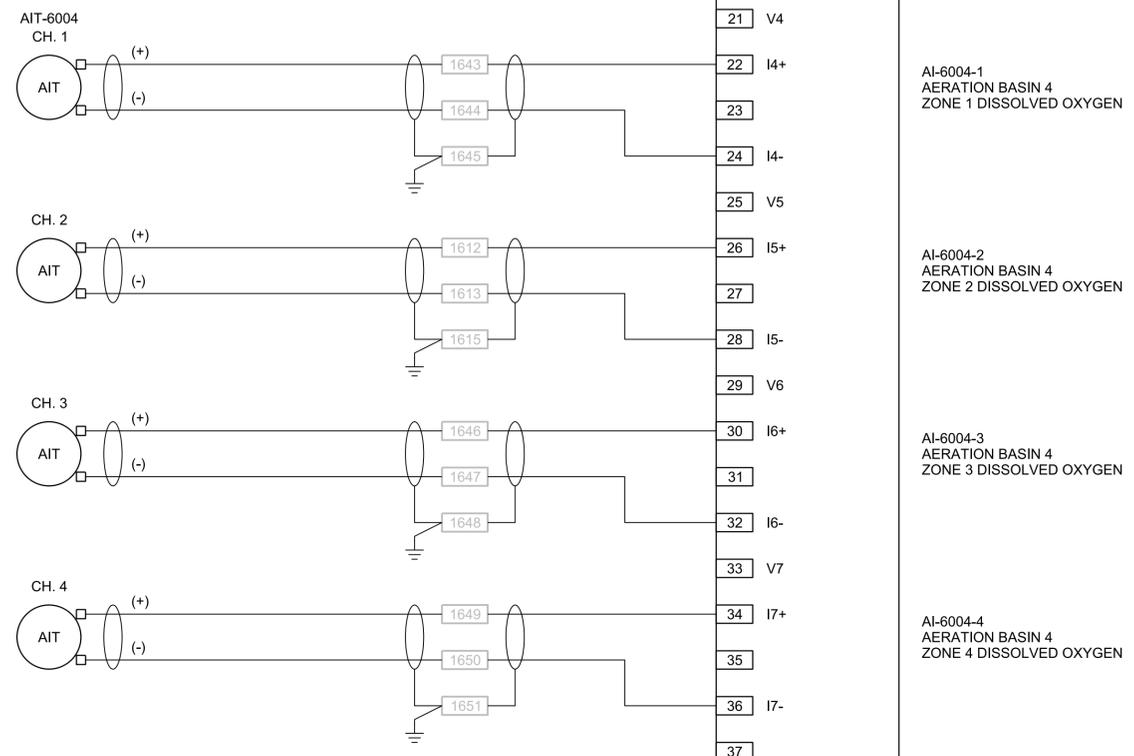
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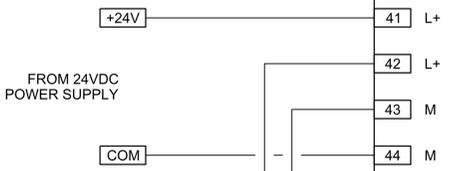
PLC2 - RACK 0 - SLOT 02
8 CHANNEL ANALOG INPUT
6ES7531 7NF10 0AB0



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J. NORDAL			M. NOUSEN	
			L. WOOD	
			B. FULLER	

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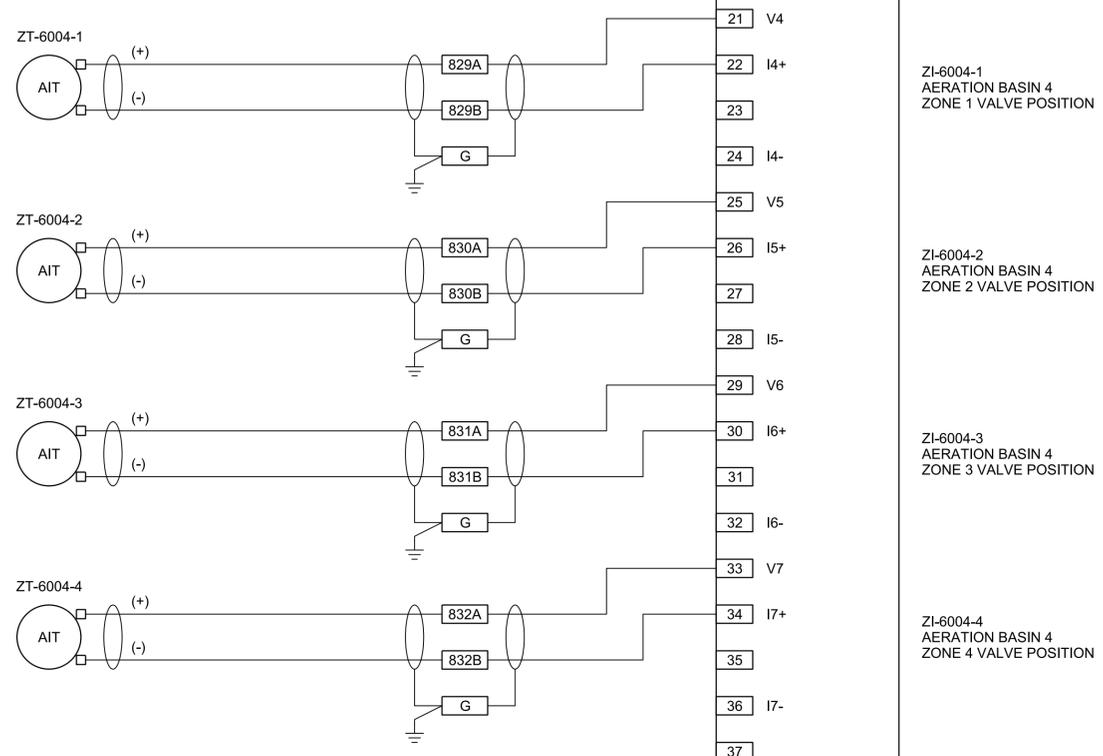
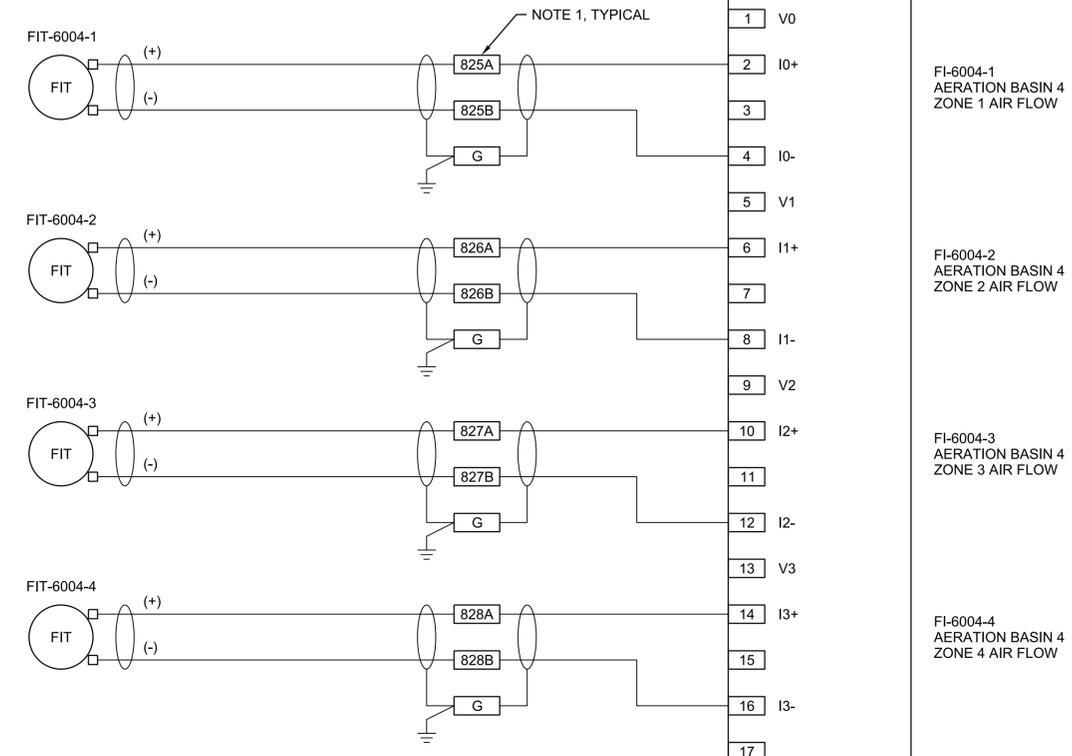
Jacobs
 INSTRUMENTATION AND CONTROL
 LCP-3 PLC WIRING
 DIAGRAM
 RACK 0 SLOT 02

SCALE: AS SHOWN
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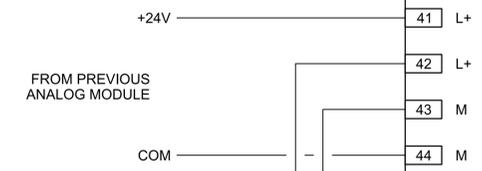
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PLC2 - RACK 0 - SLOT 04
8 CHANNEL ANALOG INPUT
6ES7531 7NF10 0AB0



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CONTINUED AT RIGHT



- NOTES:**
1. NEW TERMINAL BLOCKS, FOR EACH POINT PROVIDE MULTILEVEL TERMINAL BLOCK WITH DISCONNECT AND GROUND, PHOENIX CONTACT UT 4-PE/MT - 3214364, OR EQUAL.



NO.	DATE	DR	REVISION	BY
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			CHK	L. WOOD
			APVD	
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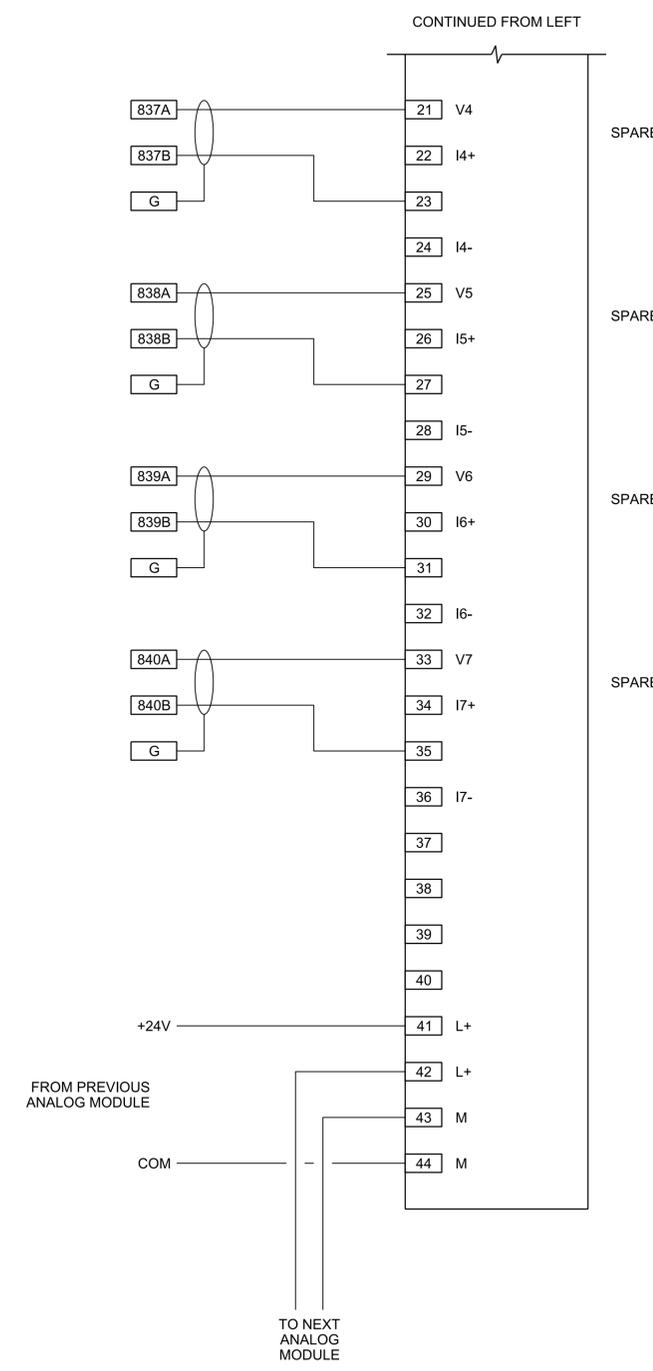
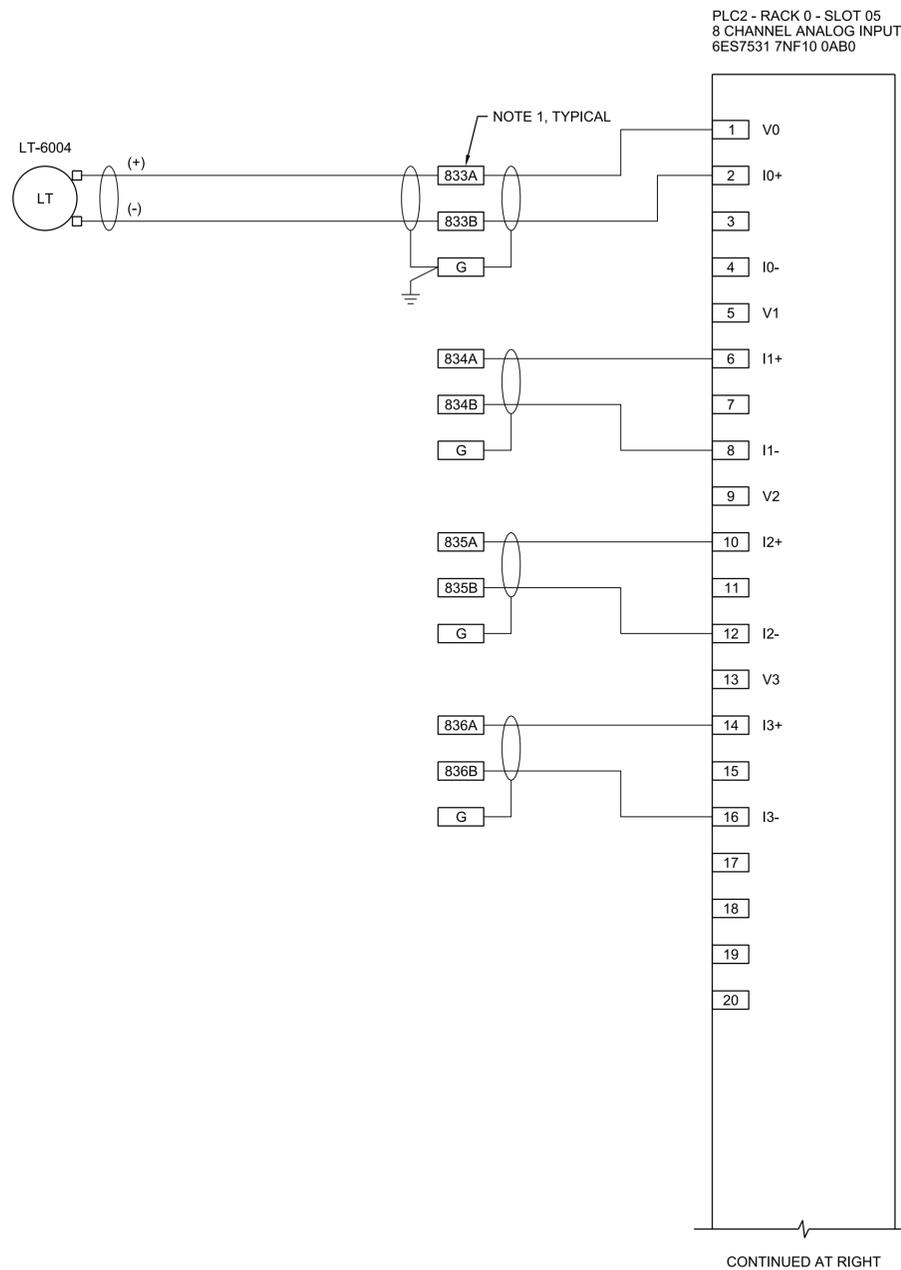
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LCP-3 PLC WIRING
DIAGRAM
RACK 0 SLOT 04

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		J. NORDAL	M. NOUSEN	L. WOOD	B. FULLER
		DSGN	CHK	APVD	APVD

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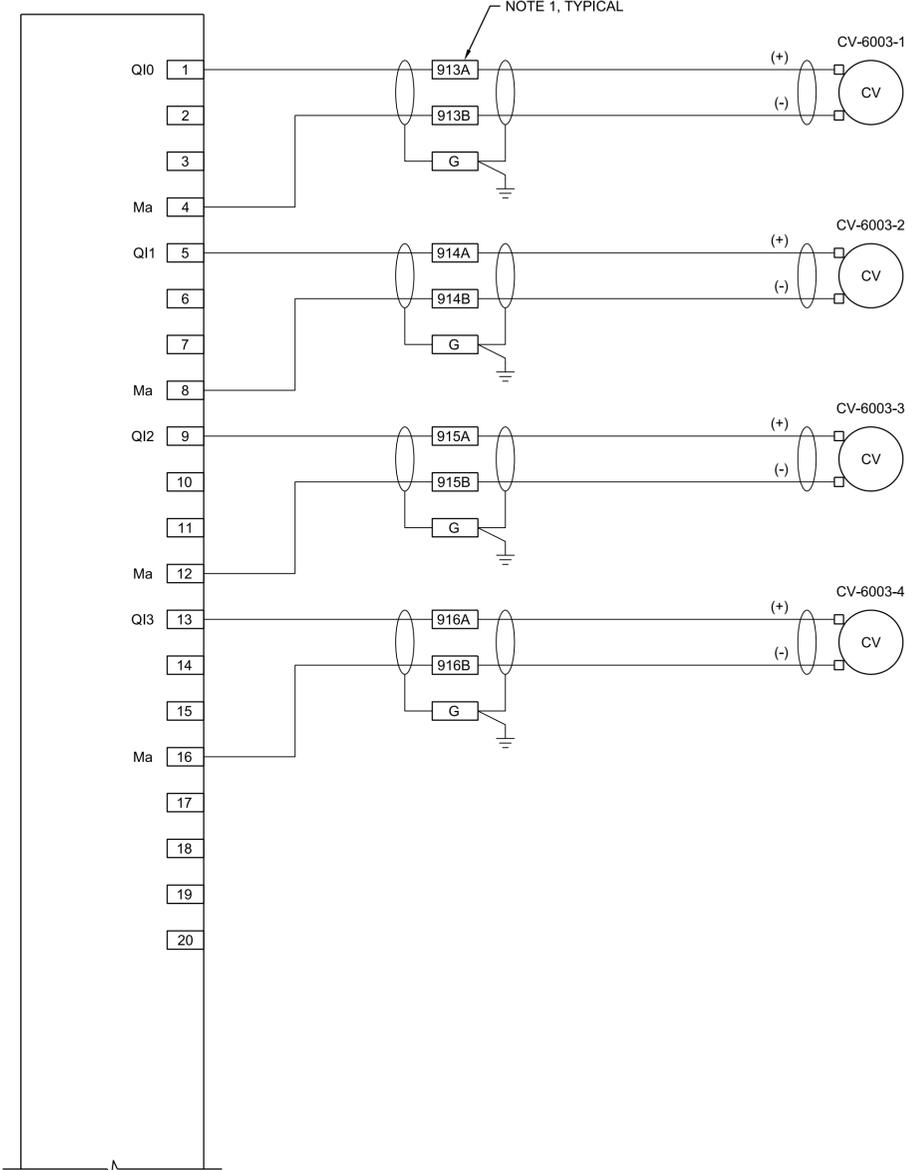
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DIAGRAM
RACK 0 SLOT 05

SCALE:	AS SHOWN
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SHEET	20 of 53

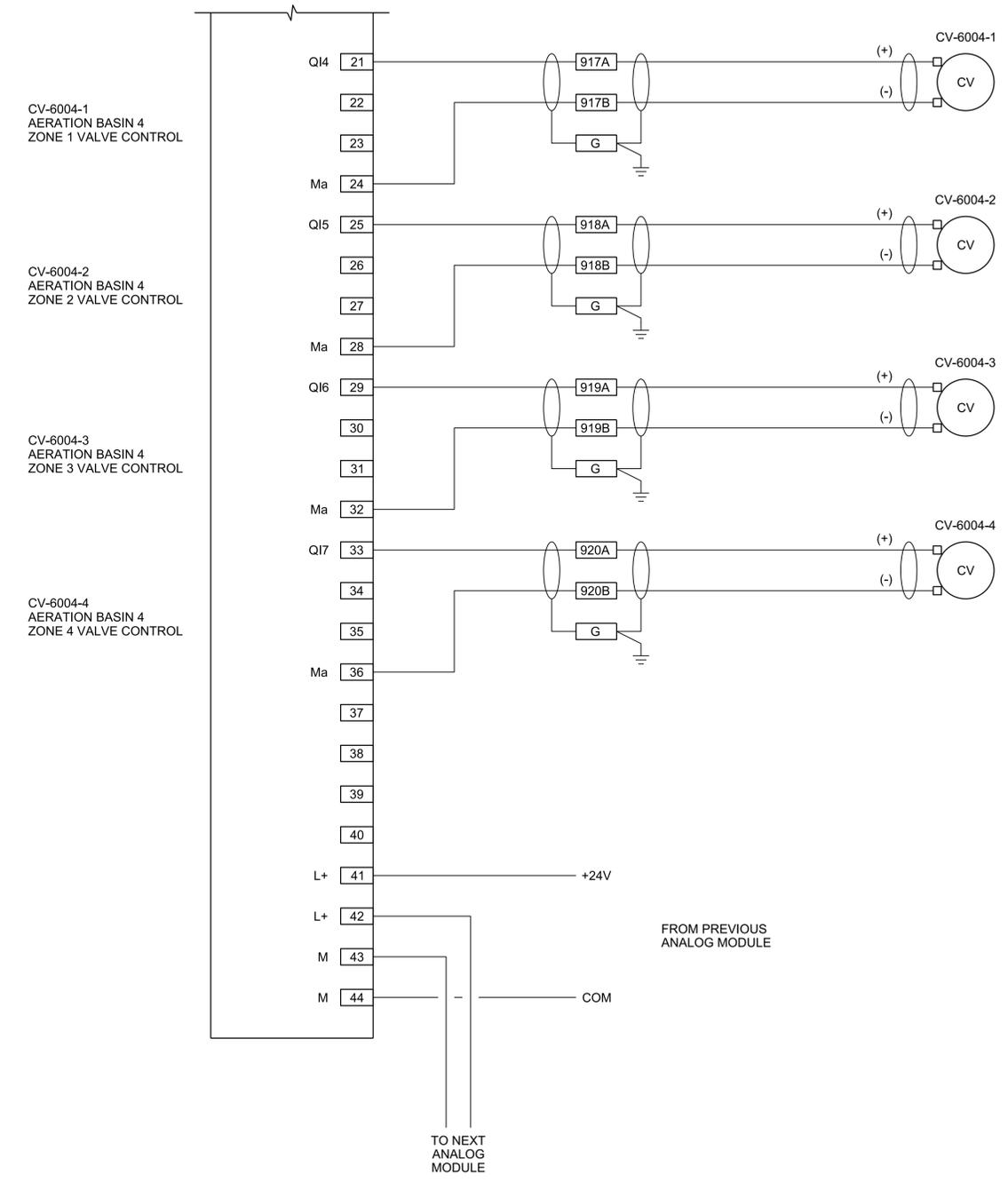
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PLC2 - RACK 0 - SLOT 06
8 CHANNEL ANALOG OUTPUT
6ES7532-5HF00-0AB0



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NOTES:
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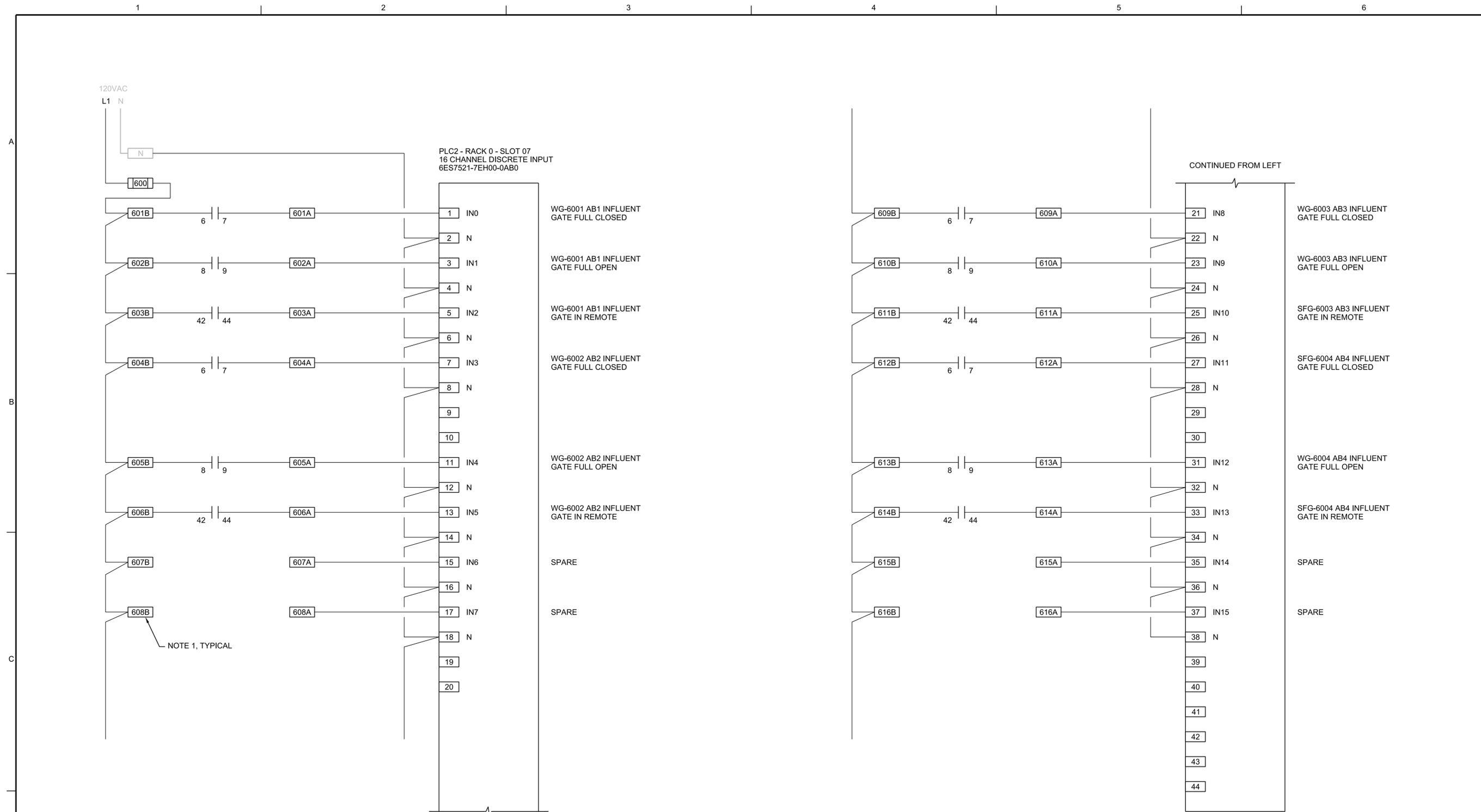
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		DSGN	REVISION	APVD	APVD

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LCP-3 PLC WIRING
DIAGRAM
RACK 0 SLOT 06

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LCP-3 PLC WIRING
DIAGRAM
RACK 0 SLOT 07

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DWG:	N-207
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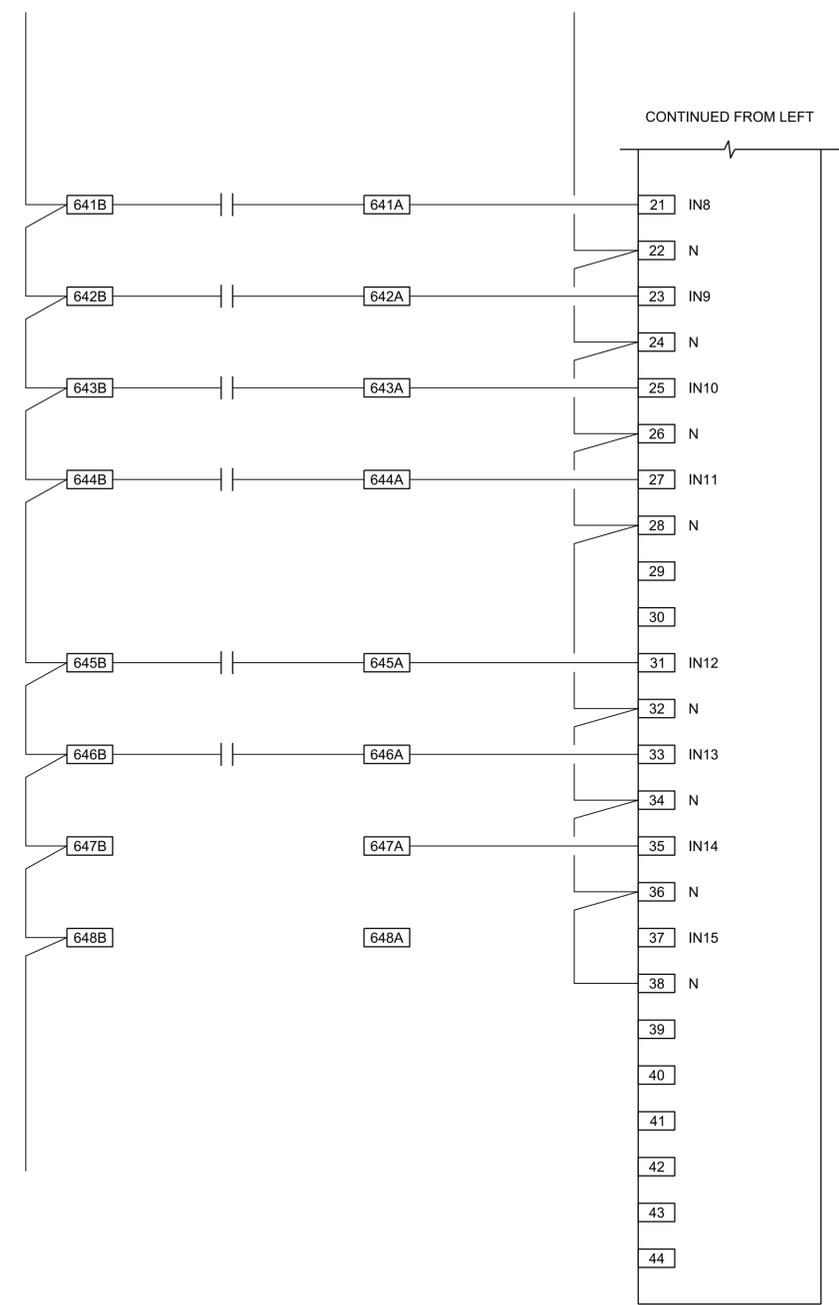
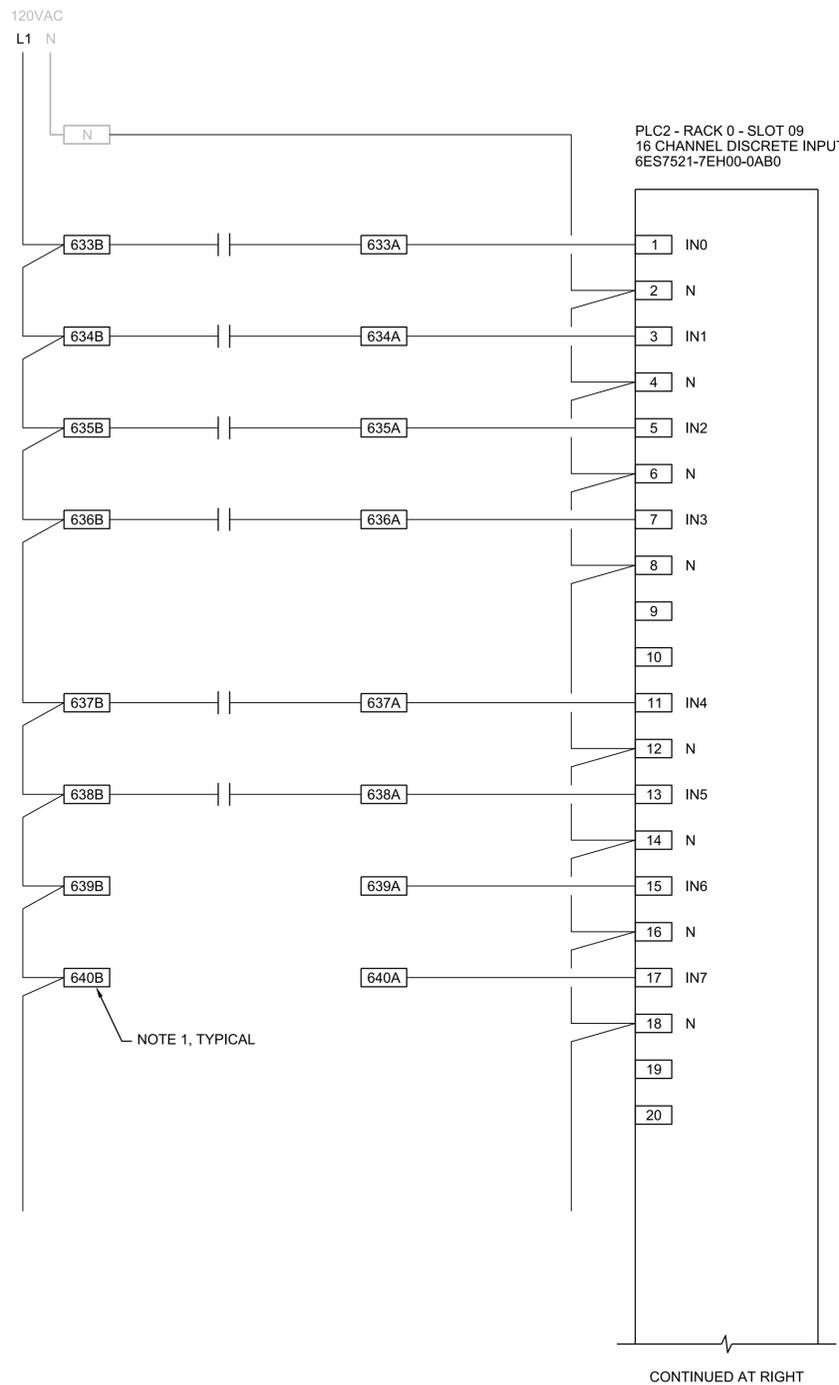
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NOTES:
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LCP-3 PLC WIRING
DIAGRAM
RACK 0 SLOT 09

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SHEET	24 of 53

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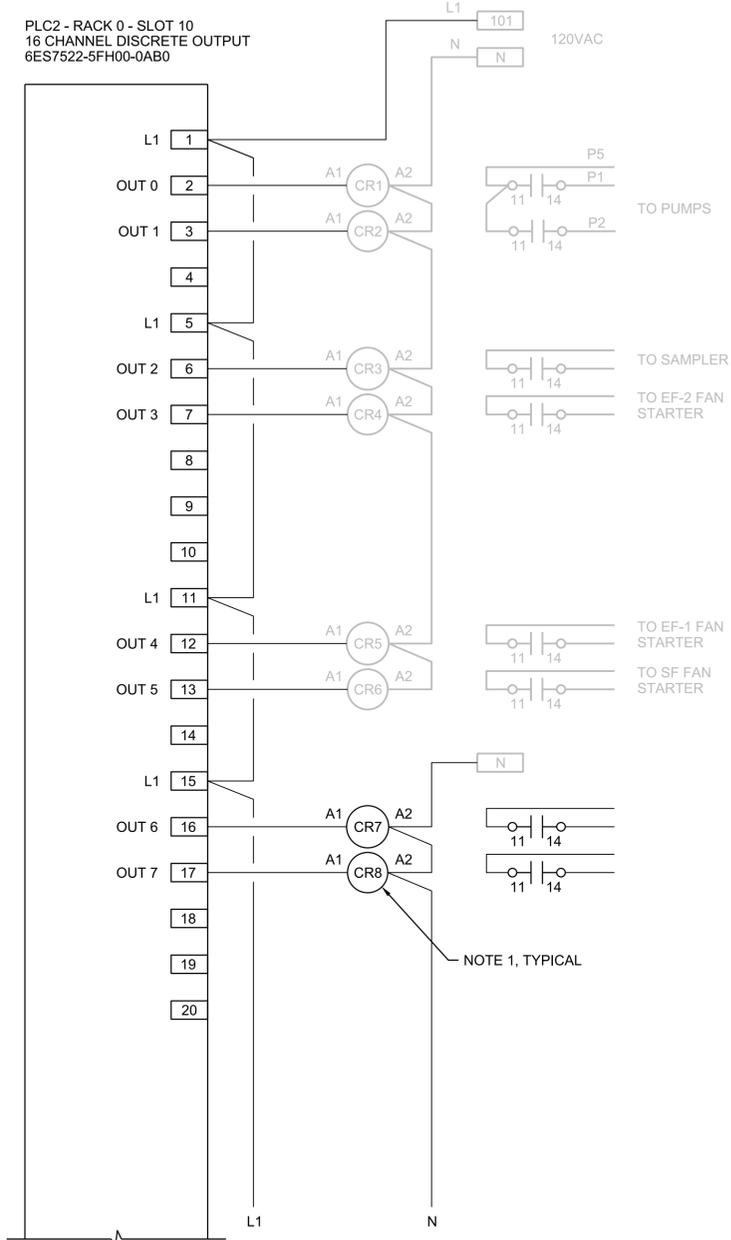
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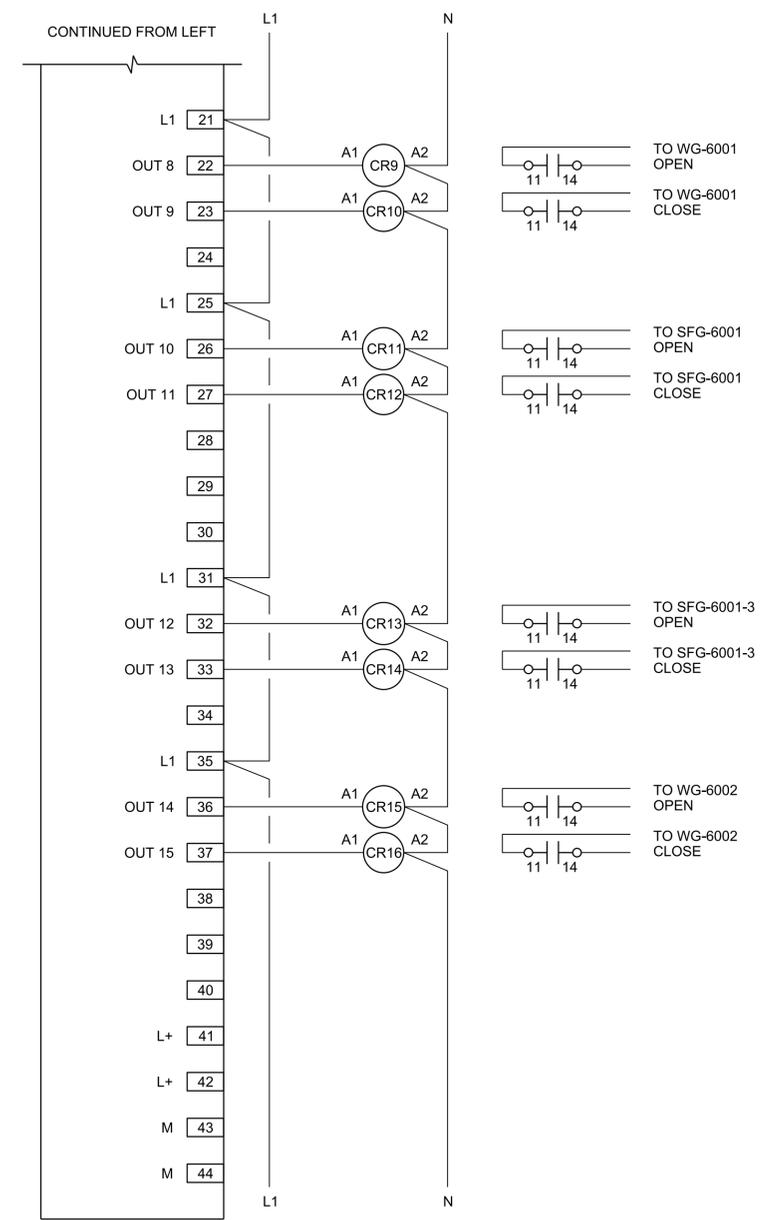
PLC2 - RACK 0 - SLOT 10
16 CHANNEL DISCRETE OUTPUT
6ES7522-5FH00-0AB0

- M-2211 PRIMARY SLUDGE PUMP 1 START (I.S. RELAY)
- M-2212 PRIMARY SLUDGE PUMP 2 START (I.S. RELAY)
- M-4150 PRIMARY EFFLUENT SAMPLER
- M-6034 BLOWER ROOM EXHAUST FAN 2 START
- M-6033 BLOWER ROOM EXHAUST FAN 1 START
- M-6035 BLOWER ROOM SUPPLY FAN START
- SPARE
- SPARE



CONTINUED AT RIGHT

- WG-6001 AB1 INFLUENT GATE OPEN
- WG-6001 AB1 INFLUENT GATE CLOSE
- SFG-6001 AB1 STEP FEED MAIN GATE OPEN
- SFG-6001 AB1 STEP FEED MAIN GATE CLOSE
- SFG-6001-3 AB1 STEP FEED GATE 3 OPEN
- SFG-6001-3 AB1 STEP FEED GATE 3 CLOSE
- WG-6002 AB2 INFLUENT GATE OPEN
- WG-6002 AB2 INFLUENT GATE CLOSE



NOTES:

- 1. PROVIDE NEW PLC INTERFACE RELAYS AS SHOWN FOR EACH DISCRETE OUTPUT, INCLUDING SPARES.

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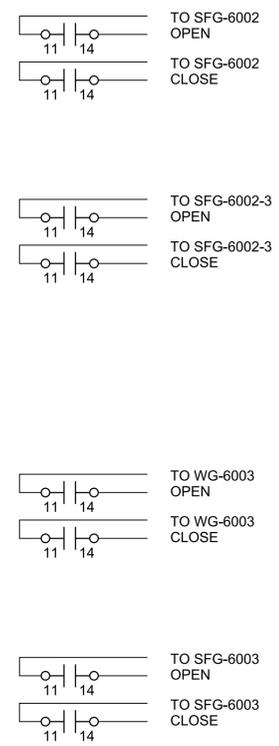
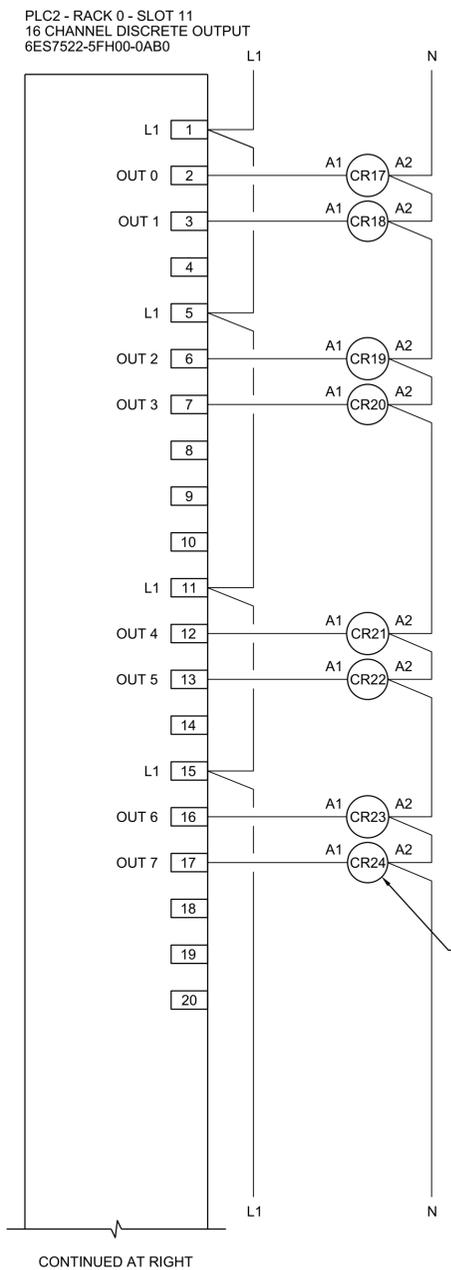
JACOBS

INSTRUMENTATION AND CONTROL
LCP-3 PLC WIRING
DIAGRAM
RACK 0 SLOT 10

SCALE:	AS SHOWN
VERIFY SCALE	
BAR IS ONE INCH ON ORIGINAL DRAWING.	
DATE	FEBRUARY 2022
PROJ	D3518800
DWG	N-210
SHEET	25 of 53

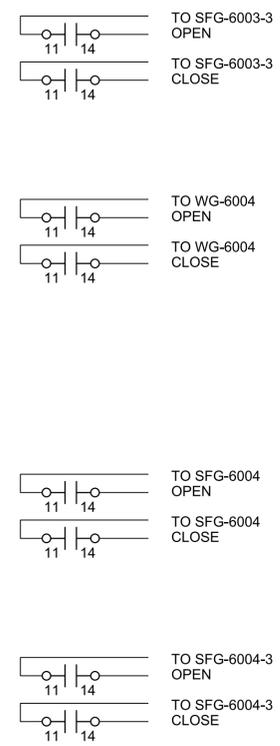
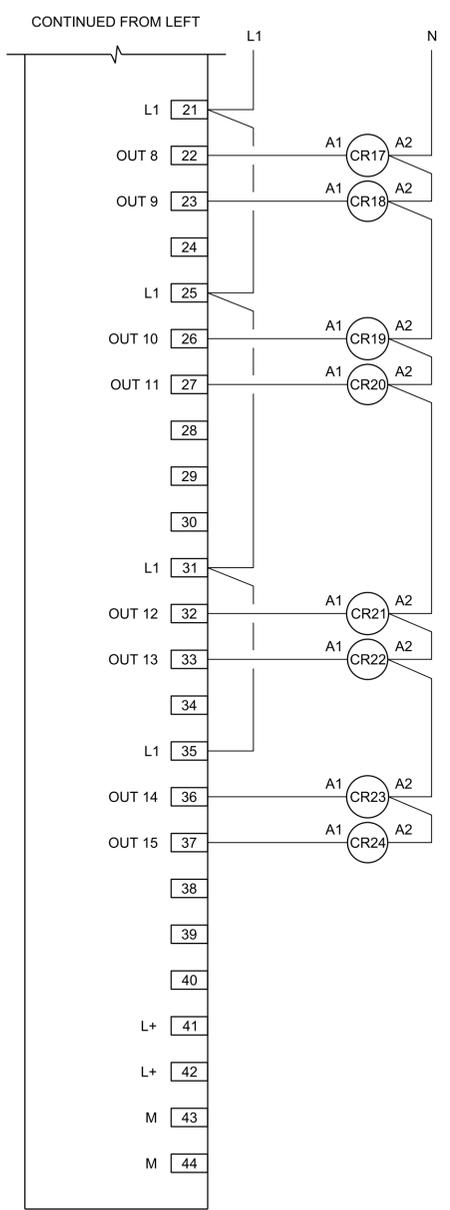
ISSUED FOR CONSTRUCTION

A
B
C
D



NOTE 1, TYPICAL

CONTINUED AT RIGHT



NOTES:

1. PROVIDE NEW PLC INTERFACE RELAYS AS SHOWN FOR EACH DISCRETE OUTPUT, INCLUDING SPARES.



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					L. WOOD
					M. NOUSEN
					CHK
					APVD

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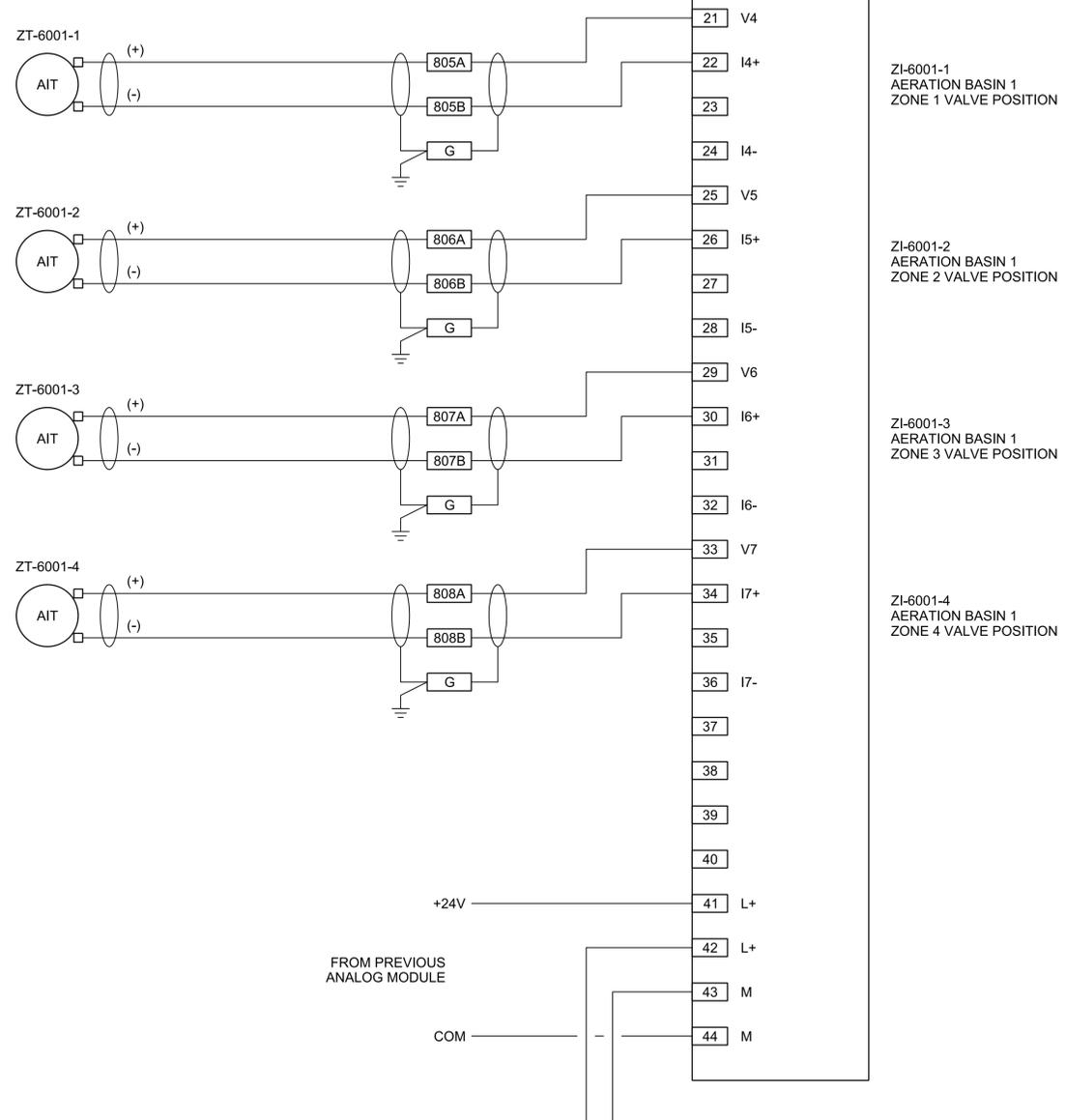
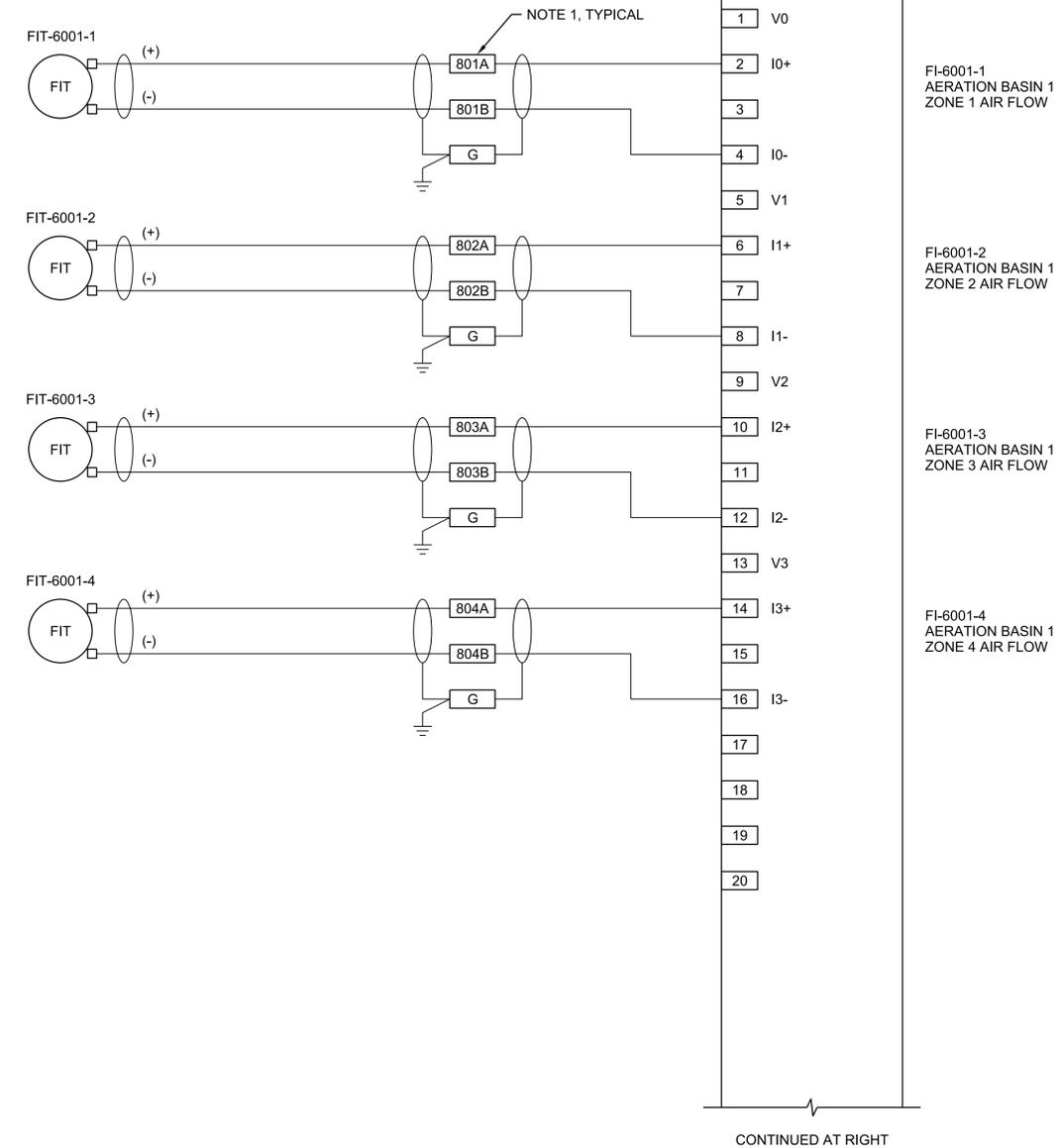
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LCP-3 PLC WIRING
DIAGRAM
RACK 0 SLOT 11

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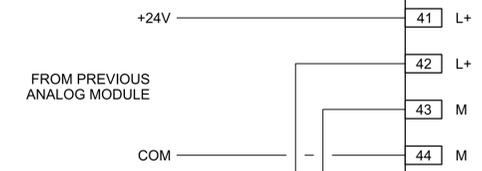
A
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C
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PLC2 - RACK 1 - SLOT 04
8 CHANNEL ANALOG INPUT
6ES7531 7NF10 0AB0



CONTINUED FROM LEFT

CONTINUED AT RIGHT



NOTES:
1. NEW TERMINAL BLOCKS, FOR EACH POINT PROVIDE MULTILEVEL TERMINAL BLOCK WITH DISCONNECT AND GROUND, PHOENIX CONTACT UT 4-PE/MT - 3214364, OR EQUAL.



NO.	DATE	DR	CHK	BY
		J. NORDAL	M. NOUSEN	B. FULLER
		DSGN	REVISION	APVD

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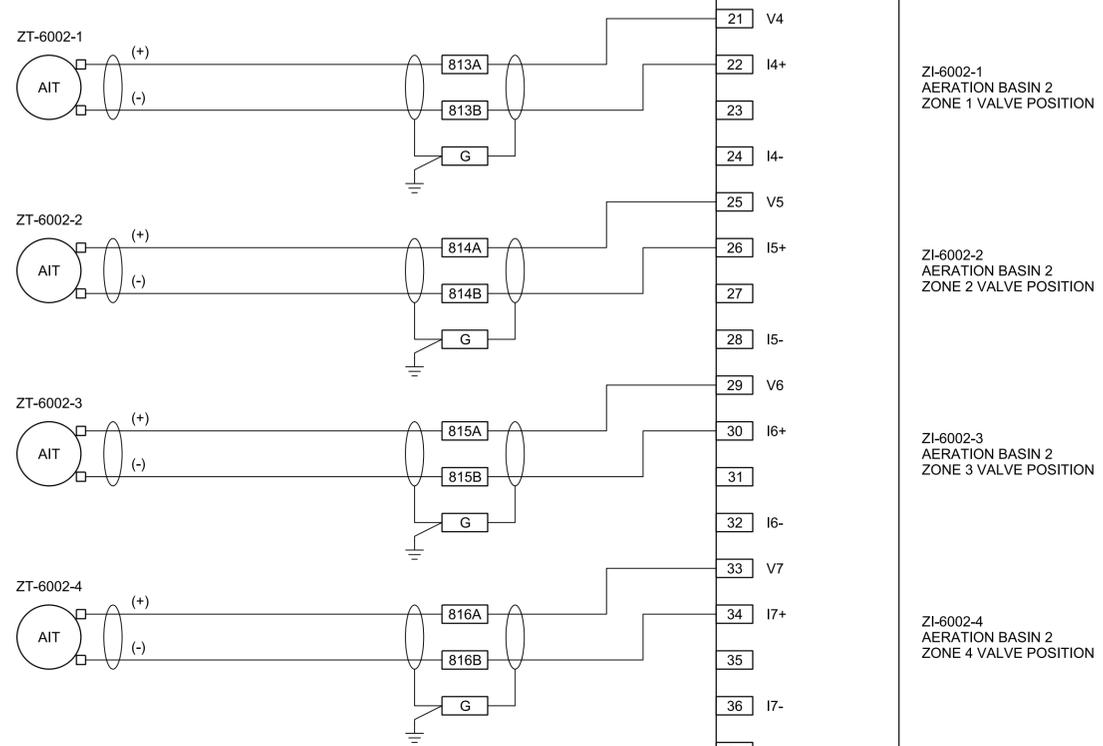
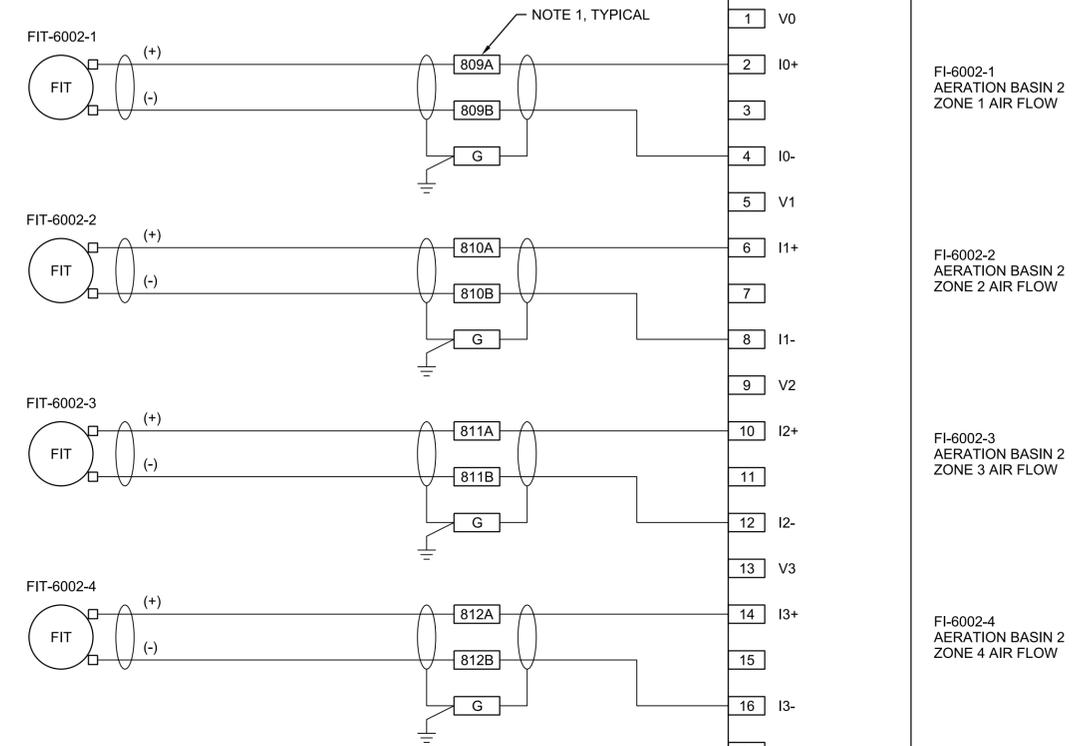
Jacobs
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LCP-3 PLC WIRING
DIAGRAM
RACK 1 SLOT 04

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DWG:	N-214
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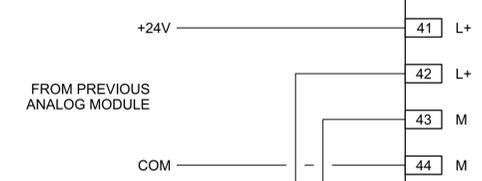
A
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PLC2 - RACK 1 - SLOT 05
8 CHANNEL ANALOG INPUT
6ES7531 7NF10 0AB0



CONTINUED FROM LEFT

CONTINUED AT RIGHT



NOTES:
1. NEW TERMINAL BLOCKS, FOR EACH POINT PROVIDE MULTILEVEL TERMINAL BLOCK WITH DISCONNECT AND GROUND, PHOENIX CONTACT UT 4-PE/MT - 3214364, OR EQUAL.



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					M. NOUSEN
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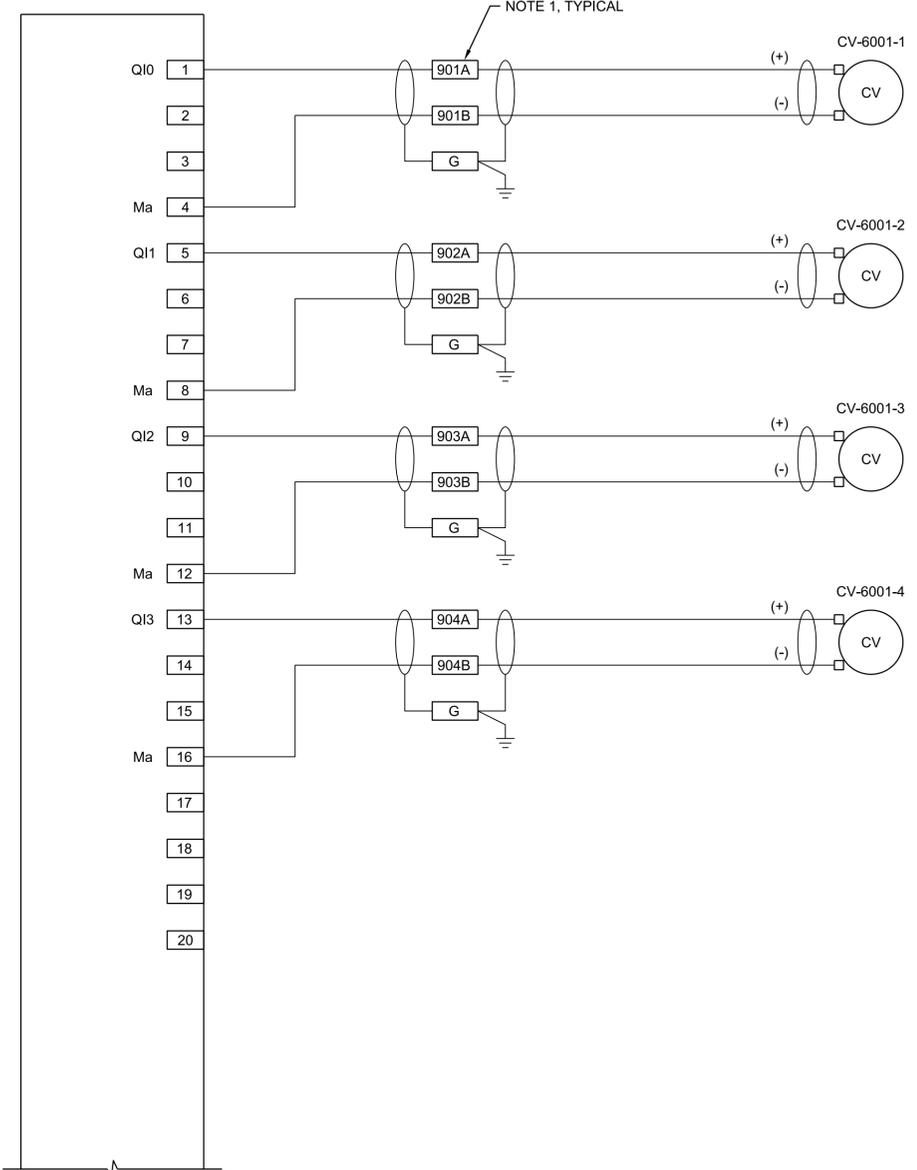
Jacobs
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LCP-3 PLC WIRING
DIAGRAM
RACK 1 SLOT 05

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DWG:	N-215
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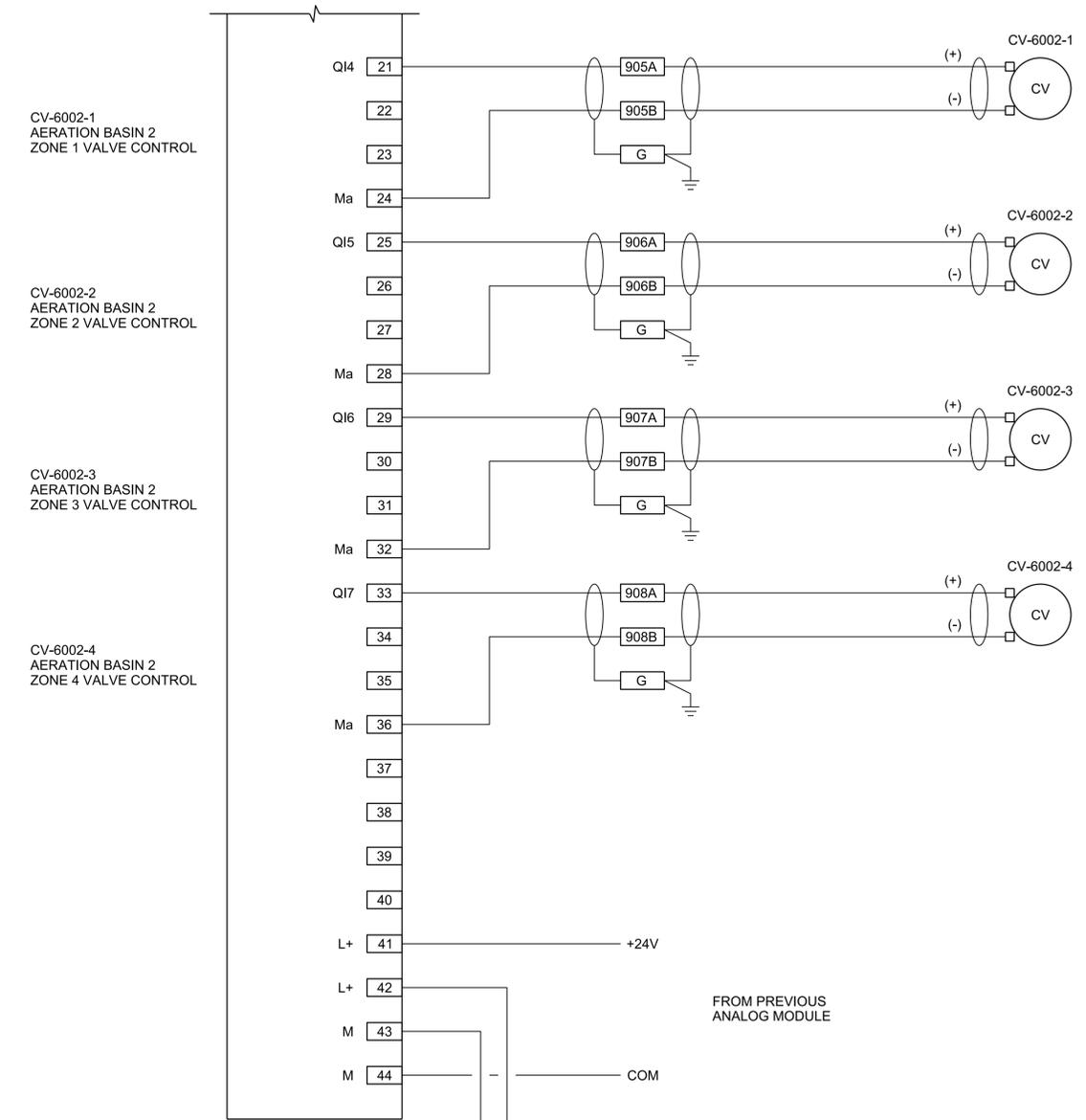
A
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PLC2 - RACK 1 - SLOT 06
8 CHANNEL ANALOG OUTPUT
6ES7532-5HF00-0AB0



NOTES:
1. NEW TERMINAL BLOCKS, FOR EACH POINT PROVIDE MULTILEVEL TERMINAL BLOCK WITH DISCONNECT AND GROUND, PHOENIX CONTACT UT 4-PE/L/MT - 3214364, OR EQUAL.

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		DSGN	REVISION	APVD	APVD

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Jacobs
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LCP-3 PLC WIRING
DIAGRAM
RACK 1 SLOT 06

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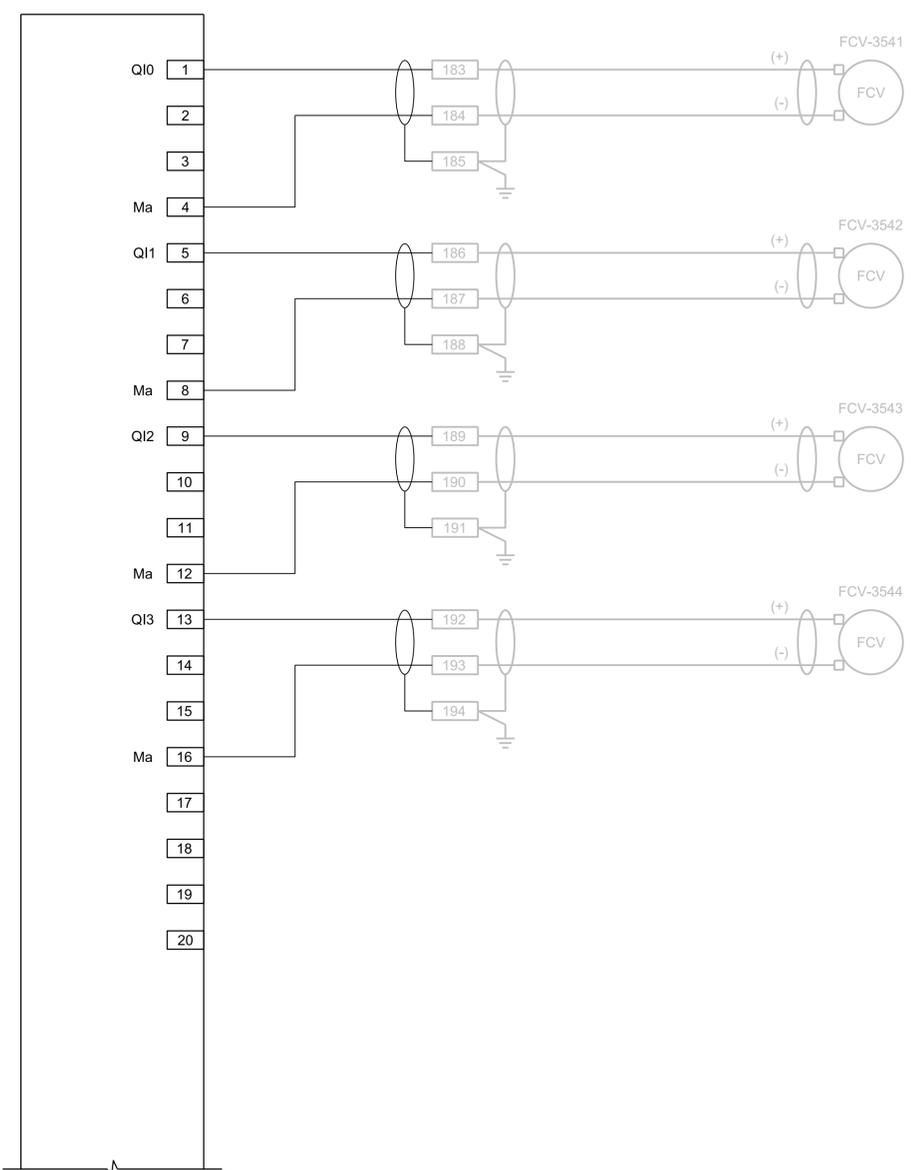
PLC2 - RACK 1 - SLOT 07
8 CHANNEL ANALOG OUTPUT
6ES7532-5HF00-0AB0

FCV-3541
AERATION BASIN 1
RAS FLOW VALVE

FCV-3542
AERATION BASIN 2
RAS FLOW VALVE

FCV-3543
AERATION BASIN 3
RAS FLOW VALVE

FCV-3544
AERATION BASIN 4
RAS FLOW VALVE



CONTINUED AT RIGHT

NOTES:

1. NEW TERMINAL BLOCKS, FOR EACH POINT PROVIDE MULTILEVEL TERMINAL BLOCK WITH DISCONNECT AND GROUND, PHOENIX CONTACT UT 4-PE/L/MT - 3214364, OR EQUAL.

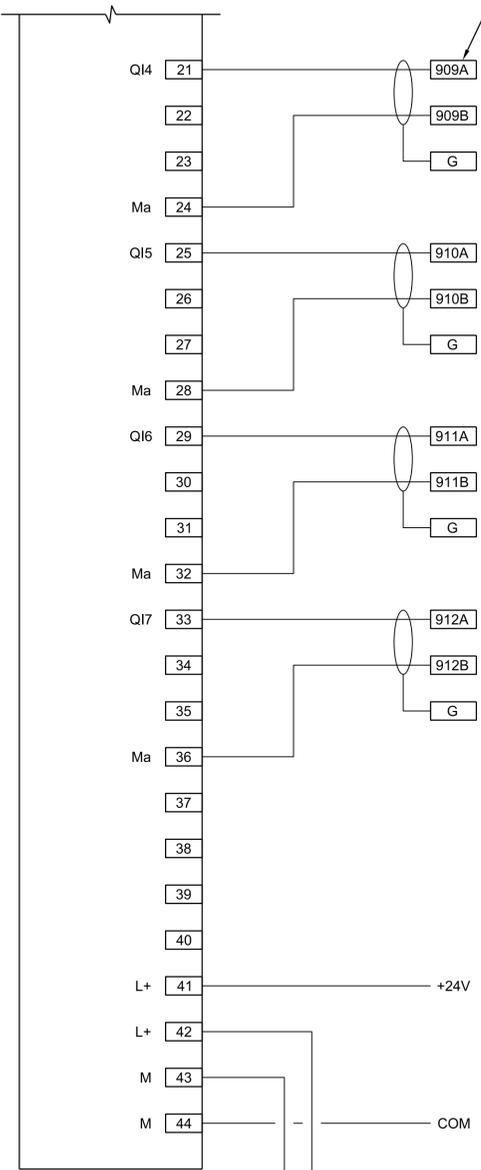
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SPARE

SPARE

SPARE

SPARE



FROM PREVIOUS ANALOG MODULE

TO NEXT ANALOG MODULE



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		DSGN	CHK	APVD	APVD

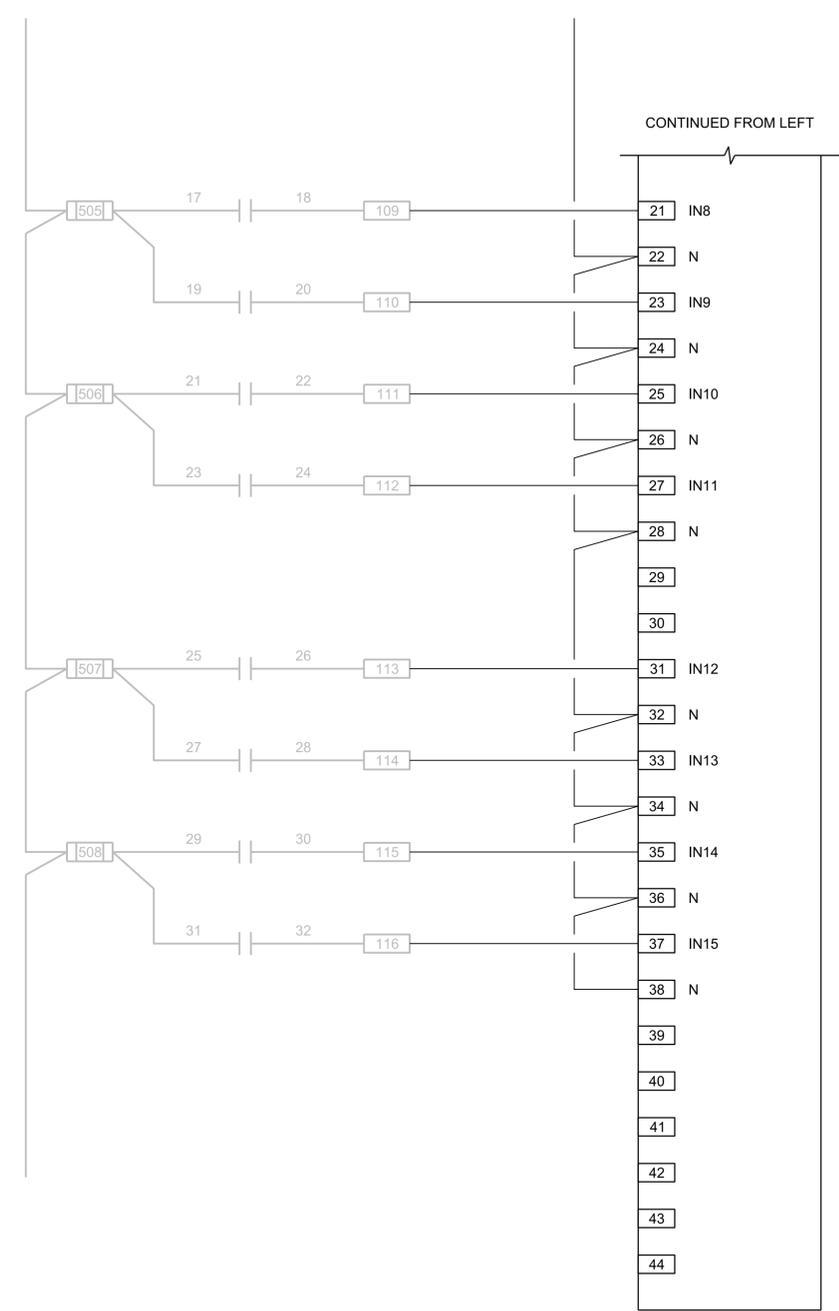
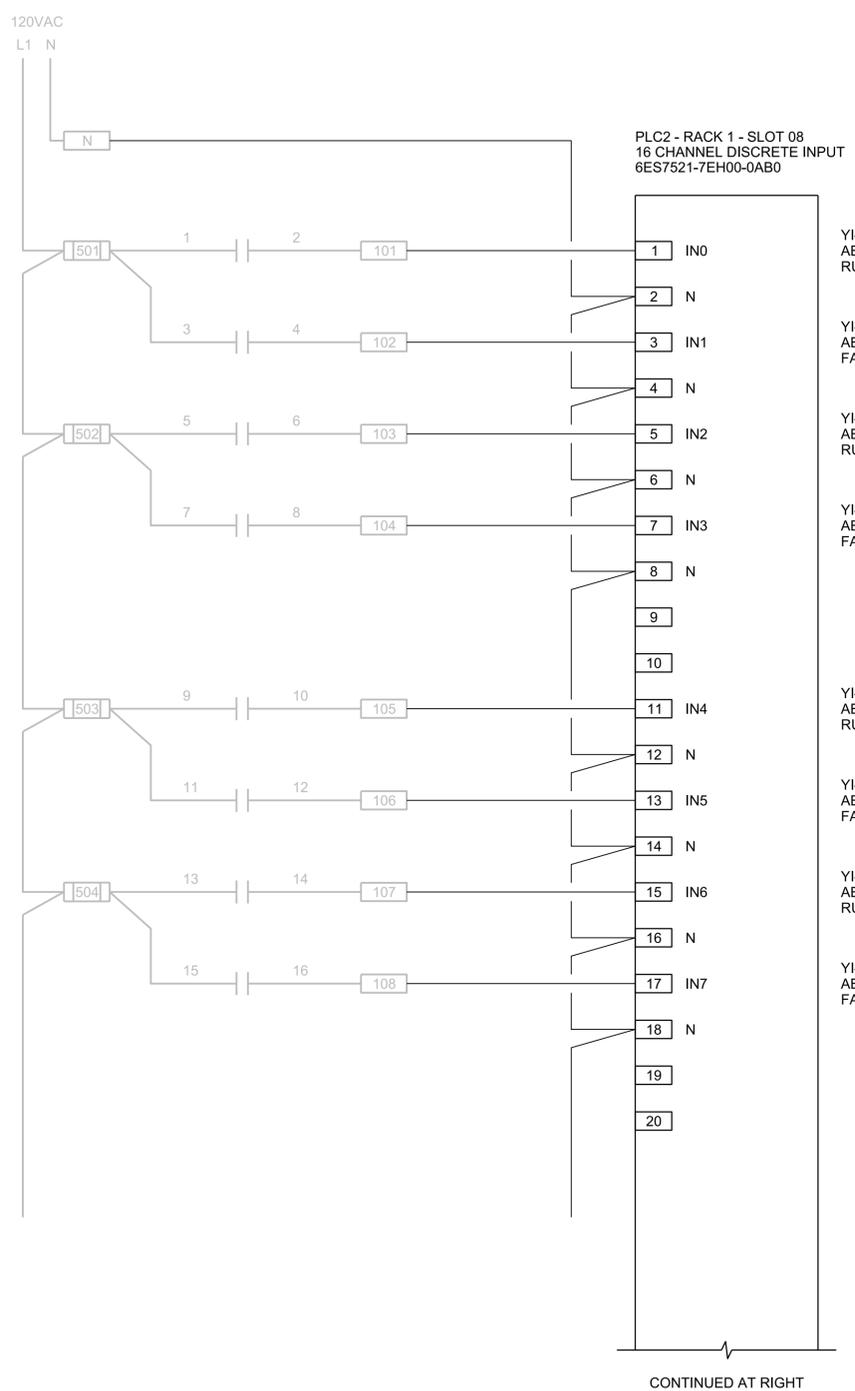
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DIAGRAM
RACK 1 SLOT 07

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		J. NORDAL	M. NOUSEN	L. WOOD	B. FULLER

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LCP-3 PLC WIRING DIAGRAM
RACK 1 SLOT 08

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DATE	FEBRUARY 2022
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DWG	N-218
SHEET	33 of 53

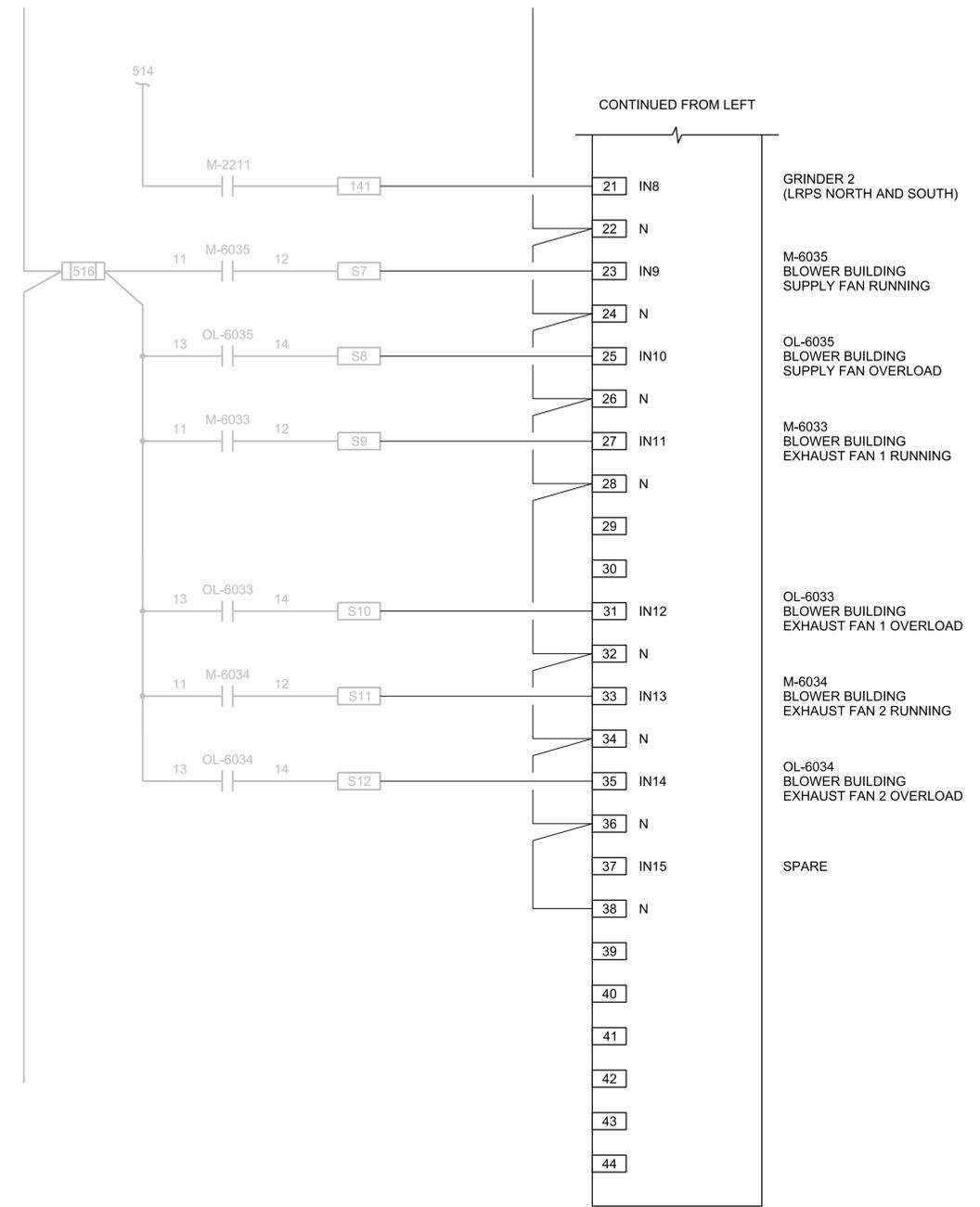
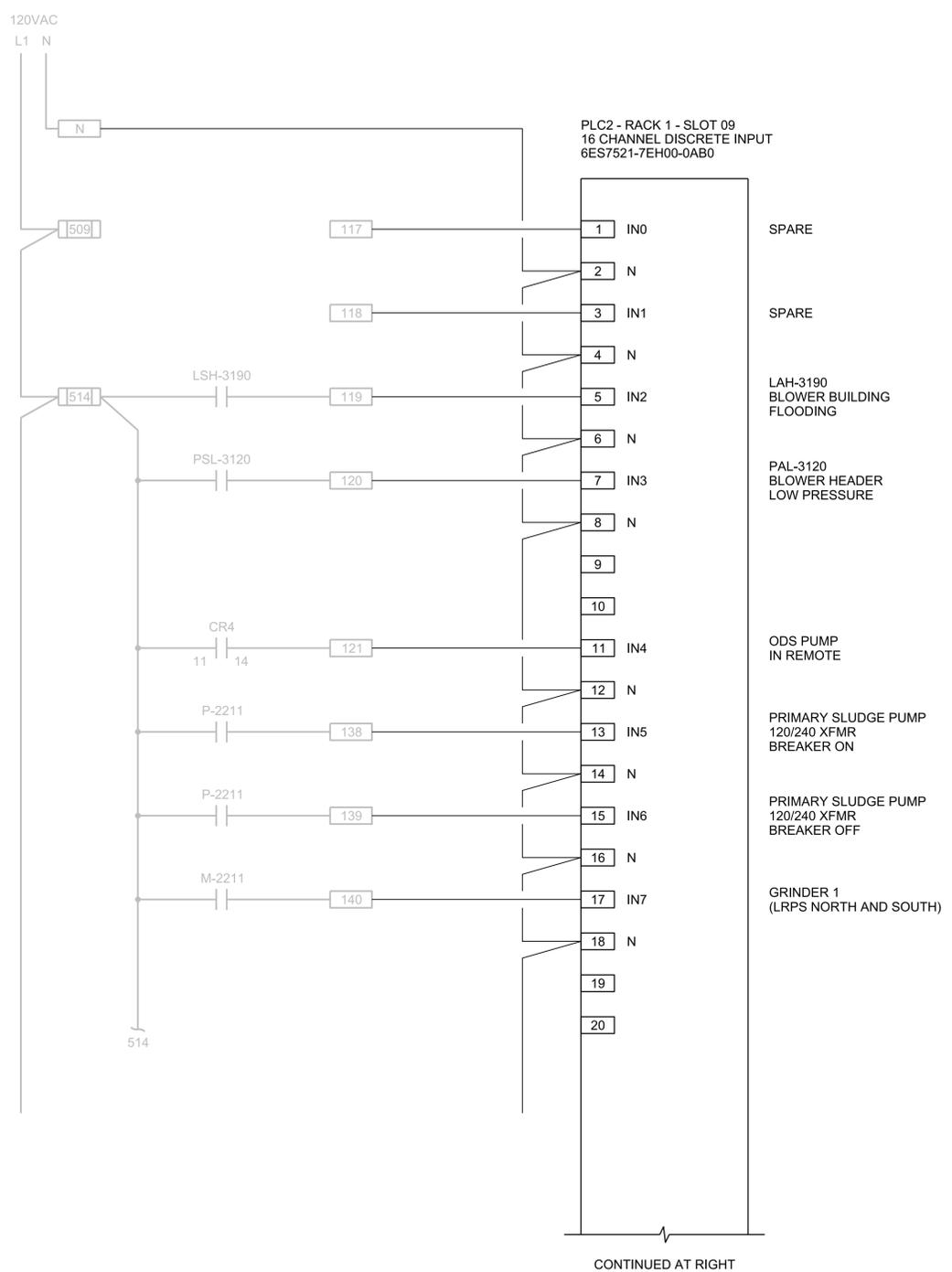
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RACK 1 SLOT 09

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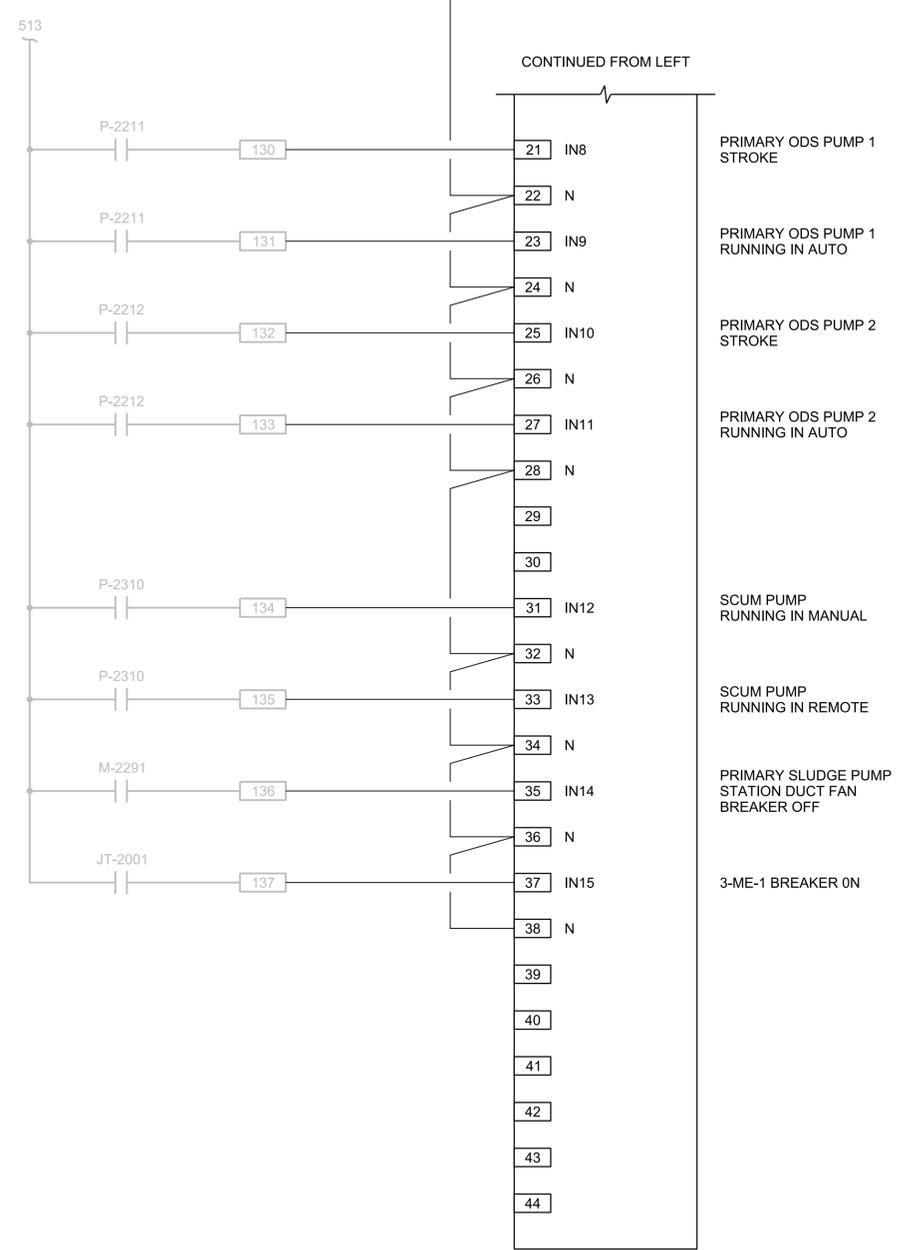
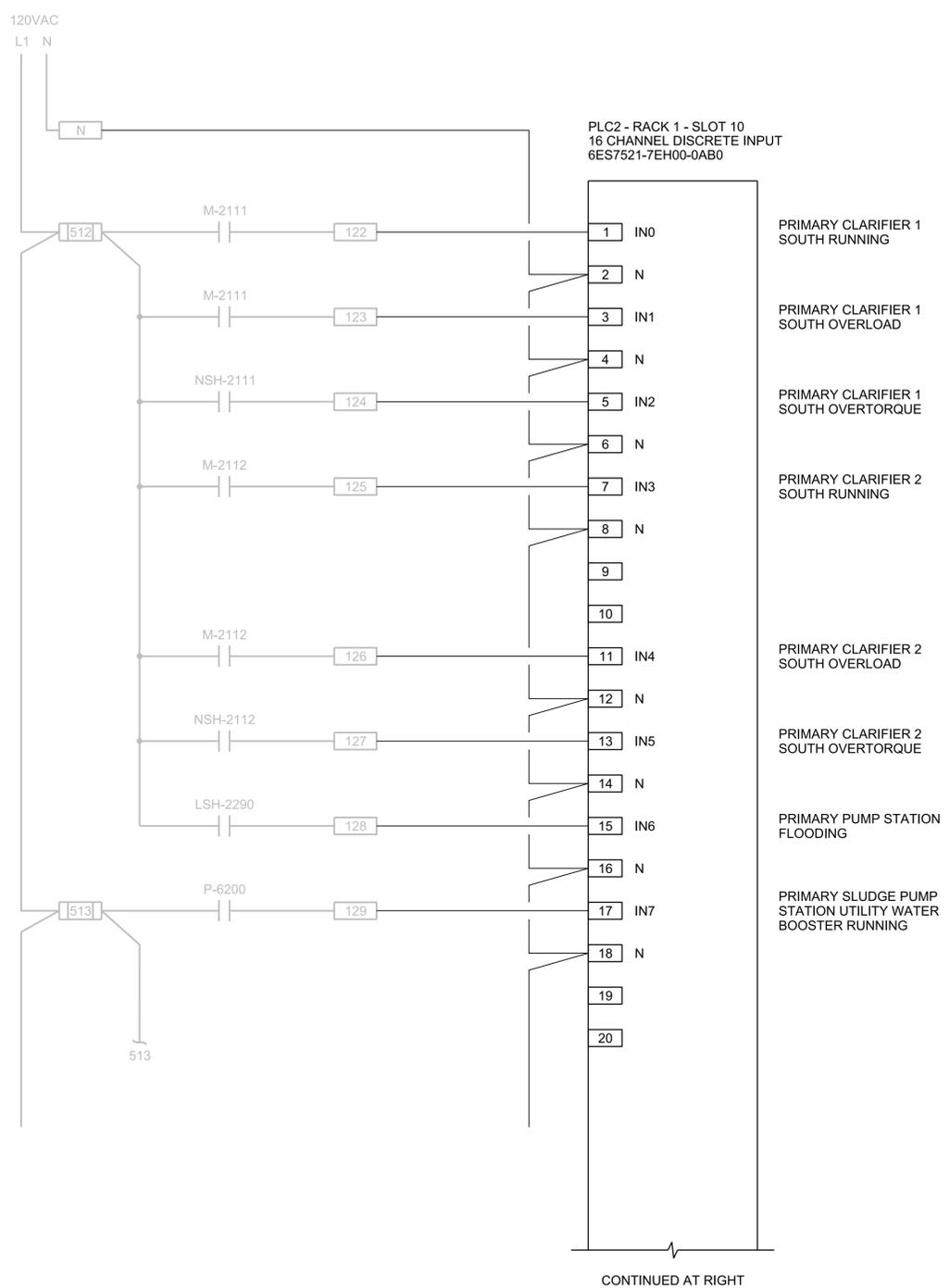
6

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Aeration Basin Improvements
Clackamas Water Environment Services
Milwaukie, Oregon



INSTRUMENTATION AND CONTROL
LCP-3 PLC WIRING
DIAGRAM
RACK 1 SLOT 10

SCALE: AS SHOWN
VERIFY SCALE
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DATE FEBRUARY 2022
PROJ D3518800
DWG N-220
SHEET 35 of 53

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REGISTERED PROFESSIONAL ENGINEER
16112PE
OREGON
JULY 21, 1993
LIONEL L. WOOD
EXP. 06-30-22

NO.	DATE	DR	CHK	BY	APVD
		J. NORDAL	M. NOUSEN	L. WOOD	B. FULLER

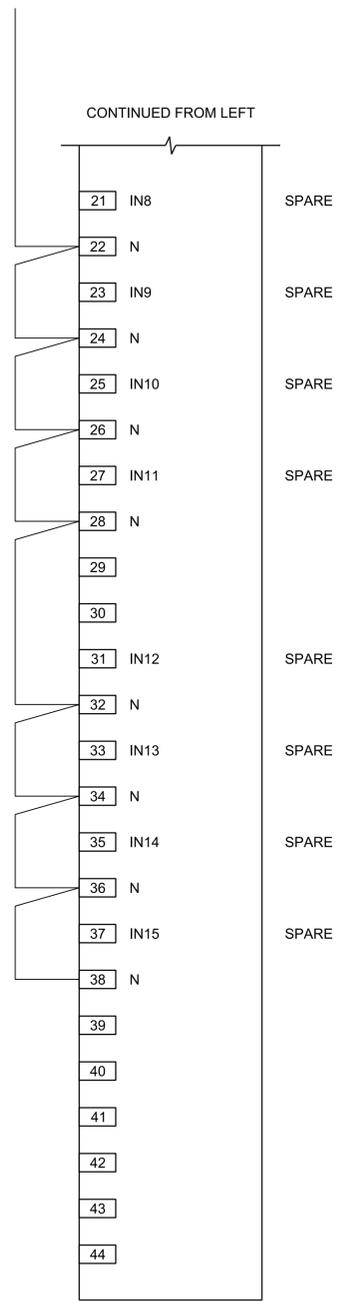
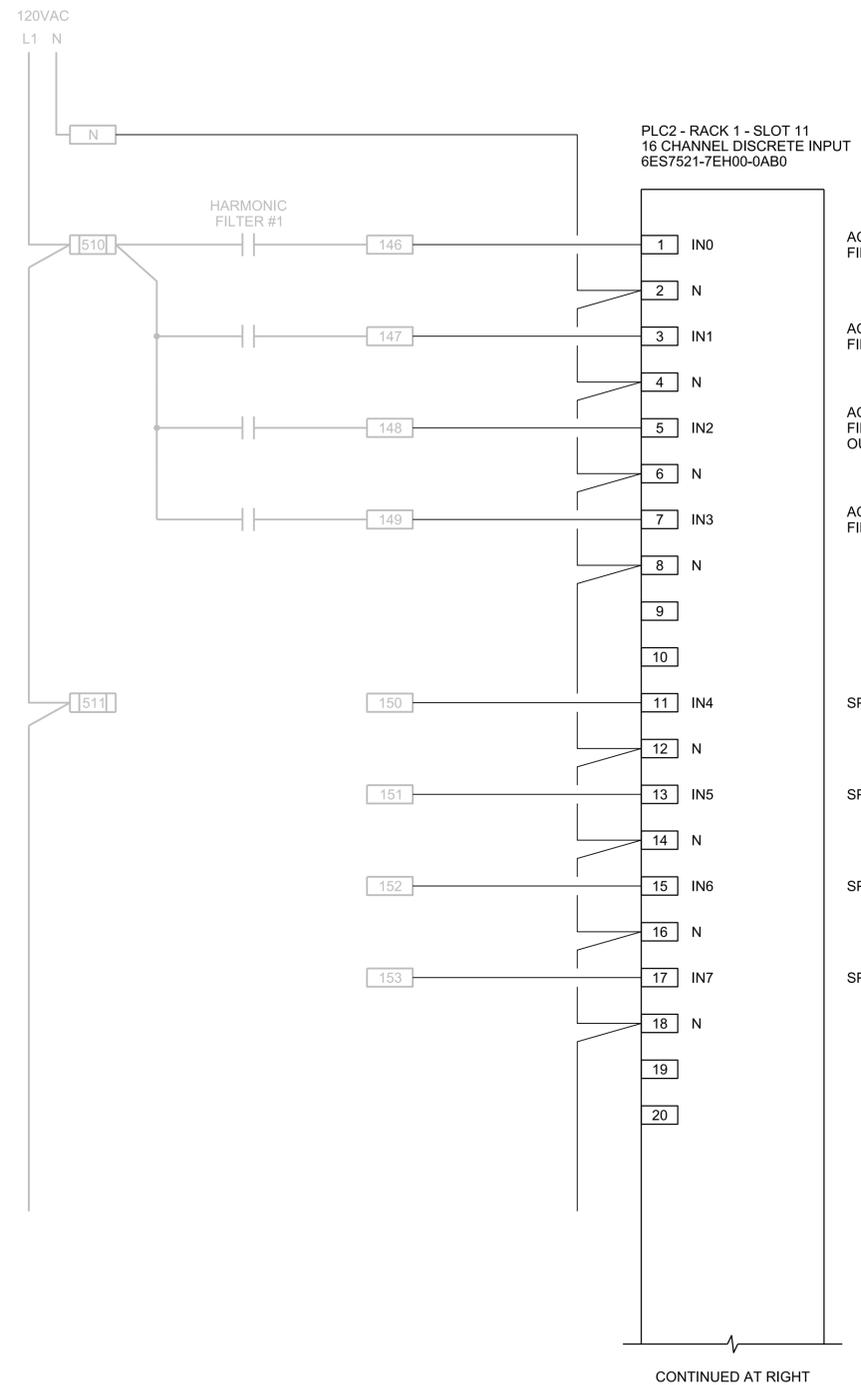
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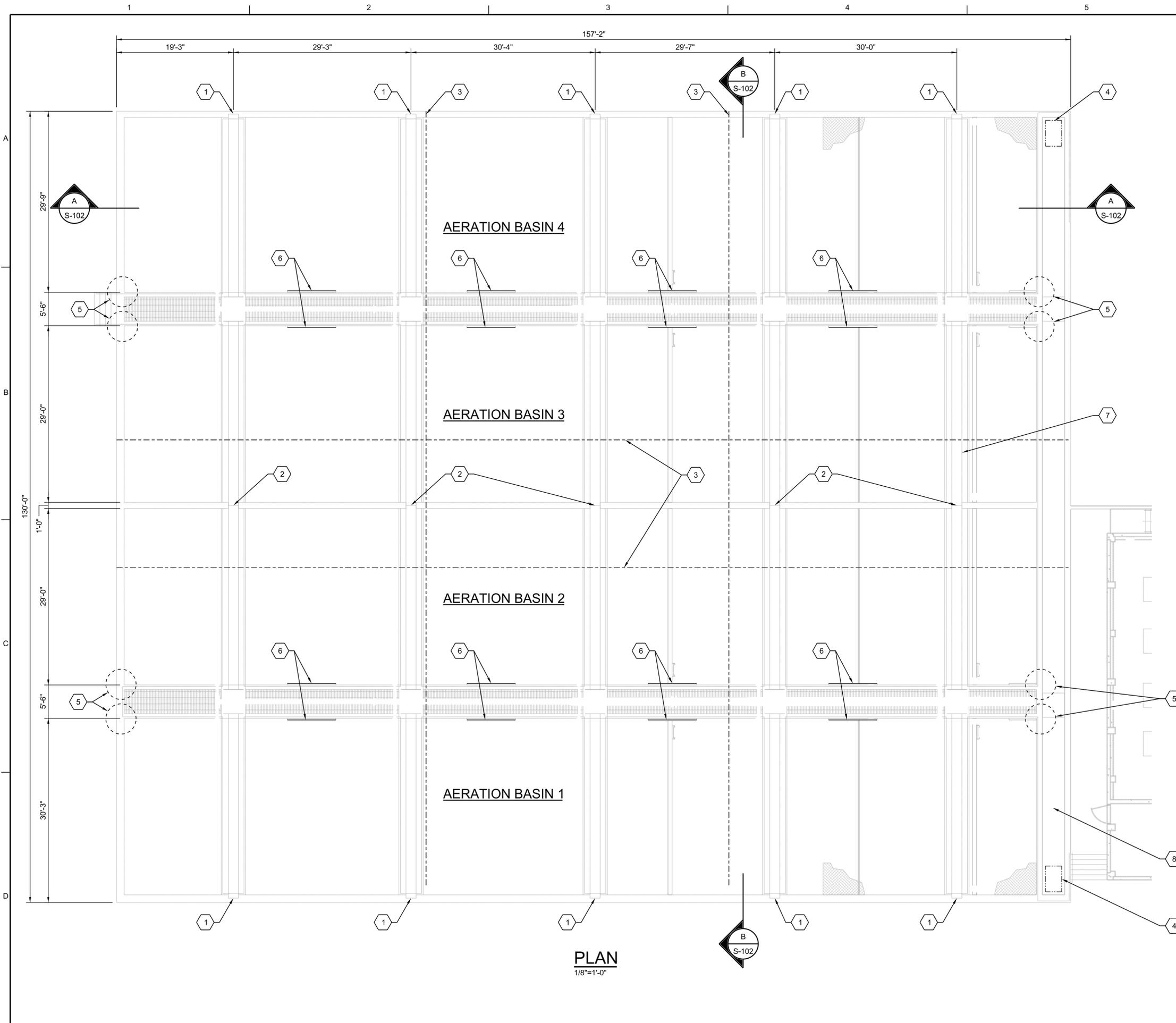
Jacobs
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LCP-3 PLC WIRING
DIAGRAM
RACK 1 SLOT 11

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PLAN
1/8"=1'-0"

- ### GENERAL NOTES
- WORK SHOWN IN ONE BASIN IS TYPICAL OF ALL BASINS.
 - INJECT EXISTING CRACKS IN AERATION BASINS AND INFLUENT CHANNEL WITH A TWO-PART EPOXY INJECTION RESIN SPECIFICALLY DESIGNED FOR CRACK REPAIR. INJECT CRACKS 0.010 INCHES OR LARGER. PRODUCT SHALL BE BASF CONSTRUCTION CHEMICALS SCB CONCRESSIVE SERIES OR APPROVED ALTERNATIVE. INSTALL CRACK REPAIR PRODUCT PER MANUFACTURER'S RECOMMENDED PROCEDURES. SEE BID FORM FOR CRACK REPAIR QUANTITY ALLOWANCE
- ### SHEET KEYNOTES
- REMOVE AND REPLACE JOINT FILLER AND SEALANT AT WALKWAY INTERSECTION, TYP 10 PLACES ON THE EXTERIOR WALL
 - REMOVE AND REPLACE JOINT FILLER AND SEALANT AT WALKWAY INTERSECTION, TYP 5 PLACES ON THE INTERIOR WALL
 - REMOVE EXISTING JOINT SEALANT AND BACKING ROD AT EXPANSION JOINTS. CLEAN AND REPLACE WITH NEW BACKING ROD AND SEALANT. TYP ALL VERTICAL AND HORIZONTAL EXPANSION JOINTS
 - MODIFY EXISTING HATCH. ADD INTERIOR ANGLES TO SUPPORT HINGED PLATE. TYP 2 LOCATIONS. SEE 1/S-102.
 - CRACK/CONCRETE REPAIR AT CHANNEL INTERSECTION, TYP 8 PLACES. SEE PHOTO 1 FOR REPRESENTATIVE DAMAGE.
 - REMOVE, CLEAN, AND RE-SEAL WEIR OPENING COVERS, TYP OF 16 LOCATIONS. PROVIDE GREENSTREAK LEAKMASTER SEALANT AT THE PLATES
 - INJECT EXISTING CRACKS ON WALKWAY WITH A TWO-PART EPOXY INJECTION RESIN SPECIFICALLY DESIGNED FOR CRACK REPAIR. INJECT CRACKS 0.010 INCHES OR LARGER. PRODUCT SHALL BE BASF CONSTRUCTION CHEMICALS SCB CONCRESSIVE SERIES OR APPROVED ALTERNATIVE
 - REPAIR ENTIRE INFLUENT CHANNEL INTERIOR CONCRETE SURFACES. NOTE THAT THIS IS UNIT PRICE WORK. SEE 03 01 32 AND 03 01 33 FOR MEASUREMENT AND PAYMENT FOR REPAIR WORK. SEE SECTION A/S-102



1 PHOTO
1"=1"

Digital Signature
ALEX L. FIRTH
EXP 12-31-23

NO.	DATE	DR	CHK	REVISION	BY	AP/VD

CLACKAMAS WATER ENVIRONMENT SERVICES
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Clackamas Water Environment Services

JACOBS
AERATION BASINS
STRUCTURAL PLAN

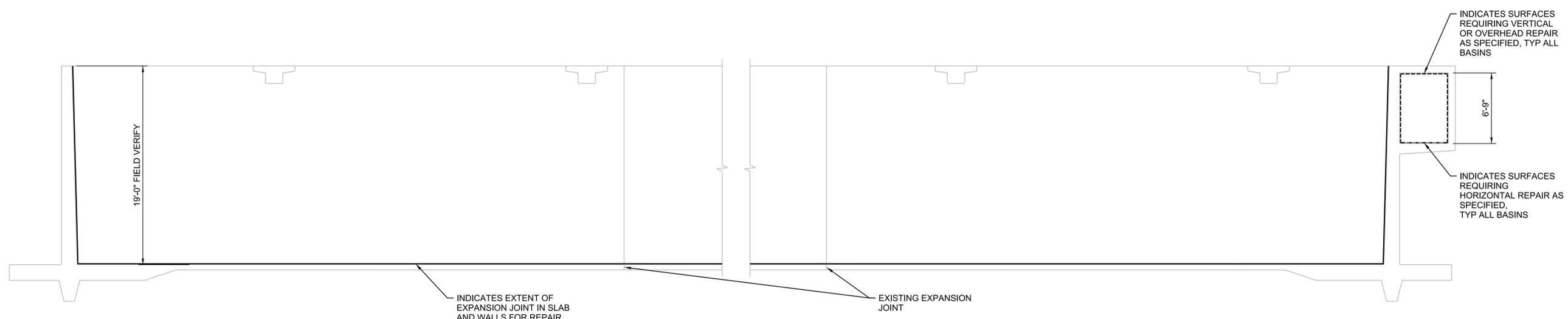
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0 1"=1"

DATE	FEBRUARY 2022
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DWG	S-101
SHEET	38 of 53

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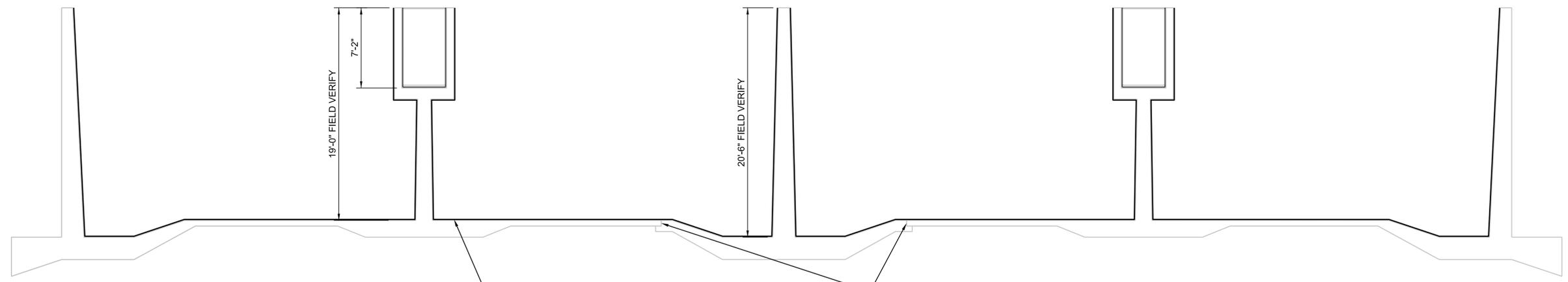
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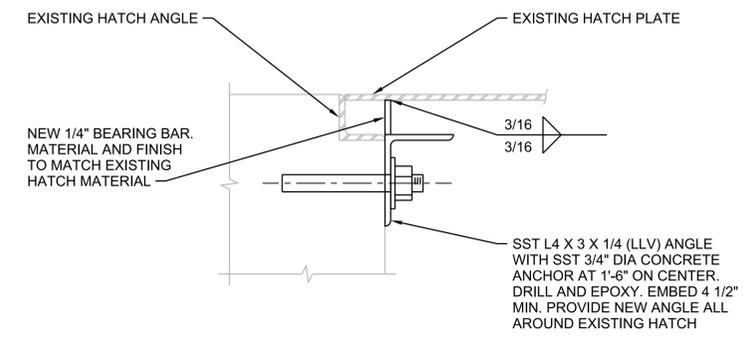
A SECTION
3/8"=1'-0"
S-101

NOTE:
1. REFERENCE SECTIONS 03 01 32 AND 03 01 33 FOR CONCRETE RESURFACING REQUIREMENTS.



B SECTION
3/16"=1'-0"
S-101

NOTE:
1. REFERENCE SECTIONS 03 01 32 AND 03 01 33 FOR CONCRETE RESURFACING REQUIREMENTS.



1 NEW HATCH SUPPORT
3"=1'-0"
S-101



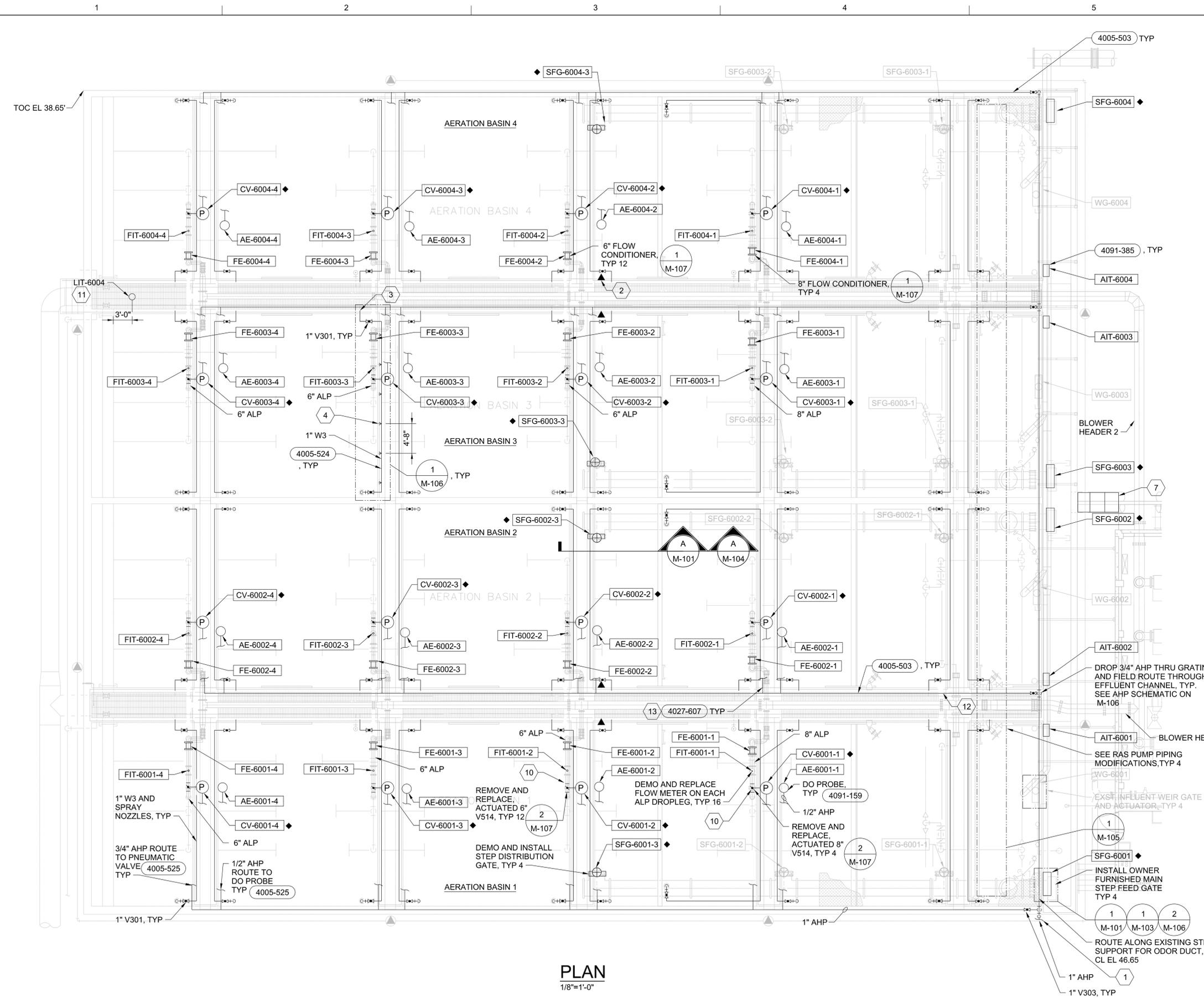
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		A FIRTH	H QUINNETT	B FULLER
		DGN	REVISION	APVD
				APVD

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Kellogg Creek Water Resource Recovery Facility
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Clackamas Water Environment Services
Milwaukie, Oregon

JACOBS
AERATION BASINS
STRUCTURAL
SECTIONS

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DWG	S-102
SHEET	39 of 53

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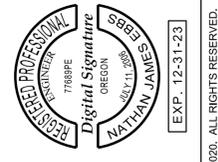


GENERAL NOTES

- SEE 01 31 13 FOR SEQUENCING AND CONSTRAINTS.
- WORK SHOWN IN ONE BASIN IS TYPICAL OF ALL BASINS.
- SEE M-106 FOR AHP SCHEMATIC.
- REPLACE 1" W3 PIPING, VALVES, SPRAYERS, AS SHOWN ON 1 M-106
- (◆) INDICATES OWNER FURNISHED EQUIPMENT TO BE INSTALLED BY THE CONTRACTOR.
- REFER TO 40 05 15 FOR PIPE SUPPORT SPACING.

SHEET KEYNOTES

- TEE INTO EXST HIGH PRESSURE AIR PIPING RUNNING ALONG WESTSIDE OF ROADWAY BETWEEN THE AERATION BASINS AND SECONDARY SLUDGE PUMP STATION. FIELD ROUTE AIR PIPING TO DO PROBES AND PNEUMATIC ACTUATED VALVES IN EACH BASIN. DO NOT ROUTE OVER WALKWAYS. ROUTE ON THE SIDES OF THE BASINS AND UNDERNEATH WALKWAYS.
- (▲) SYMBOL INDICATES PERSONNEL DAVIT BASE 4 M-107
- REPLACE 1" W3 TO W3 HEADER BRANCH CONNECTION. TYP ALL.
- SPRAY NOZZLES AND SPACING SHOWN FOR ONE SPRAY BAR IS TYPICAL OF ALL SPRAY BARS.
- NOT USED
- NOT USED
- PROPOSED LOCATION FOR PLUG TO BLOCK FLOW DURING INFLUENT CHANNEL REPAIR AND BYPASS PUMPING
- NOT USED
- NOT USED
- EXISTING BUTTERFLY VALVES ARE ELECTRICAL ACTUATED WITH DOUBLE FLANGE CONNECTIONS
- MOUNT LIT-6004 IN THE CENTER OF THE CHANNEL USING MANUFACTURER PROVIDED WALL MOUNT CANTILEVER SUPPORT BRACKET. MOUNT LEVEL INSTRUMENT ANTENNA EL 37.48' 4091-401
- FIELD ROUTE AHP THROUGH AERATION BASIN EFFLUENT CHANNEL
- SCAN FOR REBAR AND EXISTING CONDUIT. LOCATE CORES TO AVOID CUTTING REINFORCEMENT. DO NOT CUT REINFORCEMENT WITHOUT ENGINEER APPROVAL



NO.	DATE	DSGN	S BAAR	DR	REVISION	CHK	APVD	BY	APVD

Clackamas Water Environment Services
 Kelllogg Creek Water Resource Recovery Facility
 Aeration Basin Improvements
 Milwaukie, Oregon

Jacobs

AERATION BASINS
MECHANICAL PLAN

ISSUED FOR CONSTRUCTION

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DATE:	FEBRUARY 2022
PROJ:	D3518800
DWG:	M-102
SHEET:	41 of 53

1

2

3

4

5

6

SHEET KEYNOTES

- 1. WORK SHOWN IS TYPICAL OF FOUR OWNER FURNISHED MAIN STEP FEED GATES



Professional Engineer
 Matthew James
 Oregon License No. 7788PPE
 Exp. 12-31-23

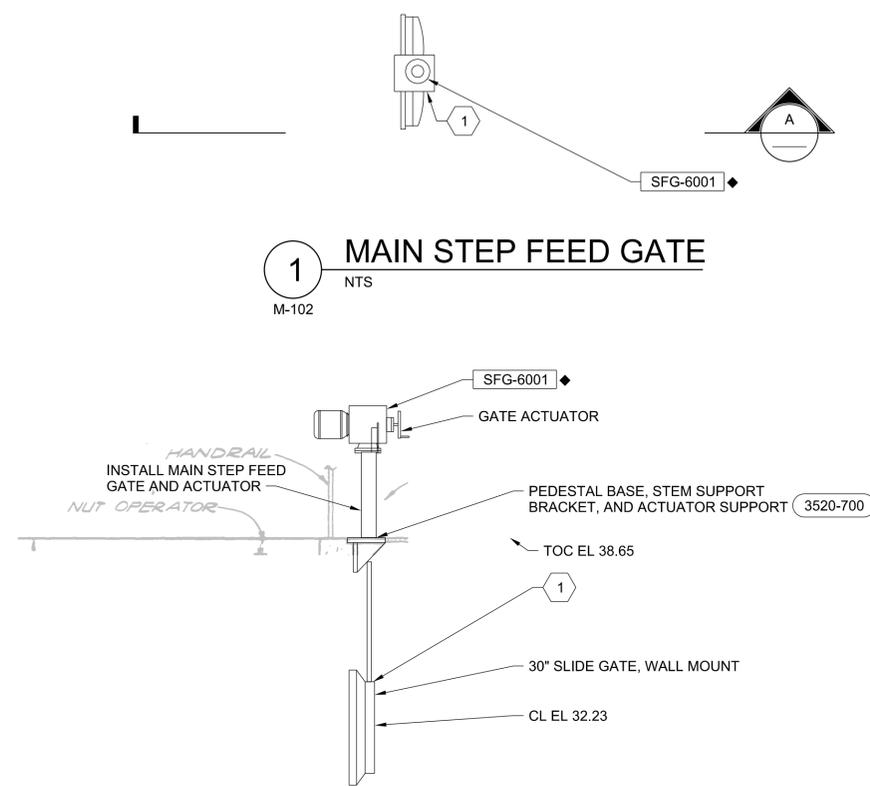
NO.	DATE	REVISION	BY	APVD

DSGN: S BAAR DATE: REVISION: CHK
 DR: S BAAR N LEBES APVD: B FULLER
 PROJECT: Kellogg Creek Water Resource Recovery Facility

CLACKAMAS WATER ENVIRONMENT SERVICES
 Kellogg Creek Water Resource Recovery Facility
 Aeration Basin Improvements
 Clackamas Water Environment Services
 Milwaukie, Oregon

Jacobs
 AERATION BASINS
MECHANICAL SECTION AND DETAILS

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DATE: FEBRUARY 2022
PROJ: D3518800
DWG: M-103
SHEET: 42 of 53



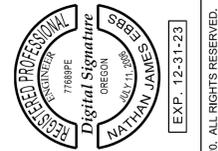
A MAIN STEP FEED GATE
 NTS

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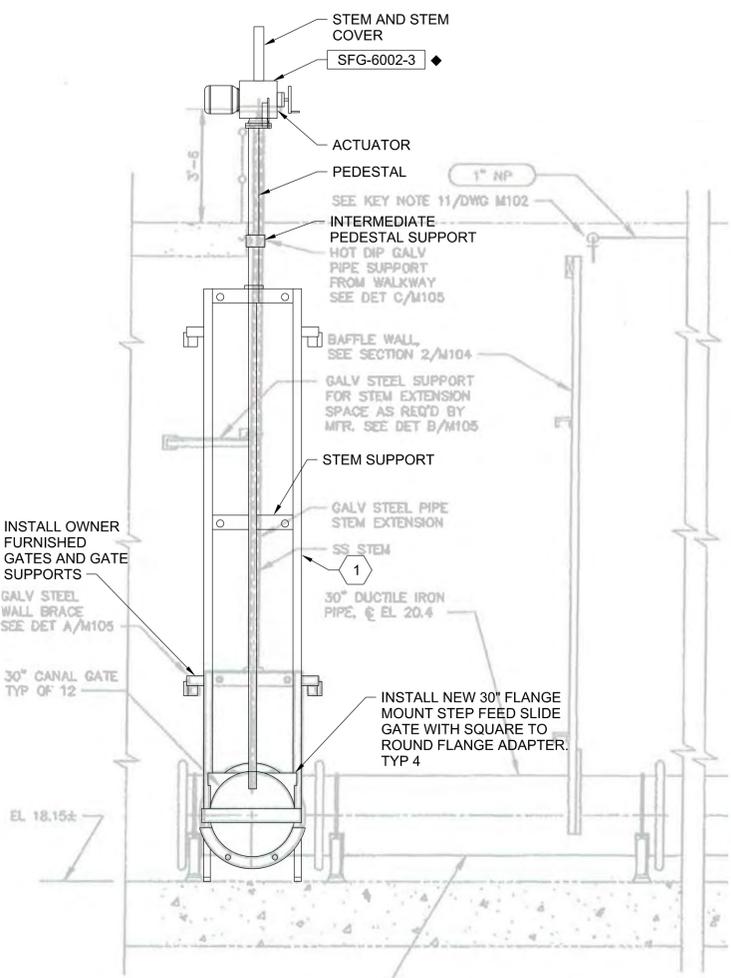
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		R CARMONA		
		N LEBES		
		CHK		
		APVD		
		B FULLER		

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 Kellogg Creek Water Resource Recovery Facility
 Aeration Basin Improvements
 Clackamas Water Environment Services
 Milwaukie, Oregon

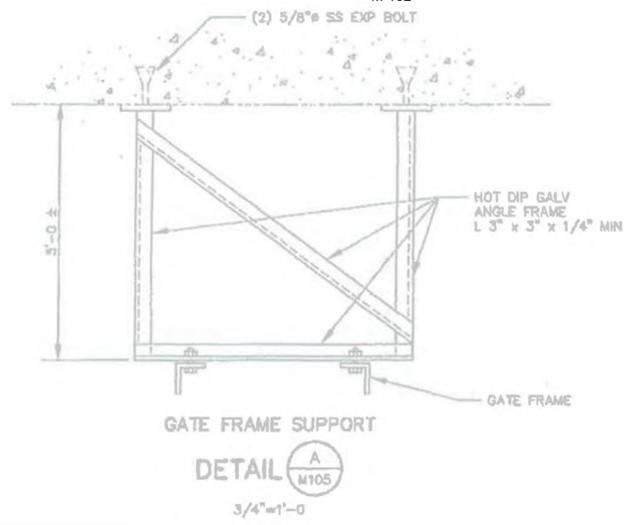
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MECHANICAL SECTION AND DETAILS

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 DWG: M-104
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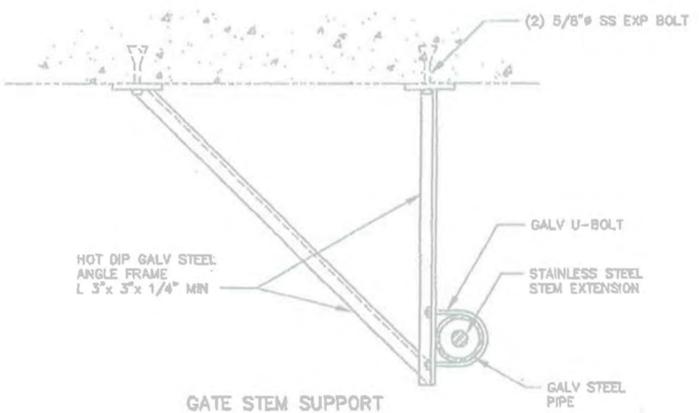
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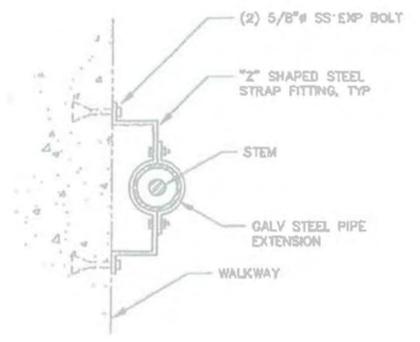
A STEP FEED DISTRIBUTION GATES
 M-102 NTS



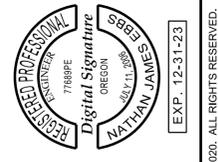
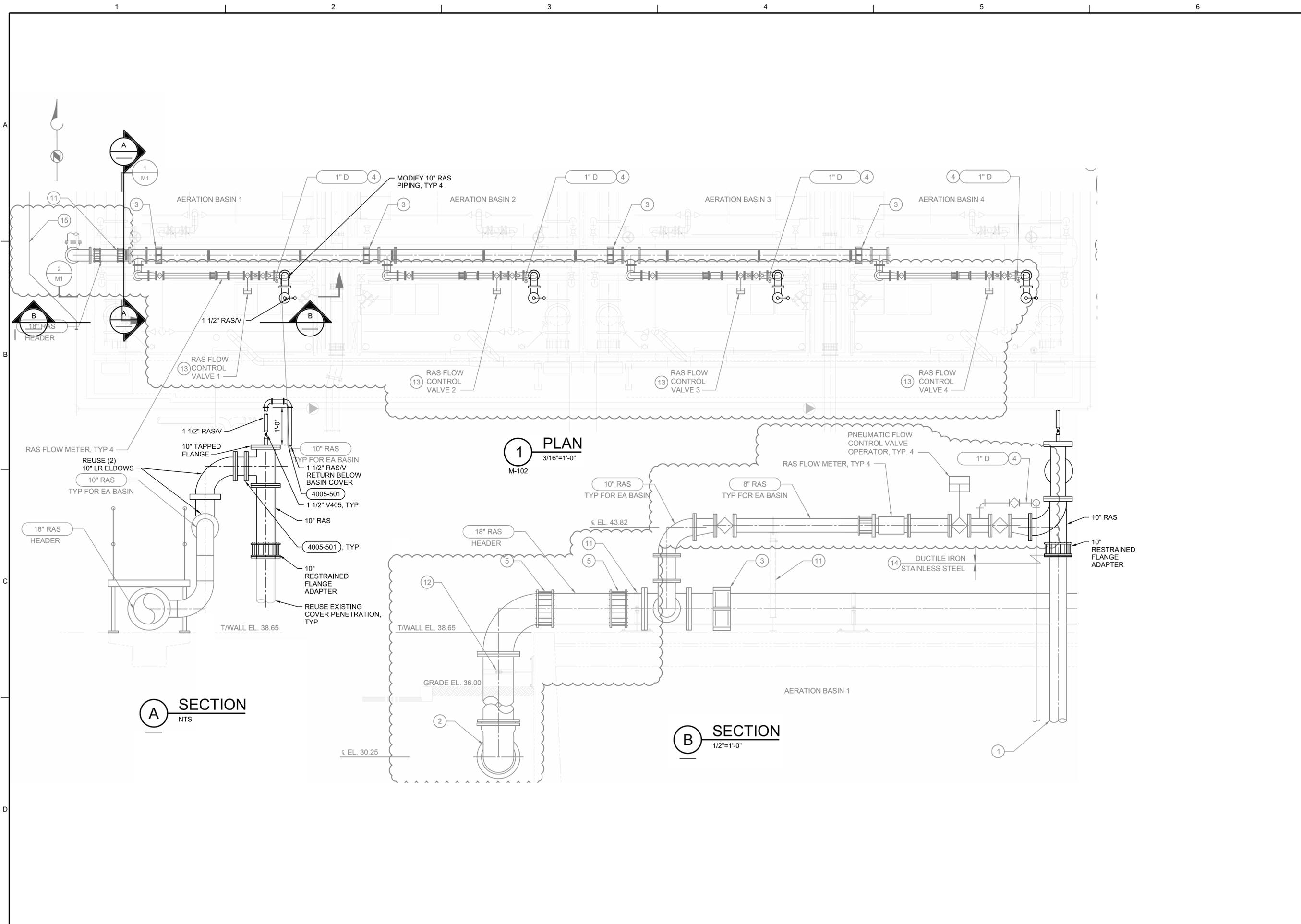
DETAIL A
 M105
 3/4\"/>



DETAIL B
 M105
 3/4\"/>



DETAIL C
 M105
 3/4\"/>



NO.	DATE	DGN	DR	REVISION	BY
			S BAAR	CHK	B FULLER
			R CARMONA	APVD	N LEBES
				APVD	B FULLER

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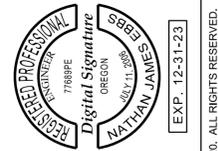
Jacobs
 AERATION BASINS
MECHANICAL ENLARGED PLAN, SECTION AND DETAIL

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SHEET KEYNOTES

1. EXISTING ACTUATED VALVE. SEE PLAN FOR LOCATIONS AND SIZING. MODIFY PIPING LENGTH AS NEEDED TO ACCOMMODATE NEW VALVE DIMENSIONS
2. 4005-524
3. 1" W3
4. 1" V301, TYP
5. 1/2" SPRAY NOZZLES, SPRAY SYSTEMS MODEL 3/8G-SS22, TYP 6 PER LINE. SPACE NOZZLES 4'-8" APART, CENTERED IN THE BASIN.
6. NOT USED
7. EXISTING FLOW METER
8. EXISTING MAIN STEP FEED GATE
9. CONTRACTOR TO MODIFY HATCH FOR NEW GATE PEDESTAL DIMENSIONS. SEE SUBMITTAL AND O&M INFORMATION FOR OWNER FURNISHED GATES, TYP
10. INSTALL PLATE CONDITIONER BETWEEN EXISTING FLANGES



NO.	DATE	DR	REVISION	BY	APVD
		S BAAR		R CARMONA	B FULLER
				N LEBES	
				CHK	

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 Kellogg Creek Water Resource Recovery Facility
 Aeration Basin Improvements
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 Milwaukie, Oregon

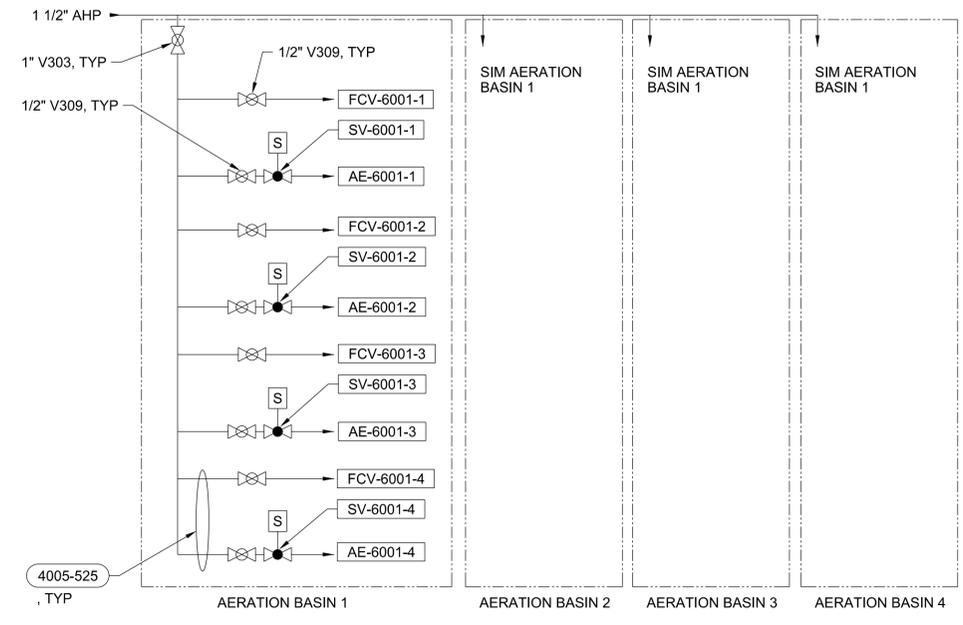
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 AERATION BASINS
 MECHANICAL
 PHOTO DETAILS

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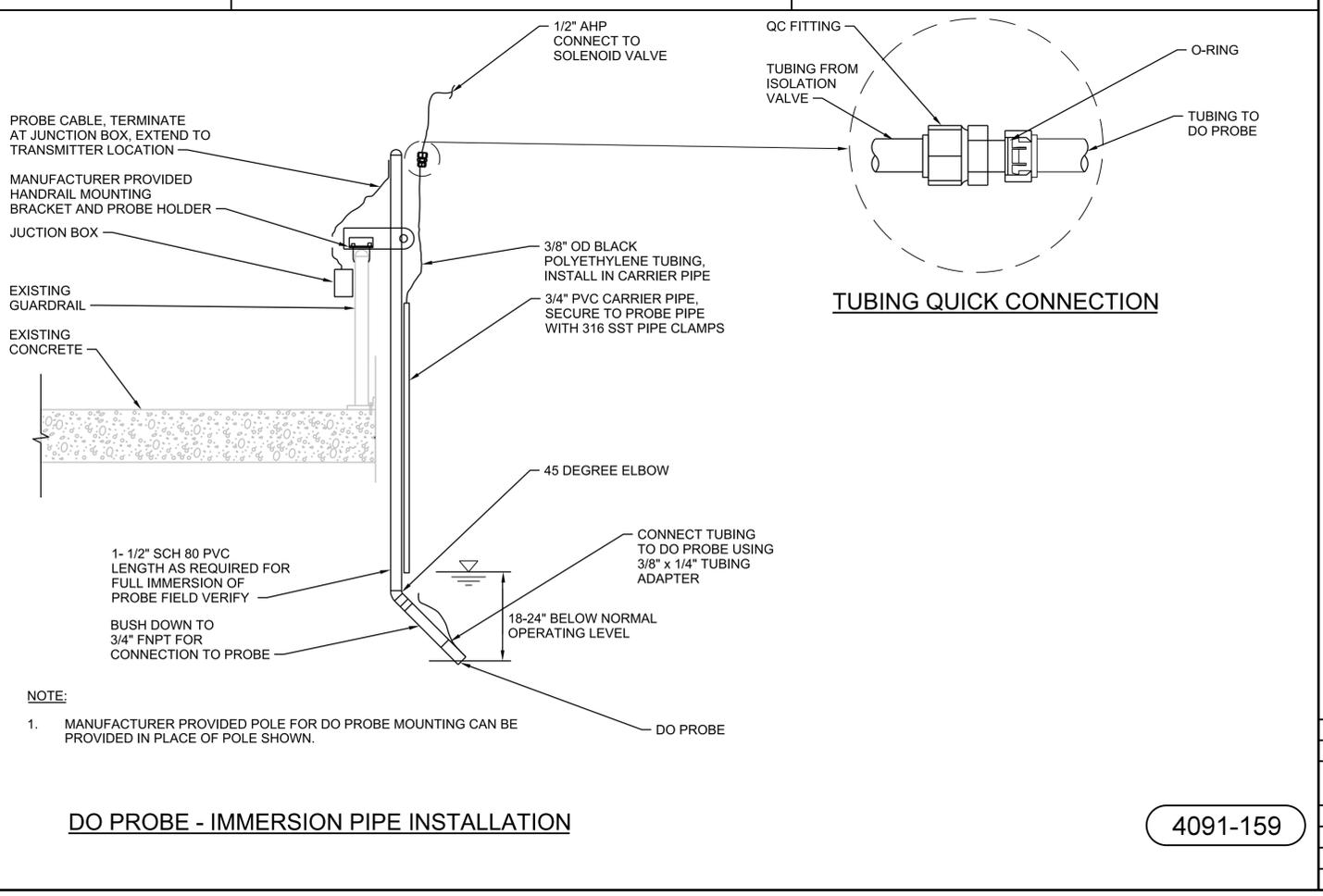
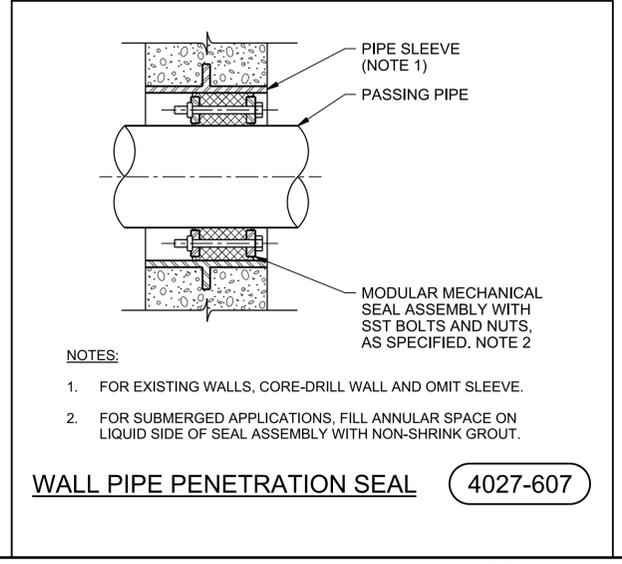
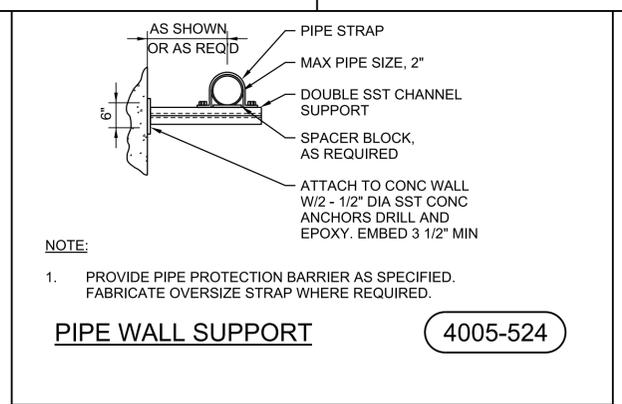
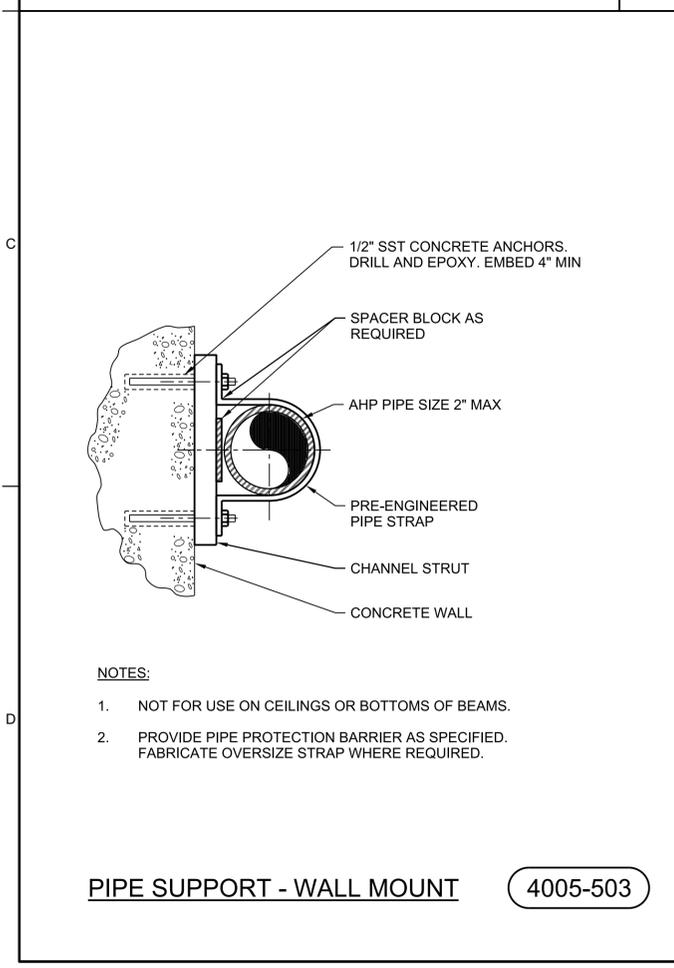
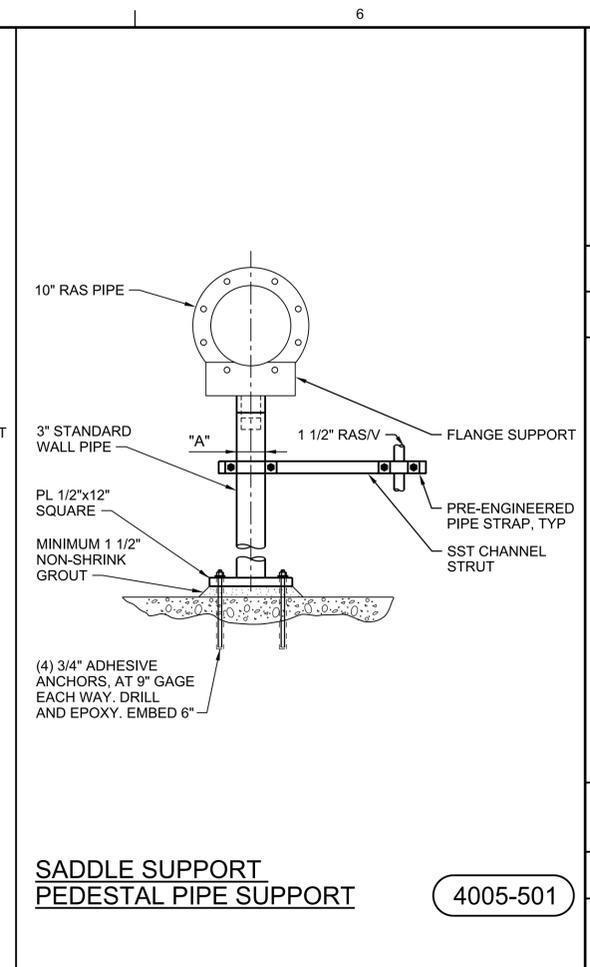
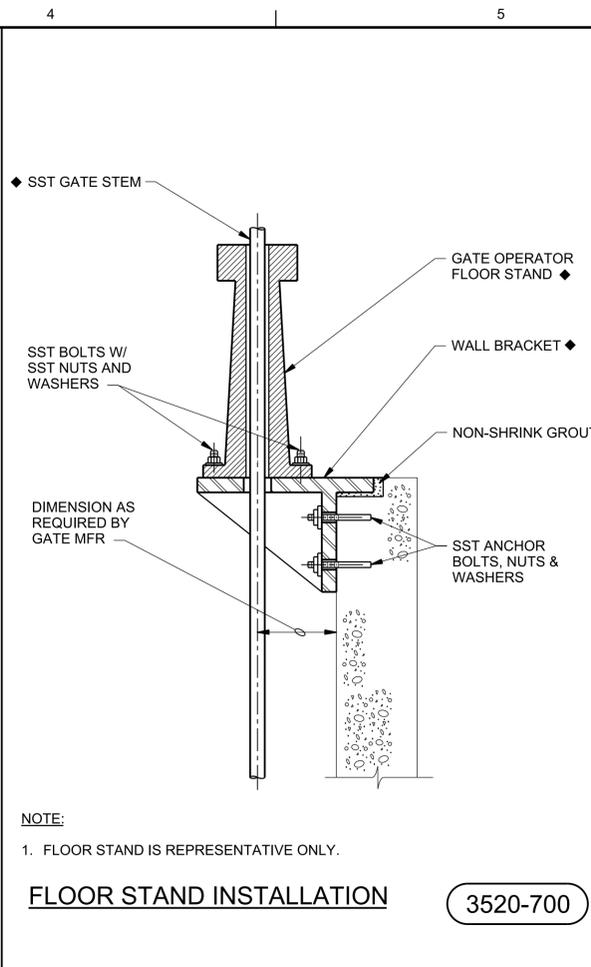
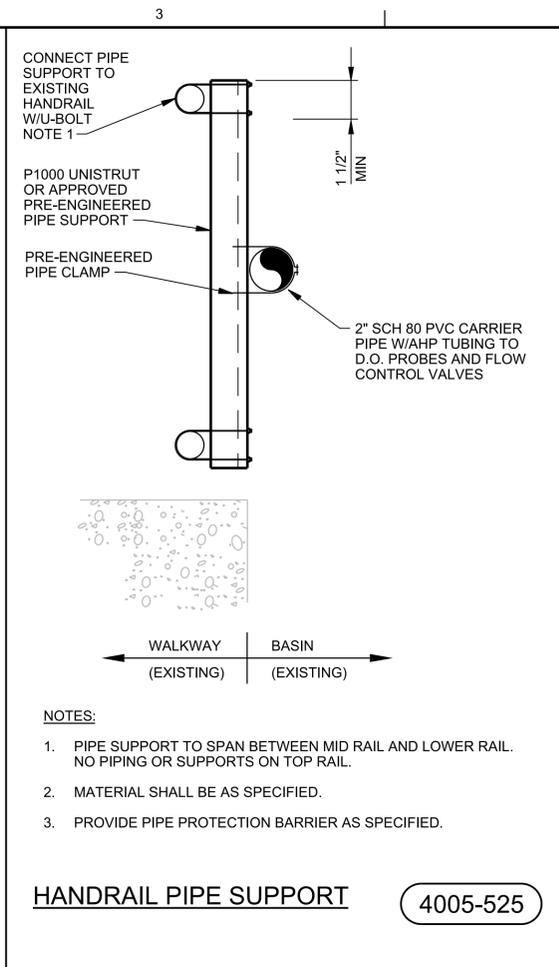
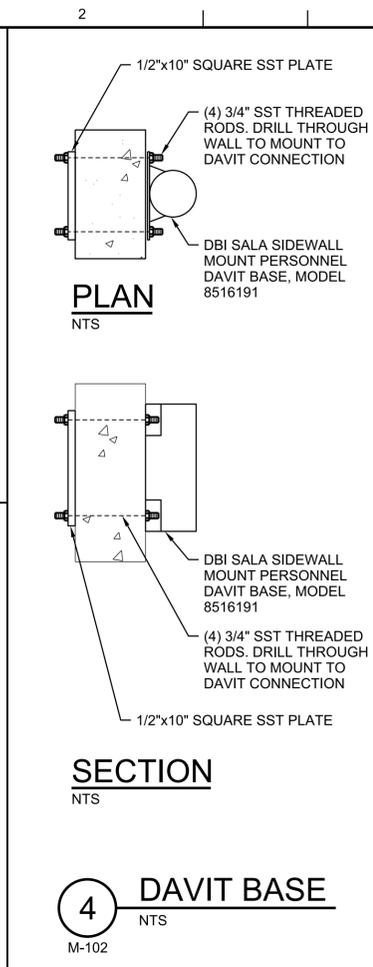
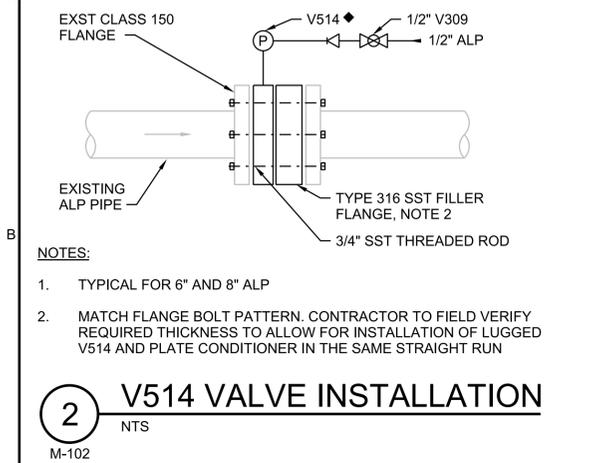
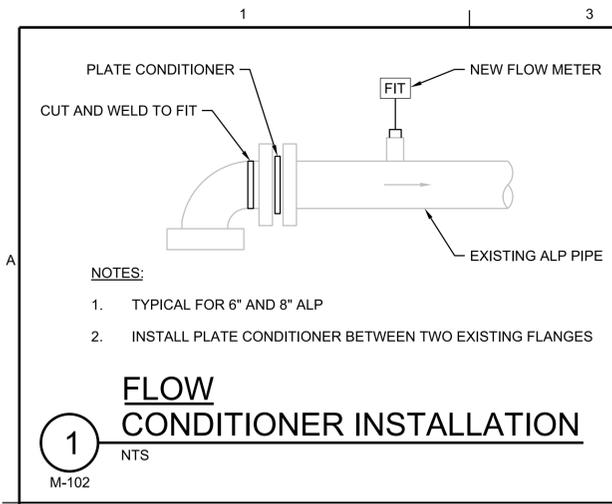
1 ALP VALVES, W3 SPRAYERS
 NTS
 M-102

2 MAIN STEP FEED GATE
 NTS
 M-102



AHP SCHEMATIC
 NTS

ISSUED FOR CONSTRUCTION



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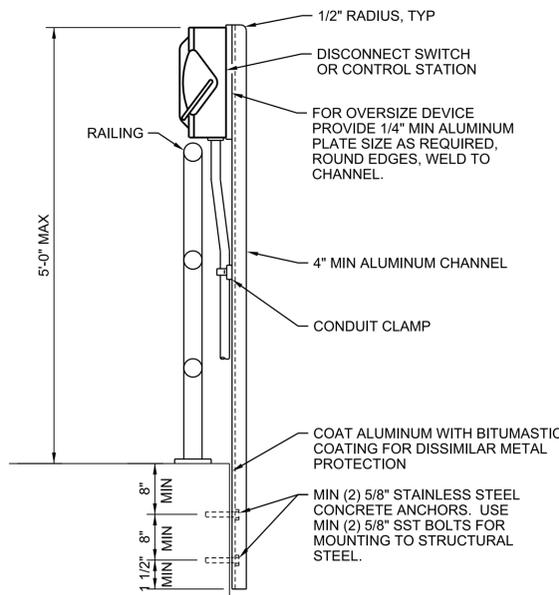
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DETAILS

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DWG: M-107
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REGISTERED PROFESSIONAL ENGINEER
MATTHEW JAYNE
77889PE
OREGON
EXP. 12-31-23

NO. DATE
DSGN
S BAAR
DR
R CARMONA
N LEBES
APVD
BY APVD
REVISION
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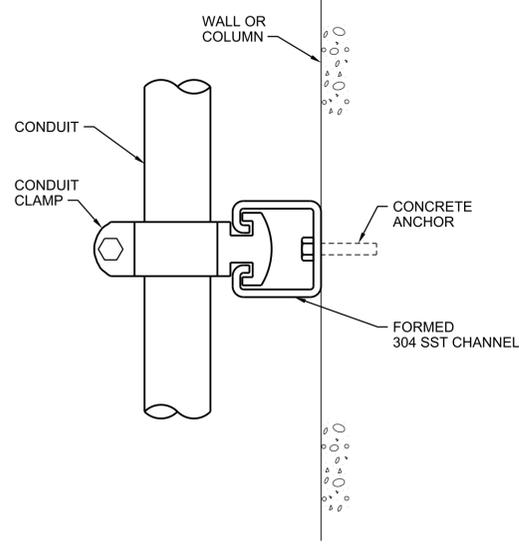


NOTES:

- EQUIPMENT HAVING A FRONTAL AREA GREATER THAN 3 SQUARE FEET OR WIDER THAN 18 INCHES SHALL BE SUPPORTED BY MIN 2 CHANNELS.
- MINIMUM COMPONENT AND CONNECTION SIZES SHOWN. FURNISH LARGER SIZES AS REQUIRED BY CALCULATIONS.
- SUBMIT FINAL DESIGN AND CALCULATIONS FOR SUPPORT AND ANCHORAGE AS SPECIFIED.
- USE STAINLESS STEEL MOUNTING HARDWARE. USE WASHER AND LOCK WASHERS UNDER ALL NUTS AND BOLTS.
- EQUIPMENT WEIGHING LESS THAN 50LBS MAY UTILIZE HANDRAIL MOUNTING DETAIL, 4091-385.

DEVICE MOUNTING, AT RAILING
NTS

2605-013



NOTES:

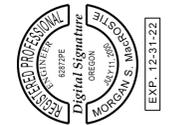
- SUPPORT ALL EXPOSED CONDUITS ON FORMED STEEL CHANNELS.
- SUBMIT FINAL DESIGN AND CALCULATIONS FOR SUPPORT AND ANCHORAGE AS SPECIFIED.

CONDUIT SUPPORT ON STRUCTURE
NTS

2605-017

ENVIRONMENTAL CONDITIONS AND MATERIALS APPLICATION (EC&MA) TABLE

FACILITY	LOCATION DESIGNATION	NEMA 250 ENCLOSURE TYPE	ELECTRICAL CONDUIT	ELECTRICAL BOXES & FITTINGS	ELECTRICAL SUPPORTS	ELECTRICAL FRAMING CHANNEL	MOUNTING HARDWARE (ANCHORS, NUTS, BOLTS, FASTENERS, ETC.)
AERATION BASINS	OUTDOOR WEATHER	4X, AL	AL	AL	AL	AL	304 SST



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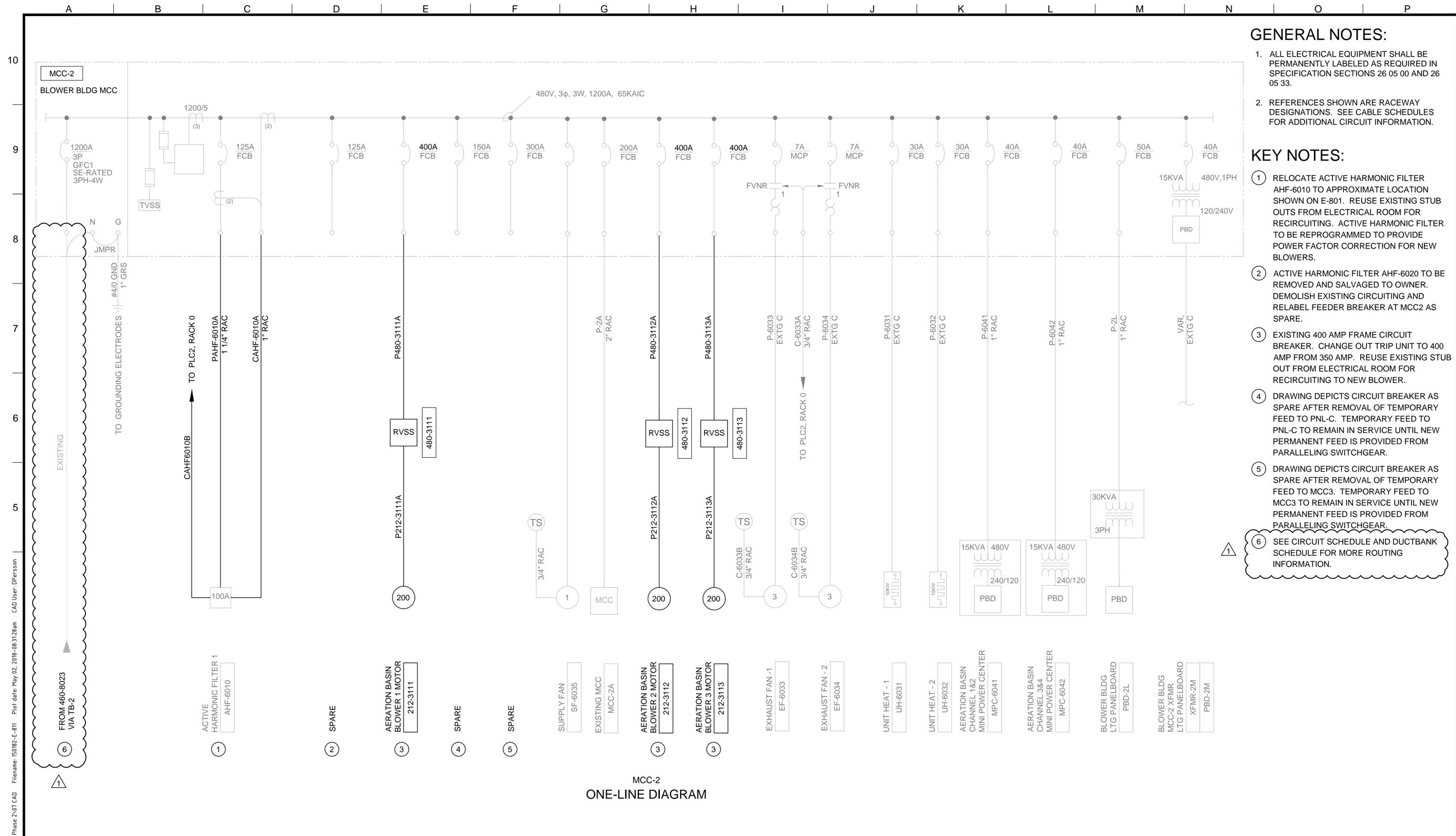
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Clackamas Water Environment Services
Milwaukie, Oregon

Jacobs
AERATION BASINS
ELECTRICAL INSTALLATION DETAILS

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REFERENCE DRAWINGS



GENERAL NOTES:

1. ALL ELECTRICAL EQUIPMENT SHALL BE PERMANENTLY LABELED AS REQUIRED IN SPECIFICATION SECTIONS 26 05 00 AND 26 05 33.
2. REFERENCES SHOWN ARE RACEWAY DESIGNATIONS. SEE CABLE SCHEDULES FOR ADDITIONAL CIRCUIT INFORMATION.

KEY NOTES:

- 1 RELOCATE ACTIVE HARMONIC FILTER AHF-6010 TO APPROXIMATE LOCATION SHOWN ON E-801. REUSE EXISTING STUB OUTS FROM ELECTRICAL ROOM FOR RECIRCUITING. ACTIVE HARMONIC FILTER TO BE REPROGRAMMED TO PROVIDE POWER FACTOR CORRECTION FOR NEW BLOWERS.
- 2 ACTIVE HARMONIC FILTER AHF-6020 TO BE REMOVED AND SALVAGED TO OWNER. DEMOLISH EXISTING CIRCUITING AND RELABEL FEEDER BREAKER AT MCC2 AS SPARE.
- 3 EXISTING 400 AMP FRAME CIRCUIT BREAKER. CHANGE OUT TRIP UNIT TO 400 AMP FROM 350 AMP. REUSE EXISTING STUB OUT FROM ELECTRICAL ROOM FOR RECIRCUITING TO NEW BLOWER.
- 4 DRAWING DEPICTS CIRCUIT BREAKER AS SPARE AFTER REMOVAL OF TEMPORARY FEED TO PNL-C. TEMPORARY FEED TO PNL-C TO REMAIN IN SERVICE UNTIL NEW PERMANENT FEED IS PROVIDED FROM PARALLELING SWITCHGEAR.
- 5 DRAWING DEPICTS CIRCUIT BREAKER AS SPARE AFTER REMOVAL OF TEMPORARY FEED TO MCC3. TEMPORARY FEED TO MCC3 TO REMAIN IN SERVICE UNTIL NEW PERMANENT FEED IS PROVIDED FROM PARALLELING SWITCHGEAR.
- 6 SEE CIRCUIT SCHEDULE AND DUCTBANK SCHEDULE FOR MORE ROUTING INFORMATION.

MCC-2
ONE-LINE DIAGRAM

	LINE IS 2 INCHES AT FULL SIZE (IF NOT 2" - SCALE ACCORDINGLY)	EXTERNAL REFERENCE FILES	WATER ENVIRONMENT SERVICES CLACKAMAS COUNTY KELLOGG CREEK WATER RESOURCE RECOVERY FACILITY IMPROVEMENTS	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="5">REVISIONS</th> </tr> <tr> <th>ZONE</th> <th>REV.</th> <th>DESCRIPTION</th> <th>BY</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td></td> <td>1</td> <td>GMP ADDENDUM 1</td> <td>AMV</td> <td>12/17</td> </tr> </tbody> </table>	REVISIONS					ZONE	REV.	DESCRIPTION	BY	DATE		1	GMP ADDENDUM 1	AMV	12/17	CONFORMED DOCUMENTS FOR SIGNATURE AND SEAL SEE CONTRACT DOCUMENTS	GUARANTEED MAXIMUM PRICE ELECTRICAL BLOWER BUILDING MCC-2 ONE-LINE DIAGRAM	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>FILENAME 150182-E-811</td> </tr> <tr> <td>BC PROJECT NUMBER 150182</td> </tr> <tr> <td>SCALE</td> </tr> <tr> <td>DRAWING NUMBER E-811</td> </tr> <tr> <td>SHEET NUMBER 12 OF 239</td> </tr> </table>	FILENAME 150182-E-811	BC PROJECT NUMBER 150182	SCALE	DRAWING NUMBER E-811	SHEET NUMBER 12 OF 239
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ZONE	REV.	DESCRIPTION	BY	DATE																							
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SCALE																											
DRAWING NUMBER E-811																											
SHEET NUMBER 12 OF 239																											
PORTLAND, OREGON	DESIGNED: PMM DRAWN: AMV CHECKED: SNH CHECKED: ACM APPROVED: BKP																										

Photo Image Filename: Path: P:\150182\CSD\Kellogg WRRF Phase 2\VT CAD Filename: 150182-E-811 Plot date: May 02, 2018-08:31:28am CAD User: DPersson