PART 1:

PROPOSAL REQUIREMENTS

INVITATION FOR PROPOSALS

Pursuant to ORS 279B.060, governing competitive sealed proposals, the City of Aumsville (City) is conducting a formal selection procedure to procure proposals from sequencing batch reactor (SBR) suppliers and dissolved air floatation clarifier (DAF) suppliers to provide equipment and services related to City's wastewater treatment system expansion. The City plans to award to the highest ranked proposer selected from those suppliers submitting proposals.

Sealed responses marked "**Proposal for SBR System Supplier**" or "**Proposal for DAF System Supplier**" will be received on behalf of the **City of Aumsville** ("Owner"), by Christopher J. Brugato, P.E., of Westech Engineering, Inc. at 3841 Fairview Industrial Drive SE, Suite 100, Salem, Oregon 97302-1192, until solicitation closing at 2:00 p.m. local time on December 4, 2024. Responses received after this time will be rejected as non-responsive. Proposers shall submit proposals in a sealed opaque envelope, plainly marked "Request for Proposals for SBR System Supplier" or "Supplier for DAF System Supplier" to Christopher J. Brugato, P.E., of Westech Engineering, Inc. at 3841 Fairview Industrial Drive SE, Suite 100, Salem, Oregon 97302-1192. Proposers may submit a proposal for either the SBR system or the DAF system or both. Proposers submitting proposals for both systems shall submit separate sealed proposals for each system. Faxed proposals or proposals sent by email will be rejected as non-responsive.

Proposals will only be considered from suppliers that meet the following minimum prequalification requirements. Proposers shall submit the prequalification form as described in the Information for Proposers. The prequalification forms shall be submitted prior to 2:00 p.m. local time on November 13, 2024. Prequalification forms received after this time will be rejected as non-responsive.

The SBR and DAF equipment supplier equipment shall satisfy the following prequalification requirements.

1. The SBR equipment supplier shall have similar equipment installed and operating in at least five similar facilities in Oregon or Washington.
2. The DAF equipment supplier shall have similar equipment installed and operating in at least five similar facilities in the United States.
3. The SBR installed in similar facilities shall have a minimum treatment capacity of 0.5 million gallons per day (MGD) on an average dry weather basis.
4. The DAF equipment installed in similar facilities shall have a minimum treatment capacity of 200 gallons per minute.
5. Each of the referenced installations shall have been operational for a minimum of 2 years.

Proposals will be opened (at the above address) immediately after the solicitation closing time and only the name of the proposing firms will be read aloud. In accordance with ORS 279B.060(6), the content of each proposal will not be available for inspection until after the notice of intent to award the proposal is issued.

Complete digital (pdf) copies of the Request for Proposals package are available at http://www.westech-eng.com (under the Currently Bidding tab). The digital RPF

Documents may be downloaded for a non-refundable payment of $25 by inputting QuestCDN eBidDoc Number listed on the project information sheet available through the website link above. Assistance with free QuestCDN registration, document downloading or working with the project information may be obtained at QuestCDN.com, at 952-233-1632, or via email at info@questcdn.com.

Copies of the complete Request for Proposals package may be examined at:

1. City of Aumsville, City Hall, 595 Main Street, Aumsville, OR 97325
2. Westech Engineering Inc., 3841 Fairview Industrial Dr. SE, Suite 100, Salem, OR 97302

All questions concerning the proposal or scope of work should be directed to Christopher J. Brugato, P.E., Westech Engineering, Inc., (503) 585-2474.

This project is subject to the Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953. Absent an approved waiver, all iron, steel, manufactured products, and construction materials used in this project must be produced in the United States. All proposers shall complete and submit the certification form included in the Request for Proposal Package. The following waivers apply to this Contract: BABA De Minimus, Small Grants, and Minor Components.

The City reserves the right to amend the RFP, extend the deadline for submittal, waive minor irregularities, informalities, or failures to conform to the RFP requirements, reject any proposal not in compliance with all proscribed public contracting procedures and requirements, including the requirement to demonstrate responsibility pursuant to ORS 279B.110, contact proposers and request additional information to clarity submitted proposals; and to reject for good cause and without liability therefore any and all proposals, and upon a finding that it is in the public interest to do so, cancel the RFP at any time prior to contract execution in accordance with ORS 279B.120.

Publication Dates:
Daily Journal of Commerce: 10/23 & 10/28, 2024
Statesman Journal: 10/28, 2024

INSTRUCTIONS TO BIDDERS FOR PROCUREMENT CONTRACTS

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INSTRUCTIONS TO BIDDERS FOR PROCUREMENT CONTRACT

ARTICLE 1—DEFINED TERMS

1.01 Terms used in these Instructions to Bidders will have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below.

A. *Issuing Office*—The office from which the Procurement Bidding Documents are to be issued and where the bidding procedures are to be administered.

B. Engineer: Westech Engineering, Inc. 3841 Fairview Industrial Dr. SE, Suite 100, Salem, Oregon, 97302, Phone (503) 585-2474. Project Manager: Christopher J. Brugato, cbrugato@westech-eng.com

C. Proposer, Supplier, Contractor, Bidder, Seller, Offeror: The entity submitting a proposal to furnish goods in response to this solicitation.

D. Buyer or Owner: The City of Aumsville, Oregon

E. General Contractor or Construction Contractor: The firm that will be retained by the Owner to construction the wastewater treatment plant equipment and install the SBR and DAF equipment.

F. Construction Contract: The work performed by the Construction Contractor which will include the installation of the goods furnished in response to this solicitation.

G. Proposal or Bid: The offer made in response to this solicitation.

ARTICLE 2—PROCUREMENT BIDDING DOCUMENTS

2.01 Bidder may obtain complete sets of the Procurement Bidding Documents in the manner described in the Invitation For Proposals.

2.02 Bidder must use a complete set of the Procurement Bidding Documents in preparing the Bid; neither Buyer nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Procurement Bidding Documents.

2.03 Buyer and Engineer make copies of Procurement Bidding Documents available on the above terms only for obtaining Bids for furnishing Goods and Special Services, and do not authorize or confer a license for any other use.

ARTICLE 3—QUALIFICATIONS OF BIDDERS

3.01 Buyer may at any time conduct such investigations as Buyer deems necessary to establish the responsibility, qualifications, and financial ability of Bidder, and after the opening of Bids may require a Bidder to submit documentation of its qualifications, including but not limited to financial data and documentation of previous experience providing goods and services comparable to the specified Goods and Special Services.

3.02 Bidder is to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

1. **Prequalifications:** Only proposals from Suppliers meeting the minimum prequalification

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requirements listed in the Invitation For Proposals will be considered for award. Proposers shall demonstrate compliance with the prequalification requirements submission of the Prequalification form prior to the deadline listed in the Advertisement For Proposals. The prequalification form is included at the end of this section. The Owner will respond to all prequalification applicants by email of acceptance or rejection of their application. Applicants have a right to a hearing per ORS 279B.425 if they are found not to be qualified, and if they request a hearing with three business days after receipt of the notice.

3.03 Deleted

ARTICLE 4—SITE VISIT; PRE-BID CONFERENCE

4.01 Buyer recommends that Bidder visit the Point of Destination and the site where the Goods are to be installed and Special Services will be provided, taking into account observable local and site conditions that may affect the delivery, cost, progress, and furnishing of the Goods and Special Services. Arrangements for such a visit may be made through Engineer.

4.02 A pre-bid conference will not be held for this procurement.

ARTICLE 5—INTERPRETATIONS AND ADDENDA

5.01 All questions about the meaning or intent of the Procurement Bidding Documents are to be submitted to Engineer in writing by email at:

Westech Engineering, Inc., 3841 Fairview Industrial Dr. SE, Suite 100, Salem, OR, 97302, Phone (503) 585-2474, Project Manager: Christopher J. Brugato, P.E. cbrugato@westech-eng.com

5.02 Interpretations or clarifications considered necessary by Engineer in response to such written questions will be issued by Addenda mailed or delivered to all parties recorded as having received the Procurement Bidding Documents. Questions received less than 10 days prior to the date for opening of Bids will not be answered. Only answers in the Addenda will be binding. Oral statements, interpretations, and clarifications may not be relied upon in the preparation of a Bid, and will not be binding or legally effective.

5.03 Addenda may be issued to clarify, correct, or change the Procurement Bidding Documents as deemed advisable by Buyer or Engineer.

ARTICLE 6—BID SECURITY

6.01 A Bid must be accompanied by Bid security made payable to Buyer in an amount of **10** percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a Bid bond issued by a surety meeting the requirements of Paragraph 5.01 of the General Conditions. Such Bid bond will be issued in the form included in the Procurement Bidding Documents.

6.02 The Bid security of the apparent Successful Bidder will be retained until Buyer (Project Owner) awards the Procurement Contract to such Bidder, and such Bidder has executed the Procurement Contract, furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Procurement Contract and furnish the required contract security within 15 days after

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the Notice of Award, Buyer (Project Owner) may consider Bidder to be in default and annul the Notice of Award, and the Bid security of that Bidder will be forfeited, in whole in the case of a penal sum bid bond, and to the extent of Buyer's damages in the case of a damages-form bond. Such forfeiture will be Buyer's exclusive remedy if Bidder defaults.

6.03 The Bid security of other Bidders that Buyer believes to have a reasonable chance of receiving the award may be retained by Buyer until the earlier of 7 days after the Effective Date of the Procurement Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

6.04 Bid security of other Bidders that Buyer believes do not have a reasonable chance of receiving the award will be released within 7 days after the Bid opening.

ARTICLE 7—PROCUREMENT CONTRACT TIMES

7.01 See applicable provisions in the Procurement Agreement to be executed with the successful bidder.

ARTICLE 8—LIQUIDATED DAMAGES

8.01 Any provisions for liquidated damages, such as those for Seller's failure to attain a specified Milestone such as the delivery of the Goods, are set forth in the Procurement Agreement.

ARTICLE 9—RESERVED

ARTICLE 10—"OR-EQUAL" ITEMS

10.01 The Procurement Contract, if awarded, will be based on materials and equipment specified or described in the Procurement Bidding Documents. Bidders may propose "or equal" materials and equipment, which if approved by Engineer will be identified by Addendum. The materials and equipment described in the Procurement Bidding Documents establish a standard of required type, function, and quality to be met by any proposed "or-equal" item. No item of material or equipment will be considered by Engineer as an "or-equal" unless written request for approval has been submitted by Bidder and has been received by Engineer no later than 15 days after the advertisement or invitation to bid is first issued. Each such request shall conform to the requirements of Paragraph 7.04 of the General Conditions. Each such request shall include the Manufacturers' Certification for Compliance with Domestic Preference requirements. Refer to the suggested Manufacturer's Certification provided in these construction Contract Documents. The burden of proof of the merit of the proposed item is upon Bidder. Engineer's decision of approval or disapproval of a proposed item as an equal will be final. Bidders shall not rely upon approvals unless set forth in an Addendum. Send requests to the same address listed for receipt of Bids. Substitutes and "or-equal" materials and equipment may be proposed by Contractor in accordance with Paragraphs 7.05 and 7.06 of the General Conditions after the Effective Date of the Contract. Each such request shall include Manufacturer's Certification letter to document

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compliance with Domestic Preference requirements. Refer to Manufacturer's Certification Letter provided in these Contract Documents.

ARTICLE 11—PREPARATION OF BID

11.01 The Bid Form is included with the Procurement Bidding Documents. Additional copies of Procurement Bidding Documents may be obtained from the Issuing Office.

11.02 All blanks on the Bid Form must be completed and the Bid Form must be signed by an individual authorized to act on behalf of the Bidder. Alterations must be initialed by an individual authorized to act on behalf of the Bidder. A Bid price must be indicated for each item in the Bid Form. In the case of optional alternates, the words "No Bid" may be entered.

11.03 Bidder must acknowledge all Addenda by filling in the number and date of each Addendum in the Bid Form and sign where indicated to verify that the Addenda were received. A Bid that does not acknowledge receipt of all Addenda may be considered non-responsive.

11.04 Bidder shall:

A. Sign the Bid Form as indicated in the Bid Form.

B. Include evidence of authority to sign.

C. Provide information on the individual to be contacted for any communications regarding the Bid.

D. Provide evidence of the Bidder's authority and qualification to do business in the locality of the Project, to the extent required, or indicate the ability to obtain such authority and qualification prior to award of the Procurement Contract.

11.05 The responsibilities of each Bidder submitting a Bid are described in the Bidder's representations and certifications set forth in Article 6 of the Bid Form.

ARTICLE 12—BASIS OF BID; COMPARISON OF BIDS

12.01 In accordance with ORS 279.395, the Owner reserves the right to reject any proposal not in compliance with all prescribed public contracting procedures and requirements, including the requirement to demonstrate the Bidder's responsibility under ORS 279B.100, and may reject any and all proposals after finding that doing so is in the best interest of the Owner.

12.02 Proposals for the SBR and DAF equipment will be considered separately and contracts will be awarded to the highest ranked proposer for each equipment system resulting in two separate procurement contracts. While proposed prices will be a consideration, price will not be the sole determining factor in ranking each proposal. The proposal evaluation process implemented by the City will take into consideration the following criteria and associated maximum possible weights:

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Criteria	Points Available
Proposal responsiveness, completeness, organization and Clarity	10 pts
Completeness of the proposed equipment package and expected performance of the proposed equipment	15 pts
Experience of the supplier including number of similar installations	15 pts
Expected responsiveness and service of the supplier considering location of service representatives, track record for other Northwest systems, and ongoing operator training and user-group opportunities.	15 pts
Expected ease and cost of operation and maintenance.	15 pts
Cost	30 pts
Total	100 pts

12.03 *Buyer's Contingency Allowance*

A. If Buyer has stipulated a Buyer's Contingency Allowance in the Bid Form, such Buyer's Contingency Allowance is the same for all Bidders and is not a factor in determining the apparent low Bid.

ARTICLE 13—SUBMITTAL OF BID

13.01 Bidder shall refer to the **Invitation for Proposals** for specific identification of the date, time, and place where Bids are to be submitted.

13.02 Bidder must submit one separate unbound copy of the completed Bid Form, and, if required, the Bid Security and the other documents required to be submitted under the terms of Article 4 of the Bid Form.

13.03 A Bid must be submitted no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid. Submit the Bid in an envelope plainly marked **"Proposal for SBR System Supplier" or "Proposal for DAF System Supplier"** and the name and address of Bidder. Enclose the Bid security and other documents required to be submitted with the Bid as listed in the Bid Form. If a Bid is sent by mail or other delivery system, the sealed envelope

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containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED."

13.04 Faxed or electronically mailed (email) proposals will not be accepted.

13.05 Proposers may submit a proposal for either the Sequencing Batch Reactor (SBR) System or the Dissolved Air Floatation (DAF) system or both. Proposers submitting proposals for both systems shall submit separate sealed proposals/bids for each system.

ARTICLE 14—MODIFICATION OR WITHDRAWAL OF BID

14.01 A Bid may be modified or withdrawn by a document duly signed in the same manner that a Bid must be signed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

14.02 If, within 24 hours after Bids are opened, any Bidder files a duly signed written notice with Buyer and promptly thereafter demonstrates to the reasonable satisfaction of Buyer that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned.

ARTICLE 15—OPENING OF BIDS

15.01 Bids will be publicly opened at the time and place indicated in the advertisement or invitation for proposals.

ARTICLE 16—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

16.01 All Bids will remain subject to acceptance for the period stated in the Bid Form, but Buyer may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 17—EVALUATION OF BIDS AND AWARD OF PROCUREMENT CONTRACT

17.01 Buyer reserves the right to reject any and all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Buyer also reserves the right to waive all informalities not involving price, time, or changes in the Goods and Special Services.

17.02 Buyer will reject the Bid of any Bidder that Buyer finds, after reasonable inquiry and evaluation, to not be responsible.

17.03 In evaluating Bids, Buyer will consider whether the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data as may be requested in the Bid Form or may be requested from Bidders prior to a Notice of Award.

17.04 The criteria described in Article 12.02 will be used to score each proposal. Total scores will be tabulated and a recommendation to award the contract to the highest scoring proposer will be presented to the Aumsville City Council for approval. Following selection of a supplier for the SBR and DAF equipment, Agreements of the form included in this RFP will be prepared and executed for each system. The City reserves the right to reject any and all proposals and terminate the

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selection process at any time if, at its sole discretion, it determines such action would be in the best interest of the City.

ARTICLE 18—BONDS AND INSURANCE

18.01 Article 5 of the General Conditions and Article 5 of the Supplementary Conditions set forth Buyer's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the signed Procurement Agreement to Buyer, it must be accompanied by such bonds and acceptable evidence of insurance.

ARTICLE 19—SIGNING OF PROCUREMENT AGREEMENT

19.01 When Buyer issues a Notice of Award to the Successful Bidder, it will be accompanied by the unsigned counterparts of the Procurement Agreement along with the other Procurement Contract Documents identified in the Procurement Agreement. Within 15 days thereafter, Successful Bidder must execute and deliver the required number of counterparts of the Procurement Agreement and any bonds and insurance documentation required to be delivered by the Procurement Contract Documents to Buyer. Within 10 days thereafter, Buyer will deliver one fully executed counterpart of the Procurement Agreement to Successful Bidder, together with printed and electronic copies of the Procurement Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 20—RESERVED

ARTICLE 21—PROCUREMENT CONTRACT TO BE ASSIGNED

21.01 Bidder's attention is directed to the provisions of Article 5 of the Procurement Agreement which provide for the assignment of the Procurement Contract to a construction contractor designated by the Buyer to construct the **Aumsville Wastewater Treatment Plant Improvements**. Successful Bidder (Seller) will be required to perform the Procurement Contract after it has been assigned to the construction contractor (Contractor Assignee) in accordance with the provisions in the Procurement Contract. Timing of the assignment is addressed in the Procurement Agreement. Forms documenting the assignment of the Procurement Contract and for the agreement of the Seller's surety to such assignment are included as attachments to the Procurement Agreement.

ARTICLE 22—FEDERAL REQUIREMENTS CONTRACT

22.01 Federal requirements at Article 16 of the Supplementary Conditions apply to this project.

22.02 Domestic Preference requirements apply to this project.

ARTICLE 23—AVAILABILITY OF PROPOSALS

23.01 After opening, the Contracting Agency will make Proposals available for public inspection pursuant with timeframes under OAR 137-047-0630 (i.e., proposals are not required to be

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available for public inspection until after the "notice of intent to award" a contract is issued by or on behalf of the contracting agency).

ARTICLE 24—NOTICE OF INTENT TO AWARD, PROTESTS

24.01 As provided by OAR 137-047-0610, notice of intent to award will be issued to all proposer, and any award protests must be submitted in writing and received no later than 4:00 p.m. seven (7) calendar days after the date of issuance of the notice of intent to award (ie. if the Notice of Intent to Award is dated and issued on a Friday, the protest period ends at 4:00 p.m. on the following Friday). Award will not become final until the latter of the seven (7) calendar days following the issuance of the notice of intent to award, or until the Owner provides written response to all timely filed protests that denies the protest and affirms the award. Solicitation protests must be submitted not less than ten (10) days prior to the proposal closing date as specified in (and will be processed in accordance with) OAR 137-047-0730. Award protests must be submitted (and will be processed) in accordance with OAR 137-047-0740.

ARTICLE 25—APPLICATION FOR PAYMENT & CERTIFICATION

25.01 With each application for payment, the Seller will be required to complete and EJCDC form C-620.

ARTICLE 26—INCURRING COSTS

26.01 Neither the Owner nor the Engineer are liable for any costs incurred by the Proposer in the preparation or presentation of the Proposal.

ARTICLE 27—DOMESTIC PREFERENCE REQUIREMENTS

27.01 The project is being funded with assistance from the USDA Rural Development Department. All equipment furnished under this procurement shall comply with the Build America, Buy America Act (BABA) requirements mandated by Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953. All proposers shall complete and submit the "Manufacturer's Certification of Compliance" form included at the end of this section. The "Manufacturer's Certification of Compliance shall be included as an attachment to the Bid Form.

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PREQUALIFICATION FORM

Prequalification Form for the (check only one box)

☒ Sequencing Batch Reactor Equipment for the Aumsville Wastewater Treatment Plant

☐ Dissolved Air Floatation Equipment for the Aumsville Wastewater Treatment Plant

Mail or hand-deliver completed form prior to Bid opening, by 2:00 p.m., local time, by the deadline indicated in the Advertisement for Proposals, to the Engineer (Christopher J. Brugato, P.E., Westech Engineering, Inc., 3841 Fairview Industrial Drive, SE Suite 100, Salem, Oregon 97333, cbrugato@westech-eng.com PH 503.585.2474). This form may be emailed to the Engineer, instead of mailed or hand-delivered, although it is the responsibility of the Proposer emailing the form to confirm its receipt by phone. Email completed form to: cbrugato@westech-eng.com

Name of Proposer: Jeremy Jensen, P.E. - Sanitaire Territory Manager West Region Xylem

Phone: O: 1.414.365.5996 | M: 1.979.436.7407

Email: jeremy.jensen@xylem.com

1. SBR Equipment Supplier: List at least five locations in Oregon or Washington where proposer's equipment is installed and operating. Provide contact name, email, and telephone.

2. DAF Equipment Supplier: List at least five locations in the United States where proposer's equipment is installed and operating. Provide contact name, email, and telephone.

3. Indicate production capacity for each. Each installation must have a treatment capacity of at least 0.5 million gallons per day (mgd) on an average dry weather basis for the Sequencing Batch Reactor supplier and 200 gallons per minute for the Dissolved Air Floatation System supplier.

4. Indicate startup date for each. Each installation must have been operating for a minimum of 2 years since the equipment was placed into service.

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1. Jefferson, OR | Kyle Ward | (541) 971-0953 | kward@jeffersonoregon.org

ADWF = 0.652 MGD | PWWF = 4.820 MGD | Commissioned 2010

2. McCleary, WA | Kevin Trewhella | (360) 495-3217 | kevint@cityofmccleary.com

ADWF = 0.570 MGD | PWWF = 1.310 MGD | Commissioned 2005

3. Sutherlin, OR | Jody Gardner | O: (541) 459-5768 M: (541) 315-6565 | j.gardner@ci.sutherlin.or.us

ADWF = 1.800 MGD | PWWF = 7.00 MGD | Commissioned 2020

4. Coquille, OR | Gary Dagit | (541) 396-4336 | gdagit@cityofcoquille.org

ADWF = 2.040 MGD | PWWF = 6.120 MGD | Commissioned 2013

5. Gold Beach, OR | Ron Hansen | (541) 247-7459 | rhanson@goldbeachoregon.gov

ADWF = 0.630 MGD | PWWF = 3.150 MGD | Commissioned 2012

6. Netarts-Oceanside Sanitary District | Brian Mello | (503) 842-8231 ext 5 | brian@nosd.us

ADWF = 0.700 MGD | PWWF = 2.530 MGD | Commissioned 2013

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MANUFACTURER'S CERTIFICATION OF COMPLIANCE

Date: 12/4/2024

Company Name: Xylem Water Solutions USA, Inc.

Company Address: N19 W23993 Ridgeview Pkwy STE 200, Waukesha WI 53188

Subject: Domestic Preference Requirements Certification for:

City of Aumsville, Oregon Wastewater Treatment Plant Improvement Project

I hereby certify that the following product(s) and/or material(s) shipped or provided for the subject project are in full compliance with the Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58 ,§§ 70901-70953.

Common Name of Items, Products and/or Materials:

1.) ICEAS SBR Mixers

2.) ICEAS SBR Blowers

3.) ICEAS SBR Aeration equipment

4.) Air control valves and valve actuators

5.) ICEAS SBR Decanter

6.) ICEAS SBR Waste Sludge Pumps

7.) Digester Blowers

8.) Digester Aeration equipment

9.) Digested Sludge Pumps

*See attached for Non-BABA compliant or optional BABA compliant items

These products and/or materials were manufactured in the following location(s):

Sartell, MN; Cannonsburg, PA; Sedalia, MO; Blandon, PA; Marshfield, WI; Des Plaines, IL; Germantown, WI; Augusta, GA; Marietta, GA; Pittsburg, PA; Pewaukee, WI

City, State

Authorized Company Representative (Signature and Printed Name)

Scott J. Lapcewich - Vice President

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MANUFACTURER'S CERTIFICATION OF COMPLIANCE
Non-BABA or optional BABA Compliant Items

1.) ICEAS SBR Decanter (Optional)

2.) ICEAS SBR Decanter Actuator

3.) Air Control Valves and Actuators (Optional)

4.) Instrumentation (DO sensors, level sensors, float switches)

5.) Motor Control Center

6.) Packaged Control Panel for ICEAS SBR and Aerobic Digesters

7.) Local Operation stations

BID FORM FOR PROCUREMENT CONTRACT

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BID FORM FOR PROCUREMENT CONTRACT

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 1—BUYER AND BIDDER

1.01 This Bid is submitted to:

The City of Aumsville
595 Main Street
Aumsville, OR 97325

Note: Proposals shall be submitted to Westech Engineering, Inc. as noted in the Invitation for Proposals.

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into a Procurement Contract with Buyer in the form included in the Procurement Bidding Documents, and to furnish the following Goods and Special Services as specified or indicated in the Procurement Bidding Documents, for the prices and within the times indicated in this Bid, and in accordance with the other terms and conditions of the Procurement Bidding Documents.

(Check only one box)

☒ Sequencing Batch Reactor and Digester Equipment for the Aumsville Wastewater Treatment Plant

☐ Dissolved Air Floatation Equipment for the Aumsville Wastewater Treatment Plant

Proposers submitting proposals for both the Sequencing Batch Reactor (SBR) and the Dissolved Air Floatation (DAF) system shall submit separate sealed proposals for each system.

ARTICLE 2—BASIS OF BID

2.01 *Lump Sum Bids*

A. Bidder will furnish the Goods and Special Services in accordance with the Procurement Contract Documents for the following Procurement Contract Price(s):

1. Lump Sum Bid Price

*$167,342 of Lump Sum Bid Price is Non-BABA compliant.
**Price deductions available by selecting additional non-BABA compliant components identified as "OPTIONAL" on attachment to Manufacturer's Certification of Compliance Form.

Lump Sum Bid Price	$ 1,945,509.00

2.02 *Buyer's Contingency Allowance*

A. The Bid Price is supplemented by the following Buyer's Contingency Allowance, as described in the General Conditions, Paragraph 11.06:

Buyer's Contingency Allowance	$75,000

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2.03 *Total Bid Price*

A. The following Total Bid Price is the sum of the Lump Sum Bid Price from Paragraph 2.01and the Buyer's Contingency Allowance. The Total Bid Price, if accepted and incorporated in the Procurement Contract to be awarded, will be subject to any Buyer-accepted Alternates and to final Unit Price and Buyer's Contingency Allowance adjustments.

Total Bid Price	$ 2,020,509.00

ARTICLE 3—TIME OF COMPLETION

3.01 Bidder agrees that the furnishing of Goods and Special Services will conform to the schedule of Procurement Contract Times set forth in Article 2 of the Procurement Agreement.

3.02 Bidder accepts the provisions of the Procurement Agreement as to liquidated damages.

ARTICLE 4—ATTACHMENTS TO THIS BID

4.01 The following documents are attached to and made a condition of this Bid:

A. Required Bid security in the form prescribed in the Instructions to Bidders.

B. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids.

C. Information to document compliance with prequalification requirements listed in the Invitation for Proposals.

D. Manufacturer's Certification of Compliance form (see Instructions To Bidders) to demonstrate compliance with the Build American Buy American Act requirements of this contract.

E. If Bid amount exceeds $10,000, signed Compliance Statement (RD-400-6) Refer to specific equal opportunity requirements set forth in the Supplementary Conditions of the Construction Contract (EJCDC P-800).

F. If bid amount exceeds $25,000, signed Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – Lower Tier Covered Transactions (AD-1048).

G. If Bid amount exceeds $100,000, signed RD Instruction 1940-Q Exhibit A-1, Certification for Contracts, Grants, and Loans.

H. Sworn Statement of Good Faith Effort with Small, Women, or Minority Business Utilization Requirements.

I. ARPA/SLFRF Required Contract Clauses.

J. Certification Regarding Lobbying

K. Submittals required with the Proposal as described in Section 11300 Packaged SBR and Digester Equipment and Section 11400 Packaged DAF Equipment.

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ARTICLE 5—BIDDER'S ACKNOWLEDGMENTS

5.01 Bidder accepts all terms and conditions of the Instructions to Bidders. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period that Bidder may agree to in writing upon request of Buyer.

5.02 Bidder has examined and carefully studied the Procurement Bidding Documents, the related data identified in the Procurement Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged:

Addendum No.	Addendum Date
Addendum No. 1-25	11/14/2024
Addendum No. 2-18	11/19/2024

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Bidder's Representations*

A. In submitting this Bid, Bidder represents that:

1. Bidder has examined and carefully studied the Procurement Contract Documents.

2. If required by the Instructions to Bidders to visit the Point of Destination and the site where the Goods are to be installed or Special Services will be provided, or if, in Bidder's judgment, any observable local or site conditions may affect the delivery, cost, progress, or furnishing of the Goods and Special Services, then Bidder has visited the Point of Destination and site where the Goods are to be installed or Special Services will be provided (as applicable) and become familiar with and is satisfied as to the observable local and site conditions that may affect delivery, cost, progress, and furnishing of the Goods and Special Services.

3. Bidder is familiar with and is satisfied as to all Laws and Regulations that may affect the cost, progress, and performance of Seller's obligations under the Procurement Contract, including all Domestic Preference requirements.

4. Bidder has carefully studied, considered, and correlated the information known to Bidder with respect to the effect of such information on the cost, progress, and performance of Seller's obligations under the Procurement Contract.

5. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Procurement Contract Documents, and the written resolution (if any) thereof by Engineer is acceptable to Bidder.

6. The Procurement Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance of Seller's obligations under the Procurement Contract.

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7. The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of the Bidding Requirements, that without exception the Bid (including all Bid prices) is premised upon furnishing the Goods and Special Services as required by the Procurement Contract Documents.

6.02 *Bidder's Certifications*

A. Bidder certifies that:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

3. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Procurement Contract. For the purposes of this Paragraph 6.02.A.4:

   a. "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;

   b. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Buyer, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Buyer of the benefits of free and open competition;

   c. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Buyer, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

   d. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process.

5. The Bidder understands the manner of payment for the cost of the Goods and Special Services;

6. The undersigned Bidder certifies their bidder status as follows (as defined in ORS 279A.120):

   Oregon Resident Bidder: YES ☐ NO ☒

   If the bidder is a nonresident bidder, indicate the percent of preference given to resident bidders in the state in which you reside. N/A - Xylem is not a contractor %

7. The undersigned Bidder certifies that it has not discriminated and will not discriminate against minority, women or emerging small business enterprises in obtaining any required subcontracts.

8. The undersigned Bidder certifies that the surety issuing all required bonds is duly authorized and licensed to transact surety business in the state of Oregon.

9. The provisions of ORS 305.385, relating to Oregon tax laws will be complied with.

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10. Bidder acknowledges that in the event the any or all bids are rejected or deemed non-responsive, that Bidder, sub-bidders or suppliers shall have no claim for recovery of bidding costs, or loss of anticipated profits or revenue or other economic loss arising out of or resulting from such rejection, including lost opportunity costs.

11. The undersigned Bidder agrees & certifies that any Performance Bond provided will also remain in full force and effect as a maintenance/warranty bond during the entire guaranty/warranty period, unless a separate warranty/maintenance bond acceptable to the Owner is provided by the Contractor as applicable.

12. Bidder accepts the provisions of the Agreement as to liquidated damages, and agrees that liquidated damages in the amounts listed in the Agreement, accruing on a daily basis, are part of the consideration for the bid and that this amount is a reasonable sum for such damages.

13. Bidder agrees to be responsible for all patent and/or royalty payments associated with completion of the work, as applicable.

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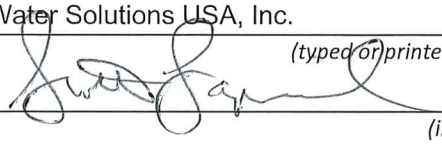
This Bid is offered by:

Bidder:

Xylem Water Solutions USA, Inc.

(typed or printed name of organization)

By: 

(individual's signature)

Date: 12/10/2024

(date signed)

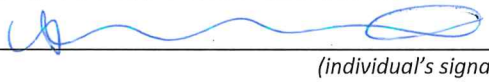
Name: Scott J. Lapcewich

(typed or printed)

Title: Vice President

(typed or printed)

(If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: 

(individual's signature)

Title: EXE. ADMINISTRATIVE ASSISTANT

(typed or printed)

Address for giving notices:

Xylem Water Solutions USA, Inc.

N19 W23993 Ridgeview Pkwy STE 200

Waukesha WI 53188

Designated Representative:

Name: Eric Hunter - Beaver Equipment

(typed or printed)

Title: Sales Engineer

(typed or printed)

Address:

Beaver Equipment

15112 NE 198th St

Woodinville, WA 98072

Phone: Office: (855) 878-6386 Direct:801.803.2082

Email: EricH@Beaver-Equipment.com

License No.: N/A

Classification: N/A

Limitation: Manufacturer's Representative

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XYLEM WATER SOLUTIONS U.S.A., INC.

*****

UNANIMOUS CONSENT OF THE BOARD OF DIRECTORS

WHEREAS, the undersigned, constituting all of the members of the Board of Directors of Xylem Water Solutions U.S.A., Inc., a Delaware corporation formed pursuant to the laws of the State of Delaware (the "Corporation"), do hereby consent, pursuant to Section 141(f) of the General Corporation Law of the State of Delaware, to the adoption of the resolutions set forth below, with the same effect as if said actions were taken by unanimous approving vote at a meeting at which all of the directors were present in person:

RESOLVED: That the lawful actions taken by the current and former officers of the Corporation, in the name of and on behalf of the Corporation are hereby adopted, ratified, and approved.

RESOLVED FURTHER: That the following named persons are appointed as officers of the Corporation in the capacities indicated opposite their respective names, to serve as officers from this date forward until their resignation, removal, termination of employment with the Corporation or its affiliates, or death or until their successors are duly appointed.

Individuals	**Office (s)**
David Alban	Vice President
Ken Albaugh	Vice President
Nitin Bhate	Vice President
Peter Bilelis	Vice President & Assistant Secretary
Todd Boyle	Vice President
Christopher Carapella	Vice President & Assistant Treasurer
Scott A. Holzborn	Vice President
Todd Huffman	Vice President
Scott J. Lapcewich	Vice President
Matthew Latino	Vice President & Treasurer
Chad Lawrence	Vice President
Roger Lobo	Vice President
Josheph McCausland	Vice President & Assistant Treasurer
Michael J. McGann	President
Adam McNeill	Vice President
Stewart Nix	Vice President
Richard Pangrazzi	Vice President
Sean Petraitis	Vice President
Justin Allen Pifer	Vice President & Secretary
Christopher Peterson	Vice President
Randy Stewart	Vice President
Christine Valencia	Vice President

RESOLVED: That any previous appointments of officers for the Corporation are hereby revoked.

RESOLVED FURTHER: That this Unanimous Written Consent may be executed in any number of counterparts, each of which when so executed shall be deemed to be an original and all of which when taken together shall constitute one and the same document, and that the different directors of the Corporation need not be signatories to the same counterpart.

This Unanimous Written Consent of the Board of Directors is effective on November 25, 2024.

[Signature page follows.]

Docusign Envelope ID: 9CDB6241-DA78-4208-8EA6-9259FA70B425

Signed by:
Justin Allen Pifer
38B510D38D9F476...

Justin Allen Pifer

Matthew Latino

Michael J. McGann

Xylem
N 19 W 23993 Ridgeway PKWY, Suite 200,
Waukesha, WI 53188
t +1 979 436 7407
jeremy.jensen@xylem.com, www.xylem.com

December 23, 2024

City of Aumsville
595 Main Street
Aumsville, OR 97325

To Whom it May Concern:

This memo is to provide a response to questions from Westech Engineering regarding the recent bid for the City of Aumsville wastewater treatment facility.

1. Regarding the “kit” pricing request. Xylem has received direction from the EPA that we cannot use the “kit” approach with our ICEAS system, so we will not be providing a price for this option.

2. We were requested to remove blower sound enclosures from our pricing. The price for sound enclosures has been removed from all pricing below.

3. We received updated BABA pricing last week on our decanter mechanism which was substantially lower than what we had previously received. We are passing this price reduction on to the City of Aumsville. The new BABA compliant pricing is $1,598,152.

4. Another request was for non-BABA compliant pricing (our standard offering). The pricing for this approach is $1,345,980.

5. We also looked at options for providing specific non-BABA compliant equipment to reduce the overall cost of our offering. These items would need to be included in the non-BABA portion of the project costs. We determined that the BABA compliant decanters were by far the largest single cost adder to the project cost. By providing our standard non-BABA compliant decanters, we can keep the remaining BABA complaint equipment in the package and reduce the price significantly. The price for this approach is $1,498,360.

Please let us know if you have any further questions.

xylem

Sincerely,

Jeremy Jensen, P.E.

SN:JJ

BID BOND

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER *(Name and Address)*: Xylem Water Solutions USA, Inc.

4828 Parkway Plaza Boulevard, Suite 200, Charlotte, NC 28217

SURETY *(Name, and Address of Principal Place of Business)*:

Liberty Mutual Insurance Company

175 Berkeley Street, Boston, MA 02116

OWNER *(Name and Address)*: The City of Aumsville, 595 Main Street, Aumsville, OR 97325

BID

Bid Due Date: 12/12/2024

Description (check only one box):

☑ Sequencing Batch Reactor and Digester Equipment for the Aumsville Wastewater Treatment Plant, Aumsville, Oregon

☐ Dissolved Air Floatation Equipment for the Aumsville Wastewater Treatment Plant, Aumsville, Oregon

BOND (amount not to be less than 10% of the bid total)

Bond Number: N/A

Date: 11/27/2024

Penal sum Ten Percent of Amount Bid (Words) $ 10% of Amount Bid (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

BIDDER	**SURETY**
Xylem Water Solutions USA, Inc. (Seal)	Liberty Mutual Insurance Company (Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: J. Stewart Nix	By: Anne Potter
Signature	Signature (Attach Power of Attorney)
J. Stewart Nix	Anne Potter
Print Name	Print Name
Vice President	Attorney-in-Fact
Title	Title
Attest: Eve Renee Davey	Attest: Beverly A. Woolford
Signature	Signature Beverly A. Woolford
Title Service Coordinator	Title Surety Analyst

Note: Addresses are to be used for giving any required notice.
Provide execution by any additional parties, such as joint venturers, if necessary.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

3.2 All Bids are rejected by Owner, or

3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

Certificate No: 8210937- 015009

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Debra A. Deming, Sandra Diaz, Vilma Gonzalez, Peter Healy, Pablo Garcia Horcajo, Jennifer L. Jakaitis, Francesca Kazmierczak, Aklima Noorhassan, Anne Potter, Frances Rodriguez, Valorie Spates, Susan A. Welsh, Beverly A. Woolford

all of the city of New York state of NY each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 6th day of November, 2023.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

By: _____
David M. Carey, Assistant Secretary

State of PENNSYLVANIA
County of MONTGOMERY ss

On this 6th day of November, 2023 before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at Plymouth Meeting, Pennsylvania, on the day and year first above written.

Commonwealth of Pennsylvania - Notary Seal
Teresa Pastella, Notary Public
Montgomery County
My commission expires March 28, 2025
Commission number 1126044
Member, Pennsylvania Association of Notaries

By: _____
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS: Section 12. Power of Attorney.
Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts: Section 5. Surety Bonds and Undertakings.
Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 27th day of November, 2024.

By: _____
Renee C. Llewellyn, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

For bond and/or Power of Attorney (POA) verification inquiries, please call 610-832-8240 or email HOSUR@libertymutual.com.

Liberty Mutual SURETY

LIBERTY MUTUAL INSURANCE COMPANY

FINANCIAL STATEMENT – DECEMBER 31, 2023

Assets		Liabilities	
Cash and Bank Deposits	$1,850,245,073.00	Unearned Premiums	$10,298,963,305.00
*Bonds – U.S Government	$3,859,565,383.00	Reserve for Claims and Claims Expense	$28,848,537,243.00
*Other Bonds	$21,048,805,773.00	Funds Held Under Reinsurance Treaties	$360,714,151.00
*Stocks	$19,937,271,802.00	Reserve for Dividends to Policyholders	$1,310,198.00
Real Estate	$122,228,711.00	Additional Statutory Reserve	$296,126,000.00
Agents' Balances or Uncollected Premiums	$8,208,660,427.00	Reserve for Commissions, Taxes and Other Liabilities	$7,622,413,466.63
Accrued Interest and Rents	$186,906,667.00	**Total**	**$47,428,064,363.63**
Other Admitted Assets	$15,677,869,683.63	Special Surplus Funds	$209,508,757.00
Total Admitted Assets	**$70,891,553,519.63**	Capital Stock	$10,000,075.00
		Paid in Surplus	$13,834,867,488.00
		Unassigned Surplus	$9,409,112,836.00
		Surplus to Policyholders	$23,463,489,156.00
		Total Liabilities and Surplus	**$70,891,553,519.63**

* Bonds are stated at amortized or investment value; Stocks at Association Market Values.
The foregoing financial information is taken from Liberty Mutual Insurance Company's financial statement filed with the Massachusetts Department of Insurance.

I, TIM MIKOLAJEWSKI, Assistant Secretary of Liberty Mutual Insurance Company, do hereby certify that the foregoing is a true, and correct statement of the Assets and Liabilities of said Corporation, as of December 31, 2023, to the best of my knowledge and belief.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of said Corporation at Seattle, Washington, this 8th day of March, 2024.

LIBERTY MUTUAL INSURANCE COMPANY INCORPORATED 1912 MASSACHUSETTS

Timothy A. Mikolajewski

Timothy A. Mikolajewski, Assistant Secretary

LMS-1262/LMIC

USDA
Form RD 400-6
(Rev.12-09)

Form Approved
OMB No. 0575-0018

COMPLIANCE STATEMENT

This statement relates to a proposed contract with The City of Aumsville, Oregon

_____,
(Name of borrower or grantee)

who expects to finance the contract with assistance from either the Rural Housing Service (RHS), Rural Business-Cooperative Service (RBS), or the Rural Utilities Service (RUS) or their successor agencies, United States Department of Agriculture (whether by a loan, grant, loan insurance, guarantee, or other form of financial assistance). I am the undersigned bidder or prospective contractor, I represent that:

*Form does not apply to equipment manufacturer.

1. I ☐ have, ☐ have not, participated in a previous contract or subcontract subject to Executive Order 11246 (regarding equal employment opportunity) or a preceding similar Executive Order.

2. If I have participated in such a contract or subcontract, I ☐ have, ☐ have not, filed all compliance reports that have been required to file in connection with the contract or subcontract.

☐ If the proposed contract is for $50,000 or more: or ☐ If the proposed nonconstruction contract is for $50,000 or more and I have 50 or more employees, I also represent that:

3. I ☐ have, ☐ have not previously had contracts subject to the written affirmative action programs requirements of the Secretary of Labor.

4. If I have participated in such a contract or subcontract, ☐ I have, ☐ have not developed and placed on file at each establishment affirmative action programs as required by the rules and regulations of the Secretary of Labor.

I understand that if I have failed to file any compliance reports that have been required of me, I am not eligible and will not be eligible to have my bid considered or to enter into the proposed contract unless and until I make an arrangement regarding such reports that is satisfactory to either the RHS, RBS or RUS, or to the office where the reports are required to be filed.

I also certify that I do not maintain or provide for my employees any segregated facilities at any of my establishments, and that I do not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I certify further that I will not maintain or provide for my employees any segregated facilities at any of my establishments, and that I will not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I agree that a breach of this certification is a violation of the Equal Opportunity clause in my contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and wash rooms, restaurants and other eating areas time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. I further agree that (except where I have obtained identical certifications for proposed subcontractors for specific time periods) I will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause; that I will retain such certifications in my files; and that I will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays the valid OMB control number. The valid OMB control number for this information collection is 0575-0018. The time required to complete this information collection is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR CERTIFICATIONS OF NON-SEGREGATED FACILITIES

A certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32F.R. 7439, may 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding $ 10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

*Form does not apply to equipment manufacturer.

DATE 12/10/2024

(Signature of Bidder or Prospective Contractor)

Scott J. Lapcewich - Vice President

N19 W23993 Ridgeview Pkwy STE 200, Waukesha WI 53188

Address (including Zip Code)

This form is available electronically.

OMB Control No. 0505-0027
Expiration Date: 04/30/2022

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion Lower Tier Covered Transactions

AD-1048

The following statement is made in accordance with the Privacy Act of 1974 (5 U.S.C. § 552a, as amended). This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, and 2 C.F.R. §§ 180.300, 180.335, Participants' responsibilities. The regulations were amended and published on August 31, 2005, in 70 Fed. Reg. 51865-51880. Copies of the regulations may be obtained by contacting the Department of Agriculture agency offering the proposed covered transaction.

According to the Paperwork Reduction Act of 1995 an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0505-0027. The time required to complete this information collection is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. The provisions of appropriate criminal, civil, fraud, privacy, and other statutes may be applicable to the information provided.

(Read instructions on page two before completing certification.)

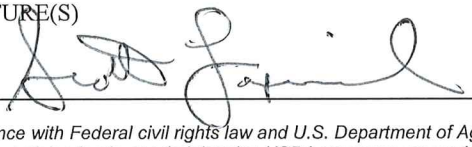
A. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency;

B. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

ORGANIZATION NAME	PR/AWARD NUMBER OR PROJECT NAME
Xylem Water Solutions USA Inc	Aumsville, OR SBR Equipment

NAME(S) AND TITLE(S) OF AUTHORIZED REPRESENTATIVE(S)

Scott J Lapcewich - Vice President

SIGNATURE(S)	DATE
	12/10/2024

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at How to File a Program Discrimination Complaint (https://www.ascr.usda.gov/filing-program-discrimination-complaint-usda-customer) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442.

Instructions for Certification

(1) By signing and submitting this form, the prospective lower tier participant is providing the certification set out on page 1 in accordance with these instructions.

(2) The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension or debarment.

(3) The prospective lower tier participant shall provide immediate written notice to the person(s) to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(4) The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549, at 2 C.F.R. Parts 180 and 417. You may contact the department or agency to which this proposal is being submitted for assistance in obtaining a copy of those regulations.

(5) The prospective lower tier participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

(6) The prospective lower tier participant further agrees by submitting this form that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

(7) A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the System for Award Management (SAM) database.

(8) Nothing contained in the foregoing shall be construed to require establishment of a system of records to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(9) Except for transactions authorized under paragraph (5) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

CERTIFICATION FOR CONTRACTS, GRANTS AND LOANS

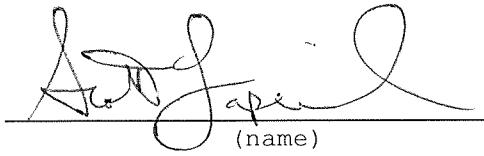
The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant or Federal loan, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant or loan.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant or loan, the undersigned shall complete and submit Standard Form - LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including contracts, subcontracts, and subgrants under grants and loans) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.



(name)

12/10/2024
(date)

Scott J. Lapcewich - Vice President
(title)

oOo

SWORN STATEMENT OF GOOD FAITH EFFORT WITH SMALL, WOMEN, OR MINORITY BUSINESS UTILIZATION REQUIREMENTS

Although this project does not have specific MBE/WBE/SBRA participation requirements, the funding agency requires that the prime contractor must engage in outreach, recruitment or other race/gender-neutral activities as a part of their good faith efforts to achieve a fair share of contracts by minority and women owned businesses as well as small businesses in rural areas. The prime contractor may select various outreach, recruitment or other race/gender neutral activities for a particular contract, but at a minimum, the prime contractor must take six steps:

1. Include qualified MBEs, WBEs and SBRAs on solicitation list;

2. Assure that MBEs, WBEs and SBRAs are solicited whenever they are potential sources;

3. Divide total requirements, when economically feasible, into small tasks or quantities to permit maximum participation of MBEs, WBEs and SBRAs;

4. Establish delivery schedules, where the requirements of the work permit, which will encourage participation by MBEs, WBEs and SBRAs;

5. Use the services and assistance of the Small Business Administration and the Minority Business Development Agency, U.S. Department of Commerce, as appropriate; and

6. If the prime contractor awards subcontracts/procurement, require the subcontractor to take the affirmative steps in numbers 1 through 5 above.

* *

A list of contacted Minority, Women and Small Businesses must be attached to this form indicating which minority, women and small businesses were contacted by the bidder, a phone number, the name of a contact person, , whether or not they are being utilized, along with their reasons for non-participation.

By signing this form, the contractor swears that she or he has taken all the steps listed above to obtain participation by minority, women and small business enterprises.

***Due to the heavily engineered and specialty nature of the equipment being provided by Xylem and the tooling required, it is not possible to change existing vendors to MBE/WBE vendors.**

Signature

12/10/2024
Date

Printed name and title of signer

Scott J. Lapcewich - Vice President

List of Minority, Women and Small Businesses Contacted and/or Utilized

Name of Business	Contact Person	Phone Number	Date of Contact	Utilized or Not? (Yes/No) Reason for Non-participation if No (ie. not low bid, did not submit bid, etc.)

ARPA/SLFRF Required Contract Clauses

*Form does not apply to equipment manufacturer.

Purpose: The purpose of this reference is to assist ARPA grant award recipients by summarizing required contract clauses consistent with the federal Uniform Guidance requirements that are applicable to the State and Local Fiscal Recovery Funds (SLFRF) program as part of the American Rescue Plan Act (ARPA).
As described in this document a "recipient" is a recipient of an APRA funded grant award from Business Oregon.

The SLFRF awards are generally subject to the requirements set forth in the **The Office of Management and Budget's (OMB) Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards** (commonly called "Uniform Guidance"). The "Uniform Guidance" is the set of federal rules (administrative requirements, cost principles, and audit guidelines) that apply to federal money. This includes requirements such as the treatment of eligible uses of funds, procurement, and reporting requirements. Please see the SLFRF Compliance and Reporting Guidance page 12 for full Award terms and conditions.

It is the recipient's responsibility to ensure all SLFRF award funds are used in compliance with these requirements. In addition, recipients should be mindful of any additional compliance obligations that may apply – for example, additional restrictions imposed upon other sources of funds used in conjunction with SLFRF award funds, or statutes and regulations that may independently apply to water and sewer infrastructure projects.

Contract Clause Checklist

Directions:
Appendix II of 2 CFR 200 (The Uniform Guidance) outlines the contract provisions that you must place in contracts with your contractors, and in contracts with subrecipients (if any). The checklist below contains these standard clauses for inclusion in contracts needed to utilize ARPA funds.

Clauses for All Contracts:

Creating a contract that complies with ARPA requirements must include the below sections as verbatim:

☐ **Contractor must be registered in SAM.gov.** - The Contractor shall register in the System for Award Management (SAM), which is the primary registrant database for the U.S. Federal Government and shall update the information at least annually after the initial registration and maintain its status in the SAM through the Term of this

*Form does not apply to equipment manufacturer.

Agreement. Information regarding the process to register in the SAM can be obtained at Sam.gov

☐ **Whistleblower -** Contractor receiving ARPA funds shall under or through this contract post notice of the rights and remedies provided to whistleblowers under No Fear Act Pub. L. 107-174. 29 CFR § 1614.703 (d).

☐ **Inspections; Information** - Contractor shall permit, and cause its subcontractors to allow the State of Oregon, the federal government and any party designated by them to:

- Examine, visit and inspect, at any and all reasonable times, the property, if any, constituting the Project.
- Inspect and make copies of any accounts, books and records, including, without limitation, its records regarding receipts, disbursement, contracts, and any other matters relating to the Project, and to its financial standing, and shall supply such reports and information as reasonably requested.
- Interview any officer or employee of the Contractor, or its subcontractors, regarding the Project.

☐ **Equal Opportunity -** Contractor shall comply with Executive Order 11246 of September 24, 1965, entitled "Equal Employment Opportunity," as amended by Executive Order 11375 of October 13, 1967, and as supplemented in Department of Labor regulations (41 CFR chapter 60).

☐ **Copeland "Anti-Kickback" Act -** Contractor shall comply with the Copeland "Anti-Kickback" Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). The Act provides that each contractor or subrecipient must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency.

☐ **Debarment and Suspension (Executive Orders 12549 and 12689)** - A contract award (see 2 CFR 180.220) must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension." SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

☐ **Prohibition on purchasing telecommunications or surveillance equipment, services, or systems.** As required by 2 CFR 200.216, federal grant or loan recipients and subrecipients

*Form does not apply to equipment manufacturer.

are prohibited from obligating or expending loan or grant funds to procure or obtain; extend or renew a contract to procure or obtain; or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that use covered telecommunications equipment, video surveillance services or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities). Prohibitions extend to the use of Federal funds by recipients and subrecipients to enter into a contract with an entity that "uses any equipment, system, or service that uses covered telecommunications equipment or services" as a substantial or essential component of any system, or as critical technology as part of any system. Certain equipment, systems, or services, including equipment, systems, or services produced or provided by entities subject to the prohibition are recorded in the System for Award Management exclusion list.

☐ **Preference to United States made goods.** - As appropriate and to the extent consistent with law, the contractor should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award. For purposes of this section:
(1) "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.
(2) "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

Additional Clauses for Contracts Over $10,000:

Creating a contract over $10,000 that complies with ARPA requirements must include the additional below sections as verbatim:

☐ **Procurement of recovered materials over $10,000. -** The Contractor must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000 or the value of the quantity acquired during the preceding fiscal year exceeded $10,000; procuring solid waste management services in a manner that

*Form does not apply to equipment manufacturer.

maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

☐ **Termination for cause and for convenience** - Contractor shall address termination for cause and for convenience, including the manner by which it will be affected and the basis for settlement.
The Contract Owner shall have the option, in its sole discretion, to terminate this Agreement, at any time during the term hereof, for convenience and without cause. The Contract Owner shall exercise this option by giving Contractor written notice of termination. The notice shall specify the date on which termination shall become effective.

Additional Clauses for Contracts Over $100,000:

Creating a contract over $100,000 that complies with ARPA requirements must include the additional below section(s) as verbatim:

☐ **Certification form located in Appendix I. Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)** - Contractors that apply or bid for an award exceeding $100,000 must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.

☐ **Note: Only include for contracts that involve the employment of mechanics or laborers.** The Contract Work Hours and Safety Standards Act requires all contractors—prime and sub—to pay laborers and mechanics performing on a federal service contract and federal and federally assisted construction contract over $100,000, 1.5 times their basic rate of pay for all hours worked over 40 in a workweek. Employers are liable to employees for these unpaid wages. The failure of a contractor to comply with this Act may also result in liability under the False Claims Act. Employees who are due unpaid wages under the Contract Work Hours and Safety Standards Act may file a complaint with the Wage and Hour Division within the U.S. Department of Labor. The DOL may then enforce the provisions of the Act against violators.

Additional Clauses for Contracts Over $150,000:

*Form does not apply to equipment manufacturer.

Creating a contract over $150,000 that complies with ARPA requirements must include the additional below section(s) as verbatim:

☐ Contractor shall comply with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 U.S.C. 1857(h)), section 508 of the Clean Water Act (33 U.S.C. 1368), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR part 15).

Additional Clauses for Contracts Over $250,000 (the simplified acquisition threshold as of 2022):

Creating a contract over $250,000 that complies with ARPA requirements must include the additional below section(s) as verbatim:

☐ Contracts for more than the simplified acquisition threshold, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. 1908, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate. Upon any breach of this Agreement by Contractor, the Contract Owner shall have all remedies available to it both in equity and/or at law.

Appendix I

Certification Regarding Lobbying
(Awards to Contractors and Subcontractors in Excess of $100,000)

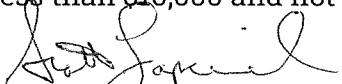
The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Signed: 

Title: Scott J. Lapcewich - Vice President

Date: 12/10/2024

Xylem Water Solutions USA, Inc.
N19 W23993 Ridgeview Parkway, Suite 200
Waukesha, WI 53188
Tel 414.365.2200 Fax 414.365.2210

SANITAIRE
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DATE: **December 20, 2024**
*To Supersede Section 6 of City of Aumsville, Oregon Sequencing Batch Reactor Equipment for the Aumsville Wastewater Treatment Plant Improvements – Xylem Bid Proposal, opened Dec. 12, 2024

TO: **Bidding Contractors**

RE: **Aumsville WWTP, OR**
Wastewater Treatment Facility Improvements
Bid Date: December 12, 2024
Sanitaire #30323-20a

Xylem Water Solutions USA is pleased to present this bid proposal for the supply and startup of a complete Sanitaire® Intermittent Cycle Extended Aeration System (ICEAS™) for the Aumsville WWTP, OR WTF. Sanitaire is proposing equipment for the following specification sections:

Section 11300	Sequential Batch Reactor System
Section 11300	Digester Aeration Equipment
Section 16090	Packaged Electrical System Requirements
Section 16447	Low Voltage Motor Control Centers
Section 17090	Packaged Control System Requirements

A. PROCESS DESIGN DETAILS

The Sanitaire ICEAS (SBR) system is designed around the following influent conditions:

ADWF	1,750,000	gpd
PDWF	2,620,000	gpd
PWWF	5,240,000	gpd
BOD_5 (at 20°C)*	127.4	mg/L
TSS*	106.9	mg/L
TKN*	17.5	mg/L
Total Phosphorus*	0	mg/L
Alkalinity required (minimum)	85	mg/L
Wastewater Temperature (Range)	8 – 25	°C

*Concentrations based on design mass loading at ADWF

The process design is based on meeting the following effluent criteria (defined by a monthly average):

BOD_5 Conc. (at 20°C)	10	mg/L
TSS Conc.	10	mg/L
NH_3–N Conc.	1	mg/L
Total Nitrogen Conc.	10	mg/L
Total Phosphorus Conc.*		mg/L

*May require chemical addition.

B. EQUIPMENT AND SERVICE:

The Sanitaire scope of supply for this project includes the following equipment and services:

1. **ICEAS Blower:** Three (3) positive displacement blowers for air supply to the ICEAS basins. Each complete blower package will be supplied with all necessary accessories, including:
   - 40 HP – 1800 RPM – TEFC – 3-phase 1.15 S.F. Motor
   - Discharge check valve
   - Inlet/discharge flexible connectors
   - Discharge butterfly valve
   - V-Belt Drive with guard
   - Inlet Air Filter/Silencer
   - Discharge Silencer
   - Weight Relief Valve
   - Discharge pressure gauge
   - Discharge thermometer
   - Elevated Steel Base

2. **Digester Blower:** Two (2) positive displacement blowers for air supply to the Digester basins. Each complete blower package will be supplied with all necessary accessories, including:
   - 40 HP – 1800 RPM – TEFC – 3-phase 1.15 S.F. Motor
   - Discharge check valve
   - Inlet/discharge flexible connectors
   - Discharge butterfly valve
   - V-Belt Drive with guard
   - Inlet Air Filter/Silencer
   - Discharge Silencer
   - Weight Relief Valve
   - Discharge pressure gauge
   - Discharge thermometer
   - Elevated Steel Base

SANITAIRE
a xylem brand

3. **Air Control Valve:** Two (2) 8" diameter air control valves, one (1) for each one for each ICEAS tank. Each valve will be supplied with 120 V, 1 Ph, 60 Hz electric operator, compartment heaters and handwheel for manual operation. Valves will be DeZurik BRS with an AUMA three-phase actuator.

4. **ICEAS Fine Bubble Aeration:** A complete SANITAIRE Fine Bubble aeration system for each ICEAS basin. There is one (1) grid per ICEAS tank. Equipment for each grid will include:

- One 304L stainless steel and PVC vertical drop pipe including flange for connection at the top of the tank and bottom connection to the air manifold.
- One 304L stainless steel manifold with connections for each 4 inch diameter air distribution header.
- 304 Stainless steel manifold supports with hold down clamp and washer.
- Four-inch diameter PVC air distribution headers including:
    - Fixed anti-rotational joint connection to the air manifold.
    - Factory installed (solvent welded) diffuser holders.
    - Positive locking fixed anti-rotational joint connections.
- 304L Stainless steel air distribution header support stands with header hold down clamp and locating plate.
- Fine Bubble Diffuser Elements with gaskets and retainer rings.
- Flanges, bolts, nuts and neoprene gaskets necessary to assemble the system.
- One automated moisture purge system for the SBR aeration system.
- One manual moisture purge system for the digester aeration system.
- Stainless steel anchor bolts for the manifold and header supports.

NOTE: Anchor bolts are designed for installation in 4000 PSI Concrete per ACI Committee 350 ("Concrete Sanitary Engineering Structures).

5. **Digester Fine Bubble Aeration:** A complete SANITAIRE Fine Bubble aeration system for each Digester basin. There is one (1) grid per ICEAS tank. Equipment for each grid will include:

- One 304L stainless steel and PVC vertical drop pipe including flange for connection at the top of the tank and bottom connection to the air manifold.
- One 304L stainless steel manifold with connections for each 4 inch diameter air distribution header.
- 304 Stainless steel manifold supports with hold down clamp and washer.
- Four-inch diameter PVC air distribution headers including:
    - Fixed anti-rotational joint connection to the air manifold.
    - Factory installed (solvent welded) diffuser holders.
    - Positive locking fixed anti-rotational joint connections.
- 304 Stainless steel air distribution header support stands with header hold down clamp and locating plate.
- Fine Bubble Diffuser Elements with gaskets and retainer rings.
- Flanges, bolts, nuts and neoprene gaskets necessary to assemble the system.

- One automated moisture purge system for the SBR aeration system.
- One manual moisture purge system for the digester aeration system.
- Stainless steel anchor bolts for the manifold and header supports.

NOTE: Anchor bolts are designed for installation in 4000 PSI Concrete per ACI Committee 350 ("Concrete Sanitary Engineering Structures).

6. **Decant Mechanism:** Two (2) stainless steel decanters, (1) per ICEAS basin. Each decanter will include a 35 foot long stainless steel trough, scum exclusion float, downcomer pipes, swivel joint, wall connection, and anchors. Each decanter drive assembly will be provided with electro-mechanical actuator decanter drive with 3/4 HP, 460V, 3 phase 60 Hz variable speed drive duty motor, decanter drive support, boot and end position limit switches.

7. **Submersible Mixers:** Two (2) submersible mixers, one (1) per basin. Each mixer will come equipped with 15 Hp, 460 V, 3 Ph, 60 Hz motor. Hoist socket, power cable and lifting cable will be provided for each mixer. Leak detection for the mixers will be provided. One portable hoist will be provided and hoist sockets for each mixer.

8. **ICEAS Pump:** Two (2) submersible pumps, one (1) for each ICEAS basin. Each pump will come equipped with 2.4 Hp, 460 V, 3 Ph, 60 Hz motor, discharge base, guide rail brackets, lifting cable and power cable. One portable hoist will be provided and hoist sockets for each mixer. **Guide rails, discharge piping and valves by others.**

9. **Level Indicators:** Two (2) level transducers, one (1) per ICEAS basin. The transducer shall have a stainless steel body with a head-pressure-sensing bottom Teflon faced diaphragm and an internal precision, gage pressure transducer assembly. The transducer shall be cable mounted and factory calibrated for the basin depth. The transducer shall be a 2-wire type and produce a 4-20ma signal in direct proportion to the measured level.

10. **High Level Storm Float:** Two (2) high level non-mercury float switches, one (1) per ICEAS basin.

11. **Motor Control Center:** Motor Control Center (MCC) for ICEAS motors and other electrical devices. MCC will be provided with motor starters and spare parts as specified.

12. **Control System:** One (1) NEMA 12 control panel with software as required for proper control of the ICEAS process, including all equipment listed in this scope. The system will be supplied with the following items:

    - Allen Bradley Human Machine Interface – Touchscreen HMI
    - Allen Bradley Programmable Logic Controller (PLC) – Compact Logix
    - Control Switches
    - Pilot Lights
    - Uninterruptable Power Supply (UPS)

- A local control station for each SBR decanter

13. **DO Control:** Two (2) dissolved oxygen probes, one (1) analyzer and control system.

14. **Digester Pumps:** Two (2) submersible pumps, one (1) for each SHT basin. Each pump will come equipped with 2.4 Hp, 460 V, 3 Ph, 60 Hz motor, discharge base, guide rail brackets, lifting cable and power cable. One portable hoist will be provided and hoist sockets for each mixer. **Guide rails, discharge piping and valves by others.**

15. **Spare Parts:** included as specified in 11300 2.6 n. with the exception of 10 Diffuser holders. Holders are factory solvent welded to distributor header piping and can not be installed in the field. (3) sections of air distributor piping will include holders.

16. **Engineering Drawings:** Required sets of engineering drawings.

17. **O & M Manuals:** Required sets of O & M Manuals.

18. **Field Installation Guidance and Start-Up Services:**

The following services will be provided as specified.

Start-Up, Training	Two (2) Trips, Twenty (20) Days
Process Training/Follow-up	One (1) Trip, Three (3) Days

Additional days available at $1,700 per day.

C. EXCLUSIONS

The following from are specifically excluded from our proposal:

1. Equipment unloading or storage at jobsite.
2. Concrete tank or building design and installation.
3. Field installation or painting of equipment.
4. All influent piping and influent piping supports (including those in-basin). All effluent piping downstream of the decanter effluent including through the wall piping. Effluent vent piping outside basin where required. All yard piping and valves not listed in Section A including influent, effluent and supernatant piping/valves. Any splitter boxes.
5. Air supply piping between the blower isolation valves and the ICEAS basins at top of basin drop pipes including any valves not listed in Section A.

6. All bolts, gaskets and connectors for attaching drop pipe to upper air main piping.

7. Inside and outside basin sludge piping and valves. All waste sludge piping and valves (including check and plug valves) downstream of each pump discharge elbow/slide-away fitting. Sludge pump guide rails.

8. Guide rails, discharge piping and valves for ICEAS WAS pumps and digested sludge pumps.

9. Local display for level transducers (not available for proposed equipment).

10. All level transducer stilling well and mounting hardware.

11. High level float switch bracket.

12. Stainless steel junction box for high level floats.

13. Field wiring and conduits, field wireways, local disconnect switches.

14. Anchor bolts and other embedded materials except for anchor bolts specifically included in the Section A of this proposal.

15. Platforms, gratings (including those over the influent flow splitter box), handrails, ladders, and stairs.

16. Power, water, chemical and labor for operating equipment.

17. Any field and laboratory testing.

18. Any instrumentation including flow meters, or equipment including disinfection or chemical feed equipment not specifically listed in Section A.

19. All costs associated with video recording services.

20. All field testing (all anchor bolt and support pull-out, leakage, aeration system level, uniformity, mixing and pressure testing, if required)

21. All costs associated with providing seismic calculations. If required for any Xylem supplied equipment a change order will be executed.

22. All costs associate with equipment reinforcements due to seismic requirements. If required for any Xylem equipment a change order will be executed.

23. ICEAS and Digester Blower Sound Enclosures.

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D. ESTIMATED SUBMITTALS AND DELIVERIES:

The submittal schedule begins after acceptance of purchase order by Xylem Sanitaire. Delivery schedule begins after receipt of approved drawings; Assume four week turnaround of submittals by the review engineer.

Certified engineered equipment drawings: 14-16 weeks

Equipment Shipment (after release for fabrication): 18-22 weeks*
*Approximately 36 weeks for MCC, all other equipment as noted above

E. PRICING:

Pricing for the equipment and field services outlined in this proposal, DAP Jobsite per Incoterms 2020, Full freight allowed to destination:

$_____

F. PRICE NOTES

1. Taxes are not included. Purchaser to pay directly all applicable taxes separate from purchase order to Xylem Water Solutions USA.

2. All prices quoted shall be valid for 45 days from the date of bidding.

3. The prices are based on the equipment being released for shipment by August 31st, 2026.

4. Prices on orders received after the above deadline or specifying later shipping dates shall be subject to review and possible adjustment in line with the then existing economic conditions.

5. Terms of Payment:

   10% Net 30 days following initial submittal for approval
   80% Net 30 days following shipment
   5% Net 30 days NTE 150 days – following installation (whichever comes first)
   5% Net 30 days NTE 180 days – following start-up (whichever comes first).

6. An interest charge of 1 1/2% per month will be added to past due accounts.

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7. The prices quoted herein are based on the current tariff rates, duties, government charges, and trade regulations as of the date of this quote. If any new tariffs, duties, taxes, or similar charges are imposed, or any existing tariffs, duties, or charges are increased or modified by any government or regulatory authority (collectively, "Tariff Changes"), and such Tariff Changes result in an increase in the cost of goods, Xylem reserves the right to adjust the pricing of the affected goods to reflect the increased costs. Xylem is not obligated to deliver the goods and/or services until an agreement on the new price has been reached.

8. This order is subject to the Standard Terms and Conditions of Sale – Xylem Americas effective on the date the order is accepted. Terms are available at http://www.xyleminc.com/en-us/Pages/terms-conditions-of-sale.aspx and incorporated herein by reference and made a part of the agreement between parties. Different terms are hereby rejected unless expressly assented to in writing.

G. WARRANTY

Xylem Water Solutions USA warrants all parts to be free from defective material and workmanship for a period of eighteen (18) months after startup or two (2) years after shipment (whichever comes first) and to furnish to the Owner replacements for any such items found to be defective within that period.

We appreciate your interest in Sanitaire and look forward to providing Sanitaire-ICEAS process equipment and fully-integrated control system for your treatment plant. If you should have any questions, please do not hesitate to contact us.

Very truly yours,

Daphne F Odishoo

Odishoo, Daphne - Xylem

cc: **Sanitaire Representative:**
Beaver Equipment

Rev. 5/5/2015
ABJ Bid Proposal

PART 2:

CONTRACT FORMS

AGREEMENT BETWEEN BUYER AND SELLER FOR PROCUREMENT CONTRACT

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AGREEMENT BETWEEN BUYER AND SELLER FOR PROCUREMENT CONTRACT

This Procurement Agreement is by and between **The City of Aumsville, Oregon** ("Buyer") and **Xylem Water Solutions, USA, Inc.** ("Seller").

Terms used in this Procurement Agreement have the meanings stated in the General Conditions of the Procurement Contract and the Supplementary Conditions of the Procurement Contract.

Buyer and Seller hereby agree as follows:

ARTICLE 1—PROCUREMENT CONTRACT

1.01 *Goods and Special Services*

A. Seller shall furnish the Goods and Special Services as specified or indicated in the Procurement Contract Documents. The Goods and Special Services are generally described as follows (check only one box and delete the other):

X Sequencing Batch Reactor and Digester Equipment for the Aumsville Wastewater Treatment Plant

1.02 *The Project*

A. The Project, of which the Goods and Special Services are a part, is generally described as follows: **The Aumsville Wastewater Treatment Plant Improvements**.

1.03 *Engineer*

A. Buyer has retained **Westech Engineering, Inc.** ("Engineer"), to prepare Procurement Contract Documents and act as Buyer's representative. Engineer assumes all duties and responsibilities and has the rights and authority assigned to Engineer in the Procurement Contract Documents in connection with Seller's furnishing of Goods and Special Services.

1.04 *Point of Destination*

A. The Point of Destination is designated as: **The Aumsville Wastewater Treatment Plant, 955 Olney Street SE, Aumsville, Oregon 97325**.

ARTICLE 2—PROCUREMENT CONTRACT TIMES

2.01 *Time of the Essence*

A. All time limits for Milestones, including the submittal of Shop Drawings and Samples, the delivery of Goods, and the furnishing of Special Services as stated in the Procurement Contract Documents, are of the essence of the Procurement Contract.

2.02 *Schedule of Procurement Contract Times*

A. The following schedule sets forth the Procurement Contract Times:

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Milestone	Date or Days	Notes
Provide initial submittal package consisting of the following items: • Decanter, actuator, corbel dimensions • General aeration layout and design • Blower footprint and dimensions • Other appurtenances provided by Xylem inside the basins.	60 days after notice to proceed	
Provide all remaining submittal information as specified under the heading "Submittals Required After Notice of Award" in the relevant equipment specification sections.	112 days after notice to proceed	
Deliver acceptable Goods to Point of Destination	September 1, 2026	The actual delivery date shall be coordinated with the General Contractor for the construction and installation of the treatment plant.

2.03 *Shop Drawings and Samples*

A. *Submittal of Shop Drawings and Samples*: Seller shall submit all Shop Drawings and Samples required by the Procurement Contract Documents to Engineer for its review and approval. **A manufacturer's Certification letter must be included in the submittal for each item subject to Domestic Preference requirements. Refer to the Manufacturer's certification form is included in the Instructions to Bidders.**

B. *Engineer's Review*: It is the intent of the parties that Engineer will conduct its review of Shop Drawings and Samples and issue its approval, or a denial accompanied by substantive comments regarding information needed to gain approval, within **20** days after Seller's submittal of such Shop Drawings and Samples, or within such longer period that is needed because of the quantity and quality of such submittals. Resubmittals will be limited whenever possible. **Engineer's review and approval of a Shop Drawing or Sample shall include review of Manufacturer's Certifications in order to document compliance with Domestic Preference requirements, as applicable**.

2.04 *Liquidated Damages*

A. Buyer and Seller recognize that time is of the essence as stated in Paragraph 2.01, and that Buyer will suffer financial and other losses if the Goods are not delivered to the Point of Destination and ready for receipt of delivery by Buyer within the time specified in Paragraph 2.02, plus any extensions thereof allowed in accordance with this Procurement Contract. The parties also recognize that the timely performance of services by others involved in the Project is materially dependent upon Seller's specific compliance with the delivery requirements of Paragraph 2.02. Further, the parties recognize the time, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the loss (whether direct, consequential, or otherwise) suffered by Buyer if complete, acceptable Goods are not

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delivered on time. Accordingly, instead of requiring any such proof, Buyer and Seller agree that as liquidated damages for delay (but not as a penalty) Seller shall pay Buyer $**1,500** for each day that expires after the time specified in Paragraph 2.02 for delivery of acceptable Goods.

ARTICLE 3—PROCUREMENT CONTRACT PRICE

3.01 *Procurement Contract Price and Total Price*

A. The Procurement Contract Price is comprised of the Lump Sum and Unit Price amounts set forth in the following paragraphs.

B. Buyer shall pay Seller a Lump Sum of $**1,598,152.00** for furnishing the Goods and Special Services (other than any Unit Price Goods and Special Services) in accordance with the Procurement Contract Documents. Such Lump Sum amount accounts for the following Buyer-accepted alternates: **None.**

C. Buyer's Contingency Allowance is stipulated as $**75,000**. Buyer's use of such allowance, including resulting compensation of Buyer, is governed by Paragraph 11.06 of the General Conditions.

D. The Total Price is $**1,673,152.00.** Such Total Price is comprised of the Lump Sum amount (taking into account any accepted alternates), Unit Price Goods and Special Services amount (if any) (subject to final adjustment), and Buyer's Contingency Allowance (if any) (subject to final adjustment).

ARTICLE 4—PAYMENT PROCEDURES

4.01 *Submittal and Processing of Applications for Payment*

A. Seller shall submit Applications for Payment in accordance with Article 13 of the General Conditions, the Information for Proposers, and the following paragraphs. Engineer and Buyer will process such Applications for Payment in accordance with said Article 13.

4.02 *Progress Payments; Final Payment*

A. Seller may submit an Application for Payment requesting the stated percentage of Procurement Contract Price upon attainment of each of the following Payment Line Items:

Payment Line Item (Lump Sum)	Percentage of Lump Sum
1. **Receipt of Approval of Shop Drawings and Samples**	**10**
2. **Delivery of Goods to Point of Destination in accordance with the Procurement Contract Documents**	**80**
3. **Completion of Startup and Commissioning Services in accordance with the Procurement Contract Documents**	**5**
4. **Final Payment: Correction of non-conformities, provision of final Operations and Maintenance manuals, submittal of warranties and other final documentation required by the Procurement Contract Documents.**	**5**
Total Procurement Contract Price (Lump Sum)	100

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B. For Unit Price Goods and Special Services, if any, or for payments owed to Seller as a result of authorizations by Buyer under the Buyer's Contingency Allowance (if any), Seller shall submit a separate Application for Payment, no more frequently than monthly, that states (1) the actual quantities of such Unit Price Goods and Special Services that have been furnished, and the applicable unit prices; and (2) the services or items performed or furnished under the Buyer's Contingency Allowance, and the amounts owed. If practical, and at Seller's option, Seller may apply for such unit price and Buyer's Contingency Allowance payments in a separate section of an Application for Payment submitted under Paragraph 4.02.A for lump sum items.

C. Buyer shall pay Seller the amount owed under an Application for Payment within 45 days after Engineer's presentation to Buyer of the Application for Payment and Engineer's recommendation.

ARTICLE 5—ASSIGNMENT OF PROCUREMENT CONTRACT

5.01 *Assignment of Contract*

A. Buyer has the right to assign this Procurement Contract for furnishing Goods and Special Services, but only to a person or entity with sufficient apparent ability to satisfy all of Buyer's obligations under this Procurement Contract, and Seller hereby consents to such assignment. Forms documenting the assignment of the Procurement Contract, and consent of Seller's surety to the assignment, have been executed by Buyer, Seller, and Seller's surety, and are attached as exhibits to this Procurement Agreement. If so assigned, the following provisions apply:

1. The Procurement Contract is initially executed in the name of the entity identified herein as Buyer, and will be assigned by such Buyer (as assignor) to a construction contractor (Contractor/Assignee) designated by such Buyer. The assignment will occur on the effective date of the construction contract between such Buyer (Project Owner) and the Contractor/Assignee, which is expected to occur on or about **January 15, 2026**. Commencing on the date of acceptance of assignment by the Contractor/Assignee, all references in the Procurement Contract to "Buyer" shall mean the designated Contractor/Assignee.

2. The assignment of this Procurement Contract relieves the assignor from all further obligations and liabilities under this Procurement Contract. After assignment, Seller shall become a subcontractor or supplier to the Contractor/Assignee and, except as noted herein, all rights, duties, and obligations of Buyer under the Procurement Contract become the rights, duties, and obligations of the Contractor/Assignee.

3. After assignment:

    a. The Procurement Drawings and Procurement Specifications, and any modifying Addenda will become "Contract Documents" under the construction contract.

    b. If the Procurement Drawings or Procurement Specifications, as "Contract Documents" under the construction contract, are duly modified under such construction contract, then Seller and Contractor/Assignee shall enter into a corresponding Change Order under the applicable provisions of this Procurement Contract.

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c. The Procurement Drawings and Procurement Specifications may not be modified by Seller or Contractor/Assignee, singly or in tandem, except as such Procurement Drawings or Procurement Specifications, as "Contract Documents" under the construction contract, have been duly modified under such construction contract.

d. All performance warranties, guarantees, and indemnifications required by the Procurement Contract will continue to run for the benefit of assignor (Project Owner) and, in addition, for the benefit of the Contractor/Assignee. However, if assignor (Project Owner) and Contractor/Assignee make the same warranty or guarantee claim, then Seller shall only be liable once for such claim. Other than its remedies under such warranties, guarantees, and indemnifications, assignor will not retain direct rights under this Procurement Contract, but will have rights and remedies as a party to the construction contract, whose scope of work will encompass the Procurement Drawings, Procurement Specifications, and modifying Addenda; provided, however, that any limitations on Seller's liability in this Procurement Contract will continue to bind the original Buyer (assignor) after assignment.

e. The Contractor/Assignee shall have all the rights of the Buyer under the Performance Bond and Payment Bond.

f. Seller shall submit all Applications for Payment directly to Contractor/Assignee.

   1) Contractor/Assignee shall review each Application for Payment promptly, determine the amount that Contractor/Assignee approves for payment, and then include the amount approved in the next application for payment submitted to Project Owner (or Engineer) under the construction contract.

   2) Contractor/Assignee shall pay Seller within **30** days of receipt of payment from the Project Owner under the construction contract, but in no event later than 60 days after receipt of undisputed invoice.

   3) After assignment Engineer will review, approve, or deny the content of Applications for Payment under the Procurement Contract only to the extent that Contractor/Assignee, as construction contractor, has incorporated such content into payment applications that Engineer reviews under the construction contract.

g. The Contractor/Assignee shall have all the rights of the Buyer under any pending Claim by Buyer.

h. All Claims and supporting documentation will be submitted directly by the claimant party (either Buyer **Xylem Water Solutions, USA, Inc** or Seller), to the other party, without submittal to Engineer.

   1) The other party will render a response in writing within 30 days of receipt of the last submittal of claimant.

   2) If the other party does not render a written response to a Claim within 30 days after receipt of the last submittal of the claimant, the other party shall be deemed to have approved the Claim in its entirety.

   3) The other party's written response to a Claim, or the approval of the Claim in its entirety as a function of failure to respond within 30 days, will be final and

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binding upon Buyer and Seller 30 days after it is issued, unless within such 30 days of issuance either Buyer or Seller appeals the result by initiating the mediation of the Claim in accordance with the dispute resolution procedures set forth in Paragraph 12.02 of the General Conditions.

4) Any Claim by Seller that Contractor/Assignee may choose to submit, present, or forward to Project Owner must be submitted to Buyer within sufficient time for Contractor/Assignee to preserve its rights under the construction contract, notwithstanding any procedures or time limits in this Procurement Contract.

i. Seller's recovery of additional cost, time, or both cost and time for any Claim attributable to the Project Owner will be limited to the proportionate recovery by Contractor/Assignee against Project Owner for such Claim. Seller will cooperate and assist Contractor/Assignee in pursuing any Claim by Contractor/Assignee against Project Owner on behalf of Seller, including the timely preparation and delivery of supporting documentation.

j. If the pursuit of any claim by Contractor/Assignee against Project Owner on Seller's behalf requires the expenditure by Contractor/Assignee of legal or consulting fees, or results in litigation, arbitration, or any dispute resolution procedures, Seller agrees to pay for a proportionate share of attorneys' fees, consultant fees, and litigation, arbitration, and other resolution costs incurred by Contractor/Assignee in pursuing the claim on behalf of Seller, based upon the amount claimed by Seller as compared to the total value of the claim pursued by the Contractor/Assignee.

k. All rights, duties, and obligations of Engineer to Contractor/Assignee and Seller under this Procurement Contract will cease.

l. Subject to the foregoing provisions, all references in the Procurement Contract to submitting items to Engineer, or to Engineer having tasks or obligations, will be read after such an assignment as requiring submittal to Contractor/Assignee, or as Contractor/Assignee having such tasks or obligations (which Contractor/Assignee may delegate when appropriate).

m. If the Procurement Contract includes a Buyer's Contingency Allowance, upon assignment such allowance will be automatically reduced to the amount previously authorized by Buyer (Project Owner), and cease to be operational.

B. No other assignment by a party hereto of any rights under or interests in the Procurement Contract will be binding on another party hereto without the written consent of the party sought to be bound. Specifically, but without limitation, Procurement Contract payments or other money that may become due, and Procurement Contract payments or other money that are due, may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by Laws and Regulations). Unless specifically stated to the contrary in any written consent to such an assignment, such an assignment will not release or discharge the assignor from any duty or responsibility under the Procurement Contract Documents.

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ARTICLE 6—PROCUREMENT CONTRACT DOCUMENTS

6.01 *List of Procurement Contract Documents*

A. The Procurement Contract Documents consist of the following:

1. Invitation for Proposals.
2. Information for Proposers.
3. Instructions to Proposers.
4. Proposals (Bid) Form including all attachments.
5. This Procurement Agreement.
6. General Conditions of the Procurement Contract.
7. Supplementary Conditions of the Procurement Contract.
8. Procurement Specifications as listed in the Procurement Specifications table of contents.
9. Addenda Numbers **1 – 2**
10. Bonds:
    a. Performance bond (together with power of attorney).
    b. Payment bond (together with power of attorney).
11. Exhibits to this Procurement Agreement (enumerated as follows):
    a. Exhibit A, Assignment of Contract, Consent to Assignment, and Acceptance of Assignment.
    b. Exhibit B, Surety's Consent to Assignment.
    c. Documentation submitted by Seller **Xylem Water Solutions, USA, Inc; (Proposal dated 12/12/2024)** and
    d. Manufacturer's Certification of Compliance Form (see Information for Proposers) to demonstrate compliance with the Build American Buy American requirements of this contract.
    e. Submittals required with the Proposal as described in Section 11300 Packaged SBR and Digester Equipment **(See proposal from Xylem dated 12/12/2024).**
12. The following which may be delivered or issued on or after the Effective Date of the Procurement Contract and are not attached hereto:
    a. Change Orders;
    b. Change Directives; and
    c. Field Orders.

B. The documents listed in Paragraph 6.01.A are attached to this Procurement Agreement (except as expressly noted otherwise above).

C. There are no Procurement Contract Documents other than those listed above.

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D. The Procurement Contract Documents may only be amended or supplemented as provided in Paragraph 11.01 of the Procurement General Conditions.

ARTICLE 7—SELLER'S REPRESENTATIONS AND CERTIFICATIONS

7.01 *Seller's Representations*

A. In order to induce Buyer to enter into this Procurement Agreement, Seller makes the following representations:

1. Seller has examined and carefully studied the Procurement Contract Documents.

2. If required by the Instructions to Bidders to visit the Point of Destination and the site where the Goods are to be installed or Special Services will be provided, or if, in Seller's judgment, any observable local or site conditions may affect the delivery, cost, progress, or furnishing of the Goods and Special Services, then Seller has visited the Point of Destination and site where the Goods are to be installed or Special Services will be provided (as applicable) and become familiar with and is satisfied as to the observable local and site conditions that may affect delivery, cost, progress, and furnishing of the Goods and Special Services.

3. Seller is familiar with and is satisfied as to all Laws and Regulations that may affect the cost, progress, and performance of Seller's obligations under the Procurement Contract.

4. Seller has carefully studied, considered, and correlated the information known to Seller with respect to the effect of such information on the cost, progress, and performance of Seller's obligations under the Procurement Contract.

5. Seller has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Seller has discovered in the Procurement Contract Documents, and the written resolution (if any) thereof by Engineer is acceptable to Seller.

6. The Procurement Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance of Seller's obligations under the Procurement Contract.

7. Seller's entry into this Procurement Contract constitutes an incontrovertible representation by Seller that without exception all prices in the Procurement Agreement are premised upon furnishing the Goods and Special Services as required by the Procurement Contract Documents.

8. All other representations listed in the Proposal Form.

7.02 *Seller's Certifications*

A. Seller certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Procurement Contract. For the purposes of this Paragraph 7.02:

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 Procurement Contract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Procurement Contract to the

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detriment of Buyer, (b) to establish bid or contract prices at artificial non-competitive levels, or (c) to deprive Buyer 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 Buyer, 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 Procurement Contract.

B. Seller's Certifications shall include also include all Certifications listed in the Proposal Form.

ARTICLE 8—RESERVED

ARTICLE 9—MUTUAL WAIVER

9.01 *Mutual Waiver of Consequential Damages*

A. Buyer and Seller waive against each other, and against the other's officers, directors, members, partners, employees, agents, consultants, and subcontractors, any and all claims for or entitlement to incidental, indirect, or consequential damages arising out of, resulting from, or related to the Procurement Contract. Further, the parties agree that the total liability of each party to the other for claims, costs, losses, and damages arising from this Contract shall be limited to the amount established in the Procurement Contract as the Total Contract Price. If Buyer (Project Owner) assigns this Procurement Contract to a construction contractor (Contractor/Assignee), then the terms of this Paragraph 9.01.A will be binding upon the Contractor/Assignee with respect to Seller and assignor. The terms of this mutual waiver do not apply to or limit any claim by either Buyer or Seller against the other based on any of the following: (a) contribution or indemnification, (b) costs, losses, or damages attributable to personal or bodily injury, sickness, disease, or death, or to injury to or destruction of the tangible property of others, (c) intentional or reckless wrongful conduct.

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IN WITNESS WHEREOF, Buyer and Seller have signed this Procurement Agreement. Counterparts have been delivered to Buyer and Seller.

The Effective Date of the Procurement Contract is **[date to be inserted at the time of execution]**.

3/31/25

Buyer	Seller
The City of Aumsville, Oregon *(typed or printed name of organization)*	Xylem Water Solutions USA Inc *(typed or printed name of organization)*
By: _____ *(individual's signature)*	By: _____ *(individual's signature)*
Date: 4/14/25 *(date signed)*	Date: 3/31/25 *(date signed)*
Name: Ron HARDING *(typed or printed)*	Name: Adam Mc Neill *(typed or printed)*
Title: City Administrator *(typed or printed)*	Title: Vice President *(typed or printed)* *(If Seller is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*
Attest: _____ *(individual's signature)*	Attest: _____ *(individual's signature)*
Title: Assistant City Administrator *(typed or printed)*	Title: Application Engineer *(typed or printed)*
Address for giving notices: 595 Main Street Aumsville, OR 97325	Address for giving notices: Xylem, Inc 301 Water Street SE, Suite 200 Washington, D.C. 20003
Designated Representative: Name: Ron Harding *(typed or printed)* Title: City Administrator *(typed or printed)*	Designated Representative: Name: _____ *(typed or printed)* Title: _____ *(typed or printed)*
Address: 595 Main Street Aumsville, OR 97325	Address:
Phone: (503) 749-2030	Phone: _____
Email: _____ *(If Buyer is a corporation, attach evidence of authority to sign. If Buyer is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)*	Email: _____

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EXHIBIT A—ASSIGNMENT OF PROCUREMENT CONTRACT, CONSENT TO ASSIGNMENT, AND ACCEPTANCE OF ASSIGNMENT

This assignment will be effective on the effective date of the construction contract between Buyer (as "Owner") and Contractor/Assignee (as "Contractor").

The Procurement Contract between **The City of Aumsville, Oregon ("Buyer")** and **[insert name of Seller]** ("Seller") for furnishing Goods and Special Services entitled (check only one box and delete the other):

☒ **Sequencing Batch Reactor and Digester Equipment for the Aumsville Wastewater Treatment Plant**

☐ **Dissolved Air Floatation Equipment for the Aumsville Wastewater Treatment Plant**

(Procurement Contract) is hereby assigned, transferred, and set over to Contractor/Assignee, as assignee, by Buyer, as assignor. Upon assignment the Contractor/Assignee shall have the duties, rights, and obligations of Buyer under the terms of the Procurement Contract, and will be responsible to Owner under the construction contract for the performance of obligations by Seller, which will become a Subcontractor or Supplier to Contractor/Assignee. Buyer, Seller, and Contractor/Assignee hereby acknowledge and agree to be bound by the terms and conditions of assignment set forth in Article 5 of the Agreement Between Buyer and Seller for Procurement Contract.

Assignment Made by Buyer

The City of Aumsville, Oregon
(typed or printed name of organization)

By: _____ Date: 4/15/25
(individual's signature) *(date signed)*

Name: Ron Hardy Title: City Administrator
(typed or printed) *(typed or printed)*

If Buyer is a corporation, attach evidence of authority to sign. If Buyer is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of Buyer-Seller Agreement.

Assignment Acknowledged and Accepted by Seller

Xylem Water Solutions USA Inc
(typed or printed name of organization)

By: _____ Date: 3/31/25
(individual's signature) *(date signed)*

Name: Adam McNeill Title: Vice President
(typed or printed) *(typed or printed)*

If Seller is a corporation, attach evidence of authority to sign.

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Assignment Accepted by Contractor/Assignee

Xylem Water Solutions USA Inc

(typed or printed name of organization)

By: _____ Date: 3/31/25

(individual's signature) *(date signed)*

Name: Adam McNeill Title: Vice President

(typed or printed) *(typed or printed)*

If Contractor/Assignee is a corporation, attach evidence of authority to sign.

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XYLEM WATER SOLUTIONS U.S.A., INC.

*****

UNANIMOUS CONSENT OF THE BOARD OF DIRECTORS

WHEREAS, the undersigned, constituting all of the members of the Board of Directors of Xylem Water Solutions U.S.A., Inc., a Delaware corporation formed pursuant to the laws of the State of Delaware (the "Corporation"), do hereby consent, pursuant to Section 141(f) of the General Corporation Law of the State of Delaware, to the adoption of the resolutions set forth below, with the same effect as if said actions were taken by unanimous approving vote at a meeting at which all of the directors were present in person:

RESOLVED: That the lawful actions taken by the current and former officers of the Corporation, in the name of and on behalf of the Corporation are hereby adopted, ratified, and approved.

RESOLVED FURTHER: That the following named persons are appointed as officers of the Corporation in the capacities indicated opposite their respective names, to serve as officers from this date forward until their resignation, removal, termination of employment with the Corporation or its affiliates, or death or until their successors are duly appointed.

Individuals	**Office (s)**
David Alban	Vice President
Ken Albaugh	Vice President
Nitin Bhate	Vice President
Kevin Jaffe	Vice President & Assistant Secretary
Todd Boyle	Vice President
Christopher Carapella	Vice President & Assistant Treasurer
Scott A. Holzborn	Vice President
Todd Huffman	Vice President
Scott J. Lapcewich	Vice President
Matthew Latino	Vice President & Treasurer
Chad Lawrence	Vice President
Roger Lobo	Vice President
Josheph McCausland	Vice President & Assistant Treasurer
Michael J. McGann	President
Adam McNeill	Vice President
Stewart Nix	Vice President
Richard Pangrazzi	Vice President
Sean Petraitis	Vice President
Justin Allen Pifer	Vice President & Secretary
Christopher Peterson	Vice President
Randy Stewart	Vice President
Christine Valencia	Vice President

RESOLVED: That any previous appointments of officers for the Corporation are hereby revoked.

RESOLVED FURTHER: That this Unanimous Written Consent may be executed in any number of counterparts, each of which when so executed shall be deemed to be an original and all of which when taken together shall constitute one and the same document, and that the different directors of the Corporation need not be signatories to the same counterpart.

This Unanimous Written Consent of the Board of Directors is effective on January 1, 2025.

[Signature page follows.]

Docusign Envelope ID: 9CDB6241-DA78-4208-8EA6-9259FA70B425

Signed by:
Justin Allen Pifer
38B510D38D9F476...

Justin Allen Pifer

Matthew Latino

Michael J. McGann

EXHIBIT B—SURETY'S CONSENT TO ASSIGNMENT

Surety hereby acknowledges, agrees, and consents that the Procurement Contract for furnishing Goods and Special Services entitled (check only one box and delete the other):

☒ Sequencing Batch Reactor and Digester Equipment for the Aumsville Wastewater Treatment Plant

☐ Dissolved Air Floatation Equipment for the Aumsville Wastewater Treatment Plant

by and between **The City of Aumsville, Oregon** ("Buyer") and **Xylem Water Solutions USA, Inc.** ("Seller") may be assigned, transferred, and set over to ("Contractor/Assignee"), in accordance with Article 5 and Exhibit A of the Agreement between Buyer and Seller for Procurement Contract.

Surety further agrees that, upon assignment of the Procurement Contract, the Contractor/Assignee shall have all the rights of the Buyer under the Procurement Performance Bond and Procurement Payment Bond.

Agreement to Assignment Acknowledged and Accepted by Surety

Liberty Mutual Insurance Company
(typed or printed name of organization)

By: _____ Date: 04/03/2025
(individual's signature) *(date signed)*

Name: Anne Potter Title: Attorney-in-Fact
(typed or printed) *(typed or printed)*

Attach Power of Attorney.

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POWER OF ATTORNEY

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

Certificate No: **8213584-015009**

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Aklima Noorhassan; Anne Potter; Beverly A. Woolford; Debra A. Deming; Frances Rodriguez; Francesca Kazmierczak; Jennifer L. Jakaitis; Pablo Garcia Horcajo; Peter Healy; Sandra Diaz; Susan A. Welsh; Valorie Spates; Vilma Gonzalez

all of the city of New York state of NY each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 2nd day of April, 2025.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

By: _____
Nathan J. Zangerle, Assistant Secretary

State of PENNSYLVANIA
County of MONTGOMERY ss

On this 2nd day of April, 2025 before me personally appeared Nathan J. Zangerle, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at Plymouth Meeting, Pennsylvania, on the day and year first above written.

Commonwealth of Pennsylvania - Notary Seal
Teresa Pastella, Notary Public
Montgomery County
My commission expires March 28, 2029
Commission number 1126044
Member, Pennsylvania Association of Notaries

By: _____
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS: Section 12. Power of Attorney.
Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts: Section 5. Surety Bonds and Undertakings.
Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes Nathan J. Zangerle, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 3rd day of April, 2025.

By: _____
Renee C. Llewellyn, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

For bond and/or Power of Attorney (POA) verification inquiries, please call 610-832-8240 or email HOSUR@libertymutual.com.

Liberty Mutual. SURETY

LIBERTY MUTUAL INSURANCE COMPANY

FINANCIAL STATEMENT – DECEMBER 31, 2024

Assets		Liabilities	
Cash and Bank Deposits	$4,608,826,756.00	Unearned Premiums	$9,890,896,878.00
*Bonds – U.S Government	$4,281,375,446.74	Reserve for Claims and Claims Expense	$29,467,071,865.00
*Other Bonds	$21,566,489,527.26	Funds Held Under Reinsurance Treaties	$341,948,172.00
*Stocks	$15,589,644,012.00	Reserve for Dividends to Policyholders	$954,025.00
Real Estate	$86,497,925.00	Additional Statutory Reserve	$150,547,865.00
Agents' Balances or Uncollected Premiums	$7,512,975,129.00	Reserve for Commissions, Taxes and Other Liabilities	$5,049,906,410.00
Accrued Interest and Rents	$225,249,712.00	**Total**	**$47,104,416,171.00**
Other Admitted Assets	$19,367,663,200.00	Special Surplus Funds	$174,153,086.00
		Capital Stock	$10,000,075.00
		Paid in Surplus	$13,209,595,772.00
		Unassigned Surplus	$13,415,980,561.00
		Surplus to Policyholders	$27,435,067,490.00
Total Admitted Assets	**$74,539,483,661.00**	**Total Liabilities and Surplus**	**$74,539,483,661.00**

* Bonds are stated at amortized or investment value; Stocks at Association Market Values.
The foregoing financial information is taken from Liberty Mutual Insurance Company's financial statement filed with the Massachusetts Department of Insurance.

I, TIM MIKOLAJEWSKI, Assistant Secretary of Liberty Mutual Insurance Company, do hereby certify that the foregoing is a true, and correct statement of the Assets and Liabilities of said Corporation, as of December 31, 2024, to the best of my knowledge and belief.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of said Corporation at Seattle, Washington, this 8th day of March, 2025.

LIBERTY MUTUAL INSURANCE COMPANY INCORPORATED 1912 MASSACHUSETTS

Timothy A. Mikolajewski

Timothy A. Mikolajewski, Assistant Secretary

LMS-1262/LMIC

PAYMENT BOND FOR PROCUREMENT CONTRACT

Seller	Surety
Name: **Xylem Water Solutions USA, Inc.** Address *(principal place of business)*: **N19 W23993 Ridgeview Pkwy, STE 200, Waukesha, WI 53188**	Name: **Liberty Mutual Insurance Company** Address *(principal place of business)*: **175 Berkeley Street, Boston, MA 02116**
Buyer Name: **The City of Aumsville, Oregon** Mailing address *(principal place of business)*: **595 Main Street** **Aumsville, Oregon 97325**	**Procurement Contract** Description *(name and location)*: (check only one box and delete the other): ☒ SEQUENCING BATCH REACTOR AND DIGESTER EQUIPMENT FOR THE AUMSVILLE WASTEWATER TREATMENT PLANT ☐ Dissolved Air Floatation Equipment for the Aumsville Wastewater Treatment Plant Procurement Contract Price: $1,673,152.00 Effective Date of Procurement Contract: 03/31/2025

Bond

Bond Amount: **$ 1,673,152.00**

Date of Bond: **04/03/2025**

(Date of Bond cannot be earlier than Effective Date of Procurement Contract)

Modifications to this Bond form:

☒ None ☐ See Paragraph 17

Surety and Seller, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

Seller as Principal	Surety
Xylem Water Solutions USA, Inc. *(Full formal name of Seller)*	Liberty Mutual Insurance Company *(Full formal name of Surety) (corporate seal)*
By: _____ *(Signature)*	By: _____ *(Signature)(Attach Power of Attorney)*
Name: J. Stewart Nix *(Printed or typed)*	Name: Anne Potter *(Printed or typed)*
Title: Vice President	Title: Attorney-in-Fact
Attest: Elaine Hudson *(Signature)*	Attest: Francesca Kazmierczak *(Signature)*
Name: Elaine Hudson *(Printed or typed)*	Name: Francesca Kazmierczak *(Printed or typed)*
Title: Sr. Receptionist	Title: Surety Analyst

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Seller, Surety, Buyer, or other party is considered plural where applicable.

EJCDC® P-615, Payment Bond for Procurement Contract.
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1. The Seller and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Buyer to pay for labor, materials, and equipment furnished for use in the performance of the Procurement Contract, which is incorporated herein by reference, subject to the following terms.

2. If the Seller promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Buyer from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Procurement Contract, then the Surety and the Seller shall have no obligation under this Bond.

3. If there is no Buyer Default under the Procurement Contract, the Surety's obligation to the Buyer under this Bond will arise after the Buyer has promptly notified the Seller and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Buyer or the Buyer's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Procurement Contract, and tendered defense of such claims, demands, liens, or suits to the Seller and the Surety.

4. When the Buyer has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Buyer against a duly tendered claim, demand, lien, or suit.

5. The Surety's obligations to a Claimant under this Bond will arise after the following:

    5.1. Claimants who do not have a direct contract with the Seller

        5.1.1. have furnished a written notice of non-payment to the Seller, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

        5.1.2. have sent a Claim to the Surety (at the address described in Paragraph 13).

    5.2. Claimants who are employed by or have a direct contract with the Seller have sent a Claim to the Surety (at the address described in Paragraph 13).

6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Buyer to the Seller, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

    7.1. Send an answer to the Claimant, with a copy to the Buyer, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

    7.2. Pay or arrange for payment of any undisputed amounts.

    7.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will not be deemed to constitute a waiver of defenses the Surety or Seller may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

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8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Buyer to the Seller under the Procurement Contract will be used for the performance of the Procurement Contract and to satisfy claims, if any, under any procurement performance bond. By the Seller furnishing and the Buyer accepting this Bond, they agree that all funds earned by the Seller in the performance of the Procurement Contract are dedicated to satisfying obligations of the Seller and Surety under this Bond, subject to the Buyer's priority to use the funds for the completion of the Goods and Special Services.

10. The Surety shall not be liable to the Buyer, Claimants, or others for obligations of the Seller that are unrelated to the Procurement Contract. The Buyer shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

11. The Surety hereby waives notice of any change, including changes of time, to the Procurement Contract or to related subcontracts, purchase orders, and other obligations.

12. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the Point of Destination is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Procurement Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.

13. Notice and Claims to the Surety, the Buyer, or the Seller must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.

14. When this Bond has been furnished to comply with a statutory or other legal requirement where the Point of Destination is located, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Seller and Buyer shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. Definitions

    16.1. *Buyer Default*—Failure of the Buyer, which has not been remedied or waived, to pay the Seller as required under the Procurement Contract or to perform and complete or comply with the other material terms of the Procurement Contract.

    16.2. *Claim*—A written statement by the Claimant including at a minimum:

        16.2.1. The name of the Claimant;

        16.2.2. The name of the person for whom the labor was done, or materials or equipment furnished;

        16.2.3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Procurement Contract;

        16.2.4. A brief description of the labor, materials, or equipment furnished;

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16.2.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Procurement Contract;

16.2.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;

16.2.7. The total amount of previous payments received by the Claimant; and

16.2.8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.3. *Claimant*—An individual or entity having a direct contract with the Seller or with a subcontractor of the Seller to furnish labor, materials, or equipment for use in the performance of the Procurement Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Point of Destination is located or where the Goods and Special Services are to be installed or furnished. The intent of this Bond is to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Procurement Contract, architectural and engineering services required for performance of the work of the Seller and the Seller's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.4. *Goods and Special Services*—The full scope of materials, equipment, other items, and services to be furnished by Seller, as defined in the Procurement Contract.

16.5. *Point of Destination*—The location where delivery of the Goods shall be made, as stated in the Procurement Contract.

16.6. *Procurement Contract*—The contractual agreement between the Buyer and Seller identified on the cover page, including all Procurement Contract Documents and all changes made to the Procurement Contract.

16.7. *Procurement Contract Documents*—All the documents that comprise the contractual agreement between the Buyer and Seller.

17. Modifications to this Bond are as follows: **None**

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POWER OF ATTORNEY

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

Certificate No: **8213584-015009**

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Aklima Noorhassan; Anne Potter; Beverly A. Woolford; Debra A. Deming; Frances Rodriguez; Francesca Kazmierczak; Jennifer L. Jakaitis; Pablo Garcia Horcajo; Peter Healy; Sandra Diaz; Susan A. Welsh; Valorie Spates; Vilma Gonzalez

all of the city of New York state of NY each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 2nd day of April, 2025.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

By: _____
Nathan J. Zangerle, Assistant Secretary

State of PENNSYLVANIA
County of MONTGOMERY ss

On this 2nd day of April, 2025 before me personally appeared Nathan J. Zangerle, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at Plymouth Meeting, Pennsylvania, on the day and year first above written.

Commonwealth of Pennsylvania - Notary Seal
Teresa Pastella, Notary Public
Montgomery County
My commission expires March 28, 2029
Commission number 1126044
Member, Pennsylvania Association of Notaries

By: _____
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS: Section 12. Power of Attorney.
Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts: Section 5. Surety Bonds and Undertakings.
Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes Nathan J. Zangerle, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 3rd day of Apri, 2025.

By: _____
Renee C. Llewellyn, Assistant Secretary

LMS-12873 LMIC OCIC WAIC Multi Co 02/24

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

For bond and/or Power of Attorney (POA) verification inquiries, please call 610-832-8240 or email HOSUR@libertymutual.com.

LIBERTY MUTUAL INSURANCE COMPANY

FINANCIAL STATEMENT – DECEMBER 31, 2024

Assets

Cash and Bank Deposits	$4,608,826,756.00
*Bonds – U.S Government	$4,281,375,446.74
*Other Bonds	$21,566,489,527.26
*Stocks	$15,589,644,012.00
Real Estate	$86,497,925.00
Agents' Balances or Uncollected Premiums	$7,512,975,129.00
Accrued Interest and Rents	$225,249,712.00
Other Admitted Assets	$19,367,663,200.00
Total Admitted Assets	**$74,539,483,661.00**

Liabilities

Unearned Premiums	$9,890,896,878.00
Reserve for Claims and Claims Expense	$29,467,071,865.00
Funds Held Under Reinsurance Treaties	$341,948,172.00
Reserve for Dividends to Policyholders	$954,025.00
Additional Statutory Reserve	$150,547,865.00
Reserve for Commissions, Taxes and Other Liabilities	$5,049,906,410.00
Total	**$47,104,416,171.00**
Special Surplus Funds	$174,153,086.00
Capital Stock	$10,000,075.00
Paid in Surplus	$13,209,595,772.00
Unassigned Surplus	$13,415,980,561.00
Surplus to Policyholders	$27,435,067,490.00
Total Liabilities and Surplus	**$74,539,483,661.00**

* Bonds are stated at amortized or investment value; Stocks at Association Market Values.
The foregoing financial information is taken from Liberty Mutual Insurance Company's financial statement filed with the Massachusetts Department of Insurance.

I, TIM MIKOLAJEWSKI, Assistant Secretary of Liberty Mutual Insurance Company, do hereby certify that the foregoing is a true, and correct statement of the Assets and Liabilities of said Corporation, as of December 31, 2024, to the best of my knowledge and belief.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of said Corporation at Seattle, Washington, this 8th day of March, 2025.

LIBERTY MUTUAL INSURANCE COMPANY INCORPORATED 1912 MASSACHUSETTS

Timothy A. Mikolajewski

Timothy A. Mikolajewski, Assistant Secretary

LMS-1262/LMIC

Bond #015224008

PERFORMANCE BOND FOR PROCUREMENT CONTRACT

Seller	**Surety**
Name: **Xylem Water Solutions USA, Inc.**	Name: **Liberty Mutual Insurance Company**
Address *(principal place of business)*: **N19 W23993 Ridgeview Pkwy, STE 200, Waukesha, WI 53188**	Address *(principal place of business)*: **175 Berkeley Street, Boston, MA 02116**
Buyer	**Procurement Contract**
Name: **The City of Aumsville, Oregon**	Description *(name and location)*: (check only one box and delete the other): ☒ SEQUENCING BATCH REACTOR AND DIGESTER EQUIPMENT FOR THE AUMSVILLE WASTEWATER TREATMENT PLANT ☐ DISSOLVED AIR FLOATATION EQUIPMENT FOR THE AUMSVILLE WASTEWATER TREATMENT PLANT Procurement Contract Price: $1,673,152.00 Effective Date of Procurement Contract: 03/31/2025
Mailing address *(principal place of business)*: **595 Main Street Aumsville, Oregon 97325**	

Bond

Bond Amount: **$1,673,152.00**

Date of Bond: **04/03/2025**

(Date of Bond cannot be earlier than Effective Date of Procurement Contract)

Modifications to this Bond form:

☒ None ☐ See Paragraph 15

Surety and Seller, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

Seller as Principal	Surety
Xylem Water Solutions USA, Inc. *(Full formal name of Seller)*	Liberty Mutual Insurance Company *(Full formal name of Surety) (corporate seal)*
By: *(Signature)*	By: *(Signature)(Attach Power of Attorney)*
Name: T. Stewart Nix *(Printed or typed)*	Name: Anne Potter *(Printed or typed)*
Title: Vice President	Title: Attorney-in-Fact
Attest: Elaine Hudson *(Signature)*	Attest: Francesca Kazmierczak *(Signature)*
Name: Elaine Hudson *(Printed or typed)*	Name: Francesca Kazmierczak *(Printed or typed)*
Title: Sr. Receptionist	Title: Surety Analyst

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Seller, Surety, Buyer, or other party is considered plural where applicable.

EJCDC® P-610, Performance Bond for Procurement Contract.
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1. The Seller and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Buyer for the performance of the Procurement Contract, which is incorporated herein by reference.

2. If the Seller performs the Procurement Contract, the Surety and the Seller shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Buyer Default under the Procurement Contract, the Surety's obligation under this Bond will arise after:

    3.1. The Buyer first provides notice to the Seller and the Surety that the Buyer is considering declaring a Seller Default. Such notice may indicate whether the Buyer is requesting a conference among the Buyer, Seller, and Surety to discuss the Seller's performance. If the Buyer does not request a conference, the Surety may, within five (5) business days after receipt of the Buyer's notice, request such a conference. If the Surety timely requests a conference, the Buyer shall attend. Unless the Buyer agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Buyer's notice. If the Buyer, the Seller, and the Surety agree, the Seller shall be allowed a reasonable time to perform the Procurement Contract, but such an agreement does not waive the Buyer's right, if any, subsequently to declare a Seller Default;

    3.2. The Buyer declares a Seller Default, terminates the Procurement Contract, and notifies the Surety; and

    3.3. The Buyer has agreed to pay the Balance of the Procurement Contract Price in accordance with the terms of the Procurement Contract to the Surety or to a seller selected to perform the Procurement Contract.

4. Failure on the part of the Buyer to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Buyer has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

    5.1. Arrange for the Seller, with the consent of the Buyer, to perform and complete the Procurement Contract;

    5.2. Undertake to perform and complete the Procurement Contract itself, through its agents or independent contractors;

    5.3. Obtain bids or negotiated proposals from qualified sellers acceptable to the Buyer for a contract for performance and completion of the Procurement Contract, arrange for a contract to be prepared for execution by the Buyer and a seller selected with the Buyer's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Procurement Contract, and pay to the Buyer the amount of damages as described in Paragraph 7 in excess of the Balance of the Procurement Contract Price incurred by the Buyer as a result of the Seller Default; or

    5.4. Waive its right to perform and complete, arrange for completion, or obtain a new seller, and with reasonable promptness under the circumstances:

        5.4.1. After investigation, determine the amount for which Surety may be liable to the Buyer and, as soon as practicable after the amount is determined, make payment to the Buyer; or

        5.4.2. Deny liability in whole or in part and notify the Buyer, citing the reasons for denial.

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6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven (7) days after receipt of an additional written notice from the Buyer to the Surety demanding that the Surety perform its obligations under this Bond, and the Buyer shall be entitled to enforce any remedy available to the Buyer. If the Surety proceeds as provided in Paragraph 5.4, and the Buyer refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Buyer shall be entitled to enforce any remedy available to the Buyer.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Buyer will not be greater than those of the Seller under the Procurement Contract, and the responsibilities of the Buyer to the Surety will not be greater than those of the Buyer under the Procurement Contract. Subject to the commitment by the Buyer to pay the Balance of the Procurement Contract Price, the Surety is obligated, without duplication for:

    7.1. the responsibilities of the Seller for correction of defective or non-conforming Goods and Special Services, and completion of the Procurement Contract;

    7.2. additional legal, design professional, and delay costs resulting from the Seller's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

    7.3. liquidated damages, or if no liquidated damages are specified in the Procurement Contract, actual damages caused by delayed performance or non-performance of the Seller.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Buyer or others for obligations of the Seller that are unrelated to the Procurement Contract, and the Balance of the Procurement Contract Price will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Buyer or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Procurement Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction where the Point of Destination is located and must be instituted within two years after a declaration of Seller Default, or within two years after the Seller ceased working, or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.

12. Notice to the Surety, the Buyer, or the Seller must be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Point of Destination, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

14. Definitions

    14.1. *Balance of the Procurement Contract Price*—The total amount payable by the Buyer to the Seller under the Procurement Contract after all proper adjustments have been made including allowance for the Seller for any amounts received or to be received by the Buyer in settlement of insurance or other claims for damages to which the Seller is entitled, reduced by all valid and proper payments made to or on behalf of the Seller under the Procurement Contract.

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14.2. *Buyer Default*—Failure of the Buyer, which has not been remedied or waived, to pay the Seller as required under the Procurement Contract or to perform and complete or comply with the other material terms of the Procurement Contract.

14.3. *Goods and Special Services*—The full scope of materials, equipment, other items, and services to be furnished by Seller, as defined in the Procurement Contract.

14.4. *Point of Destination*—The location where delivery of the Goods shall be made, as stated in the Procurement Contract.

14.5. *Procurement Contract*—The contractual agreement between the Buyer and Seller identified on the cover page, including all Procurement Contract Documents and changes made to the Procurement Contract.

14.6. *Seller Default*—Failure of the Seller, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Procurement Contract.

14.7. *Procurement Contract Documents*—All the documents that comprise the contractual agreement between the Buyer and Seller.

15. Modifications to this Bond are as follows: **None**

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PART 3:

CONDITIONS OF THE CONTRACT

STANDARD GENERAL CONDITIONS OF THE PROCUREMENT CONTRACT

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ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Whenever used in the Procurement Bidding Requirements or Procurement Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated, which are applicable to the singular or plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Procurement 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 Procurement Contract Documents.

2. *Application for Payment*—The document prepared by Seller, in a form acceptable to Buyer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Procurement Contract Documents.

3. *Bid*—An offer or proposal of a prospective Seller submitted on the prescribed form setting forth the prices for the Goods and Special Services to be provided.

4. *Bidder*—An individual or entity that, as a prospective Seller, submits a Bid to Buyer.

5. *Buyer*—The individual or entity purchasing the Goods and Special Services.

6. *Change Directive*—A written directive from Buyer to Seller issued on or after the Effective Date of the Procurement Contract, ordering an addition, deletion, or revision in the Goods and Special Services.

7. *Change Order*—A document which is signed by Seller and Buyer and authorizes an addition, deletion, or revision to the Procurement Contract Documents or an adjustment in the Procurement Contract Price or the Procurement Contract Times, issued on or after the Effective Date of the Procurement Contract. Change Orders may be the result of mutual agreement by Buyer and Seller, or of resolution of a Claim.

8. *Claim*—A demand or assertion by Buyer or Seller seeking an adjustment of Procurement Contract Price or Procurement Contract Times, or both, or other relief with respect to the terms of the Procurement Contract. A demand for money or services by a third party is not a Claim.

9. *Contractor/Assignee*—A construction contractor with which Project Owner enters into a construction contract, and to which Project Owner, as initial Buyer, assigns this Procurement Contract.

10. *Effective Date of the Procurement Contract*—The date indicated in the Procurement Agreement on which the Procurement Contract becomes effective.

11. *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.

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12. *Electronic Means*—Electronic mail (e-mail), upload/download from a secure Project website, or other communications methods that allow: the transmission or communication of Electronic Documents; the documentation of transmissions, including sending and receipt; printing of the transmitted Electronic Document by the recipient; the storage and archiving of the Electronic Document by sender and recipient; and the use by recipient of the Electronic Document for purposes permitted by this Procurement 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.

13. *Engineer*—The individual or entity designated as such in the Procurement Agreement.

14. *Field Order*—A written order issued by Engineer which requires minor changes in the Goods or Special Services, but which does not involve a change in the Procurement Contract Price or Procurement Contract Times.

15. *Goods*—The tangible and movable personal property that is described in the Procurement Contract Documents, regardless of whether the property is to be later attached to realty.

16. *Goods and Special Services*—The full scope of materials, equipment, other items, and services to be furnished by Seller, including Goods, as defined herein, and Special Services, if any, as defined herein. This term refers to both the Goods and the Special Services, or to either the Goods or the Special Services, and to any portion of the Goods or the Special Services, as the context requires.

17. *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.

18. *Milestone*—A principal event specified in the Procurement Contract that Seller must attain by the date or within the number of days indicated, including but not limited to the delivery of the Goods and the furnishing of Special Services.

19. *Notice of Award*—The written notice, by Buyer to a Bidder, of Buyer's acceptance of the Bid.

20. *Point of Destination*—The specific address of the location where delivery of the Goods will be made, as stated in the Procurement Agreement.

21. *Procurement Agreement*—The written instrument, executed by Buyer and Seller, that sets forth the Procurement Contract Price and Procurement Contract Times, identifies the parties and the Engineer, and designates the specific items that are Procurement Contract Documents.

22. *Procurement Bidding Documents*—The Procurement Bidding Requirements and the proposed Procurement Contract Documents (including all Addenda).

23. *Procurement Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and Bid Form with any supplements.

24. *Procurement Contract*—The entire and integrated written agreement between Buyer and Seller concerning the Goods and Special Services.

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25. *Procurement Contract Documents*—Those items so designated in the Procurement Agreement, and which together comprise the Procurement Contract. Shop Drawings and other Seller submittals are not Procurement Contract Documents, even if accepted, reviewed, or approved by Engineer or Buyer.

26. *Procurement Contract Price*—The money that Buyer has agreed to pay Seller for furnishing the Goods and Special Services in accordance with the Procurement Contract Documents.

27. *Procurement Contract Times*—The times stated in the Procurement Agreement by which the Goods must be delivered, Special Services must be furnished, and other Milestones must be attained.

28. *Procurement Drawings*—That part of the Procurement Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Goods and Special Services to be furnished by Seller. Shop Drawings and other Seller submittals are not Procurement Drawings as so defined.

29. *Procurement Specifications*—That part of the Procurement Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the furnishing of the Goods and Special Services, and certain administrative requirements and procedural matters applicable thereto.

30. *Project*—The total undertaking to be accomplished for Project Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Goods and Special Services are a part.

31. *Project Owner*—The entity that has retained (or will retain) engineers, contractors, and others for the planning, study, design, construction, testing, commissioning, and start-up of facilities and improvements. As of the Effective Date of the Procurement Contract, the Project Owner is the Buyer.

32. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Goods and Special Services and which establish the standards by which such portion of the Goods and Special Services will be judged.

33. *Schedule of Submittals*—A schedule, prepared and maintained by Seller, of required Submittals and the time requirements for Engineer's review of the Submittals.

34. *Seller*—The individual or entity furnishing the Goods and Special Services.

35. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Seller and submitted by Seller to illustrate some portion of the Goods and Special Services. Shop Drawings, whether approved or not, are not Procurement Drawings and are not Procurement Contract Documents.

36. *Special Services*—Services to be performed by Seller (or its agents or subcontractors) in association with the Goods to be furnished by Seller, as required by the Procurement Contract Documents.

37. *Submittal*—A written or graphic document, prepared by or for Seller, which the Procurement Contract Documents require Seller to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals

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may include Shop Drawings and Samples; schedules; product data; 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; record documents; and other such documents required by the Procurement Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Procurement Contract Documents. Change proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

38. *Successful Bidder*—The Bidder whose Bid the Buyer accepts, and to which Buyer makes an award of the Procurement Contract.

39. *Supplementary Conditions*—The part of the Procurement Contract that amends or supplements these General Conditions.

40. *Unit Price Goods and Special Services*—Goods and Special Services to be paid for on the basis of unit prices (if any).

1.02 *Terminology*

A. The words and terms discussed in Paragraphs 1.02.B and 1.02.C are not defined, but have the indicated meanings when used in the Bidding Requirements or Procurement Contract Documents.

B. *Intent of Certain Terms or Adjectives*

1. The Procurement 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 Goods and Special Services. It is intended that such exercise of professional judgment, action, or determination will be commercially reasonable and will be solely to evaluate, in general, the Goods and Special Services for compliance with the requirements of and information in the Procurement Contract Documents and conformance with the design concept of the completed Project as a functioning whole, as shown or indicated in the Procurement Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective will not be effective to assign to Engineer any duty or authority to supervise or direct the furnishing of Goods or Special Services or any duty or authority to undertake responsibility contrary to any other provision of the Procurement Contract Documents.

2. The word "non-conforming" when modifying the words "Goods and Special Services," "Goods," or "Special Services," refers to Goods and Special Services that are unsatisfactory, faulty, or deficient in that they:

a. do not conform to or comply with the requirements of the Procurement Contract Documents;

b. do not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Procurement Contract Documents; or

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c. in the case of Special Services, have not been completed.

3. The word “receipt” when referring to the Goods, means the physical taking and possession by the Buyer under the conditions specified in Paragraph 9.02.B.2.

4. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

5. The word "furnish," when used in connection with the Goods and Special Services means to supply and deliver said Goods to the Point of Destination (or some other specified location) and to perform said Special Services fully, all in accordance with the Procurement Contract Documents.

C. *Procurement Contract Price or Procurement Contract Times*: References to a change in “Procurement Contract Price or Procurement Contract Times” or “Procurement Contract Times or Procurement Contract Price” or similar, indicate that such change applies to (1) Procurement Contract Price, (2) Procurement Contract Times, or (3) both Procurement Contract Price and Procurement Contract Times, as warranted, even if the term “or both” is not expressed.

D. Unless stated otherwise in the Procurement Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Procurement Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. When Seller delivers the executed counterparts of the Procurement Agreement to Buyer, the Seller also shall deliver to Buyer the performance bond and payment bond (if the Procurement Contract requires Seller to furnish such bonds).

B. *Evidence of Seller’s Insurance*: When Seller delivers the signed counterparts of the Procurement Agreement to Buyer, the Seller also shall deliver to Buyer, with copies to each additional insured (as identified in the Procurement Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Seller in accordance with Article 5. Evidence of insurance to be obtained at a later date, such as insurance relating to transit or storage of the Goods, will be provided to Buyer at the time of such insurance is obtained.

C. *Evidence of Buyer’s Insurance*: After receipt of the signed counterparts of the Procurement Agreement and all required bonds and insurance documentation, Buyer shall promptly deliver to Seller, with copies to each additional insured (as identified in the Procurement Contract), certificates and other evidence of insurance (if any) required to be provided by Buyer.

2.02 *Copies of Documents*

A. Buyer shall furnish to Seller four printed copies of the Procurement Contract (including one fully executed counterpart of the Procurement Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

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2.03 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Procurement Contract, the Buyer, Seller, and Engineer may send, and shall accept, Electronic Documents transmitted by Electronic Means.

B. If the Procurement Contract does not establish protocols for Electronic Means, then Buyer, Seller, and Engineer 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.

2.04 *Preliminary Schedules*

A. Within 15 days after the Effective Date of the Procurement Contract, Seller shall submit to Buyer and Engineer for timely review:

1. a progress schedule of activities, consistent with the Procurement Contract Times, including at a minimum, Shop Drawing and Sample submittals, tests, and deliveries as required by the Procurement Contract Documents.

a. The progress schedule will be acceptable to Buyer and Engineer if it provides an orderly progression of the Submittals, tests, and deliveries to completion within the specified Milestones of the Procurement Contract Times.

b. Such acceptance will not impose on Buyer or Engineer responsibility for the progress schedule, for sequencing, scheduling, or progress of Seller's performance of its obligations under the Procurement Contract, nor interfere with or relieve Seller from Seller's full responsibility therefor.

c. Such acceptance will not be deemed as an acknowledgment of the reasonableness and attainability of the schedule.

2. a preliminary schedule of Submittals.

B. No progress payment will be made to Seller until an acceptable progress schedule and acceptable schedule of Submittals are submitted to Buyer and Engineer (and other conditions applicable to progress payments are met).

2.05 *Preliminary Conference*

A. Within 20 days after the Procurement Contract Times start to run, a conference attended by Seller, Buyer, Engineer and others as appropriate will be held to establish a working understanding among the parties as to the Goods and Special Services and to discuss the schedules referred to in Paragraph 2.04.A, procedures for handling Shop Drawings and other Submittals, processing Applications for Payment, and maintaining required records.

2.06 *Safety*

A. Buyer and Seller shall comply with all applicable Laws and Regulations relating to the safety of persons or property, and to the protection of persons or property from damage, injury, or loss.

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B. When Seller's personnel, or the personnel of any subcontractor to Seller, are present at the Point of Destination or any work area or site controlled by Buyer, the Seller shall be responsible for the compliance by such personnel with any applicable requirements of Buyer's safety programs that are made known to Seller.

C. If Buyer or its representatives visit the Seller's manufacturing or storage facilities, for testing, inspection, or other purposes, Seller shall inform Buyer in advance of any safety preparations, standards, or programs with which Buyer and its representatives must comply.

ARTICLE 3—PROCUREMENT CONTRACT DOCUMENTS

3.01 *Intent*

A. The Procurement Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Procurement Contract Documents or from prevailing custom or trade usage as being required to produce or furnish the indicated Goods and Special Services will be provided, whether or not specifically called for, at no additional cost to Buyer.

C. Unless otherwise stated in the Procurement Contract Documents, if there is a discrepancy between the electronic or digital versions of the Procurement Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version will govern.

D. The Procurement Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Procurement Contract Documents, as provided in Paragraph 3.04.

F. Any provision or part of the Procurement 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 Buyer and Seller.

3.02 *Reference Standards*

A. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws and Regulations, whether such reference be specific or by implication, means the standard, specification, manual, code, or Laws and Regulations in effect at the time of opening of Bids (or on the Effective Date of the Procurement Agreement if there were no Bids), except as may be otherwise specifically stated in the Procurement Contract Documents.

B. 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 Buyer, Seller, or Engineer from those set forth in the part of the Procurement Contract Documents prepared by or for Engineer. No such provision or instruction will be effective to assign to Buyer or Engineer any duty or authority to supervise or direct the performance of Seller's obligations, or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Procurement Contract Documents prepared by or for Engineer.

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3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Seller's Review of Procurement Contract Documents*: If, before or during the performance of Seller's obligations, Seller discovers any conflict, error, ambiguity, or discrepancy within the Procurement Contract Documents, or between the Procurement 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 to Seller, then Seller shall promptly report it to Engineer (or if the Procurement Contract is assigned, then directly to Contractor/Assignee) in writing. Seller shall not proceed with the Goods and Special Services affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer (or if the Procurement Contract is assigned, then by Contractor/Assignee) or by an amendment or supplement to the Procurement Contract Documents issued pursuant to Article 11.

2. Seller shall not be liable to Buyer or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Procurement Contract Documents unless Seller had actual knowledge thereof.

B. *Resolving Discrepancies*: Except as may be otherwise specifically stated in the Procurement Contract Documents, the provisions of the Procurement Contract Documents will take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Procurement Contract Documents and:

1. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Procurement Contract Documents); or

2. the provisions of any Laws or Regulations applicable to the furnishing of the Goods and Special Services (unless such an interpretation of the provisions of the Procurement Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Procurement Drawings and Procurement Specifications*

A. During the performance of Seller's obligations and until final payment, Seller and Buyer shall submit to the Engineer all matters in question concerning the requirements of the Procurement Drawings and Procurement Specifications (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Goods and Special Services, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Procurement Drawings and Procurement Specifications, and judge of the acceptability of the Goods and Special Services thereunder.

1. After assignment (if any) Seller shall submit such matters directly to Contractor/Assignee for response or administration, and the Procurement Contract provisions in Paragraphs 3.04.B and C will not apply.

B. Engineer will issue with reasonable promptness a written clarification, interpretation, or decision on the issue submitted, and if necessary, initiate an amendment or supplement to the Procurement Drawings or Procurement Specifications. Engineer's written clarification, interpretation, or decision will be consistent with the overall intent of the Procurement Contract Documents, and will be final and binding on Seller and Buyer. If either Buyer or Seller believes that a written clarification or interpretation justifies an adjustment in the

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Procurement Contract Price or Procurement Contract Times, either may make a Claim for such adjustment as provided in Article 12.

C. If a submitted matter in question concerns terms and conditions of the Procurement Contract Documents that do not involve (1) the performance or acceptability of the Goods and Services, (2) the design (as set forth in the Procurement Drawings, Procurement Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Buyer and Seller that Engineer is unable to provide a decision or interpretation.

3.05 *Reuse of Documents*

A. Seller and its subcontractors and suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Procurement Drawings, Procurement Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Procurement Drawings, Procurement Specifications, other documents, or copies thereof, on extensions of the Project or any other project, without written consent of Buyer and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Procurement Contract Documents, reuse any such Procurement Contract Documents for any purpose without Buyer's express written consent, or violate any copyrights pertaining to such Procurement Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Procurement Contract. Nothing herein precludes Seller from retaining copies of the Procurement Contract Documents for record purposes.

ARTICLE 4—COMMENCEMENT AND SCHEDULE

4.01 *Commencement of Procurement Contract Times*

A. The Procurement Contract Times will commence to run on the Effective Date of the Procurement Contract.

4.02 *Continuing Performance*

A. Seller shall adhere to the progress schedule established in accordance with Paragraph 2.04.A., as duly adjusted, and the Goods will be delivered and the Special Services furnished within the Procurement Contract Times.

B. Seller shall carry on furnishing of the Goods and Special Services and adhere to the progress schedule during all disputes or disagreements with Buyer. No furnishing of Goods and Special Services will be delayed or postponed pending resolution of any disputes or disagreements, except as expressly permitted herein, or as Buyer and Seller may otherwise agree in writing.

4.03 *Adjustments to Progress Schedule*

A. The progress schedule established in accordance with Paragraph 2.04 may be adjusted from time to time as provided below.

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1. Seller shall submit to Buyer for acceptance (to the extent indicated in Paragraph 2.04) proposed adjustments in the progress schedule that will not result in changing the Procurement Contract Times. Such adjustments will comply with any applicable provisions of the Procurement Specifications.

2. Proposed adjustments in the progress schedule that will change the Procurement Contract Times must be submitted in accordance with the requirements of Article 11. Adjustments in Procurement Contract Times may only be made by a Change Order.

4.04 *Delays*

A. If Buyer, Engineer, or anyone for whom Buyer is responsible, delays, disrupts, or interferes with Seller's performance or progress, then Seller shall be entitled to an equitable adjustment in Procurement Contract Price or Procurement Contract Times.

B. Seller shall not be entitled to an adjustment in Procurement Contract Price or Procurement Contract Times for delay, disruption, or interference caused by or within the control of Seller or anyone for whom Seller is responsible.

C. If Seller's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Buyer, Seller, and those for which they are responsible, then Seller shall be entitled to an equitable adjustment in Procurement Contract Times. Such an adjustment will be Seller'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 Procurement 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. inspection delays by governmental authorities, and custom delays;

4. international shipping delays;

5. acts or failures to act of third-party entities; and

6. acts of war or terrorism.

D. *Adjustments of Procurement Contract Times or Procurement Contract Price—General Provisions*: Seller's entitlement to an adjustment of Procurement Contract Times or Procurement Contract Price is limited as follows:

1. Seller's entitlement to an adjustment of the Procurement Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of Seller's obligations, as of the time of the delay, disruption, or interference.

2. Seller shall not be entitled to an adjustment in Procurement 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 Seller. Such a concurrent delay by Seller does not preclude an adjustment of Procurement Contract Times to which Seller is otherwise entitled.

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3. Adjustments of Procurement Contract Times or Procurement Contract Price are subject to the provisions of Articles 11 and 12.

E. Each Seller request seeking a delay-related increase in Procurement Contract Times or Procurement 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 Seller's progress; (3) the date upon which each cause of delay, disruption, or interference ceased to affect Seller's progress; (4) the number of days' increase in Procurement Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and (5) the impact on Procurement Contract Price. Seller shall also furnish such additional supporting documentation as Buyer 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.

ARTICLE 5—BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. Seller shall furnish a performance bond and a payment bond, each in an amount at least equal to the Procurement Contract Price, as security for the faithful performance and payment of Seller's obligations under the Procurement 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 9.04, 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 Procurement Contract.

B. Seller shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Procurement Contract.

C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Buyer prior to execution of the Procurement 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. Seller 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 Seller is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Seller shall promptly notify Buyer and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements of this Procurement Contract.

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F. If Seller has failed to obtain a required bond, Buyer may exercise Buyer's termination rights under Article 14.

G. Upon request to Buyer from any subcontractor, supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of Seller's obligations, Buyer shall provide a copy of the payment bond to such person or entity.

H. Upon request to Seller from any subcontractor, supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of Seller's obligations, Seller shall provide a copy of the payment bond to such person or entity.

5.02 *Insurance*

A. Seller shall provide insurance of the types and coverages and in the amounts stipulated in the Supplementary Conditions.

B. Failure of Buyer to demand certificates of insurance or other evidence of Seller's full compliance with these insurance requirements or failure of Buyer to identify a deficiency in compliance from the evidence provided will not be construed as a waiver of Seller's obligation to maintain such insurance.

C. Upon assignment of this Procurement Contract, Seller shall name the Contractor/Assignee as an additional insured and comply with the written request of Contractor/Assignee to provide evidence of insurance.

D. Buyer does not represent that insurance coverage and limits established in this Procurement Contract necessarily will be adequate to protect Seller.

E. The insurance and insurance limits required herein will not be deemed as a limitation on Seller's liability under the indemnities and other rights granted to Buyer in the Procurement Contract.

5.03 *Surety or Insurance Companies*

A. All bonds and insurance required by the Procurement Contract Documents to be purchased and maintained by Buyer or Seller shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies must also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

ARTICLE 6—LICENSES AND FEES

6.01 *Intellectual Property and License Fees*

A. Except to the extent stated elsewhere in the Procurement Contract Documents, Seller is not transferring any patent rights, copyrights, or other intellectual property rights for the Goods delivered.

B. To the extent Seller is manufacturing to Buyer's design, Buyer retains all patent rights, copyrights, and other intellectual property rights in such design.

C. If an invention, design, process, product, or device is specified in the Procurement Contract Documents for incorporation in the Goods or for the performance of Special Services, and if, to the actual knowledge of Buyer or Engineer, its use is subject to patent rights, copyrights,

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or other intellectual property rights calling for the payment of a license fee or royalty to others, then the existence of such rights and payment obligations will be disclosed to Seller in the Procurement Contract Documents.

D. Seller shall pay all license fees and royalties and assume all costs incident to the use or the furnishing of the Goods, unless specified otherwise by the Procurement Contract Documents.

6.02 *Seller's Infringement*

A. Subject to Paragraph 6.01, to the fullest extent permitted by Laws and Regulations, Seller shall indemnify and hold harmless Buyer, Engineer, and their officers, directors, members, partners, employees, agents, consultants, contractors, and subcontractors, from and against all claims, costs, losses, damages, and judgments (including but not limited to all reasonable 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 or alleged infringement of any patent, copyright, or other intellectual property right by any of the Goods as delivered or Special Services as performed.

B. Buyer will promptly notify Seller in writing of any claim, suit, or threat of suit by a third party for any infringement or alleged infringement of any patent, copyright, or other intellectual property right with respect to the Goods as delivered or Special Services as performed.

C. Seller shall promptly defend or settle the claim or suit. Seller shall have control over such claim or suit, bear all expenses, and satisfy any adverse judgment.

1. If Seller fails to defend such suit or claim after written notice by Buyer, Seller will be bound, in any subsequent suit or claim against Seller by Buyer, by any factual determination in the prior suit or claim.

2. If Buyer fails to provide Seller the opportunity to defend such suit or claim, Buyer shall be barred from any remedy against Seller for such suit or claim.

D. If a determination is made that Seller has infringed upon the intellectual property rights of another, Seller may, at Seller's own expense, obtain the necessary licenses for Buyer's benefit, or replace the Goods and provide related design and construction, consistent with the requirements of the Procurement Contract Documents, to avoid the infringement.

6.03 *Buyer's Infringement*

A. Subject to Paragraph 6.01, and to the fullest extent permitted by Laws and Regulations, Buyer shall be responsible to Seller for any infringement or alleged infringement of any patent, copyright, or other intellectual property right caused by Seller's compliance with the Procurement Drawings or Procurement Specifications, and will reimburse Seller for any license fee or royalties paid by Seller to others if such payment resulted from any invention, design, process, product, or device specified to be furnished or performed in the Procurement Drawings or Procurement Specifications, but not identified as being subject to payment of such license fee or royalty.

B. Seller will promptly notify Buyer in writing of any claim, suit, or threat of suit by a third party for intellectual property infringement arising from Seller's compliance with the Procurement Drawings or Procurement Specifications.

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C. Buyer shall defend or settle the claim or suit. Buyer shall have control over such claim or suit, bear all expenses, and satisfy any adverse judgment.

1. If Buyer fails to defend such suit or claim after written notice by Seller, Buyer will be bound, in any subsequent suit or claim against Buyer by Seller, by any factual determination in the prior suit or claim.

2. If Seller fails to provide Buyer the opportunity to defend such suit or claim, Seller shall be barred from any remedy against Buyer for such suit or claim.

ARTICLE 7—SELLER'S RESPONSIBILITIES

7.01 *Performance of Obligations*

A. Seller shall be solely responsible for the means, methods, techniques, sequences, and procedures necessary to perform its obligations in accordance with the Procurement Contract Documents.

B. Seller shall supervise, inspect, and direct the furnishing of the Goods and Special Services competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform its obligations in accordance with the Procurement Contract Documents.

C. Seller shall coordinate the provision of Special Services to avoid or limit interference or disruption of other activities at the location where the Special Services are to occur, including but not limited to ongoing facility operations and construction activities.

7.02 *Labor, Materials and Equipment*

A. Seller shall provide competent, qualified and trained personnel in all aspects of its performance of the Procurement Contract.

B. All Goods, and all equipment and material incorporated into the Goods, must be as specified, and unless specified otherwise in the Procurement Contract Documents, must be:

1. new, and of good quality;

2. protected, assembled, connected, cleaned, and conditioned in accordance with the original manufacturer's instructions; and

3. shop-assembled to the greatest extent practicable.

7.03 *Laws and Regulations*

A. Seller shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of its obligations in accordance with the Procurement Contract Documents. Except where otherwise expressly required by such Laws and Regulations, neither Buyer nor Engineer shall be responsible for monitoring Seller's compliance with any Laws or Regulations.

B. If Seller furnishes Goods and Special Services knowing or having reason to know that such furnishing is contrary to Laws or Regulations, Seller shall bear 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 performance. It will not be Seller's responsibility to make certain

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that the Procurement Specifications and Procurement Drawings are in accordance with Laws and Regulations, but this provision will not relieve Seller of Seller's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Procurement Contract if there were no Bids) that have a direct effect on the cost or time of Seller's performance will be the subject of an adjustment in Procurement Contract Price or Procurement Contract Times. If Buyer and Seller are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Article 12.

7.04 *"Or Equals"*

A. Whenever an item of material or equipment to be incorporated into the Goods is specified or described in the Procurement Contract Documents by using the names of one or more proprietary items or specific suppliers or manufacturers, the specification or description 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, other items of material or equipment or material or equipment of other suppliers or manufacturers may be submitted to Buyer for Engineer's review.

1. If in Engineer's sole discretion, such an item of material or equipment proposed by Seller is functionally equal to that named and sufficiently similar so that no change in related work will be required, it may be considered by Engineer as an "or equal" item.

2. For the purposes of this paragraph, a proposed item of material or equipment may be considered functionally equal to an item so named only if in the exercise of reasonable judgment, Engineer determines that: 1) it is at least equal in quality, durability, appearance, strength, and design characteristics; 2) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole; 3) it has an acceptable record of performance and availability of responsive service; and (4) Seller certifies that if approved: a) there will be no increase in any cost, including capital, installation or operating costs, to Buyer; and b) the proposed item will conform substantially to the detailed requirements of the item named in the Procurement Contract Documents.

B. *Engineer's Evaluation*: Engineer will be allowed a reasonable time within which to evaluate each proposal or Submittal made pursuant to Paragraph 7.04.A. Engineer will be the sole judge of whether to accept or reject such a proposal or Submittal. No "or equal" will be ordered, manufactured or utilized until Engineer's review is complete, which will be evidenced by an approved Shop Drawing. Engineer will advise Buyer and Seller in writing of any negative determination. Notwithstanding Engineer's approval of an "or-equal" item, Seller shall remain obligated to comply with the requirements of the Procurement Contract Documents.

C. *Special Guarantee*: Buyer may require Seller to furnish at Seller's expense a special performance guarantee or other surety with respect to any such proposed "or-equal."

D. *Data*: Seller shall provide all data in support of any such proposed "or equal" at Seller's expense.

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7.05 *Taxes*

A. Seller shall pay all taxes and duties arising out of the sale of the Goods and the performance of Special Services. All taxes and duties are included in the Procurement Contract Price, except as noted in the Supplementary Conditions.

7.06 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Seller shall:

a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Procurement 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; and

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 Seller's obligations.

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 Seller has satisfied its obligations under the Procurement Contract Documents with respect to Seller's review of that Submittal, and that Seller approves the Submittal.

3. With each Shop Drawing or Sample, Seller shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Procurement Contract Documents. This notice will 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*: Seller 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. Seller shall submit the number of copies required in the Procurement 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 Seller proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.06.C.

2. *Samples*

a. Seller shall submit the number of Samples required in the Procurement Specifications.

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b. Seller 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 7.06.C.

3. Where a Shop Drawing or Sample is required by the Procurement Contract Documents or the Schedule of Submittals, any related work performed by Seller prior to Engineer's review and approval of the pertinent Submittal will be at the sole expense and responsibility of Seller.

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 Goods, comply with the requirements of the Procurement Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Procurement Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, manufacturing, fabrication, installation, or shipping, 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 Seller from responsibility for any variation from the requirements of the Procurement Contract Documents unless Seller has complied with the requirements of Paragraph 7.06.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 Procurement Contract Documents in a Field Order or other appropriate Procurement Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Seller from responsibility for complying with the requirements of Paragraphs 7.06.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Procurement Contract Documents, will not, under any circumstances, change the Procurement Contract Times or Procurement 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 Procurement Contract Document.

8. Seller shall furnish Goods that comply with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.06.C.4.

D. *Resubmittal Procedures for Shop Drawings and Samples*

1. Seller 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

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and approval. Seller shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.

2. Seller 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 Seller shall be responsible for Engineer's charges to Buyer for such time. Buyer may impose a set-off against payments due Seller to secure reimbursement for such charges.

3. If Seller requests a change of a previously approved Shop Drawing or Sample, Seller shall be responsible for Engineer's charges to Buyer for its review time, and Buyer may impose a set-off against payments due Seller to secure reimbursement for such charges, unless the need for such change is beyond the control of Seller.

E. *Submittals Other than Shop Drawings and Samples*

1. The following provisions apply to all Submittals other than Shop Drawings and Samples:

a. Seller shall submit all such Submittals to the Engineer in accordance with the schedule of Submittals and pursuant to the applicable terms of the Procurement 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 Procurement Contract Documents as to general form and content of the Submittal.

d. If any such Submittal is not accepted, Seller 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 2.04 and 2.05.

7.07 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Seller shall indemnify and hold harmless Buyer, Engineer, Project Owner, and any assignee of Buyer, including Contractor/Assignee, and their officers, directors, members, partners, employees, agents, consultants, contractors, 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 the performance of Seller's obligations under the Procurement Contract, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Goods themselves), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Seller, or any individual or entity directly or indirectly employed by Seller or anyone for whose acts Seller may be liable.

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B. In any and all claims against Buyer, Engineer, Project Owner, or any assignee of Buyer, including Contractor/Assignee, or their officers, directors, members, partners, employees, agents, consultants, contractors, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Seller, any subcontractor, any supplier, or any individual or entity directly or indirectly employed by any of them to furnish any of the Goods and Special Services, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.07.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 Seller or any such subcontractor, supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.08 *Concerning Subcontractors and Suppliers*

A. Seller may retain subcontractors and suppliers for the performance of parts of the furnishing of the Goods and Special Services. The Seller's retention of a subcontractor or supplier will not relieve Seller's obligation to Buyer to perform and complete the furnishing the Goods and Special Services in accordance with the Procurement Contract Documents.

ARTICLE 8—SHIPPING AND DELIVERY

8.01 *Shipping*

A. Seller shall select the carrier and bear all costs of packaging, transportation, insurance, special handling, and all other costs associated with shipment and delivery.

8.02 *Delivery*

A. Seller shall deliver the Goods free on board (FOB) to the Point of Destination, freight prepaid, in accordance with the Procurement Contract Times set forth in the Procurement Agreement, or other date agreed to by Buyer and Seller.

B. At least 10 days before shipment, Seller shall provide written notice to Buyer of the manner of shipment and the anticipated delivery date. The notice must also include any instructions concerning special equipment or services required at the Point of Destination to unload and care for the Goods. Seller shall also require the carrier to give Buyer at least 24 hours' notice by telephone prior to the anticipated time of delivery.

C. Buyer will be responsible and bear all costs for unloading the Goods from carrier.

D. Buyer will assure that adequate facilities are available to receive delivery of the Goods at the time established for delivery, or on another date agreed to by Buyer and Seller.

E. No partial deliveries will be allowed, unless permitted or required by the Procurement Contract Documents or agreed to in writing by Buyer.

F. Provisions governing inspection on delivery are set forth in Paragraph 9.02.

8.03 *Risk of Loss*

A. Risk of loss and insurable interests transfer from Seller to Buyer upon Buyer's receipt of the Goods.

B. Notwithstanding the provisions of Paragraph 8.03.A, if Buyer rejects the Goods as non-conforming, the risk of loss on such Goods will remain with Seller until Seller corrects the non-conformity or Buyer accepts the Goods. If rejected Goods remain at the Point of

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Destination pending modification and acceptance, then Seller shall be responsible for arranging adequate protection and maintenance of the Goods at Seller's expense.

ARTICLE 9—BUYER'S RIGHTS

9.01 *Seller's Warranties and Guarantees*

A. Seller warrants and guarantees to Buyer that the title to the Goods conveyed will be proper, its transfer rightful, and free from any security interest, lien, or other encumbrance. Seller shall defend, indemnify, and hold Buyer harmless against any liens, claims, or demands contesting or affecting title of the Goods conveyed.

B. Seller warrants and guarantees to Buyer that all Goods and Special Services will conform with the Procurement Contract Documents, and with the standards established by any Samples approved by Engineer. Engineer shall be entitled to rely on Seller's warranty and guarantee. If the Procurement Contract Documents do not otherwise specify the characteristics or the quality of the Goods, the Goods must comply with the requirements of Paragraph 7.02.B.

C. Seller's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, improper modification, improper maintenance, or improper operation by persons other than Seller;

2. excessive corrosion or chemical attack, unless corrosive or chemically-damaging conditions were disclosed by Buyer in the Procurement Contract Documents and the Procurement Contract Documents required the Goods to withstand such conditions;

3. use in a manner contrary to Seller's written instructions for installation, operation, and maintenance; or

4. normal wear and tear under normal usage.

D. Seller's obligation to furnish the Goods and Special Services in accordance with the Procurement Contract Documents will be absolute. None of the following will constitute an acceptance of Goods and Special Services that are non-conforming, or a release of Seller's obligation to furnish the Goods and Special Services in accordance with the Procurement Contract Documents:

1. observations by Buyer, Engineer, or Project Owner;

2. recommendation by Engineer or payment by Buyer of any progress or final payment;

3. use of the Goods by Buyer or Project Owner;

4. any acceptance by Buyer, Engineer, or Project Owner, or any failure to do so;

5. the end of the correction period established in Paragraph 9.04;

6. the issuance of a notice of acceptance;

7. any inspection, test or approval by others; or

8. any correction of non-conforming Goods and Special Services by Buyer or Project Owner.

E. Buyer shall promptly notify Seller of any breach of Seller's warranties or guarantees.

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9.02 *Inspections and Testing*

A. *General Provisions*

1. The Procurement Contract Documents specify required inspections and tests. Buyer shall have the right to perform, or cause to be performed, reasonable inspections and require reasonable tests of the Goods at Seller's facility, and at the Point of Destination. Seller shall allow Buyer a reasonable time to perform such inspections or tests.

2. Seller shall reimburse Buyer for all expenses, except for travel, lodging, and subsistence expenses of Buyer's and Engineer's representatives, for inspections and tests specified in the Procurement Contract Documents. If as the result of any such specified testing the Goods are determined to be non-conforming, then Seller shall also bear the travel, lodging, and subsistence expenses of Buyer's and Engineer's representatives, and all expenses of re-inspection or retesting.

3. Buyer shall bear all expenses of inspections and tests that are not specified in the Procurement Contract Documents (other than any re-inspection or retesting resulting from a determination of non-conformity, as set forth in Paragraph 9.03); provided, however, that if as the result of any such non-specified inspections or testing the Goods are determined to be non-conforming, then Seller shall bear all expenses of such inspections and testing, and of any necessary re-inspection and retesting.

4. Seller shall provide Buyer timely written notice of the readiness of the Goods for all inspections, tests, or approvals which the Procurement Contract Documents specify are to be observed by Buyer prior to shipment.

5. Buyer will give Seller timely notice of all specified tests, inspections, and approvals of the Goods which are to be conducted at the Point of Destination, and a representative of Seller will attend such tests, inspections, and approvals.

6. If, on the basis of inspections or testing, the Goods appear to be conforming, Buyer will give Seller prompt notice thereof. If on the basis of inspections or testing, the Goods appear to be non-conforming, Buyer will give Seller prompt notice thereof and will advise Seller of the remedy Buyer elects under the provisions of Paragraph 9.03.

7. Neither payments made by Buyer to Seller prior to any tests or inspections, nor any tests or inspections, will constitute acceptance of non-conforming Goods, or prejudice Buyer's rights under the Procurement Contract.

B. *Visual Inspection on Delivery*

1. Buyer will visually inspect the Goods upon delivery solely for purposes of identifying the Goods, general verification of quantities, and observation of apparent condition. Such visual inspection will not be construed as final or as receipt of any Goods and Special Services that, as a result of subsequent inspections and tests, are determined to be non-conforming.

2. If, on the basis of the visual inspection specified in Paragraph 9.02.B.1, the Goods appear to comply with the requirements of the Procurement Contract Documents as to quantities and condition, then within 10 days of delivery Buyer shall issue to Seller Buyer's acknowledgment of the receipt of Goods.

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C. *Final Inspection*

1. After all of the Goods have been incorporated into the Project, tested in accordance with such testing requirements as are specified, and are functioning as required, and Seller has performed and completed all Special Services, Buyer will make a final inspection.

2. If, on the basis of the final inspection, Buyer determines that the Goods and Special Services are conforming, Buyer's notice thereof will constitute Buyer's acceptance of the Goods and Special Services, subject to any limitations stated in the notice.

3. If, on the basis of the final inspection, the Goods and Special Services are non-conforming, Buyer will identify the non-conformity in writing.

9.03 *Non-Conforming Goods and Special Services*

A. If, on the basis of inspections and testing prior to delivery, the Goods and Special Services are found to be non-conforming, or if at any time after Buyer has acknowledged receipt of delivery and before the expiration of the correction period described in Paragraph 9.04, Buyer determines that the Goods and Special Services are non-conforming, then Seller shall promptly, without cost to Buyer and in response to written instructions from Buyer, either correct such non-conforming Goods and Special Services, or, if Goods are rejected by Buyer, remove and replace the non-conforming Goods with conforming Goods, including all work required for reinstallation.

B. *Buyer's Rejection of Non-Conforming Goods*

1. If Buyer elects to reject the Goods in whole or in part, Buyer's notice to Seller will describe in sufficient detail the non-conforming aspect of the Goods. If Goods have been delivered to Buyer, Seller shall promptly, and within the Procurement Contract Times, remove and replace the rejected Goods.

2. Seller shall bear all costs, losses and damages attributable to the removal, replacement, reinspection, and retesting of the non-conforming Goods.

3. Upon rejection of the Goods, Buyer retains a security interest in the Goods to the extent of any payments made and expenses incurred in their testing and inspection.

C. *Buyer's Rejection of Non-Conforming Special Services*

1. If at any time Buyer elects to reject the Special Services in whole or in part, Buyer's notice to Seller will describe in sufficient detail the non-conforming aspect of the Special Services.

2. Seller shall promptly provide conforming Special Services acceptable to Buyer.

3. If Seller fails to provide conforming Special Services, Buyer may remove the Special Services from the scope of the Procurement Contract, and equitably reduce the Procurement Contract Price.

D. *Remedying Non-Conforming Goods*: If Buyer elects to permit the Seller to modify the Goods to correct the non-conformance, then Seller shall promptly provide a schedule for such modifications and shall make the Goods conforming within a reasonable time.

E. *Buyer's Acceptance of Non-Conforming Goods*: Instead of requiring correction or removal and replacement of non-conforming Goods discovered either before or after final payment,

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Buyer may accept the non-conforming Goods. Seller shall bear all reasonable costs, losses, and damages attributable to Buyer's evaluation of and determination to accept such non-conforming Goods.

F. *Seller Obligations*: Seller shall pay all claims, costs, losses, and damages, including but not limited to all fees and charges for re-inspection, retesting and for any engineers, architects, attorneys and other professionals, and all court or arbitration or other dispute resolution costs arising out of or relating to the non-conforming Goods and Special Services. Seller's obligations will include the costs of the correction or removal and replacement of the non-conforming Goods and the replacement of property of Buyer and others destroyed by the correction or removal and replacement of the non-conforming Goods, and obtaining conforming Special Services from others.

G. *Buyer's Rejection of Conforming Goods*: If Buyer asserts that Goods and Special Services are non-conforming and such Goods and Special Services are determined to be conforming, or if Buyer rejects as non-conforming Goods and Special Services that are later determined to be conforming, then Seller shall be entitled to reimbursement from Buyer of costs incurred by Seller in inspecting, testing, correcting, removing, or replacing the conforming Goods and Special Services, including but not limited to fees and charges of engineers, architects, attorneys and other professionals, and all court or arbitration or other dispute resolution costs associated with the incorrect assertion of non-conformance or rejection of conforming Goods and Special Services.

9.04 *Correction Period*

A. Seller's responsibility for correcting all non-conformities in the Goods and Special Services will extend for a period of one year after the acceptance of the Goods and Special Services in accordance with Paragraph 9.02.C.2.

B. Where non-conforming Goods and Services (and damage to other work resulting therefrom) have been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Goods and Services will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

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

ARTICLE 10—ENGINEER'S STATUS

10.01 *Engineer's Role Defined*

A. Engineer will be Buyer's representative until assignment (if any) of the Procurement Contract.

B. The duties and responsibilities and the limitations of authority of Engineer prior to assignment, if any, of the Procurement Contract, are set forth in the Procurement Contract Documents.

C. Engineer's responsibilities, if any, after an assignment (if any) of the Procurement Contract, are set forth in the Procurement Agreement.

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10.02 *Duties and Responsibilities; Authority; Limitations*

A. As set forth in Article 3, Engineer will be the initial interpreter of the Procurement Contract Documents and judge of the acceptability of the Goods and Special Services, and will issue clarifications, interpretations, and decisions regarding such issues.

B. Acting on behalf of Buyer under the provisions of Article 9, Engineer has the authority to disapprove or reject Goods and Special Services that Engineer believes to be non-conforming. Engineer also has the authority to require special inspection or testing of the Goods or Special Services as provided in Paragraph 9.02, whether or not the Goods are fabricated or installed, or the Special Services are completed.

C. Engineer may authorize minor deviations or variations in the Procurement Contract Documents by: 1) written approval of specific variations set forth in Shop Drawings when Seller has duly noted such variations as required in Paragraph 7.06.A.3, or 2) a Field Order.

D. As set forth in Article 12, Engineer will review Claims, and render decisions on Claims.

E. In rendering any interpretations, clarifications, reviews, decisions, disapprovals, acceptances, rejections, authorizations, and judgments, Engineer will not show partiality to Buyer or Seller. Engineer will not be liable to Buyer, Seller, or others in connection with any interpretations, clarifications, reviews, decisions, disapprovals, acceptances, rejections, authorizations, or judgments conducted or rendered by Engineer in good faith.

F. Engineer will not supervise, direct, control, or have authority over or be responsible for the means, methods, techniques, sequences, or procedures used by Seller to perform its obligations under this Procurement Contract, or the safety precautions and programs incident thereto, or for any failure of Seller to comply with Laws and Regulations applicable to the performance of its obligations. Engineer will not be responsible for Seller's failure to furnish the Goods and Special Services in accordance with the Procurement Contract Documents.

ARTICLE 11—CHANGES

11.01 *Amending and Supplementing the Procurement Contract*

A. The Procurement Contract may be amended or supplemented by a Change Order, a Change Directive, or a Field Order.

B. If an amendment or supplement to the Procurement Contract includes a change in the Procurement Contract Price or the Procurement Contract Times, such amendment or supplement must be set forth in a Change Order.

C. All changes to the Procurement Contract that involve (1) the conformance or acceptability of the Goods and Special Services, (2) the design (as set forth in the Procurement Drawings, Procurement Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Buyer and Seller may amend other terms and conditions of the Procurement Contract without the recommendation of the Engineer.

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11.02 *Change Orders*

A. Buyer and Seller shall execute appropriate Change Orders covering:

1. Changes in Procurement Contract Price or Procurement Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Goods and Special Services furnished in accordance with a Change Directive;

2. Changes in Procurement Contract Price resulting from a Buyer set-off, unless Seller has duly contested such set-off;

3. Changes in the Goods and Special Services which are: (a) ordered by Buyer pursuant to Paragraph 11.05, (b) required because of Buyer's acceptance of non-conforming Goods and Services under Paragraph 9.03 or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Goods and Special Services involves the design (as set forth in the Procurement Drawings, Procurement 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 Change Directive; Article 12, Claims; and similar provisions.

B. If Buyer or Seller 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 *Change Directives*

A. A Change Directive will not change the Procurement Contract Price or the Procurement Contract Times but is evidence that the parties expect that the modification ordered or documented by a Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Change Directive's effect, if any, on the Procurement Contract Price and Procurement Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Procurement Contract Documents governing adjustments, expressly including Paragraph 11.08 regarding change of Procurement Contract Price.

B. If Buyer has issued a Change Directive and Buyer or Seller believes that an adjustment in Procurement Contract Times or Procurement Contract Price is necessary, then such party shall submit a Claim seeking such an adjustment no later than 30 days after the completion of the Goods and Services set out in the Change Directive.

11.04 *Field Orders*

A. Engineer may authorize minor changes in the Goods and Services if the changes do not involve an adjustment in the Procurement Contract Price or the Procurement Contract Times and are compatible with the design concept as indicated by the Procurement Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Buyer and also on Seller, which shall perform the Goods and Special Services involved promptly.

B. If Seller believes that a Field Order justifies an adjustment in the Procurement Contract Price or Procurement Contract Times, then before proceeding with the Goods and Special Services at issue, Seller shall submit a Claim as provided herein.

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11.05 *Buyer-Authorized Changes in the Goods and Special Services*

A. Without invalidating the Procurement Contract and without notice to any surety, Buyer may, at any time or from time to time, order additions, deletions, or revisions in the Goods and Special Services. Changes involving the design (as set forth in the Procurement Drawings, Procurement Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.

B. Such changes in the Goods and Special Services may be accomplished by a Change Order, if Buyer and Seller have agreed as to the effect, if any, of the changes on Procurement Contract Times or Procurement Contract Price; or by a Change Directive. Upon receipt of any such document, Seller shall promptly proceed with the Goods and Special Services involved; or, in the case of a deletion in the Goods and Special Services, promptly cease activities with respect to such deletion. Added or revised Goods and Special Services must be performed under the applicable conditions of the Procurement Contract Documents.

11.06 *Buyer's Contingency Allowance*

A. The Buyer's Contingency Allowance, if any such is set forth in the Procurement Agreement, is for the sole use of Buyer to cover unanticipated costs.

B. If Buyer exercises its unilateral right to use all or a portion of the Buyer's Contingency Allowance, Buyer will issue a written directive that documents the costs to which the allowance is applied, Seller's entitlement to compensation, and the consequent reduction in such allowance.

C. Prior to final payment, the Total Price, as set forth in the Procurement Agreement, will be duly adjusted to account for any unused portion of the Buyer's Contingency Allowance.

D. The Procurement Agreement, Article 5, addresses the impact on Buyer's Contingency Allowance of an assignment of the Procurement Contract.

11.07 *Unauthorized Changes in the Goods and Special Services*

A. Seller shall not be entitled to an increase in the Procurement Contract Price or an extension of the Procurement Contract Times with respect to any work performed that is not required by the Procurement Contract Documents, as amended, modified, or supplemented.

11.08 *Change of Procurement Contract Price*

A. The Procurement Contract Price may only be changed by a Change Order. Any Claim for an adjustment of Procurement Contract Price must comply with the provisions of Article 12.

B. An adjustment in the Procurement Contract Price will be determined as follows:

1. For changes in Unit Price Goods and Special Services, by application of the unit prices to the quantities of the items involved;

2. To the extent the cost of the change is not covered by unit prices, then by a mutually agreed lump sum; or

3. To the extent the cost of the change is not covered by unit prices and the parties do not reach mutual agreement to a lump sum, then on the basis of documented costs plus a Seller's fee for overhead and profit of 15%.

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11.09 *Change of Procurement Contract Times*

A. The Procurement Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Procurement Contract Times must comply with the provisions of Article 12.

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 Goods and Special Services or the provisions of the Procurement Contract (including, but not limited to, Procurement Contract Price or Procurement Contract Times), the giving of any such notice will be Seller's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS, DISPUTES, AND DISPUTE RESOLUTION

12.01 *Claims*

A. The parties agree to endeavor to avoid or resolve Claims through direct, good faith discussions and negotiations whenever practicable. Such discussions and negotiations should at the outset address whether the parties mutually agree to suspend the Claims process, including the time periods established in this Paragraph 12.01; if so, a written record of such mutual agreement should be made and jointly executed.

B. Claimant shall deliver to Engineer and the other party to the Procurement Contract written notice of each Claim within 15 days after the occurrence of the event giving rise to the Claim.

C. Claimant shall deliver written supporting data to Engineer and the other party within 45 days after such occurrence unless Engineer allows an additional period of time.

D. Engineer will review each such Claim and render a decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.

E. If Engineer does not render a formal written decision on a Claim within the time stated in Paragraph 12.01.D., Engineer shall be deemed to have issued a decision denying the Claim in its entirety 31 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.

F. The rendering of a decision by Engineer pursuant to this Paragraph 12.01 with respect to any such Claim, dispute, or other matter (except any which have been waived by the making or acceptance of final payment) will be a condition precedent to any exercise by Buyer or Seller of such rights or remedies as either may otherwise have under the Procurement Contract Documents or by Laws or Regulations in respect of any such Claim, dispute, or other matter. If the exercise of such rights or remedies will imminently be time-barred, a party may take actions necessary to preserve such rights and remedies notwithstanding the lack of the condition precedent referred to in this paragraph.

G. If a submitted matter in question concerns terms and conditions of the Procurement Contract Documents that do not involve (1) the performance or acceptability of Goods and Special Services under the Procurement Contract Documents, (2) the design (as set forth in the Procurement Drawings, Procurement Specifications, Addenda, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Buyer and Seller that Engineer is unable to provide a decision or interpretation. If Buyer and Seller

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are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Paragraph 12.02.

H. Engineer's written decision on such Claim or a decision denying the Claim in its entirety that is deemed to have been issued pursuant to Paragraph 12.01, will be final and binding upon Buyer and Seller 30 days after it is issued unless within 30 days of issuance Buyer or Seller appeals Engineer's decision by initiating the mediation of such Claim in accordance with the dispute resolution procedures set forth in Paragraph 12.02.

I. If Article 12 has been amended to delete the mediation requirement, then Buyer or Seller may appeal Engineer's decision within 30 days of issuance by following the alternative dispute resolution process set forth in Article 12, as amended; or if no such alternative dispute resolution process has been set forth, Buyer or Seller may appeal Engineer's decision by 1) delivering to the other party within 30 days of the date of such decision a written notice of intent to submit the Claim to a court of competent jurisdiction, and 2) within 60 days after the date of such decision instituting a formal proceeding in a court of competent jurisdiction.

J. No Claim for an adjustment in Procurement Contract Price or Procurement Contract Times will be valid if not submitted in accordance with Article 12.

K. The effect on Claims of an assignment of the Procurement Contract by Buyer to a Contractor/Assignee is addressed in the Procurement Agreement, Article 5.

12.02 *Dispute Resolution Method*

A. Either Buyer or Seller may initiate the mediation of (1) any Claim decided in writing by Engineer under Paragraph 12.01 before such decision becomes final and binding, or (2) any other dispute between the parties, including but not limited to any dispute arising after final inspection of the Goods and Services. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Procurement Contract. The request for mediation must be submitted in writing to the American Arbitration Association and the other party to the Procurement Contract. Timely submission of the request will stay Engineer's decision from becoming final and binding.

B. Mediation is a condition precedent to seeking final dispute resolution under Paragraph 12.02.C. Buyer and Seller shall participate in the mediation process in good faith. The process must be concluded within 60 days of filing of the request. The date of termination of the mediation will be determined by application of the mediation rules referenced above.

C. If the mediation process does not result in resolution of the dispute, then Engineer's written Claim decision under Paragraph 12.01.D or a Claim denial pursuant to Paragraph 12.01.E becomes final and binding, or if applicable such other dispute is deemed resolved in favor of respondent, unless, within 30 days after termination of the mediation, Buyer or Seller:

1. elects in writing to invoke any final dispute resolution process provided for in the Supplementary Conditions, or

2. agrees with the other party to submit the Claim or dispute to another final dispute resolution process, or

3. if no final dispute resolution process has been provided for in the Supplementary Conditions, delivers to the other party written notice of the intent to submit the Claim

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or dispute to a court of competent jurisdiction, and within 60 days of the termination of the mediation institutes such formal proceeding.

ARTICLE 13—PAYMENT

13.01 *Applications for Progress Payments*

A. Seller shall submit to Buyer for Engineer's review Applications for Payment filled out and signed by Seller and accompanied by such supporting documentation as is required by the Procurement Contract Documents and also as Buyer or Engineer may reasonably require.

B. The timing and amounts of progress payments will be as stipulated in the Procurement Agreement.

C. Any Application for Payment that is based in whole or in part on the delivery of Goods must be accompanied by a bill of sale, invoice, or other documentation reasonably satisfactory to Buyer warranting that Buyer has rightfully received good title to the Goods from Seller and that, upon payment, the Goods will be free and clear of all liens. Such documentation will include releases and waivers from all parties with viable lien rights.

D. Buyer shall notify Seller promptly of any deficiency in the required documentation.

13.02 *Review of Applications for Progress Payments*

A. *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 Buyer, or return the Application to Seller indicating in writing Engineer's reasons for refusing to recommend payment.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Buyer, based on Engineer's observations of Seller's progress, 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 Goods and Special Services or other obligations of Seller have progressed to the point indicated;

b. the quality of the Goods and Special Services or other obligations of Seller are generally in accordance with the Procurement Contract Documents; and

c. the conditions precedent to Seller being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Seller's progress.

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 Goods and Special Services or other obligations of Seller have been exhaustive, extended to every aspect of the Goods and Special Services or other obligations of Seller in progress, or involved detailed inspections of the Goods and Special Services or other

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obligations of Seller beyond the responsibilities specifically assigned to Engineer in the Procurement Contract; or

b. there may not be other matters or issues between the parties that might entitle Seller to be paid additionally by Buyer, or entitle Buyer to withhold payment to Seller.

4. Neither Engineer's review of Seller's progress 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 Seller's performance or furnishing of Goods and Special Services or other obligations of Seller; or

b. for the means, methods, techniques, sequences, or procedures of construction, manufacturing, fabrication, installation, or shipping, or the safety precautions and programs incident thereto; or

c. for Seller's failure to comply with Laws and Regulations applicable to Seller's performance under the Procurement Contract; or

d. to make any examination to ascertain how or for what purposes Seller has used the money paid for the Procurement Contract Price; or

e. to determine that title to any of the Goods or component parts have passed to Buyer 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 Buyer stated in Paragraph 13.02.A.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Buyer from loss because:

a. the Goods and Services are non-conforming, requiring correction or replacement;

b. the Procurement Contract Price has been reduced by Change Orders;

c. Buyer has been required to correct non-conforming Goods and Special Services in accordance with Paragraph 9.03.C, or has accepted non-conforming Goods and Special Services pursuant to Paragraph 9.03.E; or

d. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Seller and therefore justify termination for cause under the Procurement Contract Documents.

13.03 *Basis and Amount of Progress Payments*

A. The basis and amounts of the progress payments will be as provided in the Procurement Agreement, subject to the provisions of this Article 13 regarding reductions in payment.

13.04 *Suspension of or Reduction in Payment*

A. Buyer may temporarily cease making progress payments, or reduce the amount of a progress payment, even though recommended for payment by Engineer, under the following circumstances:

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1. Buyer has reasonable grounds to conclude that Seller will not furnish the Goods or the Special Services in accordance with the Procurement Contract Documents, and

2. Buyer has requested in writing assurances from Seller that the Goods and Special Services will be delivered or furnished in accordance with the Procurement Contract Documents, and Seller has failed to provide adequate assurances within ten days of Buyer's written request.

3. In addition to any reductions in payment (set-offs) recommended by Engineer, Buyer is entitled to impose a set-off against payment based on any of the following:

    a. claims have been made against Buyer based on Seller's conduct in the performance or furnishing of the Goods and Special Services, or buyer has incurred costs, losses, or damages resulting from Seller's conduct in the performance or furnishing of the Goods and Special Services, 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. Seller has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Point of Destination or the worksite;

    c. Seller has failed to provide and maintain required bonds or insurance;

    d. Buyer 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;

    e. the Goods and Special Services are non-conforming, requiring correction or replacement;

    f. Buyer has been required to correct non-conforming Goods and Special Services, in accordance with Paragraph 9.03.C, or has accepted non-conforming Goods and Special Services pursuant to Paragraph 9.03.E;

    g. the Procurement Contract Price has been reduced by Change Orders;

    h. an event that would constitute a default by Seller and therefore justify a termination for cause has occurred;

    i. liquidated or other damages have accrued as a result of Seller's failure to achieve Milestones, Substantial Completion, or final completion of the Goods and Special Services; or

    j. liens have been filed in connection with the Procurement Contract, except where Seller has delivered a specific bond satisfactory to Buyer to secure the satisfaction and discharge of such liens.

B. If Buyer refuses to make payment of the full amount recommended by Engineer, Buyer will provide Seller and Engineer immediate written notice stating the reason for such action and promptly pay Seller any amount remaining after deduction of the amount withheld. Buyer shall promptly pay Seller the amount withheld when Seller corrects the reason for such action to Buyer's satisfaction.

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13.05 *Final Payment*

A. After Seller has corrected all non-conformities to the reasonable satisfaction of Buyer and Engineer and furnished all Special Services, Seller may submit its final Application for Payment following the procedures for progress payments.

B. The final Application for Payment will be accompanied by all documentation called for in the Procurement Contract Documents (including but not limited to all final operations and maintenance manuals, and any special warranties), a list of all unsettled Claims, and the written consent of surety to the making of final payment.

C. If, on the basis of final inspection and the review of the final Application for Payment and accompanying documentation, Engineer is reasonably satisfied that Seller has furnished the Goods and Special Services in accordance with the Procurement Contract Documents, and that Seller has fulfilled all other obligations under the Procurement Contract Documents, then Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment subject to the provisions of Paragraph 13.02, and present the final Application for Payment to Buyer. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Buyer from loss for the reasons stated in Paragraph 13.02.

D. If Engineer does not recommend final payment, Engineer will return the final Application for Payment to Seller, indicating the reasons for refusing to recommend final payment, in which case Seller shall make the necessary corrections and resubmit the final Application for Payment.

E. In support of its recommendation of final payment Engineer will also give written notice to Buyer and Seller that the Goods and Special Services are acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 13.06.

F. If the final Application for Payment and accompanying documentation are appropriate as to form and substance, Buyer shall, within 30 days after receipt thereof, pay Seller the amount recommended by Engineer, less any sum Buyer is entitled to set off against Engineer's recommendation, pursuant to the provisions of Paragraph 13.04.

G. Buyer will not make final payment, or return or release included retainage (if any) at any time, unless Seller submits written consent of the surety to such payment, return, or release.

13.06 *Waiver of Claims*

A. By making final payment, Buyer waives its claim or right to liquidated damages or other damages for late completion by Seller, except as set forth in an outstanding Claim, appeal, set-off, or express reservation of rights by Buyer. Buyer reserves all other claims or rights after final payment.

B. The acceptance of final payment by Seller will constitute a waiver by Seller of all claims and rights against Buyer other than those pending matters that have been duly submitted or appealed under the provisions of Article 12.

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ARTICLE 14—CANCELLATION, SUSPENSION, AND TERMINATION

14.01 *Cancellation*

A. Buyer has the right to cancel the Procurement Contract, without cause, at any time prior to delivery of the Goods by written notice. Cancellation pursuant to the terms of this paragraph will not constitute a breach of contract by Buyer. Upon cancellation:

1. Buyer shall pay Seller for the direct costs incurred in producing any Goods that Seller has specially manufactured for the Project, plus a fair and reasonable amount for overhead and profit.

2. For Goods that are not specially manufactured for the Project, Seller shall be entitled to a restocking charge of 10 percent of the unpaid Procurement Contract Price of such Goods.

14.02 *Suspension of Performance by Buyer*

A. Buyer has the right to suspend performance of the Procurement Contract for up to 90 days, without cause, by written notice. Upon suspension under this paragraph, Seller shall be entitled to an increase in the Procurement Contract Times and Procurement Contract Price caused by the suspension, provided that performance would not have been suspended or delayed for causes attributable to Seller.

14.03 *Suspension of Performance by Seller*

A. Seller may suspend the furnishing of the Goods and Special Services only under the following circumstance:

1. Seller has reasonable grounds to conclude that Buyer will not perform its future payment obligations under the Procurement Contract; and

2. Seller has requested in writing assurances from Buyer that future payments will be made in accordance with the Procurement Contract, and Buyer has failed to provide such assurances within ten days of Seller's written request.

14.04 *Breach and Termination*

A. *Buyer's Breach*

1. Seller shall have the right to terminate the Procurement Contract for cause by declaring a breach if Buyer fails to comply with any material provision of the Procurement Contract. Upon termination, Seller shall be entitled to all remedies provided by Laws and Regulations.

2. If Seller believes Buyer is in breach of its obligations under the Procurement Contract, Seller shall provide Buyer with reasonably prompt written notice setting forth in sufficient detail the reasons for declaring that it believes a breach has occurred. Buyer shall have 7 days from receipt of the written notice declaring the breach (or such longer period of time as Seller may grant in writing) within which to cure or to proceed diligently to cure such alleged breach.

B. *Seller's Breach*

1. Buyer may terminate Seller's right to perform the Procurement Contract for cause by declaring a breach should Seller fail to comply with any material provision of the

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Procurement Contract Documents. Upon termination, Buyer shall be entitled to all remedies provided by Laws and Regulations.

2. In the event Buyer believes Seller is in breach of its obligations under the Procurement Contract, Buyer shall provide Seller with reasonably prompt written notice setting forth in sufficient detail the reasons for declaring that it believes a breach has occurred. Seller shall have 7 days from receipt of the written notice declaring the breach (or such longer period of time as Buyer may grant in writing) within which to cure or to proceed diligently to cure such alleged breach.

3. If and to the extent that Seller has provided a performance bond under the provisions of Paragraph 5.01, the notice and cure procedures of that bond, if any, will supersede the notice and cure procedures of Paragraph 14.04.B.2.

ARTICLE 15—MISCELLANEOUS

15.01 *Giving Notice*

A. Whenever any provision of the Procurement Contract requires the giving of written notice to Buyer, Seller, or Engineer, it will be deemed to have been validly given 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.

15.02 *Controlling Law*

A. This Procurement Contract is to be governed by the law of the state in which the Goods are to be installed.

B. In the case of any conflict between the express terms of this Procurement Contract and the Uniform Commercial Code, as adopted in the state whose law governs, it is the intent of the parties that the express terms of this Procurement Contract will apply.

15.03 *Computation of Time*

A. When any period of time is referred to in the Procurement Contract by number of 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.

15.04 *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 Procurement Contract, and the provisions of this paragraph will be as effective as if repeated specifically in the Procurement Contract in connection with each particular duty, obligation, right, and remedy to which they apply.

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15.05 *Survival of Obligations*

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

15.06 *Entire Agreement*

A. Buyer and Seller agree that this Procurement Contract is the complete and final agreement between them, and supersedes all prior negotiations, representations, or agreements, either written or oral. This Procurement Contract may not be altered, modified, or amended except in writing signed by an authorized representative of both parties.

15.07 *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 Procurement Contract.

15.08 *Headings*

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

15.09 *Successors and Assigns*

A. Buyer and Seller each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Procurement Contract.

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SUPPLEMENTARY CONDITIONS OF THE PROCUREMENT CONTRACT

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SUPPLEMENTARY CONDITIONS OF THE PROCUREMENT CONTRACT

These Supplementary Conditions amend or supplement EJCDC® P-700, Standard General Conditions of the Procurement Contract (2019). The General Conditions remain in full force and effect except as amended.

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.

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—for example, “Paragraph SC-4.05.”

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

SC-1.01.A.5 Add the following at the end of the Paragraph:

For the purposes of Rural Development, this term is synonymous with the term “applicant” as defined in 7 CFR 1780.7 (a) (1), (2) and (3) and is an entity receiving financial assistance from the federal programs.

SC-1.01.A.7 Add the following at the end of the Paragraph:

The Change Order form to be used on this Project is EJCDC C-941 (2018). Agency approval is required before Change Orders are effective.

SC-1.01.A.41 Add the following new paragraph immediately after Paragraph 1.01.A.40:

41. Agency - The Project is financed in whole or in part by USDA Rural Utilities Service pursuant to the Consolidated Farm and Rural Development Act (7 USC Section 1921 et seq.). The Rural Utilities Service programs are administered through the USDA Rural Development offices; therefore, the Agency for these documents is USDA Rural Development.

SC-1.01.A.42 Add the following new paragraph immediately after Paragraph 1.01.A.41:

42. Domestic Preference Definitions:

42.a - Build America, Buy America Act (BABAA) – Requirements mandated by Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§

70901-70953-58 mandating domestic preference that all iron and steel, manufactured products, and construction materials are produced in the United States, in accordance with 2 CFR part 184.

42.b - Construction Materials – Those articles, materials, or supplies — other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives— that are or consist primarily of: non-ferrous metals, plastic and polymer- based products, glass, lumber or drywall.

42.c - Contractor’s Certification – A certification submitted by Contractor that, to the best of the Contractor’s knowledge and belief, all Work complies with Domestic Preference requirements.

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42.d - De Minimis – Materials and products that represent a small portion of an infrastructure project, specifically no more than 5% of the project costs up to a maximum of $1,000,000.

42.e - Domestic Preference – The Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953.

42.f - Engineer's Certification – Documentation submitted by the Engineer that Drawings, Specifications, and Bidding Documents comply with Domestic Preference requirements.

42.g - Manufactured Product – Items assembled out of components, or otherwise made or processed from raw materials into finished products. Manufactured products must be manufactured (assembled) in the United States, and the cost of components that were mined, produced, or manufactured in the United States must be greater than 55 percent of the total cost of all components of the product.

42.h - Manufacturer's Certification – Documentation provided by the Manufacturer stating that Domestic Preference requirements have been satisfied for all provided items. Manufacturers' Certifications must include (at a minimum): specific list of products (using common names) associated with the certificate, location of the final manufacturing, signature of the manufacturer's representative, and a reference to the Domestic Preference statute. If items are purchased via a Supplier, distributor, vendor, etc. from the Manufacturer directly, then the Supplier, distributor, vendor, etc. will be responsible for obtaining and providing these certifications to the parties purchasing the products.

42.i - Minor Components - Components within an iron and/or steel product otherwise compliant with the Domestic Preference requirements. This waiver, typically used by Manufacturers, allows use of non-domestically produced miscellaneous Minor Components comprising up to five percent of the total material cost of an otherwise domestically produced iron and steel product. However, unless a separate waiver for a product has been approved, all other iron and steel components in said product must still meet the Domestic Preference requirements. This waiver does not exempt the whole product from the Domestic Preference requirements only Minor Components within said product and the iron or steel components of the product must be produced domestically.

42.j - Primarily Iron or Steel - A product is made of greater than 50 percent iron or Steel on a materials cost basis. Construction Materials - Those articles, materials, or supplies made primarily of iron and/or steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered "structural steel". Note: Mechanical and electrical components, equipment and systems are not considered Construction Materials. See definitions of Mechanical Equipment and Electrical Equipment.

ARTICLE 2—PRELIMINARY MATTERS

SC-2.02.A – Delete "four" and insert in its place "five."

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ARTICLE 3—PROCUREMENT CONTRACT DOCUMENTS

No Supplementary Conditions in this Article.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF WORK

No Supplementary Conditions in this Article.

ARTICLE 5—BONDS AND INSURANCE

SC-5.02 Add the following new paragraphs immediately after Paragraph 5.02.E:

F. Seller shall purchase and maintain such liability and other insurance as is appropriate for the furnishing of Goods and Special Services and as will provide protection from claims set forth below which may arise out of or result from Seller's furnishing of the Goods or Special Services and Seller's other obligations under the Procurement Contract Documents, whether the furnishing of Goods and Special Services or other obligations are to be performed by Seller, any subcontractor or supplier, or by anyone directly or indirectly employed by any of them to furnish the Goods and Special Services, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Seller's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Seller's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained: (a) by any person as a result of an offense directly or indirectly related to the employment of such person by Seller, or (b) by any other person for any other reason;

5. claims for damages, other than to the Goods, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

G. The policies of insurance so required by this Paragraph 5.02 to be purchased and maintained must:

1. with respect to insurance required by Paragraphs SC-5.02.F.3 through SC-5.02.F.6 inclusive, include as additional insureds (subject to any customary exclusion in respect of professional liability):

a. The City of Aumsville, Oregon.

b. Westech Engineering, Inc.

c. all of whom must be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of all such additional insureds, and the

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insurance afforded to these additional insureds must provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided below or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering Seller's indemnity obligations under Paragraph 7.07;

5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused, until at least 30 days prior written notice has been given to the purchasing policyholder and to each other additional insured identified in these Supplementary Conditions.

6. remain in effect at least until final payment and at all times thereafter when Seller may be correcting, removing, or replacing non-conforming Goods in accordance with Paragraph 9.03 and 9.04; and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment (and Seller shall furnish Buyer and each other additional insured identified in these Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Buyer and any such additional insured of continuation of such insurance at final payment and one year thereafter).

H. The limits of liability for the insurance required by Paragraph SC-5.02.F must provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages under Paragraphs SC-5.02.F.1 and F.2:

a.	State:	Statutory
b.	Applicable Federal (e.g., Longshoremen's)	Statutory
c.	Employer's Liability	$500,000

d. In accordance with ORS 279B.230, Contractor shall promptly, as due, make payment to any entity furnishing care incident to sickness or injury, to employees of Contractor, of all sums which Contractor agrees to pay for such care and all moneys which Contractor deducted from the wages of employees pursuant to any law, contract, or agreement for the purpose of providing or paying for such service.

e. Contractor and Subcontractors that employ workers who work under this Contract in the State of Oregon shall comply with ORS 656.017 and provide required Workers' Compensation coverage, unless such employers are exempt under ORS 656.126. Contractor shall ensure that each of its Subcontractors complies with these requirements.

2. Seller's General Liability under Paragraphs SC-5.02.F.3 through F.6 which must include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody and control of Seller:

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a. Each Occurrence (Bodily Injury and Property Damage) $1,000,000

b. Medical Expense (any one person) $10,000

c. Personal and Advertising Injury $1,000,000

d. General Aggregate $2,000,000

e. Products & Completed Operations Aggregate $2,000,000

f. Property Damage liability insurance shall NOT exclude Explosion, Collapse, and Underground (XCU) coverages (no XCU exclusion), with the exception that exclusions for blasting operations are acceptable for insurance covering projects which do not include or allow blasting.

g. Excess or Umbrella Liability

1) General Aggregate $2,000,000

2) Each Occurrence $2,000,000

3. Automobile Liability under Paragraph SC-5.02.F.6:

a. Bodily Injury

1) Each Person $1,000,000

2) Each Accident $1,000,000

b. Property Damage

1) Each Accident $1,000,000

2) Combined Single Limit of $1,000,000

c. If each of the categories listed above does not include the full listed limits, the umbrella coverage shall be increased to $8,000,000 and include coverage for all auto categories.

I. Seller shall deliver to Buyer, with copies to each additional insured identified in these Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Buyer or any other additional insured) which Seller is required to purchase and maintain. Certificates of insurance shall be delivered to the City within 10 days after the award of the Procurement Agreement.

ARTICLE 6—LICENSES AND FEES

SC-6.02.A Delete this paragraph and replace with the following paragraph.

A. Subject to Paragraph 6.01, to the fullest extent permitted by Laws and Regulations, Seller shall indemnify, defend, and hold harmless Buyer, Engineer, and their officers, directors, members, partners, employees, agents, consultants, contractors, and subcontractors, from and against all claims, costs, losses, damages, and judgments (including but not limited to all reasonable 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 or alleged infringement of any patent, copyright, or other intellectual property

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right by any of the Goods, including materials or any part thereof, as delivered or Special Services as performed.

ARTICLE 7—SELLER'S RESPONSIBILITIES

SC-7.03.A.1 Add the following paragraph after Paragraph 7.03A

1) While not intended to be inclusive of all Laws and Regulations for which Seller may be responsible under paragraph 7.03, the following Laws or Regulations are included as mandated: Oregon Revised Statutes 279.

2) Seller shall comply with the public contracting requirements set forth in Exhibit A to the Supplementary Conditions of the Contract.

SC-7.02.C Add the following new paragraph immediately after Paragraph 7.02.B:

All Materials and products incorporated into the Work shall meet the Domestic Preference requirements.

SC-7.04.A Amend the second sentence of paragraph by striking out the following words

Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item is permitted,

SC-7.04.A.2 Amend the first sentence of Paragraph by deleting the following:

"it has an acceptable record of performance and availability of responsive service; 4)"

SC-7.04.D Add the following at the end of paragraph:

"Seller shall include a Manufacturer's Certification letter for compliance with Domestic Preference requirements, if applicable. Refer to Manufacturer's Certification Letter provided in these Contract Documents."

SC-7.06.A.1.c Amend paragraph by deleting the last period and adding:

", including Manufacturer's Certification letter for any item in the submittal subject to Domestic Preference requirements. Refer to Manufacturer's Certification Letter provided in these Contract Documents."

SC-7.06.C.9 Add new paragraph immediately after Paragraph 7.06.C.8:

9.Engineer's review and approval of a Shop Drawing or Sample shall include review of Manufacturers' Certifications in order to document compliance with Domestic Preference requirements, as applicable.

SC-7.07.A Delete this paragraph and replace with the following paragraph.

A. To the fullest extent permitted by Laws and Regulations, Seller shall indemnify, defend, and hold harmless Buyer, Engineer, Project Owner, and any assignee of Buyer, including Contractor/Assignee, and their officers, directors, members, partners, employees, agents, consultants, contractors, 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 the performance of Seller's obligations under the Procurement Contract, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness,

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disease, or death, or to injury to or destruction of property, including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Seller, or any individual or entity directly or indirectly employed by Seller or anyone for whose acts Seller may be liable.

SC-7.08.A Amend by adding the following to the end of the paragraph:

The total amount of work subcontracted by the Seller shall not exceed fifty percent of the Procurement Contract price without prior approval from the Owner, Engineer and Agency.

ARTICLE 8—SHIPPING AND DELIVERY

SC-8.02.A Delete this paragraph and replace with the following paragraph

A. Seller shall deliver the Goods free on board (FOB) to the Point of Destination, freight and insurance prepaid, in accordance with the Procurement Contract Times set forth in the Procurement Agreement, or other date agreed to by Buyer and Seller.

ARTICLE 9—BUYER'S RIGHTS

SC-9.01.F Add new paragraph immediately after Paragraph 9.01.E:

F. Seller shall certify prior to final payment that all Work and Materials have complied with Domestic Preference requirements. Seller shall provide Certification to Owner and Engineer. Refer to the Sample Language for Contractor's Certification provided in these Contract Documents.

SC-9.01.G Add new paragraph immediately after Paragraph 9.01F:

G. Seller warrants the Goods to be free from defects in materials and workmanship under normal use and service for a period of one year from the date that Substantial Completion is issued to the General Construction Contractor. The Goods shall be warranted to meet all functional and performance requirements. The above provisions do not in any way limit the guarantees on any items for which a longer guarantee is specified or on any items for which a manufacturer gives a guarantee for a longer period. Seller shall furnish to Buyer all appropriate guarantee or warranty certificates as indicated in the Procurement Specifications or upon request by Buyer.

SC-9.01.H Add new paragraph immediately after Paragraph 9.01G:

H. Notwithstanding any express warranties provided elsewhere, the implied warranties of merchantability and of fitness for a particular purpose are applicable and shall not be deemed to be excluded or modified, and Seller may not exclude or modify them. Goods provided shall also be covered by any additional warranty customarily provided by Seller or by the manufacturer of the Goods.

SC-9.03.A.1 Add new Paragraph 9.03.A.1 immediately after Paragraph 9.03.A:

1. Goods that are non-compliant with Domestic Preference requirements are considered non-conforming.

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ARTICLE 10—ENGINEER'S STATUS

No Supplementary Conditions in this Article.

ARTICLE 11—CHANGES

SC-11.02.C Add new paragraph immediately after Paragraph 11.02.B:

C. The Buyer shall contact the Agency for concurrence on each Change Order prior to issuance. All Contract Change Orders must be concurred on (signed) by Agency before they are effective.

ARTICLE 12—CLAIMS, DISPUTES, AND DISPUTE RESOLUTION

No Supplementary Conditions in this Article.

ARTICLE 13—PAYMENT

SC-13.01.E Add new paragraph immediately after Paragraph 13.01.D:

E. The Application for Payment form to be used on this Project is EJCDC® C-620. The Agency must approve all Applications for Payment before payment is made.

SC-13.01.F Add new paragraph immediately after Paragraph 13.01.E:

F. By submitting an Application for Payment based in whole or in part on furnishing equipment or materials, Seller certifies that such equipment and materials are compliant with Domestic Preference requirements. Manufacturer's Certification letter for materials satisfy this requirement. Refer to Manufacturer's Certification Letter provided in these Contract Documents.

SC-13.02.A.2.d Add the following new paragraph immediately after Paragraph 13.02.A.2.c:

d. The materials presented for payment in an Application for Payment comply with Domestic Preference requirements.

SC-13.05.G Add the following language at the end of paragraph:

No payments will be made that would deplete the retainage, place in escrow any funds that are required for retainage or invest the retainage for the benefit of the Contractor.

ARTICLE 14—CANCELLATION, SUSPENSION, AND TERMINATION

No suggested Supplementary Conditions in this Article.

ARTICLE 15—MISCELLANEOUS

SC-15.10 Add new paragraph immediately after Paragraph 15.09:

15.10 Tribal Sovereignty

A. No provision of this Agreement will be construed by any of the signatories as abridging or debilitating any sovereign powers of the [insert name of Tribe] Tribe; affecting the trust-beneficiary relationship between the Secretary of the Interior, Tribe, and Indian

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landowner(s); or interfering with the government- to-government relationship between the United States and the Tribe.

SC-16 – Add the following new Article 16 immediately after Article 15:

ARTICLE 16—FEDERAL REQUIREMENTS

16.01 Agency Not a Party

A. This Contract is expected to be funded in part with funds provided by Agency. Neither Agency, nor any of its departments, entities, or employees, is a party to this Contract.

16.02 Procurement Contract Approval

A. Buyer and Seller will furnish Buyer's attorney such evidence as required so that Buyer's attorney can complete and execute the "Certificate of Owner's Attorney and Agency Concurrence" (Exhibit A, Attachment 1 of RUS Bulletin 1780-26) before Buyer submits the executed Procurement Contract Documents to Agency for approval.

B. Agency concurrence is required on both the Bid and the Procurement Contract before the Procurement Contract is effective.

16.03 Conflict of Interest

A. Seller may not knowingly Procurement Contract with a Supplier or Manufacturer if the individual or entity who prepared the Drawings and Specifications has a corporate or financial affiliation with the Supplier or Manufacturer. Buyer's officers, employees, or agents shall not engage in the award or administration of this Procurement Contract if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest or other interest in or a tangible personal benefit from the Seller. Buyer's officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Seller or subcontractors.

16.04 Gratuities

A. If Buyer finds after a notice and hearing that Seller, or any of Seller's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of Buyer or Agency in an attempt to secure this Procurement Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Procurement Contract, Buyer may, by written notice to Seller, terminate this Procurement Contract. Buyer may also pursue other rights and remedies that the law or this Procurement Contract provides. However, the existence of the facts on which Buyer bases such findings shall be an issue and may be reviewed in proceedings under the dispute resolution provisions of this Contract.

B. In the event this Procurement Contract is terminated as provided in paragraph 16.04.A, Buyer may pursue the same remedies against Seller as it could pursue in the event of a breach of this Procurement Contract by Seller. As a penalty, in addition to any other damages to which it may be entitled by law, Buyer may pursue exemplary damages in an amount (as determined by Buyer) which shall not be less than three nor more than ten

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times the cost Seller incurs in providing any such gratuities to any such officer or employee.

16.05 Small, Minority and Women's Businesses

A. If Seller intends to let any subcontracts for a portion of the work, Seller will take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible. Affirmative steps will include:

1. Placing qualified small and minority businesses and women's business enterprises on solicitation lists;

2. Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;

3. Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;

4. Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;

5. Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce.

16.06 Anti-Kickback

A. Seller shall comply with the Copeland Anti-Kickback Act (40 USC 3145) as supplemented by Department of Labor regulations (29 CFR Part 3,

"Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States"). The Act provides that Seller or subcontractor shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public facilities, to give up any part of the compensation to which they are otherwise entitled. Buyer shall report all suspected or reported violations to Agency.

16.07 Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended

A. Seller to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

16.08 Equal Employment Opportunity

A. The Procurement Contract is considered a federally assisted construction contract. Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of "federally assisted construction contract" in 41 CFR Part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR Part, 1964-1965

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Comp., p. 339), as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and implementing regulations at 41 CFR part 60, "Office of Federal Procurement Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."

16.09 Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)

A. Seller that applies or bid for an award exceeding $100,000 must file the required certification (RD Instruction 1940-Q Exhibit A-1). The Seller certifies to the Buyer and every subcontractor certifies to the Seller that it will not and has not used federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining the Procurement Contract if it is covered by 31 U.S.C. 1352. The Seller and every subcontractor must also disclose any lobbying with non-federal funds that takes place in connection with obtaining any federal award. Such disclosures are forwarded from tier to tier up to the Buyer. Necessary certification and disclosure forms shall be provided by Buyer.

16.10 Environmental Requirements

A. When constructing a Project involving trenching and/or other related earth excavations, Seller shall comply with the following environmental conditions:

1. Wetlands – When disposing of excess, spoil, or other Construction Materials on public or private property, Seller or subcontractor shall not fill in or otherwise convert wetlands.

2. Floodplains – When disposing of excess, spoil, or other Construction Materials on public or private property, Seller or subcontractor shall not fill in or otherwise convert 100-year floodplain areas (Standard Flood Hazard Area) delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, e.g., alluvial soils on NRCS Soil Survey Maps.

3. Historic Preservation – Buyer shall ensure that the seller and/or subcontractor maintains a copy of the following inadvertent discovery plan onsite for review:

4. Endangered Species – Seller or subcontractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Seller or subcontractor, Seller or subcontractor will immediately report this evidence to Buyer and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.

B. Mitigation Measures – The following environmental mitigation measures are required on this Project:

1. Buyer shall obtain and comply with all required County, State, and federal permits, including mitigations measures.

2. An Inadvertent Discovery Plan (IDP) must be "in place" before construction begins. If earth disturbing activities during project construction uncover cultural

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materials (i.e. Structural remains, historic artifacts, or prehistoric artifacts), the area around the discovery shall be secured, all work shall cease, and the appropriate authorities shall be contacted to discuss appropriate protocol for removal, inventory, and proper preservation of the resource(s). These authorities are: 1) RD State Environmental Coordinator (SEC) Brian Daily, at (503) 801-2689; 2) the Oregon State Historic Preservation Office Archaeologist, Jamie French, at (503) 979-7580. The RD SEC will notify any applicable tribal contacts.

3. If earth disturbing activities in any portion of the project area uncover human remains, all work shall cease immediately in accordance with Treatment of Native American Human Remains Discovered Inadvertently or through Criminal Investigations on Private and Public, State-Owned Lands in Oregon and ORS 97.740-.994 and 358.905-961. The area around the discovery shall be secured and the Morrow County Coroner and RD SEC shall be notified immediately. The RD SEC shall notify the State Archaeologist at SHPO and the appropriate tribes without delay.

4. Wetland areas, if identified, will be avoided during construction as much as possible. Best management practices (BMPs), such as the placement of silt fencing and appropriate buffering, will be used in proposed project areas located near wetland areas, and disturbed areas will be restored following construction. If any staging or additional grading is required for the wastewater improvements, within the inventoried wetlands areas along Johnson Road the DSL shall be notified for comments. An Oregon Removal-Fill Law (ORS 196.795-990) may be required.

5. In order to alleviate the health risk to the community in event of a flood, the design of the system shall provide that in event of a flood the system remain operable in order to process wastewater and alleviate a health risk.

6. If trees or shrubs are removed during the migratory bird breeding season (April 15 through August 10), a nest survey should be completed prior to vegetation disturbance.

7. Project equipment will be cleaned prior to arriving on site and before leaving the work site, with routine monitoring and control of weeds.

8. Fugitive dust control measures shall be applied as needed.

9. Construction activities shall be limited to daylight hours to reduce noise impacts.

16.11 Procurement Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708)

A. Where applicable, for contracts awarded by the Buyer in excess of $100,000 that involve the employment of mechanics or laborers, the Seller will comply with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, the Seller will compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic will be required to work in surroundings or under

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working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

16.12 Debarment and Suspension (Executive Orders 12549 and 12689)

A. A Procurement Contract award (see 2 CFR 180.220) must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension." SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

16.13 Procurement of recovered materials

A. The Seller will comply with 2 CFR Part 200.322, "Procurement of recovered materials."

16.14 Domestic Preference

A. Build America, Buy America Act (BABAA). All Iron and Steel Products, Manufactured Products, and Construction Materials used in this project must comply with the Build America, Buy America Act (BABAA) requirements mandated by Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953. Aggregates such as stone, sand, or gravel do not apply to BABAA

B. The following waivers apply to this Contract:

1. BABAA De Minimis, Small Grants and Minor Components

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EXHIIBIT A
TO
SUPPLEMENTARY CONDITIONS OF THE PROCUREMENT CONTRACT

Oregon Public Contracting Requirements

A. **Conditions Concerning Payment**. Seller agrees to (1) make payment promptly, as due, to all persons supplying to Seller labor or material for the performance of the work provided for in the Procurement Agreement; (2) pay all contributions or amounts due the Industrial Accident Fund from Seller or subcontractor incurred in the performance of the Procurement Agreement; (3) not permit any lien or claim to be filed or prosecuted against the state or a county, school district, municipality, municipal corporation or subdivision thereof, on account of any labor or material furnished; and (4) pay to the Department of Revenue all sums withheld from employees under ORS 316.167.

B. **Medical Care and Workers' Compensation.** Seller shall promptly, as due, make payment to any person, copartnership, association or corporation furnishing medical, surgical and hospital care services or other needed care and attention, incident to sickness or injury, to the employees of Seller, of all sums that Seller agrees to pay in connection with the Goods and all moneys and sums that Seller collected or deducted from the wages of employees under any law, contract or agreement for the purpose of providing or paying for the Goods.

C. **Nondiscrimination**. During the term of the Procurement Agreement, Seller shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, age, sexual orientation, disability or national origin.

D. **Hours of Labor**. Pursuant to ORS 279B.020, ORS 279B.235, and ORS 279C.520 Seller shall pay employees for overtime work performed under this Agreement in accordance with ORS 653.010 to 653.261 and the Fair Labor Standards Act of 1938 (29 U.S.C. 201 et seq.).

E. **Compliance with Laws and Regulations**. Seller shall adhere to all applicable federal, state, and local laws, regulations, executive orders and ordinances applicable to the work under this Agreement. Seller shall comply with the clauses required in every public Agreement entered into in the State of Oregon as set forth in ORS 279B.220, 279B.225, 279B.230, 279B.235, 279C.505, 279C.510, 279C.515, 279C.520, and 279C.530, which are hereby incorporated by reference.

F. **Audit and Inspection of Records**

i. Seller shall maintain a complete set of records relating to this Procurement Agreement in accordance with generally accepted accounting procedures. Seller shall permit the authorized representatives of Buyer, to inspect and audit all work, materials, payrolls, books, accounts, and other data and records of Seller relating to its performance under this Procurement Agreement until the expiration of three (3) years after final payment under this Procurement Agreement.

ii. Seller further agrees to include in all of its subcontracts under this Procurement Agreement a provision to the effect that the subcontractor agrees that Buyer, or any of their duly authorized representatives shall, until the expiration of three (3) years after final payment under the subcontract, have access to and the right to examine any directly pertinent books, documents, papers, and other records of the subcontractor.

iii. The periods of access and examination described in subparagraphs i and ii of this Section

for records that relate to (1) disputes between Buyer and Seller, (2) litigation or settlement of claims arising out of the performance of the Procurement Agreement, or (3) costs and expenses of the Procurement Agreement as to which exception has been taken by the Comptroller General or any of his or her duly authorized representatives, shall continue until all disputes, claims, litigation, appeals, and exceptions have been resolved.

G. **Certificate of Oregon Tax Law Compliance**. By signature hereto, both Parties agree to this Agreement as written. Seller affirms, under penalty of perjury as provided in ORS 305.385(6), that to the best of its knowledge it is not in violation of any Oregon Tax Laws set forth at ORS Chapters 118, 314, 316-18, 321 and 323 and the elderly rental assistance program under ORS 310.630-310.706; under ORS 320.005-320.150; under ORS 403.200–403.250 and any local tax laws administered by the Oregon Department of Revenue under ORS 305.620.

BUYER'S ACKNOWLEDGMENT OF RECEIPT OF GOODS

Buyer:	The City of Aumsville	Buyer's Project No.:
Engineer:	Westech Engineering, Inc.	Engineer's Project No.:
Seller:		Seller's Project No.:
Project:		
Contract Name:		

This Buyer's Acknowledgment of Receipt of Goods (Acknowledgment) applies to:

☐ All Goods ☐ The following specified portions of the Goods: **[Specify]**

Date of delivery of the Goods to the Point of Destination: **[Date]**

Date of Buyer's visual inspection of the Goods: **[Date]**

Date of this Acknowledgment: **[Date]**

Buyer acknowledges:

1. The Goods to which this notice applies have been delivered to the Point of Destination.
2. Buyer has visually inspected such Goods pursuant to Paragraph 9.02.B.1 of the General Conditions of the Procurement Contract.
3. Based on the visual inspection, such Goods appear to comply with the requirements of the Procurement Contract Documents as to quantities and condition, subject to any exceptions and limitations in this Acknowledgment.
4. Such Goods are deemed received for purposes of Paragraph 9.02.B.2 of the General Conditions of the Procurement Contract.
5. Seller may submit its Application for Payment for the delivered Goods, subject to the terms of the Procurement Agreement.

Exceptions (if any) to this Acknowledgment: ☐ None ☐ As follows:

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The responsibilities between Buyer and Seller for securing and storing the Goods, maintaining the Goods during storage, and for furnishing the Special Services, shall be as provided in the Procurement Contract.

The following documents are attached to and made a part of this Acknowledgement:

[List, if any, or indicate None]

This Acknowledgment does not constitute an acceptance of any Goods not in conformance with the Procurement Contract Documents, nor is it a release of Seller's obligation to furnish all Goods and Special Services in accordance with the Procurement Contract.

Buyer

By (signature): _____

Name (Printed): _____

Title: _____

Date: _____

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BUYER'S NOTICE REGARDING CONFORMITY OF GOODS AND SPECIAL SERVICES

Buyer:	The City of Aumsville	Buyer's Project No.:
Engineer:	Westech Engineering, Inc.	Engineer's Project No.:
Seller:		Seller's Project No.:
Project:		
Contract Name:		
Notice Date:	Effective Date of the Procurement Contract:	

Buyer hereby gives notice to Seller that, to the best of Buyer's knowledge, information, and belief, the Goods and Special Services:

☐ Are in conformance with the Procurement Contract Documents. Upon Seller's submittal of its final Application for Payment in accordance with the Procurement Contract Documents, Seller will be eligible for final payment, except as expressly indicated in the Procurement Contract.

☐ Are nonconforming with the Procurement Contract Documents for the following reason(s):

1. **[List reason(s) and clearly cite contractual provisions and factual circumstances of each]**

Seller's Special Services were completed on: **[fill in date]**

Notes to User—Where the Procurement Contract has not been assigned by initial Buyer, use the following paragraph. If the Procurement Contract has been assigned, delete the following paragraph.

Buyer has consulted with and received Engineer's recommendation on conformity of the Goods and Special Services.

This Buyer's Notice Regarding Conformity of Goods and Special Services (Notice) is made expressly subject to the following terms and conditions to which all who receive and rely on said Notice agree: **[Edit the following to suit the specific procurement]**

1. This Notice is expressly subject to the terms and conditions set forth in the Procurement Contract.
2. This Notice is not a guarantee or warranty of Seller's performance under the Procurement Contract, an acceptance of Goods and Special Services that are not in accordance with the related Procurement Contract Documents, including but not limited to nonconforming Goods and Special Services discovered after final inspection, nor an assumption of responsibility for any failure of Seller to furnish the Goods and Special Services thereunder in accordance with the Procurement Contract, or to otherwise comply with the Procurement Contract Documents or the terms of any special guarantees specified therein.
3. This Notice does not relieve Seller of any surviving obligations under the Procurement Contract and is subject to Buyer's reservations of rights with respect to completion and final payment.

Buyer

By (signature): _____ Name (Printed): _____

Date: _____ Title: _____

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PART 4:

SPECIFICATIONS

SECTION 11300
PACKAGED SBR AND DIGESTER EQUIPMENT

PART 1: GENERAL

1.1 SUMMARY

a. This section covers the Work necessary for a packaged sequencing batch reactor (SBR) system supplier to furnish a pre-engineered, packaged, two-basin, SBR equipment package as well a packaged system for the two aerobic digesters, complete and operable with all ancillary equipment including a packaged control system.

b. At a minimum, the equipment package shall include the items listed below as well as all other equipment and instrumentation that is monitored or controlled by the manufacturer's control panel.
   1) Influent control valves and actuators (if required for manufacturer's proprietary system).
   2) Mixing equipment to provide anoxic mixing conditions in the SBR basins.
   3) SBR Blowers.
   4) All required SBR aeration equipment.
   5) All air control valves and valve actuators.
   6) SBR dissolved oxygen sensors and transmitters.
   7) SBR level sensors and transmitters.
   8) SBR High Level Float Switches.
   9) Any other instrumentation required for the manufacturer's proprietary system.
   10) Decanting mechanisms including all actuated valves or decanter actuators required for a complete system.
   11) SBR waste sludge pumps to pump waste sludge from the SBR tanks to the digesters.
   12) Digester Blowers.
   13) All Digester aeration equipment.
   14) Digester level transducers and transmitters.
   15) Digested sludge pump flow meters.
   16) A motor control center to house all variable frequency drives and motor starters.
   17) A packaged control panel to control the SBR process and the aerobic digesters.
   18) Local operation stations for the influent flow control valves, actuated air valves, the mixers, the decanter actuators or decant valves, waste sludge pumps, and the digested sludge pumps. Valves with electric actuators may be supplied with integral local controls in lieu of a local control station.
   19) Operation and maintenance manual.
   20) Warranty as specified.
   21) Startup assistance and training.

1.2 RELATED SECTIONS

a. This section is supplemented by the following sections.
   1) Section 16090, Packaged Electrical System Requirements
   2) Section 16447, Low Voltage Motor Control Centers
   3) Section 17090, Packaged Control Systems Requirements

1.3 DOMESTIC PREFERENCE REQUIREMENTS.

a. The project is being funded with assistance from the USDA Rural Development Department. All equipment furnished under this procurement shall comply with the Build America, Buy America Act (BABA) under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953. Absent an approved waiver, all iron, steel, manufactured products, and construction materials used in this project must be produced in the United States. All proposers shall complete and submit the "Manufacturer's Certification of Compliance" form included in the Information for Bidders with their proposal as described in the Information for Bidders.

1.4 BACKGROUND INFORMATION

a. Design Conditions. Plant influent will pass through a new headworks structure that will include 0.25-inch fine screening prior to the SBR's. The headworks will not include grit removal facilities. It is anticipated that each SBR tank will be taken out of service every other dry season to allow for manual grit removal. The plant will not include any primary treatment (other than screening) prior to the SBRs. The SBRs will be installed outdoors and will remain uncovered. Effluent from the SBRs will be discharged into an equalization basin. Waste sludge will be pumped from the SBR's into one of two aerobic digesters. The aerobic digesters will provide about 20 days of solids retention time. Effluent from the digesters will be discharged to a sludge storage lagoon for long-term storage and additional stabilization.

b. Preliminary Drawings. Preliminary drawings for the treatment plant improvements are included in Appendix A. The drawings in Appendix A are based on the ICEAS NDN process as manufactured by Xylem. If this procurement results in the selection of a different SBR supplier, the drawings will be revised accordingly. The drawings in Appendix A are preliminary in nature, not ready for construction purposes, and are for informational purposes only. The information presented in these bidding documents and this specification take precedence over any conflicting information shown on the drawings included in Appendix A.

1.5 PERFORMANCE REQUIREMENTS

a. Design Criteria
   1) Influent Data: The sequencing batch reactor system design is to be based on influent conditions listed in Table 1. The system shall be designed to meet the specified effluent limits at the 2045 design-year maximum month wet weather flow (MMWWF) and maximum month BOD, TSS, TKN, and Ammonia loading conditions. The existing flow and loading conditions are the expected conditions after initial startup of the new facility.

Table 1: Influent Data

Year	**Existing**	**2045**
Service Population	4,300	6,250
Influent Flows		
Average Dry Weather Flow (ADWF) May - October	0.40 MGD	0.58 MGD
Average Wet Weather Flow (AWWF) November-April	0.75 MGD	1.12 MGD
Average Annual Flow (AAF)	0.57 MGD	0.85 MGD
Maximum Month Dry Weather Flow (MMDWF)	0.82 MGD	1.20 MGD
Maximum Month Wet Weather Flow (MMWWF)	1.20 MGD	**1.75 MGD**
Peak Day Flow	2.40 MGD	3.13 MGD
Peak Instantaneous Flow (PIF)	4.80 MGD	5.24 MGD
Influent Loading		
Maximum Month Daily BOD Load	1,250 pounds per day	**1,860 pounds per day**
Maximum Month Daily TSS Load	1,000 pounds per day	**1,560 pounds per day**
Maximum Month Daily Ammonia	115 pounds per day	**170 pounds per day**
Maximum Month TKN	170 pounds per day	**255 pounds per day**
pH	6.5 - 8.6	6.5 – 8.6
Average Alkalinity	260 mg/L as CaCO3	260 mg/L as CaCO3
Wastewater Temperature	8° C – 25° C	8° C – 25° C
Site Elevation		350 feet

2) Effluent Limits – Final effluent quality from the SBR shall be as follows:

BOD	< 10 mg/L
TSS	< 10 mg/L
Ammonia	< 1 mg/L
Total N	< 10 mg/L

3) SBR Tank Configuration

Number of Tanks	2
Minimum Size	672,000 gallons each (at top water level)
Maximum Top Water Level	18 feet
Minimum Bottom Water Level	12.7 feet

4) SBR Aeration System

Number of Blowers	3 (two duty, one standby)
Lbs O2 / lb. BOD Removed	1.25 (minimum)
Lbs O2/ lb. Ammonia Removed	4.6 (minimum)
Speed Control	VFD controlled by D.O. level in basin

5) Aerobic Digester Tank Configuration

Number of Tanks	2
Size	149,000 gallons each (at top water level)

Maximum Top Water Level	18 feet

6) Aerobic Digester Aeration System

Number of Blowers	2 (one duty, one standby)
Aeration Type	fine bubble
Mixing/Aeration Provided	25 SCFM/1000 cubic feet (minimum)

1.6 SUBMITTALS

a. Required with Proposal: Provide submittal information in accordance with the following outline.

1) Manufacturer Information:
   a) A brief history of the manufacturing company
   b) Manufacturer location information and contact information.
   c) Duration manufacturer has been in business
   d) Duration manufacturer has been manufacturing sequencing batch reactor processes.
   e) Project Manager name and qualifications proposed for this project. The proposed project manager shall be Owner's primary point of contact throughout this project.
   f) Location and qualifications of the nearest qualified service representative.

2) Manufacturer Experience:
   a) Total number of sequencing batch reactor treatment facilities installed in the last 10 years including location and capacity.

   b) Provide owner name, location, contact name, contact telephone number, capacity, date of installation, and model name and/or number for at least three similar facilities with a minimum treatment capacity of 0.5 mgd in Oregon and/or Washington.

3) Exceptions: Identify any exceptions to these Contract Documents.

4) Missing Items: Identify components that are not specified, but are necessary to provide a fully operational system.

5) Recommendations: Provide recommendations to make SBR and digester system more cost-effective or to improve operation and maintenance. For each recommendation, identify any advantages and disadvantages in terms of operational flexibility, system performance, or operations and maintenance requirements.

6) Process Description: Provide technical information describing the proposed treatment process.

7) Design Calculations: Provide design calculations supporting the proposed design including basin sizing calculations, biological calculations including waste sludge production rates, decanter sizing calculations, oxygen transfer calculations, and blower sizing calculations.

8) Design Criteria: Provide a listing of design criteria for the SBR and Digester equipment including influent flows and loads, anticipated effluent quality, tank size, top and bottom water levels, proposed cycle structure for normal and peak flows, proposed cycle timing for normal and peak flow cycle times, decant rates for normal and peak flow cycle times, maximum water level downstream of the SBR tanks (i.e., the maximum water level in the equalization basin), blower type, blower number, blower size, mixer type, mixer number, mixer horsepower, waste sludge production rates, waste sludge pump size, provide horsepower, voltage, and NEMA rating for all motors and approximate run time in hours per day, etc.

9) Equipment List: Provide a complete listing of all proposed equipment including manufacturer and model, capacity, horsepower, constant speed versus adjustable speed drives, voltage, and other similar information.

10) Excluded Items: Provide a list of all materials and equipment that must be furnished and installed by the Construction General Contractor to complete the system such as anchor bolts, piping, valves, field wiring, etc.

11) Drawings: Show plan layout and cross sections and dimensions of the required tanks and all equipment and instrumentation.

12) Process and Instrumentation Diagram.

13) Instrumentation: Describe software, hardware, control features, monitoring, data storage, and alarms.

14) Operation Description: Provide operations guide including procedures for system startup, normal operating procedures, and procedures for operating on a single SBR basin at a minimum.

15) Annual O&M cost estimate along with a 20-year life-cycle cost analysis for the proposed equipment. This shall include an itemized cost for all materials and equipment reasonably expected to require replacement during a 20-year period. Provide projected monthly electrical cost for supplied equipment assuming the electrical cost to be $0.10 per kW-hour. Calculations shall be based on operating at the existing average annual flows and the existing loading rates listed in Table 1.

16) Spare Parts: List of recommended spare parts and costs.

b. Required after Notice of Award:
1) Provide initial action submittal 60 calendar days after Notice to Proceed.
2) Provide resubmittal 21 days after receipt of Engineer's review comments.
3) Action Submittals:
a) Detailed drawings, with mechanical, electrical, and instrumentation connection types and sizes shown and dimensioned for each component including manufacturer, materials of construction, and spare parts provided.
b) Plan, section, and detail drawings in paper and CAD format.
c) Certified Oxygen Transfer Performance Curves for the aeration equipment.
(1) Submit certified oxygen transfer performance curves to demonstrate capability of the aeration equipment to meet the required oxygen transfer requirements.
(2) Base oxygen transfer curves on the following criteria:
(a) A minimum of 3 tests for each specified condition in complete accordance with ASCE Clean Water Test Procedure (1992 or latest edition).
(b) Conduct tests by an independent aeration testing firm in a full scale aeration test tank (minimum of 200 sq. ft.) at the specified submergence and water depth with a diffuser density equivalent to the specified tank configuration. Diffuser density is defined as the ratio of the total tank surface area to the total active diffuser surface area.
(c) Conduct shop test with air rate and mass rate of oxygen transfer directly proportional to the ratio of the shop test tank volume and the design tank volume.
(d) Plot of pounds of oxygen per day per 1000 cubic feet of tank volume versus air per 1000 cubic feet of tank volume in tap water at 14.7 psia, 20°C and zero dissolved oxygen at the specified submergence.
(3) Certify and stamp all curves by a Professional Engineer registered in the State of Oregon.
d) List of all original equipment by model and part number (detailed bill-of-materials). List manufacturer names, addresses, and phone numbers.
e) Pumps, Actuators, Valves, and Blowers:
(1) Make, model, weight, and horsepower of each equipment assembly.
(2) Complete catalog information, descriptive literature, specifications, and identification of materials of construction. seal, coupling, and bearing literature shall be included with pump information.
(3) Performance curves.
(4) Data and diagrams per Section 16090, Packaged Electrical System Requirements, including:

(a) Power and control wiring diagrams, including terminals and numbers.
(b) Complete motor nameplate data, as defined by NEMA, motor manufacturer, and motor modifications.

f) Sample of proposed warranty.

g) Electrical:
(1) Shop drawings for the control panel, any remote control stations, and the motor control center including control panel construction drawings, enclosure sizes, exterior panel elevations, panel interior elevations, schematic and ladder logic drawings with field wiring terminations clearly identified.
(2) Complete composite diagram showing wiring of power and control interconnections between each component of the packaged system
(3) List number and capacity of transformer(s), if any. List any components that will run off power supply other than 480V, three-phase.
(4) For Each Motor: Frequency of operation and percent of full load operation for power demand analysis.

h) Instrumentation and Control:
(1) P&IDs, in pdf and CAD format.
(2) Process and instrumentation diagrams and description of functions monitored, controlled, and alarmed.
(3) Submittals required per Section 17090, Packaged Control System Requirements.

c. Informational Submittals
1) Installation guide for use by the Construction General Contractor. Installation information shall, at a minimum, include assembly instructions, mounting requirements, and recommended startup and commissioning sequence.
2) Shipping information including size and type of vehicles used for shipping, number of shipments, number and weight of each component of each shipment.
3) Unloading requirements for each component of each shipment.
4) Recommended handling method, and requirements for storage and protection of all components prior to installation and following installation but prior to startup.
5) Assembly instructions for any components that are shipped unassembled.
6) Operation and Maintenance Manual for all equipment. The manuals shall be written specifically for this project and shall include detailed process operation instructions, start-up, and shutdown procedures, process control and troubleshooting procedures, emergency procedures, and all necessary safety precautions. The O&M manual shall be complete in all respects for all equipment, controls, accessories, and associated appurtenances supplied under this Section. Manuals shall be supplied in three ring binders with a labelled cover sheet and spine.
7) Data summary from testing and startup period.

1.7 WARRANTY

a. Supplier shall warrant all equipment furnished to be free from defects in materials and workmanship under normal use and service for a period of one year from the date that Substantial Completion is issued to the General Construction Contractor. The entire equipment package shall be warranted to meet all functional and performance requirements.

1.8 EXTRA MATERIALS

a. Furnish, tag, and box for shipment and storage the following spare parts, special tools, and materials:
   1) Expendable material such as gaskets, seals, and packing: One complete set.
   2) Special tools required to maintain or dismantle, if any required: One complete set.

PART 2: PRODUCTS

2.1 SBR TANK DESIGN

a. The SBR tanks shall be rectangular and utilize common wall construction to the maximum extent possible as shown on the drawings included in Appendix A. The drawings in Appendix A are based on the ICEAS NDN process as manufactured by Xylem. If this procurement results in the selection of a different SBR supplier, the drawings will be revised accordingly. The drawings in Appendix A are preliminary in nature, not ready for construction purposes, and are for informational purposes only. The information presented in these bidding documents and this specification take precedence over any conflicting information shown on the drawings included in Appendix A.

b. All metallic components mounted and around the SBR basins shall be stainless steel.

2.2 DIGESTER TANK DESIGN

a. The digester tanks will be designed to provide about 20 days of solids retention time. The tanks will be designed to be the same combined width of the two SBR basins as shown in the drawings presented in Appendix A. Based on the preliminary layout shown on the drawings, the interior dimension of each tank are 46 feet long by 24 feet wide. The final size of the tanks will likely need to be adjusted based on the overall width of the final SBR tanks and the thicknesses of the various concrete walls.

b. The drawings in Appendix A are based on the ICEAS NDN process as manufactured by Xylem. If this procurement results in the selection of a different SBR supplier, the drawings will be revised accordingly. The drawings in Appendix A are preliminary in nature, not ready for construction purposes, and are for informational purposes only. The

information presented in these bidding documents and this specification take precedence over any conflicting information shown on the drawings included in Appendix A.

c. All metallic components mounted and around the digester basins shall be stainless steel.

2.3 INFLUENT FLOW CONTROL VALVES

a. For systems that utilize influent flow control valves to alternate flows between the SBR tanks, the valves shall comply with the following subsection. These valves may be omitted for SBR systems that are designed to receive inflow throughout all phases of the SBR operational cycle.

b. Flow control valves shall be sized by the manufacture to convey the peak flows listed in Table 1. Valves shall be flanged plug valves with an electric actuator suitable for mounting outside. Electric actuators shall be NEMA 6P rated for occasional submersion.

c. Valves shall be AWWA C-517 with flanged end connections. ASTM A-1216 Class B cast iron body with welded in nickel seat, EPDM coated ductile iron plug, assembled and tested with an electric actuator. The valve shall be non-lubricated type with a full port area matching the full pipe size.

d. Each valve shall include a manual override with limit switch feedback to the SBR control system in both the open and closed position and status contacts for relaying the position to the SBR control system.

e. Each flow control valve shall be provided with a local control station or integral local controls with a Hand-Off-Auto switch and controls to manually open and close the valve using the actuator motor.

2.4 BLOWERS

a. Three blowers shall be provided for the two SBR tanks. The blowers shall be sized so that two blowers in operation will provide required aeration to a single SBR basin. The air pipe feeding air to each SBR tank shall be fitted with an actuated valve to enable the air flow to be alternated between the two tanks. The third blower is to provide redundancy. If an alternate means of aeration is proposed it shall provide the same level of redundancy.

b. Two blowers shall be provided for the two aerobic digester tanks. The blowers shall be sized so that one blower will provide the required aeration and mixing in each basin. The air pipe feeding air to each digester tank shall be fitted with an actuated valve to enable the air flow to be alternated between the two tanks.The second blower is to provide redundancy. If an alternate means of aeration is proposed it shall provide the same level of redundancy.

c. The blowers shall be suitable for mounting inside a blower building. Sound attenuating enclosures are not required for this project but may be included at the suppliers option.

d. Shipping. All equipment supplied for each blower package shall be assembled and shipped as one package from the factory.

e. Blower Construction.

1) Blower shall be vertically mounted, positive displacement rotary type with top inlet and bottom outlet.
2) Blower shall be V-belt driven by a motor.
3) All bearings shall be anti-friction type rated by AFBMA standards to have a B10 life of 60,000 hours at design speed and maximum radial and thrust load conditions.
4) All inlet and outlet air piping shall be installed so that no weight or strain will be imposed on the blower or silencers.
5) All gauges and instruments are to be package mounted with all necessary tubing and hardware unless otherwise shown on the drawings. Location, height and angle shall allow ease in viewing by a standing operator.

f. Base. The blower motor, inlet silencer, discharge silencer, valves and instruments shall be mounted on a common elevated structural steel base of sufficient stiffness to prevent flexing. Silencers must be adequately supported to prevent any distortion to the blower flanges.

g. Drive System. Each blower shall be driven by a multiple V-belt drive system with a 1.4 service factor. A two-part OSHA approved drive guard shall be provided for each blower.

h. Motor.

1) Each blower shall be equipped with an electric motor designed, manufactured, and tested in accordance with the latest revised edition of NEMA MG-1. The motor shall be a squirrel-cage induction type, single-speed, horizontally mounted motor conforming to the following:

Synchronous speed:	1800 RPM
Voltage, phase, & frequency:	460 Volts, 3 Phase, 60 Hz
Insulation:	Class B or better
Enclosure:	TEFC or ODP
Service factor:	1.15
Duty cycle:	Continuous
Ambient temperature rating:	40°C
Bearing lubrication:	Manufacturer's standard
Bearing life:	50,000 hours rating life as defined by AFBMA Standards

2) Motor windings shall have embedded, normally closed thermal switch that will open upon excessive temperature.

i. Accessories. Each blower shall be furnished with the following accessory items.

1) Expansion joints shall be reinforced rubber of the spool or sleeve type. The expansion joints shall be capable of withstanding the following temperatures:

On the suction side of the blower: 150°F
On the discharge side of blower: 250°F (minimum)

2) Intake Filter
   a) Each blower shall be furnished with a dry type element inlet filter.
   b) Filters for blowers shall have a flanged connection rated at 120% of design flow.
   c) Filter to remove 98% of particles 10 microns and larger with a maximum pressure drop of 3" water column.

3) Inlet Silencers
   a) The inlet silencers shall be of heavy duty, welded steel construction, two chamber-absorptive type, with flanged or threaded connections and side outlet. The silencers shall provide attenuation suitable for critical pitch line velocity applications.
   b) Inlet connection 5 inch ANSI 125/150 lb. drilled flange for connection to air intake (threaded optional).
   c) Outlet connection ANSI 125/150 lb. drilled flange for connection to blower intake flange (threaded optional).
   d) Supports: Provide two, carbon steel, clamp-type supports at each end of silencer for rigidly mounting silencer horizontally to the blower package frame.

4) Discharge silencers
   a) The discharge silencers shall be of heavy duty, welded steel construction, two chamber-absorptive type with flanged or threaded connections and side inlet. The silencers shall provide attenuation suitable for critical pitch line velocity applications.
   b) Discharge connection shall be ANSI 125/150 lb. drilled flange for connection to piping system flexible connector.
   c) Supports: Provide two (2) carbon steel, clamp-type supports at each end of horizontal silencer for rigidly mounting to the blower package frame.

5) Pressure Relief Valves. Provide a spring (up to 2-inch only) or weighted discharge pressure relief valve installed on the discharge silencer. Set the valve to relieve one and one half (1.5) psig above the blower operating pressure. Relief valve to be tested during shop performance test.

6) Check Valve. Provide wafer or threaded steel body, split disc type check valve for mounting in blower discharge piping. Furnish valve with 304 SS spring and EPDM seat.

7) Discharge Butterfly Valve. Provide wafer body, resilient-seated, lever operated, tight closing butterfly valve for positively isolating the blower from discharge manifold piping. Furnish with cast iron body, ductile iron disc, EPDM seat.

Valve to have lever handle with notched plate. Valves 10" and larger to have gear operator and handwheel. Valves 2" and smaller may be 2 piece ball valves.

8) Vibration Isolator Pads. Provide molded, synthetic rubber and cork vibration isolation pads for each blower, sized to fit the structural steel base.

9) Inlet Vacuum Gauge. Provide a Model 2020 differential pressure gauge by Dwyer Instruments, Inc. to indicate pressure drop through the air filter or equal.

10) Discharge Pressure Gauge. Provide a Type 1009A liquid filled pressure gauge by Ashcroft or equal.

11) Temperature gauge(s). Provide an Ashcroft Series EL liquid filled bimetal thermometer or equal.

j. Painting.

1) Shop paint assembly frame, blower, silencers, motor, and sliding motor base separately and assemble using grade 5 zinc plated hardware.
2) Preparation – Remove weld splatter, grind sharp edges and welds, contouring to a rounded shape, and solvent clean in accordance with Steel Structures Painting Council SSPC-SP1.
3) Primer coat – Apply one coat of Tnemec Series 66-1211, 3 to 4MDFT or equivalent.
4) Interim coat – Apply one coat of Tnemec Series 66 Epoxoline, 3 to 4MDFT or equivalent after all components are assembled and system has been performance tested.
5) Finish coat – Apply one coat of Tnemec Series 73 Endura Shield III Polyurethane, 2 to 3MDFT or equivalent. (Optional for outdoor or chemical duty only)
6) Touch-up paint – Provide one pint of finish coat paint for field touch-up.

k. Testing. Factory testing – The blower package supplier shall supply a certified ASME PTC-9, Method B performance test data based on a factory 1.0 psi shop test. A certified test report, signed by a registered professional engineer, shall be submitted for record.

l. Spare Parts. The equipment supplier shall deliver the following spare parts for each blower size. Package spare parts in a separate container clearly marked as “Blower Spare Parts” and provide inventory list on exterior of the container.
1) One (1) set of bearings
2) One (1) drive end cover seal
3) One (1) set of gaskets
4) One (1) set of V-belts of each size
5) One (1) filter element for each size air intake filter
6) All of the above parts shall be provided as spare parts and shall be packaged for potential long-term dry storage.

2.5 AIR CONTROL VALVES

a. Air control valves shall be provided for each SBR tank and each digester tank. Air control valves and electric actuator shall be designed for mounting outside. Electric actuators shall be NEMA 6P, rated for occasional submersion.

b. Each air valve shall be provided with a local control station or integral local controls with and Hand-Off-Auto switch and controls to manually open and close the valve using the actuator motor.

c. Each valve shall include a manual override with limit switch feedback to the SBR control system in both the open and closed position and status contacts for relaying the position to the SBR control system.

d. The valves shall be butterfly valves, wafer body style, EPDM-seat, tight-closing type for installation between two (2) ANSI Class 125/150 standard flanges.

e. The valves shall be rated at 50 psi (345 kPa) and provide drop tight shutoff at differentials up to 50 psi.

f. Valve bodies shall have two flange bolt guides to center the body in the pipeline. Valves shall be provided with electric power actuators.

g. The seat shall be tongue-and-grove design and act as a body liner to prevent flow from contacting the body casting. The seat shall also provide a positive seal without use of flange gaskets. Seats shall be of EPDM suitable for use with compressed air and shall be field replaceable.

h. The disc shall be aluminum bronze. The disc-to-shaft connections shall be direct drive double “D” design requiring no disc screws or pins to connect shaft to disc. Outside diameter of disc shall be designed that when opened, it will not interfere with adjacent piping.

~~i.~~ Shafts shall be one piece and shall be 416 stainless steel. Shafts shall be finish ground to minimize bearing and shaft seal wear. Shaft seals shall be provided to prevent leakage and to protect bearings from internal or external corrosion.

j. Valves shall be furnished with self-adjusting stem seal and non-corrosive Acetal bushings for smooth, low torque operation.

k. Valves actuators shall be CSM and FM rated for Class I, Division 2, with quarter turn, open/close motor operators. Each operator shall be driven by a single phase, 120 Volt motor. A handwheel shall be attached for manual operation with a positive de-clutch mechanism to engage the handwheel when required. Two limit switches shall be provided with each operator. Torque limit switches shall be provided to de-energize the motor control circuit when the valve encounters an obstruction during travel. Control terminations shall be plug-and-socket assembly. A space heater shall be installed in the limit switch compartment. A dial position indicator shall also be furnished.

l. Materials of Construction

Body:	Cast Iron (ASTM A126, Class B)
Seat:	EPDM
Disc:	Aluminum Bronze (ASTM B148-954)
Stem:	416 Stainless Steel (ASTM A582 Type 416)
Bearings:	Acetal

2.6 FINE BUBBLE AERATION EQUIPMENT

a. For SBR systems that utilize aeration grids, the aeration equipment shall be fine bubble in accordance with this subsection. Suppliers may propose alternate aeration equipment that is compatible with their proprietary SBR equipment package.

b. The digester aeration equipment shall be fine bubble in accordance with this subsection.

c. The aeration system shall be capable of delivering the design SCFM per basin with an operating pressure as measured at the connection to the riser pipe of not more than 11 psi.

d. The fine bubble aeration equipment system shall include the following components.
   1) Stainless steel droplegs.
   2) PVC manifolds and air distributors.
   3) PVC diffuser holders and retainer rings.
   4) Stainless steel supports and anchors.
   5) Bolts, nuts and gaskets for aeration system flange connections.
   6) Air distributor purge systems.
   7) Membrane diffusers.

e. Materials, Fabrication, and Finishing.

   1) Stainless Steel – Pipe, Fittings and Supports
      a) Fabricate all welded parts and assemblies from sheets and plates of 304L stainless steel with a 2D finish conforming to ASTM A240, 554, 774, 778.
      b) Fabricate non-welded parts and flanges from sheets, plates or bars of 304 stainless steel conforming to ASTM A240 or ASTM A276.
      c) Welds & Welding Procedure
         (1) Weld in the factory with ER 316L filler wire using MIG, TIG or plasma-arc inert gas welding processes. Provide a cross section equal to or greater than the parent metal.
         (2) Provide full penetration butt welds to the interior surface with gas shielding of interior and exterior of joint.
         (3) Continuously weld both sides of face rings and flanges to eliminate potential for crevice corrosion.
      d) Corrosion Protection and Finishing. Clean all welded stainless steel surfaces and welds after fabrication by using the following procedure:
         (1) Pre-clean all outside weld areas to remove weld splatter with stainless steel brushes and/or deburring and finish grinding wheels.

(2) Finish clean all interior and exterior welds and piping by full immersion pickling and rinse with water to remove all carbon deposits and contaminants to regenerate a uniform corrosion resistant chromium oxide film per ASTM A380 Section 6.2.11, Table A2.1 Annex A2 and Section 8.3.

(3) Corrosion protection techniques not utilizing full immersion methods are unacceptable and will be cause for rejection of the equipment.

2) Natural Rubber – Furnish all fixed and expansion joint O-ring gaskets of natural rubber/SBR with a Shore A durometer of 45 ± 5.

3) Polyvinyl Chloride (PVC) – Pipe and Fittings

a) Produce all PVC pipe and fittings from PVC compound with a minimum tensile strength of 7000 psi.

b) Design air distributors and manifolds to withstand 125° F mean wall temperature.

c) Add two parts by weight of titanium dioxide per 100 parts of resin to PVC compounds for manifolds, air distributors, joints and PVC diffuser assembly components to minimize ultraviolet light degradation.

4) EPDM - Membrane Diffusers and Gaskets

a) Manufacture circular membrane diffuser discs with integral O-ring of EPDM synthetic rubber compound with precision die formed slits.

b) Add carbon black to the material for resistance to ultraviolet light.

c) Limit the maximum tensile strength of the diffuser to 10 pi when operating at 2.4 SCFM/sq. ft. of material. Furnish proportionately thicker material for larger diameter disc diffusers to limit the maximum tensile stress and to resist stretching.

d) Produce diffusers free of tears, voids, bubbles, creases or other structural defects.

e) Quality Control – Test diffuser using primary sampling criteria outlined in Military Standard 105E.

f. Droplegs. Provide a stainless steel dropleg from the air main connection to the dropleg connection on the manifold.

1) Clearly identify the point where the suppliers piping connects to the air piping supplied and installed by the Construction General Contractor.

2) Provide a stainless steel flange with a 150 pound bolt pattern for the top connection.

3) Provide a band clamp coupling with gasket for the lower dropleg to manifold connection.

g. Manifolds. Provide PVC manifolds for connection to the air distribution headers.
   1) Fabricate manifolds with fixed threaded union or flanged joints for connection to the air distributors.
   2) Design manifold, distributor connections and supports to resist thrust generated by expansion/contraction of the air distributors over a temperature range of 125°F.
   3) Support manifold with a minimum of two supports.
   4) Connect manifolds with fixed threaded union or flanged joints to prevent rotation or blow apart.

h. Air Distributors and Diffuser Holders. Provide air distributors perpendicular to the air manifold
   1) Design distributors and holders to resist a dead load of 200 lbs. applied vertically to the outer edge of the diffuser holder.
   2) Provide threaded removable end caps on all air distributor pipe sections complete with gasket, threaded coupling and end plate for clean out at the end of each distributor.

i. Air Distributor and Manifold Connection Joints.
   1) Join air distributor sections with positive locking fixed threaded union or flange type joints for all submerged header joints to prevent blow apart and rotation.
   2) Bell and spigot, slip on or expansion type joints are not acceptable for submerged joints.
   3) Design threaded union joints with spigot section connected to one end of the distribution header, a threaded socket section connected to the mating distribution header, an "O" ring gasket and a threaded screw on retainer ring. Solvent welding shall be done in the factory.
   4) Design flanged joints with a 125 lb drilling angle, face ring, follower flange and stainless steel hardware.

j. Supports. Provide each section of manifold and air distributor with a minimum of two (2) supports.
   1) Limit maximum support spacing to 8 feet.
   2) Design all supports to allow for thermal expansion and contraction forces over a temperature range of 125°F and to minimize stress build up in the piping system.
   3) Design supports to be adjustable without removing the air distributor from the support.
   4) Design supports to allow for complete removal from the tank to facilitate installation of additional headers and in-tank maintenance.
   5) Attach supports to tank floor with one stainless steel anchor bolt.

k. Diffuser Assemblies. Furnish diffuser assemblies including diffuser, diffuser gasket, holder, retaining ring and air flow control orifice.
   1) Membrane Diffuser
      a) Incorporate an integral check valve into the membrane diffuser.
      b) Design and test diffusers for a dynamic wet pressure (DWP) of 12 inches ± 20% water column @ 1.0 SCFM/diffuser and 2 inches submergence.

c) Visual Uniformity – Observe diffusers for uniform air distribution across the active surface of the diffuser at 1.0 SCFM/diffuser and 2 inches submergence. Active surface is defined as the perforated horizontal projected area of the diffuser.

d) Quality Control – Test diffuser using primary sampling criteria outlined in Military Standard 105E.

e) Diffuser Support Plate – Provide a PVC support plate to form an air plenum under the diffuser and support for the membrane when the air is off.

2) Diffuser Holders and Retainer Rings

a) Design holder with air flow control orifice and plenum chamber below the diffuser. Holder to provide peripheral support for the diffuser.

b) Design retainer ring to seal the diffuser and O-ring in the holder to prevent air leakage around gasket.

c) Design retainer rings threads with minimum cross section of 1/8-inch and allow for one complete turn to engage threads.

l. Anchor Bolts. Design anchor bolts for embedment in 4000 psi concrete with a pullout safety factor of 4.

m. Liquid Purge System. Provide a liquid purge system to drain the entire submerged aeration piping system for each aeration grid including airlift purge eductor line and control valve. The purge system shall use a solenoid valve for automatic operation coordinated with SBR operation. The solenoid valve shall be housed in a NEMA 7 enclosure and shall be FM rated Class 1, Division 2.

n. Spare Parts. Package spare parts in a separate container clearly marked as "Aeration System Spare Parts" and provide inventory list on exterior of the container.

1) Furnish 25 diffuser elements and gaskets
2) Furnish 10 diffuser holder retainer rings
3) Furnish 10 diffuser holders
4) Furnish 5 air distributor supports
5) Furnish 3 manifold supports
6) Furnish 3 air distributor sections
7) Furnish 10 air distributor repair couplings
8) Furnish 5 fixed joint assemblies

2.7 DECANT MECHANISMS

a. A decant mechanism shall be supplied for each SBR basin.

b. All components of the decanter drive shall be FM rated Class I, Division 2.

c. Each decanter shall be capable of withdrawing decant fluid from beneath the water surface in a manner that excludes floatables and scum from entering the decant flow stream.

d. The decant mechanism shall be designed to prevent solids from entering the decant piping during the aeration, mixing, and settle phases of the SBR cycle.

e. Materials.
   1) All in-basin metal decanter components, except seals and bearings, shall be constructed of corrosion and ultra-violet resistant 304L stainless steel. All fasteners shall be constructed of 304 stainless steel.
   2) The decanter seals and bearings shall be constructed of maintenance free, synthetic materials for longest possible service life. All seals and bearings shall be shipped factory assembled, simplifying installation.

f. Fabricating & Finishing.
   1) All decanter welding must be conducted by welders certified under ASME Code 9 to the following procedures:
      a) Welding Procedure Specification No. GM 8-8
      b) Base metal QW-403 Plate
      c) Type 300 Series
      d) P No. 8
      e) In all positions and pipe ½-inch diameter and larger.

   2) All joints to be finish tested for integrity by either air pressure (3.0 pi) or dye penetrate methods.

   3) All finished decanter units to be fee of abrasions, damage, flaws, carbon contamination and discoloration. All weld burn and discoloration shall be removed with pickle paste (DeRustit SS-3 stainless steel cleaner or equal). All stainless steel surfaces shall be passivated with Oakite 33 or equal. All finished units shall have a pleasing and uniform passivated appearance. Decanters shall be power washed for final cleaning prior to shipment.

2.8 MIXERS

a. Mechanical mixing equipment shall be provided for each SBR basin to facilitate anoxic mixed SBR cycles.

b. The mixing equipment shall have a zone of complete mix with a basin turnover of 1.5 minutes at the maximum water level. Complete mix shall be defined as maintaining biological suspension of all mixed liquor suspended solids at the design MLSS, without the introduction of air. The complete mix zone shall be the size of the SBR tank.

c. All metal components of the mixing equipment mounted in the basin including all mounting and removal hardware shall be 304 stainless steel.

d. Mechanical mixing equipment mounted in the basin shall include provisions for removing the equipment for service without the need to drain the tank.

2.9 WASTE SLUDGE AND DIGESTED SLUDGE PUMPS

a. Supplier shall furnish a waste sludge pump for each SBR basin and a digested sludge pump for each digester basin. If possible, the pumps shall be the same make and model for interchangeability.

b. Pumps shall be supplied as a complete package including the pump, power cable, discharge elbow, guide bars and accessories.

c. Waste sludge and digester pumps shall be submersible pumps powered by 460 volt, 3 phase electrical motors. The pumps shall be supplied with a mating cast iron discharge connection and be capable of pumping the design waste sludge flowrate at a TDH of 30 feet. The final pump duty point will be confirmed with the manufacturer during the final design phase of the project.

d. The pumps shall be supplied with local control stations as specified below. The pump cable connection to the local control station shall be made using a suitable Meltric plug and receptacle or equivalent system that does not require an electrician to disconnect the power cable from the control station.

e. The pump shall be supplied with a submersion cable (SUBCB) suitable for submersible pump applications.

f. The pump shall be automatically and firmly connected to the discharge connection, guide by no less than two guide bars extending from the top of the tank to discharge connection. The pump shall be removable from above without the need to enter the tank.

g. Major pump components shall be of grey cast iron, ASTM A-48, Class 30B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts and bolts shall be AISI type 304 stainless steel or brass construction. All exterior metal surfaces coming into contact with water shall be protected by a factory applied spray coating of alkyd primer and a synthetic resin enamel finish.

h. The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

i. Bearings. The upper bearing shall be a single row ball bearing. The lower bearing shall be a two row angular contact ball bearing. Motor bearings shall be permanently grease lubricated.

j. Mechanical Seal. The pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in an oil reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate.

The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing.

k. Pump Shaft. Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The shaft shall rotate on two permanently lubricated ball bearings. The shaft shall be of ASTM 420 stainless steel.

l. Cable Entry Seal.

1) The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable.

2) The assembly shall provide ease of changing the cable when necessary using the same entry seal.

3) The junction box shall be completely sealed off from the pumped media. Epoxies, silicones, or other secondary sealing system shall not be considered acceptable.

m. Motor.

1) The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber, NEMA B type. The stator windings and stator leads shall be insulated with moisture resistant Class F insulation rated for 155C (311F). The stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted into the stator housing. The use of bolts, pin, or other fastening devices requiring penetration of the stator housing is not acceptable.

2) The motor shall be designed for continuous duty handling pumped media of 40C (104F) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125C (260F) shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected in series with the motor starting circuit in the control panel. The motor and pump shall be designed and assembled by the same manufacturer.

3) The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40C (104F) ambient and with a temperature rise not to exceed 80C. A performance chart shall be provided showing curves for torque, current, power factor, input/output

kW and efficiency. This chart shall also include data on starting and no-load characteristics.

4) The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber. The motor and cable shall be capable of continuous submergence underwater without of watertight integrity to a depth of 65 feet. The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from the shut-off through run-out.

n. Impeller. Impellers available for this pump model shall be either single vaned, totally enclosed or multi-vaned, vortex type.

o. Wearing Rings. A wear ring system shall be used to provide efficient sealing between the volute and suction inlet for totally enclosed impellers. Each pump shall be furnished with a leaded red brass ring insert that is drive fitted to the volute inlet.

p. Volute. Pump volute (s) shall be single-piece grey cast iron, Class 30, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified.

q. Accessories. The pumps shall be supplied with the following accessories.
1) Discharge elbow with stainless steel anchor bolts as specified above.
2) Stainless steel upper guidebar bracket.
3) Guide rails. Two schedule 40 type 304 stainless steel pipe. Length as required to remove the pump from each tank at the maximum water depth. Diameter per pump manufacturer.
4) Pump Removal System Consisting of the following.
a) Complete attachments necessary for lifting the pump and motor from the tanks.
5) Stainless steel hook assembly for hanging excess pump cable and lifting rope. The hook assembly shall be fabricated from type 304 stainless steel and shall be mounted to the top of the tank walls.
6) Stainless steel wire braid sleeve with attachment tail for hanging pump power cable from hook assembly.

2.10 DISSOLVED OXYGEN SENSORS

a. Furnish one (1) dissolved oxygen sensor per basin. Sensors shall be suspended on a removable mounting pipe assembly. Stainless steel pipe, stainless steel supports, and stainless-steel anchors shall be provided.

b. The dissolved oxygen sensors shall be furnished with a local transmitter for local display. The transmitter shall be monitored by the SBR Control System and the signal used to

automatically control the speed of the blowers to maintain an operator selected dissolved oxygen setpoint.

2.11 PRESSURE TRANSDUCERS

a. Furnish a pressure transducer assembly for each SBR basin and each digester basin.

b. Submersible pressure transducers shall be constructed of stainless steel. Transducer shall utilize a diffused silicone semiconductor sensor protected by an integral stainless-steel diaphragm with seal fluid. Transducer output shall be a 4-20 mA signal.

c. The transducers shall be furnished with a local transmitter for local display. The transmitter shall be monitored by the SBR Control System and the signal used to automatically timer control.

d. Transducers shall be suspended using ¼" 304 stainless steel suspension cables and bracket.

e. Adhesive anchors of 304 stainless steel shall be provided for anchoring the pressure transducer suspension cables and mounting bracket.

2.12 HIGH LEVEL FLOAT SWITCHES

a. Furnish high level float switch assemblies for each SBR basin.

b. Float switch assemblies shall be provided with a smooth, chemical resistant polypropylene casing and 316 stainless steel mounting bracket for each location. Each float switch shall be provided with a three conductor electrical cable. Electrical cable shall terminate at a junction box/disconnect located at the basin wall.

c. NEMA 4X 304 stainless steel junction box shall be provided. The junction box shall contain intrinsically safe relays and terminal blocks for terminating electrical controls and components.

2.13 SBR/DIGESTER CONTROL PANEL

a. The control panel shall be designed to automatically control all of the SBR and Digester equipment while minimizing operator attention. The control software program shall be factory tested prior to delivery to the jobsite.

b. The control system shall be a timer-based system with level overrides and shall provide control, sequence, monitoring, and alarm annunciation capabilities. The operator shall be able to access the timer values and set points through the operator interface panel to allow for adjustment of cycle times and system flexibility. The control system shall be designed to automatically accommodate the plant's full range of loads and flows.

c. The control system shall be capable of starting and stopping blowers and adjusting the blower speed to maintain an operator-selected dissolved oxygen set point. The control

system shall also be capable of controlling the blowers on timer settings only (i.e., no DO control).

d. Refer to Section 16090, Packaged Electrical System Requirements and Section 17090, Packaged Control System Requirements for additional requirements.

e. The control panel enclosure shall be a heavy duty, free standing, NEMA 12, enclosure. The panel shall be made of 10-gauge steel and fully braced. The doors shall be heavy duty 3-point latching doors with a padlocking handle. The master circuit breaker disconnect shall be on the far right, and be interlocked with the doors. The panel shall include an internal light, service outlet, and be UL approved and labelled.

f. 120-volt control power shall be supplied via an Uninterruptible Power Supply (UPS). All 120V branch feeders shall be protected by circuit breakers.

g. Control relays shall be industrial plug-in type. Motor starters shall be UL Listed as a self-protected control device type of combination starter [rated at 42,000 AIC]. Terminal blocks shall be high-density type, rated for 600 VAC, 30 amp min. with test plugs and clearly marked. 10% spare terminals shall be provided. All internal devices shall be clearly marked and identified on the outside and inside of the panel. All terminals and wires shall be clearly tagged in accordance with the schematic and wiring diagrams.

h. A "Hand-Off-Auto" switch shall be provided on the exterior of the panel for each motor. The Auto position will allow automatic PLC operation while the Hand position will allow the operator to bypass the PLC when operating equipment. Switches shall be rated NEMA 4X with contacts rated at 60 amp make, 6 amp break, 10 amp continuous. Pilot lights shall be 120/6 volt transformer type rated NEMA 4X. All switches and lights shall be clearly labeled with white plastic legend plates with black lettering.

i. Uninterruptible Power Supply system (UPS) shall supply power to the PLC, MMI/Display Unit and miscellaneous field instruments. The UPS shall be provided with leak proof, maintenance free, lead acid batteries capable of operating at 50 % load for 24 minutes and at 100 % load for 6.5 minutes minimum. The UPS shall have an audible alarm, LED display for load, battery bar graph, online indication, on battery indication, replace battery indication and overload battery indication. The UPS shall be provided with a relay output module with a minimum dry contact outputs to monitor the following conditions: Replace UPS battery, UPS fault, UPS overloaded and UPS loads are on battery power. The dry contacts shall be form C type and rated for 120 volts AC. The UPS provided shall be a tower style, hardwired service bypass panel directly coupled to the UPS. The bypass panel shall be by the same manufacturer as the UPS and sized for the UPS specified. The warranty shall be a minimum of 1 year after final competition.

j. Programmable Logic Controller (PLC). The Programmable Logic Controller (PLC) shall provide a minimum of 750k program memory and up to 960 discrete I/O capacity. RAM memory shall be protected by a backup battery with further memory protection from a flash card. The processor shall have LED Indicators showing Run, Fault, and Battery Low status. Typical Scan Time is 1ms/1k ladder logic. The processor shall have one dedicated serial port, which supports RS232 communications. The processor shall have a

built in Ethernet port for network communications. A modem with a built in four-port Ethernet switch shall be provided to allow direct access for online technical support. The Ethernet switch will provide the network connections.

k. Human Machine Interface (HMI). A Graphic Operator Interface Terminal (HMI) shall be mounted on the front of the panel for control of the SBR and Digester Equipment and shall provide graphic display of the process parameters and equipment status on a VGA-quality [640x480 resolution] color display. The display shall have touch-screen operators. The system shall allow operator changes to set points and control of equipment. The terminal shall include an alarm annunciator with a dedicated alarm page and allow acknowledgment of alarms. It shall allow the display of analog data in bar graph or digital form combined with process graphics on multiple screens.

2.14 MOTOR CONTROL CENTER.

a. SBR supplier shall furnish a motor control center (MCC). The MCC shall be provided with a fully rated neutral bus. The unit shall have main lugs and bus system, which shall be tin plated copper and shall be fully braced for 65,000A RMS AIC with continuous horizontal and vertical bus bracing. The bus shall be rated for a minimum of 1,000 amps. Molded polycarbonate isolating material will separate the main bus from the unit starters and wire way. The MCC shall be provided with a power monitor.

b. Refer to Section 16447 Low voltage Motor Control Centers (MCC) for additional requirements.

2.15 LOCAL OPERATION STATIONS

a. Local operation stations shall be provided for the influent flow control valves, actuated air valves, the mixers, decanters actuators or decan valves, the waste sludge pumps, and the digested sludge pumps. Valves with electric actuators may be supplied with integral local controls in lieu of a local operation station.

b. The stations shall consist of local controls and indicator lights. These devices shall either be located on a backpanel with a blind-front panel, or the switches shall be key switches or have some other means of locking the switches for security purposes. If used, the blind-front panel shall include a padlockable latching mechanism. The enclosures shall be watertight NEMA 4X suitable for outdoor installation.

c. Decanter operating stations. The decanter operating stations shall have a multiposition switch with switch positions that perform the following functions: Lower, Off, Auto, Raise. In the Auto mode, the decanter position will be controlled by the SBR control panel.

d. Pump and mixer operating stations. Pump and mixer operating stations shall have an HOA switch. The pump shall be controlled by the SBR control panel in the auto mode.

The station shall also include a green indicator light to indicate that the pump or mixer is running.

e. Valve operating stations. Valve operating stations shall have a multiposition switch with switch positions that perform the following functions: Open, Close, Off, Auto. The valve shall be controlled by the SBR panel in the auto mode. The operating stations shall include a green indicator light to indicate that the valve is open and a red indicator light to indicate that the valve is closed as well as an amber indicator light to indicate a failure to close or open. The stations shall be suitable for wall mounting.

PART 3: EXECUTION

3.1 DESIGN SUPPORT

a. The suppliers project manager shall provide design support for the design team consisting that shall consist of telephone discussions, email exchanges, and online meetings. No in-person meetings are anticipated to be required for this project.

3.2 INSPECTION, START-UP AND FIELD TESTING

a. The SBR Manufacturer/Supplier shall furnish the services of a qualified representative to supervise the installation, start-up and field testing of the equipment. A qualified manufacturer's representative shall be one who has had at least five years experience in the installation of the types of equipment specified for this project.

b. At the completion of the installation, the manufacturer’s representative shall prepare a signed certification letter stating the following at a minimum.

1) The installation is as specified and is acceptable to the manufacturer.

2) The warranty and/or guarantee will be in full effect during the warranty period with no qualifications or reservations.

c. The Supplier shall furnish the services of the manufacturer’s field representative to advise on the field installation of all equipment.

d. The representative shall inspect the installation prior to startup and commissioning. The representative shall conduct performance testing and prepare written documentation describing the results. They shall certify that the installation is correct and that the equipment is ready for startup and commissioning. After the representative has certified that the installation is ready for operation, they shall supervise startup of the facility and certify that the system has operated as designed.

e. After the installation and operation of the equipment has been certified, the manufacturer's representatives shall train the City’s personnel in the proper operation and maintenance of the equipment.

f. During the first year of operation, the representative shall perform follow-up training for one 8 hour period at a time requested by the Owner. The costs for this training including travel expenses shall be included in the Supplier's bid price. No additional compensation will be made.

g. Where the SBR Suppliers field technician lacks the expertise required to startup, adjust and calibrate the equipment, the supplier shall furnish the services of a qualified factory representative. At a minimum, the equipment systems listed below will require a separate factory trained manufacturer's representative.
    a) Blowers
    b) Actuated Valves
    c) Sludge Pumps

h. The manufacturer's field representative shall be present at the project site for the minimum days listed below, travel time excluded.
    1) 5 days for installation assistance, include travel expenses for two separate trips to break the 5 days into two separate trips.
    2) 5 days for pre-startup inspection and testing and completion of Manufacturer's Certificate of Proper Installation.
    3) 10 days for facility startup.
    4) 2 days for post-startup training of Owner's personnel.
    5) 1 day for follow up training within 1 year of initial startup.

i. Virtual support during first year of operation. The supplier shall provide operational support for City Staff during the first year of operations without additional charge. This support shall consist of telephone discussions, email exchanges, online meetings, and the in-person follow-up training specified above.

SECTION 16090

PACKAGED ELECTRICAL SYSTEM REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes
   1. The Section includes the requirements pertaining to conduits and fittings used to contain electrical conductors and cables.
   2. All conductors and cables shall be installed in conduit or approved raceways regardless of which Division the conductors or cables are specified.

1.2 REFERENCES

A. The following is a list of standards which may be referenced in this Section.
   1. American National Standards Institute (ANSI).
      a. C80.1, Rigid Steel Conduit-Zinc Coated.
   2. American Society for Testing Materials (ASTM).
      a. A123 E1, Standard Specification for Zinc-Coated (Galvanized) Coatings on Iron and Steel Products.
      b. B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard or Soft.
   3. National Electrical Contractors Association (NECA).
      a. National Electrical Installation Standards (NEIS).
   4. National Electrical Manufacturers Association (NEMA).
      a. RN 1, Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Coated and Intermediate Metal Conduit.
      b. TC 3, PVC Fittings for use with Rigid PVC Conduit and Tubing.
      c. TC 6, PVC and ABS plastic Utilities Duct for Underground Installation.
      d. WC 3, Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
      e. WC 5, Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
      f. WC 7, Cross Linked-Thermostetting Polyethylene Wire and Cable for the Transmission and Distribution of Electrical Energy.
      g. WC 55, Instrumentation Cables and Thermocouple Wire.
   5. Nation Fire Protection Association (NFPA).
      a. 70, National Electrical Code (NEC).
   6. Underwriters Laboratories, Inc. (UL).
      a. 6, Standard for Safety Rigid Metal Conduit.
      b. 13, Standard for Power-Limited Circuit Cables.
      c. 44. Standard for Safety Rubber-Insulated Wires and Cables.
      d. 50 Enclosures for Electrical Equipment.
      e. 360, Standard for Safety Liquid-Tight Flexible Metallic Conduit.

f. 510, Standard for Safety Insulating Tape.
g. 514B, Standards for Safety Fittings for Conduit and Outlet Boxes.
h. 514C Standard for Safety Non-Metallic Outlet Boxes, Flush Device Boxes and Covers.
i. 651, Standard for Safety Schedule 40 and 80 PVC Conduit.
j. 651A, Standard for Safety Type EB and Rigid PVC Conduit and HDPE Conduit.
k. 797, Standard for Safety Electrical Metallic Conduit.
l. 1581, Standard for Safety References for Electrical Wires, Cables and Flexible Cords.
m. 1660, Standard for Safety Liquid-Tight Flexible Nonmetallic Conduit.

1.3 SUBMITTALS

A. Contractor shall submit all the product data in Division 26 at the same time. Piecemeal submittals will be rejected as incomplete.

B. Submittal Format:
1. The product data shall be provided as individual PDFs for each Section, unless otherwise noted for specific items. Each PDF shall be numbered to match the specification Section numbers. Submittals not itemized and labeled as specified will be rejected as incomplete.
2. A submittal is required for each product specified. Each individual product submittal shall have the corresponding Reference Keynote Number (example - 16000.A01) typewritten in the upper right hand corner of the submittal. The submittals within each Section tab shall be in the same sequential order as they are listed in the specification Section. Submittals not containing the Reference Keynote Number will be rejected as incomplete.
3. No typical submittals will be accepted. Each submittal shall be project specific and clearly identify specifically which components or parts are being submitted for approval. Any product submittals, such as a catalog sheet, which do not clearly identify which components or parts are being submitted for approval, will be rejected as incomplete.
4. Submittals in PDF shall include an index, table of contents, or bookmarks with hyperlinks to the associated page of all submitted items. Index shall include each product specified with their corresponding Reference Keynote Number. Electronic submittals not containing a linked index, table of contents, or bookmarks will be rejected as incomplete.

1.4 PACKAGED ELECTRICAL SYSTEM REQUIREMENTS

A. All electrical connections and circuits for packaged system motors, valves, instruments, sensors, switches, and all other electrical devices and appurtenances shall be furnished and installed by the manufacturer as a packaged system. The system shall comply with the following requirement:
1. UL Listed
2. All electrical components shall be installed in a Neat and Workmanlike manner as

defined by the National Electrical Contractor's Association (NECA) and a Professional and Skillful Manner as defined by the National Electrical Code.

3. All components shall be corrosion resistant utilizing products specified within this document.
4. Separation of Class 1 wiring from Class 2 wiring shall be provided.
5. All Class 1 power wiring associated with packaged equipment that is pre-wired by the supplier shall be terminated within an enclosure that has been provided by the manufacturer. The enclosure shall be furnished with labeled terminal blocks. The enclosure shall be the point of connection for "field connections" to the pre-wired conductors and cables. The "field wiring" shall be provided by Others. .
6. Similar to the Class 1 power enclosure, dedicated enclosures shall be provided for both analog and digital Class 2 low voltage pre-wired conductors and cables.
7. All wiring shall be tested at the factory by the manufacturer for continuity and resistance.
8. All equipment, enclosures, terminal blocks, and conductors shall be individually labeled.

B. Connections requiring "Field" wiring
   1. All electrical and low voltage conduit and wiring connections that must be constructed in the field (and not at the factory) for motors, equipment, instruments, transmitters, enclosures, etc shall be clearly identified on shop drawings. The drawings shall include scaled plan views, scaled elevation views, and electrical wiring schematics. The information provided shall include, at minimum:
      a. Voltage, phase, amps.
         1) AC vs DC circuits.
      b. Motor nameplate information
      c. Instrument nameplate information
      d. Line voltage, neutral, and grounding requirements, including wire count and minimum wire size.
      e. Instrumentation and control digital and analog wiring requirements.
      f. All interlock wiring
      g. Network connectivity (i.e. CAT6)
      h. Termination locations to transition between factory and "field" wiring.
   2. The schematics shall clearly delineate between "field" and manufacturer provided conduit and wiring.

PART 2 PRODUCTS

2.1 HARDWARE

A. **Stainless Steel Hardware (260533.H01)**
   1. All hardware shall be 316 or 304 stainless steel and sized for the load served.
      a. Strut channel, nuts, hex heads, washers, threaded rods, bolts, anchors, clamps, and all other hardware.

2.2 CONDUCTORS

A. **1,000 Volt Conductors (260533.C80)**
   1. Stranded copper, XHHW/XHHW-2 insulation.

B. **Twisted Shielded Pairs (260533.C70)**
   1. Stranded copper, 18 AWG.
   2. Outer PVC jacket, overall aluminum shield, drain wire, indoor/outdoor rated, and sunlight resistant.

2.3 CONDUITS AND BOXES

A. **Galvanized Rigid Steel Conduit (GRC) (260533.C01)**.
   1. Shall be mild steel, hot dipped galvanized inside and out.
   2. Shall be manufactured in accordance with ANSI C80.1 – Rigid Steel Conduit, Zinc Coated, and UL-6.
   3. Conduit fittings shall be hot dipped galvanized malleable iron.
   4. Condulets shall form 7 type.
   5. The use of three-piece couplings shall be incorporated only when unavoidable and not simply due to poor planning and layout.
   6. The use of compression, setscrew and split conduit fittings is unacceptable.
   7. Gaskets shall be installed on all condulet covers regardless of the environment they are installed in.
   8. Conduit straps shall be hot dipped galvanized malleable iron and incorporate matching conduit spacers when attached directly to walls, ceilings and floors.

B. **Liquid-Tight Flexible Aluminum Conduit (LFAC) (260533.C20)**.
   1. Shall be constructed of a flexible aluminum core with a sunlight resistant thermoplastic outer jacket.
   2. Conduit fittings shall be manufactured to the PVC-GRC fitting specifications. Galvanized or non-metallic conduit fittings are unacceptable unless written approval is obtained from the ENGINEER for specific locations before installation.
   3. No couplings shall be installed.
   4. Sealing rings shall be installed where conduit terminates at an enclosure.

C. **Cast Iron Boxes (260533.B01)**
   1. Shall be cast iron galvanized boxes, have tapered threaded hubs and be the deep FD type in all cases.
   2. Boxes shall have internal grounding screw.
   3. Shall have external mounting tabs.
   4. Whichever manufacturer is submitted and approved, all like boxes on Project shall be of the same manufacturer.

D. **Power and Instrumentation Junction Boxes (260533.B99)**
   1. UL Listed, 304 or 316 stainless steel, NEMA 4X, IP 66.
   2. Size as selected by the Manufacturer.

3. Gasketed door with quick release latches and padlock hasp and staple.
4. Stainless steel continuous hinges.
5. Manufacturer supplied aluminum backpanel.

2.4 CONDUIT ACCESSORIES

A. **Cord Grip (CGB) (260533.C89)**.
1. Provide stainless steel bodied cord grips with NPT mounted in conduit couplings as identified on the Drawings.

B. **Cord Connector (260533.C90)**.
1. Provide stainless steel cord grip with integrated stainless steel mesh.
2. Provide cord grip with stainless steel integrated mesh for any unsupported cord longer than 59 inches to provide adequate support of the cord.

2.5 IDENTIFICATION

A. **Colored Tape (260533.I01)**
1. Colored tape shall be used to identify individual conductors larger than # 6 AWG.

B. **Conductor and Cable Sleeves (260533.I02)**
1. The identification sleeves shall be properly sized for the cable or conductor.
2. Sleeves shall be white with black machine generated characters.

C. **Plastic Nameplates (260533.I03)**
1. Shall have a black background with white engraved letters. Nameplates for emergency functions shall be red background with white engraved letters. The nameplates shall have self adhesive rated for the environment which they are installed. The font type shall be consistent on all nameplates.

D. **Color Coding (260533.I04)**
1. Conductors shall be colored as specified in the table below.

System	Conductor	Color
All Systems	Equipment Grounding	Green
IT / Data	Data Cable Sheath (outer cover)	Blue
24 Volt DC	Positive	Blue
	Negative	White w/ Blue Stripe
	Discrete Input Line (hot leg) Side	Blue
	Discrete Input Switch Leg	Blue w/ White Stripe
	Discrete Output Line (hot leg) Side	Blue
	Discrete Output Switch Leg	Blue w/ Orange Stripe
120/208 Volt Three Phase	Phase A	Black
	Phase B	Red
	Phase C	Blue
	Neutral	White

System	Conductor	Color
120, 208, 277 Volt	Switch Legs	Pink
480 Volt Three Phase	Phase A	Brown
Wye or Delta Corner Tap	Phase B	Purple
	Phase C	Yellow
	Neutral	Gray

PART 3 EXECUTION

3.1 CONDUCTOR INSTALLATION

A. General Requirements
1. Conductor and cable installations shall meet or exceed the NECA National Electrical Installation Standards.
2. CONTRACTOR shall not exceed the manufacturer's recommendations for maximum pulling tensions or minimum bending radii for respective conductors or cables.
3. Pulling compound is recommended for all conductor or cable installations and shall be used on all installations requiring a mechanical pulling device.
4. CONTRACTOR shall furnish and use a dynamometer on all conductor or cable installations requiring the use of a mechanical pulling device. The dynamometer shall be used to verify the maximum pulling tensions are not exceeded. Should the pulling tensions be exceeded, the conductor or cable shall be removed from the raceway and discarded. It shall not be reused under any circumstance on the project. The CONTRACTOR shall be responsible to make the alterations necessary before attempting to re-pull new conductors or cables.
5. Immediately after pulling in conductors or cables, the pulling compound shall be completely removed from the conductors or cables, from boxes, enclosures, floors, walls, etc.
6. Conductor and cable installations shall be continuous without splices or intermediate terminations unless specifically identified on the Drawings or prior written approval from the ENGINEER.
7. Where conductors or cables are routed in boxes enclosures or cable tray they shall be neatly bundled with cable ties at intervals not to exceed 12 inches on center. The tension for the cable ties shall be set with a tool specifically manufactured for that purpose and of the same manufacturer as the cable tie. Side cutters, linemen pliers and similar tools shall not be used to cut the tail end of the cable tie. The CONTRACTOR shall only use the tool specifically manufactured for this purpose and of the same manufacturer as the cable tie.
8. Conductors and cables shall not be installed until the raceway, boxes, enclosures, conduit bushings, etc. have all been installed. Where conductors or cables have been installed prior to meeting this requirement, the ENGINEER shall at their discretion elect to have the conductors or cables removed, disposed of and replaced with new product.

9. Should the outer jacket of any conductor or cable be damaged in any way, they shall be removed, disposed of and replaced with new product.

B. Grounding
   1. An equipment grounding conductor shall be installed in all raceways. Size shall be as identified on the Drawings or the NEC, whichever is greater, but in no case shall it be less than # 16 AWG for under 50 volts and no less than # 14 for 50 volts or above.
   2. Provide ground bushings for all conduits that do not terminate in a hub type fitting and install at the source of power with a bonding conductor fastened to the ground bushing.
   3. Provide grounding type bushings with lug for a connection to a grounding conductor for all conduits which terminate at a cable tray.
   4. Provide grounding type bushings with lugs for connection of grounding conductor at both ends of metallic conduit runs. Bond ground bushings to the grounding system.
   5. Provide a green insulated wire-grounding jumper from the ground screw to a box grounding screw and, for grounding type devices, to equipment grounding conductor.

3.2 HARDWARE INSTALLATION

A. General Requirements
   1. Hardware shall be set to a torque as recommended by the manufacturer.
   2. Washers and split lock washers shall be installed on all bolts, threaded rods and anchors.
   3. Lead or plastic type anchors are prohibited from use on the project.
   4. When threaded rods are installed in drop-in type anchors, a washer, split lock washer and a jamb nut shall be installed at the anchor to ensure stability.
   5. When channel (strut) is installed as a hanger or support from threaded rod, washers, split lock washers and jamb nuts shall be installed on both sides of the strut to lock it in place.
   6. Cut ends of channel, strut, threaded rods or other cut fittings shall be filed smooth before installation.
   7. Threaded rod shall not extend more than one (1) inch beyond the channel, strut or other material it is supporting.
   8. Hangers and supports shall be installed level and plumb.
   9. Provide strut plastic end caps at the ends of all struts that are exposed to unintentional contact by personnel. Plastic end caps shall be safety yellow finish or color as directed by the OWNER.
   10. Hangers and supports shall be installed per the National Electrical Code, Building Code and Structural Code and shall be designed to safely support the load. The ENGINEER may request the CONTRACTOR provide a copy of their design calculations for the seismic requirements and the load served

3.3 CONDUIT INSTALLATION

A. General Requirements
   1. Raceways shall be electrically and mechanically complete before the conductors are installed.
   2. Conduit joints shall be wrench tight, thoroughly grounded, secure and free of obstructions.
   3. Conduits shall be reamed.
   4. Metallic threads shall all be coated with conduit thread lubricant before assembly. Failure to install the lubricant will result in removal of all conduit and reassembly with the conduit lubricant.
   5. Exposed conduits shall be installed parallel or perpendicular to the structural members and surfaces and shall be level and or plumb.
   6. When two or more conduits are routed in the same general direction their routing shall be parallel with symmetrical bends.
   7. Conduits shall be bent with equipment specifically designed for this purpose and for the specific size and type of conduit.
   8. Conduits that are creased or crushed shall be replaced.
   9. Install conduits such that they do not interfere with the proper and safe operation of equipment and do not block or otherwise interfere with the ingress and egress and installation of removable hatches and covers.
   10. Conduits that terminate at an enclosure that does not have a threaded hub shall be installed with a Myers type hub and ground ring. No exceptions shall be permitted without prior written approval for specific locations issued by the ENGINEER. Conduits that are permitted to terminate without a Myers type hub or a threaded hub shall have a ground bushing installed. A separate bonding conductor shall be routed to all ground bushings within an enclosure and be bonded to the enclosure and grounding conductor if present.
   11. Final connections to dry type transformers, motors, instruments, and other equipment requiring a flexible connection shall be made with LFAC conduit. Lengths shall not exceed three (3) feet.
   12. Spare conduits shall be provided with a coupling and threaded male plug that matches the makeup of the conduit for the area they are installed in. The conduit shall terminate at an enclosure when one is called out and exists as part of the Work. Where the spare conduit is stubbed up in a concrete slab for future equipment, it shall be installed flush with the finished floor. Where spare conduits are routed to other areas such as outside a building envelope, in an attic, to a vault, etc., the conduit shall have a female conduit cap installed.
   13. All conduits shall be individually identified at every point they terminate. The conduit identification shall be the same as that which is used on the conduit /conductor schedule in the Drawings. Should conduits be installed that are not listed on the conduit schedules, the CONTRACTOR shall add conduit callouts to the as-built conduit schedules and label the conduits accordingly.

B. Miscellaneous
   1. Provide cord grip for any unsupported cord.

3.4 BOX INSTALLATION

A. General.
   1. Boxes and enclosures shall be mounted level and plumb.
   2. Boxes and enclosures shall not be altered, holes drilled, etc. in any way that may compromise the NEMA rating of the enclosure or box.
   3. Boxes and enclosures shall be mounted with stainless steel hardware.
   4. Boxes and enclosures shall be bonded to the equipment grounding conductor.
   5. Surface mounted enclosures and boxes shall be spaced off the surface at least ¼ inch in damp or wet locations.
   6. Boxes and enclosures with threaded hubs or punched holes shall have the opening match the conduit size. The use of reducing bushings or reducing washers is unacceptable.
   7. Galvanized cast iron boxes are permitted only where GRC conduit is permitted.
   8. Enclosures shall be provided whenever a junction or pull box larger than 4 inches square is required.
   9. Provide a divider whenever a box contains conductors of different potentials that the code requires separation.

3.5 IDENTIFICATION

A. Plastic Nameplates
   1. Provide plastic nameplates for motor control centers, control panels, enclosures, junction boxes, and similar equipment. The verbiage on the nameplate shall be as identified on the Contract Drawings. The CONTRACTOR shall request the required verbiage from the ENGINEER should it not be available on the Contract Drawings.
   2. Typically the nameplates shall be centered and installed near the top of the equipment.
   3. Nameplates shall be black with white characters unless specified otherwise.

B. Conductor and Cable Identification Sleeves
   1. Provide heat shrink, machine generated, white labels with black characters for all cables and conductors. Identify the source and load served by the conductors and cables, including the terminal identification upon which the respective conductor originates and terminates.
   2. The labels shall be installed between 6 to 8 inches from the end and shrunk. Conductors shall be labeled at all splices and points of termination.

END OF SECTION

SECTION 16447

LOW VOLTAGE MOTOR CONTROL CENTERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes
   1. This section includes requirements for Low voltage (600 VAC or less) Motor Control Centers (MCC).

1.2 REFERENCES

A. The following is a list of Standards that may be referenced in the Section.
   1. NEMA Standard ICS-2 Industrial Control and System Controllers, Contactors, and Overload Relays Rated 600 Volts.
   2. Underwriters Laboratories (UL) Standard No. UL-508C Power Conversion Equipment.
   3. Underwriters Laboratories (UL) Standard No. UL-845 Motor Control Centers.
   4. American National Standards Institute ANSI C19.3 Compressors for Process Industries.
   5. National Electric Code (NEC).

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.3 SUBMITTALS

A. Contractor shall submit all the product data in Division 16 at the same time. Piecemeal submittals will be rejected as incomplete.

B. Submittal Format:
   1. The product data shall be provided as individual PDFs for each Section, unless otherwise noted for specific items. Each PDF shall be numbered to match the specification Section numbers. Submittals not itemized and labeled as specified will be rejected as incomplete.
   2. A submittal is required for each product specified. Each individual product submittal shall have the corresponding Reference Keynote Number (example - 16000.A01) typewritten in the upper right hand corner of the submittal. The submittals within each Section tab shall be in the same sequential order as they are listed in the specification Section. Submittals not containing the Reference Keynote Number will be rejected as incomplete.
   3. No typical submittals will be accepted. Each submittal shall be project specific and clearly identify specifically which components or parts are being submitted for approval. Any product submittals, such as a catalog sheet, which do not

clearly identify which components or parts are being submitted for approval, will be rejected as incomplete.

4. Submittals in PDF shall include an index, table of contents, or bookmarks with hyperlinks to the associated page of all submitted items. Index shall include each product specified with their corresponding Reference Keynote Number. Electronic submittals not containing a linked index, table of contents, or bookmarks will be rejected as incomplete.

C. Shop Drawings

1. Dimensional drawings showing the overall length, width and height of the assembled MCC. Included on these drawings shall be individual bucket locations and conduit entry areas and wiring diagrams.
2. Physical properties, handling, mounting and, if applicable, shipping break point locations shall be shown in the drawings. This shall include total weight, lifting instructions, height and floor space required.
3. Provide control systems engineering to produce custom unit elementary drawings showing interwiring and interlocking between units and to remotely mounted devices. Show all field devices, switches, lights, wire and terminal numbers, and grounding requirements. Indicate special identifications for electrical devices per the Contract Documents including internal and external interlocking, all components, overload settings, ratings, wire tags, terminal blocks, and devices for each load. Each drawing shall be circuit specific for the load submitted on. No typical schematic drawings shall be approved.
4. All drawings shall list the equipment number of the connected motor(s) for each MCC submitted on.
5. Component designations, e.g., relays, fuses, etc. shall match those shown in the Contract Documents.
6. Complete Bills of Materials shall be included with and shown on the Schematic or panel construction drawings for each MCC. Include list of spare parts provided.
7. The equipment drawings, summary tables, elementary drawings/diagrams, spare parts list and bill of materials list shall be computer generated. Hand drawings, sketches, or lists are not acceptable.

1.4 QUALITY ASSURANCE

A. Qualifications

1. The motor control center shall be the product of a manufacturer who shall also be the manufacturer of all the circuit breakers, fused switches and motor starters included in the motor control center and who has produced the same type of equipment for a period of at least 15 consecutive years.
2. Motor control center[s] shall be designed, assembled and tested by the manufacturer of the motor control equipment included in the control center assembly.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Equipment Handling

1. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.6 SYSTEM SUPPLIER

A. The SYSTEM SUPPLIER shall be the vendor that supplies the motor control center.

1.7 OWNER'S SCADA SYSTEM AND SYSTEM INTEGRATOR (SI)

A. The OWNER has pre-selected a SYSTEM INTEGRATOR (SI) to provide a SCADA system to monitor the entire wastewater treatment system, including but not limited to the new SBR and DAF systems.
   1. The SCADA system will be Rockwell Automation FactoryTalk SE.

B. The MCC shall be Ethernet/IP compatible so that it is compatible with the SCADA system.
   1. The SYSTEM SUPPLIER shall provide all programming of protocol converters used as gateway devices between their protocol and Ethernet/IP.

C. The control panel SYSTEM SUPPLIER shall coordinate with the SI, ENGINEER, and OWNER to ensure a fully coordinated control system that integrates with the OWNER'S SCADA system.
   1. Provide for continued and ongoing coordination with plant-wide SCADA developers to ensure uniform integration of SCADA operator screens and functions where they are determined to be appropriate and useful.
   2. ENGINEER has final authority in determining the extent and degree of integration between the plant-wide SCADA and the SYSTEM SUPPLIER'S motor control center.

D. Provide a data map of all points on packaged control system PLC to the SI

1.8 MOTOR CONTROL CENTER REQUREMENTS AND STANDARDS

A. The motor control center (MCC) shall be designed by the SYSTEM SUPPLIER. The design responsibilities of the SYSTEM SUPPLIER shall include, but not be limited to, the following.
   1. Shall meet the design requirements as described in the following Specifications below. The MCCs shall be capable of controlling all of the motors and pumps associated with the packaged systems.
      a. Section 11300 SBR Equipment.
      b. Section 11400 DAF Equipment.
   2. Select the appropriate motor starter type for the respective motor loads of the packaged system (across-the-line motor starters, full voltage reversing motor starters, variable frequency drives (VFDs)).
   3. Size the motor starter (including VFDs) and size the overcurrent protection devices per the NEC.

4. Design the motor starting schematics and wiring diagrams for each motor starter, including but not limited to pushbuttons, emergency stops, indicator lights, control power transformers, control relays, etc.
5. Design motor protection relays associated with submersible pumps or motors that are located in NEC Class 1 Division 1 and Class 1 Division 2 locations. Install the relays on the door of the respective motor starter bucket within the MCC. Facilitate coordinate of the motor protection relay with the pump manufacturer and MCC manufacturer.

B. The MCC shall have the minimum characteristics.
1. UL Listed
2. Short circuit rating = 65,000 AIC.
3. Integral surge protection device.
4. Minimum of 25% spare load capacity
5. Minimum of 25% spare "bucket" space for future motor staters.
6. The MCC shall be Ethernet/IP compatible so that it may communicate with the plant's SCADA system.

C. The SYSTEM SUPPLIER shall provide a fully engineered, factory-tested, and completely functional MCC that is capable of controlling the packaged system.

1.9 COMMISSIONING
1. Provide commissioning in accordance with Section 11300 and 11400.

1.10 MAINTENANCE

A. Maintenance Manuals
1. Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets, instruction bulletins and renewal parts lists where applicable, for the complete assembly and each major component.

B. Extra Materials
1. Provide as recommended by the manufacturer.

C. Spare parts shall be boxed or packaged for long term storage. Identify each item with manufacturers name, description and part number on the exterior of the package.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

A. Low Voltage Motor Control Centers.
1. Ratings
a. The motor control center shall be rated as shown on the Drawings.
b. All units and sections shall be UL labeled.

2. Enclosure
    a. The enclosure shall be rated NEMA Type 1A with gasketed doors. Structures shall be totally enclosed, dead-front, free-standing assemblies. Adequate space for conduit and wiring to enter the top or bottom shall be provided without structural interference.
    b. Compartments for mounting control units shall be incrementally arranged such that not more than six (6) Size 1 or Size 2 starters can be mounted within each vertical structure. Guide rails shall be provided.
3. Vertical Sections
    a. Each vertical section shall be 90 inches high and up to 21 inches deep maximum.
    b. Vertical sections shall have internal base mounting angles at the bottom and external lifting angles at the top running continuous within each shipping block.
    c. Each vertical section shall have side sheets extending the full height and depth of the section to minimize the chance of fault propagation to adjacent sections.
4. Wireways
    a. Structures shall contain a horizontal wireways of standard sections, at both the top and bottom of the structure. Horizontal wireways shall be not less than 9 inches high. The horizontal wireways shall be isolated from the horizontal bus via metal barriers and be readily accessible through hinged covers. To prevent damage to cable insulation, the wireway opening between sections shall have rounded corners and the edges shall be rolled back. Adequate space for conduit and wiring to enter the top or bottom shall be provided without structural interference.
    b. A full height vertical wireway with minimum of 35 square inches of cross-sectional area and hinged door shall be provided in each standard vertical section. Wireways shall contain steel rod cable supports. A permanent vertical wireway wall shall separate the buckets from the vertical wireway, and remain intact even when the buckets are removed.
5. Horizontal and Vertical Power Bus Bars
    a. Bus material shall be tin-plated copper or silver-plated copper. Vertical bus shall have a minimum rating of 300 amps and in no case shall it be rated less than the load served within the vertical bus's respective vertical section. The bus bracing shall be fully rated to withstand the fault current specified.
    b. The power bus system shall be supported, braced, and isolated by a bus support molded of a high strength, non-tracking glass-reinforced polyester material.
    c. The horizontal bus shall be rated at 65 degrees C temperature rise over a 40 degrees C ambient in compliance with UL standards.
    d. The horizontal bus shall be connected to the vertical bus with a minimum of two (2) bolts and each bolt shall be capable of handling the load.
    e. Vertical bus safety protection shall consist of shutters that automatically open when buckets are inserted and automatically close when buckets are

removed. Shutters shall prevent personnel exposure to live vertical bus bars. Shutters shall isolate the bus from arcing faults.

6. Grounding and Ground Bus
   a. A tin-plated copper or silver-plated copper ground bus shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the motor control center. The ground bus shall be located in the horizontal wireway.
   b. The size of the horizontal ground bus shall be sized for the load served.
   c. Each structure shall contain a tin-plated vertical ground bus rated 300 amperes. The vertical ground bus shall be directly connected to the horizontal ground bus via a tin-plated copper connector.
   d. A grounding stab shall be provided on each plug-in unit, such that the stab engages onto a copper vertical ground bus prior to the power stabs engaging.
   e. A grounding point shall be provided at each starter unit for purposes of landing the ground wire coming from the motor. This grounding point shall be directly tied to the horizontal ground bus.
7. Bucket (Unit) Construction
   a. Bucket Mounting
      1) After insertion, each plug-in unit shall be held in place by a latch that is located at the front of the unit.
      2) Multi-turn latches requiring more than 1/4 turn per latch shall not be acceptable.
      3) Plug-in stabs shall be mounted in a glass reinforced plastic insulation block at the rear of the unit.
      4) Wiring from the unit disconnecting means to the plug-in stabs shall be routed into this insulation block such that the wiring is not exposed at the rear of the unit.
      5) Size 1 through Size 5 non-reversing starters (FVNR) shall be plug-in buckets.
      6) Where shown in the Contract Documents, provide buckets configured to accommodate the variable frequency drives (VFD). VFDs mounted in motor control centers shall be factory integrated and shipped fully configured and fabricated to the job site. Site installation of the VFDs within the motor control centers is not acceptable.
      7) The unit door shall be fastened to the stationary structure (not the unit itself), so that the door can be closed when the unit has been removed.
      8) The door shall be hinged on the left-hand side so that it opens away from the vertical wireway.
      9) Minimum bucket height shall be 12 inches nominal.
   b. The operator handle of all buckets shall be interlocked with the MCC frame, so that a unit insert cannot be withdrawn or inserted when the operator is in the ON position.
   c. The operating handle of all buckets shall be capable of being pad locked in the open (off) position.
8. Control Power

a. Control Potential Transformers (CPT) shall be mounted in each unit containing motor starters and motor contactors.
b. CPT's shall have primary and secondary fuses and provide the following excess capacity in addition to that required by the starter coil:
    1) Size 1 - extra 40VA
    2) Size 2 - extra 40VA
    3) Size 3 - extra 125VA
    4) Size 4 - extra 180VA
    5) Size 5 - extra 200VA
c. Primary and secondary fuses shall have a clearly visible integral blown fuse indicator.

9. Overcurrent Devices
    a. Main Circuit Protective Device
        1) Circuit breakers shall be molded case with inverse time and instantaneous tripping characteristics.
        2) Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be non-welding silver allow and arc extinction shall be accomplished by means of DE-ION arc chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.
        3) Circuits shall have a minimum symmetrical interrupting capacity as indicated on the Drawings.
        4) Main breaker shall be molded case with electronic trip units.
    b. Electronic Trip Units
        1) Each molded case circuit breaker microprocessor-based tripping system shall consist of three (3) current sensors, a trip unit and a flux-transfer shunt trip. The trip unit shall use microprocessor-based technology to provide the adjustable time-current protection functions. True RMS sensing circuit protection shall be achieved by analyzing the secondary current signals received from the circuit breaker current sensors, and initiating trip signals to the circuit breaker trip actuators when predetermined trip levels and time-delay settings are reached.
        2) An adjustable trip setting dial mounted on the front of the trip unit shall establish the continuous trip ratings of each circuit breaker. Rating plugs shall be adjustable and settings shall be adjusted by the CONTRACTOR as indicated on the Drawings. Rating plugs shall be interlocked so they are not interchangeable between frames, and interlocked such that a breaker cannot be closed and latched with the rating plug removed.
        3) System coordination shall be provided by the following microprocessor-based time-current curve shaping adjustments:
            a) Adjustable long-time setting (set by adjusting the trip setting dial).
            b) Adjustable short-time setting and delay with selective curve shaping.
            c) Adjustable instantaneous setting.
            d) Adjustable ground fault setting and delay (where required by Code).

e) The microprocessor-based trip unit shall have both powered and unpowered thermal memory to provide protection against cumulative overheating should a number of overload conditions occur in quick succession.
f) When the adjustable instantaneous setting is omitted, the trip unit shall be provided with an instantaneous override.
g) Where internal ground fault protection is specified, adjustable settings shall not exceed 1200 amperes. Provide neutral ground fault sensor for four-wire loads.
h) Where continuous current rating of the protective device is rated or can be adjusted to 1200 amperes or higher, the electronic trip unit shall be provided with a arc flash energy-reducing maintenance mode capability.
i) Breakers shall have built-in test points for testing the long-time delay, instantaneous, and ground fault functions of the breaker by means of a test set.

c. Starter buckets shall have full-voltage, non-reversing, motor circuit protectors (HMCP) with magnetic trip only, and a 65,000 short circuit rating, unless otherwise noted. The HMCP shall provide adjustable magnetic protection and be adjustable up to 1700% of motor nameplate full load current to comply with NEC requirements. All HMCP combination starter units shall have a 'tripped' position on the unit disconnect and a push-to-test button on the HMCP. Type HMCP motor circuit protectors through size 4 shall include transient override feature for motor inrush current.

10. Motor Starters
    a. Magnetic starters through NEMA Size 9 shall be equipped with double-break silver alloy contacts. The starter must have straight-through wiring. Each starter shall have a minimum of one (1) normally open auxiliary contact.
    b. Coils shall be of molded construction through NEMA Size 9. All coils to be color-coded through size 5 and permanently marked with voltage, frequency and part number.
11. Solid State Overload Relays
    a. Provide a solid-state overload relay for protection of the motors.
    b. The overload relay shall provide high accuracy through the use of state-of-the-art microelectronic packaging technology. The relay shall be suitable for application with NEMA Size 1 through Size 7 motor starters.
    c. The overload relay shall be modular in design, be an integral part of a family of relays to provide a choice of levels of protection, be designed to directly replace existing electromechanical overload relays, and be listed under UL Standard 508.
    d. The overload relay shall have the following features:
        1) Self-powered
        2) Class 10A, 10, 20, or 30 selectable tripping characteristics
        3) Manual or automatic reset
        4) Supply with electronic reset
        5) Reset capabilities through onboard fieldbus

6) Selectable (On/Off) Phase loss protection. The relay shall trip in 10 seconds or less under phase loss condition
7) Selectable (On/Off) Phase Imbalance protection. The relay shall trip in 10 seconds or less under phase imbalance condition.
8) Visible trip indication
9) One normally open and one normally closed isolated auxiliary contact
10) Test button that operates the normally closed contact
11) Test trip function that trips both the normally and normally closed contacts
12) A current adjustment range of 5:1 or greater
13) Embedded, selectable (On/Off) ground fault protection shall be an available option. Relay shall trip when ground fault is detected at 50% of full load ampere setting.
14) An LED that provides self-diagnostic information
15) An LED that aids in commissioning by indicating running current is too high compared to the FLA dial.
16) Ethernet/IP with I/O and webserver communication shall be provided.
17) Additional digital inputs and outputs (4 in and 2 out additional) shall be an available option. Inputs shall be both 24 VDC and 120 VAC, and outputs shall be discrete relay outputs
18) Diagnostic Trip Information indicating a specific trip on either ground fault, phase loss, phase imbalance, or thermal.
19) When using any of the available fieldbus the relay shall be capable of providing the following data monitoring:
    a) Individual Phase Currents
    b) Average RMS Current
    c) Thermal Capacity
    d) % Phase unbalance
    e) GF Current
    f) Line Frequency
    g) Relay settings
    h) Contactor Status

12. Variable Frequency Drives
    a. The VFDs shall be installed within the MCC.
    b. The final VFD size shall be based on the full load current of the approved submittals of the driven load.
    c. Any modifications to a standard product necessary to meet this Section shall be made only by the VFD manufacturer.
        1) Each VFD shall be completely factory pre-wired, assembled, and then tested as a complete system by the VFD manufacturer to ensure a properly coordinated, fully integrated drive system.
    d. It is the responsibility of the VFD manufacturer to ensure that the drive will not damage motor insulation due to high carrier frequency, reflected wave, dv/dt or other drive electrical characteristics based upon the installed conditions.

1) Provide equipment necessary to mitigate potential damage to motor insulation.

e. Minimum efficiency = 96%.
f. Sinusoidal pulse width modulated (PWM) type drive.
   1) Six-pulse insulated gate bipolar transistor (IGBT) power section.
   2) Microprocessor based controls.
   3) 5% Line reactors and 3% dv/dt load filters.
g. Minimum protective features:
   1) Motor overload protection.
   2) Instantaneous overcurrent.
   3) Instantaneous overvoltage.
   4) Undervoltage.
   5) Power unit overtemperature.
   6) Phase loss.
   7) VFD output short circuit.
h. Operation in either a constant volts/hertz or sensorless vector mode:
   1) Control mode selectable via programming keypad.
i. Frequency control
   1) Minimum of 3 selectable skip frequencies with adjustable bandwidths.
   2) Programmable minimum frequency.
   3) Programmable maximum frequency.
j. Separately adjustable acceleration and deceleration rates:
   1) Each rate adjustable from 0.01 to 3,600 seconds.
k. The VFD shall be capable of determining the speed and direction of a spinning load, “catch” the load and accelerate or decelerate it without damage to the load
l. Upon loss of speed reference, the VFD shall be programmable to either:
   1) Stop
   2) Maintain current speed
   3) Default to pre-selected speed
m. The VFD shall be capable of continuous operation in the event of a power loss of 5 cycles or less.
n. Inputs/Outputs
   1) Analog inputs:
      a) Configurable as either 0-10 volts or 4-20mA.
   2) Analog outputs:
      a) Programmable 4-20mA isolated
   3) Discrete inputs:
      a) Programmable
   4) Discrete outputs:
      a) Programmable
      b) Form C relay contacts
o. Potentiometer 3-wire input
p. Ethernet/IP communications.
q. Stop on a communication loss to PLC.
r. Diagnostics

1) Store a minimum of 4 fault conditions in non-volatile memory on a first in- first out basis.
    a) Operating frequency.
    b) Drive status.
    c) Power mode

s. User selectable automatic restart feature allowing the VFD to restart following a momentary power failure or other VFD fault.
    1) Programmable for up to 9 restart attempts
    2) Adjustable time delay between restart attempts.

t. The VFD shall be capable of being programmed while energized. Provide an accessible port to connect a laptop from outside of the enclosure with the enclosure door closed and the VFD energized.

u. Provide cabinet cooling devices required to maintain the VFD within the Manufacturer's specified temperature limits for the project conditions.
    1) Controlled by control power on.
    2) Long-life low noise cooling fans, sized for 150 percent capacity cooling.
    3) Provide power and fuse protection for the cooling fans.

v. Power disconnect:
    1) Thermal magnetic circuit breaker.
    2) Lockable in the off position

w. Line reactors:
    1) 5 percent input

x. Load DV/DT filters:
    1) 3 percent.

y. Metal oxide varistors to provide protection against:
    1) Line transients: 5,000 volts peak min
    2) Line to ground transients: 7,000 peak min

z. Provide each VFD with a keypad
    1) Password protected
    2) Mounted on door of MCC.
    3) Back-lit LCD
        a) Minimum of 2 lines with 16 characters per line.
    4) Display following parameters:
        a) Speed
        b) Output current
        c) Output frequency
        d) Input voltage
        e) Output voltage
        f) Total 3-phase kilowatts
        g) Kilowatt-hour meter
        h) Elapsed run time meter
        i) Revolutions per minute
        j) DC bus voltage

aa. Pilot devices, including but not limited to, selector switches, pushbuttons, and indicator lights. Refer to Section 17090,

13. Terminal Blocks

a. Terminal blocks shall be mounted within the unit and located near the front for accessibility. They shall not be located at the rear of the vertical wireway.
b. Power terminal blocks shall be provided.
c. On plug-in units, control terminal blocks shall be pull-apart style.

14. Internal Wiring shall be NEMA Class IIS, Type B. All internal wires shall be clearly labeled at each termination and the label identification shall be clearly present on the record drawings submitted. Manufacture installed wires shall be green for grounds, white for neutrals, and red for control power. All terminal blocks shall be identified with labels showing the terminal block identification and individual terminal numbers. Control wiring shall be 600V, 90 °C, 16 AWG minimum machine tool wire (MTW). Power wiring shall be 600V, 90 °C, 10 AWG minimum.
15. Operator Control Stations
    a. Each starter shall be equipped with a fused control power transformer, minimum of two (2) indicating lights, Hand-Off-Auto (HOA) selector switch, and two (2) normally open contacts, unless otherwise scheduled on the drawings. A unit-mounted device panel shall have space to accommodate six (6) 30 mm oil-tight pilot-control devices or indicating ammeters, voltmeters, or elapsed time meters. In order to improve maintenance capabilities, the device panel shall withdraw with the unit. Door-mounted pilot devices are not acceptable.
    b. Indicator lights: LED type full size, full voltage, with push-to-test feature. Colors and quantities shall be as shown in the Contract Documents.
16. Finishes
    a. Surfaces shall be painted according to the manufacturers standard color scheme. All unpainted parts shall be plated for resistance to corrosion.
17. Identification Requirements
    a. Equipment and internal and external components shall be identified pursuant to Section 16090.
18. Control Devices: Relays, timers, surge monitors, and other control components shall be in accordance with Section 17090.
19. Digital Metering Module (DMM)
    a. Ethernet/IP communications.
    b. Provide a digital metering module (DMM) for each MCC as shown in the Contract Documents.
    c. The DMM shall be a microprocessor based, solid state unit suitable for door mounting on the electrical equipment enclosure and for providing monitoring for the 3 phase electrical circuits detailed in the Contract Documents. The DMM shall be UL-listed and comply with applicable portions of ANSI C37.90.
    d. The DMM shall provide direct reading of metered or calculated values for the items listed below and shall automatically range between Units, Kilo-units, and Mega-units for all displayed values. Accuracy's indicated shall be of read or calculated values.
        1) AC amperes in each phase: 1 percent accuracy.
        2) AC voltage, phase-to-phase and phase-to-neutral: 1 percent accuracy.

3) Kilowatts: 2 percent accuracy.
4) Kilovars: 2 percent accuracy.
5) Power factor: 4 percent accuracy.
6) Frequency: 0.5 percent accuracy.
7) Kilowatt demand (5, 10, 15, 30 minutes interval programmable): 2 percent accuracy.
8) Kilowatt hours: 2 percent accuracy.
9) Kilovar hours: 2 percent accuracy.
10) KVA: 2 percent accuracy.
11) KVAH: 2 percent accuracy.
12) Percent TDD.
13) Percent THD.
14) K factor.

e. External current transformers with ratios as indicated on the drawing or as required shall be provided integrated into the equipment lineup.
f. The DMM shall not utilize voltages greater than 120 VAC on the equipment enclosure door. This may be accomplished by back pan mounting of the voltage input sensors and door mounting the display portion of the DMM or with the use of separate (and fused) potential transformers. Integral potential transformers shall be fused.
g. The DMM shall have a dedicated communication port configured for Ethernet/IP protocol.
h. The DMM display face shall be membrane type and rated suitable for NEMA 12 mounting and integrated into the motor control center enclosure. The device shall have a durable, LED display screen accessible to the user without requiring opening a switchboard door.
i. The DMM shall have an operating temperature range of 0 degrees C to 70 degrees C, and 0 to 95 percent relative humidity non-condensing.
j. The DMM shall allow the user to disable undesired values/functions and to later reactivate them if required.
k. Control power shall be drawn from the monitored incoming AC line terminal connections. No separate AC supply input shall be required.
l. The device shall have non-volatile memory and not require battery backup; in the event of a power failure, the device shall retain all pre-set parameters, accumulated watt-hours, watt demand. Data at time of power loss shall be stored.

20. Surge Protection Devices (SPDs)
    a. Provide a surge suppression device (SPD) as shown on the Drawings.
    b. The SPDs shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards.
    c. The Maximum Continuous Operating Voltage (MCOV) of the SPDs shall not be less than 115% of the nominal system operating voltage.
    d. The SPDs shall provide line-to-line and line-to-ground protection.

e. The Nominal Discharge Current rating of the SPDs shall be 20kA.
f. The maximum Voltage Protection Rating of the SPDs shall not exceed 2,000.
g. The SPDs shall be provided with the following integral mounting options:
h. Protection Status Indicators - Each unit shall have a green / red solid-state indicator light that reports the status of the protection on each phase.
i. The indicator lights shall report the status of all protection elements and circuitry in the L-G and L-L modes.
j. The absence of a green light and the presence of a red light shall indicate that damage has occurred on the respective phase or mode. All protection status indicators shall indicate the actual status of the protection on each phase or mode. If power is removed from any one phase, the indicator lights shall continue to indicate the status of the protection on all other phases and protection modes. Diagnostics packages that simply indicate whether power is present on a particular phase shall not be accepted
k. The SPD shall include Form C dry contacts (one NO and one NC) for remote annunciation of its status. Both the NO and NC contacts shall change state under any fault condition.
l. The SPD shall contain an audible alarm that will be activated under any fault condition. There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.
m. The SPD shall be equipped with an LCD display that indicates to the user how many surges have occurred at the location. The surge counter shall trigger each time a surge event with a peak current magnitude of a minimum of 50 ± 20A occurs. A reset pushbutton shall also be standard, allowing the surge counter to be zeroed. The reset button shall contain a mechanism to prevent accidental resetting of the counter via a single, short-duration button press. In order to prevent accidental resetting, the surge counter reset button shall be depressed for a minimum of 2 seconds in order to clear the surge count total.
n. The ongoing surge count shall be stored in non-volatile memory. If power to the SPD is completely interrupted, the ongoing count indicated on the surge counter's display prior to the interruption shall be stored in non-volatile memory and displayed after power is restored. The surge counter's memory shall not require a backup battery in order to achieve this functionality.
o. The unit shall contain thermally protected MOVs. These thermally protected MOVs shall have a thermal protection element packaged together with the MOV in order to achieve overcurrent protection of the MOV. The thermal protection element shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.
p. All of the SPD's components and diagnostics shall be contained within one discrete assembly.
q. The minimum surge current withstand capacity of the SPD shall be as follows:
r. 250kA per phase.
s. 125kA per mode.

t. The SPDs shall be mounted within the switchboard enclosure. Externally mounted SPDs shall not be acceptable.
u. The SPDs shall be provided with a circuit breaker disconnect.

21. Ethernet/IP Devices
    a. Motor Control Center assemblies shall be provided with a factory assembled EtherNet/IP field bus communications network providing direct connectivity between MCC devices and the system controller and/or HMI.
    b. Ethernet 10/100 auto negotiate layer 2 managed industrial switches shall be provided as required in the MCC lineup. The Ethernet switch shall have sufficient ports available to connect to each EtherNet/IP device and have at least 2 open ports for a customer connection and a PC connection for maintenance. The Ethernet switch shall be mounted in the top removable unit of each vertical section or shipping split and not in the vertical wireway. If required by the application, the switch shall be capable of connecting to multiple sections.
    c. The EtherNet/IP system installed in the MCC shall include a complete and tested cabling system. The cabling system shall be shielded 600V CAT 6 and consist of home run connections from the device to a switch located in the MCC and in accordance with the ODVA specification. Non-standard, non-shielded cable will not be accepted.
    d. It shall be permissible to daisy chain Ethernet/IP devices using a 2-port switch configuration in each device unit or bucket and not use the home run topology.
    e. All cabling shall be securely supported and attached to the MCC structure in accordance with the contract drawings and the manufacturer's recommendations.
    f. EtherNet/IP communications modules shall be provided at each device interfacing to the EtherNet/IP field bus. The communications modules shall be installed in the unit device compartment or bucket, and shall be direct-connected to the EtherNet/IP Ethernet cable. Each device shall be provided with the appropriate factory fabricated cable for interfacing the communications module with the associated EtherNet/IP device.
    g. Industrial Ethernet Switch
        1) The MCC shall have a managed industrial Ethernet switches mounted in fixed mounted units within the lineup. Reference the Drawings for locations.
        2) The managed industrial Ethernet switch shall deliver optimal network security, network resiliency (if needed), and flexibility. The functionality should include port based control/prioritization, switch-level ring support, VLAN segmentation, and other Layer-2 switch features.
        3) The switch shall be suitable for use in a switch-level ring network topology.
        4) The switch shall be provided with a minimum of two (2) spare Ethernet ports.
        5) The spare Ethernet ports shall be wired to spare Industrial Ethernet RJ45 connectors within the vertical wireways of the motor control center,

located as shown on the Drawings. The spare Ethernet ports shall be located in vertical wireways that are adjacent to SPACE compartments.

6) The switch shall be located in the top horizontal wireway or within it's own bucket, as shown on the Drawings.
7) The switch shall accept redundant fiber optic cable connectors. The redundant fiber optic cable shall be used to network the switch to the Plant's PLC control panels.
8) The switch shall be provided with single mode LC type fiber optic connectors.
9) The size and quantities of switches shall be determined by the Manufacturer.

h. Industrial Ethernet Cable
   1) Shall be rated 600 volt UL Category 6 PLTC.

2.2 SEISMIC

A. Provide manufacturer's seismic certificate.

PART 3 EXECUTION

3.1 SOURCE QUALITY CONTROL

A. Tests and Inspections
   1. Provide factory testing of the control panels to ensure correct operation.
      a. Correct all errors prior to shipping
   2. Provide copy of the test results in electronic (PDF) format to the OWNER and ENGINEER.
   3. OWNER has the option to perform a virtual "witness testing" of the factory testing. Coordinate scheduling with the OWNER if desired.

3.2 DEMONSTRATION, TRAINING, START-UP, AND COMMISSIONING

A. Refer to the following Specifications for requirements.
   1. Section 11300 SBR Equipment
   2. Section 11400 DAF Equipment

3.3 AS-BUILT DATA

A. Provide a final as-built drawing in electronic format (PDF) as part of the O&Ms
   1. MCC drawings, elevations, and wiring diagrams
   2. All product data
   3. Recommended maintenance procedures
   4. Training materials
   5. Test results
   6. Warranty information

END OF SECTION

SECTION 17090

PACKAGED CONTROL SYSTEM REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes
   1. This section contains the requirements pertaining to the construction and installation of the control panels.

1.2 REFERENCES

A. The following is a list of standards which may be referenced in this section:
   1. National Electrical Contractors Association (NECA)
   2. National Electrical Installation Standard (NEIS)
      a. 5055, Standard of Installation
   3. National Fire Protection Association (NFPA)
      a. 70, National Electrical Code (NEC)
      b. 79, Electrical Standard for Industrial Machinery
   4. Underwriters Laboratories, Inc. (UL)
      a. 3121-1, Standard for Safety for Process Control Equipment
      b. 508, Industrial Control Equipment
      c. 698A, Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations
   5. National Electrical Manufacturer's Association (NEMA)
      a. 250, Enclosures for Electrical Equipment
      b. ICS 1-2000, Industrial Control and Systems General Requirements

1.3 SUBMITTALS

A. Contractor shall submit all the product data in Division 40 at the same time. Piecemeal submittals will be rejected as incomplete.

B. Submittal Format:
   1. The product data shall be provided as individual PDFs for each Section, unless otherwise noted for specific items. Each PDF shall be numbered to match the specification Section numbers. Submittals not itemized and labeled as specified will be rejected as incomplete.
   2. A submittal is required for each product specified. Each individual product submittal shall have the corresponding Reference Keynote Number (example - 16000.A01) typewritten in the upper right hand corner of the submittal. The submittals within each Section tab shall be in the same sequential order as they are listed in the specification Section. Submittals not containing the Reference Keynote Number will be rejected as incomplete.

3. No typical submittals will be accepted. Each submittal shall be project specific and clearly identify specifically which components or parts are being submitted for approval. Any product submittals, such as a catalog sheet, which do not clearly identify which components or parts are being submitted for approval, will be rejected as incomplete.
4. Submittals in PDF shall include an index, table of contents, or bookmarks with hyperlinks to the associated page of all submitted items. Index shall include each product specified with their corresponding Reference Keynote Number. Electronic submittals not containing a linked index, table of contents, or bookmarks will be rejected as incomplete.

C. Shop Drawings
1. Dimensional drawings showing the overall length, width, and height of the assembled control panel. Included on these drawings shall be the back panel layout of installed control devices showing part numbers, dimensions, nameplate text, and other details required for a complete assembly. Provide elevation drawings of the interior and exterior of the control panel.
2. For large control panel, physical properties, handling, mounting, shipping break point locations shall be shown in submittal drawings. This shall include total weight, lifting instructions, height, and floor space required.
3. Provide electrical schematic drawings that include: wiring details such as internal and field connection terminal block numbers; shielded wire termination requirements; grounding requirements; and wire colors. Show all required internal and external interlocking. Each drawing shall be circuit specific for the system submitted. No typical schematic drawings shall be submitted.
    a. Include all “field” connections (i.e. wiring that is external to the panel but terminates on the panel).
    b. Include all 120-volt and 24-volt circuits, including power to devices and instruments which are external to the control panel.
    c. Include all auxiliary contacts for alarms, status monitoring, and control.
4. Provide enlarged details of all of the electrical components on each DIN rail within the control panel.
5. Provide loop drawings of all digital and analog inputs and outputs (I/O).
    a. Indicate if instruments and devices are loop or self-powered.
6. Drawings shall list the equipment number of the box, control panel, or center submitted.
7. Component designations shall match those shown on the Drawings.
8. Complete bills of materials shall be included with submittal.

D. Operator Interface Terminal (OIT) Screen Submittals
1. Provide one (1) submittal in PDF format, showing all proposed OIT screens. Include the following:
    a. Actual colors used
    b. User interface buttons and interfaces
    c. Alarms and data monitoring
    d. Description of hierarchy of screens

2. Assume a minimum of three (3) rounds of submittals with the OWNER and ENGINEER.

1.4 SYSTEM SUPPLIER

A. The SYSTEM SUPPLIER shall be the vendor that supplies a programmable logic controller (PLC) PLC control panel for either the SBR or DAS packaged systems.

1.5 OWNER'S SCADA SYSTEM AND SYSTEM INTEGRATOR (SI)

A. The OWNER has pre-selected a SYSTEM INTEGRATOR (SI) to provide a SCADA system to monitor the entire wastewater treatment system, including but not limited to the new SBR and DAF systems.
   1. The SCADA system will be Rockwell Automation FactoryTalk SE.

B. The packaged control systems shall be Ethernet/IP compatible so that they are compatible with the SCADA system.
   1. The SYSTEM SUPPLIER shall provide all programming of protocol converters used as gateway devices between their protocol and Ethernet/IP.

C. The control panel SYSTEM SUPPLIER shall coordinate with the SI, ENGINEER, and OWNER to ensure a fully coordinated control system that integrates with the OWNER'S SCADA system.
   1. Provide for continued and ongoing coordination with plant-wide SCADA developers to ensure uniform integration of SCADA operator screens and functions where they are determined to be appropriate and useful.
   2. ENGINEER has final authority in determining the extent and degree of integration between the plant-wide SCADA and the SYSTEM SUPPLIER'S packaged control system.

D. Provide a data map of all points on packaged control system PLC to the SI.

1.6 CONTROL PANEL REQUIREMENTS AND STANDARDS

A. The SYSTEM SUPPLIER shall provide all components for a complete and functional PLC control panel, regardless of whether the components are specifically identified within this Specification or not. Generally, the control panel shall consist of the following:
   1. Programmable Logic Controller (PLC)
   2. Operator Interface Terminal (OIT)
   3. Network switch and Ethernet/IP protocol converter (if required)
   4. Uninterruptible power supply (UPS), battery backup for the UPS, and low voltage power supplies.
   5. Indicator lights, pushbuttons, selector switches.
   6. Surge protection device
   7. Overcurrent protective devices, terminal blocks, and terminal strips.

B. The overall size of the control panel, backpanel, and spacing of the internal components on the backpanel shall provide reasonable access for maintenance and troubleshooting. A design which does not permit reasonable use of typical hand tools (screw driver) by an average person to access and troubleshoot components shall not be acceptable.

C. An uninterruptible power supply (UPS) capable of supply the PLC, OIT, network switch, protocol converter, power supplies, and all I/O for a minimum of fifteen (15) minutes.

D. The exact design and layout of the control panel shall be the responsibility of the SYSTEM SUPPLIER due to its custom and unique nature. However, the control panel shall comply with the requirements and standards:
   1. All electrical components, devices, and wiring shall be installed in a Neat and Workmanlike manner as defined by the National Electrical Contractor's Association (NECA) and a Professional and Skillful Manner as defined by the National Electrical Code
   2. 18-month warranty minimum.
   3. UL 508A label.
   4. The control panel shall be capable of communicating with the Owner's SCADA system via Ethernet/IP. The Owner's SCADA system will be a Rockwell FactoryTalk View.
   5. Minimum short circuit rating = 42,000 AIC.
      a. The control panel nameplate shall include the AIC rating.
   6. Seismic certificate.
   7. Single enclosure.
   8. Separation of voltages for Class 1, Class 2, and Class 3 wiring as required by Code.
   9. Provide Code-required intrinsically safe relays and barriers as required. Provide Code-required separation of intrinsically safe wiring within the panel as required.
   10. Cooled and ventilated, engineered by the SYSTEM SUPPLIER.
      a. Provide intake and exhaust shrouds as needed.
      b. Provide exhaust fans with thermostats as needed.
   11. Shall monitor for loss of input power and shall generator an alarm to the SCADA system if power is lost.
   12. Surge protection on the incoming power circuit.
   13. Install wiring to maintain Code required separation of Class 1 and Class 2 wiring.
   14. Utilize wire duct management with covers, cable ties, and Velcro straps for all wiring.
   15. Control outputs shall be individually fused.
   16. 24-VDC digital input and output circuits.
      a. Provide MOV-type surge arresters on relay outputs where required.
   17. 24-VDC analog input and output circuits.
   18. 120-VAC digital output circuits.
   19. Provide uninterruptible power supplies to maintain constant power to the control panel.
   20. All control circuits protected by circuit breakers or fuses.

21. Provide 24 VDC power supplies for both internal and external loads.
    a. Size the power supplies so that all instrumentation associated with the packaged system may be powered by the power supply.
    b. 25% spare (volt-amps) minimum.
22. 120-VAC, 15-amp GFCI protected receptacle for troubleshooting and connecting a laptop.
23. Indicator lights for each alarm and status recommended by the Manufacturer.
24. Hand-Off-Auto for each motor or valve as recommended by the Manufacturer.
25. LED strip lights above every enclosure door, activated by motion sensors.
26. Grounding bus bar.
27. Data packet on door to hold as-built drawings.
28. All power distribution blocks, terminal blocks, conductors, relays, pilot devices, and all other components within the control panel shall be individually and distinctly labeled. The labels shall match the shop drawings.
29. Leave space at the bottom and top of the control panel enclosure for the installation of "field" conduits and wiring.
30. Fully tested and commissioned by the System Supplier at the factory prior to shipping.
    a. Provide written certification of testing to the OWNER.

E. Coordinate with the OWNER and ENGINEER through the submittals and coordination meetings to ensure the control panel, PLC, OIT, and networking system applications conform to the requirements of the Owner's project requirements and standards.

1.7 QUALITY ASSURANCE

A. Qualifications
    1. Equipment provided as part of this section shall be manufactured by a single licensed firm, regularly engaged in the design and manufacture of such equipment for a minimum of five years. The control panels shall have a UL508A listing. Components within control panels shall be listed in a manner consistent with UL508A requirements.

1.8 MAINTENANCE

A. Manufacturer shall provide and list in the bill of materials the following spare parts.
    1. One each of all power and control fuses provided in the assembled control panel/ center.

B. Provide Operation and Maintenance Data and Manuals Pursuant to the Contract Documents.

1.9 WARRANTY

A. Refer to the following sections for requirements
    1. Section 11300 SBR Equipment
    2. Section 11400 DAF Equipment

PART 2 PRODUCTS

2.1 PLC COMPONENTS, HARDWARE, AND SOFTWARE

A. Programmable Logic Controller (PLC)
   1. Shall consist of power supply, processor, 24-VDC digital inputs, 24-VDC digital outputs, 120-VAC digital outputs, 4-20mA analog inputs, and 4-20mA analog outputs, and all other modules for a complete PLC capable of controlling and monitoring the packaged control system.
   2. The Programmable Logic Controller (PLC) shall provide program memory, processing speed, I/O capacity, and Ethernet/IP node capacity as needed for optimal operation of the packaged control system without delays or lag caused by scanning time, lack of processing or memory resources, or inefficient PLC code. RAM memory shall be protected by a backup battery with further memory protection from a flash card. The processor shall have LED Indicators showing Run, Fault, and Battery Low status. Typical Scan Time is 1ms/1k ladder logic. The processor shall have one dedicated serial port, which supports RS232 communications. The processor shall have a built in Ethernet port for Ethernet/IP network communications and a minimum of one USB port.
      a. Memory, speed, and I/O capacity shall be sized for a minimum of 25% spare capacity and expansion.
      b. Shall include non-volatile memory storage.
   3. PLC shall support programming via relay ladder, structured text, function block, and sequential function chart.
   4. DIN rail mounted.
   5. Rated for the temperature and environment in which the PLC is installed.
   6. UL Listed.

B. Operator Interface Terminal
   1. UL listed and rated for the environment in which it is installed.
   2. OITs shall be capable of displaying operating data, alarms, set points, etc. by a color display screen and shall have the following characteristics:
      a. Capable of generating graphics to display trends and access PLC data.
      b. OIT shall have a touch-screen with wide aspect ratio color.
   3. Touch screen shall allow the following gestures:
      a. Tap
      b. Double-tap
      c. Drag
      d. Long press
   4. OITs shall be capable of applying user defined graphic symbols including push buttons, selector switches, numeric and ASCII entry devices, diagnostic indicators, message displays, embedded numbers, ASCII variable displays and other devices.
   5. Shall support up to 100 screens and up to 500 alarms minimum.
   6. OITs shall have an alarm capability that utilizes an alarm list to record and display important data on triggered alarms with buttons for printing or clearing the list.

7. An alarm banner may be used to notify an operator when an alarm occurs by displaying a message and providing buttons for alarm response.
8. OIT power supplies shall be 24V DC and rated for operation from 18 to 32V DC absolute.
9. Display size for OIT shall be 12 inches nominal.
10. Conformal coated.
11. Installed on the control panel door. OIT shall be provided with mounting levers.
12. SD card (1GB) with protective cover, hot swappable, for external storage.
13. Lithium ion battery with cover.
14. Status indicators on back of terminal, including fault conditions.
15. Ethernet/IP compatible with Ethernet port.
16. USB host and device ports.
17. Provide with all software and firmware, including license, for screen development and packaged control system operation.

C. Managed Network Switches
1. Switch shall be UL Listed, EtherNet/IP, and rated for the environment in which it is installed.
2. Compatible with the OWNER's SCADA system.
3. Port count for number of devices served with 25% spare minimum.
4. Copper Ethernet connectors shall be RJ45.
5. DIN Rail Mounted.
6. 24 VDC powered.
7. Security
   a. STP, RSTP, MSTP resiliency protocols.
   b. EtherChannel (link aggregation)
   c. MAC ID port security
   d. Port thresholds and mirroring
   e. CIP Interface
   f. VLANs

D. Protocol Converters
1. If required, shall be used to convert the PLC, OIT, and network switch communication protocol to Ethernet/IP.
2. The control panel equipment shall be capable of communicating over Ethernet/IP with the OWNER'S SCADA system.
3. Switch shall be UL Listed, EtherNet/IP Certified and rated for the environment in which it is installed.
4. 24 VDC powered.

E. PLC and OIT Software
1. Provide software, firmware, and licenses for the PLC and OIT,
2. Provide a licensed copy of the PLC and OIT software to the OWNER.

2.2 CONTROL PANEL ENCLOSURE AND COMPONENTS

A. Control Panel Enclosure (407800.E20).

1. Control panel enclosure shall be provided as shown on the Drawings.
2. Control Panel enclosure shall be painted steel, NEMA 12.
3. Control Panel enclosure shall be continuous hinged with gasketed doors.
4. Control Panel enclosure shall include a lockable hasp.
5. Control Panel enclosure back-panel shall be painted steel.
6. Control Panel enclosure shall be supported on 12-inch legs.

B. Panel Vents (407800.V01).
   1. Panel Vents shall be provided as shown on the Drawings.

C. Enclosure Cooling Fan (407800.T01).
   1. Enclosure cooling fans shall be provided as shown on the Drawings.
   2. Enclosure cooling fans shall operate on 115 VAC.
   3. Enclosure cooling thermostats shall be provided for each fan.
   4. Enclosure cooling fans shall be provided with air filter, air plenum, finger guard, and inlet grille.
   5. Enclosure cooling exhaust vents shall be provided for each fan.
   6. Enclosure cooling exhaust vents shall be provided with air filter, filter retainer with integral finger guard, and exhaust grille.

D. Enclosure Lighting (407800.L01).
   1. Enclosure lighting shall be provided as shown on the Drawings.
   2. Enclosure lighting shall be LED.
      a. Lamp shall be provided by CONTRACTOR.
   3. Enclosure lighting shall be operated via a remote door switch.
   4. Enclosure lighting shall be 115 VAC powered.

E. Enclosure Corrosion Inhibitor (407800.I06).
   1. Enclosure corrosion inhibitors shall be provided as shown on the Drawings.

F. General Purpose Control Relays (407800.R01).
   1. General purpose control relays shall be provided as shown on the Drawings.
   2. General purpose control relays shall be industrial plug-in blade style.
   3. General purpose control relays shall indicate the on/off status by either a neon indicating light, LED indicating light, or by mechanical means.
   4. General purpose control relays shall be provided with a “push-to-test” function.
   5. General purpose control relays shall be provided with a minimum of three Form C contacts, and 10 Amp contact rating.
   6. General purpose control relay coil voltage shall be either 120 VAC or 24 VDC as indicated on the Drawings.
   7. General purpose control relays shall be provided with DIN rail mounting bases and hold down clips.
      1) Relay bases shall be of the same manufacturer as the relay.

G. Time Delay Relays (407800.R12).
   1. Time delay relays shall be provided as shown on the Drawings.

2. Time delay relays shall be either time delay on energize (TDOE), or time delay on de-energize (TDODE) as indicated on the Drawings.
3. Time delay relays shall be provided with a timing range as indicated on the Drawings.
4. Time delay relays shall be industrial plug-in blade style.
5. Time delay relays shall indicate the timed out status by either a neon indicating light, LED indicating light, or by mechanical means.
6. Time delay relays shall be provided with a minimum of three Form C contacts, and 10 Amp contact rating.
7. Time delay relay coil voltage shall be either 120 VAC or 24 VDC as indicated on the Drawings.
8. Time delay relays shall be provided with DIN rail mounting bases and hold down clips.
    1) Relay bases shall be of the same manufacturer as the relay.

H. Low Voltage Monitoring Relay (407800.R50).
1. Low voltage monitoring relays shall be provided as shown on the Drawings.
2. Low voltage monitoring relays shall have a fixed pick up at 22 VDC.
3. Low voltage monitoring relays shall have an adjustable dropout from 16 to 21 VDC.
4. Low voltage monitoring relays shall plug into an eight-pin octal relay base.
    a. Relay base shall be of the same manufacturer as the relay.

I. Power Circuit Breaker (407800.C02).
1. Power circuit breakers shall be provided as shown on the Drawings.
2. Power circuit breakers shall be current-limiting and designed to interrupt and isolate electrical power to individual power circuits and components deriving power from the enclosure.
3. Power circuit breakers shall be UL489 listed.
4. Power circuit breakers shall have the number of poles as indicated on the Drawings.
5. Power circuit breakers shall have current interruption ratings of 10K RMS symmetrical amperes, minimum, with voltage ratings and current trip ratings as shown on the Drawings.
6. Power circuit breakers shall have fast acting (type “B” trip curve), normal (type “C” trip curve) and high inrush (type “D” trip curve) trip characteristics as dictated by the connected load.
7. Power circuit breakers shall be panel mounted on DIN rail.
8. Power circuit breakers shall include a positively trip-free mechanism that cannot be defeated by holding the handle in the ON position.
9. Power circuit breakers shall be wire connected and include terminal lugs.

J. Power Circuit Breaker Accessories (407800.C04).
1. Provide busbar for one-pole, two-pole or three-pole circuits when shown on the Drawings. The busbar shall be the same manufacturer as the power circuit breaker.

2. Provide busbar shroud on all unused terminals. The shroud shall be the same manufacturer as the busbar.
3. Provide a bus connector to supply the power feed to the bus bar as shown on the Drawings. The bus connector shall be the same manufacturer as the busbar.

K. Control Fuses (407800.F01).
1. Control Fuses shall be provided as shown on the Drawings.
2. Control Fuses shall interrupt and isolate electrical power to individual control circuits and components within each enclosure and for circuits and components located outside each enclosure but deriving power from the enclosure.
3. Control Fuses shall be rated at 250 VAC minimum and with current ratings as shown on the Drawings.
4. Control Fuses shall have fast acting and time delay characteristics as dictated by the connected load.
5. Provide five (5) spare fuses of each type and size provided for each control panel.

L. Transient Voltage Surge Suppressors (407800.V10).
1. Transient voltage surge suppressors shall be provided as shown on the Drawings.
2. Transient voltage surge suppressors shall be capable of continuously sustaining a minimum of 20 amp for connected loads, operating from 120 VAC power with a line frequency between 47-63 Hz.
3. Transient voltage surge suppressors shall have a UL 1449 Suppressor Classification of 400 VAC for normal/common mode noise suppression.
4. Transient voltage surge suppressors shall include L-N, L-L, L-G and N-G modes of suppression, with noise attenuation of 50dB minimum for normal mode and 40dB minimum for common mode and a peak surge capability of 25kA.
5. Transient voltage surge suppressors shall have a green status LED as well as form C contacts for operating status indication and alarming.
6. Transient voltage surge suppressors shall mount on DIN rail.

M. Selector Switches (407800.S01).
1. Selector switches shall be provided as shown on the drawings.
2. Selector switches shall be of round construction with rotary operators.
3. Selector switches operation shall be to maintain the position turned to unless shown otherwise on the Drawings.
4. Selector switches shall be provided with the number of contacts, switch positions, and other details as shown on the Drawings.
5. Selector switches shall be rated NEMA 13 for indoor applications and NEMA 4 for outdoor applications.
6. Selector switch contacts shall be rated at 10 Amps.

N. Pushbutton Switch (407800.S02).
1. Pushbutton switches shall be provided as shown on the drawings.
2. Pushbutton switches shall be of round construction with push or push-pull operators.
3. Pushbutton switch operation shall be momentary or maintained as shown on the Drawings.

4. Pushbutton switches shall be provided with the number of contacts, switch positions, and other details as shown on the Drawings.
5. Pushbutton switches shall be rated NEMA 13 for indoor applications and NEMA 4 for outdoor applications.
6. Pushbutton switch contacts shall be rated at 10 Amps.
7. Pushbutton switches for Emergency Stop and other emergency switches (e.g., Help Me switches) shall be: provided with a red mushroom head; pull to reset; provided with N/C (failsafe) contacts; and shall be non-illuminated.

O. Indicator Lights (407800.L20).
1. Indicator lights shall be provided as shown on the drawings.
2. Indicator lights shall be of round construction.
3. Indicator lights shall have a built in push-to-test function.
4. Indicator light operation shall be as shown on the Drawings.
5. Indicator light lens colors shall be as shown on the Drawings.
6. Indicator lights shall be provided with high visibility LED lamps with transformers for circuit voltages over 24 VAC/DC, and high visibility LED lamps without transformers for circuits 24 VAC/DC and below.
7. Indicating lights shall be rated as NEMA 13 for indoor applications and NEMA 4 for outdoor applications.
8. Indicator light contacts shall be rated at 10 Amps.

P. Terminal Strip Identification Block (407800.T15).
1. Provide a terminal strip identification block with a machine generated label to match those shown on the Drawings.

Q. Low Current Terminal Blocks (407800.T10).
1. Low current terminal blocks shall be provided as shown on the Drawings and in all panels requiring low current field terminations. Provide accessories as required and as shown including, but not limited to end anchors, end barriers, bridge jumpers, terminal strip pre-printed markers and snap-in pre-printed terminal block markers.
2. Low current terminal blocks shall be used for electrical circuits rated at or less than 30 amps.
3. Low current terminal blocks shall mount on DIN rail.
4. Low current terminal blocks shall be supplied with all required accessories including end covers, fixed bridge bars, partition plates and end brackets.
5. Low current terminal blocks shall be supplied with machine printed terminal block and terminal strip identification numbers that match the approved submittals.
6. Low current terminal blocks shall be grey in color.
7. Low current terminal blocks shall be UL rated for up to 30 amps at 600 VAC.
8. Low current terminal blocks shall accept wires from 24 to 10 AWG for single conductor per termination.

R. Grounding Terminal Blocks (407800.T60).

1. Grounding terminal blocks shall be provided as shown on the Drawings and in all panels requiring field terminations.
2. Grounding terminal blocks shall be used for electrical circuits rated at or less than 30 amps.
3. Grounding terminal blocks shall mount on DIN rail.
4. Grounding terminal blocks shall be UL rated for a maximum of 30 amps and 600 VAC and to accept wires from 26 to 10 AWG for single conductor per termination.
5. Grounding terminal blocks shall be supplied with all required accessories including end covers, fixed bridge bars, partition plates and end brackets.
6. Low current terminal blocks shall be supplied with machine printed terminal block and terminal strip identification numbers that match the approved submittals.
7. Grounding terminal blocks shall be green / yellow in color.

S. Knife Disconnect Terminal Blocks (407800.T55).
1. Knife disconnect terminal blocks shall be provided shown on the Drawings, on all non-fused analog loop terminations, and in all panels requiring field analog loop terminations.
2. Knife disconnect terminal blocks shall be used for analog circuits.
3. Knife disconnect terminal blocks shall mount on DIN rail.
4. Knife disconnect terminal blocks shall be supplied with all required accessories including end covers, fixed bridge bars, partition plates and end brackets.
5. Knife disconnect terminal blocks shall be gray/orange in color.

T. Fusible DC Terminal Blocks (407800.T30).
1. Fusible DC terminal blocks shall be provided for 24 VDC control circuits as shown on the Drawings.
2. Fusible DC terminal blocks shall be rated for use in electrical control circuits rated 6.3 amps or less and 15-30 VAC/DC.
3. Fusible DC terminal blocks shall mount on DIN rail.
4. Fusible DC terminal blocks shall accept 5 mm by 20, 25 or 30 mm fuses and use LED type blown fuse indicators.
5. Fusible DC terminal blocks shall be supplied with all required accessories including end covers, fixed bridge bars, partition plates and end brackets.
6. Fusible DC terminal blocks shall be supplied with machine printed terminal block and terminal strip identification numbers that match the approved submittals.
7. Fusible DC terminal blocks shall be black in color.

U. Fusible AC Terminal Blocks (407800.T35).
1. Fusible AC terminal blocks shall be provided for 120 VAC control circuits as shown on the Drawings.
2. Fusible AC terminal blocks shall be rated for use in electrical control circuits rated 6.3 amps or less and 110-250 VAC/DC.
3. Fusible AC terminal blocks shall mount on DIN rail.
4. Fusible terminal blocks shall accept 5 mm by 20, 25 or 30 mm fuses and use neon blown fuse indicators.

5. Fusible AC terminal blocks shall be supplied with all required accessories including end covers, fixed bridge bars, partition plates and end brackets.
6. Fusible AC terminal blocks shall be supplied with machine printed terminal block and terminal strip identification numbers that match the approved submittals.
7. Fusible AC terminal blocks shall be black in color.

V. Relay Terminal Blocks (407800.T50).
1. Relay terminal blocks shall be provided as shown on the Drawings.
2. Relay terminal blocks shall mount on DIN rail.
3. Relay terminal blocks shall include coil voltage present indication.
4. Relay terminal blocks shall be supplied with all required accessories including end covers, fixed bridge bars, partition plates and end brackets.
5. Relay terminal blocks shall be supplied with machine printed terminal block and terminal strip identification numbers that match the approved submittals.
6. Relay terminal block coil voltage shall match the coil voltage shown on the Drawings.
7. Relay terminal block contacts shall SPDT, rated for 5A at 24V AC/3A at 120V AC.

W. Single Wire Conductors (407800.C20).
1. Single wire conductors shall be provided as required for wiring within control panels and control centers.
2. Single wire conductors shall be UL listed, standard type MTW.
3. Insulation colors shall comply with Section 16121 600-volt Conductors and Cables.
4. Single wire conductors shall be rated at a minimum of 600 volts.
5. Single wire conductors for 120 VAC circuits shall be 14AWG minimum.
6. Single wire conductors for motor power circuits shall be sized to the larger of; 125% of the attached motor load or 14AWG.
7. Single wire conductors for transformer power circuits shall be sized to the larger of; 125% of the transformer rating or 14AWG.
8. Single wire conductors for all other circuits shall be sized to the larger of; 100% of the attached load or 16AWG.

X. Single Pair Twisted Shielded Cable (407800.C25).
1. Single pair twisted shielded cables shall be provided as required for wiring within control panels and control centers.
2. Single pair twisted shielded cable be twisted, single pair with a drain wire and overall foil shielding, and PVC jacket.
3. Single pair twisted shielded cables shall be UL listed.
4. Single pair twisted shielded cables shall be rated at a minimum of 300 volts.

Y. Insulated Wire Ferrules (407800.F30).
1. Insulated wire ferrules shall be provided for all wiring within boxes, control panels, and control centers.
2. Insulated wire ferrules shall be plastic sleeved and insulated.
3. Insulated wire ferrule color code shall match DIN color code.

4. Insulated wire ferrules shall be installed using a controlled cycle tool from the ferrule manufacturer and specifically intended for use with the ferrules provided.

Z. Wire Identification Labels (407800.L02).
1. Wire identification labels shall be provided for all conductors within control panels and control centers.
2. Wire identification labels shall be machine printed, non-adhesive, wire marker heat shrink sleeves with identification numbers that match the approved submittals.
3. Wire identification labels shall be properly sized for the conductor or cable and shall be white with black characters.

AA. Wide Slot Wire Duct (407800.W20).
1. Wire ducts shall be provided as shown on the Drawings.
2. Wire ducts shall be sized as shown on the Drawings, or larger.
3. Wire ducts shall be no more than 40% filled based on the total cross sectional area of the wire duct.
4. Wire ducts shall be white in color.
5. Wire ducts shall have slotted sides.
6. Wire ducts shall include removable covers
7. Wire ducts shall be attached to the backpanel with screws or plastic fasteners that are approved for the use and provided by the wire duct manufacturer.
8. Wire ducts shall not be attached to backpanel or enclosure side surfaces with glue or other such adhesives.

BB. Narrow Slot Wire Ducts (Narrow Slot) (407800.W21).
1. Wire ducts shall be provided as shown on the Drawings.
2. Wire ducts shall be large enough to provide a wire fill area no more than 40 percent of the total cross sectional area of the wire ducts.
3. Wire ducts shall be attached to the back panel with screws or plastic fasteners that are approved for use with, and provided by the wire duct manufacturer.
4. Wire ducts shall not be attached to back panel or enclosure side surfaces with glue, tape, or other such adhesives.
5. Wire ducts shall be white in color.
6. Wire ducts shall have slotted sides.
7. Wire ducts shall be provided with removable covers.

CC. Noise Shield (407800.N20).
1. Noise shields shall be provided as shown on the Drawings.
2. Noise shields shall be designed to provide up to 20 dB reduction in noise, equivalent to six-inch air spacing.
3. Noise shields shall be provided with bonding clips to allow mounting inside wire ducts.
4. Noise shield height shall match the wire duct height.
5. Noise shields shall be perforated and pre-scored.
6. Noise shields shall include vertical wall slots and horizontal cable tie slots.

7. Noise shields shall be zinc plated on all horizontal (contact) surfaces and black powder coated on all vertical surfaces.
8. Noise shields shall be attached to the backpanel with screws or plastic fasteners that are approved for the use and provided by the wire duct manufacturer.

DD. Spiral Wrap (407800.W30).
1. Spiral wrap shall be provided as shown on the Drawings and for all conductor and cable wire assemblies that cross hinged connections.
2. Spiral wrap shall be sized per the manufacturer's instructions.
3. Spiral wrapped assemblies shall include a strain relieving loop at each hinge crossing, with a minimum 6 inch vertical height, to minimize flexing of the wires in the conductor and cable assemblies.

EE. Cable Ties (407800.W40).
1. Cable Ties shall be provided as required for organizing and arranging conductors within boxes, control panels, and control centers.
2. Cable ties shall be UV resistant.
3. Cable ties shall be black in color.
4. Cable ties shall be installed using a tool from the cable tie manufacturer and specifically intended for use with the cable ties provided.

FF. DIN Mounting Rail (407800.D10).
1. DIN Mounting Rail shall be provided as shown on the Drawings and in all panels requiring DIN mounting rail.
2. DIN mounting rails shall be made of steel, galvanized, and yellow chromated.

GG. Dual Outlet DIN Mounting GFCI Receptacles (407800.R88).
1. Dual outlet DIN mounting GFCI receptacles shall be provided as shown on the Drawings.
2. Dual outlet DIN mounting GFCI receptacles shall be rated for 20A at 120V AC.
3. Dual outlet DIN mounting GFCI receptacles shall be suitable for use with wires up to #10 AWG.
4. Dual outlet DIN mounting GFCI receptacles shall be rated for 25mS response time at 4-6 mA.
5. Dual outlet DIN mounting GFCI receptacles shall comply with UL943.

HH. Ground Bars (407800.G06).
1. Ground bars shall be provided as shown on the Drawings.
2. Ground bars shall be low profile, "bus" type with set screw or pressure type connections and all copper construction.
3. Ground bars shall include sufficient termination points to accommodate all equipment grounding conductors as shown on the Drawings.
4. Ground bars shall include spare termination points to accommodate twenty (20) additional conductors sized, #14 through #8 AWG.

II. Control Power Transformers (407800.T05).
1. Control power transformers shall be provided as shown on the Drawings.

2. Provided with primary and secondary fusing.

JJ. 24 VDC Power Supplies (270800.P96)
1. 24 VDC output, sized by the SYSTEM SUPPLIER.
2. UL Listed.
3. DIN Rail mounted.
4. LED colored indicators:
   a. DC OK output
   b. Floating DC OK output.
   c. Active power boost
5. Form C contacts for output alarm
6. Minimum 25% spare capacity.

KK. Uninterruptible Power Supplies (407800.U06).
1. Uninterruptible power supplies shall be sized by the SYSTEM SUPPLIER and shall provide backup power for the PLC, OIT, network switch, protocol converter, 24vdc power supply, and any other hardware upon which loss of power is unacceptable.
2. The UPS shall be provided with leak proof, maintenance free, lead acid batteries capable of operating at 50 % load for 24 minutes and at 100 % load for 6.5 minutes minimum.
3. Uninterruptible power supplies shall be UL1778 listed.
4. Uninterruptible power supply enclosures shall be zinc plated sheet steel.
5. Uninterruptible power supplies shall be designed for DIN rail mounting and panel mounting.
6. Uninterruptible power supplies shall be provided with three LED indicating lights and audible alarm to indicating the following signals:
   a. Alarm.
   b. Battery Mode.
   c. Power OK.
7. Uninterruptible power supplies shall be provided with an LED graph display that indicates the quantity of battery reserve in percent.
8. Uninterruptible power supplies shall be capable of ‘fast charging.’ The UPS shall be wired to the associated 24VDC power supply for ‘fast charging.’ The ‘fast charging’ feature shall minimize the time required to re-charge the UPS’s power supply units.
9. Uninterruptible power supplies shall include relay contacts to allow monitoring of the following signals:
   a. Alarm.
   b. Battery Mode.
   c. Power OK.
10. The warranty shall be a minimum of 1 year after final competition.
11. Minimum 25% spare capacity.

LL. UPS Power Storage Device (407800.B02)..
1. UPS power storage device shall be provided as shown on the Drawings.

2. UPS power storage devices shall be maintenance-free lead gel, rechargeable batteries.
3. UPS power storage devices shall be suitable for DIN rail mounting.
4. UPS power storage devices shall be rated 24VDC.
5. UPS power storage devices shall be connected in parallel to increase amp-hour buffer capacity..
6. UPS power storage devices shall be provided with an internal output fuse.
7. UPS power storage devices shall be rated for operating temperatures between 0 degrees C and 40 degrees C.
8. UPS power storage devices shall be compatible with the UPS.
9. Minimum 25% spare capacity.

MM. Heavy Duty End Bracket (407800.A61).
1. Provide heavy duty end brackets on DIN rails as indicated on the Drawings.
2. Heavy duty end brackets shall be suitable for 35 mm DIN rails.
3. End brackets shall be screw-on style.
4. Provide Phoenix E/AL-NS 35 series or approved equal.

NN. Intrinsically Safe Relay (407800.R90).
1. Intrinsically safe relay shall be a signal conditioner used for transfer of binary switching signals from a hazardous area.
2. The input circuit shall be monitored for line faults (breakage and short circuit (LFD)).
3. Errors on the intrinsically safe relay shall be indicated by a red flashing LED and the output shall switch to a high-impedance state.
4. Intrinsically safe relay shall be two (2) channel.

OO. Intrinsically Safe HART Barrier (407800.B90).
1. Intrinsically safe HART barrier shall be a repeater power supply and input isolating amplifier. The repeater power supply and input signal conditioner shall be designed for the intrinsically safe and electrically isolated operation of measuring transducers and mA current sources installed in the hazardous areas.
2. Intrinsically safe barrier shall be capable of supplying power to 2-wire transducers.
3. Intrinsically safe barrier shall be capable of operating and measuring 4-wire transducers via a non-powered input.
4. The analog measured value on the intrinsically safe or non-intrinsically safe side shall be capable of overlaying a digital (HART) communication signal and transmit bidirectionally.
5. Intrinsically safe HART Barrier shall be single (1) channel. .

PP. Category 6 Ethernet Patch Cable (407800.C90).
1. Category 6 Ethernet patch cable shall be provided for all Ethernet/IP networked devices.
2. Category 6 Ethernet patch cable shall be suitable for use as Industrial Ethernet Cable, 100BaseTX.

3. Category 6 Ethernet patch cable shall be rated for use in a temperature range between -10 degrees C and 60 degrees C.
4. Category 6 Ethernet patch cable shall be rated for outdoor use.
5. Category 6 Ethernet patch cable shall be rated for 300 volts maximum.
6. Category 6 Ethernet patch cable conductors shall be 4-pair, solid copper, 24 AWG.
7. Category Ethernet patch cable conductor pairs shall be bonded.
8. Category 6 Ethernet patch cable insulation material shall be Polyolefin.
9. Category 6 Ethernet patch cable insulation color shall be blue.
10. Category 6 Ethernet patch cable shall be provided with aluminum foil polyester tape shield with 100% insulation coverage.
11. Category 6 Ethernet patch cable outer jacket material shall be PVC. Jacket material shall be sunlight and oil resistant. Jacket shall have sequential markings at two foot intervals.
12. Category 6 Ethernet patch cable shall be provided with RJ45 plugs, suitable for IP20 applications.

PART 3 EXECUTION

3.1 GENERAL

A. For all conductors terminating on terminal strips, install crimp-on, insulated plastic sleeve ferrules on each wire. Install ferrules with a crimping tool provided by the ferrule manufacturer for that purpose.

B. Individual conductors and cables shall be grouped together and routed through plastic wire ducts mounted on the backpanel surface.

C. Bond each enclosure back-panel to the grounding electrode system with a # 8 AWG copper conductor.

D. Where conductors and cables are routed in boxes or enclosures, they shall be neatly bundled with cable ties at intervals not to exceed 12 inches on center. The tension for the cable ties shall be set with a tool specifically made for this purpose and of the same manufacturer as the cable tie. Side cutters or other type tools shall not be used to cut the tail end of the cable tie. The CONTRACTOR shall only use the tool specifically made for this purpose and designed for use with the cable ties provided.

3.2 PLC AND OIT SOFTWARE DESIGN REQUIREMENTS

A. The PLC shall be used to provide packaged system automatic control, automatic manual control, alarming, and monitoring. The OIT shall be used to allow a user to interface with the packaged system controls and alarms in graphical format.

B. General requirements for PLC software design
   1. Password protected
   2. Subdivide into sections by processes

3. Further subdivide into subsections which contain logic for individual equipment, motors, valves, and instruments.
4. Use comments within the software to note and describe each program section. Briefly describe the control objectives.
5. Utilize a naming convention for points, variables, and tags that is consistent with the actual equipment name and process number used on at the plant. Coordinate with the ENGINEER for the process names and numbers.

C. General requirements for OIT software and screen design
1. Password protected
2. Easily navigated menus
3. Touch screen operation
4. Maintain consistency in graphic display and controls design
5. Maintain consistent and predictable window operations
6. Accurate representation of the packaged system and its operations
7. Allows operators to change set points and control equipment.
8. Include help menus and windows to provide information to help operations staff understand complex control options.
9. Alarm annunciation with dedicated alarm page including acknowledgement of alarms.
10. Include overview displays with a similar physical layout as the actual facility.
11. Display organizational philosophy
    a. Organize into a hierarchy that allows fast, intuitive, and easy navigation between screens.
        1) Data and trends – display alarm history, data monitoring, and set points.
        2) Plant overview – display major and critical processes
        3) Process overviews – display detailed data for each process within the plant
        4) Control displays – display means to monitor and control specific process equipment, motors, valves, and instruments within a process. It shall allow the display of analog data in bar graph or digital form combined with process graphics on multiple screens.
12. Software Documentation and Commenting
13. Use comments within the software to note and describe each program section. Briefly describe the control objectives.

D. Provide a database or map which lists all of the discrete and analog I/O points.

3.3 SOURCE QUALITY CONTROL

A. Tests and Inspections
1. Provide factory testing of the control panels to ensure correct operation.
    a. Correct all errors prior to shipping
2. Provide copy of the test results in electronic (PDF) format to the OWNER and ENGINEER.
3. OWNER has the option to perform a virtual “witness testing” of the factory testing. Coordinate scheduling with the OWNER if desired.

3.4 DEMONSTRATION, TRAINING, START-UP, AND COMMISSIONING

A. Refer to the following Specifications for requirements.
   1. Section 11300 SBR Equipment
   2. Section 11400 DAF Equipment

3.5 AS-BUILT DATA

A. Provide a final as-built drawing in electronic format (PDF) as part of the O&Ms
   1. PLC ladder logic
   2. OIT screens
   3. Control panel drawings, elevations, and wiring diagrams
   4. All product data
   5. Sequence of operations
   6. Recommended maintenance procedures
   7. Training materials
   8. Test results
   9. Warranty information

END OF SECTION

SBR Equipment Procurement Contract Change Orders

CHANGE ORDER NO.: 1

Owner/Buyer:	City of Aumsville, Oregon	Owner's Project No.:	
Engineer:	Westech Engineering, Inc.	Engineer's Project No.:	2599.3220.0
Seller:	Xylem Water Solutions USA, Inc.	Contractor's Project No.:	25-0365a
Project:	Aumsville Wastewater Treatment Plant		
Contract Name:	Sequencing Batch Reactor Equipment		
Date Issued:	6/27/25	Effective Date of Change Order:	6/27/25

The Contract is modified as follows upon execution of this Change Order:

Description:

The funding agency for the project (USDA) granted a project waiver from the requirements of the Build America Buy America (BABA) Act. Therefore, the project is no longer subject to these requirements and all references to the Build America Buy America (BABA) Act, are hereby deleted from the contract.

The project must comply with the American Iron and Steel Requirements. Therefore, the domestic preference requirements for this project remain in place for any Iron and Steel components of the system and all Iron and Steel components shall be produced in the United States. The Seller shall submit a written certification that all equipment complies that all Iron and Steel (if any) used in the project was manufactured in the United States.

The City has completed a value engineering study and determined that the Aerobic Digesters are not needed and will be eliminated from the project. Therefore, the following items are hereby deleted from the Seller's scope of supply: 2 digester blowers, 2 digested sludge pumps, 2 aeration grids for the digester tanks, and the associated electrical control equipment and instruments that were to be used for the digesters.

The changes in the contract price are summarized below.

Attachments:

Xylem Water Solutions USA, Inc. Change Order pricing dated June 25, 2025
UDSA, BABA Waiver Memo dated June 27, 2025

Change in Contract Price		Change in Contract Times	
Original Contract Price:		Original Contract Times:	
Lump Sum Price	$1,598,152	Delivery of acceptable goods to Point of Destination:	Sept. 1, 2026
Buyers Contingency Allowance	$75,000		
Total Price	$1,673,152		
Changes from previously approved Change Orders		Changes from previously approved Change Orders:	
Lump Sum Price	$0	Delivery of acceptable goods to Point of Destination:	None
Buyers Contingency Allowance	$0		
Total Price	$0		
Contract Price prior to this Change Order:		Contract Times prior to this Change Order:	
Lump Sum Price	$1,598,152	Delivery of acceptable goods to Point of Destination	September 1, 2026
Buyers Contingency Allowance	$75,000		
Total Price	$1,673,152		
Changes this Change Order:		Changes this Change Order:	
Lump Sum Price	- $345,272	Delivery of acceptable goods to Point of Destination	none
Buyers Contingency Allowance	$0		
Total Price	$0		

Contract Price incorporating this Change Order:		Contract Times with all approved Change Orders:
Lump Sum Price	$1,252,880	Delivery of acceptable goods
Buyers Contingency Allowance	$75,000	to Point of Destination
Total Price	$1,327,880	Sept. 1, 2026

Recommended by Engineer (if required)	Accepted by Seller
By: Christopher J. Brugato, P.E.	Adam McNeill
Title: Project Manager, Westech Engineering	VP Treatment North America
Date: 6/27/25	6/30/25

Authorized by Owner/Buyer	Approved by Funding Agency (if applicable)
By:	EMILY JENNINGS Digitally signed by EMILY JENNINGS Date: 2025.07.21 10:17:25 -07'00'
Title:	USDA RD Oregon State Engineer
Date: 7/14/25	07/21/2025

Xylem, Inc.
N19 W23993 Ridgeview Pkwy, Suite 200
Waukesha, WI 53188
Tel: (414) 365-2200 Fax: (414) 365-2210

SANITAIRE
a xylem brand

June 25, 2025

Mr. Eric Hunter
Sales Engineer
Beaver Equipment
EricH@Beaver-Equipment.com

Subject: Change Order – Aumsville WWTP, OR
Remove Scope for BABA compliance and Digester/Sludge Holding Tank (SHT)
Sanitaire Project #25-0365a

Dear Mr. Hunter,

Xylem Water Solutions USA is pleased to present revised pricing reflecting the deduction of the **Buy American Build American (BABA) compliance requirements** and the **Digester/SHT equipment** (blowers, pumps, aeration equipment, and controls) for the Aumsville, OR WWTP Improvements project (Sanitaire Project #25-0365a). The revised project prices are as follows:

Item	Price
Original Price	$1,598,152
Revised Price with BABA Compliance Deducted	$1,351,353
Revised Price with BABA and Digester/SHT Deducted	$1,252,880

Price Notes:
1. All other items in scope will remain as outlined in Sanitaire proposal #30323-20a dated December 20, 2024
2. Previously negotiated Terms & Conditions applied
3. Taxes not included.

Thank you for your consideration. If you have any questions, please contact me at heidi.ruddy@xylem.com or +1 980 416 8727.

Regards,

Heidi Ruddy

Heidi Ruddy

Project Manager

cc. Jeremy Jensen – Territory Manager
Daphne Odishoo – Applications Engineer

USDA

United States Department of Agriculture

June 27, 2025

To: Aumsville, city of
595 Main Street
Aumsville, OR 97325

The PPP (previously planned project) waiver for the Build America Buy America Act was approved for Aumsville on 2/21/2025 by Valdis Krumins, Environmental Engineer.

If you have any questions, please contact Emily Jennings or Holly Halligan.

LaDonn McElligott
Community Programs Director

Rural Development
1901 Adams Ave., Suite 1, La Grande, OR 97850
Voice (541) 624-3087

USDA is an equal opportunity provider and employer.

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html, or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter to us by mail at U.S. Department of Agriculture, Director, Office of Adjudication, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, by fax (202) 690-7442 or email at program.intake@usda.gov.

Docusign Envelope ID: D422A1A6-D0DE-899A-8235-678801D0F854

CHANGE ORDER NO.: 2

Owner/Buyer:	City of Aumsville, Oregon	Owner's Project No.:	
Engineer:	Westech Engineering, Inc.	Engineer's Project No.:	2599.3220.0
Seller:	Xylem Water Solutions USA, Inc.	Contractor's Project No.:	25-0365a
Project:	Aumsville Wastewater Treatment Plant		
Contract Name:	Sequencing Batch Reactor Equipment		
Date Issued:	5/13/26	Effective Date of Change Order:	5/13/26

The Contract is modified as follows upon execution of this Change Order:

Description:

During the final design process, it was determined that some modifications to the motor control center that is being furnished by Xylem Water Solutions USA would be beneficial to streamline the overall electrical system. These changes include adding line reactors to protect the variable frequency drives and other features to the system that will more easily facilitate integration with the City's SCADA system. Adding these features separately from the equipment furnished by Xylem would be more costly and would result in a somewhat awkward installation.

This change order also includes the addition of three davit cranes to enable the operations staff to remove the two sludge pumps and the two mixers in each basin without the need to relocate a single davit crane to each equipment location. The additional davit cranes can be left in place at each equipment item which will simplify the installation.

Attachments:

Xylem Water Solutions USA, Inc. Change Order pricing dated May 12, 2026

Change in Contract Price		Change in Contract Times	
Original Contract Price:		Original Contract Times:	
Lump Sum Price	$1,598,152.00	Delivery of acceptable goods to Point of Destination:	Sept. 1, 2026
Buyers Contingency Allowance	$75,000.00		
Total Price	$1,673,152.00		
Changes from previously approved Change Orders		Changes from previously approved Change Orders:	
Lump Sum Price	-$345,272.00	Delivery of acceptable goods to Point of Destination:	None
Buyers Contingency Allowance	$0		
Total Price	$0		
Contract Price prior to this Change Order:		Contract Times prior to this Change Order:	
Lump Sum Price	$1,252,880.00	Delivery of acceptable goods to Point of Destination	September 1, 2026
Buyers Contingency Allowance	$75,000.00		
Total Price	$1,327,880.00		
Changes this Change Order:		Changes this Change Order:	
Lump Sum Price	+$34,963.50	Delivery of acceptable goods to Point of Destination	none
Buyers Contingency Allowance	-$34,963.50		
Total Price	$0		
Contract Price incorporating this Change Order:		Contract Times with all approved Change Orders:	
Lump Sum Price	$1,287,843.50	Delivery of acceptable goods to Point of Destination	Sept. 1, 2026
Buyers Contingency Allowance	$40,036.50		
Total Price	$1,327,880		

Docusign Envelope ID: D422A1A6-D0DE-899A-8235-678801D0F854

	Recommended by Engineer (if required)	Accepted by Seller
By:	Christopher J. Brugato, P.E.	Adam McNeill
Title:	Project Manager, Westech Engineering	VP-Treatment North American
Date:	5/13/26	5/14/2026

Adam McNeill

Signed by:
8D7AAECADAEB4BA...

	Authorized by Owner/Buyer	Approved by Funding Agency (if applicable)
By:	Matthew Etzel	EMILY JENNINGS Digitally signed by EMILY JENNINGS Date: 2026.05.18 08:53:28 -07'00'
Title:	Assistant Public Works Director	USDA RD State Engineer
Date:	5-15-26	5/18/2026

Docusign Envelope ID: D422A1A6-D0DE-899A-8235-678801D0F854

SANITAIRE
a xylem brand

Xylem Water Solutions USA, Inc.
N19 W23993 Ridgeview Pkwy, Suite 200
Waukesha, WI 53188
Tel: (414) 365-2200 Fax: (414) 365-2210

May 12, 2026

Mr. Christopher J. Brugato, P.E.
Westech Engineering, Inc.
3841 Fairview Industrial Dr. SE, Suite 100
Salem, OR 97302

Subject: MCC upgrades, Additional Hoists
Aumsville, OR WWTP
Sanitaire Project #25-0365a

Dear Mr. Brugato,

Xylem Water Solutions USA is presenting this proposal for the MCC controls upgrades/changes as requested during the submission and contractor bid development process for the Aumsville, OR project; Sanitaire Project #25-0365a. The pricing below accounts for updating the MCC reactors from 3% to 5% and adding three (3) Halliday hoists to the project.

Qty	Item	Description	Price
1	**2100-MCC**	**MCC updates**	**$24,390.00**
3	**D2B36D**	**Halliday Products Series DB Portable Hoist**	**$10,573.50**
		Total	**$34,963.50**

Price Notes:
1. Previously negotiated Terms & Conditions applied.
2. Taxes not included.

Thank you for your consideration. If you have any questions, please contact me at heidi.ruddy@xylem.com or +1 980 416 8727. Otherwise, if satisfactory, please sign below and send a purchase order to my attention.

Regards,

Heidi Ruddy

Heidi Ruddy
Project Manager

Accepted By (name): _____

Signature: _____ Date: _____

SBR EQUIPMENT PROCUREMENT CONTRACT
PREVIOUS PAYMENTS

Contractor's Application for Payment

Owner:	The City of Aumsville, Oregon	**Owner's Project No.:**	
Engineer:	Westech Engineering, Inc.	**Engineer's Project No.:**	2599.3220.0
Contractor:	Xylem Water Solutions USA	**Contractor's Project No.:**	25-0365a
Project:	Wastewater Treatment Plant Improvements		
Contract:	Sequencing Batch Reactor Equipment		
Application No.:	1	**Application Date:**	4/1/2026
Application Period:	**From** 3/1/2026	**to**	3/31/2026

1. Original Contract Price		$ 1,598,152.00
2. Net change by Change Orders		$ (345,272.00)
3. Current Contract Price (Line 1 + Line 2)		$ 1,252,880.00
4. Total Work completed and materials stored to date (Sum of Column G Lump Sum Total and Column J Unit Price Total)		$ 125,288.00
5. Retainage		
a. 5% X $ 125,288.00 Work Completed		$ 6,264.40
b. 5% X $ - Stored Materials		$ -
c. Total Retainage (Line 5.a + Line 5.b)		$ 6,264.40
6. Amount eligible to date (Line 4 - Line 5.c)		$ 119,023.60
7. Less previous payments (Line 6 from prior application)		
8. Amount due this application		$ 119,023.60
9. Balance to finish, including retainage (Line 3 - Line 4)		$ 1,133,856.40

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:
(1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;
(2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such liens, security interest, or encumbrances); and
(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective; and
(4)In consideration for the payment referenced above, and upon receipt of such payment, Contractor hereby waives and releases its lien and right to claim a lien for labor, services, or materials furnished through the date of this application, with the exception that this release does not cover retainage; and
(5)Contractor represents that receipt of said payment constitutes full and complete payment for all work, and all costs or expenses incurred (including, but not limited to, costs for supervision, field office overhead, interest on capital, profit and conditions costs) relative to the work or improvements as of the date of this application; and
(6)Contractor specifically waives, quitclaims and releases any claim for damages due to delay, hindrances, interference, acceleration, inefficiencies or extra work, or any other claim of any kind it may have as of the date of this application, except as follows (outstanding claims or change order work to be listed by Contractor, attach pages if required):

Contractor: Xylem Water Solutions USA Inc.

Signature: Teresa Ann Reimb **Date:** 4/6/2026

Recommended by Engineer		**Approved by Owner**	
By:	Chris J. Beck	**By:**	Ray Hernandez
Title:	Project Manager - Westech Engineering, Inc.	**Title:**	City Administrator, City of Aumsville
Date:	4/8/2026	**Date:**	4/14/2026
Approved by Funding Agency			
By:	Email approval from Holly Halligan	**By:**	
Title:	USDA Community Programs Area Specialist	**Title:**	
Date:	Email received 4/22/2026	**Date:**	

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Progress Estimate - Lump Sum Work

Contractor's Application for Payment

Owner:	The City of Aumsville, Oregon	**Owner's Project No.:**	
Engineer:	Westech Engineering, Inc.	**Engineer's Project No.:**	2599.3220.0
Contractor:	Xylem Water Solutions USA	**Contractor's Project No.:**	25-0365a
Project:	Wastewater Treatment Plant Improvements		
Contract:	Sequencing Batch Reactor Equipment		

Application No.: 1 **Application Period:** From 03/01/26 to 03/31/26 **Application Date:** 04/01/26

A	B	C	D	E	F	G	H	I
			Work Completed					
Item No.	Description	Scheduled Value ($)	(D + E) From Previous Application ($)	This Period ($)	Materials Currently Stored (not in D or E) ($)	Work Completed and Materials Stored to Date (D + E + F) ($)	% of Scheduled Value (G / C) (%)	Balance to Finish (C - G) ($)
	Original Contract							
1	Receipt of Approval of Shop Drawings and Samples	125,288.00	-	125,288.00		125,288.00	100%	-
2	Delivery of Goods to Point of Destination	1,347,576.00				-	0%	1,347,576.00
3	Completion of Startup and Comissioning Services	62,644.00				-	0%	62,644.00
4	Final Payment	62,644.00				-	0%	62,644.00
						-		-
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	Original Contract Totals	$ 1,598,152.00	$ -	$ 125,288.00	$ -	$ 125,288.00	8%	$ 1,472,864.00

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Progress Estimate - Lump Sum Work

Contractor's Application for Payment

Owner:	The City of Aumsville, Oregon	**Owner's Project No.:**	
Engineer:	Westech Engineering, Inc.	**Engineer's Project No.:**	2599.3220.0
Contractor:	Xylem Water Solutions USA	**Contractor's Project No.:**	25-0365a
Project:	Wastewater Treatment Plant Improvements		
Contract:	Sequencing Batch Reactor Equipment		

Application No.: 1 **Application Period:** **From** 03/01/26 **to** 03/31/26 **Application Date:** 04/01/26

A	B	C	D	E	F	G	H	I
			Work Completed					
Item No.	Description	Scheduled Value ($)	(D + E) From Previous Application ($)	This Period ($)	Materials Currently Stored (not in D or E) ($)	Work Completed and Materials Stored to Date (D + E + F) ($)	% of Scheduled Value (G / C) (%)	Balance to Finish (C - G) ($)
Change Orders								
1	Delete BABA Requirements and Digester Equipment	(345,272.00)				-	0%	(345,272.00)
						-		-
						-		-
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	Change Order Totals	$ (345,272.00)	$ -	$ -	$ -	$ -	0%	$ (345,272.00)
Original Contract and Change Orders								
	Project Totals	$ 1,252,880.00	$ -	$ 125,288.00	$ -	$ 125,288.00	10%	$ 1,127,592.00

EJCDC C-620 Contractor's Application for Payment

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Progress Estimate - Unit Price Work

Contractor's Application for Payment

Owner:	The City of Aumsville, Oregon	**Owner's Project No.:**	
Engineer:	Westech Engineering, Inc.	**Engineer's Project No.:**	2599.3220.0
Contractor:	Xylem Water Solutions USA	**Contractor's Project No.:**	25-0365a
Project:	Wastewater Treatment Plant Improvements		
Contract:	Sequencing Batch Reactor Equipment		

Application No.: 1 **Application Period:** **From** 03/01/26 **to** 03/31/26 **Application Date:** 04/01/26

A	B	C	D	E	F	G	H	I	J	K	L
		Contract Information				Work Completed					
Bid Item No.	Description	Item Quantity	Units	Unit Price ($)	Value of Bid Item (C X E) ($)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) ($)	Materials Currently Stored (not in G) ($)	Work Completed and Materials Stored to Date (H + I) ($)	% of Value of Item (J / F) (%)	Balance to Finish (F - J) ($)
Original Contract											
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				Original Contract Totals	$ -		$ -	$ -	$ -		$ -

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Progress Estimate - Unit Price Work

Contractor's Application for Payment

Owner:	The City of Aumsville, Oregon	**Owner's Project No.:**	
Engineer:	Westech Engineering, Inc.	**Engineer's Project No.:**	2599.3220.0
Contractor:	Xylem Water Solutions USA	**Contractor's Project No.:**	25-0365a
Project:	Wastewater Treatment Plant Improvements		
Contract:	Sequencing Batch Reactor Equipment		

Application No.: 1 **Application Period:** **From** 03/01/26 **to** 03/31/26 **Application Date:** 04/01/26

A	B	C	D	E	F	G	H	I	J	K	L
		Contract Information				Work Completed					
Bid Item No.	Description	Item Quantity	Units	Unit Price ($)	Value of Bid Item (C X E) ($)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) ($)	Materials Currently Stored (not in G) ($)	Work Completed and Materials Stored to Date (H + I) ($)	% of Value of Item (J / F) (%)	Balance to Finish (F - J) ($)
Change Orders											
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				Change Order Totals	$ -		$ -	$ -	$ -		$ -
Original Contract and Change Orders											
				Project Totals	$ -		$ -	$ -	$ -		$ -

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Stored Materials Summary

Contractor's Application for Payment

Owner:	The City of Aumsville, Oregon	**Owner's Project No.:**	
Engineer:	Westech Engineering, Inc.	**Engineer's Project No.:**	2599.3220.0
Contractor:	Xylem Water Solutions USA	**Contractor's Project No.:**	25-0365a
Project:	Wastewater Treatment Plant Improvements		
Contract:	Sequencing Batch Reactor Equipment		

Application No.: 1 **Application Period:** **From** 03/01/26 **to** 03/31/26 **Application Date:** 04/01/26

A	B	C	D	E	F	G	H	I	J	K	L	M
						Materials Stored			Incorporated in Work			
Item No. (Lump Sum Tab) or Bid Item No. (Unit Price Tab)	Supplier Invoice No.	Submittal No. (with Specification Section No.)	Description of Materials or Equipment Stored	Storage Location	Application No. When Materials Placed in Storage	Previous Amount Stored ($)	Amount Stored this Period ($)	Amount Stored to Date (G+H) ($)	Amount Previously Incorporated in the Work ($)	Amount Incorporated in the Work this Period ($)	Total Amount Incorporated in the Work (J+K) ($)	Materials Remaining in Storage (I-L) ($)
								-			-	-
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					Totals	$ -	$ -	$ -	$ -	$ -	$ -	$ -

EJCDC C-620 Contractor's Application for Payment
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Xylem Water Solutions U.S.A., Inc.

4152 136TH AVE
DOCK 12 HOLLAND ,MI 49424
Tel.(414)365-2200 Fax:(414)365-2210

REMIT TO

26717 Network Place
Chicago, IL 60673-1267

INVOICE			YOUR PURCHASE ORDER AGREEMENT
INVOICE NO. 3556E16255	FUS NO. F15812	DATE SHIPPED 3/30/26	DELIVERY NOTE K54746
INVOICE DATE 3/30/26	TRN P1	WHS 820	PAYMENT TERMS 100% N30 FROM INVOICE

Sold To:

Customer No.	163243
Global No.	5011711

CITY OF AUMSVILLE

595 MAIN ST

AUMSVILLE OR 97325-9005

Ship To:

CITY OF AUMSVILLE WWTP

955 Olney Street SE
AUMSVILLE OR 97325

FREIGHT TERMS	DELIVERY TERMS	ORDER PROCESSED BY
Jobsite	NOT APPLICABLE THIS	SANITAIRE-HOLLAND, MI
SHIP VIA	ORDER TEXT	CUSTOMER TEXT
PER CONTRACT	AUMSVILLE,OR	HEIDI RUDDY

LINE	ITEM/DESCRIPTION	QUANTITY SHIPPED UM	UNIT PRICE DISCOUNT/CHARGE	NET PRICE	EXTENDED AMOUNT
001	1400000699731 SANITAIRE SUBMITTAL APPROVE + MILESTONE,PROJ PROGRESS BILL	1 EA		125,288.000	125,288.00
	NET AMOUNT BEFORE TAXES USD				125,288.00
				ORDER TOTAL USD	
					125,288.00

IMPORTANT - This invoice is governed by and subject to TERMS AND CONDITIONS OF SALE - XYLEM AMERICAS. Different terms are hereby rejected unless expressly assented to in writing. Terms are accessible at http://www.xylem.com/en-us/Pages/terms-conditions-of-sale.aspx. Please contact Xylem at the number listed on this invoice within 72 hours should you have any issues or concerns pertaining to this invoice.

SBR EQUIPMENT PROCUREMENT CONTRACT SUBMITTALS

SANITAIRE PROJECT:
Aumsville, TX
Wastewater Treatment Plant

SANITAIRE PROJECT NUMBER:
25-0365A

MECHANICAL SUBMITTAL ITEMS:

Specification Section 11300

1. SUBMITTAL COMMENTS
2. OPERATIONAL DESCRIPTION
3. MECHANICAL DRAWINGS
4. BLOWER SYSTEMS
5. AIR CONTROL VALVES
6. AERATION SYSTEMS
7. SUBMERSIBLE MIXERS
8. DECANTER ACTUATORS
9. SUBMERSIBLE WAS PUMPS
10. LIFTING HOIST

PURCHASER:
City of Aumsville
595 Main Street
Aumsville, OR 97325
PO # Signed Agreement

ENGINEER:
Westech Engineering, Inc.
Salem, OR

REPRESENTATIVE:
Beaver Equipment, LLC
15112 NE 198th Street
Woodinville, WA 98072

SUPPLIER:
Xylem – Sanitaire Products
N19W23993 Rigdeview Parkway West, Suite 200
Waukesha, WI 53188 USA

SUBMITTAL DATE:
July 23rd, 2025

SANITAIRE
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Project: Aumsville, OR WWTP **Sanitaire #:** 25-0365A

MECHANICAL SUBMITTAL COMMENTS

1) Please review any deviations on our Mechanical Drawings and provide comments as required.

2) Please review the General Comments in Section 6 that specifically pertain to the aeration systems.

3) Specification Section 11300, Part 2.8b. specifies that the complete mixing zone is the SBR tank. For the Sanitaire ICEAS System, only the Main Zone of the SBR Basin is mixed. Xylem requests that this deviation be approved as submitted.

4) Specification Section 11300, Part 2.9c. specifies that the SBR WAS pump duty point will be confirmed during the final design phase of the project. For this submittal, Xylem used a duty point of 110gpm @ 15.0ft TDH.

If there are any questions about these comments or anything else regarding this project, please do not hesitate to contact me.

Best regards,
Xylem, Inc.

Frank B. Maier, P.E., PMP
Senior Project Engineer

Operational Description

ICEAS®

(Intermittent Cycle Extended Aeration System)

Sequencing Batch Reactor (SBR)

With OSCAR™ Process Performance Optimizer

City of Aumsville WWTP

Marion County, OR, USA

Project no: 25-0365a

Xylem
Sanitaire products
Milwaukee, Wisconsin, USA

July 2025

SANITAIRE
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Issue, Revision, and Approval Record

Issue	Date	Sections Changed	Description of Changes	Changes Made By	Approved By
A	April 15, 2025	n/a	n/a	APV	
B	July 15, 2025	7.1 / 7.2	Removed sludge digester equipment description	APV	

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5 Process Description 7
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5.2 ICEAS® Process Overview 8
5.3 Basin Layers 9
5.4 Basin Hydraulics and Loading 9
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2 Introduction

Xylem is the provider of Sanitaire process and associated equipment. This operational description describes the basic operation of the process and is specific to the following plant:

Project name	City of Aumsville WWTP
Project Location	Marion County, OR, USA
Sanitaire Number	25-0365a
Process	NDN, 2-basin

This document should be used in conjunction with the Functional Design Specification (FDS) for the system. This document gives a process overview, whereas the FDS will describe in detail the control of each system component, interlocks between components, operating ranges and how to change the control setpoints.

3 Abbreviations

The following abbreviations applies to this document as well as the Functional Design Specification (FDS)

Auto	Automatic Control
BOD_5	Biochemical Oxygen Demand - 5 day test
BWL	Bottom Water Level
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
ETM	Elapsed Time Meter
FDS	Functional Design Specification
F/M	Food to Microorganism Ratio
FS	Float Switch
ft	feet
gpd	gallons per day
HMI	Human-Machine Interface
HOA	Hand-Off-Auto
HOR	Hand-Off-Remote
HRT	Hydraulic Retention Time
I/O	Inputs/Outputs
ICEAS	Intermittent Cycle Extended Aeration System
kg	Kilogram
lb	pound
LT	Level Transducer
m	Meters
m^3/day	cubic meters per day
MCC	Motor Control Center
mg/L	milligrams per Liter (parts per million, ppm)
MLSS	Mixed Liquor Suspended Solids
MLVSS	Mixed Liquor Volatile Suspended Solids
NDN	Nitrification/Denitrification Process
NDNP	Nitrification/Denitrification/Phosphorus Process
NH_3-N	Ammonia - Nitrogen
NIT	Nitrification Process
NO_2-N	Nitrite - Nitrogen
NO_3-N	Nitrate - Nitrogen
COAO	Close-Off-Auto-Open
ORP	Oxidation-Reduction Potential
PAO	Phosphorus Accumulating Organisms
PID	Proportional Integral Derivative
P&ID	Piping and Instrumentation Diagram
PC	Personal Computer
PD	Positive Displacement
PLC	Programmable Logic Controller
PO_4	Phosphate
SBR	Sequencing Batch Reactor
SCADA	Supervisory Control and Data Acquisition
SIMS	Sludge Inventory Management System
SRT	Sludge Retention Time
SVI	Sludge Volume Index
TKN	Total Kjeldahl Nitrogen
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
TWL	Top Water Level
VFD	Variable Frequency Drive
WAS	Waste Activated Sludge
WWTP	Wastewater Treatment Plant
°C	degrees Celcius

4 Plant Design Overview

An overview of the design data for the City of Aumsville WWTP is briefly described in this section. More details can be found in the contract documents. Description of plant specific settings and process are found further down in this document.

The City of Aumsville WWTP has been designed based on the following influent wastewater characteristics and site conditions. These parameters have been used for basin design and process criteria.

Influent Wastewater Characteristics and Site Conditions				
Maximum Month Flow	1,750,000	Gpd	6,624	m^3/day
Max 4.8h Cycle Flow	2,620,000	gpd	9,918	m^3/day
Max 3.6h Cycle Flow	3,493,333	gpd	13,224	m^3/day
Max 2.4h Cycle Flow	5,240,000	gpd	19,836	m^3/day
Peak Day Flow	3,130,000	gpd	11,848	m^3/day
Peak Hour Flow	5,240,000	gpd	19,836	m^3/day
BOD_5 Conc. (at 20°C)	127.4	mg/L	127.4	mg/L
BOD_5 Loading	1860	lb/day	844.2	kg/day
TSS Conc.	106.8	mg/L	106.9	mg/L
TSS Loading	1560	lb/day	708	kg/day
TKN Conc.	17.5	mg/L	17.5	mg/L
TKN Loading	255	lb/day	115.7	kg/day
Alkalinity required (minimum)	260	mg/L	260	mg/L
Wastewater Temperature, Min	8	°C	8	°C
Wastewater Temperature, Max	25	°C	25	°C
Ambient Air Temperature	0 to 32	°C	0 to 32	°C
pH Range	6.5 to 8.6	SU	6.5 to 8.6	SU
Site Elevation - above sea level	350	ft	107	m

The activated sludge process has been designed to meet the following effluent requirements on a 30-day arithmetic average:

Effluent Quality Requirements		
BOD_5 Conc. (at 20°C)	<10	mg/L
TSS Conc.	<10	mg/L
NH_3-N Conc.	<1	mg/L
Total Nitrogen Conc.	<10	mg/L

The activated sludge process has been designed according to the following parameters in order to meet the effluent requirements.

Design Parameters for Biological Process				
Food to Mass (F/M) Ratio	0.0481	lb BOD/lb MLSS-d	0.0481	kg BOD/kg MLSS-d
Sludge Volume Index (SVI) (after 30 min settle)	150	mL/gm (max)	150	mL/gm (max)
Mixed Liquor Suspended Solids (MLSS)	4,869	mg/L	4,869	mg/L
Hydraulic Retention Time (HRT)	0.69	days	0.69	days
Solids Retention Time (SRT)	29.02	days	29.02	days
Total WAS mass produced	593.37	lb/day/basin	269.32	kg/day/basin
WAS volume produced @ 0.85% solids	8,370	Gpd/basin	31.68	m^3/day/basin

To meet the effluent requirements, the activated sludge process has the following basin dimensions:

Basin Design				
Number of Basins	2	basins	2	basins
Basin Length (Excluding Pre-react wall)	108.5	ft	33.1	m
Basin Width	46.0	ft	14.0	m
Top Water Level (TWL)	18.0	ft	5.5	m
Bottom Water Level (BWL)	12.74	ft	3.88	m
Basin Volume at TWL	672,035	gallons	2,544	m^3
Basin Volume at BWL	475,521	gallons	1,800	m^3

5 Process Description

The Intermittent Cycle Extended Aeration System (ICEAS®) process is a modification of a conventional SBR. The ICEAS® process allows continuous inflow of wastewater into the treatment basins during all phases of the cycle. The continuous inflow is an advantage over conventional SBRs in that it optimizes biological treatment by supplying a constant food source for the process and equalizes the flow loadings in multiple-basin systems. A cycle consists of different phases (react, settle, and decant) during which treatment takes place. The cycles operate continuously in each basin to meet the treatment goals of the plant.

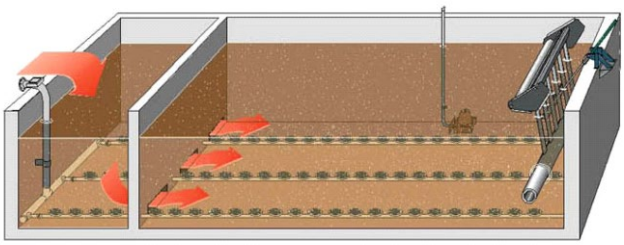
5.1 Basin Configuration

The ICEAS® basin has two compartments: a pre-react zone and a main-react zone. The pre-react zone acts as a biological selector and receives the continuous influent flow. The two compartments are separated by a baffle wall that spans the tank width and has openings at the basin floor. The baffle wall prevents short circuiting and allows the two zones to be hydraulically connected as it directs the flow to enter the main-react zone at the bottom of the basin.

5.2 ICEAS® Process Overview

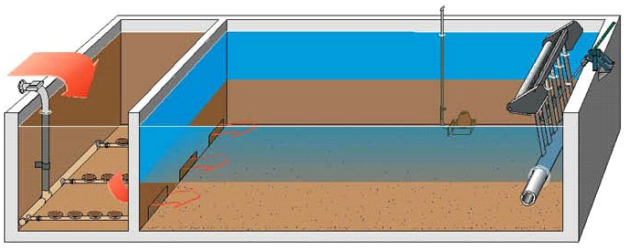
The following is a brief process overview of the three treatment phases of the ICEAS® cycle:

React Phase



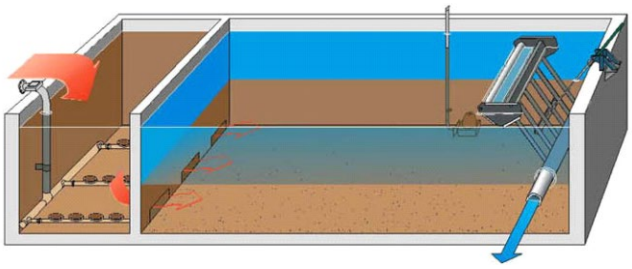
During the **react** phase, raw wastewater flows into the pre-react zone continuously to react with the mixed liquor suspended solids. Depending on the process scheme, the basin contents are aerated, anoxically mixed, allowed to react anaerobically, or a combination thereof. As the basin continues to fill, biological oxidation/reduction reactions take place simultaneously to treat the wastewater.

Settle Phase



During the **settle** phase, basin agitation from the react phase (i.e. aeration or mixing) is stopped to allow the solids to settle to the bottom of the basin. Raw wastewater continues to flow into the pre-react zone as the main-react zone settles. As the solids settle, a clear layer of water is formed on top of the basin.

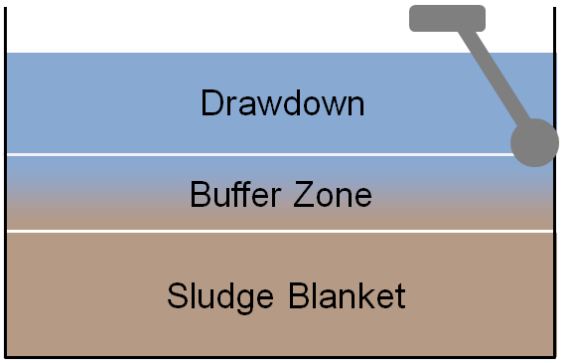
Decant Phase



During the **decant** phase, the decanter rotates downward to draw off the clarified supernatant and discharge it to the effluent line. Raw wastewater continues to flow into the pre-react zone as the main-react zone is decanted. Sludge is typically wasted from the basin during this phase in the cycle.

5.3 Basin Layers

The picture illustrates the three stratified layers that are formed in each basin at the end of the settle phase and beginning of the decant phase. The sludge blanket forms on the bottom of the basin as the mixed liquor suspended solids (MLSS) settle. A buffer zone of ~3.4 feet acts to buffer the sludge blanket from the volume that will be removed during the decant phase. The drawdown is the top layer of clear liquid that remains after the MLSS settle and is the maximum volume that will be drawn off during the decant phase.



5.4 Basin Hydraulics and Loading

The basins are designed to handle the Maximum Month Flow, the Max 4.8h Cycle Flow, Max. 3.6h Cycle Flow and the Max 2.4h Cycle Flow as specified in the design parameters. Three time-based cycles are used to hydraulically process the flow. A normal cycle will process the Maximum Month Flow up to the Max 4.8h Cycle Flow. A high flow cycle has time periods that are 25 percent shorter than the normal cycle to process flows above the Max 4.8h Cycle Flow, up to the Max 3.6h Cycle Flow. A very high flow cycle has time periods that are 50 % shorter than the normal cycle and process flows that are above the Max 3.6h Cycle Flow, up to the Max 2.4h Cycle Flow.

During all phases of the ICEAS® cycle, raw influent (usually screened and degritted) flows into each basin. To allow equal loading, flow is split equally to all basins by a splitter box. Since influent flow is continuous, the ICEAS® process can be operated in a single basin allowing for basins to be taken out of service for maintenance or during low flow/loading conditions. Flow enters the basin continuously and the treated effluent leaves the basin intermittently (only during the decant phase).

5.5 Biological Treatment Process

The process is designed as a nitrification-denitrification (NDN) process and operates to remove BOD, TSS, ammonia-nitrogen (NH_3-N) through nitrification as well as nitrite-nitrogen (NO_2-N) and nitrate-nitrogen (NO_3-N) through denitrification. In the NDN process, the react phase consists of alternating periods of aeration and anoxic mixing. The aeration periods supply oxygen to the biomass for BOD oxidation and nitrification. The anoxic mixing periods provide minimal oxygen and mixing of the biomass to allow denitrification to occur. Additional denitrification can occur as the sludge settle during the settle phase of the cycle.

Total nitrogen removal is a two-step process which includes both nitrification and denitrification. In the nitrification process, ammonia is converted to nitrate by autotrophic bacteria. The process requires oxygen and takes place under aerobic conditions. Nitrification is largely dependent on dissolved oxygen (DO), solids retention time (SRT), temperature, pH and inhibitory compounds.

Denitrification concludes the nitrogen removal process by converting nitrate from the nitrification step to nitrogen gas which is released to the atmosphere. Denitrification occurs under anoxic conditions, relying on heterotrophic bacteria and readily available biodegradable substrate. In the absence of dissolved oxygen, these bacteria can chemically bind the oxygen in nitrate to reduce readily available biodegradable substrate.

6 Treatment Cycle

6.1 Treatment cycle times

The process will complete one normal cycle every 288 minutes or 4.8 hours. Each cycle is divided into 168 minutes of react phase, 48 minutes of settle phase, and 72 minutes of decant phase. The react phase is divided into seven 24-minute periods that can alternate between anoxic or anaerobic mixing and aeration. There are five periods of aeration or “air on”, which have adjustable blower run times. The second and sixth periods are “air off” periods for anoxic or anaerobic treatment, which have adjustable mixer operation modes. The basins are staggered in their respective timelines as shown in the cycle chart below. “Air off” periods that do not overlap with “Air on” periods in another basin sharing the same blower can be aerated if needed. Aeration in period 7 can be turned off to allow extra time for settling if during high flow mode and very high flow mode. This feature can be enabled or disabled as needed using a button on the HMI.

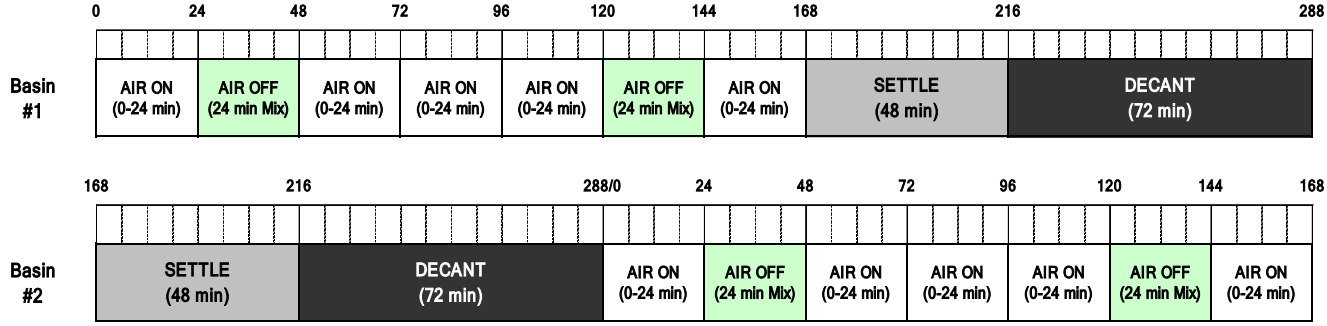
The high flow cycle is 216 minutes or 3.6 hours in duration as shown in the cycle chart below. The high flow cycle has time periods that are reduced by 25 percent of the normal cycle time periods. Each of the seven periods in the react phases are 18 minutes instead of 24 minutes, the settle phase is 36 minutes, and the decant phase is 54 minutes. The total react times per day remain the same as the normal cycle. It is only the duration per cycle that is changed to accommodate higher flows and process more flow in a shorter amount of time.

The very high flow cycle is 144 minutes or 2.4 hours in duration, as shown in the cycle chart below. The very high flow cycle has time periods that are reduced by 50 percent of the normal cycle time periods. . During the very high flow cycle, react periods 6 and 7 are converted to settle time, to allow additional settling time to avoid TSS carried away with effluent during very high flow cycle. Accordingly, the very high flow cycle has five react periods of 12 minutes, 48 minutes of settle phase, and 36 minutes of decant phase.

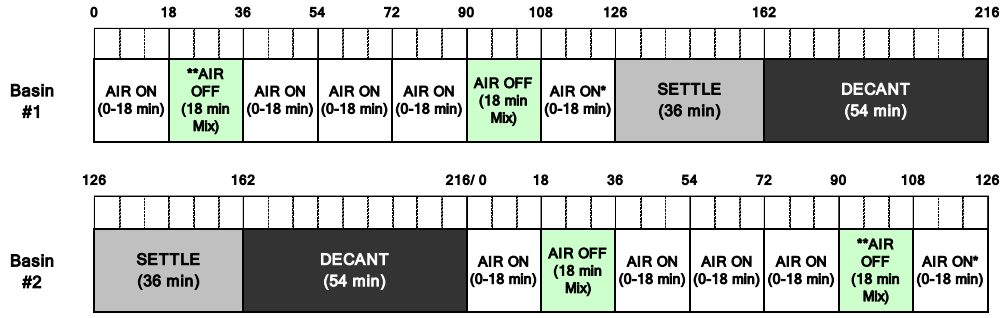
The shifting in timelines between basins allows a pair of basins to be supplied by the same blowers, since the basins never will require air at the same time. When one basin of the pair is aerated, the other is in a mixing phase or the settle and decant phase. Air will be directed to one basin at the time by the operation of motorized air control valves.

Any of the seven periods in the react phase can be re-defined as aerated or mixed, as long as this does not require two basins that share the same blowers to be aerated at the same time.

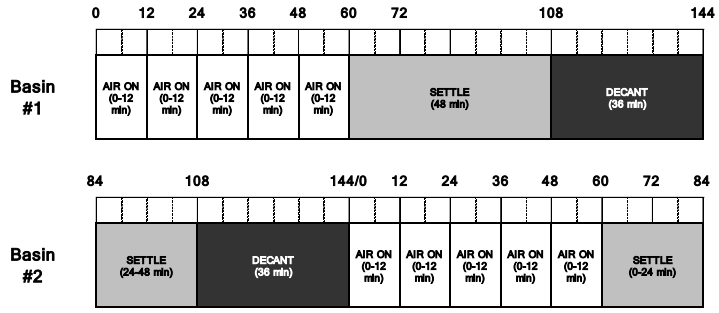
ICEAS 2-Basin NDN Normal Cycle: 288 minutes (4.8 hours)



ICEAS 2-Basin NDN High Flow Cycle: 216 minutes (3.6 hours)



ICEAS 2-Basin NDN Very High Flow Cycle: 144 minutes (2.4 hours)



** "Air Off" periods that do not overlap with the other basin can be aerated if needed.

* In High flow cycle "Air On" periods in period 7 can be turned off to allow extra time for settling if needed

6.2 High Flow Cycle Transitions

The system switches from normal cycle operation to high flow cycle operation when the level sensing equipment in a basin detects a water level that corresponds to a flow that is above Max 4.8h Cycle Flow. All basins always operate in the same cycle mode. After the high flow cycle is initiated, the system will stay in the high flow cycle until the basin that indicated a high flow event has completed its cycle (end of decant phase) and completed another full high flow cycle.

At the completion of the full high flow cycle for that basin, the system will switch back to normal cycle operation if no basins are indicating water levels that correspond to a flow above Max 4.8h Cycle Flow. If a basin detects high water levels that indicate a flow above Max 4.8h Cycle Flow, the system will stay in the high flow cycle until normal cycle water levels return. The system can switch into the high flow cycle at any time during the normal cycle. The system cannot, however, switch from high flow back to normal cycle until the completion of the high flow cycle for the initiating basin.

The system switches from high flow cycle operation to very high flow cycle operation when the level sensing equipment in a basin detects a water level that corresponds to a flow that is above the Max 3.6h Cycle Flow. After the very high flow cycle is initiated, the system will stay in the very high flow cycle until the basin that indicated a high flow event has completed its cycle (end of decant phase) and completed another full high flow cycle. When the system is in a high flow cycle, it can switch into the very high flow cycle at any time to accommodate addition flow.

7 Equipment Operation

The following sections contain brief descriptions of the equipment operation for the process. More detailed descriptions are found in the FDS and individual equipment manuals.

7.1 Blowers

Three positive displacement ICEAS blowers operate to supply air to the aeration systems in the ICEAS basins. Each blower is capable of delivering 50 percent of the air requirements to the process. Two blowers operate together to provide 100 percent of the air requirements to the process in one basin at a time. One blower operates as the "Lead Duty" blower and the second one operates as the "Lag Duty" blower. The third blower operates as the "Standby" blower in the event that one of the "Duty" blowers is not available. The blowers can alternate duty on a weekly basis.

Each blower can be turned "on" or "off" using the selector switches on the panel face. Each blower also has a variable frequency drive (VFD) for controlling the output airflow, which can be adjusted through the HMI.

7.2 Diffused Aeration System

Each ICEAS basin has a diffused aeration system installed at the bottom of the basin. The aeration system operates to deliver diffused air required for the treatment process and ensures that the basin is sufficiently mixed during the aerobic treatment periods of the cycle. Air is transferred to the water though fine bubble diffusers distributed evenly on the floor of the basin.

The aeration system includes one or more aeration grids. Each aeration grid receives air through a dropleg pipe which leads the air from the basin surface to the basin floor. At the floor of the basin, manifold and header pipes distribute the air to the diffusers. Each aeration grid only receives air if the air valve positioned between the grid dropleg and the blowers is open.

As the aeration system operates, moisture can build up in the system leading to poor distribution of air and high pressure losses. A solenoid valve connected to the aeration system in each ICEAS basin periodically opens and closes to allow the system to purge and depressurize. In addition to the automatic purge in the ICEAS basins, each aeration grid has a manual purge valve that the operator can use to remove any trapped liquid.

7.3 Mixers

Each ICEAS basin has one mixers installed in the main-react zone, which operate during the "air off" periods of the react phase to ensure proper mixing and prevent sedimentation. The operator can enable or disable the mixers during each "air off" period through the HMI. If a reduced "air on" time is selected for an air period or if the air shuts off due to the DO control system, the operator can select to run the mixers for these time periods as well. The aeration and mixers cannot be operating at the same time.

7.4 Air Valves

Air Valves are located on the air lines between the blowers and the aeration system in each ICEAS basin. Each basin has a motorized air valve, which is automatically controlled by the PLC to allow air to enter a basin at a certain time.

The two air valves will operate in an alternating sequence during blower operation; when one valve is open, the other one is closed, etc. The air valves divert air between the two basins when blower operation is required in the cycle. At certain times in the cycle, both basins will have the air valves closed. This will occur when one basin is in the settle or decant phase and the other basin is in an “air off” period of the react phase.

7.5 Decanters

Each ICEAS basin has a decanter installed on the wall opposite the pre-react zone. The decanter operates to remove clarified effluent from the top layer of the basin (drawdown) during the decant phase of the cycle. The drawdown is defined by the top water level (TWL) and the bottom water level (BWL). When the decanter is not operating, it remains in a parked position above the TWL, which eliminates the possibility of solids carryover during other phases in the cycle. In the park position, the decanter can act as a clarifier weir in the event of a power outage.

The decanter is mechanically operated by the use of an electro-mechanical actuator that is mounted on the basin walkway for easy access. The actuator moves the decanter between the top and bottom limit switches whenever the decanter is in operation. The decanter speed is controlled through the use of a variable frequency drive (VFD). As a result, the decanter discharge rate will be relatively constant from the time the decanter enters the water to the time it reaches the BWL.

During the end of the settle phase, the decanter will travel from the park position to the TWL. When decant phase is started, the decanter will travel from the TWL to the BWL in the allotted time to remove the drawdown volume from the basin. Since influent flow to the plant varies, the water level in the basin at the start of each decant phase will be at differing levels above BWL. Consequently, during the decant phase, the decanter will travel downward for a period of time before reaching the water surface. Also mounted on the decanter in front of the weir is a floatable scum guard that operates to exclude floating material during the decant phase.

7.6 Waste Activated Sludge (WAS) Pumps

Each ICEAS basin has a submersible pump, which operates to waste sludge from the basin during the decant phase of the cycle. The waste activated sludge (WAS) pump operation is controlled automatically by the PLC.

7.7 Process Instrumentation

7.7.1 Level Sensing Equipment

A level transducer and float switch are installed in each ICEAS basin. The level transducer continuously indicates the basin water level at the HMI. The PLC uses the water level reading to calculate the corresponding flow rate into the basin. If the basin water level indicates that a flow above the PDWF is entering the basin, the system will transition into the high flow cycle.

The float switch has two functions. One function is to signal a high level in the basin and force the system into a settle phase to allow a minimum of 30 minutes of settle time prior to the water level overtopping the decanter. The second function is to signal that the system must transition into the high flow cycle if the level transducer has not already signaled this to take place.

7.7.2 Process Instrumentation

Instrumentation is installed in the treatment plant to monitor the process and assist in equipment control. The instruments measure a parameter in the process and an analyzer sends the reading to the PLC. The readings are continuously displayed on the HMI. The table below lists the instrument, parameter measured and location.

Instrument	Parameter	Location
DO Sensor	Dissolved oxygen, Temperature	ICEAS Basins

7.7.3 IQ Sensor Net

All sensors provided by WTW or YSI are connected to the IQ SensorNet (IQSN) system. The IQSN system collects readings of the instrumentation and sends them to the PLC. The system includes a user display which allows for monitoring and handling of the sensor data, sensor calibrations as well as switching sensors into maintenance mode while doing cleaning and other maintenance.

7.7.4 Process Instrument Maintenance

The following section contains brief descriptions of the **online** sensors required cleaning, calibration and maintenance. More detailed descriptions are found in the WTW/YSI Operation and Maintenance manual.

7.7.4.1 DO sensor: FDO 700 IQ

The DO sensor requires cleaning on a weekly or biweekly basis. Cleaning should be done with a soft cloth using tap water or process water with soap/detergent. Calibration of the DO sensor is not required. The sensor cap needs to be replaced as needed and has an expected lifetime of three to five years.

8 Process Control System

The biological treatment process can be automatically controlled using feedback from process instrumentation and equipment control via the PLC. The control system for the process consists of a control panel, which contains the programmable logic controller (PLC), a human-machine interface (HMI), control switches, indicator lights, power connection, etc. The motor starters and variable frequency drives (VFDs) for the equipment are mounted in the control panel or housed in a separate motor control center (MCC). The PLC contains logic to operate the process equipment when the equipment is in automatic ("Auto") control. The HMI is an operator interface that communicates with the PLC to display system status, allow set point adjustments and perform alarm handling.

The process control options are described in the following sections.

8.1 Aeration Control

The aeration control system regulates the Dissolved Oxygen (DO) in the ICEAS basins by adjusting blower operation. The goal of the system is to achieve a constant DO concentration without over- or under-aerating the process.

Each basin has a DO sensor which indicates the DO concentration in milligrams per liter (mg/L). The target DO setpoints are selected and entered at the HMI. Blower speed is regulated by the PLC based on the difference between the DO concentration and the DO setpoints. If the DO concentration is higher than the DO setpoint, the blower will be regulated to reduce the airflow and if the DO concentration is lower than the DO setpoint the blower will be regulated to increase the airflow.

In addition, high and low DO setpoints can be selected and entered at the HMI. The purpose of the setpoints is to prevent the DO from rising to too high values in the basin. When the high DO setpoint has been reached, there is a time delay before the blower will respond that is operator adjustable through the HMI.

If the aeration control mode is off the operator can manually adjust each blower's operation through the HMI.

8.2 Waste Activated Sludge (WAS) Pump control

The WAS pump control system regulates the WAS pump operation based on operator selections in the HMI. The goal of the WAS pump control is to enable the operator to maintain a stable and healthy biomass in the system to ensure sufficient treatment is reached.

Wasting of biomass is done once per treatment cycle. In the HMI, the operator can select the duration the pump should run each time.

During wasting, running the pump for long periods of time can cause the solids near the pump to be completely removed and for the pump to start pulling clear water above the sludge blanket. This effect is commonly referred to as "coning". In some situations, this resulting drop in the WAS TSS concentration after the pump has been running increases the volume of sludge that needs to be wasted. Coning can be avoided by running the pump for several shorter periods instead of one long period during the same cycle. During the pause periods when the pump is off, the TSS concentration around the pump will increase again.

The operator can manually select to run the pump more than one time during each cycle. The number of runs per cycle and the pause time between each run is selected and entered at the HMI and the pump operation is regulated by the PLC accordingly.

8.3 HMI

The HMI is the operator interface for monitoring and adjusting the plant operation. From the HMI, the operator can navigate through the display screens to monitor the process and make setpoint changes. The HMI provides key features such as alarm management and trends of measured process variables. Alarm troubleshooting guides and electronic Xylem equipment manuals are available directly in the HMI to simplify process operation and optimization. The HMI is available remotely through PC, smartphone and tablet to enable monitoring and adjustments at the operator convenience.

More detailed information can be found in the HMI Operation and Maintenance (O&M) manual.

8.4 Data validation and Sensor Maintenance

The process control system relies on online measurements to control the process. To ensure a reliable operation, a set of data validation features are included in the process control system which automatically detect issues with any sensor or measurement. Issues that can occur include general sensor malfunctions, lack of calibration as well as fouling of the sensors. If an issue is detected, the affected control mode is automatically switched to a safe mode or operation and the operator is notified that faults or maintenance needs are detected on a specific sensor. The purpose is to continuously validate that the automatic control modes are based on accurate and reliable data to ensure a healthy process operation.

8.4.1 Data validation

Sensor faults are automatically detected though the IQSN system, which communicates to the PLC that the measurement no longer is valid. Additional data validation includes detection of fast changes or no changes in the data. If invalid measured data is detected, the affected control strategy will switch to a safe mode and a notification will be sent to the operator though the HMI.

8.4.2 Sensor Maintenance

When doing maintenance, such as cleaning, on any of the sensors used by the process control systems, the sensor should always be put into maintenance mode on the IQSN display. Once a sensor is in maintenance mode, the affected process control system automatically adjusts by using previously obtained data or switching to a safe control mode as long as the sensor readings are affected by the maintenance. Once maintenance is completed and the sensor is taken out of maintenance mode on the IQSN, the process control mode is switched back to regular operation. If a sensor remains in maintenance mode for an extended period of time, the operator will be notified though the HMI. The purpose is to ensure that all automatic control is based on reliable data at all times to certify a healthy process operation.

9 Plant Specific Processes and Settings

The following section describes specific processes and setpoint recommendations for the City of Aumsville WWTP. More details regarding the overall process at the plant can be found in the contract documents. More information about how to change setpoints can be found in the control FDS.

9.1 Aeration Control Setpoints

For nitrification to occur, it is important to maintain suitable DO concentrations in the basin during the aerobic periods in the react phase. It is also important to ensure that the DO concentration during the aeration periods is kept within reasonable levels to enable denitrification to occur during anoxic periods as well as the settle and decant periods. High DO concentrations during the aerobic phase, such as concentrations greater than 3 mg/L, can compromise the denitrification since it will take time to decrease the DO concentration to values low enough for denitrification to occur.

The following setpoints are recommended for the design conditions and can be adjusted by the operator through the HMI.

Parameter	Setpoint Value	
Aeration Control	On	
O_2 Setpoint	2.0	Mg/L
High O_2 Setpoint	3.0	Mg/L
Low O_2 Setpoint	1.0	Mg/L
Blower Off Delay	2	Min

If the Aeration Control system is “On”, it will automatically adjust the blower operation to ensure the desired DO concentration is maintained in the aerobic zones. The O_2 Setpoint is the target DO concentration at the sensor location. The “High O_2 Setpoint”, “Low O_2 Setpoint” and “Blower Off Delay” setpoints clamp the DO in the aerobic basin by turning the blower off if DO raises too high in the basin. If the DO concentration reach above the “High O_2 Setpoint” for more than “Blower Off Delay”, the blower turn off until DO reaches below “Low O_2 Setpoint”.

If the O_2 Control is “Off”, the following setpoints are recommended for the design conditions and can be adjusted by the operator though the HMI.

Parameter	Setpoint Value	
Number of Blowers Running	2	
O_2 Off Blower Speed	97	%

9.2 WAS Pump Setpoints

The WAS pump operation affect the biomass concentration and solids retention time in the basin. It is therefore important to select the WAS pump settings with care to ensure a sufficient treatment capacity in the process.

The operator can select a “Start time” in the HMI which defines when in the treatment cycle the WAS pump will start running. To maximize the concentration of solids in the waste to be removed from the basin, it is recommended that the WAS pump operate near the end of the decant phase. The process decant phase takes place in each basin from minute 216 to minute 288. It is recommended that the WAS pump start at half time after the decant phase starts, corresponding to minute 252. This will allow the solids most time to settle and compact.

The WAS pump will operate based on an operator selected input “Run time” each cycle. To determine how long to operate the WAS pump, the operator must monitor the MLSS level in the basin in conjunction with the system solids retention time (SRT) and food-to-microorganism (F/M) ratio. A change in sludge settling characteristics must also be considered when selecting the WAS pump setpoints. The WAS pump selected for the plant has a capacity around 110 gpm. Based on the design parameters for the plant, it is estimated that 8,370 gallons/basin should be wasted each day at 8500 mg/l TSS. This correspond to running the WAS pump for ~15.3 minutes each cycle when running. Wasting should be selected to maintain a solids retention time of 29.02 days. During High Flow mode, the WAS pump run time will reduce proportionally to match the cycle time, which results in the same amount of sludge wasted per day in all cycle modes.

The “No. of Runs” defines how many times the WAS pump should run each wasting cycle. If a value higher than 1 is selected, the total run time for the pump each wasting cycle will be divided into several shorter runs separated by the “Time Between” setting. One wasting event is sufficient if a wasting time below five minutes is selected. Two wasting times with a ten minute break is recommended for wasting for five to fifteen minutes. If wasting is required for fifteen minutes or more, three wasting times are recommended with ten minutes breaks. If coning or a lighter wasting towards the end of the wasting time is occurring, additional wasting periods could be implemented to alleviate the problem.

The following WAS pump setpoints are recommended for design conditions and can be adjusted by the operator through the HMI.

Parameter	Setpoint Value	
Start time	252	
Total Run time	15.3	min
No. of Runs	2	
Time Between	10	Min

9.3 Processes Preceding the Biological Treatment Process

In order to protect downstream mechanical equipment from damage, clog, wear and increased maintenance, large solids and grits are removed using physical treatment processes. Solids can include rags, paper, plastics, debris and metals while grits include sand, gravel, cinder or other heavy solids material with a higher gravity than biodegradable organics. The processes preceding the biological treatment process include:

Process	Comments
Bar Screens	Controlled by others
Influent Pumps	Controlled by others

The raw influent wastewater first passes a bar screen for removing large particles.

From the headworks, the flow is discharged into a wet well to be hydraulically raised by the dry-pit pumps to flow through the plant. From the dry-pit pumps, the flow will be directed to the splitting structure for discharge into the biological treatment basins.

9.4 Processes Following the Sanitaire System

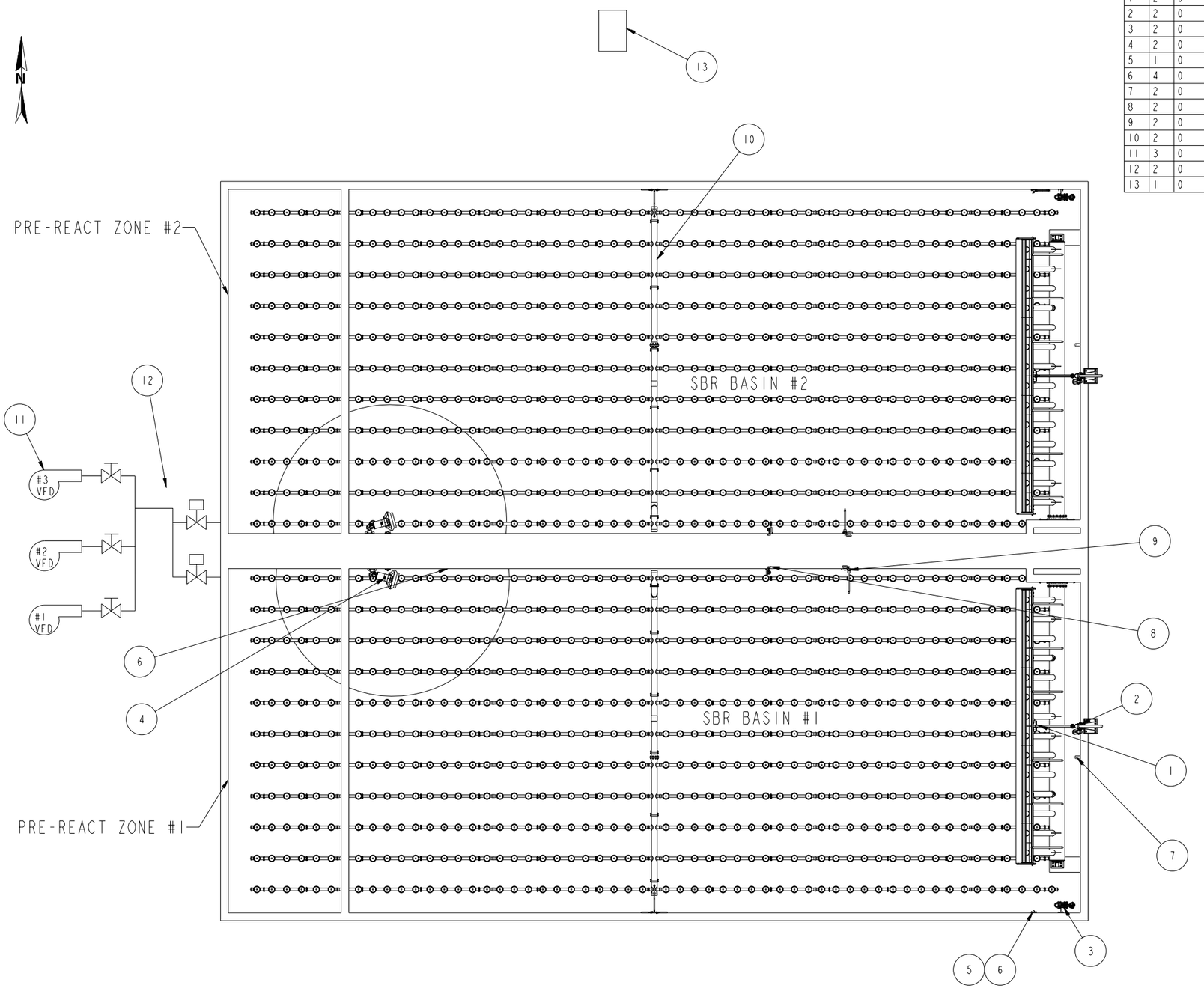
In order to reduce the number of microorganisms, including pathogens, in the treated water before discharging to the environment, the biological treatment process is followed by tertiary treatment. After disinfection, the flow is directed for final discharge. The processes that follow the biological treatment process include:

Process	Comments
Chlorine Contact Chamber	Controlled by others

During the decant phase, the treatment flow will leave the basins through the decanter and discharge into an equalization tank, from equalization tank flow will be be discharge into the chlorine contact chamber for disinfection contact time.

Chlorine is a strong oxidizer that oxidized most organic material including of bacteria, viruses, and other pathogens.

ITEM	QT'Y	SPARES	DESCRIPTION	MANUFACTURER	REF. DWGS
1	2	0	DECANTER, 35' 0" WEIR	XYLEM	M20
2	2	0	ACTUATOR MODEL 9020	DUFF NORTON	M20
3	2	0	PUMP, MODEL 3069, 3" DISCHARGE	FLYGT	M50
4	2	0	SUBMERSIBLE MIXER, MODEL 4660	FLYGT	M60
5	1	0	HOIST, MODEL D2B36D	HALLIDAY	M50 & M60
6	4	0	HOIST BRACKET, WALL MOUNT	HALLIDAY	M50 & M60
7	2	0	STORM FLOAT SWITCH, ICEAS	FLYGT	M21
8	2	0	LEVEL TRANSDUCER, LTU-801	FLYGT	M21
9	2	0	DO SENSOR, YSI DIQ/S 2020XT ANALYZER	YSI	M70
10	2	0	FINE BUBBLE AERATION SYSTEM	XYLEM	SEE AERATION
11	3	0	BLOWER 40HP, SUTORBILT 6M-DSL	GARDNER DENVER	SEE BLOWERS
12	2	0	AIR VALVE, 8" BRAY W/AUMA SG7.2 ACTUATOR	DORNER	SEE VALVES
13	1	0	CONTROL PANEL	XYLEM	SEE ELECTRICAL



KEY PLAN 1

NOTE:

1) INTERCONNECTING AIRMAIN PIPING BETWEEN BLOWERS AND CONTROL VALVES ARE PROVIDED BY OTHERS.

2) BLOWERS, VALVES, SENSORS, AND CONTROL PANEL, ARE LOCATED FOR REFERENCE ONLY. EXACT LOCATION TO BE DETERMINED BY OTHERS.

3) PUMPS, LEVEL TRANSDUCERS, BASIN SENSORS, AND FLOAT SWITCHES, SHOULD BE LOCATED AS NECESSARY TO PROVIDE SUFFICIENT ACCESS.

NOTE:
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xylem
07/16/25

WARNING
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REV.	DATE	REVISION	BY

AUMSVILLE, OREGON
WASTEWATER TREATMENT PLANT

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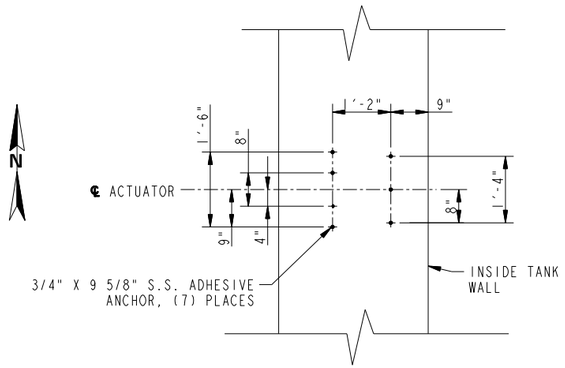
ICEAS SYSTEM
GENERAL LAYOUT

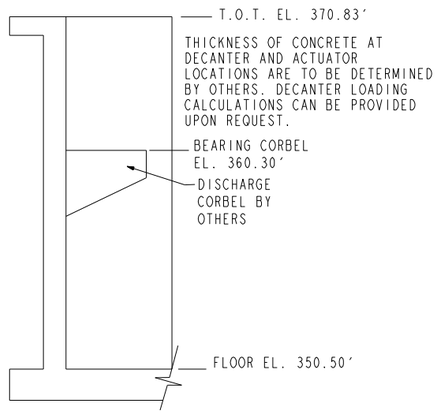
SANITAIRE
a xylem brand
WAUKESHA, WISCONSIN 53188

DRWN BY	MJS	DATE 07/16/25	EQUIP.	JOB NO.	25-0365A
CHKD BY	FBM	DATE 07/17/25	STD.	DWG. NO.	0365-G01
APPVD BY	FBM	DATE 07/17/25	SIZE D	REV. -	SHEET 1 OF 8

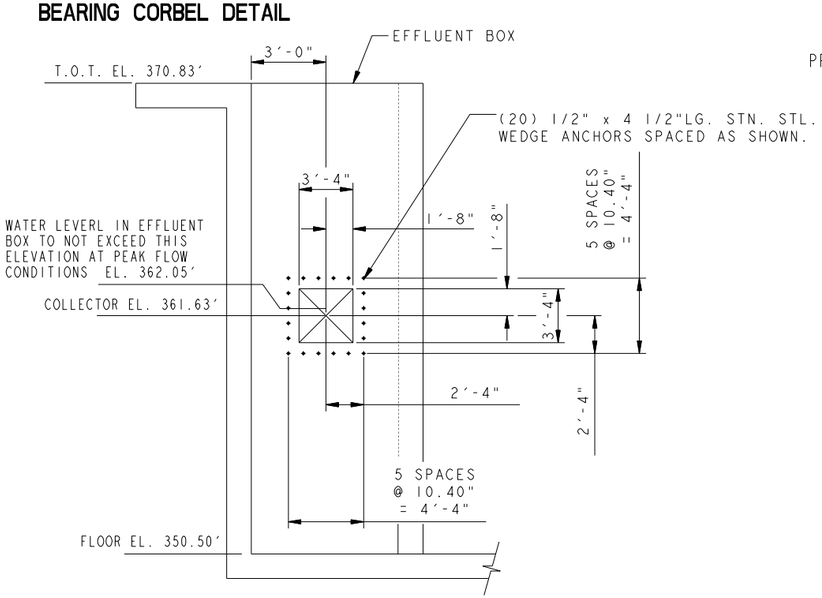


ACTUATOR MOUNT DETAIL

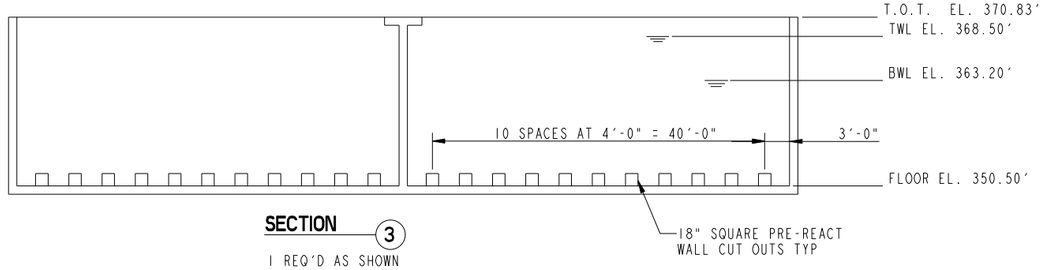
ANCHORS TO BE LOCATED AND INSTALLED AT ASSEMBLY WITH EQUIPMENT AND ARE SHOWN FOR REFERENCE ONLY



BEARING CORBEL DETAIL

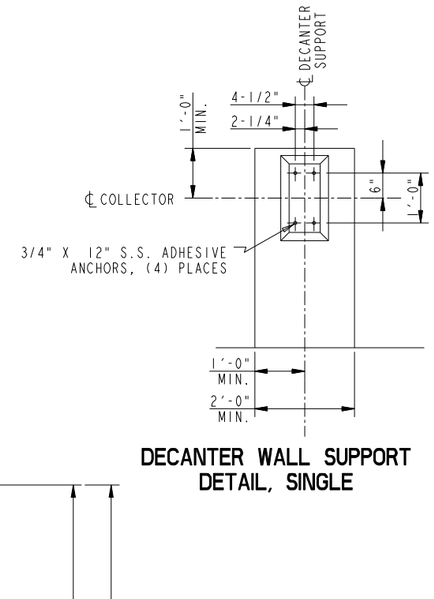


EFFLUENT CUTOUT/ANCHOR DETAIL

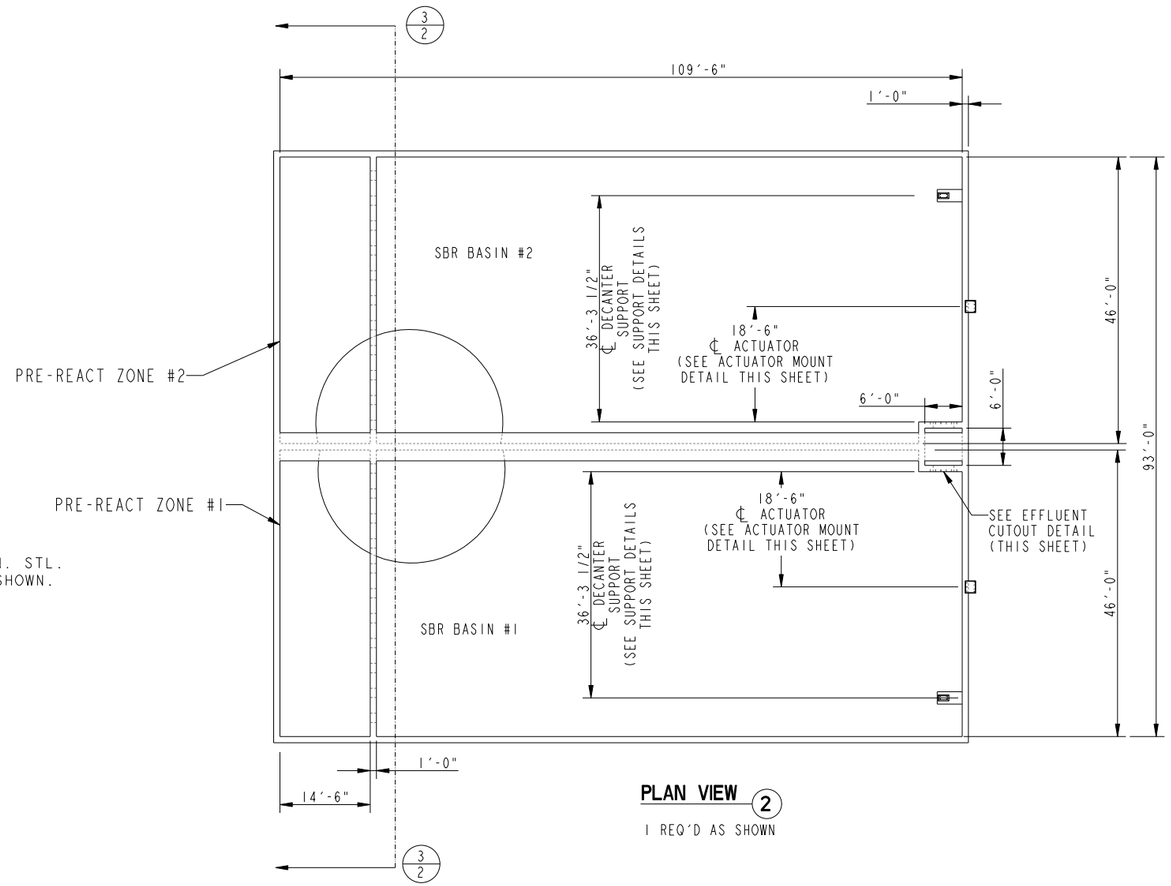


SECTION ③

1 REQ'D AS SHOWN



DECANTER WALL SUPPORT DETAIL, SINGLE



PLAN VIEW ②

1 REQ'D AS SHOWN

NOTE:
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xylem
07/16/25

WARNING
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REV	DATE	REVISION	BY
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WASTEWATER TREATMENT PLANT

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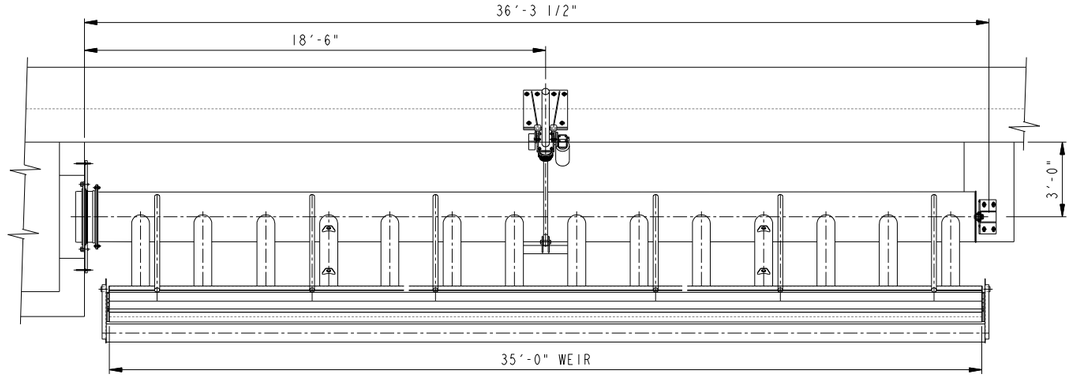
SBR BASIN CONCRETE
PLAN VIEW AND DETAILS

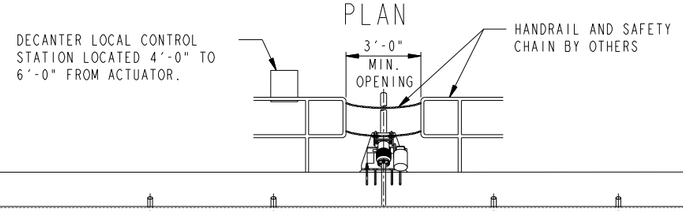
SANITAIRE
a xylem brand
WAUKESHA, WISCONSIN 53188

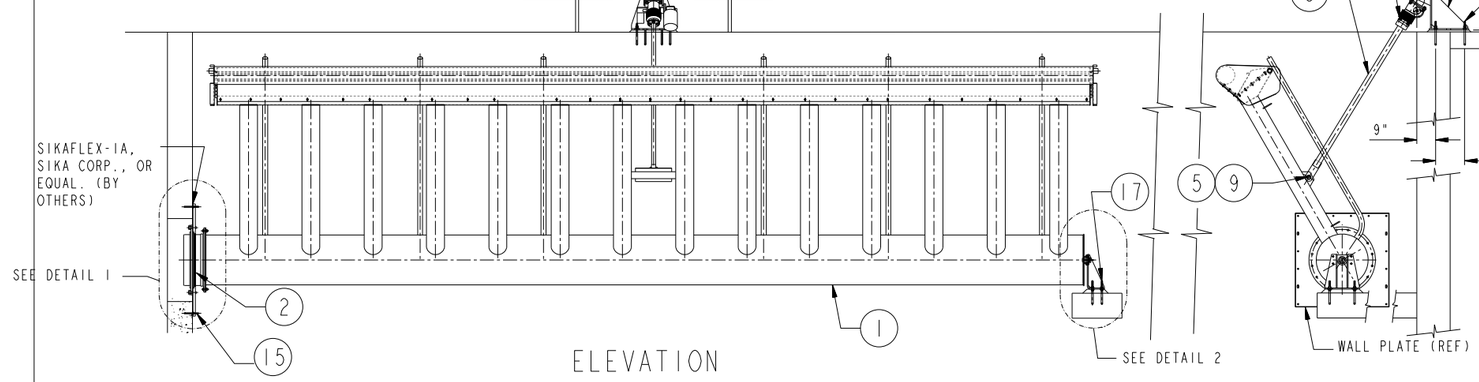
DRWN BY MJS DATE 07/16/25	SCALE:	JOB NO.	25-0365A
CHKD BY FBM DATE 07/17/25	STD.		
APPVD BY FBM DATE 07/17/25	SIZE D REV. -	DWG. NO.	0365-C10

SHEET 2 OF 8

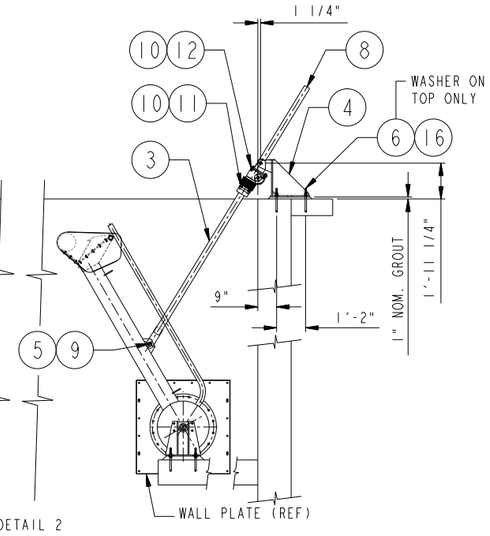


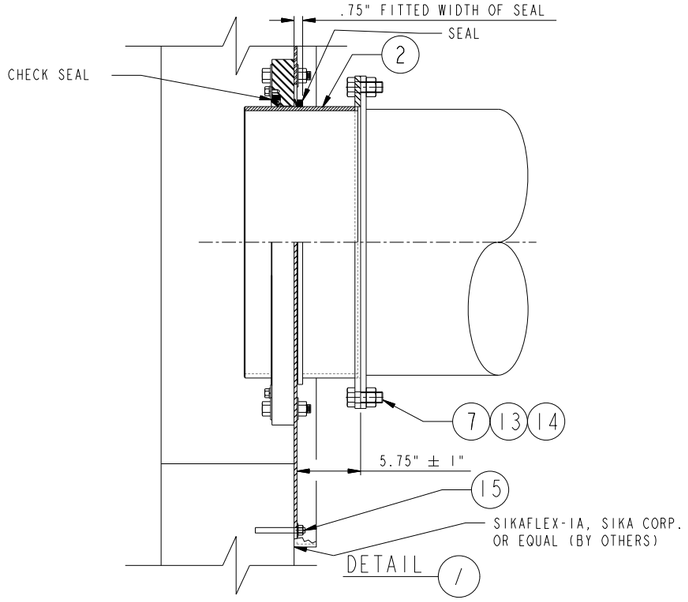
PLAN



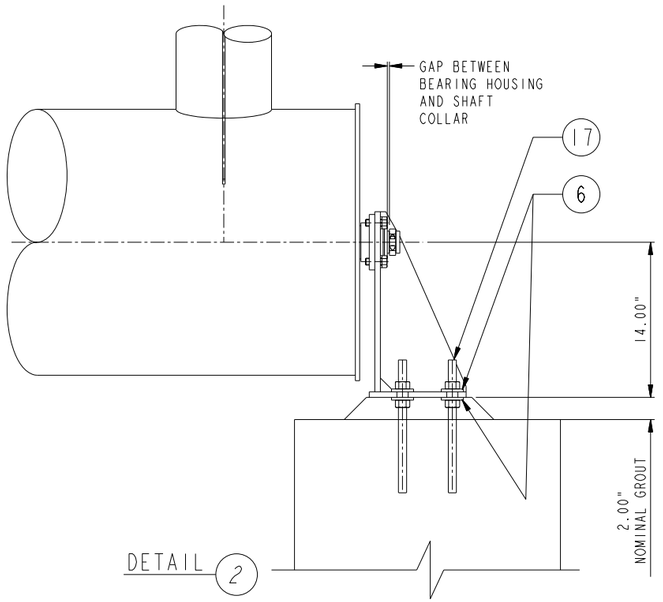


ELEVATION





DETAIL 1



DETAIL 2

ITEM	QT'Y	DESCRIPTION	DWGS.	MAT'L.
1	1	DECANTER SUB-ASSEMBLY, 24" COLLECTOR	STD2132	S.S.
2	1	BEARING SUB ASSEMBLY, 24" COLLECTOR	STD2035-24	S.S.
3	1	CONNECTING ROD	STD2136	S.S.
4	1	ACTUATOR BRACKET ASSEMBLY	STD1912	S.S.
5	1	PIN, CONNECTING STRUT, 1 3/4"Ø	STD1518	S.S.
6	15	PLATEWASHER, 2 x 2 x 1/4 THK.	STD1540	S.S.
7	1	GASKET, 24" COLLECTOR PIPE	STD2145-24	NEOPRENE
8	1	ACTUATOR, MODEL 9020		
9	2	COTTER PIN, Ø3/16" x 2 1/2" LONG		S.S.
10	8	BOLT, HEX HEAD, 3/4"-10UNC X 2 1/4" LG		S.S.
11	4	LOCK WASHER 3/4"		S.S.
12	4	NUT, HEX HEAD, 3/4-10 UNC		S.S.
13	16	BOLT HEX HD, 1"-8 UNC X 2 1/2" LG.		S.S.
14	16	NUT, HEX HEAD, 1"-8 UNC		S.S.
15	20	1/2"Ø X 4 1/2" LG WEDGE ANCHOR W/HEX NUT AND WASHER		S.S.
16	7	Ø3/4" X 9 5/8" LG HILTI HAS-R ROD		S.S.
		W/2 NUTS & 1 WASHERS, ADHESIVE TO BE		
		HILTI HVU. 6 5/8" EMBEDMENT		
17	4	Ø3/4" X 12" LG HILTI HAS-R ROD		S.S.
		W/2 NUTS & 1 WASHER, ADHESIVE TO BE		
		HILTI HVU. 6 5/8" EMBEDMENT		

GENERAL NOTES:

1.) REFERENCE DRAWING C10.

2.) QUANTITIES SHOWN ARE FOR ONE DECANTER. TOTAL ASSEMBLIES REQUIRED: 1 R.H. & 1 L.H. (RIGHT HAND DECANTER SHOWN).

3.) ALL THREADED CONNECTIONS MADE IN THE FIELD TO BE DRESSED WITH LOCTITE 262 OR EQUAL.

SHOP NOTES:

4.) ALL PARTS TO BE ASSEMBLED BY FABRICATOR TO CHECK FIT AND MATCH MARKED BEFORE DISASSEMBLY AND SHIPPING. MATCH MARKS TO BE ALPHA CHARACTERS (A,B,C,..), STEEL PUNCHED AND THE LOCATION HIGHLIGHTED W/1 1/2" CIRCLE OR YELLOW PAINT.

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REV	DATE	REVISION	BY

AUMSVILLE, OREGON
WASTEWATER TREATMENT PLANT

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xylem
07/16/25

DECANTER/ACTUATOR MAIN ASSEMBLY
35'-0" DECANTER- DUFF-NORTON
9020 ACTUATOR
24" COLLECTOR PIPE

WARNING
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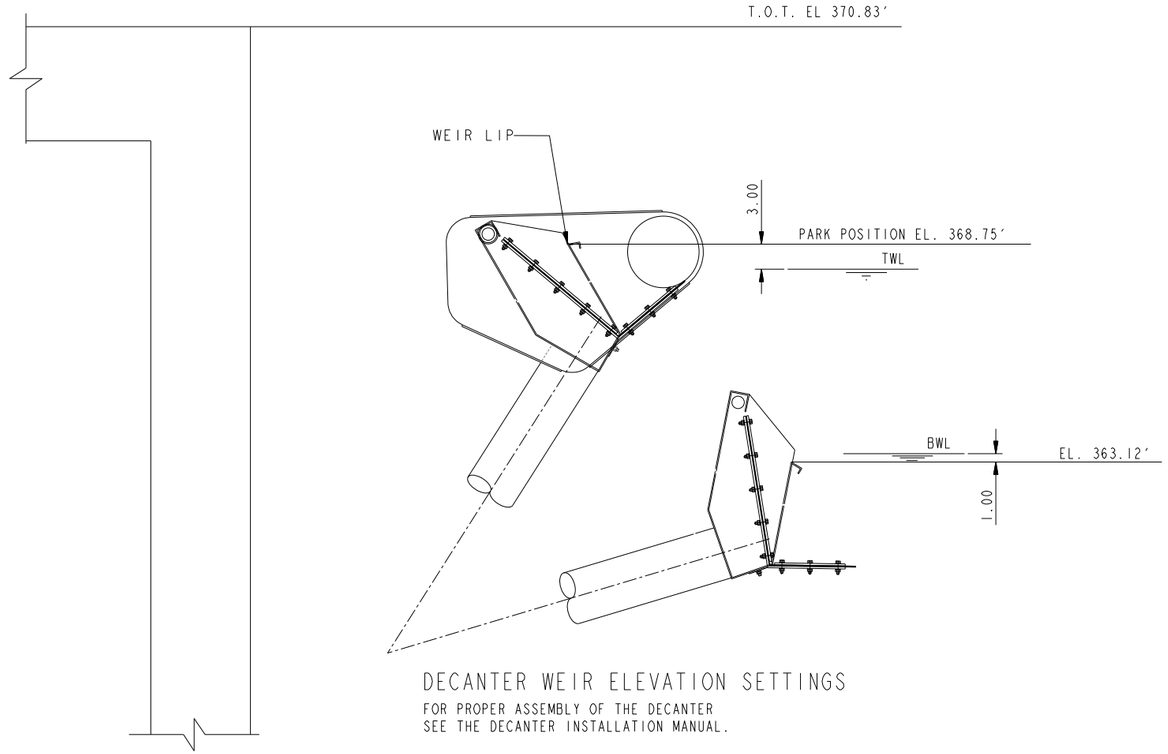
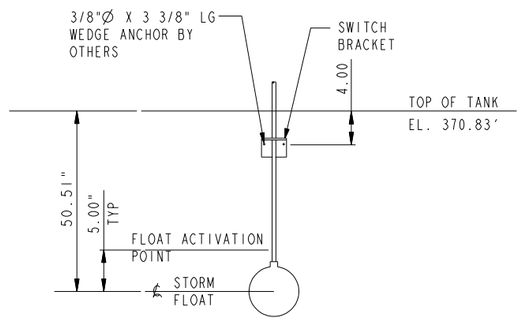
SANITAIRE
a xylem brand
WAUKESHA, WISCONSIN 53188

DRWN BY MJS DATE 07/16/25	SCALE:	JOB NO. 25-0365A	SHEET 3 OF 8
CHKD BY FBM DATE 07/17/25	STD.		
APPVD BY FBM DATE 07/17/25	SIZE D	REV. -	DWG NO. 0365-M20

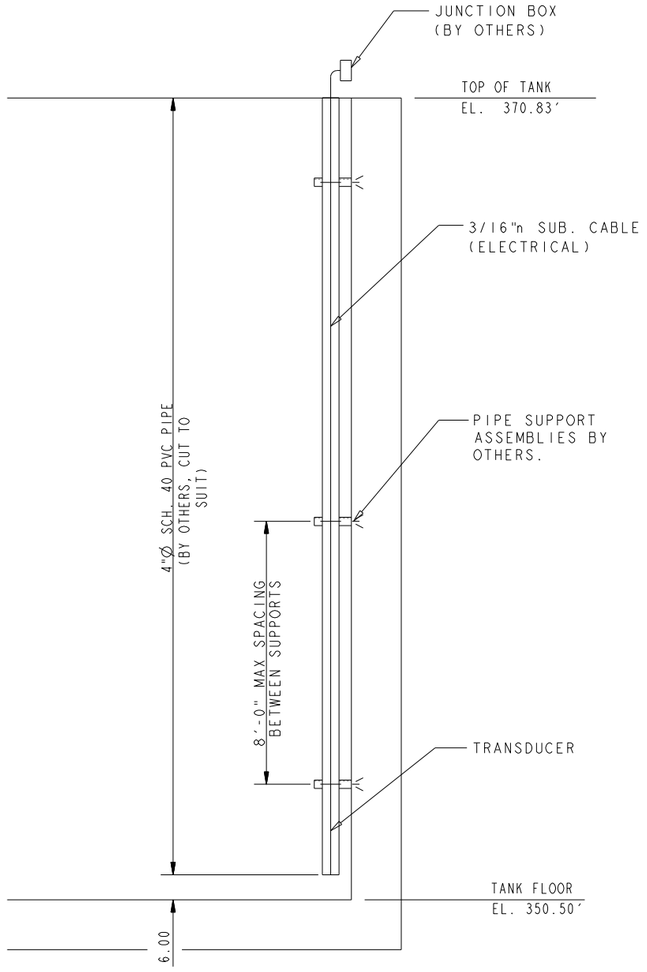


DECANTER WEIR ELEVATION SETTINGS

FOR PROPER ASSEMBLY OF THE DECANTER
SEE THE DECANTER INSTALLATION MANUAL.



SBR FLOAT SWITCH INSTALLATION



LEVEL TRANSDUCER ASSEMBLY
DETAIL

NOTES:

1. CONDUIT, JUNCTION BOX & (2) CONDUCTOR SHIELDED CABLE BY OTHERS.
2. UNITS CAN BE INSTALLED AT ANY CONVENIENT LOCATION IN BASIN, PREFERABLY ON A FLAT WALL.
3. ELECTRICAL CABLE TO BE TIED OFF w/ CORD GRIP NEAR JUNCTION BOX.
4. PRIOR TO INSTALLING PVC PIPE, DRILL A SERIES OF 1/2" HOLES 2'-0" ON CENTER. THIS WILL PREVENT THE PIPE FROM ACTING LIKE AN AIRLIFT.

NOTE:
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xylem
07/16/25

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AUMSVILLE, OREGON
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DECANTER WEIR ELEVATIONS
FLOAT SWITCH & LEVEL
TRANSDUCER INSTALLATION DEETAILS

SANITAIRE
a xylem brand
WAUKESHA, WISCONSIN 53188

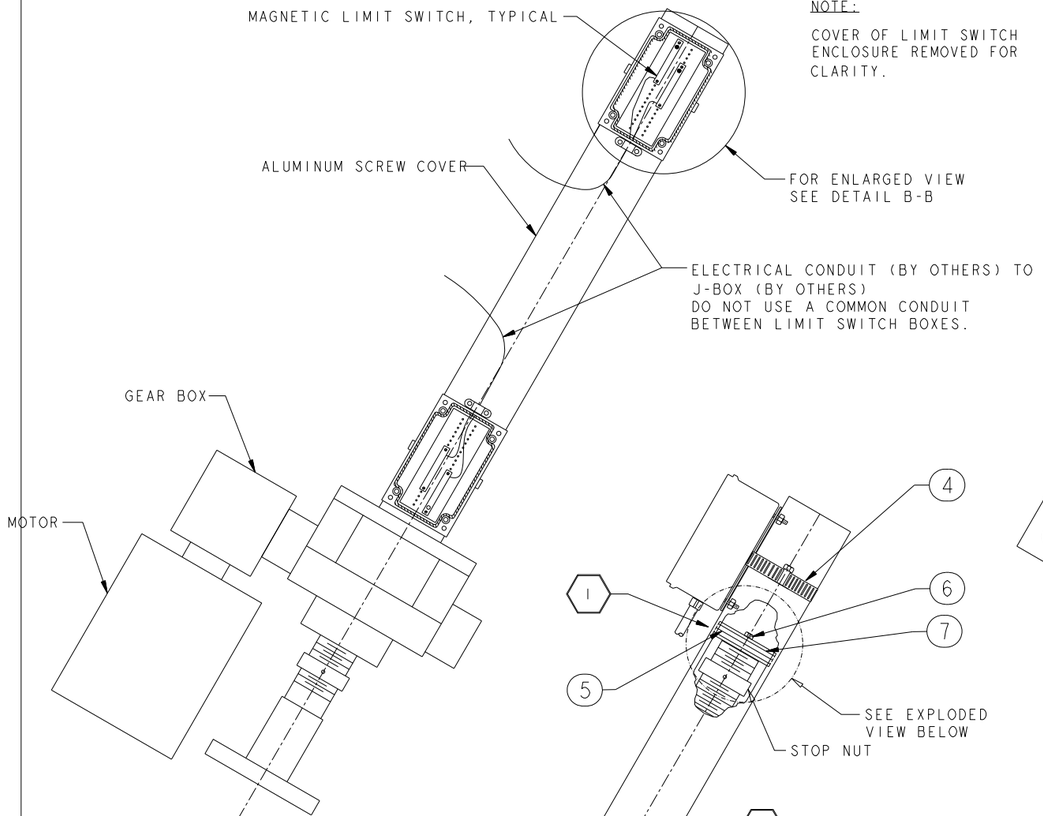
DRWN BY	MJS	DATE 07/16/25	EQUIP.	JOB NO.	25-0365A
CHKD BY	FBM	DATE 07/17/25	STD.		
APPVD BY	FBM	DATE 07/17/25	SIZE D	REV. -	DWG. NO. 0365-M21

SHEET 4 OF 8

ITEM	QT'Y	DESCRIPTION	DWGS.	MAT'L.
1	2	LIMIT SWITCH ENCLOSURE ASSEMBLY	STD1389	FIBERGLASS
2	4	LIMIT SWITCH - MAGNETIC W / 20'-0" CABLE	-	CELANEX
3	8	SCREW, SELF TAPPING, No. 4 X 3/4" LG.	-	S.S.
4	2	WORM DRIVE HOSE CLAMP, 5" DIA.	-	S.S.
5	2	MAGNET	STD1393	CERAMIC
6	1	BOLT 3/8-16 UNC X 1 1/4" LG.	-	S.S.
7	2	WASHER	STD1392	S.S.
8	2	LIMIT SWITCH HEATER ASS'Y #ALMTSWCHEATER	-	-

NOTES:

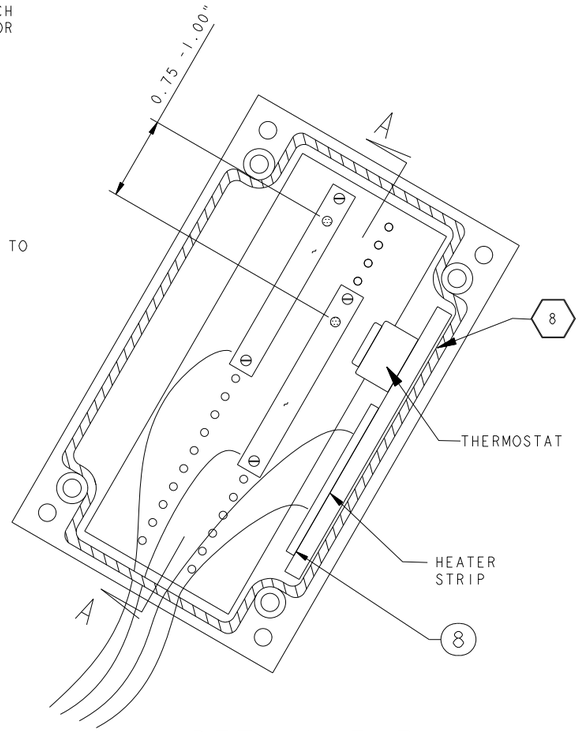
1. QUANTITIES ARE FOR ONE ACTUATOR
* 1 OR 2 MAGNETS PER ACTUATOR DEPENDING ON MODEL



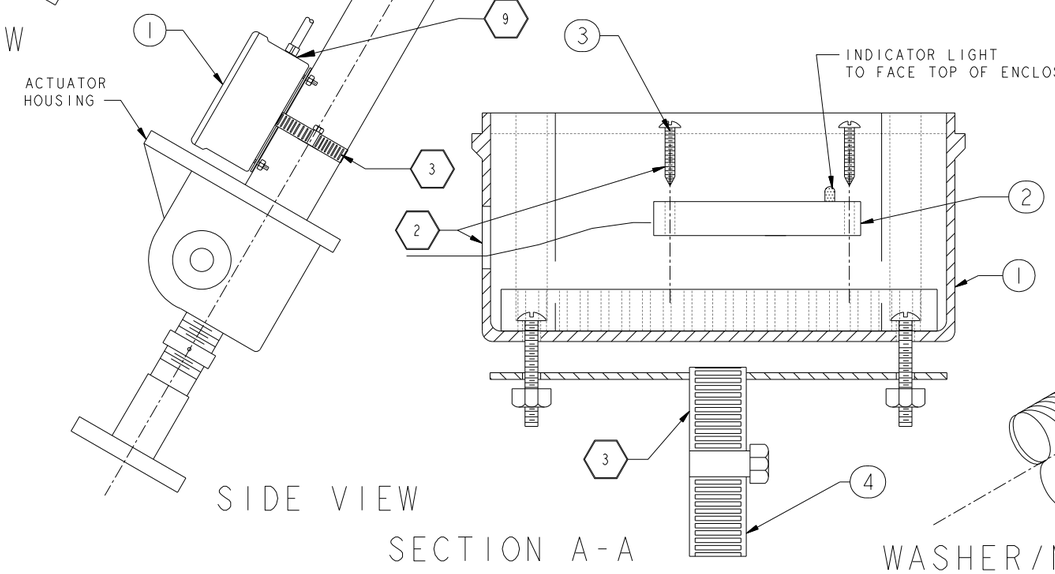
TOP VIEW

NOTE:

COVER OF LIMIT SWITCH ENCLOSURE REMOVED FOR CLARITY.

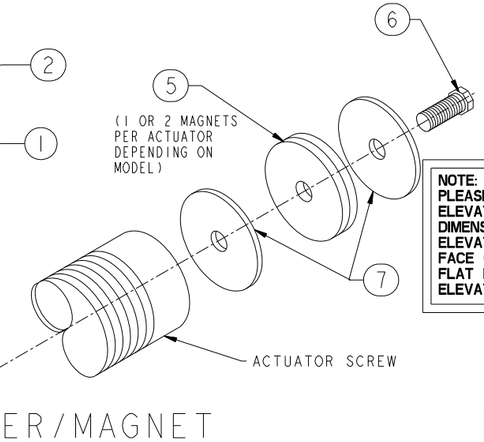


DETAIL B-B



SIDE VIEW

SECTION A-A



WASHER/MAGNET ATTACHMENT VIEW

LIMIT SWITCH INSTALLATION INSTRUCTIONS

REFERENCE DRAWING M21

1. UNSCREW ALUMINUM COVER PIPE. CLEAN OUT 3/8"° THREADED HOLE ON SCREW END AND BOLT MAGNET SANDWICH (MAGNET BETWEEN TWO WASHERS) ONTO ACTUATOR SCREW WITH 3/8" BOLT PROVIDED. REINSTALL PIPE COVER.
2. REMOVE ENCLOSURE COVER, DRILL HOLE IN ENCLOSURE END. SECURE TWO SWITCHES IN EACH ENCLOSURE AS SHOWN. PLUG AND SEAL CONDUIT.
3. USING HOSE CLAMP (ONE PER ENCLOSURE), SECURE ENCLOSURES TO PIPE COVER. HOSE CLAMP SLIDES BETWEEN MOUNTING PLATE AND ENCLOSURE BOTTOM.
4) FOR WIRE/CONDUIT LENGTH PURPOSES, PLACE ENCLOSURES TO THE VERY ENDS (TOP AND BOTTOM) OF THE PIPE COVER. IMPORTANT: INSURE THAT ENOUGH WIRE/CONDUIT IS PROVIDED BETWEEN THE ENCLOSURES AND THE JUNCTION BOX (BY OTHERS) OR LOCAL DECANTER PANEL TO ALLOW FOR ADJUSTMENTS OF THE ENCLOSURE UP AND DOWN THE PIPE COVER.
5) FINAL ENCLOSURE POSITIONS WILL BE DETERMINED BY FACTORY START-UP PERSONNEL.
6) REFER TO THE ABJ WIRING/CONTROL DRAWINGS FOR ALL WIRE TERMINATIONS AT THE LOCAL DECANTER CONTROL PANEL.
7) TWO SWITCHES ARE PROVIDED PER ENCLOSURE. THE FIRST SWITCH THAT THE MAGNET ENGAGES IS THE PRIMARY SWITCH. THE SECOND SWITCH IS PROVIDED FOR REDUNDANCY (BACK-UP) IN CASE OF FAILURE OF THE PRIMARY SWITCH. INDICATING LIGHTS ARE PROVIDED FOR START-UP AND MAINTENANCE PURPOSES.
8. INSTALL HEATER ASSEMBLIES INSIDE UPPER AND LOWER LIMIT SWITCH BOXES USING THE SUPPLIED TWO-SIDED TAPE ALONG THE LONG SIDE OF THE BOX. PRESS AND HOLD IN PLACE FOR 30 SECONDS. ROUTE WIRES THROUGH THE SAME CONDUIT USED FOR THE LIMIT SWITCHES.
9. WHEN INSTALLING CONDUIT IN THIS POSITION, PROPER APPLICATION OF WATERPROOF SEAL IS NECESSARY.

REV	DATE	REVISION	BY

NOTE:
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WARNING
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AUMSVILLE, OREGON
WASTEWATER TREATMENT PLANT

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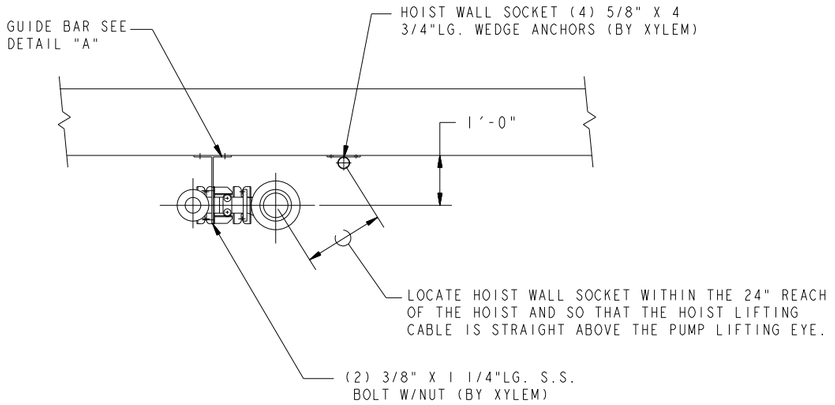
DECANTER LIMIT SWITCH ASSEMBLIES

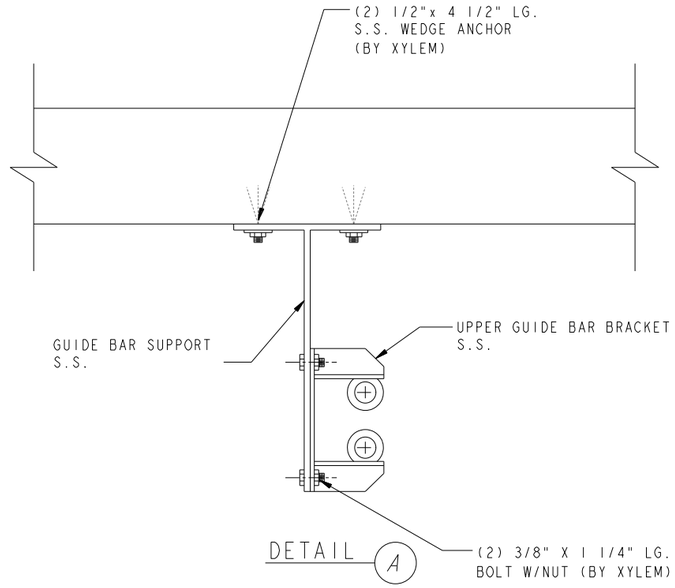
SANITAIRE
a xylem brand
WAUKESHA, WISCONSIN 53189

DRWN BY MJS DATE 07/16/25	SCALE:	JOB NO. 25-0365A	SHEET 5 OF 8
CHKD BY FBM DATE 07/17/25	STD.		
APPVD BY FBM DATE 07/17/25	SIZE D REV. -	DWG NO. 0365-M24	

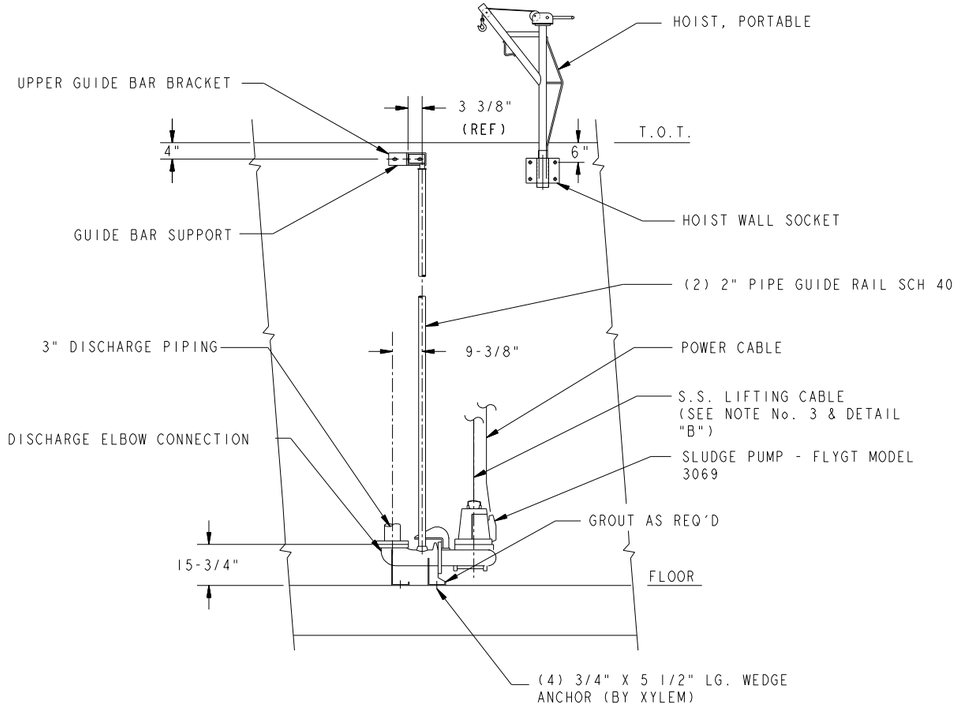


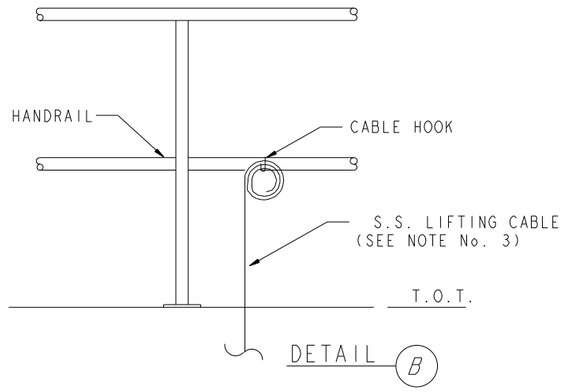
NOTES:

1. DRAWING IS FOR ONE ASSEMBLY. TOTAL REQUIRED: 2
2. LOCATE UPPER GUIDE BAR BRACKET WITH DISCHARGE ELBOW. GUIDE BARS TO BE PLUMBED AFTER PUMP IS ANCHORED.
3. COIL AND TIE WRAP EXCESS HOISTING CABLE TO RAILING AS NECESSARY FOR ALL BUT ONE OF THE PUMPS. ONE UNIT'S CABLE CAN BE ATTACHED DIRECTLY TO THE HOIST.



DETAIL A





DETAIL B

NOTE:
PLEASE VERIFY ALL DIMENSIONS AND ELEVATIONS, INCLUDING: INSIDE TANK DIMENSIONS, DROPLEG LOCATIONS, ELEVATIONS OF DROPLEGS CONNECTIONS, FACE OF FLANGES, DIFFUSER ELEVATIONS, FLAT FLOOR AND HIGHPOINT/LOWPOINT ELEVATIONS OF SLOPED FLOOR.

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xylem
07/16/25

WARNING
xylem DOES NOT ACCEPT RESPONSIBILITY FOR UNDOCUMENTED CUSTOMER INITIATED CHANGES TO ELECTRONICALLY TRANSMITTED DRAWINGS.

REV	DATE	REVISION	BY

AUMSVILLE, OREGON
WASTEWATER TREATMENT PLANT

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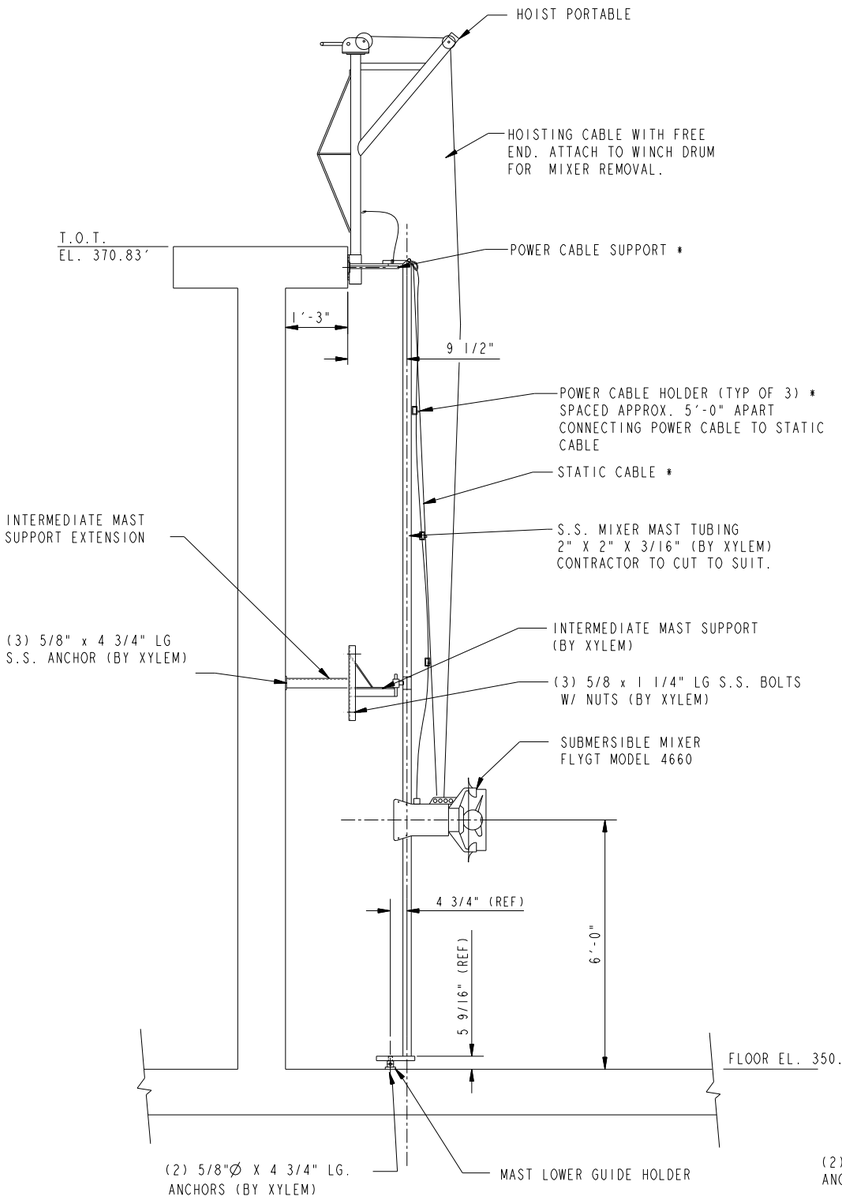
SBR BASIN WAS PUMPS

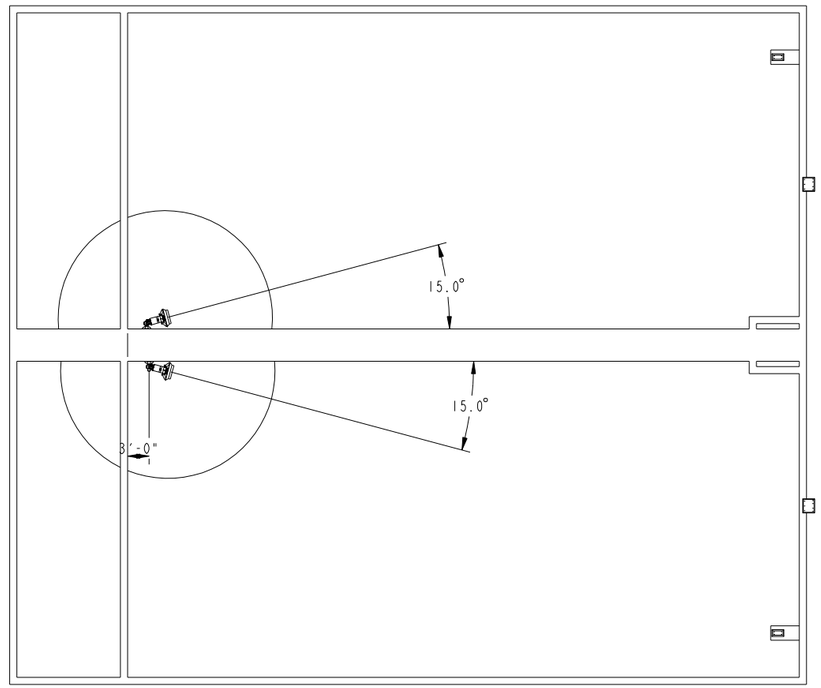
SANITAIRE
a xylem brand
WAUKESHA, WISCONSIN 53188

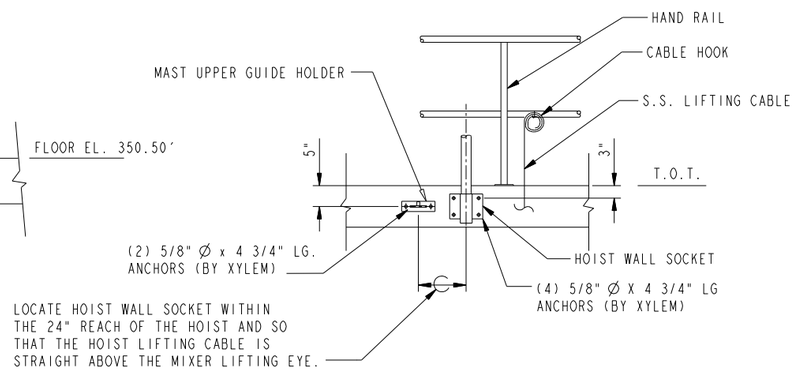
DRWN BY MJS DATE 07/16/25	SCALE:	JOB NO.	25-0365A
CHKD BY FBM DATE 07/17/25	STD.		
APPVD BY FBM DATE 07/17/25	SIZE D REV. -	DWG. NO.	0365-M50

SHEET 6 OF 8



* - SUPPLIED WITH MIXER





LOCATE HOIST WALL SOCKET WITHIN THE 24" REACH OF THE HOIST AND SO THAT THE HOIST LIFTING CABLE IS STRAIGHT ABOVE THE MIXER LIFTING EYE.

NOTE:

COIL AND TIE WRAP EXCESS HOISTING CABLE TO RAILING AS NECESSARY FOR ALL BUT ONE OF THE MIXERS. ONE UNIT'S CABLE CAN BE ATTACHED DIRECTLY TO THE HOIST.

NOTE:
PLEASE VERIFY ALL DIMENSIONS AND ELEVATIONS, INCLUDING: INSIDE TANK DIMENSIONS, DROPLEG LOCATIONS, ELEVATIONS OF DROPLEGS CONNECTIONS, FACE OF FLANGES, DIFFUSER ELEVATIONS, FLAT FLOOR AND HIGHPOINT/LOWPOINT ELEVATIONS OF SLOPED FLOOR.

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xylem
07/16/25

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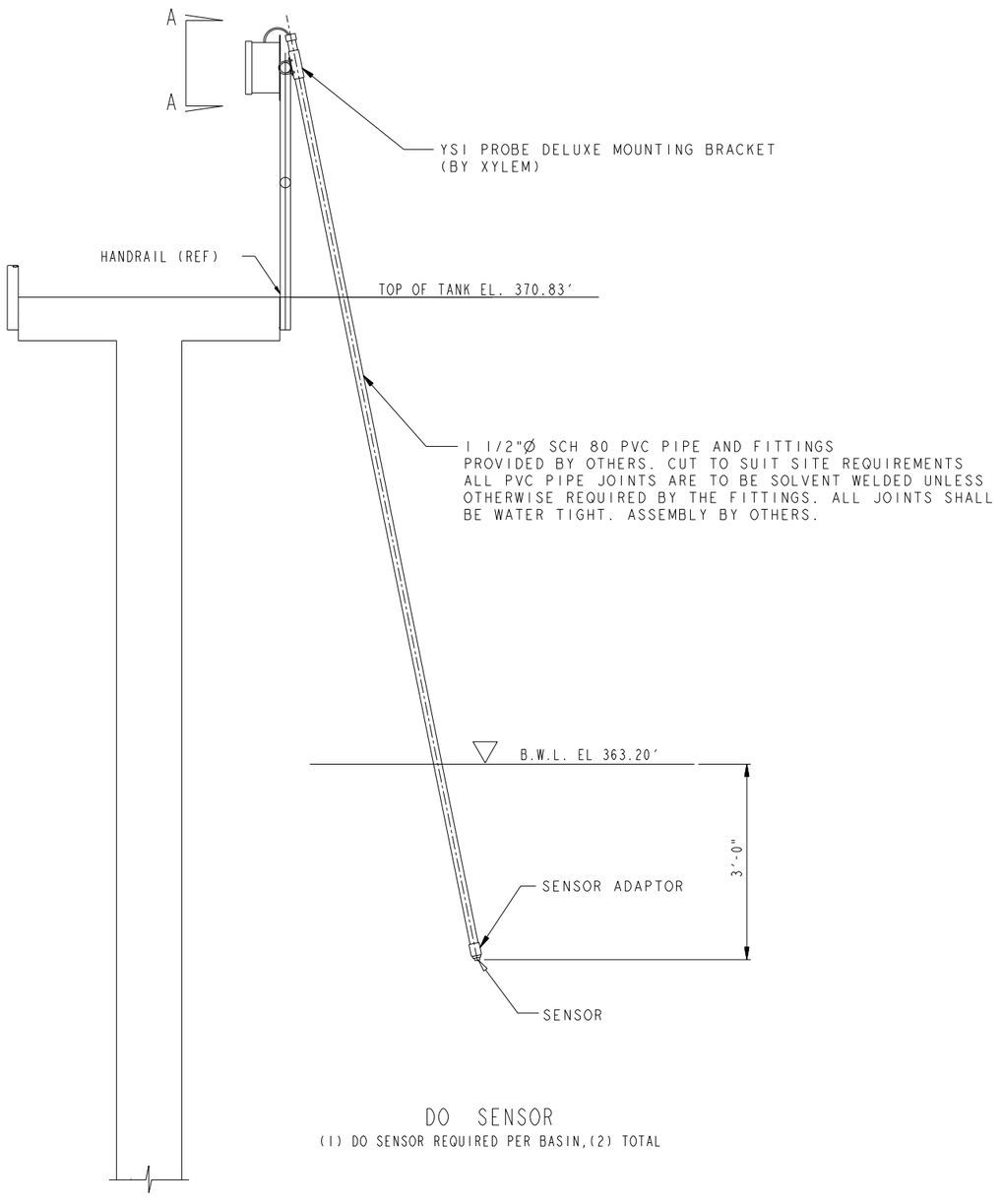
SBR BASIN MIXERS

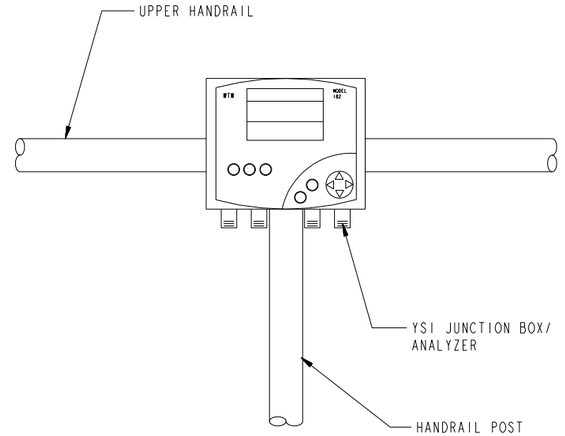
SANITAIRE
a xylem brand
WAUKESHA, WISCONSIN 53188

DRWN BY	WJS	DATE 07/16/25	EQUIP.	JOB NO.	25-0365A
CHKD BY	FBM	DATE 07/17/25	STD.	DWG. NO.	0365-M60
APPVD BY	FBM	DATE 07/17/25	SIZE D	REV. -	SHEET 7 OF 8



DO SENSOR

(1) DO SENSOR REQUIRED PER BASIN, (2) TOTAL



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xylem
07/16/25

WARNING

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REV	DATE	REVISION	BY

AUMSVILLE, OREGON
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DISSOLVED OXYGEN
SENSORS

SANITAIRE
a xylem brand
WAUKESHA, WISCONSIN 53188

DRWN BY	MJS	DATE 07/16/25	SCHP.	JOB NO.	25-0365A
CHKD BY	FBM	DATE 07/17/25	STD.		
APPVD BY	FBM	DATE 07/17/25	SIZE D	REV. -	DWG. NO. 0365-M70

SHEET 8 OF 8

331 June Ave.
Blandon, PA 19510
ph (610) 921-9558, fx (610) 921-9727

BLOWER PACKAGE SUBMITTAL

CUSTOMER:

XYLEM, INC.

PO BOX 30160
COLLEGE STATION, TX 77842

PROJECT:

Aumsville, OR

P.O.# 867227 // Excelsior Job # 96150

April 21, 2025

C O N T E N T S

1A. SBR BLOWER PACKAGE ASSEMBLY DRAWING NO. 96150A-1
BLOWER PERFORMANCE DATA, SUTORBILT 6M-DSL

1B. DIGESTER BLOWER PACKAGE ASSEMBLY DRAWING NO. 96150B-1
BLOWER PERFORMANCE DATA, SUTORBILT 6M-DSL

2. BLOWER, SUTORBILT LEGEND DSL SERIES

3. MOTOR, WEG 40 HP

4. INLET FILTER, EXCELSIOR EBS-5"

5. DIFFERENTIAL PRESSURE GAUGE, DWYER 2020

6. DISCHARGE SILENCER, PROGENTEX DRS-SP-5"

7. FLEXIBLE CONNECTOR, FLEX-FAB

8. PRESSURE RELIEF VALVE, SUTORBILT PL-2"

9. CHECK VALVE, FLEXI-HINGE 518-5"

10. BUTTERFLY VALVE, DELVAL 50-5"

11. PRESSURE GAUGE, WIKA 213.53

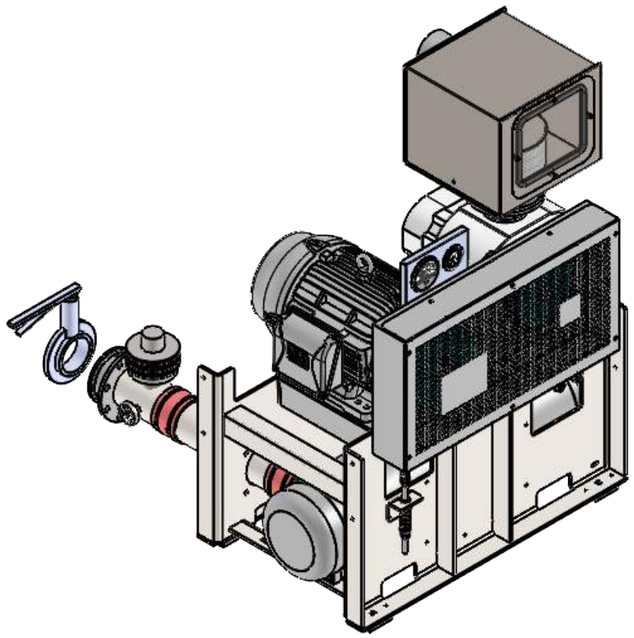
12. THERMOMETER, REOTEMP AA

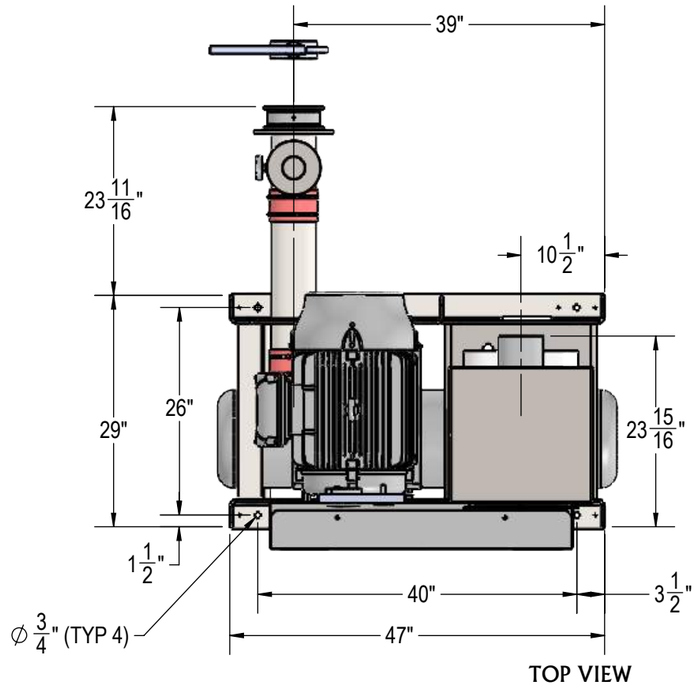
13. VIBRATION ISOLATION PAD, V.M.C. CORK-RIB

14. SHOP PAINTING SYSTEM, TNEMEC SERIES 66 / 73

15. PARTS LIST

16. GARDNER DENVER BLOWER ACCEPTANCE / PERFORMANCE TESTING

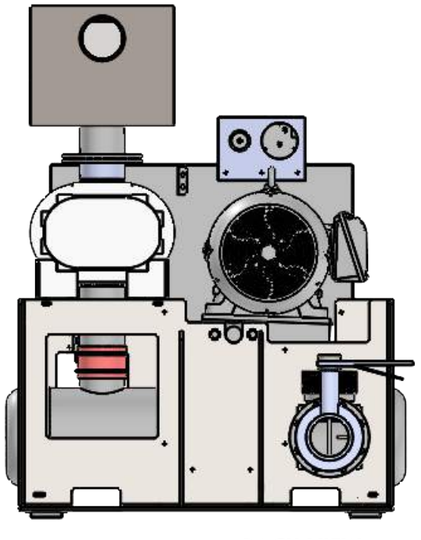


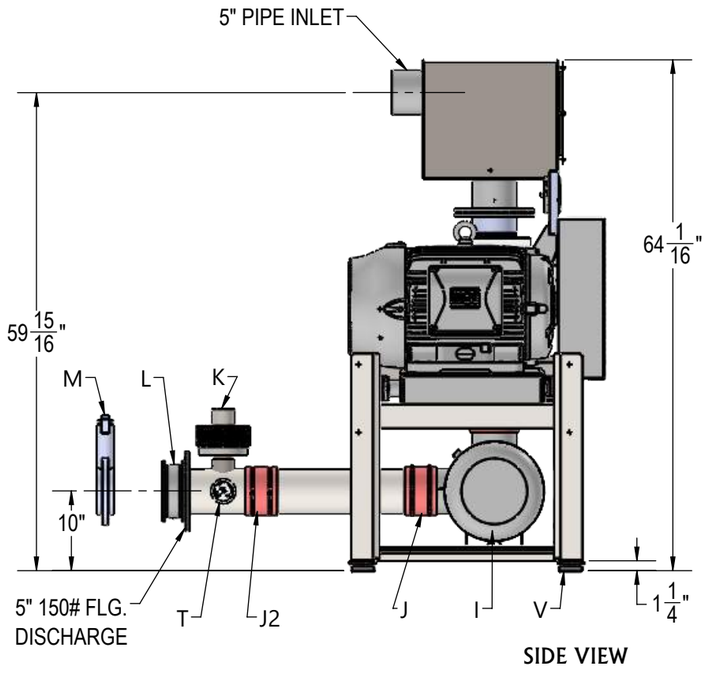


TOP VIEW

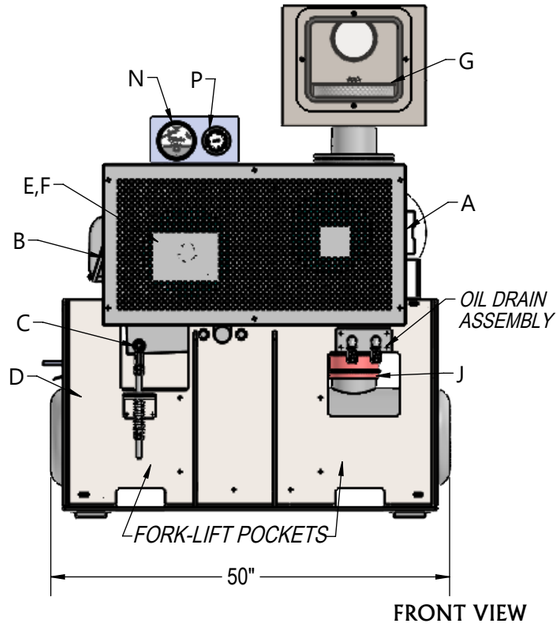
ITEM	DESCRIPTION	QTY
A	BLOWER: SUTORBILT 6M-DSL, 480 SCFM / 535 ICFM @ 8.8 PSIG, 1766 RPM	3
B	MOTOR*: WEG 40 HP, 1800 RPM, 324T, TEFC, 230/460/3/60	3
C	MOTOR TILT BASE	3
D	ELEVATED STEEL BASE	3
E	V-BELT DRIVE	
	BLOWER SHEAVE: 5V10.3X2 - SK x 1 3/8	3
	MOTOR SHEAVE: 5V10.3X2 - SK x 2 1/8	3
	BELTS: 5VX680 C.D. = 17.82"	6
F	BELT GUARD: STEEL	3
G	INLET FILTER SILENCER: XL-IFS-5"	3
I	DISCHARGE SILENCER: PROGENTEX DRS-SP-5", GRADE I	3
J	FLEXIBLE PIPE CONNECTOR: FLEX-FAB TYPE II & III	6
J2	FLEXIBLE PIPE CONNECTOR: FLEX-FAB TYPE III	3
K	RELIEF VALVE: SUTORBILT PL-2", SET @ 10.0 PSI	3
L	CHECK VALVE: FLEXI-HINGE 518-5"	3
M	BUTTERFLY VALVE: DELTECH 50-5"	3
N	DIFFERENTIAL PRESSURE GAUGE: DWYER 2020 0-20"WC	3
P	PRESSURE GAUGE: WIKA 213.53, 0-15 PSI	3
T	TEMPERATURE GAUGE: REOTEMP AA0251F63, 50-300°F	3
V	VIBRATION ISOLATION PADS: VMC CORK-RIBBED, 1"THICK	12

BLOWER ROTATION: CCW
ESTIMATED BLOWER PACKAGE WEIGHT: 1,650#
TOLERANCE: ± 1/2"
DISCHARGE PIPING MUST BE INDEPENDENTLY SUPPORTED.
COMPONENTS J2, K, T, L, & M WILL SHIP LOOSE.
* MOTORS ARE EQUIPPED WITH N.C. THERMOSTATS IN WINDING.
* VFD DRIVEN MOTOR ARE EQUIPPED WITH AEGIS D.E. SHAFT GROUNDING RING


BACK VIEW



SIDE VIEW



FRONT VIEW

SBR BLOWERS

REV.	DATE	DESCRIPTION	BY

EBS EXCELSIOR BLOWER SYSTEMS
BLANDON, PENNSYLVANIA

XYLEM
AUMSVILLE, OR
P.O.# 867227

DATE: 04/21/2025 SCALE: 1:19

DWG#: 96150A-1 REV#: 0

QuickPik

Sutorbilt Legend - 6MDSL

SBR BLOWERS

Product Information

CORRECTED VALUES	ORIGINAL UNITS	ENGLISH UNITS	METRIC UNITS
Ambient Pressure	366 ALTI-FT	14.498 PSIA	1 bar a
Elevation	366 ALTI-FT	366 ALTI-FT	112 ab m
Inlet Pressure	14.498 PSIA	-0.000 PSIG	0 bar g
Inlet Pressure Loss	0.3 PSIG	0.300 PSIG	0.021 bar g
Inlet Temp	100 F	100 °F	38 °C
Inlet Flow	480 SCFM	535 ICFM	910 m³/h
Discharge Pressure	8.8 PSIG	8.800 PSIG	0.607 bar g
Discharge Pressure Loss	0.2 PSIG	0.200 PSIG	0.014 bar g

MEASURED VALUES	ORIGINAL UNITS	ENGLISH UNITS	METRIC UNITS
Speed	1766 RPM	1766 RPM	1766 RPM
RPM % Of Max	75	75	75
Power	29.8 HP	29.8 HP	22.222 kW
Discharge Temp	231 °F	231 °F	111 °C
Temp % of Max	71	71	71
Noise	89 dBa	89 dBa	89 dBa
Pressure % of Max	88	88	88
Adiabatic Efficiency	60.12%	60.12%	60.12%

PHYSICAL	
Weight	330 lbs.
Gear Diameter / Center Distance	6 in.
Connection Size	5/5d in.
Case Length	8 in.
WR^2	5.09 $lb\text{-}ft^2$
Orientation	horizontal

PERFORMANCE	
Max Delta P	14 PSI
Max Temp	325 °F
Max Speed	2350 RPM
Min Speed	637 RPM
Max Case Pressure	25 PSIG
Max Delta T	225 °F

Created: 04-21-2025

QuickPik

AMBIENT GAS PARAMETERS	ENGLISH UNITS	METRIC UNITS
Molecular Weight	28.700 lbm/lbmol	28.700 kg/kgmol
R Value	53.833 ft lbf/lbm R	0.260 kJ/kg K
Density	0.069 lbm/ft ^{3}	1.110 kg/m^3

GAS MIX:	VOL
Air	100%

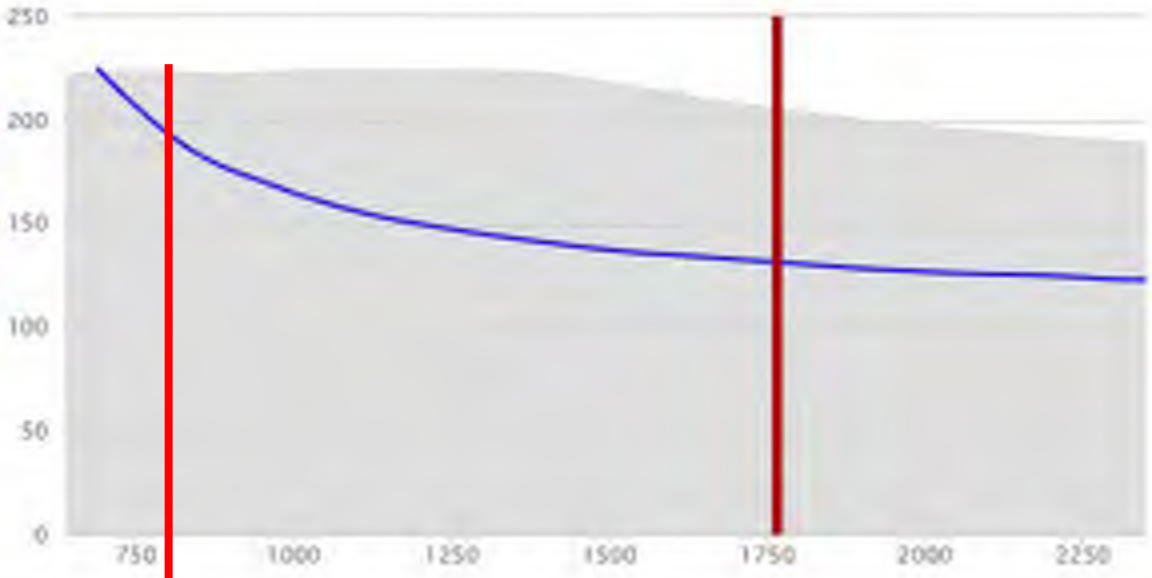
Performance Curves

Temperature Rise

DEFINED CONDITIONS
131 F

RPM
1766

Published Data
Defined Conditions

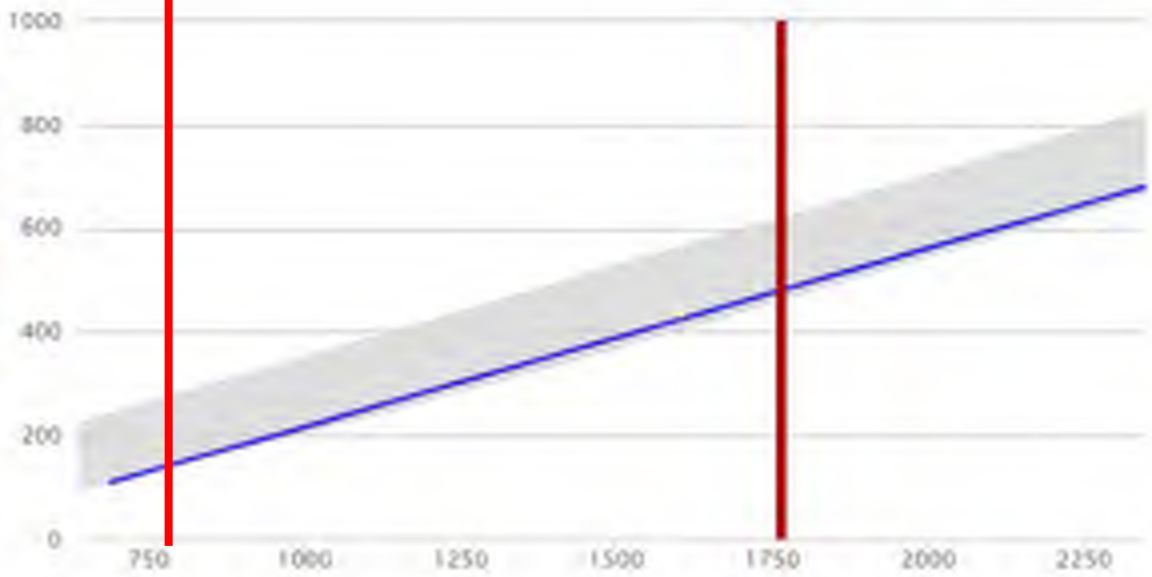


Flow

DEFINED CONDITIONS
480 SCFM

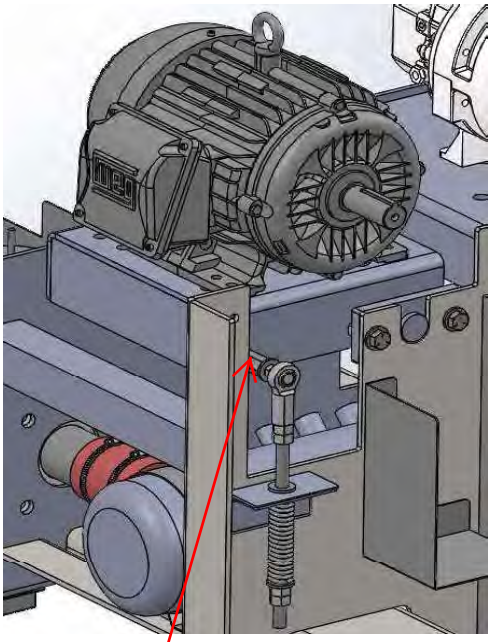
RPM
1766

Published Data
Defined Conditions

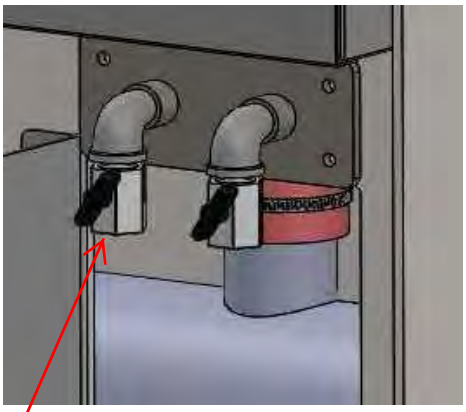


MIN. BLOWER SPEED: 820 RPM
MIN. ALLOWABLE SPEED FOR VFD USE: 28 Hz

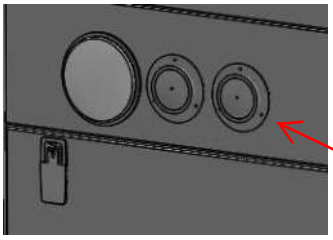
Created: 04-21-2022



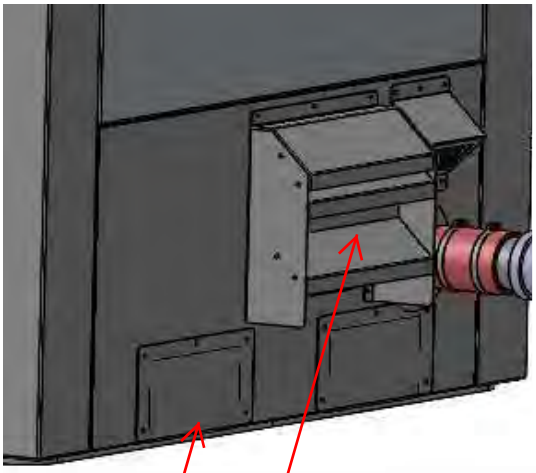
BASE EQUIPPED WITH AUTO-TENSION DEVICE



REMOTE OIL DRAIN VALVES

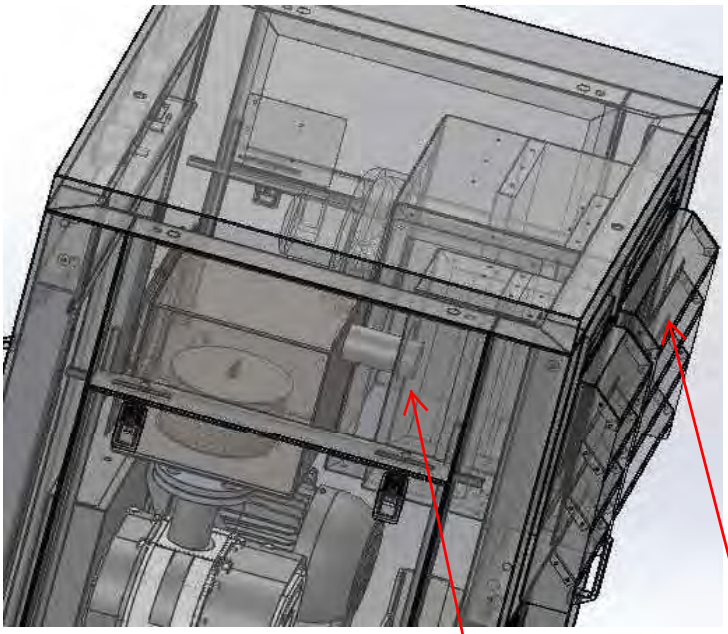


PANEL MOUNTED GAUGES



** BAFFLED FRESH AIR INTAKE FOR VENTILATION

COVERED FORKLIFT SLOTS



** BAFFLED EXHAUST FAN (THERMOSTATICALLY CONTROLED)

BAFFLED INLET FILTER

** EXTERIOR HOODS FOR OUTDOOR PACKAGES ONLY FOR WEATHER PROTECTION

Sutorbilt® Legend® DSL Series

Gardner Denver

– Tradition

– Quality

– Innovation

– Results

Sutorbilt Legend DSL

Improving a great, trusted and proven product was the challenge. The Legend DSL integrates proven experience with world-class blower design and manufacturing to create a product worthy of the name “Legend.”

Quality + Tradition = Trust

- Tradition: 150 years of quality manufacturing with proven results
- Every Legend DSL is manufactured in our ISO 9001 certified facility in Sedalia, Missouri
- Each Legend DSL is individually tested to meet rigorous performance specifications
- Superior and consistent quality can be found in each Legend DSL as a result of:
  - Continual investment in the training of world-class manufacturing personnel
  - Quality inspections throughout the entire manufacturing process
- Requested by leading Original Equipment Manufacturers (OEMs) worldwide for a wide range of applications
- A Legend is at the heart of an ever-expanding variety of air solutions working every minute of every day
- Supported by a worldwide network of experienced and trusted sales and service professionals
- Quiet Series available with reduced noise up to 5 dBA
- The Legend DSL Warranty
  - **30 months** from the date of shipment or
  - **24 months** from the date of installation, whichever occurs first

Experience Proven Results
with the Legend DSL

Legend DSL Provides

– Pressure to 15 psig

– Vacuum to 16" Hg

– Airflow to 950 cfm

– 24/30 Warranty

Innovation

- Refined timing and locking device incorporates frictional keyless shaft gear locking rings
  - Improves blower life with more resistance to slipped timing
  - Allows for easier maintenance
- Spherical roller bearing on drive shaft (4–6" gear diameters only)
  - Provides greater allowance for misaligned drives, and improves longevity

Results

- Drop-in replacement for current Legend products
- Operating temperatures which can be up to 15°F cooler compared to leading competitive brands
- Greater durability with an increased capacity for overhung load by as much as 30%
- Unmatched strength and rigidity from increased mass, which can be up to 37% more than leading competitive brands
- Universal mounting feet allows for easy field conversion

Advanced Engineering Capabilities

Finite Element Analysis (FEA) – thermal analysis

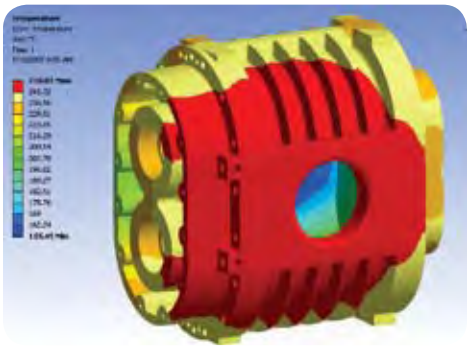


Figure 1 – Previous design was developed without the benefit of FEA thermal analysis.

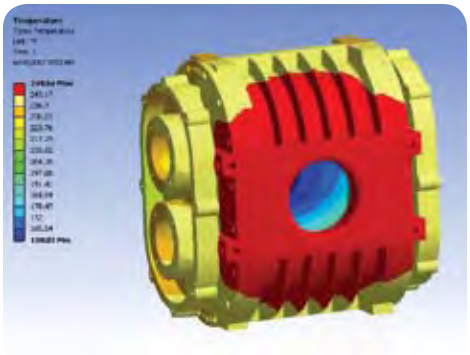
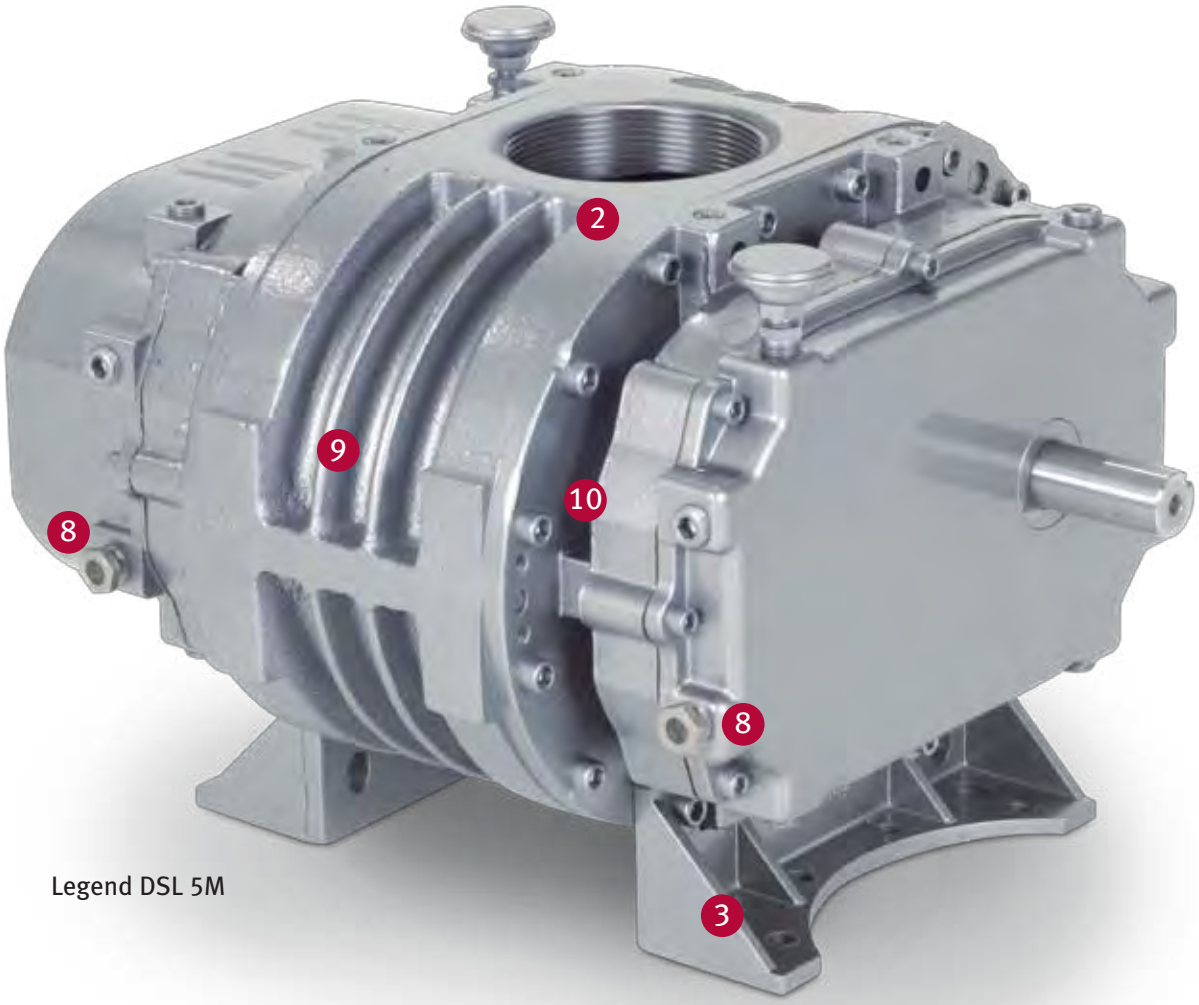


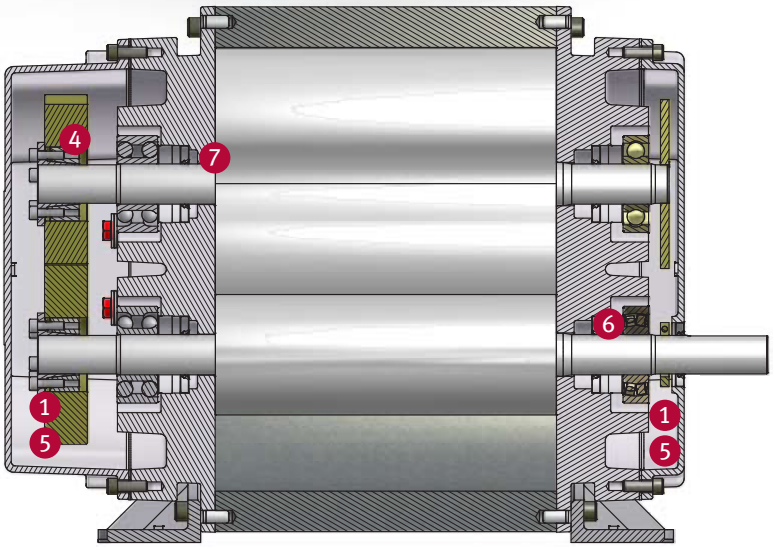
Figure 2 – With FEA thermal analysis, a good design was made great.

- Innovative bearing housing design with air gaps reduce drive end sump temperatures which can be up to 15°F, extending lubricant, bearing, and blower life

Legendary DSL Design Features & Benefits



Legend DSL 5M



1. Dual Splash Lubrication

- Reliable splash lubrication on both gear and drive ends for longer product life
- One-piece slingers are securely clamped on both shafts to ensure efficient lubrication, and allow installation flexibility

2. Single Piece Cylinder Provides Greater Strength & Rigidity

- Heavy-duty reinforced cast iron cylinder retains internal clearance
- DSL design utilizes the existing Legend cylinder and rotors with proven results

3. Universal Feet

- Drop-in replacement for current Legend design
- Reduce inventory and provide installation flexibility
- One set of feet for vertical and horizontal configurations

4. Improved Timing = Improved Reliability

- Grip rings expand against the bore and compress on the shaft for a secure, mechanical shrink fit
- Replaces pinning of timing gears
- Easier and more cost effective to teardown and rebuild

5. Larger Sump Capacities = Cooler Running Bearings

- Sump capacity is increased as much as 30% on drive end and 62% on gear end over leading competition

6. Greater Overhung Load Capacity Increases Blower Life

- Improving overhung load capabilities by as much as 30%
- Belt drive capabilities are independent of blower/motor orientation for improved packaging options
- Spherical roller drive bearing provides better misalignment capabilities (4–6" gear diameter)
- Cylindrical drive bearing on 3" gear diameter

7. High Temperature Viton® Oil Seals

- Maximize the seal life in continuous, severe-duty applications to provide leak-free operation

8. Site Glasses

- Installed on side of unit and can be readily converted in the field

9–10. Cooler Operating Temperatures Increases Blower Life

- Integral ribs (9) improve heat dissipation and performance
- Engineered air gap (10) to isolate the oil sumps from hot air
- Engineered lubrication channels ensure ample lubrication reaches critical components

Robust Design Improves Performance & Efficiency

- Additional weight provides more rigidity to the blower allowing greater efficiency and tighter clearances
- The Legend DSL weights are greater than leading competitive brands which can be up to 37% heavier

Mechanical Gas Seals

- The Legend DSL design accommodates mechanical gas seals for critical gas applications

EISA 2007 Compliant

W22 NEMA Premium

Description

High performance with maximum energy efficiency is the goal of the new WEG electric motor. High efficiency and Low cost of Ownership throughout the entire motor lifetime have been the basis for the W22 development. A design created to maximize performance and energy savings.

Typical Applications

- Pumps
- Fans
- Crushers
- Conveyor belts
- Mills
- Centrifugal machines
- Presses
- Elevators
- Packaging equipment
- Grinders and others.

Standard Features

Class 1, Div 2, Groups B, C & D

- Efficiency Certification number CC029A according to US Department of Energy Regulations;
- Three-phase, 2, 4, 6 and 8 pole, 60Hz;
- Voltage: 208-230/460V;
- No derating for 50Hz operation up to 250 HP. For 300 HP and up, please contact our sales office ;
- Totally Enclosed Fan Cooled - TEFC (IP55) water tight and dust tight enclosure;
- Squirrel cage rotor / Aluminum die cast;
- WSeal® sealing on both endshields from frame 364T/5T up to 504/5T (586/7 frame fitted with Taconite Labyrinth as standard);
- Ball bearings are supplied as standard;
- 1040/45 heat treated and stress relieved carbon steel shaft (4140 for 404/5T upwards in 4, 6 and 8 pole motors);
- Class "F" (DT 80K) insulation for all frames;
- Continuous flow insulation system with class "H" wire;
- Temperature rise limited to Class "B" (80K);
- NEMA ratings design "B";
- Service Factor: 1.25 up to 100HP 1.15 from 125HP and up;
- Continuous duty (S1);
- 104ºF (40ºC) ambient temperature;
- Altitude: 3300 ft (1000m;
- NPT threaded terminal box;
- Stainless steel nameplate AISI 316 with laser etching;

- Paint: Synthetic enamel alkyd resin base (240 hours minimum ASTM B117 salt spray test);
- Color: RAL 5009 – Blue ;
- Fitted with closed rubber drain plug;
- Regreasable bearings, With grease fittings in DE and NDE bearings;
- Gasketed conduit box;
- MGI Part 31 rating for use with VFD - 20:1 constant torque speed range up to 250HP and 12:1 above 250HP. Speed range with constant torque can be extended with optional Blower kit ;

Optional Features

- Special voltages;
- Specially designed shaft;
- Threaded NDE shaft side for encoder assembly
- Space heaters (standard on 586/7 frames);
- Labyrinth tachonite seal available for all ratings;

N.C.

- Thermostats or RTD's (PT100);
- Additional terminal box;
- Drip cover (canopy) for shaft down applications;
- Cable glands;
- C Face and NEMA D flanges for all ratings;
- Roller bearing models available;
- Special epoxy painting;

V.F.D. DRIVEN MOTORS ARE EQUIPPED WITH AEGIS D.E. SHAFT GROUNDING RING.

No.:

Date: 28-AUG-2020

DATA SHEET

Three-phase induction motor - Squirrel cage rotor

Customer	:	
Product line	:	W22 NEMA Premium - Ball Bearings

Frame	:	324/6T
Output	:	40 HP
Frequency	:	60 Hz
Poles	:	4
Full load speed	:	1770 rpm
Slip	:	1.67 %
Voltage	:	208-230/460 V
Rated current	:	104-94.2/47.1 A
Locked rotor current	:	575/287 A
Locked rotor current (Il/In)	:	6.1
No-load current	:	34.0/17.0 A
Full load torque	:	117 lb.ft
Locked rotor torque	:	230 %
Breakdown torque	:	240 %
Design	:	B
Insulation class	:	F
Temperature rise	:	80 K
Locked rotor time	:	20 s (hot)
Service factor	:	1.25
Duty cycle	:	S1
Ambient temperature	:	-20°C - +40°C
Altitude	:	1000 m
Degree of Protection	:	IP55
Approximate weight	:	492 lb
Moment of inertia	:	9.1624 sq.ft.lb
Noise level	:	66 dB(A)

	D.E.	N.D.E.
Bearings	6312 C3	6212 C3
Regreasing interval	20000 h	20000 h
Grease amount	21 g	13 g

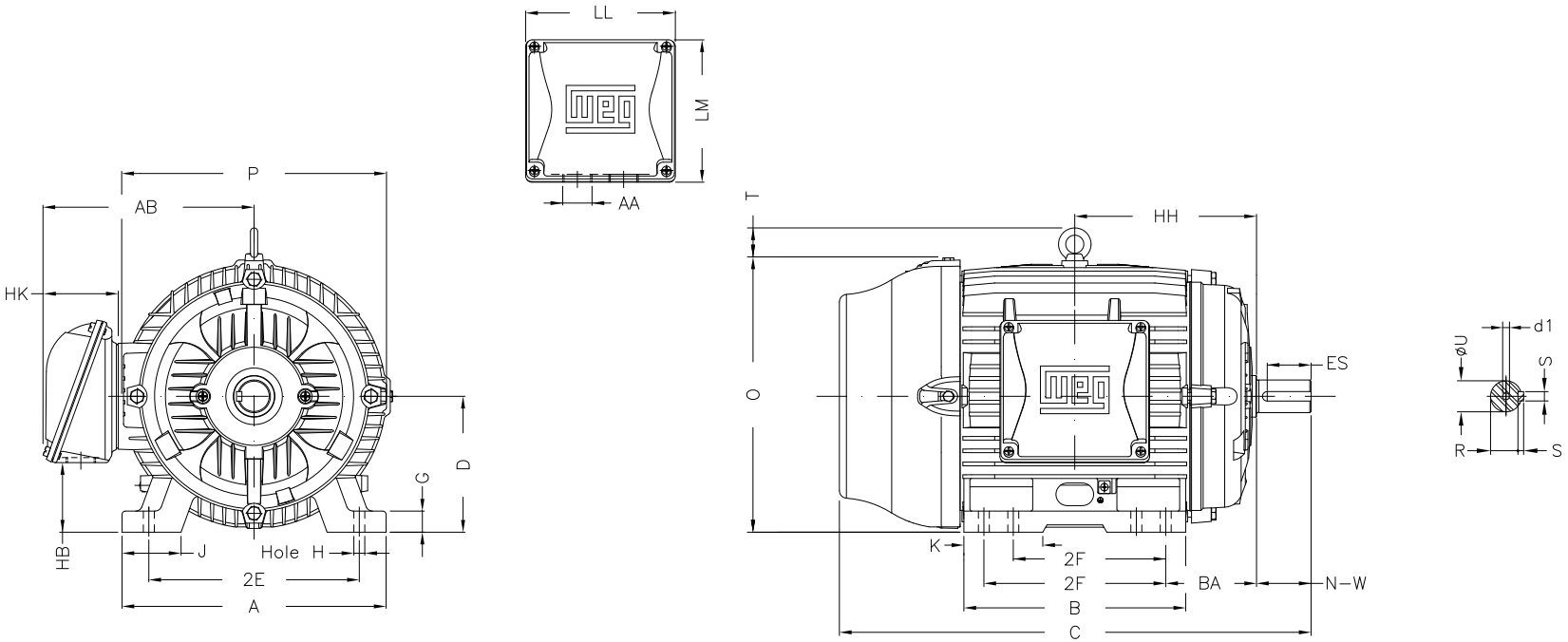
Load	Power factor	Efficiency (%)
100%	0.85	94.1
75%	0.80	94.1
50%	0.72	93.6

Notes:

04018ET3E324T-W22

W/ N.C. WINDING T-STATS
& AEGIS D.E. SHAFT GROUNDING RING.

Performed by	Checked



Notes: 04018ET3E324T-W22

Performed by:

Checked:

Customer:

W22 NEMA Premium - Ball Bearings

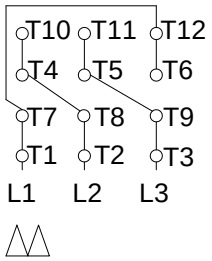
2E 12.500	J 3.189	A 15.157	P 15.827	AB 12.579
2F 10.500/12.000	K 4.055	B 14.567	BA 5.250	U 2.125
N-W 5.250	ES 3.937	S 0.500	R 1.844	depth 0.500
D 8.000	G 1.300	HB 4.803	O 15.953	T 2.441
HF 8.701	HH 11.260	HK 4.705	H 0.657	C 31.102
FC 35.866	LL 9.055	LM 8.661	AA NPT 2"	d1 A 4

Three-phase induction motor

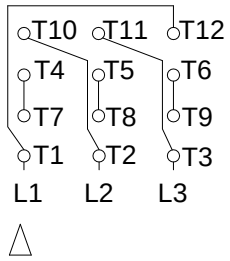
Frame 324/6T - IP55

28-AUG-2020

LOW VOLTAGE

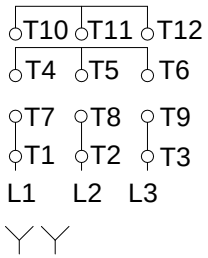


HIGH VOLTAGE

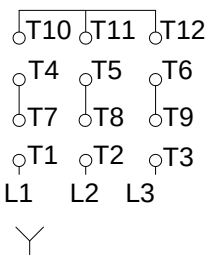


CONNECTIONS FOR STARTING ONLY:

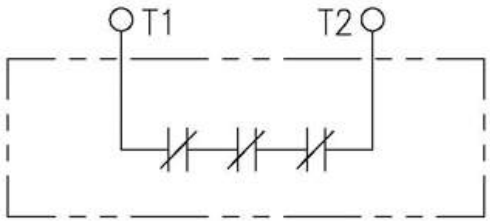
LOW VOLTAGE



HIGH VOLTAGE



N.C. WINDING T-STATS



Notes: 04018ET3E324T-W22		
Performed by:		
Checked:		
Customer:		
W22 NEMA Premium - Ball Bearings		
Three-phase induction motor Frame 324/6T - IP55	28-AUG-2020	

BEARING PROTECTION RING™

D.E. SHAFT GROUNDING RING

"The only bearing protection system guaranteed to eliminate harmful shaft currents preventing premature motor failure - for life."

Guarantee

Electro Static Technology guarantees any new motor up to 100hp/75kW will not fail from electrical bearing fluting damage for the life of the motor when the AEGIS SGR™ Bearing Protection Ring™ is installed in accordance with manufacturer's installation instructions. If electrically induced fluting damage occurs, Electro Static Technology will replace motor bearings. Guarantee is subject to the terms and conditions of the AEGIS SGR™ Guarantee Program.

For program details, visit: www.est-aegis.com

AEGIS SGR™ Bearing Protection Ring™ Options

pg. 9

NEW PRODUCT!

Conductive Epoxy Mounting

Shaft diameters: 0.311″ to 6.02″
Solid and Split Ring
Quick and easy installation to metal motor frame
Conductive Epoxy Included

pg.10-11

Standard Mounting Brackets

Shaft diameters: 0.311″ to 6.02″
Ships with mounting brackets, 6-32 screws and washers
Quick and easy installation to most surfaces

pg. 10-11

Split Ring

Shaft diameter: 0.311″ to 6.02″
4 to 6 mounting brackets, M3 screws and washers
Installs without decoupling motor

pg. 10-11

Bolt Through Mounting

Shaft diameters: 0.311″ to 6.02″
M3 x 14 socket head cap screws and lock washers
2 mounting holes up to shaft size 3.895″
4 mounting holes for larger sizes

pg. 12

Press Fit Mounting

Shaft diameters: 0.311″ to 6.02″
Clean dry 0.004″ press fit
Custom sizes available

pg. 13

NEMA-IEC Mounting Kits

Shaft diameter: see chart for standard kits
Custom kits available for other shaft diameters
Clears any slinger, shaft shoulder or protrusion

pg. 14

WTG

Long term reliable performance
Maintenance free system
Solid and Split Ring configurations

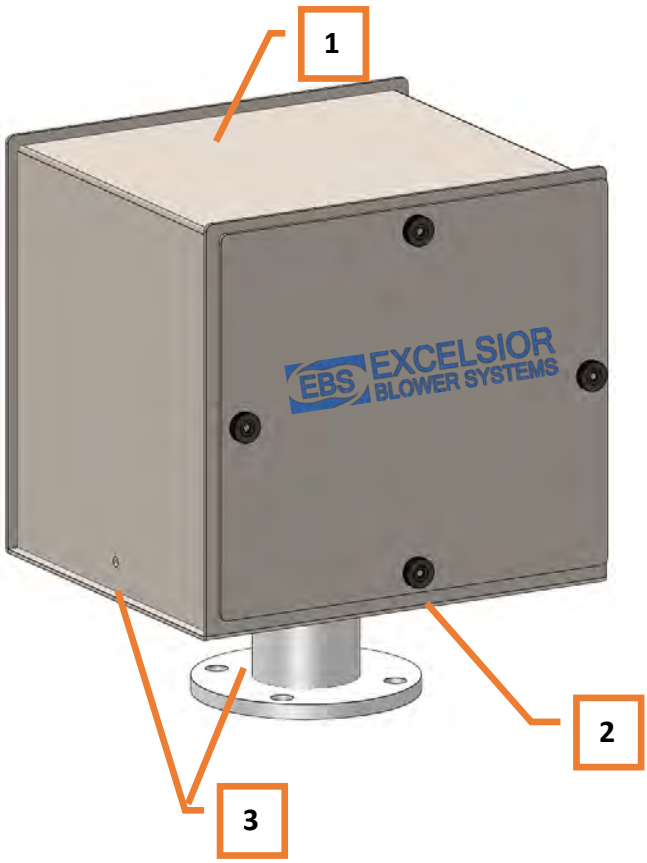
pg. 14

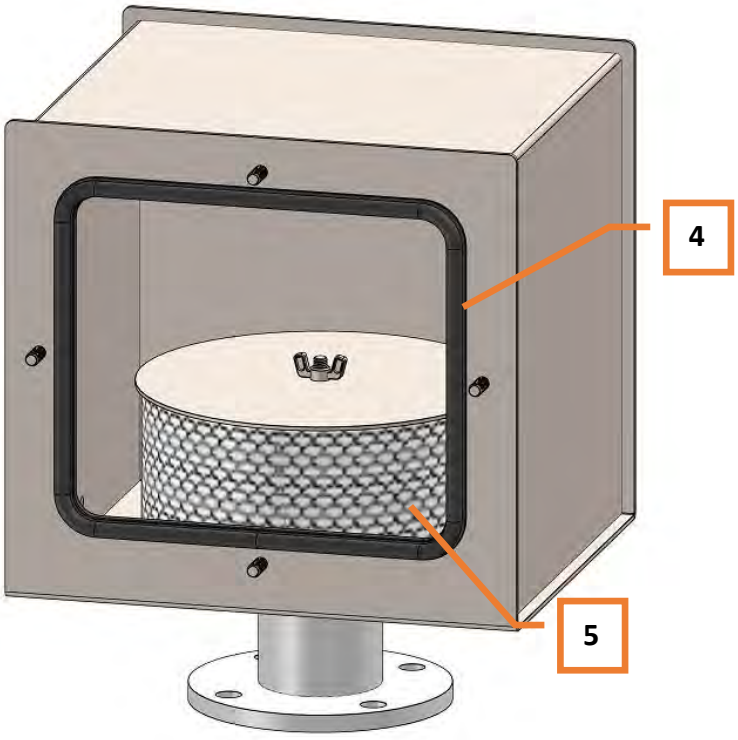
iPRO

Long term reliable performance
Maintenance free system
Solid and Split Ring configurations
Available in sizes up to 30″ shaft diameter

EBS INLINE FILTER

1- Heavy Duty Steel Sheet Metal
2- Thumb Nuts Easily Access to Filter Box
3- 1/8”NPTS for Filter Restriction Gauge
4- Air Tight Seal
5- Filter Element Easily Get Replaced





SIZE	Rated CFM	Replacement Element Number *
2"	135	F8-108
3"	285	F8-109
4"	520	F8-109
5"	750	F8-109
6"	1235	F8-110
8"	2125	F8-111

** Paper Element*

Paper Element (Standard)

- Pleated paper media in plastisol end caps with expanded metal on ID and OD for Strength.
- **Efficiency**: 99% on 1-micron particles and larger.
- **Service:** Clean by directing compressed air through filter in opposite direction of air flow (DO NOT WASH). EVENTUALLY ELEMENT WILL NEED TO BE REPLACED.

Felt Media Element

- Washable media in plastisol end caps between layers of screen mesh.
- **Efficiency:** 98% on 3-micron particles and larger.
- **Service:** Rap out excessive dirt and wash in warm water with mild detergent. Rinse thoroughly and rap out excessive water before reinstalling.

Wire Mesh Element

- Layered epoxy coated screen wire in between plastisol end caps.
- **Efficiency:** 90% on 10-micron particles and larger.
- **Service:** Soak in hot water and detergent. After rinsing allow filter to dry. Adhesive (light oil) can then be applied at 1.5 to 2 oz./ element. Allow excess adhesive to drain off prior to installing.

Polyurethane Element

- Washable polyurethane media with stainless steel core.
- **Efficiency:** 98% on 10-micron particles and larger.
- **Service:** Remove foam element from stainless steel center core. Wash element in warm, soapy water. Rinse thoroughly in fresh water and wring out. Install on stainless steel center core and set aside to dry. EVENTUALLY ELEMENT WILL NEED TO BE REPLACED.

Service Instructions

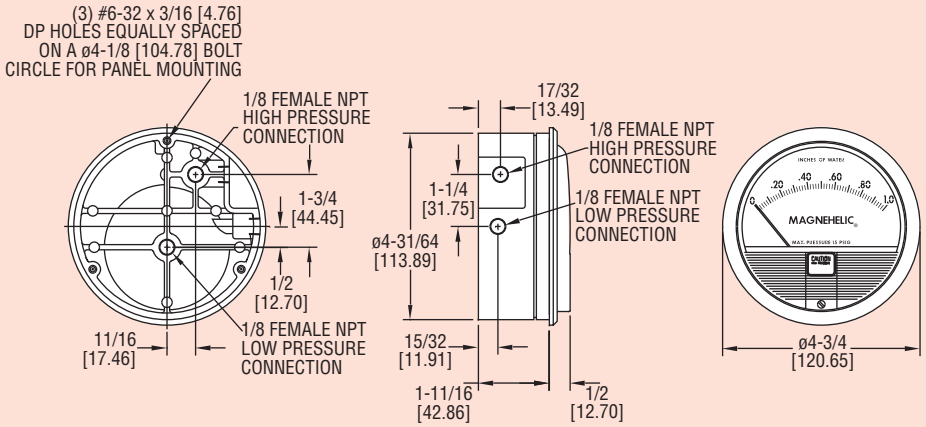
1. Turn off all moving device prior to servicing
2. Remove wing nut on housing cover. Remove cover.
3. Check elements and service as shown above for the appropriate element.
4. Check inside of housing for loose articles before replacing cover.
5. Replace weather hood.
6. Restart the air moving device.

FOR FILTER RESTRICTION

Series 2000

Magnehelic® Differential Pressure Gages

Indicate Positive, Negative or Differential, Accurate within 2%



Patent Nos. 4,030,365 5,012,678

Dimensions, Standard Series 2000 Magnehelic® Pressure Gages. (Slightly different on medium and high pressure models)

Select the Dwyer® Magnehelic® gage for high accuracy – guaranteed within 2% of full scale – and for the wide choice of 81 models available to suit your needs precisely. Using Dwyer's simple, frictionless Magnehelic® gage movement, it quickly indicates low air or non-corrosive gas pressures – either positive, negative (vacuum) or differential. The design resists shock, vibration and over-pressures. No manometer fluid to evaporate, freeze or cause toxic or leveling problems. It's inexpensive, too.

The Magnehelic® gage is the industry standard to measure fan and blower pressures, filter resistance, air velocity, furnace draft, pressure drop across orifice plates, liquid levels with bubbler systems and pressures in fluid amplifier or fluidic systems. It also checks gas-air ratio controls and automatic valves, and monitors blood and respiratory pressures in medical care equipment.

Note: May be used with Hydrogen. When ordering a Buna-N diaphragm pressures must be less than 35 psi.

Mounting

A single case size is used for most models of Magnehelic® gages. They can be flush or surface mounted with standard hardware supplied. With the optional **A-610** Pipe Mounting Kit they may be conveniently installed on horizontal or vertical 1-1/4″ - 2″ pipe. Although calibrated for vertical position, many ranges above 1″ may be used at any angle by simply re-zeroing. However, for maximum accuracy, they must be calibrated in the same position in which they are used. These characteristics make Magnehelic® gages ideal for both stationary and portable applications. A 4-9/16″ hole is required for flush panel mounting. Complete mounting and connection fittings plus instructions are furnished with each instrument.

Flush...Surface... or Pipe Mounted

Vent Valves

In applications where pressure is continuous and the Magnehelic® gage is connected by metal or plastic tubing which cannot be easily removed, we suggest using Dwyer A-310A vent valves to connect gage. Pressure can then be removed to check or re-zero the gage.

High and Medium Pressure Models

Installation is similar to standard gages except that a 4-13/16″ hole is needed for flush mounting. The medium pressure construction is rated for internal pressures up to 35 psig and the high pressure up to 80 psig. Available for all models. Because of larger case, the medium pressure and high pressure models will not fit in a portable case size. Installation of the A-321 safety relief valve on standard Magnehelic® gages often provides adequate protection against infrequent overpressure.

SPECIFICATIONS

Service: Air and non-combustible, compatible gases. (Natural Gas option available.)
Wetted Materials: Consult factory.
Housing: Die cast aluminum case and bezel, with acrylic cover. Exterior finish is coated gray to withstand 168 hour salt spray corrosion test.
Accuracy: ±2% of full scale (±3% on - 0, -100 Pa, -125 Pa, 10MM and ±4% on - 00, -60 Pa, -6MM ranges), throughout range at 70°F (21.1°C).
Pressure Limits: -20″ Hg. to 15 psig.† (-0.677 bar to 1.034 bar); MP option: 35 psig (2.41 bar), HP option: 80 psig (5.52 bar).
Overpressure: Relief plug opens at approximately 25 psig (1.72 bar), standard gages only.
Temperature Limits: 20 to 140°F.* (-6.67 to 60°C).
Size: 4″ (101.6 mm) Diameter dial face.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Process Connections: 1/8″ female NPT duplicate high and low pressure taps - one pair side and one pair back.
Weight: 1 lb 2 oz (510 g), MP & HP 2 lb 2 oz (963 g).
Standard Accessories: Two 1/8″ NPT plugs for duplicate pressure taps, two 1/8″ pipe thread to rubber tubing adapter and three flush mounting adapters with screws. (Mounting and snap ring retainer substituted for 3 adapters in MP & HP gage accessories.)

*Low temperature models available as special option.
†For applications with high cycle rate within gage total pressure rating, next higher rating is recommended. See Medium and High pressure options at lower left.

OPTIONS AND ACCESSORIES

Transparent Overlays
Furnished in red and green to highlight and emphasize critical pressures.

Adjustable Signal Flag
Integral with plastic gage cover. Available for most models except those with medium or high pressure construction. Can be ordered with gage or separate.

LED Setpoint Indicator
Bright red LED on right of scale shows when setpoint is reached. Field adjustable from gage face, unit operates on 12-24 VDC. Requires MP or HP style cover and bezel.

A-432 Portable Kit
Combine carrying case with any Magnehelic® gage of standard range, except high pressure connection. Includes 9 ft (2.7 m) of 3/16″ I.D. rubber tubing, standhang bracket and terminal tube with holder.

A-605 Air Filter Gage Accessory Kit
Adapts any standard Magnehelic® gage for use as an air filter gage. Includes aluminum surface mounting bracket with screws, two 5 ft (1.5 m) lengths of 1/4″ aluminum tubing two static pressure tips and two molded plastic vent valves, integral compression fittings on both tips and valves.

Quality design and construction features

Bezel provides flange for flush mounting in panel.

Clear plastic face is highly resistant to breakage. Provides undistorted viewing of pointer and scale.

Precision litho-printed scale is accurate and easy to read.

Red tipped pointer of heat treated aluminum tubing is easy to see. It is rigidly mounted on the helix shaft.

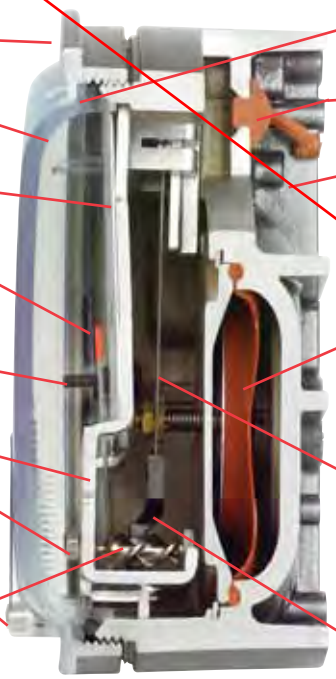
Pointer stops of molded rubber prevent pointer over-travel without damage.

"Wishbone" assembly provides mounting for helix, helix bearings and pointer shaft.

Jeweled bearings are shock-resistant mounted; provide virtually friction-free motion for helix. Motion damped with high viscosity silicone fluid.

Zero adjustment screw is conveniently located in the plastic cover, and is accessible without removing cover. O-ring seal provides pressure tightness.

Helix is precision made from an alloy of high magnetic permeability. Mounted in jeweled bearings, it turns freely, following the magnetic field to move the pointer across the scale.



O-ring seal for cover assures pressure integrity of case.

Blowout plug of silicone rubber protects against overpressure on 15 psig rated models. Opens at approximately 25 psig.

Die cast aluminum case is precision made and iridite-dipped to withstand 168 hour salt spray corrosion test. Exterior finished in baked dark gray hammerloid. One case size is used for all standard pressure options, and for both surface and flush mounting.

Silicone rubber diaphragm with integrally molded O-ring is supported by front and rear plates. It is locked and sealed in position with a sealing plate and retaining ring. Diaphragm motion is restricted to prevent damage due to overpressures.

Calibrated range spring is flat spring steel. Small amplitude of motion assures consistency and long life. It reacts to pressure on diaphragm. Live length adjustable for calibration.

Samarium Cobalt magnet mounted at one end of range spring rotates helix without mechanical linkages.

Series 2000 Magnehelic® Gage — Models and Ranges
Page V shows examples of special models built for OEM customers. For special scales furnished in ounces per square inch, inches of mercury, metric units, square root scales for volumetric flow, etc., contact the factory.

Model	Range Inches of Water
2000-00N†••	.05-0-.2
2000-00†••	0-.25
2000-0†•	0-.50
2001	0-1.0
2002	0-2.0
2003	0-3.0
2004	0-4.0
2005	0-5.0
2006	0-6.0
2008	0-8.0
2010	0-10
2012	0-12
2015	0-15
2020	0-20
2025	0-25
2030	0-30
2040	0-40
2050	0-50
2060	0-60
2080	0-80
2100	0-100
2120	0-120
2150	0-150
2160	0-160
2180	0-180
2250	0-250
Zero Center Ranges	
2300-00†••	0.125-0-0.125
2300-0†•	.25-0-.25
2301	.5-0-.5
2302	1-0-1
2304	2-0-2
2310	5-0-5
2320	10-0-10
2330	15-0-15

Model	Range PSI
2201	0-1
2202	0-2
2203	0-3
2204	0-4
2205	0-5
2210*	0-10
2215*	0-15
2220*	0-20
2230**	0-30

Model	Range, CM of Water
2000-15CM	0-15
2000-20CM	0-20
2000-25CM	0-25
2000-50CM	0-50
2000-80CM	0-80
2000-100CM	0-100
2000-150CM	0-150
2000-200CM	0-200
2000-250CM	0-250
2000-300CM	0-300
Zero Center Ranges	
2300-4CM	2-0-2
2300-10CM	5-0-5
2300-30CM	15-0-15

†These ranges calibrated for vertical scale position.
• Accuracy +/-3%
• • Accuracy +/-4%
*MP option standard
**HP option standard

Model	Range MM of Water
2000-6MM†••	0-6
2000-10MM†•	0-10
2000-15MM	0-15
2000-25MM	0-25
2000-30MM	0-30
2000-50MM	0-50
2000-80MM	0-80
2000-100MM	0-100
2000-125MM	0-125
2000-150MM	0-150
2000-200MM	0-200
2000-250MM	0-250
2000-300MM	0-300
Zero Center Ranges	
2300-6MM†••	3-0-3
2300-10MM†•	5-0-5
2300-20MM†•	10-0-10

Model	Range, Pa
2000-60NPA†••	10-0-50
2000-60PA†••	0-60
2000-100PA†•	0-100
2000-125PA†•	0-125
2000-250PA	0-250
2000-300PA	0-300
2000-500PA	0-500
2000-750PA	0-750
2000-1000PA	0-100 x 10
Zero Center Ranges	
2300-60PA†••	30-0-30
2300-100PA†•	50-0-50
2300-120PA	60-0-60
2300-200PA	100-0-100
2300-250PA	125-0-125
2300-300PA	150-0-150
2300-500PA	250-0-250
2300-1000PA	500-0-500

Model	Range, kPa
2000-0.5KPA	0-0.5
2000-1KPA	0-1
2000-1.5KPA	0-1.5
2000-2KPA	0-2
2000-2.5KPA	0-2.5
2000-3KPA	0-3
2000-4KPA	0-4
2000-5KPA	0-5
2000-8KPA	0-8
2000-10KPA	0-10
2000-15KPA	0-15
2000-20KPA	0-20
2000-25KPA	0-25
2000-30KPA	0-30
Zero Center Ranges	
2300-1KPA	.5-0-.5
2300-2KPA	1-0-1
2300-2.5KPA	1.25-0-1.25
2300-3KPA	1.5-0-1.5

Dual Scale Air Velocity Units
For use with pitot tube

Model	Range in W.C./ Velocity F.P.M.
2000-00AV†••	0-.25/300-2000
2000-0AV†•	0-.50/500-2800
2001AV	0-1.0/500-4000
2002AV	0-2.0/1000-5600
2005AV	0-5.0/2000-8800
2010AV	0-10/2000-12500

Dual Scale English/Metric Models

Model	Range, In. W.C.	Range, Pa or kPa
2000-OOD†••	0-.25	0-62 Pa
2000-OD†•	0-0.5	0-125 Pa
2001D	0-1.0	0-250 Pa
2002D	0-2.0	0-500 Pa
2003D	0-3.0	0-750 Pa
2004D	0-4.0	0-1.0 kPa
2005D	0-5.0	0-1.25 kPa
2006D	0-6.0	0-1.5 kPa
2008D	0-8.0	0-2.0 kPa
2010D	0-10	0-2.5 kPa
2015D	0-15	0-3.7 kPa
2020D	0-20	0-5 kPa
2025D	0-25	0-6.2 kPa
2050D	0-50	0-12.4 kPa
2060D	0-60	0-15 kPa

ACCESSORIES
A-299, Surface Mounting Bracket
A-300, Flat Flush Mounting Bracket
A-310A, 3-Way Vent Valve
A-321, Safety Relief Valve
A-432, Portable Kit
A-448, 3-piece magnet kit for mounting Magnehelic® gage directly to magnetic surface
A-605, Air Filter Kit
A-610, Pipe Mount Kit

OPTIONS — To order, add suffix: I.E. 2001-ASF
ASF, Adjustable Signal Flag
HP, High Pressure Option
LT, Low Temperatures to -20°F
MP, Med. Pressure Option
SP, Setpoint Indicator
Scale Overlays, Red, Green, Mirrored or Combination, Specify Locations

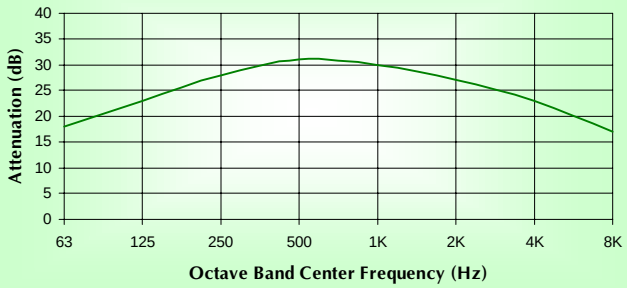
Product Specifications

ProGENTEX DRS-SP Grade I series of internally packed dissipative/reactive discharge silencers are designed for atmospheric applications requiring standard/suburban noise attenuation (25-30 dB). The multi-chambered design combines the chamber/tube configuration of a reactive silencer for low-frequency noise with the acoustic packing of a dissipative silencer for high-frequency noise. This combination enables our DRS-SP Grade I series to provide moderate, wide-band noise reduction.

Applications Include:

- Dry Vacuum Pumps
- Rotary Positive Blowers *(Above Transition Speed)*
- Steam/Air Ejectors
- Vents/Blowdowns *(Below 15 PSIG)*

Typical Attenuation Curve

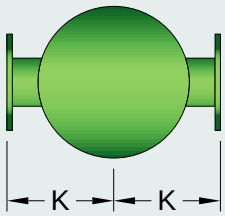


Competitive Cross-Reference

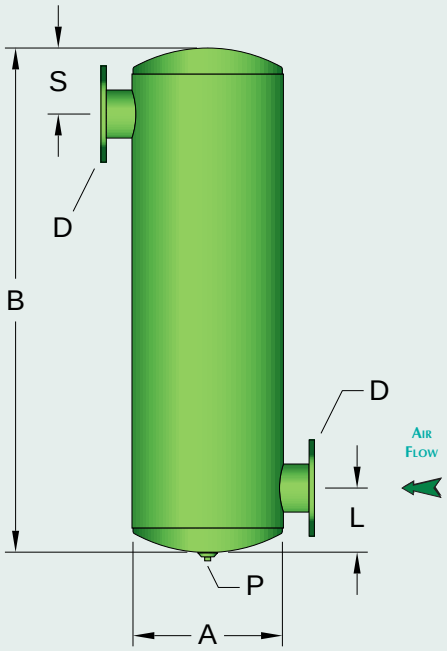
	Burgess-Manning	Stoddard	Universal Silencer
Group	BMSS	D32	SD
Series	---	---	---

DRS-SP Grade I

Top View



Side View



Dimensions and Weights

Model	D (nom.)	A	B	K	L (min)	L (max)	S (min)	S (max)	P (nom.)	Weight
DRS-SP-1 Grade I	1	Sizes 1" to 1 1/2": use RS Grade II or DS Grade I Series								
DRS-SP-1 1/2 Grade I	1 1/2	*(see Spec Sheet D-02201-01 or B-01101-01)*								
DRS-SP-2 Grade I	2	6	22 1/2	6	Fixed at 6		Fixed at 4		1/4	20
DRS-SP-2 1/2 Grade I	2 1/2	8	27	7	Fixed at 7		Fixed at 4		1/2	30
DRS-SP-3 Grade I	3	8	33	7	Fixed at 7		Fixed at 5		1/2	35
DRS-SP-3 1/2 Grade I	3 1/2	10	33 1/2	8	Fixed at 8		Fixed at 6		1/2	55
DRS-SP-4 Grade I	4	10	39	8	7 1/2	10	6	8	1/2	75
DRS-SP-5 Grade I	5	12	51 1/2	9	9	17	6	10	1/2	110
DRS-SP-6 Grade I	6	14	58 1/2	10	9	17	6 1/2	14	1/2	140
DRS-SP-8 Grade I	8	18	65	12 1/2	12	17	8	14	1	265
DRS-SP-10 Grade I	10	22	78	14 1/2	13 1/2	24	10	17	1	430
DRS-SP-12 Grade I	12	26	91	16 1/2	15	24	11	21	1	575
DRS-SP-14 Grade I	14	30	104	18 1/2	16 1/2	28	12	24	1	825
DRS-SP-16 Grade I	16	36	130	21 1/2	18 1/2	36	14	28	1	1,300
DRS-SP-18 Grade I	18	42	143	24 1/2	20 1/2	42	16	32	1 1/2	1,675

1) Standard design includes: All welded carbon steel construction, acoustic packing material rated for 350° F and standard shop coat primer.
2) Sizes 2″ - 3 1/2″: Standard MNPT inlet and discharge connections and include a half coupling or tank flange drain (P).
3) Sizes 4″ - 5″: Optional MNPT or 125/150# ANSI drilled plate flange inlet and discharge connections and include a tank flange drain (P).
4) Sizes 6″ - 18″: Standard 125/150# ANSI drilled plate flange inlet and discharge connections and include a tank flange drain (P).
5) Connections can be rotated to accomodate orientation requirements.

Mounting brackets, special finishes, relief connections and other options are available - contact ProGENTEX with requirements.

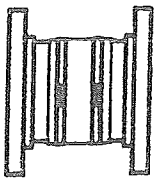
(800) 417-3210 ▪ www.progentex.com ▪ sales@progentex.com ▪ (716) 667-0038 fax

FLEXIBLE PIPE CONNECTOR

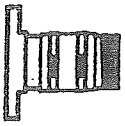
Flexible connectors consist of a heavy duty, three ply reinforced rubber hose section, pipe nipples (threaded one end, or flanged), two stainless steel T-bolt hose clamps.

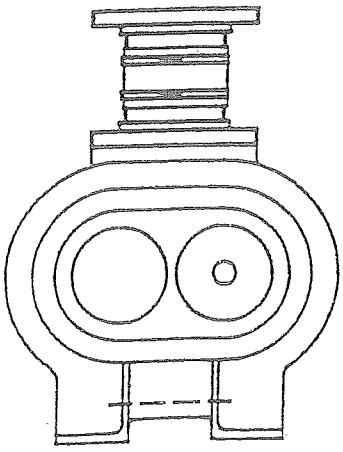
Max. Temperature: 250°F. Max. Pressure: 40 PSI.

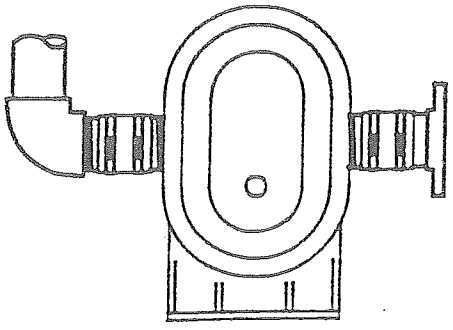
Type I: Flanged (150# ANSI).
Type II: Threaded (NPT).
Type III: Combined Flanged one end, Threaded other end.

TYPE I 

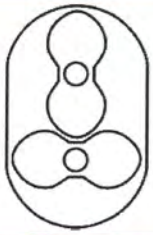
TYPE II

TYPE III 





FLEXFAB®



GARDNER DENVER Sutorbilt

Positive Displacement
Lobe Blowers/ Vacuum

ACCESSORIES

Weight Loaded Pressure Relief Valves

THREADED – 1" thru 4"

FLANGED 125# ANSI – 6" and 8"

The SUTORBILT® weight loaded pressure relief valve offers inexpensive relief capacity in a sturdy, trouble free design in 1" through 8" sizes.

Sizes 1" through 4" have standard male threaded connections. Sizes 6" and 8" have standard 125# ANSI flange drillings.

Removable weights have been carefully designed to permit accurate pressure settings in 1/2 PSI increments in the 1" through 4" size and 1/2 and 1 PSI increments in 6" and 8" size.

The operation of the relief valve is simple. As the service line air pressure reaches the pressure setting, the weight loaded cap is forced upwards off the valve seat. As pressure increases, the cap rises to expose the discharge ports. The flow-through capacity of the valve is such that no damage can be caused to the blower or related systems.

The valve automatically reseats itself as line pressure is reduced.

Since the opening and closing of the valve is essentially the sliding of a piston in a cylinder, the valve is virtually chatter-free.

The body and cap of the valve are made of cast iron with close tolerance machined surfaces in the operating areas. The weights are cut from uniform steel plate or uniformly cast to give accurate pressure adjustment.

Application of light oil to the mating surfaces of the cap and body periodically is all the maintenance required on this valve.

The SUTORBILT weight loaded relief valve was engineered to provide long life and dependable protection for your SUTORBILT blower and associated systems by its simplicity of design. Weight loaded pressure relief valves are designed to protect the blower against damage caused by operation at greater than design pressure or vacuum. **However, they are not intended as pressure regulators.**

For proper operation, the valve must be mounted in exact upright position.

Use only FULL FLANGE gasket.

Gardner Denver INC.
1800 Gardner Expressway
Quincy, IL 62305

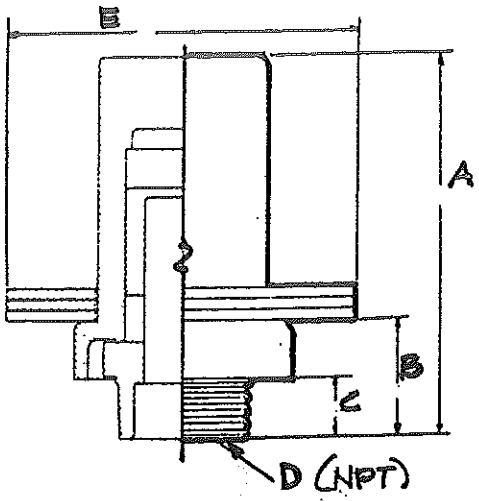
Toll Free 800-682-9868
Phone 217-222-5400
Fax 217-221-8780
www.gardnerdenver.com

Specifications Subject to change without notice

SUTORBILT WEIGHT LOADED PRESSURE RELIEF VALVES

Gardner-Denver
Industrial Machinery

THREADED CONNECTION – 1", 2", 3" AND 4"



DIMENSION CHART

VALVE SIZE	A	B	C	D	E
1 INCH	6-13/16	2-1/16	1-7/16	1" N.P.T.	3-1/2
2 INCH	7-1/8	2-3/8	1-5/16	2" N.P.T.	6-13/16
3 INCH	9-7/8	3-1/16	1-9/16	3" N.P.T.	9-1/4
4 INCH	11-3/8	3-7/16	1-11/16	4" N.P.T.	11-11/16

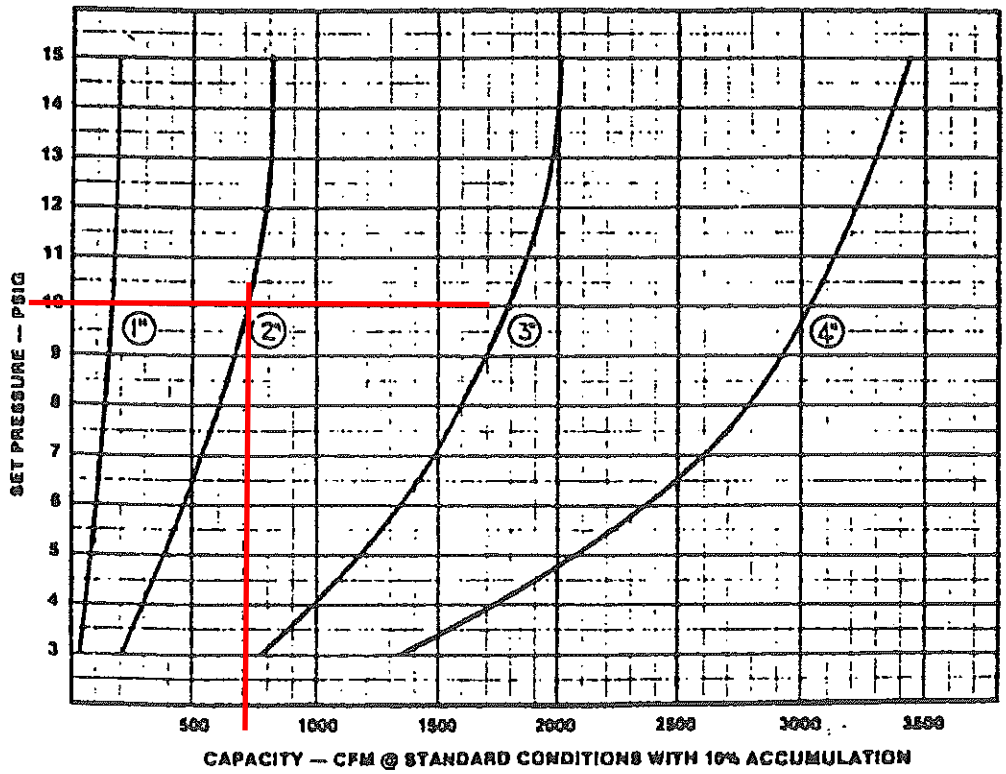
INSTRUCTIONS

A relief valve is **used** to prevent overloading the blower. Overloading can result from excessive discharge pressure or inlet vacuum.

The relief valve is **not** to be used for **pressure control.** A pressure build-up of approx. 25% will occur when the valve is relieving the full capacity of the blower. Constant operation of the relief valve may be a sign of overload on the blower; this should be investigated and corrected.

A relief valve should be **installed** close to the blower discharge and before any potential line restriction (such as check or butterfly valve). The relief valve should be installed with the **axis vertical** (weights horizontal). Wipe clean, oil contacting parts with light oil to prevent rust.

The valve has been supplied with the correct **number of weights** for the application. The valve body amounts to 3 PSI; each weight is ½ PSI. During operation there will be no air leaking from the valve. Increase of system pressure above the valve setting will cause the valve to begin opening.



NOTE: Valves not recommended to relieve at set pressures under 3 psig.

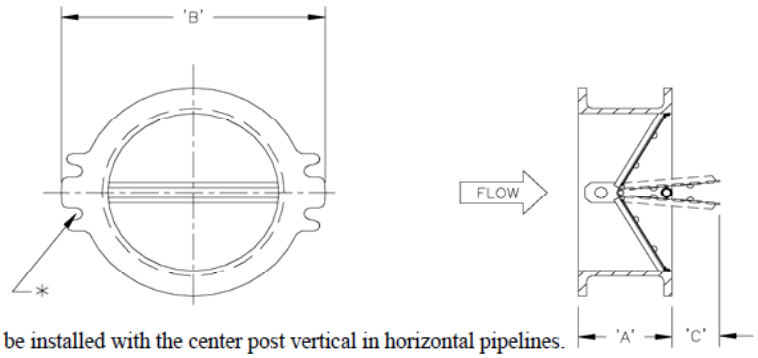
1800 GARDNER EXPRESSWAY
QUINCY, IL 62305-4024
TEL: (217) 222-5400 · FAX: (217) 223-5897

Flexi-Hinge® Valve Co., Inc.

1806 Asbury Road, Erie, PA 16505
814.833.9814 • Fax 814.833.9817
www.flexi-hinge.com

Series 518 Flexi-Hinge® Check Valve

WAFER STYLE 125# CLASS



Flexi-Hinge® valves must be installed with the center post vertical in horizontal pipelines.

*BOLTING CONFORMS TO ANSI B16.1 AND B16.5

SPECIFICATIONS

SIZE [mm]	Model No.	A [mm]	B [mm]	C [mm]	Weight -lbs. [Kg.]	Cv [l/m]
2" [50]	-518	1-3/8" [34.9]	4-1/4" [108.0]	1/2" [12.7]	4 [1.8]	160 [606]
3" [80]	-518	1-7/8" [47.6]	6" [152.4]	3/4" [19.0]	10 [4.5]	620 [2346]
4" [100]	-518	2-3/8" [60.3]	7-1/2" [190.5]	7/8" [22.2]	12 [5.5]	965 [3652]
5" [125]	-518	2-7/8" [73.0]	9" [228.6]	1-1/4" [31.8]	15 [6.8]	1510 [5716]
6" [150]	-518	3-3/8" [85.7]	10-1/2" [266.7]	1-1/2" [38.1]	25 [11.4]	3025 [11448]
8" [200]	-518	4-3/8" [111.1]	13" [330.2]	2" [50.8]	45 [20.4]	5195 [19661]
10" [250]	-518	5-3/8" [136.5]	14-7/8" [377.8]	2-5/8" [66.7]	70 [31.8]	7345 [27804]
12" [300]	-518	6-3/8" [161.9]	17-1/2" [444.5]	3" [76.2]	120 [54.5]	9450 [35772]

AVAILABLE MATERIALS

BODY		INTERNALS	
~~-1~~	~~Carbon Steel~~	~~2~~	~~316 S/S Steel~~
~~-2~~	~~316 S/S Steel~~	3	Aluminum
~~-3~~	~~Aluminum~~		
-4	Cast Iron		

Standard hardware is Aluminum
Standard seal material is Buna-N

Seals		Options	
~~1~~	~~Buna-N~~	~~0~~	~~No Spring~~
2	EPDM	1	S/S Spring
~~3~~	~~Silicone~~		
~~4~~	~~Viton~~		

Note: Maximum Working Pressure is 200 psi at 150 °F

SEAL MATERIAL	
Material	Temperature Range °F [°C]
Buna-N	-60 to 225 [-51 to 107]
EPDM	-40 to 300 [-40 to 149]
Viton ®	-20 to 400 [-29 to 204]
Silicone	-100 to 500 [-73 to 260]

Note: Dimensions subject to change. Request certified drawings.

Consult Factory for Sizes, Materials, Pressure Ratings and Combination End Configurations Not Shown

Fluid Engineering

April-09

DelVal® SERIES 50/52

Resilient Seated Butterfly Valves

Wafer & Lug

Sizes 2″-24″ / DN 50 - DN 600

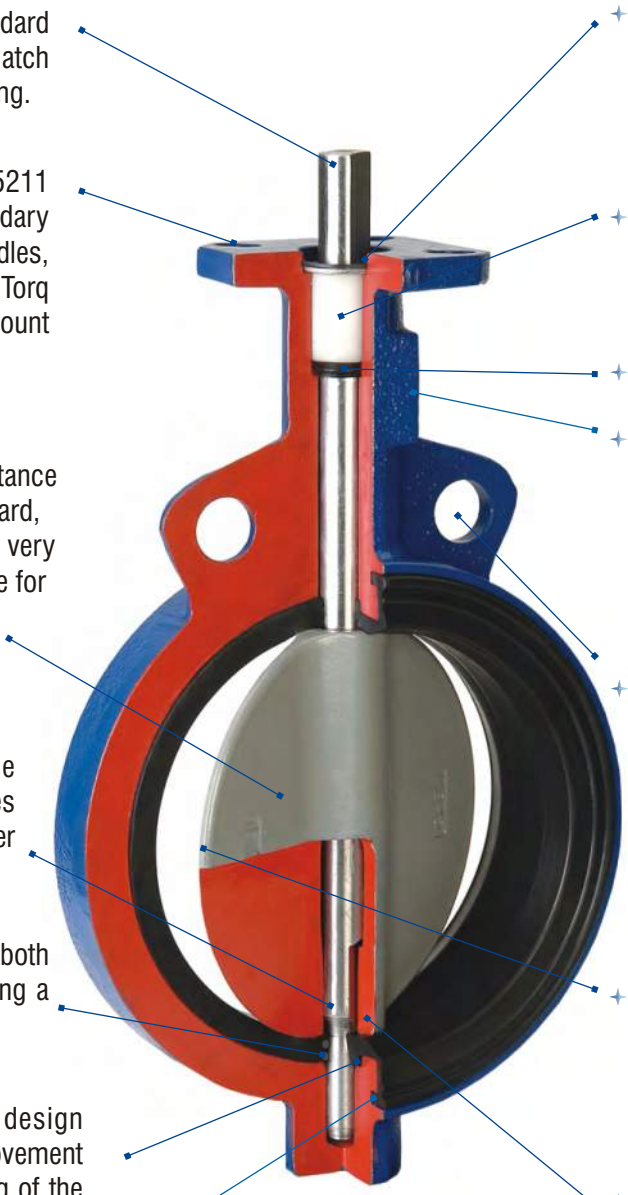
DelTech

Leading the Industry with Innovation by Design

DelTech Controls is pleased to offer top-of-the-line products in pipeline flow control. The DelVal Series 50 (wafer body) and Series 52 (lug body) Butterfly Valves have been developed with extensive application, design and manufacturing expertise. These products are produced by employing modern manufacturing practices under a robust quality assurance system. These practices ensure consistent product quality and dependable performance. The DelVal Series 50/52 Butterfly Valves have been designed to include state-of-the-art features that are described in this bulletin.

Features

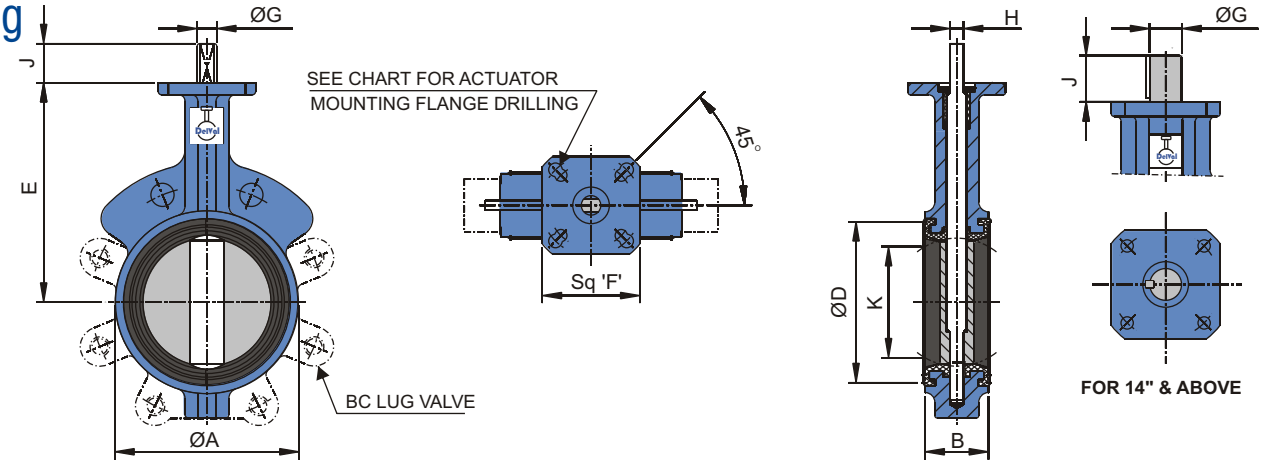
- Stem connection available in standard DelVal sizes or optional sizes to match standard secondary top plate drilling.
- Top plate double drilled to fit ISO 5211 dimensions and standard secondary bolt circle dimensions. All handles, gear operators and pneumatic DelTorq actuators are designed to mount directly to DelVal Valves.
- Nylon PA 12 coated disc option ensures excellent corrosion resistance to several chemical media. The hard, non-porous sintered polymer has very low hygroscopicity and is suitable for use in drinking water and non-alcoholic foodstuffs.
- One piece stem with close tolerance double D drive eliminates the need for disc screws or taper pins.
- Double O-rings are molded in both upper and lower journals providing a superior secondary seal.
- Unique "Center-Lock" seat design virtually eliminates any seat movement during the seating and un-seating of the disc.
- Heavy duty square-grooved seat design with molded O-ring seals to serve as flange gaskets. EPDM seats are peroxide cured to yield the best elastic properties of the elastomer.



- Unique stem retention system to provide blow-out proof stem and easy assembly and disassembly of valve.
- Heavy duty acetal bushing absorbs the forces acting on the stem/disc assembly due to line pressure.
- Bi-directional 'U' cup stem seal.
- Heavy duty one-piece body with extended neck for 2" piping insulation. Standard coating is two coats of hard, Zinc-rich epoxy for excellent corrosion resistance.
- Two flange locating holes for sizes up to 12" and four flange locating holes from size 14" to 24" for easy alignment of valve during installation. They meet ANSI #125 /150 or other world drilling standards.
- High strength disc with hand polished disc edge and hubs.
- Precision machined radius on the upper and lower disc hubs is pressed against upper and lower seat sealing faces for achieving primary sealing between disc and seat.

- "Center-Lock" seat design

Engineering



DIMENSIONS (Inch)

Valve Size		ØA	*B	ØD	E	Sq'F'	Top Plate Drilling			ØG	H	J	Key Size	K	Lug Bolting Data			Weight in Lbs.	
Inch	DN						BC	No. of Holes	Hole Dia						BC	No.of Holes	Threads UNC-2B	Wafer (Series 50)	Lug (Series 52)
2	**50**	3.58	1.62	2.99	5.51	3.15	2.76 / 3.25	4	0.39/0.438	0.55	0.39	1.25	---	1.32	4.75	4	5/8-11	5.07	6.79
2 ½	**65**	4.13	1.75	3.54	5.98	3.15	2.76 / 3.25	4	0.39/0.438	0.55	0.39	1.25	---	2.05	5.50	4	5/8-11	5.80	7.91
3	**80**	4.72	1.75	4.17	6.30	3.15	2.76 / 3.25	4	0.39/0.438	0.55	0.39	1.25	---	2.70	6.00	4	5/8-11	6.83	8.92
4	**100**	5.91	2.00	5.20	7.09	3.15	2.76 / 3.25	4	0.39/0.438	0.63	0.43	1.25	---	3.61	7.50	8	5/8-11	10.87	16.37
5	**125**	6.89	2.12	6.30	7.56	3.15	2.76 / 3.25	4	0.39/0.438	0.75	0.51	1.25	---	4.62	8.50	8	3/4-10	13.91	21.56
6	**150**	8.07	2.12	7.36	8.07	3.15	2.76 / 3.25	4	0.39/0.438	0.75	0.51	1.25	---	5.50	9.50	8	3/4-10	16.31	25.35
8	**200**	10.20	2.50	9.45	9.49	4.72	2.76/4.92/5.00	4	0.39/0.55/0.563	0.87	0.63	1.25	---	7.39	11.75	8	3/4-10	28.00	37.92
10	**250**	12.21	2.50	11.50	10.75	4.72	4.92 / 5.00	4	0.55/0.563	1.18	0.87	2.00	---	9.31	14.25	12	7/8- 9	44.09	61.73
12	**300**	14.33	3.00	13.58	12.24	4.72	4.92 / 5.00	4	0.55/0.563	1.18	0.87	2.00	---	11.12	17.00	12	7/8- 9	60.85	92.26
14	**350**	16.34	3.00	15.28	13.62	4.72	4.92 / 5.00	4	0.55/0.563	1.38	---	2.00	0.39x0.39	12.92	18.75	12	1- 8	87.96	122.80
16	**400**	18.58	4.00	17.40	14.76	4.72	4.92	4	0.55	1.38	---	2.00	0.39x0.39	14.80	21.25	16	1- 8	130.51	184.31
18	**450**	20.67	4.25	19.49	15.98	6.70	6.50	4	0.83	1.97	---	2.50	0.39x0.47	16.59	22.75	16	11/8 -7	194.45	239.42
20	**500**	22.83	5.00	21.57	17.24	6.70	6.50	4	0.83	1.97	---	2.50	0.39x0.47	18.61	25.00	20	11/8 -7	236.78	306.88
24	**600**	27.24	5.94	25.75	19.49	Ø8.27	6.50	4	0.83	2.50	---	4.00	0.62x0.62	22.55	29.50	20	11/4 -7	385.81	477.08

*Face to face dimension "B" generally conforming to API 609 Category A/BS EN 558-1 Series 20/ISO 5752 Series 20 / MSS SP 67 / ASME B 16.10

DIMENSIONS (mm)

Valve Size		ØA	**B	ØD	E	Sq'F'	Top Plate Drilling			ØG	H	J	Key Size	K	Lug Bolting Data			Weight in Kg.	
Inch	DN						BC	No. of Holes	Hole Dia						BC	No.of Holes	Threads UNC-2B	Wafer (Series 50)	Lug (Series 52)
2	**50**	91	43	76	140	80	70/82.5	4	10/11	14	10	32	---	33.5	120.7	4	5/8-11	2.30	3.08
2 ½	**65**	105	46	90	152	80	70/82.5	4	10/11	14	10	32	---	52.1	139.7	4	5/8-11	2.63	3.59
3	**80**	120	46	106	160	80	70/82.5	4	10/11	14	10	32	---	68.5	152.4	4	5/8-11	3.10	4.05
4	**100**	150	52	132	180	80	70/82.5	4	10/11	16	11	32	---	91.7	190.5	8	5/8-11	4.93	7.42
5	**125**	175	56	160	192	80	70/82.5	4	10/11	19	13	32	---	117.3	215.9	8	3/4-10	6.31	9.78
6	**150**	205	56	187	205	80	70/82.5	4	10/11	19	13	32	---	139.7	241.3	8	3/4-10	7.40	11.50
8	**200**	259	60	240	241	120	70/125/127	4	10/14/14.3	22	16	32	---	187.6	298.5	8	3/4-10	12.70	17.20
10	**250**	310	68	292	273	120	125/127	4	14/14.3	30	22	51	---	236.4	362.0	12	7/8-9	20.00	28.00
12	**300**	364	78	345	311	120	125/127	4	14/14.3	30	22	51	---	282.4	431.8	12	7/8-9	27.60	41.85
14	**350**	415	78	388	346	120	125/127	4	14/14.3	35	---	51	10x10	328.3	476.2	12	1-8	39.90	55.70
16	**400**	472	102	442	375	120	125	4	14	35	---	51	10x10	375.8	539.7	16	1-8	59.20	83.60
18	**450**	525	114	495	406	170	165	4	21	50	---	64	10x12	421.4	577.8	16	1 1/8-7	88.20	108.60
20	**500**	580	127	548	438	170	165	4	21	50	---	64	10x12	472.6	635.0	20	1 1/8-7	107.40	139.20
24	**600**	692	154	654	495	Ø210	165	4	21	63.5	---	102	15.88x15.88	572.7	749.3	20	1 1/4-7	175.00	216.40

** Metric valve face to face dimension 'B' conforms to API 609 Category A / BS EN 558-1 Series 20 / ISO 5752 Series 20 / MSS SP 67 / ASME B 16.10

TORQUE (Lbf-Inch)

Valve Size		2"	2.5"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"
Full Rated Pressure Valve △P, PSI	**50**	62	106	115	241	360	484	878	1409	2366	3064	3684	5795	6741	9601
	100	72	124	142	256	393	545	977	1586	2677	3527	4428	7273	8441	12482
	150	80	142	177	271	426	582	1083	1756	2987	3980	5178	8756	10126	15576
	175	91	150	197	279	443	620	1133	1841	3146	---	---	---	---	---
Reduced Disc Dia. △P, PSI	**50**	-	-	-	133	187	267	623	771	1259	2159	2627	3649	4285	6500

TORQUE (Nm)

Full Rated Pressure Valve △P, Bar	**3.5**	7	12	13	27	41	55	99	159	267	346	416	655	762	1085
	7	8	14	16	29	44	62	110	179	302	398	500	822	954	1410
	10	9	16	20	31	48	66	122	198	337	450	585	989	1144	1760
	12	10	17	22	32	50	70	128	208	355	---	---	---	---	---
Reduced Disc Dia. △P, Bar	**3.5**	-	-	-	15	21	30	70	87	142	244	297	412	484	734

Material of Construction

Body
- Cast Iron ASTM A126 Class B
- Ductile Iron ASTM A536 Grade 65-45-12
- Carbon steel ASTM A 216 WCB

Disc
- Nylon 12 Coated Ductile Iron ASTM A536 Grade 65-45-12
- DI ASTM A 536 Grade 65-45-12 + Aroxy coated
- 316 Stainless Steel ASTM A351 Grade CF8M

Stem
- 410 Stainless Steel ASTM A479 Type 410
- 316 Stainless Steel ASTM A276 Type 316
- Carbon steel BS 970
- ASTM A564 17-4-PH TYPE 630

Seat Temperature Range:

Seat Type	Temperature Range	
	Min.	Max.
EPDM	-13° F (-25°C)	302° F (150°C)
BUNA-N	-13° F (-25°C)	212° F (100°C)
White BUNA-N	-13° F (-25°C)	212° F (100°C)
Viton®/ FKM	23° F (-5°C)	392° F (200°C)
Silicone	-58° F (-50°C)	356° F (180°C)

Viton® is registered trademark of E.I. DuPont.

Seat
- EPDM - Food Grade
- Buna-N - Food Grade
- White Buna-N - Food Grade
- Viton® / FKM - Food Grade
- Silicone

General Design and Manufacturing Standard: API 609 / BS EN -593

Testing Standard: API 598 / BS EN 12266-1

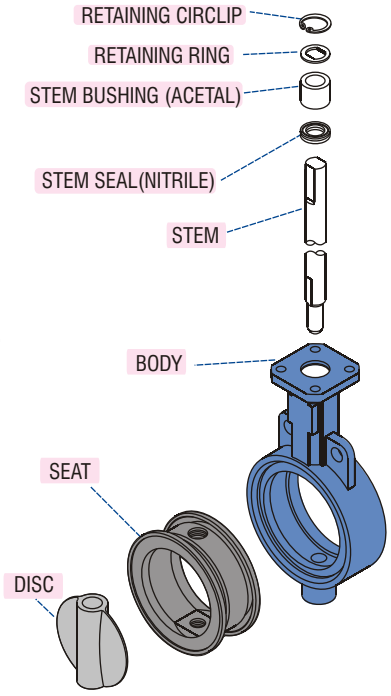
Pressure Rating:

For bi-directional bubble tight shut off and full vacuum service with disc in the closed position.

	Inch	DN	PSIG	BARG
	2"- 12"	50-300	175	12
	2"- 24"	50-600	150	10
	2"- 24"	50-600	50	3.5
*	2"- 12"	50-300	230	16
*	2"- 12"	50-300	285	Class 150

*Optional, contact factory for details.

Dead-End Service : Without a downstream flange installed, the dead-end pressure ratings are equal to the values stated above.



Operators

Valves up to size 12" can be supplied with lever handles for manual operation. Optional accessories for hand-lever operation can be provided for various flow control requirements. Pad locking can also be provided for preventing unauthorized operation.

Valves up to size 24" can be direct mounted with gear operators for manual operation. Gear operators can also be attached with chain-wheel operators for opening or closing valves located on pipelines at high elevations.

All valves can be direct mounted with pneumatic actuators or electric actuators and accessories for complete automation options such as fail open/close & positioner controlled. Valves can be mounted with manual overrides.

All statements, technical information and recommendations in the bulletin are for general use only. DelTech is not responsible for suitability or compatibility of these products in relation to system requirements. Consult DelTech distributors or factory for the specific requirements and material selection for your intended application. DelTech reserves the right to change or modify product design or product without prior notice. DelVal® - Registered trademark of DelTech Controls.

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Bourdon Tube Pressure Gauge
Model 21X.53 Stainless Steel Construction

Applications

- Intended for adverse service conditions where pulsating or vibration exists (with liquid filling)
- Hydraulics & compressors
- Suitable for gaseous or liquid media that will not obstruct the pressure system

Special features

- Vibration and shock resistant (with liquid filling)
- Stainless steel case
- Pressure ranges up to 15,000 psi

Bourdon Tube Pressure Gauge Model 21X.53

Standard Features

Design
ASME B40.100 & EN 837-1

Sizes
2", 2½" & 4" (50, 63 & 100 mm)

Accuracy class
2" & 2½": ± 2/1/2% of span (ASME B40.100 Grade A)
4": ± 1% of span (ASME B40.100 Grade 1A)

Ranges
Vacuum / Compound to 200 psi
Pressure from 15 psi to 15,000 psi
Pressure from 15 psi to 10,000 psi - 2" size
or other equivalent units of pressure or vacuum

Working pressure 0-15 PSI

2 & 2½":	Steady:	3/4 scale value
	Fluctuating:	2/3 full scale value
	Short time:	full scale value
4":	Steady:	full scale value
	Fluctuating:	0.9 x full scale value
	Short time:	1.3 x full scale value

Temperature error
Additional error when temperature changes from reference temperature of 68°F (20°C) ±0.4% for every 18°F (10°C) rising or falling. Percentage of span.

Weather protection
Weather tight (NEMA 4X / IP 65)

Pressure connection
Material: copper alloy
~~Lower mount (LM) or~~ center back mount (CBM) - 2" & 2½"
Lower mount (LM) or lower back mount (LBM) - 4"
1/8" NPT, 1/4" NPT or 1/2" NPT limited to wrench flat area

Bourdon tube
2½" Size- Material: Copper alloy
30" Hg (VAC) to 800 PSI- C-type (soldered)
1000PSI to 15,000PSI- helical type (soldered)
Changes to stainless steel at 7,500 PSI brazed
4"Size- Material: Copper alloy ≤ 1,000 PSI
316 stainless steel ≥1,500 PSI
30" Hg (Vac) to 1,000 PSI- C-type (soldered)
1,500 PSI to 15,000 PSI- helical type (brazed)
Changes to stainless steel at 1,500 PSI

Movement
Copper alloy

Dial
White ABS (2" & 2½") and white aluminum (4")

Pointer
Black aluminum

WIKA®
Part of your business

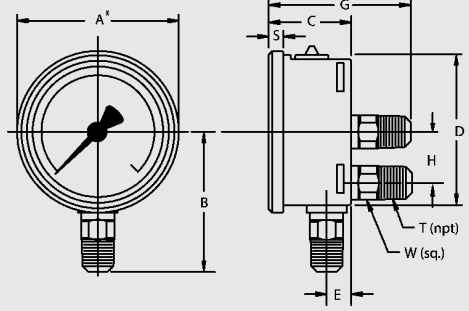
Case
304 stainless steel with vent plug and stainless steel crimp ring. Suitable for liquid filling. Case connection sealed with EPDM o-ring (glycerine filled) or Viton o-ring (dry or silicone filled).

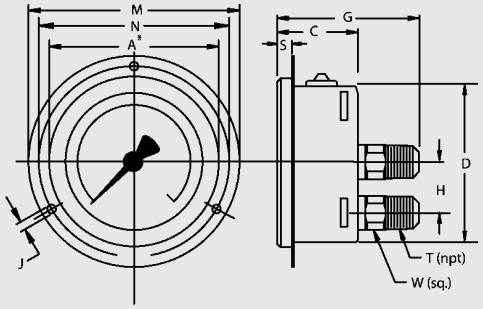
Window
Polycarbonate with Buna-N gasket

Case fill
Glycerine 99.7% - Type 213.53

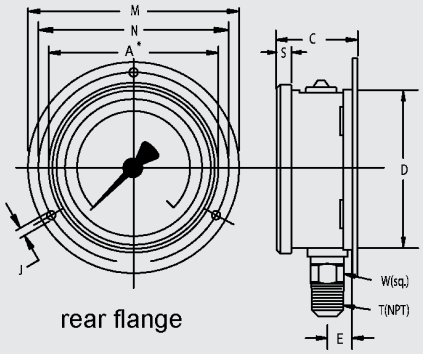
Optional extras
- Brass restrictor
- Stainless steel front or rear flange - 2½" & 4"
- Zinc-plated steel or SS u-clamp bracket (field installable)
- External zero adjustment (2½" only)
- Red drag pointer or mark pointer
- Silicone or Fluorolube case filling
- Special connections limited to wrench flat area
- Custom dial layout
- Other pressure scales available
  bar, kPa, MPa, kg/cm² and dual scales

Dimensions

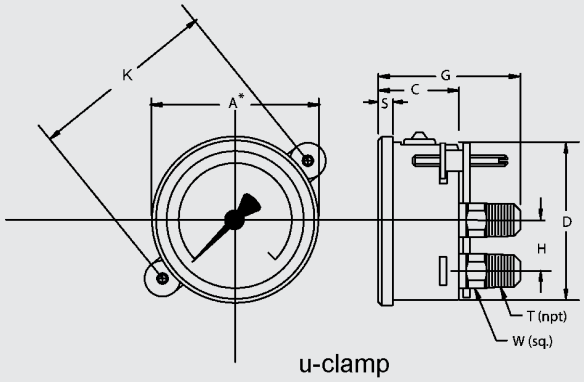




front flange



rear flange



u-clamp

Size		A	B	C	D	E	G	H	J	K	L	M	N	S	T	W	Weight	
2"	mm	55	48	30	50	12	53	-	3.6	72	6.5	71	60	5.5		14	0.27 lb.	dry
	in	2.17	1.89	1.18	1.97	0.47	2.09	-	0.14	2.83	0.26	2.80	2.36	0.22	1/4"	0.55	0.33 lb.	filled
2.5"	mm	69	54	32	62	13	54	-	3.6	72	7.5	88.1	75	6.5		14	0.36 lb.	dry
	in	2.69	2.13	1.26	2.45	0.51	2.13	-	0.14	2.83	0.30	3.47	2.95	0.26	1/4"	0.55	0.44 lb.	filled
4"	mm	107	87	48	100	15.5	79.5	30	4.8	109	9	132	116	8		22	1.10 lb.	dry
	in	4.21	3.43	1.89	3.91	0.61	3.13	1.18	0.19	4.29	0.35	5.20	4.57	0.31	1/2"	0.87	1.76 lb.	filled

Note: For 1/4" NPT connections on 4" gauges, reduce B dimension by 5mm/0.2"

Recommended panel cut-out:
2"- U-clamp: 51mm
front flange: n/a
2½"- U-clamp: 63mm
front flange: 65mm
4"- U-clamp: 101mm
front flange: 104mm
4½"- panel mount adapter 104mm minimum
(not shown)

Ordering information
Pressure gauge model / Nominal size / Scale range / Size of connection / Optional extras required
Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing.
Modifications may take place and materials specified may be replaced by others without prior notice.

WIKA Instrument Corporation
1000 Wiegand Boulevard
Lawrenceville, GA 30043
Tel (770) 513-8200 Toll-free 1-888-WIKA-USA
Fax (770) 338-5118
E-Mail info@wika.com
www.wika.com

Back Connect Bimetal Thermometer

REOTEMP INSTRUMENTS
Measuring your world since 1965

REOTEMP's Bimetal Thermometers are reliable and accurate temperature sensors requiring no electricity or wiring. Back Connect Thermometers are ideal for local, eye-level temperature readings in most process applications. They can be recalibrated with a turn of the calibration screw on the back of the dial. A variety of options are available for your specific process needs.

Fillable | HiVis™ Dials | 1% Accuracy | Custom Logos

FEATURES / BENEFITS

- Made to ASME B40.3 Specifications
- Accuracy ± 1% Full Scale (ASME B40.3 Grade A)
- All Stainless Steel Construction
- Hermetically Sealed (ASME B40.3)
- Silicone Fillable for Vibration
- Standard and Custom Stem Lengths
- Standard External Reset for Calibration
- OEM Logo Dials/Custom Dials
- Five Year Warranty
- HiVis™ Dials Available

SPECIFICATIONS

ACCURACY: ± 1% Full Scale (ASME B40.3)
DIAL SIZE: 3", ~~4" or 5"~~
DIAL MATERIAL: Anodized aluminum with black marks on satin matte finish background; White & HiVis background available.
STEM LENGTH: 2" to 80"
STEM DIAMETER: 1/4" (std) ; 3/8" & 5/16" available
HEAD, BEZEL, MOUNTING BUSHING, STEMS: 300 Series SS, ~~316SS (optional)~~
OPERATING CONDITIONS: Head temperature should not exceed 200°F (150°F if silicone filled). Stem should not be exposed to continuous temperatures exceeding 50% over-range or 800°F.
TEMPERATURE RANGES: See inside back cover for complete list of ranges.
CASE RATING: IP67, NEMA 6 Rated (Hermetically sealed per ASME B40.3)
LENS: Glass (std), ~~Acrylic, Polycarbonate, Tempered Glass~~
IMMERSION: Minimum 2" in liquid, and 4" in gas for most ranges. Certain ranges require up to 4" in liquids & 5" in gas.
MOUNTING CONNECTION: 1/2" NPT (std), ~~1/4" NPT, 3/4" NPT, Plain Hex Bushing, 1/2" BSPT, Sanitary Tri-Clamp~~
TEMPERATURE SENSING AREA: Last 2" to 4" of the stem

Standard Delivery 3-5 Days

Thermowell Recommended
(available through Reotemp)

Made in the USA

Back Connect Bimetal Thermometer

REOTEMP INSTRUMENTS
Measuring your world since 1965

Online Configurators
www.reotemp.com

HOW TO ORDER

AA	025	1	F63	—	SF

Standard Model:

AA = 3" Dial w/ Reset
CC = 4" Dial w/ Reset
BB = 5" Dial w/ Reset

Non-Reset Model:

RR = 3" Dial w/o Reset
CN = 4" Dial w/o Reset
SS = 5" Dial w/o Reset

Stem Length:

025 = 2.5"
040 = 4"
060 = 6"
090 = 9"
120 = 12"
150 = 15"
180 = 18"
240 = 24"
300 = 30"
360 = 36"

Intermediate stem lengths available up to 80".

Connection:

1 = 1/2" NPT
4 = 1/4" NPT
5 = 3/4" NPT Adapter
X = Plain Unthreaded Hex Bushing
B = 1/2" BSPT
U = 1/2" NPT Union

Sanitary:

C = 1.5" Tri-Clamp
L = 2" Tri-Clamp
A = 2.5" Tri-Clamp
P = 3" Tri-Clamp
M = 3/4" Tri-Clamp

Temperature Range:

Common Ranges:

Fahrenheit Ranges	Celsius Ranges
F23 = -40°F to 160°F	**C23** = -40°C to 70°C
***F55** = 25°F to 125°F	***C55** = 0°C to 50°C
F43 = 0°F to 200°F	**C43** = 0°C to 100°C
F47 = 0°F to 250°F	**C47** = -20°C to 120°C
F63 = 50°F to 300°F	**C59** = 0°C to 150°C
F67 = 50°F to 500°F	**C67** = 0°C to 250°C
F69 = 50°F to 550°F	**C69** = 0°C to 300°C
F81 = 150°F to 750°F	**C73** = 0°C to 400°C
F85 = 200°F to 1000°F	**C85** = 100°C to 500°C

Dual °F/°C Ranges

D23 = -40°F to 160°F & -40°C to 70°C
***D55** = 25°F to 125°F & -5°C to 50°C
D43 = 0°F to 200°F & -10°C to 90°C
D47 = 0°F to 250°F & -20°C to 120°C
D63 = 50°F to 300°F & 10°C to 150°C
D67 = 50°F to 500°F & 10°C to 260°C
D69 = 50°F to 550°F & 10°C to 290°C
F81 = 150°F to 750°F & 70°C to 400°C
F85 = 200°F to 1000°F & 100°C to 500°C

* Not available in 2.5" stem.

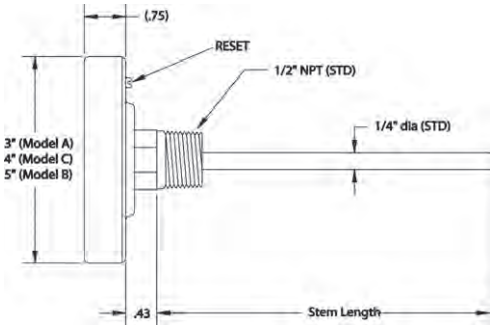
See inside back cover for complete list of ranges.

Accessories:

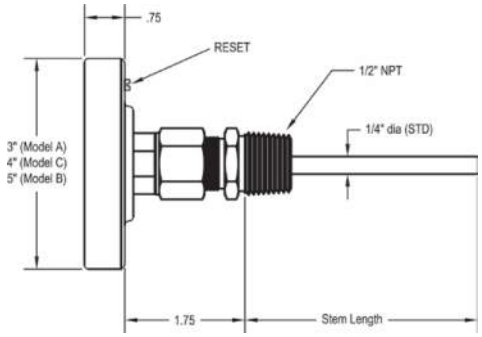
HV = Hi-Vis Dial
PS = Pointed Stem
SF = Silicone Fill (Max. Temp. 550°F)
SS = 316SS Stem
S3 = 3/8" diameter Stem
F5 = 5/16" diameter Stem
PC = Acrylic Window
PY = Polycarbonate Window
TG = Tempered Glass Window
MM = Max./Min. Pointer
HT = Heat Transfer Compound (2 oz., 1 lb container)
CC = Certificate of Conformance
C1 = 1 pt. Calibration Certificate
C3 = 3 pt. Calibration Certificate

For Thermowells, see pages 34-37.

Standard Dimensions



Fixed Union



*dimensions in inches

Bulletin No. PTM-91

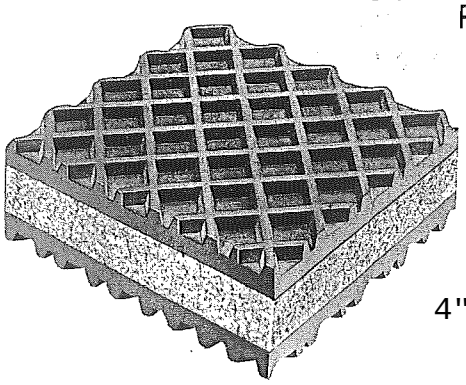
Pad Type Mountings

Available in 6 types

Load Ranges from 10psi to 1000psi

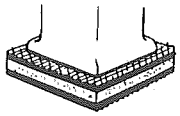
Reduces Noise & Vibration Transmission

CORK-RIB Pads



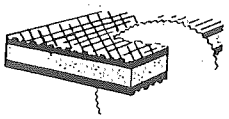
4"x4"

Cork-Rib is a laminated pad having 1/2" thick close-grained cork core securely bonded between two layers of 1/4" thick waffle design oil-resistant neoprene. This combination provides the highest degree of sound attenuation and vibration isolation attainable in a pad type mounting. Cork-Rib is 1" thick and is available in sheets of 24" x 36", 18" x 36" and 18" x 18". Smaller size pads are also carried in stock. Recommended loading for Standard Cork-Rib is 50psi., and for Heavy Duty Cork-Rib 100psi.



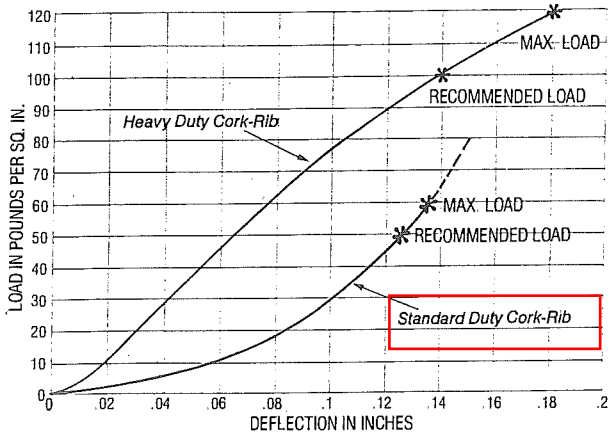
NO BOLTING

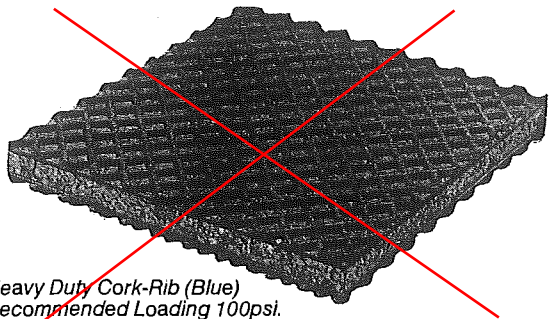
The exceptional gripping qualities of CORK-RIB eliminate the need for bolting or cementing in most installations. Adhesive is available for applications having severe horizontal thrust.



EASY TO USE

Simply cut CORK-RIB PAD slightly larger than leg or bearing plate of machine using knife or saw. If load on square inch of pad area exceeds recommended load use CORK-RIB FLEX PLATES.





Heavy Duty Cork-Rib (Blue) Recommended Loading 100psi.

TNEMEC

PRODUCT DATA SHEET

HI-BUILD EPOXOLINE SERIES 66

ONE PRIME COAT AND ONE INTERMEDIATE COAT

PRODUCT PROFILE

GENERIC DESCRIPTION	Polyamide Epoxy
COMMON USAGE	Industry standard for epoxy coatings for over 30 years. Known for its forgiving application characteristics in adverse and varied conditions, and for benchmark performance.
COLORS	Refer to Tnemec Color Guide. **Note:** Epoxies chalk with extended exposure to sunlight and may yellow on aging. Lack of ventilation, incomplete mixing, miscatalyzation or the use of heaters that emit carbon dioxide and carbon monoxide during application and initial stages of curing may accelerate any potential yellowing.
FINISH	Satin
SPECIAL QUALIFICATIONS	Meets the performance requirements of **AWWA C 210** (not for potable water contact). Contact your Tnemec representative for system recommendations.
PERFORMANCE CRITERIA	Extensive test data available. Contact your Tnemec representative for specific test results.

COATING SYSTEM

PRIMERS	**Steel:** Self-priming or Series 1, 20, FC20, 37H, N69, 90, 91-H_2O, 94-H_2O, 161, 394, 530 **Galvanized Steel and Non-Ferrous Metal:** Self-priming **Concrete:** Self-priming, 54-660, 201, 216, 218 **CMU:** 54-562, 54-660, 130, 216, 218 **Drywall:** 51-792 for dry interior environments **Note:** A maximum recoat time may apply depending on the topcoat specified. Refer to the applicable topcoat product sheet for information on product specific maximum recoat times.
TOPCOATS	46H-413, 66, N69, 73, 84, 104, 113, 114, 161, 262, 265, 290, 291, 1070, 1071, 1072, 1074, 1074U, 1075, 1075U, 1077, 1078. Refer to COLORS on applicable topcoat data sheets for additional information. **Note:** A maximum recoat time may apply depending on the topcoat specified. Refer to the applicable topcoat product sheet for information on product specific maximum recoat times.

SURFACE PREPARATION

PRIMED STEEL	**Immersion Service:** Scarify the Series 66 prime coat surface by abrasive-blasting with a fine abrasive before topcoating if: (a) the 66 prime coat has been in exterior exposure for 60 days or longer and 66, 46H-413, N69 or 161 is the specified topcoat; (b) the 66 prime coat has been in exterior exposure for 14 days or longer and Series 104 is the specified topcoat; (c) the 66 prime coat has been in exterior exposure for 7 days or longer and Series 262 or 265 is the specified topcoat.
STEEL	**Immersion Service:** SSPC-SP10/NACE 2 Near-White Blast Cleaning **Non-Immersion Service:** SSPC-SP6/NACE 3 Commercial Blast Cleaning
GALVANIZED STEEL & NON-FERROUS METAL	Surface preparation recommendations will vary depending on the substrate and exposure conditions. Contact your Tnemec representative or Tnemec Technical Services.
CAST/DUCTILE IRON	Contact your Tnemec representative or Tnemec Technical Services.
CONCRETE	Allow new concrete to cure 28 days. For optimum results and/or immersion service, abrasive blast referencing SSPC-SP13/NACE 6 Surface Preparation of Concrete and Tnemec's Surface Preparation and Application Guide.
CMU	Allow mortar to cure for 28 days. Prepare in accordance with SSPC-SP13/NACE 6 to level protrusions and mortar spatter, and remove other contaminants.
PAINTED SURFACES	**Non-Immersion Service:** Ask your Tnemec representative for specific recommendations. ***
ALL SURFACES	Must be clean, dry and free of oil, grease and other contaminants.

TECHNICAL DATA

VOLUME SOLIDS	56.0 ± 2.0% (mixed) †
RECOMMENDED DFT	2.0 to 6.0 mils (50 to 150 microns) per coat. **Note:** Number of coats and thickness requirements will vary with substrate, application method and exposure. Contact your Tnemec representative.

CURING TIME

Temperature	To Touch	To Handle	To Recoat	Immersion
75°F (24°C)	2 hours	10 hours	12 hours	7 days

Curing time varies with surface temperature, air movement, humidity and film thickness.
Ventilation: When used as a tank lining or in enclosed areas, provide adequate ventilation during application and cure. Reference guidelines contained in the latest edition of AWWA D 102.

VOLATILE ORGANIC COMPOUNDS	**Unthinned:** 3.02 lbs/gallon (362 grams/litre) **Thinned 5%:** 3.20 lbs/gallon (384 grams/litre) **Thinned 10%:** 3.37 lbs/gallon (404 grams/litre) †
THEORETICAL COVERAGE	898 mil sq ft/gal (22.0 m²/L at 25 microns). See APPLICATION for coverage rates. †
NUMBER OF COMPONENTS	Two: Part A and Part B
PACKAGING	5 gallon (18.9L) pails and 1 gallon (3.79L) cans — Order in multiples of 2.
NET WEIGHT PER GALLON	12.50 ± 0.25 lbs (5.67 ± .11 kg) (mixed) †
STORAGE TEMPERATURE	Minimum 20°F (-7°C) Maximum 110°F (43°C)
TEMPERATURE RESISTANCE	(Dry) Continuous 250°F (121°C) Intermittent 275°F (135°C)
SHELF LIFE	Part A: 24 months; Part B: 12 months at recommended storage temperature.

*** All components containing a manufactures applied prime or finish coat of paint such as blowers, motors, valves, filters, silencers & actuators are excluded from sandblasting.

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Published technical data and instructions are subject to change without notice. The online catalog at www.tnemec.com should be referenced for the most current technical data and instructions or you may contact your Tnemec representative for current technical data and instructions.

HI-BUILD EPOXOLINE | SERIES 66

FLASH POINT - SETA: Part A: 82°F (28°C) Part B: 64°F (18°C)

HEALTH & SAFETY: Paint products contain chemical ingredients which are considered hazardous. Read container label warning and Material Safety Data Sheet for important health and safety information prior to the use of this product.
Keep out of the reach of children.

APPLICATION

COVERAGE RATES

	Dry Mils (Microns)	Wet Mils (Microns)	Sq Ft/Gal (m²/Gal)
Suggested	4.0 (100)	7.0 (180)	225 (20.9)
Minimum	2.0 (50)	3.5 (90)	450 (41.8)
Maximum	6.0 (150)	10.5 (265)	150 (13.9)

Note: The above reflects the total range to which Series 66 can be applied for specific applications. To insure the proper thickness and number of coats is specified for certain substrates and exposures, consult the Tnemec Guide Specifications and/or contact your Tnemec representative. **Note:** Roller or brush application may require two or more coats to obtain recommended film thickness. Allow for overspray and surface irregularities. Wet film thickness is rounded to the nearest 0.5 mil or 5 microns. Application of coating below minimum or above maximum recommended dry film thicknesses may adversely affect coating performance. †

MIXING: Power mix contents of each container, making sure no pigment remains on the bottom. Pour a measured amount of Part B into a clean container large enough to hold both components. Add an equal volume of Part A to Part B while under agitation. Continue agitation until the two components are thoroughly mixed. Do not use mixed material beyond pot life limits. **Note:** Both components should be above 50°F (10°C) prior to mixing. For application to surfaces between 50°F to 60°F (10°C to 16°C), allow mixed material to stand thirty (30) minutes and restir before using. For optimum application properties, blended components should be above 60°F (16°C). Mixing ratio is one to one by volume.

THINNING: Use No. 4 Thinner. For air spray, thin up to 10% or 3/4 pint (380 mL) per gallon. For airless spray, roller or brush, thin up to 5% or 1/4 pint (190 mL) per gallon.

POT LIFE: 20 hours at 50°F (10°C) 10 hours at 77°F (25°C) 4 hours at 100°F (38°C)

APPLICATION EQUIPMENT

Air Spray

Gun	Fluid Tip	Air Cap	Air Hose ID	Mat'l Hose ID	Atomizing Pressure	Pot Pressure
DeVilbiss JGA	E	765 or 704	5/16" or 3/8" (7.9 or 9.5 mm)	3/8" or 1/2" (9.5 or 12.7 mm)	75-100 psi (5.2-6.9 bar)	10-20 psi (0.7-1.4 bar)

Low temperatures or longer hoses require higher pot pressure.

Airless Spray

Tip Orifice	Atomizing Pressure	Mat'l Hose ID	Manifold Filter
0.015"-0.019" (380-485 microns)	3000-4000 psi (207-276 bar)	1/4" or 3/8" (6.4 or 9.5 mm)	60 mesh (250 microns)

Use appropriate tip/atomizing pressure for equipment, applicator technique and weather conditions.
Note: Application over inorganic zinc-rich primers: Apply a wet mist coat and allow tiny bubbles to form. When bubbles disappear in 1 to 2 minutes, apply a full wet coat at specified mil thickness.
Roller: Roller application optional when environmental restrictions do not allow spraying. Use 3/8" or 1/2" (9.5 mm to 12.7 mm) synthetic woven nap covers.
Brush: Recommended for small areas only. Use high quality natural or synthetic bristle brushes.

SURFACE TEMPERATURE: Minimum 50°F (10°C) Maximum 135°F (57°C)
The surface should be dry and at least 5°F (3°C) above the dew point. Coating will not cure below minimum surface temperature.

CLEANUP: Flush and clean all equipment immediately after use with the recommended thinner or MEK.

† Values may vary with color.

WARRANTY & LIMITATION OF SELLER'S LIABILITY: Tnemec Company, Inc. warrants only that its coatings represented herein meet the formulation standards of Tnemec Company, Inc. THE WARRANTY DESCRIBED IN THE ABOVE PARAGRAPH SHALL BE IN LIEU OF ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. The buyer's sole and exclusive remedy against Tnemec Company, Inc. shall be for replacement of the product in the event a defective condition of the product should be found to exist and the exclusive remedy shall not have failed its essential purpose as long as Tnemec is willing to provide comparable replacement product to the buyer. NO OTHER REMEDY (INCLUDING, BUT NOT LIMITED TO, INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR LOST PROFITS, LOST SALES, INJURY TO PERSON OR PROPERTY, ENVIRONMENTAL INJURIES OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL LOSS) SHALL BE AVAILABLE TO THE BUYER. Technical and application information herein is provided for the purpose of establishing a general profile of the coating and proper coating application procedures. Test performance results were obtained in a controlled environment and Tnemec Company makes no claim that these tests or any other tests, accurately represent all environments. As application, environmental and design factors can vary significantly, due care should be exercised in the selection and use of the coating.

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ENDURA-SHIELD® SERIES 73

TOP COAT - COLOR: LT. GRAY

PRODUCT PROFILE

GENERIC DESCRIPTION	Aliphatic Acrylic Polyurethane
COMMON USAGE	A coating highly resistant to abrasion, wet conditions, corrosive fumes, chemical contact and exterior weathering. High build quality combines with project specific primers for two-coat, labor saving systems. NOT FOR IMMERSION SERVICE.
COLORS	Refer to Tnemec Color Guide. **Note:** Certain colors may require multiple coats depending on method of application and finish coat color. When feasible, the preceding coat should be in the same color family (blue, gray, etc.), but noticeably different.
FINISH	Semi-gloss
SPECIAL QUALIFICATIONS	Series 73 meets the accelerated weathering requirements of SSPC Paint Standard 36.
PERFORMANCE CRITERIA	Extensive test data available. Contact your Tnemec representative for specific test results.

COATING SYSTEM

PRIMERS	**Steel:** Series 1, 20, 27, 37H, 66, L69, L69F, N69, N69F, 90-97, 91-H_2O, 94-H_2O, 135, L140, L140F, N140, N140F, 161, 394, 530 **Galvanized Steel & Non-Ferrous Metal:** Series 27, 66, L69, L69F, N69, N69F, 161 **Concrete:** 54-660, 66, L69, L69F, N69, N69F, 161 **CMU:** 54-660 **Note:** Series 135 or 530 exterior exposed more than two months, or Series N69 or N140 exterior exposed more than three months must first be scarified or reprimed with themselves. Brush blasting with fine abrasive is the preferred method of scarification. Recoat windows for other primers may apply. See those data sheets for additional information.
TOPCOATS	Series 76, 700, 701, 1070, 1071, 1072, 1074, 1074U, 1075U, 1077, 1078, optional when extended weatherability is desired.

SURFACE PREPARATION

ALL SURFACES	Must be clean, dry and free of oil, grease and other contaminants. See primer product data sheet for surface preparation recommendation.

TECHNICAL DATA

VOLUME SOLIDS	58.0 ± 2.0% (mixed) †
RECOMMENDED DFT	2.0 to 5.0 mils (50 to 125 microns) per coat. **Note:** Number of coats and thickness requirements will vary with substrate, application method and exposure. Contact your Tnemec representative.

CURING TIME

Temperature	To Touch	To Handle	To Recoat
75°F (24°C)	1 hour	5-8 hours	12 hours

Curing time varies with surface temperature, air movement, humidity and film thickness. **Note:** For faster curing and low-temperature applications, add No. 44-710 Urethane Accelerator; see separate product data sheet.

VOLATILE ORGANIC COMPOUNDS

Unthinned	Thinned 10% (Max) (No. 39 Thinner)	Thinned 10% (Max) (No. 42 Thinner)	Thinned 10% (Max) (No. 56 Thinner)	Thinned 10% (Max) (No. 63 Thinner)
2.70 lbs/gallon (325 grams/litre)	3.06 lbs/gallon (367 grams/litre)	3.11 lbs/gallon (372 grams/litre)	2.77 lbs/gallon (331 grams/litre)	3.08 lbs/gallon (369 grams/litre)

†

HAPS

Unthinned	Thinned 10% (Max) (No. 39 Thinner)	Thinned 10% (Max) (No. 42 Thinner)	Thinned 10% (Max) (No. 56 Thinner)	Thinned 10% (Max) (No. 63 Thinner)
0.35 lbs/gal solids	0.34 lbs/gal solids	0.35 lbs/gal solids	0.34 lbs/gal solids	0.40 lbs/gal solids

THEORETICAL COVERAGE	930 mil sq ft/gal (22.8 m²/L at 25 microns). †
NUMBER OF COMPONENTS	Two: Part A and Part B
MIXING RATIO	By volume: Four (Part A) to one (Part B)

PACKAGING

	PART A (Partially filled)	PART B (Partially filled)	When Mixed
5 Gallon Kit	5 gallon pail	1 gallon can	5 gallons (18.9L)
1 Gallon Kit	1 gallon pail	1 quart can	1 gallon (3.79L)

NET WEIGHT PER GALLON	12.13 ± 0.25 lbs (5.50 ± .11 kg) †
STORAGE TEMPERATURE	Minimum 20°F (-7°C) Maximum 110°F (43°C)
TEMPERATURE RESISTANCE	(Dry) Continuous 250°F (121°C) Intermittent 275°F (135°C)
SHELF LIFE	Part A: 24 months at recommended storage temperature. Part B: 12 months at recommended storage temperature.
FLASH POINT - SETA	Part A: 55°F (13°C) Part B: 112°F (43°C)

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Published technical data and instructions are subject to change without notice. The online catalog at www.tnemec.com should be referenced for the most current technical data and instructions or you may contact your Tnemec representative for current technical data and instructions.

HEALTH & SAFETY

Paint products contain chemical ingredients which are considered hazardous. Read container label warning and Material Safety Data Sheet for important health and safety information prior to the use of this product.
Keep out of the reach of children.

APPLICATION

COVERAGE RATES

Conventional Build (Spray, Brush or Roller)

	Dry Mils (Microns)	Wet Mils (Microns)	Sq Ft/Gal (m²/Gal)
Suggested	2.5 (65)	4.5 (115)	372 (34.6)
Minimum	2.0 (50)	3.5 (90)	465 (43.2)
Maximum	3.0 (75)	5.0 (155)	310 (28.8)

High-Build (Spray Only)

	Dry Mils (Microns)	Wet Mils (Microns)	Sq Ft/Gal (m²/Gal)
Suggested	4.0 (100)	7.0 (180)	233 (21.6)
Minimum	3.0 (75)	5.0 (125)	310 (28.8)
Maximum	5.0 (125)	8.5 (215)	186 (17.3)

(1) Can be spray applied at 3.0 to 5.0 mils (75 to 125 microns) DFT per coat when extra protection or the elimination of a coat is desired.
(2) Can be sprayed, brushed or rolled at 2.0 to 3.0 mils (50 to 75 microns) DFT per coat for use in systems requiring a conventional build topcoat.
Allow for overspray and surface irregularities. Wet film thickness is rounded to the nearest 0.5 mil or 5 microns. Application of coating below minimum or above maximum recommended dry film thicknesses may adversely affect coating performance. †

MIXING

Stir contents of the container marked Part A, making sure no pigment remains on the bottom. Add the contents of the can marked Part B to Part A while under agitation. Continue agitation until the two components are thoroughly mixed. When used with 44-710 Urethane Accelerator, first blend 44-710 into Part A under agitation; continue as above. Do not use mixed material beyond pot life limits. **Caution: Part B is moisture-sensitive and will react with atmospheric moisture. Keep unused material tightly closed at all times.**

THINNING

For air spray, thin up to 10% or 3/4 pint (380 mL) per gallon by volume with No. 42 Thinner if temperatures are below 80°F (27°C), use No. 48 Thinner for temperatures above 80°F (27°C). Thin up to 5% or 1/4 pint (190 mL) per gallon for airless spray. For brush or roller, thin 5% to 10% or 1/4 to 3/4 pint (190 to 380 mL) per gallon with No. 39 or No. 63 Thinner. Thinning is required for proper brush or roller application. **Caution: Do not add thinner if more than thirty (30) minutes have elapsed after mixing. Note:** A maximum of 10% of No. 56 Thinner may be used to comply with VOC regulations.

POT LIFE

8 hours at 40°F (4°C) 4 hours at 77°F (25°C) 2 hours at 100°F (38°C)

APPLICATION EQUIPMENT

Air Spray

Gun	Fluid Tip	Air Cap	Air Hose ID	Mat'l Hose ID	Atomizing Pressure	Pot Pressure
DeVilbiss JGA	E	765 or 704	5/16" or 3/8" (7.9 or 9.5 mm)	3/8" or 1/2" (9.5 or 12.7 mm)	75-90 psi (5.2-6.2 bar)	10-20 psi (0.7-1.4 bar)

Low temperatures or longer hoses require higher pot pressure.

Airless Spray

Tip Orifice	Atomizing Pressure	Mat'l Hose ID	Manifold Filter
0.013"-0.017" (330-430 microns)	2700-3300 psi (186-228 bar)	1/4" or 3/8" (6.4 or 9.5 mm)	60 mesh (250 microns)

Use appropriate tip/atomizing pressure for equipment, applicator technique and weather conditions.
Roller: Use 1/4" to 3/8" (6.4 mm to 9.5 mm) synthetic woven nap roller cover. Do not use long nap roller covers. **Note:** Two coats are required to obtain dry film thickness above 3.0 mils (75 microns).
Brush: Recommended for small areas only. Use high quality natural or synthetic bristle brushes. **Note:** Two or more coats may be required to obtain recommended film thicknesses.

SURFACE TEMPERATURE

Minimum 35°F (2°C) Maximum 120°F (49°C)
The surface should be dry and at least 5°F (3°C) above the dew point.
Cure time necessary to resist direct contact with moisture at surface temperature:
40°F (4°C): 24 to 40 hours 50°F (10°C): 18 to 26 hours 60°F (16°C): 12 to 16 hours
70°F (21°C): 4 to 8 hours 90°F (32°C): 2 to 4 hours 100°F (38°C): 2 to 3 hours
If the coating is exposed to moisture before the preceding cure parameters are met, dull, flat or spotty appearing areas may develop. Actual times will vary with air movement, film thickness and humidity.

CLEANUP

Flush and clean all equipment immediately after use with the recommended thinner or MEK.

† Values may vary with color.

WARRANTY & LIMITATION OF SELLER'S LIABILITY: Tnemec Company, Inc. warrants only that its coatings represented herein meet the formulation standards of Tnemec Company, Inc. THE WARRANTY DESCRIBED IN THE ABOVE PARAGRAPH SHALL BE IN LIEU OF ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. The buyer's sole and exclusive remedy against Tnemec Company, Inc. shall be for replacement of the product in the event a defective condition of the product should be found to exist and the exclusive remedy shall not have failed its essential purpose as long as Tnemec is willing to provide comparable replacement product to the buyer. NO OTHER REMEDY (INCLUDING, BUT NOT LIMITED TO, INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR LOST PROFITS, LOST SALES, INJURY TO PERSON OR PROPERTY, ENVIRONMENTAL INJURIES OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL LOSS) SHALL BE AVAILABLE TO THE BUYER. Technical and application information herein is provided for the purpose of establishing a general profile of the coating and proper coating application procedures. Test performance results were obtained in a controlled environment and Tnemec Company makes no claim that these tests or any other tests, accurately represent all environments. As application, environmental and design factors can vary significantly, due care should be exercised in the selection and use of the coating.

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PARTS LIST

SPARES

'A' PACKAGES – SBR BLOWERS

(3) V-belt sets

(3) Filter Elements

(1) Blower bearing, seal & gasket set

'B' PACKAGES – DIGESTER BLOWERS

(2) V-belt sets

(2) Filter Elements

(1) Blower bearing, seal & gasket set

LUBRICANTS

(5) Case blower oil

(3)

GARDNER DENVER
PRODUCT TEST SPECIFICATION

DOCUMENT NO: PT 9038 **DOCUMENT VERSION: 03**

Title: SLIP TEST PROCEDURE

I. SCOPE:

To provide a method to assess the performance of straight lobe and helical lobe blowers. This procedure applies to the following models:

- Sutorbilt Legend Series blowers. (2"-8" gear diameters)
- DuroFlow Series blowers (3"-7" gear diameters)
- Sutorbilt 4500 Series blowers.(6"-8" gear diameters)
- HeliFlow Series blowers (4"-6" gear diameters)
- Sutorbilt 4800 Series blowers (7" gear diameters)
- Drum Series blowers (6" gear diameters)
- TriFlow Series blowers (4" gear diameters)

II. TEST REPORT:

All performance data shall be recorded on the Sutorbilt/DuroFlow Assembly and Test Report within the ATR system. Refer to process instructions for completion of the test record.

III. ACCEPTANCE:

The test technician is authorized to accept or reject the unit based on condemning limits and criteria set forth in this procedure. If the unit fails to satisfy this criteria, the tester is to reject the unit following Nonconforming Material (NCM) Procedures.

IV. PROCEDURE:

1.0 Slip Test (Standard, Special Suffix and Remanufactured Blowers):

1.1 Lubrication

1.1.1 Fill each blower oil sump with AEON-PD, AEON-PD XD, Shell Morlina 220, or other approved lubricant to the middle of the site glass with the unit not in operation. Special lubricants could be specified and designated on the model Bill of Material or specific PT9038.___ Table.

1.1.2 For units requiring grease lubrication, grease unit with AEON PD Grease prior to slip test until grease comes out the relief ports. Special grease could be specified and designated on the model Bill of Material.

1.1.3 Verify both the Drive and Gear Ends have been lubricated.

1.2 All slip testing shall be started with the unit at room temperature.

1.3 Mount the blower on the stand equipped for the appropriate speed as specified in appropriate specifications as follows:

- Sutorbilt Legend Series blowers :
  - PT9038.1 for standard units
  - PT9038.2 for discharge timed and certain special suffix units.
    - If special suffix code is not found on PT9038.2 use data found on PT9038.1 for a standard blower
    - If Deep Vacuum Legend blank off injection ports prior to testing.
  - PT9038.8 for Remanufactured (Reman) blowers only
- DuroFlow/Sutorbilt 4800 Series blowers:
  - PT9038.3 for Standard blowers
  - PT9038.9 for Remanufactured (Reman) blowers only
- Sutorbilt 4500 Series blowers:
  - PT9038.4 for Standard blowers
  - PT9038.10 for Remanufactured (Reman) blowers only
- HeliFlow Series blowers:
  - PT9038.5 for Standard blowers
  - PT9038.11 for Remanufactured (Reman) blowers only
- Drum Series blowers:
  - PT9038.6 for Standard blowers
  - PT9038.12 for Remanufactured (Reman) blowers only
- TriFlow Series blowers:
  - PT9038.7 for Standard blowers
  - PT9038.13 for Remanufactured (Reman) blowers only

1.4 Connect the blower drive shaft to the VFD motor shaft with the appropriate coupling and align the shafts using the alignment tool. Place a guard over the inlet port if the inlet is open to atmosphere for the particular model being tested. Install calibrated instrumentation as required to obtain all required slip test data as specified on the ATR form.

1.5 Refer to PT9038._ for specific test procedures that apply. Operate the blower at the specified test stand speed, as shown in the appropriate PT9038._ table, until the pressure stabilizes. Record the data on the test record form either manually or electronically as applicable.

1.6 Compare the corrected slip RPM value from the test report with the maximum corrected slip RPM @ 1psi shown on the appropriate specification PT9038._ table. If the test report corrected slip RPM on the test report is greater than the max. corrected slip RPM @ 1psi value listed in the specification, the performance is not acceptable. If the pressure is not acceptable, the blower should be tagged per the NCM Procedure after a thorough check has been done to ensure that the discharge piping assembly does not have any leaks.

NOTE: FOR REFERENCE ONLY - ACTUAL CORRECTED SLIP CALCULATION IS PERFORMED IN ATR PROGRAM

1.6.1 Calculate corrected slip.

$$\text{Corrected_Slip_@1_psig} = \frac{\text{Measured_Blower_Slip(RPM)}}{\sqrt{\frac{P}{27.71} * \frac{29.92}{Baro} * \frac{(T_1+460)}{530}}}$$

Where: P = Discharge Flange Pressure (in-H_20)
Baro. = Barometric Pressure (in-Hg)
T_1 = Ambient Temp. (°F)

2.0 Post Test Operations:

2.2 Complete all remaining applicable information on the test record.

2.3 Proceed with the appropriate Hot Test for the unit being tested per PT9039

V. APPROVAL:

Palani Ammasai, Manager
PD Blower Engineering

GARDNER DENVER
PRODUCT TEST SPECIFICATION

DOCUMENT NO: PT 9038 **DOCUMENT VERSION: 03**

Title: SLIP TEST PROCEDURE

CHG. NO.	PART NO.	DESCRIPTION	VER.	DATE
1047210	----------	Document Release	00	07-28-09
1079297	----------	Revised	01	11-29-13
1086505	----------	Document was re-written	02	09-22-14
1124639	----------	Added Deep Vacuum notes to Legend Section 1.3	03	03-01-19

Gardner Denver

Model: *GABHCSD* Serial: *S698678*

SUTORBILT/DUROFLOW BLOWER ASSEMBLY AND TEST RECORD

BLOWER DATA

Model GABHCSD Serial No. S698678

Size/Series 3H Assembly Order No.

ASSEMBLY DATA

ROTOR END CLEARANCES

	Long Shaft	Short Shaft
Total Clearance	0.009	0.009
Fixed End (Discharge)	0.004	0.004
Expansion End (Inlet)	0.005	0.005
Rotor ID No.	56	57

Bearing Axial Endplay (LS/SS) 0.000 / 0.000

Gear Backlash Range 0.0000 / 0.0000

INTERLOBE CLEARANCES

Interlobe	Minimum
Split (O-Side)	0.008
Split (C-Side)	0.008

TIP/NIP CLEARANCES

	Inlet	Discharge
Long Shaft	0.004	0.004
Short Shaft	0.004	0.004

Drive Shaft T.I.R. 0.0000

PROUDLY ASSEMBLED BY

1.	30007746
2.	30003253
3.	14361
4.	
5.	0
6.	0

Assembly Date 4/1/24

FUNCTIONAL TEST DATA

SLIP TEST DATA

Ambient Temperature 88.3 °F

Barometer 28.96 in. Hg.

☑ Constant Speed 38.2 Inches H_2O* at 400 RPM

☐ Variable Speed 400 RPM* at 38.2 Inches H_2O

* Corrected Slip (RPM) for 70 °F and 29.92 in. Hg. 330.3

PTC-9 Test Required ☑ YES ☐ NO

HOT TEST DATA

Discharge Pressure 9.2 PSIG

Discharge Temp 146.0 °F Differential Tem 60.8 °F

Blower Speed 2500 RPM

Inlet Vacuum 28.96 in. Hg.

Inlet Temperature 88.3

Test Stand No. 251 Test No. 1

TEST CHECKLIST

OK • Unit is free of cosmetic defects.

OK • Unit operated without rotor contact.

OK • Unit is free of oil leaks in all areas.

OK • Unit is free of excessive noise and vibration.

OK • Test report information is complete and accurate

TEST RESULTS

☑ ACCEPT ☐ REJECT

Performance Comments:

Test Completed By: 30007105 Date: 4/1/2024

☑ The test data recorded is certified as true and correct by Gardner Denver.

(Rev: 02/24)

Project: Aumsville, OR WWTP **Sanitaire #:** 25-0365A

AIR CONTROL VALVE DATA SHEET

Location: SBR Basins 1 & 2

Description

Manufacturer:	DeZurik
Size:	8"
Model #:	BOS
Type:	Butterfly
Style:	Wafer
Rating:	250psi
Quantity:	2

Materials of Construction

Body:	Ductile Iron, ASTM A536
Disc:	Al. Bronze, ASTM B148, C954
Bearings:	Al. Bronze, ASTM B148, C954
Shaft:	410 Stainless Steel, ASTM A276
Seat:	EPDM

Actuator

Manufacturer:	AUMA
Model #:	SQ07.2/AC01.2
Type:	Electric
Duty Rating:	10 minute
Travel Time (90°):	25 seconds
Supply Voltage:	120V/1ph/60Hz
Control Action:	Open/Close
Control Signal:	120VAC
Motor Horsepower:	0.013
Motor Insulation:	Class F
Full Load Amps:	1.6
Output Torque:	220ft-lbs
Enclosure Rating:	NEMA 4X

Accessories

Local Indicator:	Mechanical
Heater:	110V
Limit Switch:	2 Gear Train (8 contacts)
Override:	Handwheel
Local Controls:	Local-Off-Remote Selector Switch Open-Stop-Close Pushbuttons w/Lights

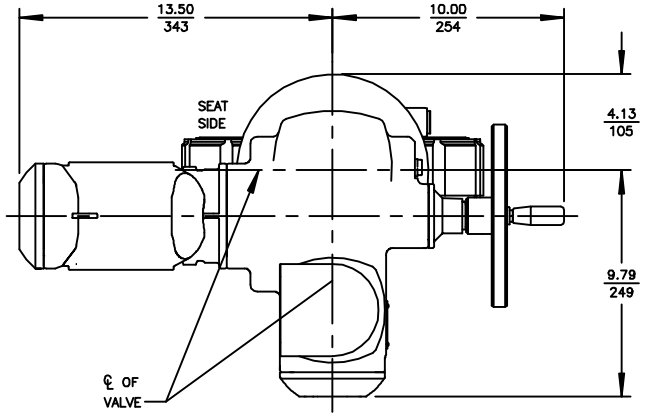
Please refer to the bulletins at the end of this section for complete details on the valve and actuator.

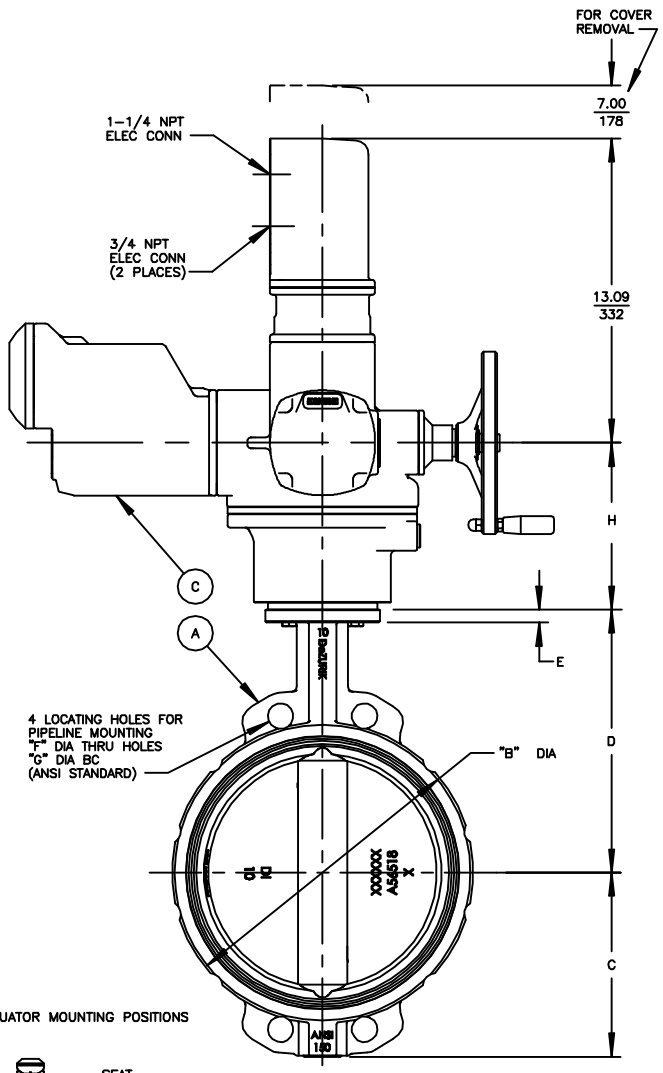
VALVE SIZE		DIMENSIONS INCHES / MILLIMETERS							
INCH	MM	A	B	C	D	E	F	G	H
8	200	2.38 / 60	10.86 / 276	6.75 / 171	10.24 / 260	.71 / 18	.88 / 22	11.75 / 298	7.25 / 184
10	250	2.69 / 68	12.84 / 326	7.93 / 201	11.50 / 292	.71 / 18	1.00 / 25	14.25 / 362	7.25 / 184
12	300	3.06 / 78	15.25 / 387	9.08 / 231	13.35 / 339	.98 / 25	1.00 / 25	17.00 / 432	6.88 / 175

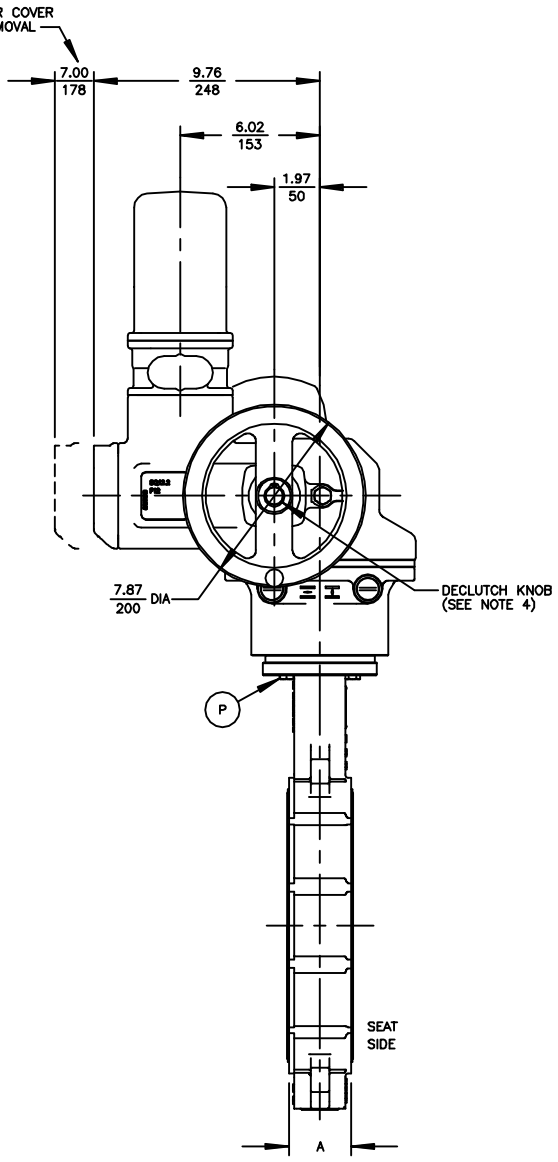
A	VALVE
C	MOTOR
P	CONNECTING PARTS

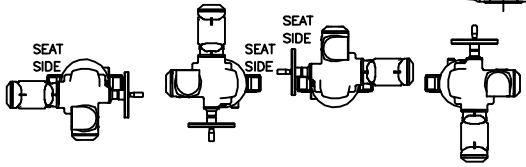
NOTE:

1. DRAWING SHOWS MOUNTING HOLES FOR ANSI CLASS 125/150 FLANGES.
2. FOR FLANGES OTHER THAN ANSI STANDARD SEE D1047B FOR DIMENSIONS.
3. RECOMMENDED FLOW DIRECTION IS WITH THE HIGHER PRESSURE AGAINST THE SEAT SIDE OF VALVE (FLAT SIDE OF DISC).
4. PULL OUT KNOB TO ENGAGE FOR MANUAL OPERATION. UNIT REMAINS IN HAND OPERATION UNTIL MOTOR IS ENERGIZED.









STANDARD POSITION SHOWN ON THIS DRAWING | 90° POSITION | 180° POSITION | 270° POSITION

G	F	E	D	C	B	A	REV 11/17/16

DeZURIK APCO | HILTON
www.dezurik.com

BOS BUTTERFLY VALVES 8–12 WAFER
AUMA SQ(R)12.2 NORM MOTOR ACTUATOR

DOCT. CODE	DRAWN	APPROVED	
C1	BMP	GK	J45242
	CHECKED GK	DATE 11/18/16	

DeZURIK
APCO | HILTON

BULLETIN
JUNE 2020

46.00-1A

DeZURIK BOS-US 2-20" (50-500MM) UNINTERRUPTED SEAT RESILIENT SEATED BUTTERFLY VALVES

- Design
- Operation
- Performance

Design and Construction

BOS-US Valves feature a one-piece body; one-piece shaft and high-performance resilient seats made of EPDM or NBR. The uninterrupted seat design provides bi-directional shutoff to the full rating of the valve. They are available as lugged or wafer bodies, with nickel plated ductile iron, 316 stainless steel or aluminum bronze discs.

Wide Range of Applications

BOS-US Resilient Seated Butterfly Valves are designed to handle a wide variety of liquids and gasses. The uninterrupted seat BOS Valve is desirable for applications where extended service applications are necessary such as high cycles, high pressures and high temperatures. BOS-US valves are excellent choices for continuous modulating control, dead-end service to 250 psi, and vacuum service to 24" Hg.

Pressure Ratings

- 250 psi (1724 kPa) for valves with Ductile Iron or Aluminum Bronze discs
- 200 psi (1380 kPa) for valves with 316 Stainless Steel discs

Temperature Ratings

- NBR, Acrylonitrile-Butadiene 10 to 180°F (-12 to 82°C)
- EPDM, Terpolymer of Ethylene Propylene & a Diene -30 to 250°F (-35 to 121°C)

Uninterrupted Seat Design

By using an off-center disc, BOS Valves have an uninterrupted seat design for improved seating performance, resulting in longer seat life. The BOS-US uninterrupted seat design assures dead-tight shutoff in isolation and dead-end service without requiring downstream flanges. BOS-US Valves have integral flange seals, eliminating the need for flange gaskets.

Superior Bonded Seats

The BOS-US seat bonding process provides a long-lasting, maintenance free seal. Seats are bonded to the body, holding the seat firmly in place and eliminating premature seat failure that can occur due to flexing and fatigue. The bonded seat also improves performance when the line maintains a vacuum, or when handling viscous liquids – circumstances that tend to dislodge seats that are not solidly retained in the valve body.

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Bearings for Reliable Operation

Three heavy-duty bearings ensure smooth, reliable valve operation and promote a longer cycle life than valve designs without bearings. They are fit into the valve body to support shaft loads and eliminate binding. Shaft seals protect bearings from internal and external corrosion.

Shaft Seals for Maximum Reliability

The BOS-US shaft sealing technology offers maximum reliability. It uses four separate sealing components for continuous protection from leakage. Disc hubs form the primary seal around the shaft. Two additional seals are molded into the seat to ensure reliability.

Blowout Proof Shaft

BOS-US Valves feature a rugged, splined disc-to-shaft connection. This provides high cycle life and great control performance. Shaft diameters meet AWWA 504 Class 75B standards. For user safety, each valve has a blowout proof shaft per API 609 standard.

Actuator Mounting Flange

The actuator mounting flange is per ISO 5211 and accommodates all types of actuators – including levers, gears, pneumatic cylinders and electric motors.

Testing and Standards

Every BOS-US Valve is tested for leakage, shell pressure and to be operational with actuator.

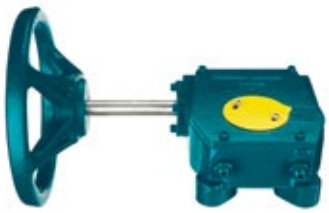
NSF-61/NSF-372 Certified

BOS-US valves with EPDM or NBR Seats are certified per NSF/ANSI-61 and NSF/ANSI-372 requirements for use in drinking water applications.

Compatible with Standard Actuators

The actuator mounting flange on BOS valves is compatible with the ISO 5211 bolt pattern which increases flexibility and reduces inventory. Actuator options include lever, handwheel, chainwheel, PowerRac®, and G-Series Cylinder.

MG-Series Manual Gear



Manual Gear actuators provide high torque for robust applications and a long service life without maintenance. Handwheel or Chainwheel input operators are available.

PowerRac® Cylinder Actuators

Double-acting and spring-return PowerRac® actuators feature a proven rack-and-pinion design ideally suited for high cycle applications. PowerRac® acuators provide high output torque for on-off applications and consistently high output torque throughout the full stroke for accurate control. Its durability is backed up with a Lifetime Warranty.

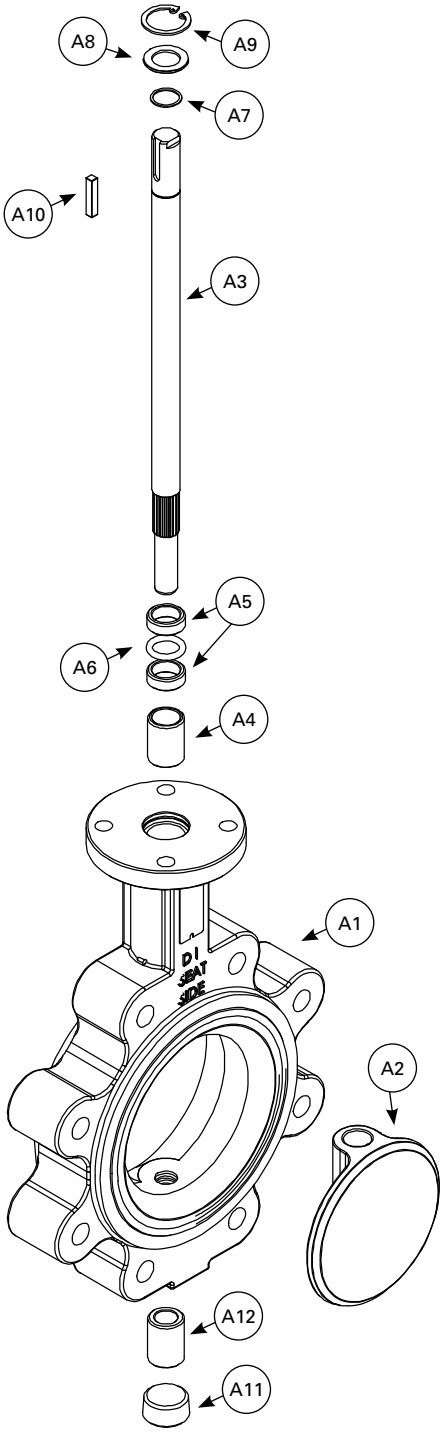
G-Series Cylinder Actuators

G-Series actuators feature a rack-and-gear design for larger size rotary valves where constant high torque capability throughout the stroke is required. They are available as double-acting with either pneumatic or hydraulic supply.

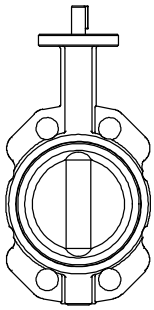
Accessories

A full line of accessories is also available, including positioners, solenoids, switches, speed controls, floorstands and valves boxes.

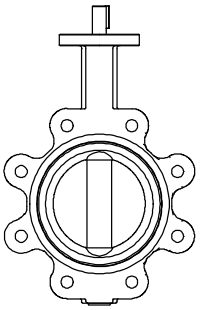
Materials of Construction



Wafer and Lugged Design



Wafer Body



Lugged Body

Item	Description	Material	
A1	Body/Seat	Ductile Iron, ASTM A536, 65-45-12/NBR – Acrylonitrile-Butadiene	
		Ductile Iron, ASTM A536, 65-45-12/EPDM – Terpolymer of Ethylene Propylene and a Diene	←
A2	Disc	Ductile Iron, ASTM A536, 65-45-12, Nickel Plated	
		Aluminum Bronze, ASTM B148, C954	←
		316 Stainless Steel, ASTM A743, CF8M	
A3	Shaft	316 Stainless Steel, ASTM A276	
		410 Stainless Steel, ASTM A276	←
A4	Middle Bearing	Aluminum Bronze, ASTM B148, C954	
A5	Upper Bearing (2)	Aluminum Bronze, ASTM B148, C954	
A6	O-Ring	NBR – Acrylonitrile-Butadiene	
		EPDM – Terpolymer of Ethylene Propylene and a Diene	←
A7	Retainer Ring	302 Stainless Steel, ASTM A276	
A8	Washer	416 Stainless Steel, ASTM A582	
A9	Retainer Ring	Steel, ASTM A29M	
A10	Key	Steel, AISI 1020	
A11	Pipe Plug	Cast Iron, Zinc Plated	
A12	Lower Bearing	Aluminum Bronze, ASTM B148, C954	

Valve Selection

Shutoff Capabilities

Seat-Type	Shutoff
All Seat Materials	Bubble Tight Shutoff*

* Full rated bi-directional shutoff; lugged valves provide dead end service to full valve rating.

Pressure Ratings

Disc/Shaft Material	Pressure Rating
Ductile Iron disc with 410 Stainless Steel Shaft	250 psi (1725 kPa)
Stainless Steel disc with 316 Stainless Steel Shaft	200 psi (1380 kPa)
Aluminum Bronze disc with 410 Stainless Steel Shaft	250 psi (1725 kPa)

Temperature Ratings

Seat Material	Temperature Rating
NBR = Acrylonitrile-Butadiene	10 to 180°F (-12 to 82°C)
EPDM = Terpolymer of Ethylene Propylene & a Diene	-30 to 250°F (-35 to 121°C)

Pipeline Velocity Range

All 2-20" valves	Up to 20 feet/second (6 meters/second)

Contact DeZURIK for pipeline velocities greater than 20 feet/second

Applicable Standards

DeZURIK BOS-US Resilient Seated Butterfly Valves are designed and/or tested to meet the following standards:	
ASME B16.1	Conforms to Class 125 flange drilling.
ASME B16.5	Conforms to Class 150 flange drilling.
ASME B16.42	Conforms to Class 150 flange drilling, body wall thickness and pressure-temperature ratings.
ASME B16.104	Exceeds Class VI shutoff requirements.
API 609	Butterfly Valves Category A.
AWWA C504	Diameter of stainless steel shaft meets AWWA Class 75B standard. Body wall thickness exceeds the AWWA Class 150B standard for butterfly valve.
MSS SP-25	Markings and identification conform to the requirements.
MSS SP-67	Butterfly Valves
ISO 5211	Actuator Mounting
NSF/ANSI-61 and NSF/ANSI-372	Certified for use in drinking water applications
International	Metric flange drilling (W110 and L110) = ISO 7005-2, DIN or BS4504 PN10 Drilling Flange Drilling Metric flange drilling (W116 and L116) = ISO 7005-2, DIN or BS4504 PN16 Drilling

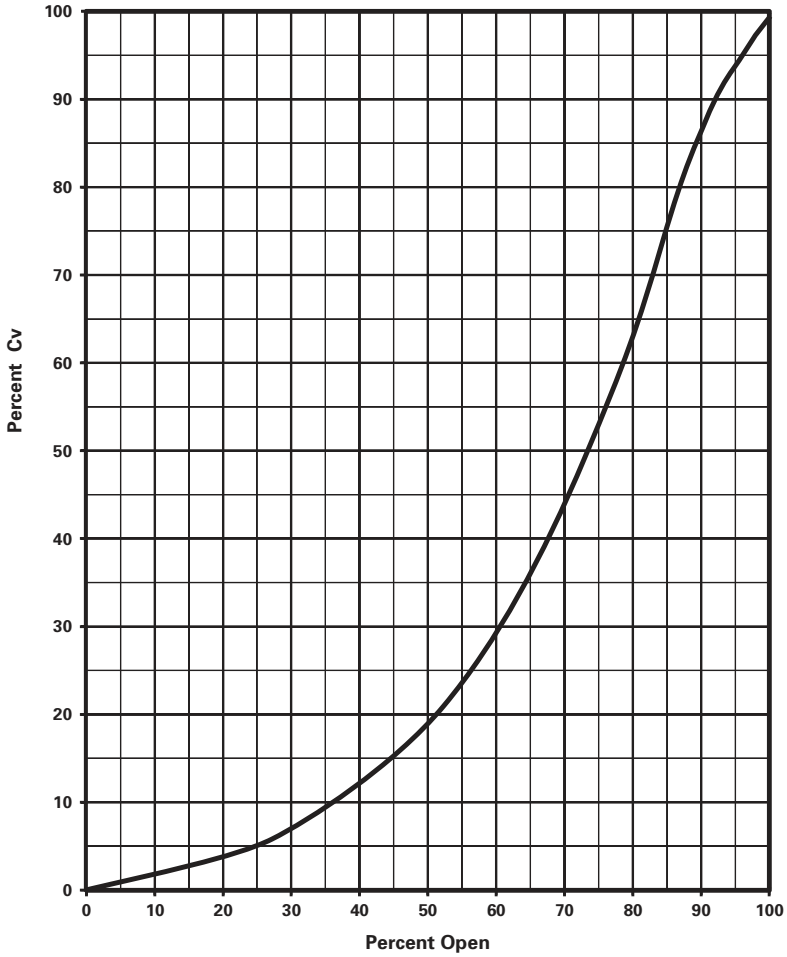
Flow Parameters

Valve Size	Cv* / Kv* 100% Open	K Factor**
2" / 50mm	101 / 87	0.81
2.5" / 65mm	163 / 141	0.77
3" / 80mm	287 / 248	0.72
4" / 100mm	507 / 439	0.68
5" / 125mm	840 / 727	0.65
6" / 150mm	1166 / 1009	0.63
8" / 200mm	2620 / 2266	0.59
10" / 250mm	4003 / 3463	0.44
12" / 300mm	7448 / 6443	0.42
14" / 350mm	8330 / 7205	0.40
16" / 400mm	11811 / 10217	0.28
18" / 450mm	14488 / 12532	0.26
20" / 500mm	18974 / 16413	0.25

*Cv = Flow in GPM of water at 1 psi pressure drop.
Kv = Flow in m3/hr. of water at 100 kPa pressure drop.
**K = The resistance coefficient of the valve. The constant (K) can be used to determine the equivalent length of pipe.

$L = \frac{KxD}{f}$ Where L = Equivalent length of pipe in feet
K = Resistance coefficient
D = Pipe diameter in feet
f = Friction factor, related to type of pipe

Flow Curve



Weights

Valve Size	Basic Valve	
	Wafer	Lugged
2" / 50mm	6 / 3	8 / 4
2.5" / 65mm	8 / 4	9 / 5
3" / 80mm	10 / 5	12 / 6
4" / 100mm	16 / 8	20 / 10
5" / 125mm	20 / 10	25 / 12
6" / 150mm	28 / 13	32 / 15
8" / 200mm	43 / 20	49 / 23
10" / 250mm	62 / 29	76 / 35
12" / 300mm	102 / 47	124 / 57
14" / 350mm	143 / 65	161 / 74
16" / 400mm	218 / 99	264 / 120
18" / 450mm	292 / 133	331 / 151
20" / 500mm	369 / 168	505 / 230

Valve Size	Lever Weight
2-6" / 50-150mm	2 / 1

Pounds
Kilograms

Ordering

To order, simply complete the valve order code from information shown.

Valve Style
Give valve style code as follows:

BOS	=	Resilient Seated Butterfly Valve

Valve Size
Give valve size code as follows:

2	=	2"	50mm	10	=	10"	250mm
2.5	=	2.5"	65mm	12	=	12"	300mm
3	=	3"	80mm	14	=	14"	350mm
4	=	4"	100mm	16	=	16"	400mm
5	=	5"	125mm	18	=	18"	450mm
6	=	6"	150mm	20	=	20"	500mm
8	=	8"	200mm				

Body Style
Give body style code as follows:

US	=	Uninterrupted Seat

End Connection
Give end connection code as follows:

W1	=	ASME Class 125/150 Wafer Drilling
L1	=	ASME Class 125/150 Lugged Drilling

On Application

W110	=	ISO 7005-2, DIN or BS4504 PN10 Wafer Drilling
W116	=	ISO 7005-2, DIN or BS4504 PN16 Wafer Drilling
L110	=	ISO 7005-2, DIN or BS4504 PN10 Lugged Drilling
L116	=	ISO 7005-2, DIN or BS4504 PN16 Lugged Drilling

Body Material
Give body material code as follows:

DI	=	Ductile Iron

Seat, Shaft Seal Material Combination
Give seat, shaft seal material code as follows:

NBR,NBR	=	Acrylonitrile-Butadiene 10° to 180°F (-12° to 82°C)
EPDM,EPDM	=	Terpolymer of Ethylene Propylene & a Diene -30° to 250°F (-35° to 121°C)

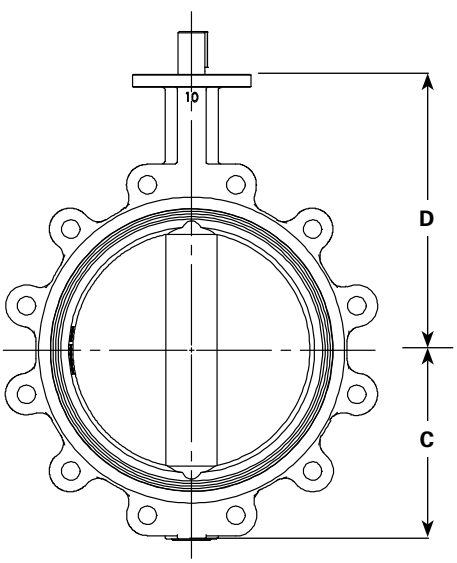
Trim Combination
Give disc-shaft material code as follows:

DI-S8	=	Ductile Iron Nickle Plated Disc - 410 Stainless Steel Shaft
S2-S2	=	316 Stainless Steel Disc - 316 Stainless Steel Shaft
ALB-S8	=	Aluminum Bronze Disc - 410 Stainless Steel Shaft

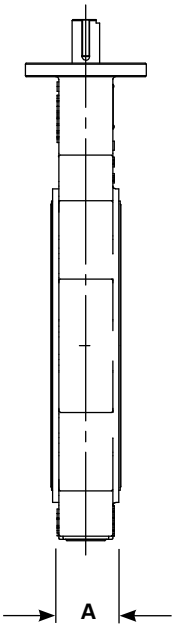
Ordering Example:

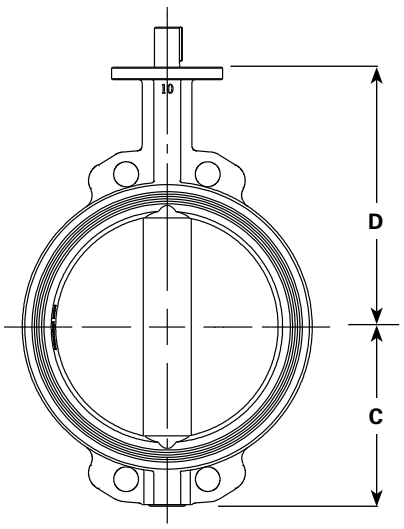
BOS,6,US,W1,DI,NBR,NBR,DI-S8*actuator

Dimensions



Lugged





Wafer

Basic Valve

Valve Size	A	C	D
2" 50mm	1.69 43	3.31 84	5.79 147
2.5" 65mm	1.81 46	3.31 84	6.10 155
3" 80mm	1.81 46	3.54 90	6.50 165
4" 100mm	2.06 52	4.47 114	7.52 191
5" 125mm	2.19 56	4.82 122	8.11 206
6" 150mm	2.19 56	5.51 140	8.62 219
8" 200mm	2.38 60	6.75 171	10.24 260
10" 250mm	2.69 68	7.93 201	11.50 292
12" 300mm	3.06 78	9.06 230	13.35 339
14" 350mm	3.06 78	10.14 258	14.50 368
16" 400mm	4.00 102	11.81 300	15.83 402
18" 450mm	4.50 114	12.93 328	16.62 422
20" 500mm	5.00 127	14.06 357	18.90 480

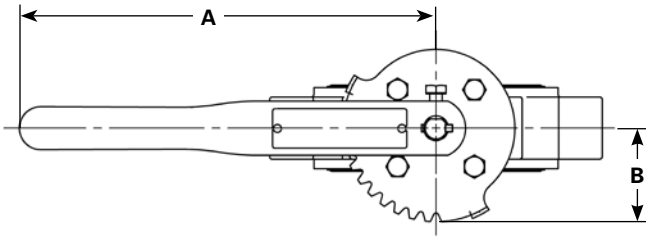
Inch
Millimeter

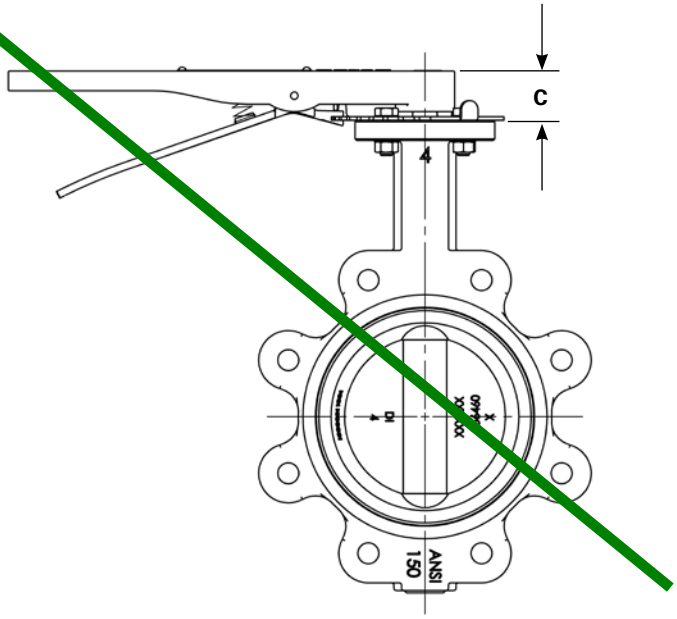
Dimensions

Lever

Valve Size	Dimensions		
	A	B	C
2-6"	10.53	2.37	1.25
50-150mm	267	60	32

Inch
Millimeter





Sales and Service

For information about our worldwide locations, approvals, certifications and local representative:
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Printed in the U.S.A.

auma®

Solutions for a world in motion

Part-turn actuators ***Generation .2***

SQ 05.2 – SQ 14.2
Expanding Possibilities

Think ahead

AUMA part-turn actuators generation .2 will be available in the near future. Get informed now and focus on the future.

The new generation of electric part-turn actuators and actuator controls

AUMA actuators and actuator controls are widely used in process plants throughout the world. Their sophisticated engineering and proven reliability guarantee precise and permanent service – for any application.

Within the new generation .2 product line, AUMA introduce a significant further development for the increasing demands in all types of process plants – from the water industry and energy sector to the oil and gas industry. AUMA part-turn actuators of generation .2 decisively expand your options. They warrant highest precision and repetitive accuracy for butterfly valves or ball valves – as modulating or open-close actuators. The modular design further facilitates fast, cost-efficient and individual configuration as well as permanent service friendliness supported by various interfaces.

Convince yourself of the many advantages of generation .2 – we look forward to further provide you with detailed information.

Improve your process – AUMA Generation .2

Part-turn actuators Generation .2

: Optimised modulating behaviour
: Extended operating time range
: Simplified commissioning and service
: Long service life and outstanding reliability
: Identical operation concept to multi-turn actuators of generation .2
: Flexible mechanical adaptation to suit different valve types

for a world in motion

AC 01.2 controls Generation .2

: Accurate programming and setting, wireless or directly at device display
: User-friendly, intuitive operation, in more than 30 languages
: Function extension updates can be made wireless via Bluetooth
: Comfortable operation, setting, diagnostic and storage of all actuator data via AUMA ToolSuite using laptop or PDA.

for a world in motion

SQ 05.2 – SQ 14.2 with AC 01.2

: Torques: 50 – 2,400 Nm
: Operating time ranges for 90°: 4 – 100 s
: High IP enclosure protection
: Explosion proof version available
: Excellent corrosion protection
: Parallel interfaces to DCS:
up to 10 binary inputs
up to 12 output contacts
up to 2 analogue inputs and outputs
: Interfaces to fieldbus systems:
Profibus DP-V2, Modbus RTU and others
: Electrical connection via AUMA plug/ socket connector with enlarged terminal compartment/cable entries

for a world in motion

Expand your possibilities

AUMA part-turn actuators of generation .2 are available for open-close and modulating duty – for any type of electrical connection. The torque range is extended at both upper and lower limits due to an additional actuator size.

Precision and control accuracy

The backlash-free AUMA motor coupling paired with the higher setting accuracy of the control unit improve precision repetitivity and positioning accuracy. The true torque measurements are more reliable and flexible. For example: stable tripping torque throughout the complete service life, reliably reaching the maximum torque and controlling smaller tripping torques.

Flexibility and adaptation

Flexible adaptation of nearly any valve type via the valve connection of generation .2 as standardised hollow shaft/ coupling solution.

Safe operation

End stops as stop screws cannot block and guarantee highest safety. Simple and reliable operation of spring-loaded change-over mechanism, including signalisation via microswitches.

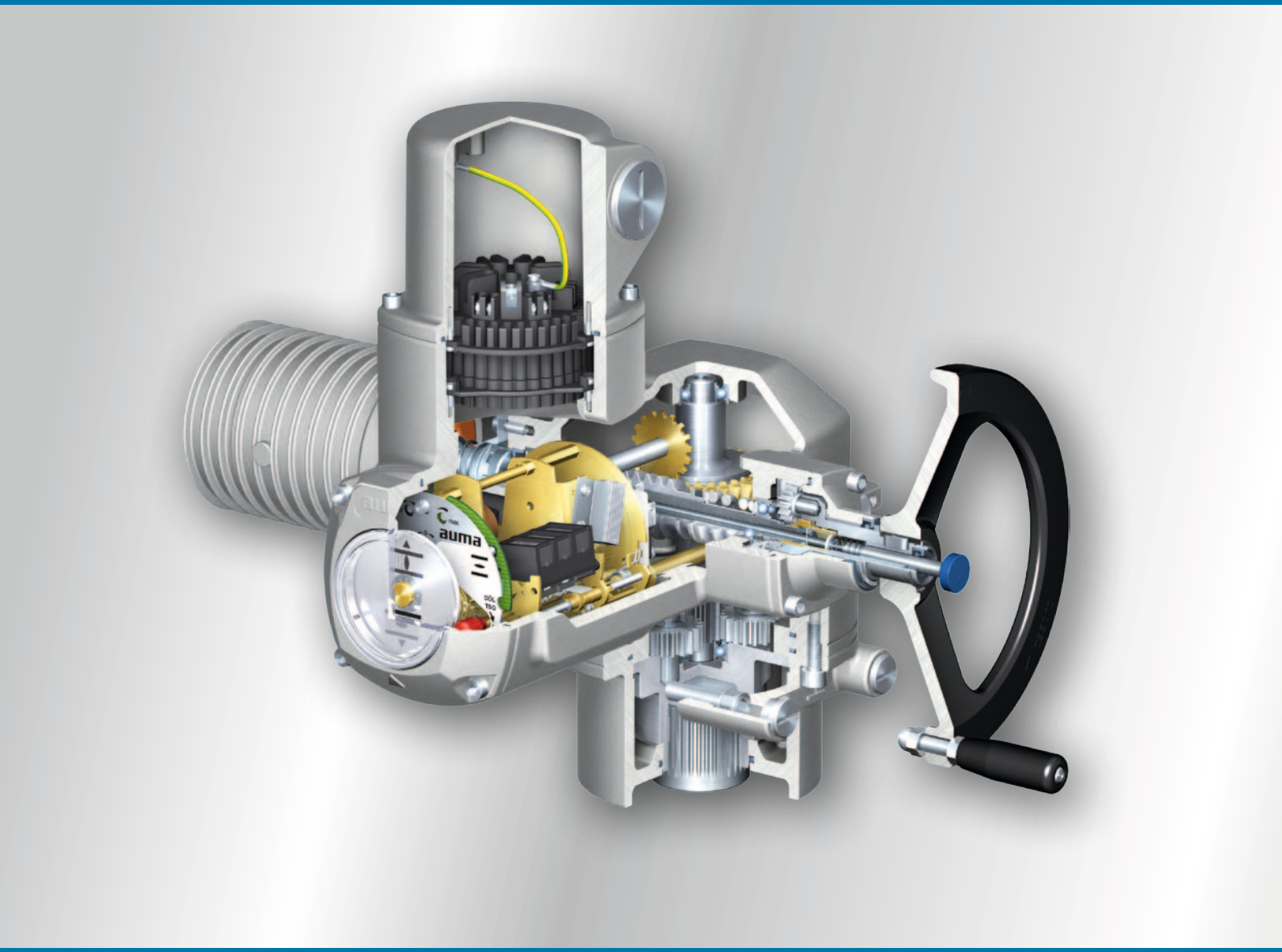
Permanent reliability

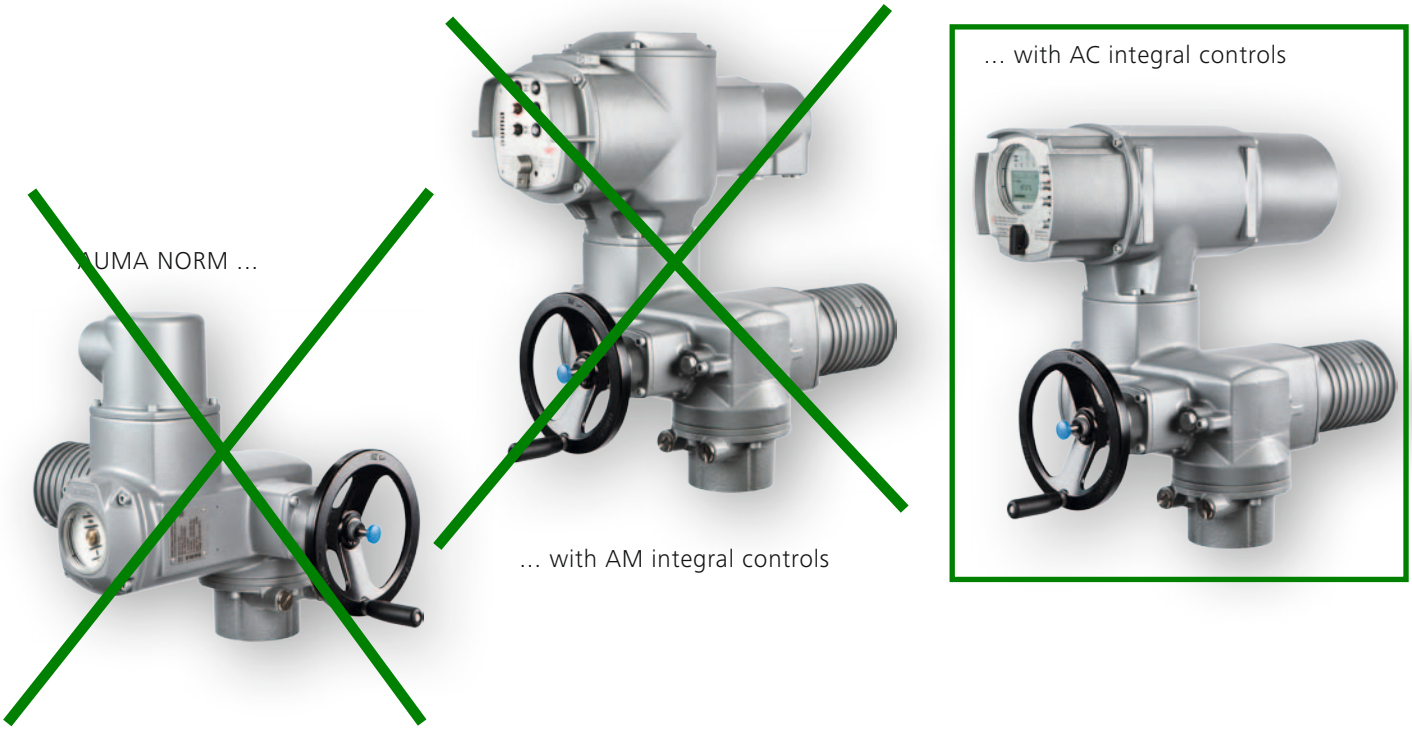
Material selection, design and new manufacturing processes significantly increase service life and safeguard your investments. Standard powder coating allows higher corrosion protection category than available market standards.

Intelligent diagnostic functions and sensor system

Temperature and vibration sensors monitor service parameters and facilitate preventive service. In combination with signals relating to maintenance, function and failures, operation safety is significantly increased and failures can be prevented.

SQ .2 part-turn actuators for open-close and modulating duty





Modularity – controls for any automation task

AUMA part-turn actuators can be integrated into any DCS concept. The options include direct processing of end position signals as well as fieldbus communication within a Plant Asset Management System. For this purpose, actuators can be supplied with or without AM or AC integral controls.

Variable assembly

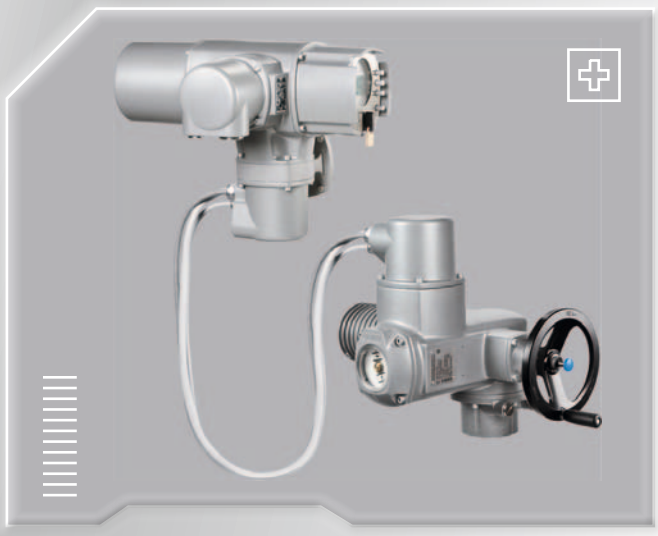
Actuators and controls can be mounted separately using the AUMA wall bracket to ensure optimum results even under space constraints or in places difficult to access.

Easy operation

Clear presentation of all operation and configuration options on a large and easy-to-read display. User-friendly menu navigation, in all universal languages. Operation via local controls or wireless connection via AUMA ToolSuite.

Diagnostic and operating data logging

All parameter and diagnostic data can be directly read out. Torque curves are recorded and displayed. Time-stamped history for setting, operation process and faults can be accessed at any time. All events and signals are classified according to NAMUR recommendation NE 107.



Perfect connection

In parallel communication, up to 10 digital inputs and up to 12 output contacts offer a comprehensive interface to the DCS. AC 01.2 controls offer interfaces to all conventional fieldbus systems, including Profibus DP-V2, and support the concepts for smooth device integration into the DCS, such as e.g. FDT/DTM.

Enhanced applications

Undervoltage conditions up to –30 %.
Ambient temperatures between –60 °C and +70 °C.

auma®

Solutions for a world in motion

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ISO 14001 TÜV SÜD ISO 9001
Certificate Registration No. 12 100/104 4269

Subject to change without notice. The product features and technical data provided do not express or imply any warranty.
Y005.679/002/en/1.12

SQ 05.2 – SQ 14.2
AUMA NORM

Technical data Part-turn actuators for open-close duty with 1-phase AC motors

Type	Operating time for 90° in seconds		Torque range[1]		Valve attachment		Valve shaft			Handwheel		Weight
	50 Hz	60 Hz	Min. [ft-lb]	Max. [ft-lb]	Standard MSS SP-101	Option EN ISO 5211	Cylindrical max. [in.]	Square max. [in.]	Two-flat max. [in.]	Ø in.	Turns for 90°	approx. [lb]
SQ 05.2	4	3	37	110	FA07	F05/F07 F10	0.85	0.85	6.30	11	46[2] 60[3]	
	5.6	4.5								16		
	8	6								11		
	11	9								16		
	16	12								11		
	22	17								16		
	32	25								11		
SQ 07.2	4	3	74	220	FA07	F05/F07 F10	1	0.85	0.85	6.30	11	46[2] 60[3]
	5.6	4.5								16		
	8	6								11		
	11	9								16		
	16	12								11		
	22	17								16		
	32	25								11		
SQ 10.2	8	6	147	330 / 440	FA10	F10/F12	1.5	1.2	1.05	7.90	11	57[2] 68[3]
	11	9									15	
	16	12									11	
	22	17									15	
	32	25									11	
	45	35									15	
	63	50									11	
SQ 12.2	16	12	295	660 / 880	FA12	F12/F14	2	1.4	1.60	7.90	22	77[2] 95[3]
	22	17									30	
	32	25									22	
	45	35									30	
	63	50									22	
SQ 14.2	24	20	590	1,325 / 1,770	FA14	F14/F16	2.38	1.80	1.80	7.90	70	97[2] 121[3]
	36	30									51	
	48	40									70	
	72	60									51	
	100	85									70	

General information

Part-turn actuators AUMA NORM require external controls.
For sizes SQ 05.2 – SQ 14.2, AUMA offer AM or AC actuator controls. These can also easily be mounted to the actuator at a later date.

Notes on table

1) Torque range	The tripping torque is adjustable for directions OPEN and CLOSE within the indicated torque range.
2) Weight	Indicated weight includes part-turn actuator AUMA NORM with 1-phase AC motor, standard electrical connection, unbored coupling and handwheel
3) Weight with base and lever	Indicated weight includes part-turn actuator AUMA NORM with 1-phase AC motor, standard electrical connection, and handwheel, including base and lever

Features and functions

Type of duty	Short-time duty S2 - 10 min
	For nominal voltage, 40 °C ambient temperature and at average load with 35 % of the max. torque
Motors	1-ph AC motor, type IM B9 according to IEC 60034
Mains voltage, mains frequency	Standard voltages:

1-phase AC current voltages/frequencies

Volt	110 – 120	110 – 120	220 – 240	220 – 240
Hz	50	60	50	60

Permissible variation of mains voltage: ±10 %
Permissible variation of mains frequency: ±5 %

Overvoltage category	Category III according to IEC 60364-4-443	
Insulation class	Standard:	F, tropicalized
	Option:	H, tropicalized

We reserve the right to alter data according to improvements made. Previous documents become invalid with the issue of this document.

Motor protection	Standard:	Thermoswitches (NC)
	Option:	PTC thermistors (according to DIN 44082) PTC thermistors additionally require a suitable tripping device in the controls
Motor heater (option)	Voltages:	110 – 120 V AC, 220 – 240 V AC or 380 – 400 V AC (externally supplied)
	Power:	12.5 W
Swing angle	Standard:	Adjustable between 75° and < 105°
	Options:	15° to < 45°, 45° to < 75°, 105° to < 135°
Self-locking	Yes (Part-turn actuators are self-locking if the valve position cannot be changed from standstill while torque acts upon the output drive.)	
Manual operation	Manual drive for setting and emergency operation, handwheel does not rotate during electrical operation	
	Options:	Handwheel lockable Handwheel stem extension
Indication for manual operation (option)	Indication whether manual operation is active/not active via single switch (1 change-over contact) For further information refer to separate data sheet Technical data for switches.	
Electrical connection	Standard:	AUMA plug/socket connector with screw-type connection
	Options:	Terminals or crimp connection Gold-plated control plug (sockets and plugs)
Threads for cable entries	Standard:	NPT-threads
	Options:	Pg-threads, metric threads, G-threads
Terminal plan	TPA01R1AB-001-000 (basic version)	
Splined coupling for connection to the valve shaft	Standard:	Coupling without bore
	Options:	Machined coupling with bore and keyway, square bore or bore with two flats according to MSS SP-101
Valve attachment	Dimensions according to MSS SP-101 without spigot	

With base and lever (option)		
Swing lever	Made of spheroidal cast iron with two or three bores for fixing a lever arrangement. Considering the installation conditions, the lever may be mounted to the output shaft in any desired position.	
Ball joints (option)	Two ball joints matching the lever, including lock nuts and two welding nuts, suitable for pipe according to dimension sheet	
Fixing	Base with four holes for fastening screws	

Electromechanical control unit		
Limit switching	Counter gear mechanism for end positions OPEN and CLOSED	
	Standard:	Tandem switches (2 NC and 2 NO) for each end position, switches galvanically isolated
	Options:	Triple switches (2 NC and 3 NO) for each end position, switches galvanically isolated Intermediate position switch (DUO limit switching), adjustable for any position
Torque switching	Torque switching adjustable for directions OPEN and CLOSE	
	Standard:	Single switches (1 NC and 1 NO) for each direction, not galvanically isolated
	Options:	Tandem switches (2 NC and 2 NO) for each direction, switches galvanically isolated
Position feedback signal, analogue (option)	Potentiometer or 0/4 – 20 mA (RWG/EWG)	
Mechanical position indicator	Continuous indication, adjustable indicator disc with symbols OPEN and CLOSED	
Running indication	Blinker transmitter	
Heater in switch compartment	Standard:	Self-regulating PTC heater, 5 – 20 W, 110 – 250 V AC/DC
	Options:	24 – 48 V AC/DC or 380 – 400 V AC
	A resistance type heater of 5 W, 24 V AC is installed in the actuator in combination with the AM or AC actuator controls.	

We reserve the right to alter data according to improvements made. Previous documents become invalid with the issue of this document.

Electronic control unit (only in combination with AC actuator controls)	
Non-intrusive setting (option)	Magnetic limit and torque transmitter (MWG)
Position feedback signal	Via actuator controls
Torque feedback signal	Via actuator controls
Mechanical position indicator	Continuous indication, adjustable indicator disc with symbols OPEN and CLOSED
Running indication	Blinking signal via controls
Heater in switch compartment	Resistance type heater with 5 W, 24 V AC

Service conditions			
Use	Indoor and outdoor use permissible		
Mounting position	Any position		
Installation altitude	≤ 6,500 ft above sea level for > 6,500 ft above sea level, please contact AUMA		
Ambient temperature	Standard:	–40 °C to +70 °C (-40 °F to +158 °F)	
	Options:	[redacted]	
Enclosure protection according to EN 60529	Standard:	IP68 with AUMA 1-phase AC motor	
	Option:	[redacted]	
	According to AUMA definition, enclosure protection IP68 meets the following requirements: • Depth of water: maximum 26 ft head of water • Duration of continuous immersion in water: Max. 96 hours • Up to 10 operations during continuous immersion		
Pollution degree	Pollution degree 4 (when closed) according to EN 50178		
Vibration resistance according to IEC 60068-2-6	2 g, from 10 Hz to 200 Hz Resistant to vibration during start-up or for failures of the plant. However, a fatigue strength may not be derived from this. Valid part-turn actuators in version AUMA NORM (with AUMA plug/socket connector, without actuator controls).		
Corrosion protection	Standard:	KS	Suitable for installation in industrial units, in water or power plants with a low pollutant concentration as well as for installation in occasionally or permanently aggressive atmospheres with a moderate pollutant concentration (e.g. wastewater treatments plants, chemical industry)
	Options:	KX	[redacted]
Color	Standard:	AUMA silver-grey (similar to RAL 7037)	
	Option:	[redacted]	
Lifetime	AUMA part-turn actuators meet or even exceed the lifetime requirements of EN 15714-2. Detailed information can be provided on request.		

Further information	
EU Directives	Electromagnetic Compatibility (EMC): (2004/108/EC) Low Voltage Directive: (2006/95/EC) Machinery Directive: (2006/42/EC)
Reference documents	Electrical data Part-turn actuators SQ 05.2 – SQ 14.2 with 1-phase AC motor Technical data Electronic position transmitter/potentiometer Technical data for switches

We reserve the right to alter data according to improvements made. Previous documents become invalid with the issue of this document.

SQ 05.2 – SQ 14.2

Electrical data Part-turn actuators for open-close duty with 1-phase AC motors

Short-time duty S2 - 10 min, 110 V – 120 V/60 Hz

Part-turn actuator			Motor									AUMA power class switchgears	
Type	Operating time for 90° [in seconds]	Max. torque [Nm]	Motor type	Nominal power[1] P_N [kW]	Speed [rpm]	Operating capacitor[2] [µF]	Nominal current[3] I_N [A]	Max. current[4] I_{max} [A]	Starting current I_A [A]	cos φ	Overcurrent protection device setting [A]	Contac-tor	Thyristor unit
SQ 05.2	3	150	VW00063-2-0.06	0.06	3,360	70	2.6	4.0	14	0.96	4.0	A1	B1
	4.5						2.6	3.7	14	0.96	3.7	A1	B1
	6		VW00063-4-0.04	0.04	1,680	50	2.7	3.2	5.4	0.98	3.2	A1	B1
	9						2.7	3.1	5.4	0.98	3.1	A1	B1
	12		VW00063-4-0.02	0.02	1,680	35	1.7	1.8	4.9	0.84	1.8	A1	B1
	17						1.7	1.8	4.9	0.84	1.8	A1	B1
	25		SW00063-4-0.01	0.01	1,680	35	1.6	1.7	4.9	0.82	1.7	A1	B1
SQ 07.2	3	300	VW00063-2-0.12	0.12	3,360	100	4.7	7.0	14	0.91	7.0	A1	B1
	4.5						4.7	6.5	14	0.91	6.5	A1	B1
	6		VW00063-4-0.06	0.06	1,680	70	3.5	4.4	8.5	0.98	4.4	A1	B1
	9						3.5	4.2	8.5	0.98	4.2	A1	B1
	12		VW00063-4-0.03	0.03	1,680	50	2.6	3.1	5.4	0.98	3.1	A1	B1
	17						2.6	3.0	5.4	0.98	3.0	A1	B1
	25		SW00063-4-0.01	0.01	1,680	35	1.6	1.9	4.9	0.82	1.9	A1	B1
SQ 10.2	6	450	VW00063-4-0.10	0.10	1,680	80	4.3	5.6	8.8	0.98	5.6	A1	B1
	9						4.3	5.7	8.8	0.98	5.7	A1	B1
	12	600	SW00063-4-0.06	0.06	1,680	60	2.9	3.9	7.7	0.96	3.9	A1	B1
	17						2.9	3.5	7.7	0.96	3.5	A1	B1
	25		SW00063-4-0.04	0.04	1,680	50	2.7	3.2	5.4	0.98	3.2	A1	B1
	35						2.7	3.0	5.4	0.98	3.0	A1	B1
	50		SW00063-4-0.02	0.02	1,680	35	1.7	1.8	4.9	0.84	1.8	A1	B1
SQ 12.2	12	900	VW00063-4-0.10	0.10	1,680	80	4.3	5.6	8.8	0.98	5.6	A1	B1
	17						4.3	5.7	8.8	0.98	5.7	A1	B1
	25	1,200	SW00063-4-0.06	0.06	1,680	60	2.9	3.9	7.7	0.96	3.9	A1	B1
	35						2.9	3.5	7.7	0.96	3.5	A1	B1
	50		SW00063-4-0.04	0.04	1,680	50	2.7	3.2	5.4	0.98	3.2	A1	B1
SQ 14.2	20	1,800	VW00063-2-0.19	0.19	3,360	110	6.0	7.2	14	0.90	7.2	A1	B1
	30		VW00063-4-0.10	0.10	1,680	80	4.3	5.6	8.8	0.98	5.6	A1	B1
	40						4.3	5.7	8.8	0.98	5.7	A1	B1
	60	2,400	SW00063-4-0.06	0.06	1,680	60	2.9	3.9	7.7	0.96	3.9	A1	B1
	85						2.9	3.5	7.7	0.96	3.5	A1	B1

Notes on table	
1) Nominal power P_N	Mechanical power output at motor shaft at running torque of part-turn actuator (corresponds to approx. 35 % of maximum torque). The consumed electrical power can be calculated using the following formula: $P = U \times I \times \cos \varphi$
2) Operating/starting capacitor	For VW/SW motors, operating capacitors are integrated within the motor.
3) Nominal current I_N	Current at running torque
4) Max. current I_{max}	Current at maximum torque

Notes on installation and sizing	
Motor data	Motor data is approximate. Due to usual manufacturing tolerances, there may be deviations from the values given.
Thermoswitches/PTC thermistors	To protect against overheating, thermoswitches or PTC thermistors are embedded in the motor windings. **Actuators without integral controls (AUMA NORM):** Thermoswitches or PTC thermistors have to be considered within the external controls (refer to terminal plan). **Note: Failure to connect thermoswitches or PTC thermistors shall void or warranty for the motor.** **Rating of the thermoswitches**

AC current		DC current	
250 V, 50 – 60 Hz		60 V	1.0 A
cos φ = 1	2.5 A	42 V	1.2 A
cos φ = 0.6	1.6 A	24 V	1.5 A

	Actuators with AM or AC integral controls: Thermal motor protection is already integrated.
Mains voltage, mains frequency	Permissible variation of the mains voltage: ±10 % Permissible variation of the mains frequency: ±5 %

We reserve the right to alter data according to improvements made. Previous documents become invalid with the issue of this document.

Terminal plan

Part-turn actuators	Motor (type)	Terminal plan
SQ 05.2 – SQ 14.2	VW.../SW...	TPA01R1AA-101-000

For further information refer to "Technical data Part-turn actuators SQ 05.2 – SQ 14.2 for open-close duty with 1-phase AC motors".

Switchgear sizing

For motor operation, reversing contactors (mechanically, electrically and electronically locked) or thyristors (electronically locked) can be used.

Actuators without integral controls (AUMA NORM):

Switchgears are supplied by the customer. We recommend specification of switchgears suitable for their rated operating power/motor power in compliance with the assigned AUMA power class.

Switchgear assignment to AUMA power classes:

AUMA power class	Reversing contactor Rated power according to IEC 60947-4-1:2010 AC-3	Reversing contactor motor power according to UL/CSA at	
	400 V AC	480 V AC	600 V AC
A1	4.0 kW	5.0 hp	5.0 hp
A2	7.5 kW	10 hp	10 hp
A3	15 kW	20 hp	25 hp
A4	30 kW	60 hp	60 hp
A5	55 kW	75 hp	100 hp

Actuators with AM or AC integral controls:

Required switchgears are already integrated.

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NOTE:
AN ELECTRICAL CONNECTION DIAGRAM HAS BEEN INCLUDED INSIDE THE UNIT AT THE CUSTOMER CONNECTIONS.

SHORT TERM STORAGE
(LESS THAN ONE YEAR)

ACTUATORS SHOULD BE STORED INDOORS IN A CLEAN, DRY, PROTECTED ENVIRONMENT FREE FROM EXCESSIVE VIBRATION AND RAPID TEMPERATURE CHANGES. IF ACTUATORS ARE STORED OUTDOORS, THEY MUST BE HIGH ENOUGH OFF THE GROUND TO BE ABOVE WATER AND SNOW LEVELS.

AUMA ACTUATORS ARE SEALED WHEN SHIPPED AND SEAL INTEGRITY MUST BE MAINTAINED WHILE IN STORAGE. ALL COVERS, SEALS AND PLUGS MUST BE KEPT SECURELY IN PLACE AT ALL TIMES.

FOR LONG TERM STORAGE RECOMMENDATIONS (MORE THAN ONE YEAR), CONTACT THE AUMA FIELD SERVICE DEPARTMENT.

CAUTION: FAILURE TO PROVIDE PROPER STORAGE WILL VOID THE WARRANTY.

Xylem, Inc.

N19W23993 Rigdeview Pkwy W, Ste 200
Waukesha, WI 53188 USA
Tel 414 365 2200
Fax 414 365 2210
www.xylem.com

EQUIPMENT SUBMITTAL BOOKLET

FOR

Aumsville, OR
Wastewater Treatment Plant

Specification Section 11300
Packaged SBR and Digester Equipment

PURCHASER:
City of Aumsville
595 Main Street
Aumsville, OR 97325
Phone:
Fax:
PO # Notice of Award

ENGINEER:
Westech Engineering, Inc.
Salem, OR

REPRESENTATIVE:
Beaver Equipment, LLC
15112 NE 198th Street
Woodinville, WA 98072
Phone: 425-398-8082
Fax: 425-398-8570

SUPPLIER:
Xylem, Inc. – Sanitaire Products
N19W23993 Rigdeview Parkway West, Suite 200
Waukesha, WI 53188 USA
Phone: +414-365-2200
Fax: +414-365-2210

Sanitaire Project #: 25-0365A

DATE: **July 23rd, 2025**

Project: Aumsville, OR WWTP **Sanitaire #: 25-0365A**

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- SBR Basins Fine Bubble Aeration System Performance Summary
- 'WE' Membrane Disc Diffuser Specifications and Quality Control Procedures
- Spare Parts List

SECTION 2

- Certified OTE Data from Past Test Results for the SBR Basins
- Oxygen Transfer Efficiency Shop Test Procedure

MECHANICAL DETAILS

- JCM Clamp Coupling Information
- Hilti Kwik Bolt III Expansion Anchor Information
- Jefferson Solenoid Valve Information

DRAWINGS

- Sanitaire Submittal Drawings E-1 through E-5

Project: Aumsville, OR WWTP **Sanitaire #: 25-0365A**

GENERAL COMMENTS

1. All items furnished by Xylem are for installation by others. Coordination between other applicable subcontractors and the aeration equipment by Xylem will be done by the Contractor.

2. Any valves, flow meters, flow conditioners and blow-offs on the air supply piping are supplied by others.

3. Any wall sleeves, wall spools, or seals required for installation of the Xylem supplied equipment are supplied by others.

4. Chemical treatment or lubrication of threaded stainless steel assemblies, if required, is supplied and installed by others.

5. Painting and protective coatings for any component supplied by Xylem are not included in the Xylem scope of supply for this contract.

6. Debris and foreign material are not to be flushed from the air main through the Xylem aeration piping. The airmain should be flushed prior to the attachment of the dropleg. Xylem will not be responsible for any damage resulting from this practice.

7. The PVC portion of the dropleg is shipped loose to the jobsite. The pipe is then cut to suit for proper length and field solvent welded into the manifold by the contractor. Materials for the field solvent welding are not supplied by Xylem.

8. Xylem does not supply any tools for anchor bolt installation.

9. There are not any additional spare parts recommended by Xylem other than those specified and listed in this Submittal.

10. The Xylem supplied stainless steel dropleg assemblies for the Sanitaire equipment are fabricated by Felker Brothers in Marshfield, WI. Their welding procedures and qualifications were developed in accordance with ASME IX. Felker Brothers welders are current to date with ASME IX. Felker Brothers is ISO 9001 certified.

11. The Xylem supplied welded stainless steel dropleg assemblies are cleaned in accordance with ASTM A380-88 Section 6.2.11. The acid solution is as defined in ASTM A380 Table A2.1 Annex A2. Materials have a final rinse using ordinary industrial or potable water and are dried in conformance with ASTM A380 Section 8.3. Xylem can provide cleaning notification or verification if required.

12. Xylem furnishes PVC pipe for the 4" sewer size air distributors with materials per ASTM D3915 and manufactured per ASTM D3034. ASTM 3034 was written specifically for sewer size pipe. Pipe and fitting manufacturing specification ASTM 3034 is required to be used with proprietary patented Sanitaire fixed joint designs.

13. The actual TiO2 content of commercially available Sch. 40 PVC is proprietary but is typically 1 to 1.5%. Sch. 40 PVC does not require the same amount of UV protection as the sewer size piping due to the greater wall thickness. The sewer size distributor and diffuser assemblies do have a minimum 2% TiO2 content per Xylem material specifications.

14. No special tools other than those shown on the drawings are required for equipment maintenance.

15. The equipment Installation, Operation and Maintenance (IO&M) Manual will be transmitted after submittal approval and before shipment. These manuals will include Erection Drawings marked "Approved for Construction" with piece marks.

16. A Bill of Materials and Warranty Statement will be included in the IO&M Manual.

17. Information on Xylem requirements for equipment storage, protection, and handling before and after installation are included in the IO&M Manual. Any costs or materials for on-site storage are supplied by others.

18. The Xylem leveling standard for SANITAIRE Fine Bubble Aeration Equipment is +/- ¼" (6mm). The supports allow leveling to within +/- 1/8" (3mm) of a common horizontal plane without removing the header from the support.

19. The equipment and manpower for all applicable field testing (i.e., leak, level, uniformity, support static load, etc.) will be provided by others. Xylem will provide the specified inspection and training services.

20. Any and all equipment and costs associated with videotaping of the operator training, if required, will be provided by others.

MEMBRANE DISC GRID SYSTEM

FINE BUBBLE AERATION EQUIPMENT DATA SHEETS

Project: Aumsville, OR WWTP **Sanitaire #: 25-0365A**

Location: SBR Basins 1-2

UPPER DROPLEG

Material: 304L S.S. Size: 8" Wall Thk.: Sch. 5 (0.109")

Number: 2

LOWER DROPLEG

Material: 304L S.S. Size: 8" Wall Thk.: Sch. 5 (0.109")

Number: 2

MANIFOLD

Material: 304L S.S. Size: 8" Wall Thk.: Sch. 5 (0.109")

Number: 2

AIR DISTRIBUTORS

Material: UPVC Size: 4.215" O.D. Wall Thk.: SDR 33.5 (0.125")

GRID PURGE SYSTEM

Type: Dual Valve Assembly Quantity: 1 per Grid

SUPPORTS

Material: 304 Stainless Steel

ANCHORS

Material: 304 Stainless Steel By: Xylem

Manifold Type: Expansion Size: 1/2"

Distributor Type: Expansion Size: 3/8"

DIFFUSERS – 9" Membrane Disc, WE

Material: EPDM Effective Area: 0.41 Square Feet

One (1) 13/64" Diameter Diffuser Orifice, Shop Drilled

GRID INFORMATION

Grid Type	No. of Grids	Distributors per Grid	Holders per Distributor	Total Holders per Grid	Total Diffusers Installed per Grid	Total Diffusers for this Grid Type
1	2	11	56	616	616	1,232

SANITAIRE
a xylem brand

Diffused Aeration Equipment

for

Aumsville, OR WWTP

SBR Basins 1 & 2

Sanitaire #25-0365A
April 2, 2025
fm J:\25-0365a\365 Engineer\365 Aeration\365 Subm Book\0365a Perf Summ SBR Basins rev 0.aer

Sanitaire Aeration Design Inputs for: Aumsville, OR WWTP, Sanitaire #25-0365A

Tank Geometry

2 Trains each Consisting of: 1

Parameter	Units	Pass 1
Parallel Reactors		1
Pass Process		Aerobic
SWD	ft	14.1
Submergence	ft	13.1
Volume	ft^3	70,223.4
Reactor Geometry:		Rect
Length	ft	108.5
Width	ft	46.0

Oxygen/Air Distribution

	Zone	1
	Pass	1
Default		100.0%

Oxygenation

Parameter	Units	Design SOR
No. Trains Operating		1
Oxygen Requirement	lb/day	6,264.0-S

Standard Oxygen Correction Factor Parameters

Parameter	Units	Design SOR
Site Elevation	FASL	350
Ambient Pressure	PSIA	14.53
Water Temperature	°C	***20***

Notes:

Bold, Italicized text indicate assumptions made by Sanitaire

A - Indicates Actual (AOR) Requirement.

S - Indicates Standard Condition (SOR) Oxygen requirement.

If the AOR/SOR parameter is not given, then its value will be evaluated later if suitable alpha, beta, D.O., theta, pressure, and temperature data is supplied.

Round tanks are evaluated as rectangular tanks diameter equal to length and equal surface area.

Annular tanks are evaluated as rectangular tanks of width equal to the annular width and equal surface area.

Sanitaire Project Name: Aumsville, OR WWTP
Sanitaire Project #25-0365A
Design Summary

	Units	Design SOR Default
No. Trains in Operation		1
No. Grids in Operation		1
No. Operating Diffusers		616
SOR	lb/day	6,264
SOTE	%	26.5
Total Air Rate	scfm	944.4
Min.Diffuser Air Rate	scfm/diff.	1.53
Max. Diffuser Air Rate	scfm/diff.	1.53
Static Pressure	psig	5.66
Diffuser DWP @ Min Air	psig	0.52
Diffuser DWP @ Max Air	psig	0.52
Pressure @ Top of Dropleg	psig	6.31
Est. Blower Efficiency		70%
Est. Motor Efficiency		90%
Shaft Power	Bhp	34.12
Est. Motor Electrical Load	kW	28.28
Est. Standard Aeration Efficiency	#SOR/BHP-hr	7.65

Notes:

(1) Design air is the maximum of process air or mixing air

(2) Delivered oxygen based on design air

(3) Brake Horsepower based on adiabatic compression, 70% mechanical efficiency and 0.30 psi lineloss

(4) Performance based on diffuser density (At/Ad), submergence, and diffuser unit air flow.

(5) Diffuser Air Flow based on Active Valve Modulation

(6) Blower Pressure Capability also requires consideration of:
blower and the aeration assembly dropleg connections.
Design Manual (EPA/625/1-89/023), WEF Manual of Practice FD-13, and other
Fine Pore systems regardless of supplier or type of diffuser element.
C. Increased diffuser submergence during Peak Flow conditions.

(7) Air Flow defined at 20°C

(8) Fine Mixing air based on MOP/8 0.12 scfm/ft²

Sanitaire Project Name: Aumsville, OR WWTP
Sanitaire Project #25-0365A
Consulting Engineer:
Operating Condition: Design SOR
Oxygen Distribution: Default

Aeration System Design

Parameter	Units	Zone 1	Totals/Overall
Pass		1	
SWD	ft	14.07	
Subm	ft	13.07	
Volume	ft³	70,223.4	70,223.4
No. Parallel Tanks		1	
No. Trains in Operation		1	
Grid Count		1	1
Dropleg Diameter	inches	8	
At/Ad		19.7616408	
Diffuser Density	% Floor	5.06%	
Diffusers/Grid		616	616

Oxygen Transfer

Diffuser Type		SSII-9	
Alpha			
Beta			
Theta			
D.O.	mg/l		
Water Temp	°C	20	
AOR/SOR			
Oxygen Distribution	%/Zone	100.0%	100.0%
AOR	lb/day		
SOR	lb/day	6,264.0	6,264.0
Air Rate (7)	scfm		

Performance

Mixing Criteria	scfm/ft²	0.12	
Safety Factor	%		
Mixing Air (8)	scfm	598.9	
Process Air (for SOR)	scfm	944.4	
Design Air (1,7)	scfm	944.4	944.4
Diffuser Air Rate	scfm/Diff.	1.53	1.53
Delivered SOR	lb/day	6,264.0	6,264.0
Delivered SOTE	%	26.5%	26.5%
Pressure @ Top of Dropleg	psig	6.31	6.31
Shaft Power	Bhp	34.1	34.1

Notes:
(1) Design air is the maximum of process air or mixing air
(2) Delivered oxygen based on design air
(3) Brake Horsepower based on adiabatic compression, 70% mechanical efficiency and 0.30 psi lineloss
(4) Performance based on diffuser density (At/Ad), submergence, and diffuser unit air flow.
(5) Diffuser Air Flow based on Active Valve Modulation
(6) Blower Pressure Capability also requires consideration of:
A. The Air Main headloss (piping, fittings, valves, instrumentation, etc.)
between the blower and the aeration assembly dropleg connections.
B. Potential for increased headloss resulting from diffuser fouling and/or aging.
Please refer to the US EPA Fine Pore Design Manual (EPA/625/1-89/023), WEF Manual of Practice FD-13,
and other technical publications for a detailed discussion on this subject. Note that this headloss
consideration relates to all Fine Pore systems regardless of supplier or type of diffuser element.
C. Increased diffuser submergence during Peak Flow conditions.
(7) Air Flow defined at 20°C
(8) Fine Mixing air based on MOP/8 0.12 scfm/ft²

Sanitaire Project Name: Aumsville, OR WWTP
Sanitaire Project #25-0365A
Headloss Summary by System Operating Point
Consulting Engineer:
Operating Condition: Design SOR
Oxygen Distribution: Default

Grid Design

	Units	Grid 1
Diffuser Count		616
Dropleg Diameter	inches	8
Line Count		11
Line Spacing	ft	4.00
Manifold Diameter	inches	8
Manifold Length	ft	40.00
Header Length	ft	101.58
Manifold Location		Center
Manifold Elevation		Inline
Dropleg Location		End
Header Orientation		Length

Grid Pressure

Grid Air Flow	scfm	944.4
Diffuser Air Flow	scfm	1.53
Submergence	ft	13.07
Orifice Diameter	inches	13/64
Static Header Pressure Differential in Assembly	psig	1.32E-02
Average Header Pressure in Assembly	PSI	6.29
A: Average Headloss from Top of Dropleg To Headers	PSI	2.12E-02
B: Diffuser Orifice Headloss	psi	1.07E-01
C: Diffuser Dynamic Wet Pressure	psi	5.21E-01
D: Static Pressure	psig	5.66
Total Pressure Required at Top of Dropleg (A+B+C+D)	psig	6.31
Friction Headloss (A+B)	PSI	1.28E-01

Project: Aumsville, OR WWTP **Sanitaire #: 25-0365A**

9" SANITAIRE® MEMBRANE DISC DIFFUSER SPECIFICATIONS "SILVER SERIES II – WE"

MATERIAL PROPERTIES	VALUE/UNITS	TEST PROCEDURE
Base Compound	EPDM With Carbon Black for UV Protection	--
Tensile Strength (Unperforated)	1,200 PSI/Min.	ASTM D412
Elongation at Break	350% Min.	ASTM D412
Hardness (Durometer)	58 $\pm$ 5, Shore A	ASTM 2240
Accelerated Aging Compression Set (Under Constant Deflection) 22 Hrs. @ 70°C	40% Max.	ASTM D395 Test Method B
Accelerated Aging (Elongation (% Retained) 70 Hrs. @ 100°C	75% Max.	ASTM D573
Ozone Resistance 72 Hrs.; 40°C, 50 pphm	No cracks @ 2X magnification	ASTM D1171 Method A
Modulus @ 300%	500 PSI/Min.	ASTM D412
Dynamic Wet Pressure	9.6" – 14.4" w.c.	@ 1.0 SCFM @ 2" w.c.
PHYSICAL PROPERTIES		
Nominal Diameter	9"	
Active Surface Area	0.41 $Ft.^2$	
Material Thickness	0.080"	
Check Valve Leakage Rate	0 ml H_2O after 48 hours unpressurized	

Project: Aumsville, OR WWTP **Sanitaire #: 25-0365A**

SANITAIRE MEMBRANE DISC DIFFUSER SILVER SERIES II – WE
QUALITY CONTROL TEST REQUIREMENTS

Manufacturing of the Sanitaire Membrane Disc Diffuser is a two-step process, which requires testing prior to and after the membrane perforation process.

STEP 1 – MANUFACTURING QUALITY CONTROL TEST

The following Quality Control test shall be performed at the point of manufacturer, prior to membrane perforation.

PRIMARY

1. DUROMETER – 58 +/- 5%, Shore A, per ASTM 2240

PRIMARY SAMPLING CRITERIA

SPECIFICATION – MILITARY STANDARD 105E

TABLE 1 – SAMPLING SIZE AND CODE LETTER INFORMATION

- Lot or batch size 3201 to 10,000 units
- Primary test general inspection level II
- Primary test sample size code letter L

TABLE III-A - DOUBLE SAMPLING PLAN INFORMATION

- Primary test sample size code letter L
- Primary test sample size, 125 units each, (2) samples per batch
- Primary test AQL level 4.0

PRIMARY TEST ACCEPTANCE CRITERIA

SAMPLE #1 (i.e.: 125 units)

A.) If 7 or less units are found defective the entire batch is accepted and no further testing is required.
B.) If 8, 9 or 10 units found defective sample number 2 must be tested
C.) If 11 or more units are found defective in the first sample the batch is rejected. The manufacturer at their option may test any or all diffusers from the rejected batch and furnish those units that are within the acceptable range.

SAMPLE #2 (i.e.: 125 units)

A.) If a cumulative total of 18 units from sample #1 and sample #2 are found defective the entire batch is accepted and no further testing is required.
B.) If a cumulative total of 19 units from sample #1 and sample #2 are found defective the entire batch is rejected. The manufacturer at their option may test any and all

diffusers from the rejected batch and furnish those units, which are within the acceptable range.

SECONDARY

1. TENSILE STRENGTH – 1200 PSI per ASTM D412

2. MINIMUM MODULAS OF ELASTICITY – 500 PSI per ASTM D 412

3. SPECIFIC GRAVITY – 1.10 +/- 5%

SECONDARY SAMPLING CRITERIA

SPECIFICATION – MILITARY STANDARD 105E

TABLE 1 – SAMPLING SIZE AND CODE LETTER INFORMATION

- Secondary test special inspection level S-2
- Secondary test sample size code letter D

TABLE III-A - DOUBLE SAMPLING PLAN INFORMATION

- Secondary test sample size code letter D
- Secondary test samples size, 5 units each, (2) samples per batch Secondary test samples to be taken from primary sample test lot.
- Secondary test AQL level 6.5

SECONDARY TEST ACCEPTANCE CRITERIA

SAMPLE #1 (i.e.: 5 units)

A) If 0 units are found defective the entire batch is accepted and no further testing is required.
B) If 1 unit is found defective sample #2 must be tested.
C) If 2 or more units are found defective in the first sample the batch is rejected. The manufacturer at their option may test any or all diffusers from the rejected batch and furnish those units that are within the acceptable range.

SAMPLE #2 (i.e.: 5 units)

A) If a cumulative total of 1 unit from sample #1 and sample #2 are found defective the entire batch is accepted and no further testing is required.
B) If a cumulative total of 2 units from sample #1 and sample #2 are found defective the entire batch is rejected. The manufacturer at their option may test any and all diffusers from the rejected batch and furnish those units, which are within the acceptable range.

STEP 2 – PERFORMANCE QUALITY CONTROL TEST

The following Quality Control test shall be performed at the point of manufacturer, after membrane perforation.

1. DYNAMIC WET PRESSURE (DWP)

   9" Dia. Membrane: 9.6"- 14.4"w.c. @ 1.0 SCFM per diffuser.

   One diffuser per 25 shall be tested for DWP.

2. AIR FLOW UNIFORMITY

   Air flow uniformity is a visual inspection to verify substantially uniform air distribution when the diffusers submerged and operated at:

   0.5, 0.75 and 1.0 SCFM for the 9" Dia. Membrane Diffuser

   One diffuser per 100 shall be tested for Air Flow Uniformity.

Project: Aumsville, OR WWTP **Sanitaire #: 25-0365A**

AERATION SYSTEM SPARE PARTS LIST

The following spare parts will be provided in accordance with Specification Section 11300, Part 2.6n.

(25) 9" Membrane Disc Diffuser (WE)

(10) 9" Diffuser Retainer Ring

(5) 4" Air Distributor Guide Support Assembly

(3) 8" Manifold Support Assembly

(3) Air Distributor Section w/Holders (longest piece)

(10) 4" Sewer Size Coupling (socket x socket)

(5) 4" Fixed Joint Assembly

SANITAIRE CERTIFIED OTE TEST DATA

9 inch Silver Series II Membrane Disc (0.41 ft²/Disc)

TARGET: At/Ad = 19.76(+/- 8%). Submergence = 13.07 (ft.)(+/- 8%)., Water Depth = 14.07 (ft.)

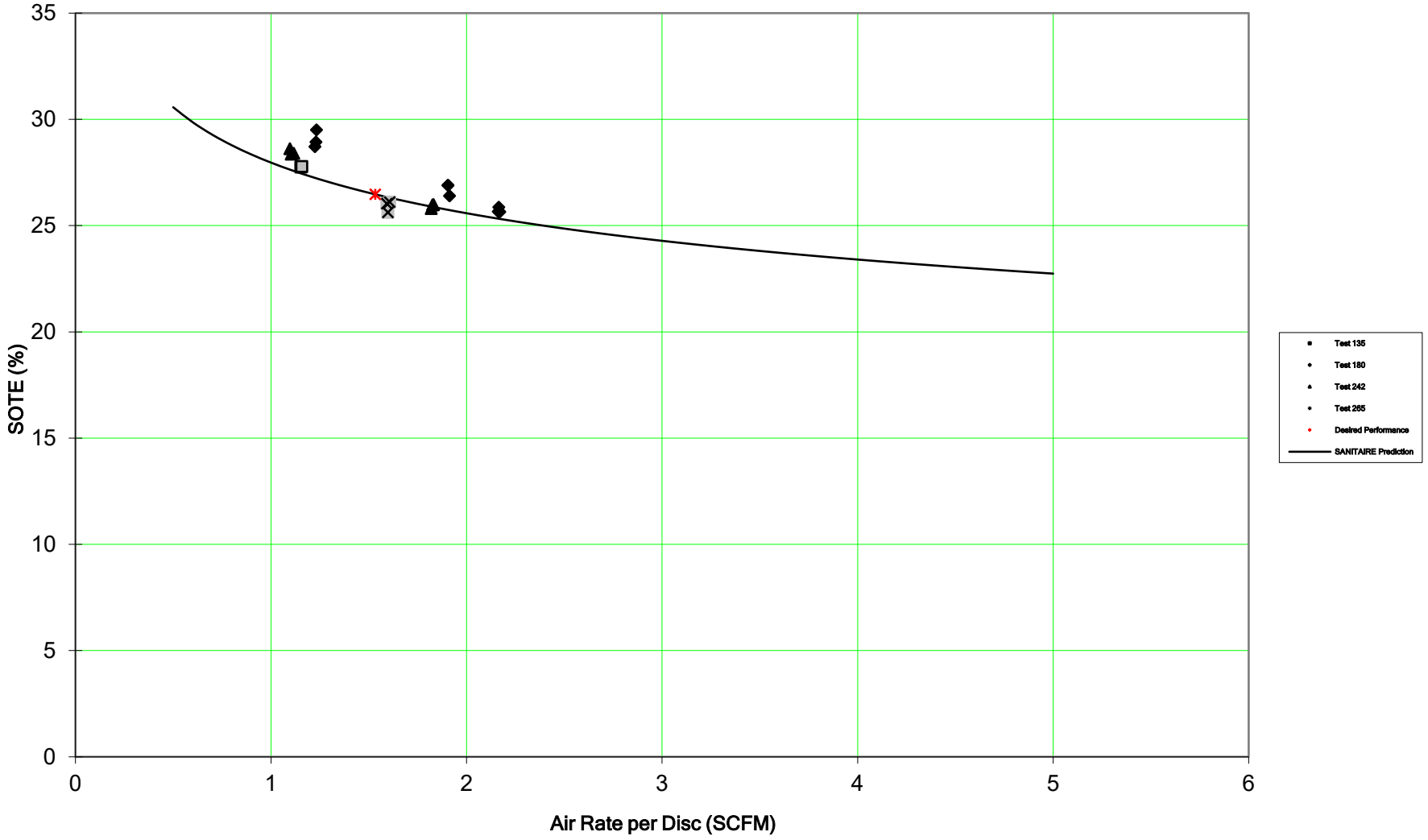
TEST	RUN	Data Subm. (feet)	At/Ad	Data Air per Diff. (SCFM)	Data SOTE (%)	Subm. Corrected SOTE (%)
135	A1	12.800	19.323	**1.154**	27.19	**27.77**
135	A2	12.800	19.323	**1.154**	27.18	**27.76**
135	A3	12.800	19.323	**1.158**	27.21	**27.79**
180	A1	13.710	18.293	**2.170**	26.91	**25.65**
180	A2	13.710	18.293	**2.163**	26.92	**25.67**
180	A3	13.710	18.293	**2.165**	27.13	**25.87**
180	B1	13.710	18.293	**1.913**	27.69	**26.40**
180	B2	13.710	18.293	**1.905**	28.21	**26.89**
180	B3	13.710	18.293	**1.905**	28.22	**26.90**
180	C1	13.710	18.293	**1.225**	30.12	**28.71**
180	C2	13.710	18.293	**1.230**	30.35	**28.94**
180	C3	13.710	18.293	**1.233**	30.94	**29.50**
242	B1	13.440	20.906	**1.820**	26.54	**25.81**
242	B2	13.440	20.906	**1.831**	26.73	**25.99**
242	B3	13.440	20.906	**1.826**	26.71	**25.97**
242	C1	13.440	20.906	**1.117**	29.20	**28.40**
242	C2	13.440	20.906	**1.103**	29.16	**28.36**
242	C3	13.440	20.906	**1.097**	29.43	**28.62**
265	A1	13.900	18.762	**1.608**	27.77	**26.11**
265	A2	13.900	18.762	**1.592**	27.68	**26.03**
265	A3	13.900	18.762	**1.597**	27.25	**25.62**

SOTE(corr) = [SUBM(target) / SUBM(data)] x SOTE(data).
SCFM/KCF=[(SCFM/Disc)1000] / [AtAd(sqft/Disc)WaterDepth]
BOLD values indicated the data plotted on the attached graph.

INDEX OF SELECTED CERTIFIED OXYGEN TRANSFER TESTS:

Test	Date	Job #	Job Name
135	Jul-93	93-2693	San Angelo, TX
180	Jun-98	98-8030	Syracuse, NY
242	Oct-16	16-8726A	Zeeland, MI
265	May-18	17-9123A	Pleasantville, IA

SANITAIRE 9 inch Silver Series II Membrane Disc Diffusers
Experimental Data vs. Factory Performance Characteristic:
At/Ad=19.8, Data Normalized to 13.07 ft. Submergence and 1000 mg/l TDS



SAMPLE
OXYGEN TRANSFER SHOP TEST PROCEDURE

FOR

Aumsville, OR
Wastewater Treatment Plant

Specification Section 11300
Packaged SBR and Digester Equipment

PURCHASER:
City of Aumsville
595 Main Street
Aumsville, OR 97325
Phone:
Fax:
PO # Notice of Award

ENGINEER:
Westech Engineering, Inc.
Salem, OR

REPRESENTATIVE:
Beaver Equipment, LLC
15112 NE 198th Street
Woodinville, WA 98072
Phone: 425-398-8082
Fax: 425-398-8570

SUPPLIER:
Xylem, Inc. – Sanitaire Products
N19W23993 Rigdeview Parkway West, Suite 200
Waukesha, WI 53188 USA
Phone: +414-365-2200
Fax: +414-365-2210

Sanitaire Project #: 25-0365A

DATE: **July 23rd, 2025**

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1. GENERAL

    A. Objective
    B. Reference Specification Section
    C. Test Site Information
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    B. Diffuser Placement
    C. Number of Tests
    D. Site Conditions
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    F. Pre and Post Test Water Sampling and Analysis
    G. Water Temperature
    H. Air Measurement
    I. Chemical Addition
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        b. Sodium Sulfite
    J. Dissolved Oxygen Probe Calibration
    K. Dissolved Oxygen Measurement
    L. Total Dissolved Solids Limits

4. PERFORMANCE TEST DESIGN SPECIFICATIONS
    (not included for sample test procedures)

1. GENERAL

A. Objective: - To determine the clean water oxygen transfer characteristics of the SANITAIRE - Aeration System as designed for the project as referenced on the cover page of this document. Specific Design parameters are shown in part four (4) of this procedure.

B. Reference Specification Section: - The test will be conducted per the design requirements as outlined in Specification Section XXXXX and the test procedures listed in this document.

C. Test Site Information: - All Oxygen Transfer Shop tests will be conducted at Xylem's Test Facilities in Milwaukee, WI.

D. Notification Procedure: - If a witnessed shop test is specified Xylem will provide a minimum of two weeks prior notification of the intended test dates to the contractor who in turn will notify the Engineer and Owner.

If a witnessed shop test is not specified, Xylem will conduct the test as time permits after receipt of the approved test procedure. As a courtesy the contractor will be notified of the scheduled test date.

E. Test Report Procedures: - A comprehensive test report of a quality sufficient to verify the aeration system performance will be forwarded to the contractor within one month from the date of testing.

2. TEST PROCEDURE AND DATA ANALYSIS METHOD

The test procedure shall follow; and C^*_∞, K_La, and Oxygen Transfer Rates determined by methods described in the "ASCE Standard for Measurement of Oxygen Transfer in Clean Water, June 1992".

The time versus D.O. data will be analyzed to determine the K_La andC^*_∞ values by the Nonlinear Regression Method as described in paragraph 7.2.1 of the referenced ASCE Standard.

The specified transfer parameter SOTR and/or OTE% will be calculated using the equations as shown in paragraph 8.1 and 8.4 of the ASCE Standard.

3. TEST PROCEDURE SPECIFICS

A. Test Tank:

1. Surface area 300 ft^2 (27.87m^2)
2. Maximum side water depth 26.5 ft. (8.077m)
3. Maximum diffuser submergence 25.50 ft. (7.772m)

4. Full floor coverage (Fine Bubble Disc)

B. Diffuser Placement:

1. Fine bubble disc systems - full floor coverage with an equivalent tank surface area to diffuser surface area ratio (AT/AD) as the full-scale tank. Diffuser placement is uniform throughout the tank.
2. Coarse bubble systems - Baffle wall used to partition tank to match aeration band widths.

C. Number of Tests: - Unless otherwise stated the initial test is considered a conditioning run and is conducted to stabilize and calibrate the test equipment. Normally this test is not included as part of the Oxygen Transfer evaluation.

Following the conditioning run, a normal minimum of three (3) test runs are made for each test condition. Testing can continue up to a TDS level of 2000 mg/l.

D. Site Conditions: - Prior to testing the following site conditions shall be recorded: ambient air temperature, relative humidity and barometric pressure.

E. Water Quality: - The initial water quality for the tests shall be the potable public water supply of Glendale, Wisconsin using treated Lake Michigan water as the source.

F. Water Sampling and Analysis: - Prior to testing a sample of the test water will be taken. The water shall be tested for Total Dissolved Solids and Temperature in accordance with the ASCE procedure section 6.3.3.

TDS and Temperature Tests shall be conducted after each successive test run.

In addition, a sample of water taken at the beginning and end of a test series shall be saved for possible additional testing for constituents as listed in section 6.3.3 of the ASCE Procedure.

G. Water Temperature: - The temperature of the water during testing must be between 10º C and 30º C, preferably at 20º C. The water temperature shall not change by more than 2º C during a single test run.

H. Air Measurement: - The amount of air in SCFM being introduced into the test tank for each run shall be measured and recorded a minimum of three (3) times per test run, including readings at the beginning and conclusion of each run. One standard cubic foot of air is defined as one cubic foot of air at 14.7 PSIA, 68º F and 36% relative humidity.

The air flow in SCFM shall be determined by an in-line mass flow device or a sharp-edged concentrically bored orifice plate, with a direct reading manometer to measure the pressure drop across the device to the nearest

tenth of an inch of water. In-line air temperature and pressure shall be measured upstream of the flow measuring device. Temperature and pressure measurements shall be made with thermometers and manometers suitable for the purpose intended.

SCFM shall be determined from the pressure, temperature, barometric, humidity readings and calibration curves of the flow measuring device.

The air flow apparatus must be capable of measuring flow with an accuracy of $\pm$5.0%.

The air delivered during any test shall be within 10% of the specified volume and shall not vary more than $\pm$ 5.0% from the mean during any single run.

The test air flow rate shall normally be set prior to chemical addition except when conditions such as high O_2 mass transfer rates and cold temperatures dictate that the air supply volume be briefly and temporarily reduced in order to avoid the use of excessive chemicals. Once the near zero dissolved oxygen level is obtained the air flow will be returned to the specified set point and the data recording can begin.

I. Chemical Addition:

1. Cobalt Chloride - Prior to the conditioning run the cobalt catalyst ($CoCl_2.6H_20$) should be added to the test water. The aeration system shall be operating and enough cobalt should be added to achieve a concentration of 0.10 to 0.50 mg/l (cobalt ion concentration). The cobalt shall be added in liquid form and be dispersed throughout the tank by allowing the aeration system to operate for at least 30 minutes.

2. Sodium Sulfite - After cobalt addition and prior to the first test run, sufficient technical grade anhydrous sodium sulfite (Na_2S0_3) shall be added to depress the dissolved oxygen level to near zero at all determination points. The sodium sulfite should be added with the aeration system running. The aeration system is left in operation and the dissolved oxygen levels will rise until saturation dissolved oxygen levels are obtained. The test duration shall be as a minimum $4/K_La$ (98% + of C_{sat}).

   The addition of sodium sulfite shall be repeated for each subsequent run. This procedure allows for chemical stabilization of the test liquid so that initial test results are reproducible.

   The sulfite shall be dissolved in a separate mixing tank and released into the basin as quickly as possible.

   The cobalt and sulfite shall be pumped into the test basin through a pipe network which includes two (2) or more injection points.

J. **Dissolved Oxygen Probe Calibration:** - Prior to each test run with the aeration system running the equilibrium DO concentration shall be determined by the Azide modification of the Winkler Titration Method as described in the latest edition of Standard Methods.

The measured DO value will be used to calibrate the DO probes prior to beginning the deoxygenation reaction.

The Dissolved Oxygen probes are calibrated in place, in the test water.

K. **Dissolved Oxygen Measurement:** - Dissolved oxygen measurements shall be made in-situ with calibrated fast response probes as manufactured by Royce, YSI or equal. All probes shall utilize either 0.5 mil. or 1.0 mil. membranes.

A multiple probe analyzer connected to a digital printer shall be used to record the time verses dissolved oxygen measurements of each probe at minimum to maximum time intervals of 15 to 60 seconds.

A minimum of four probes shall be used for test purposes along with one operational probe to serve as a backup.

A minimum of (21) discrete data values shall be selected from the dissolved oxygen probe record for analysis. The lowest D.O. value shall be approximately 20% but not be greater than 30% of the saturation oxygen concentration. The highest value shall not be less than 98% of the saturation oxygen concentration. A minimum of seven observation values shall fall in the 86.5% to 98% oxygen saturation range.

L. **Total Dissolved Solids Level: -** Repetitive tests may be conducted using the same test water up to a TDS level of 2,000 mg/l.

JCM Industries, Inc.
P. O. Box 1220, Nash, TX 75569-1220
Phone 800-527-8482 or 903-832-2581
Fax 800-874-9524 or 903-838-6260
www.jcmindustries.com

JCM 166 Fabricated Lug All Stainless Steel Clamps

The JCM 166 Fabricated Lug All Stainless Steel Clamp offers an economical solution to problems such as breaks, splits, cracks, holes in all types of pipe. Available in standard sizes for cast iron, ductile iron, IPS PVC, C-900/905 PVC, steel, asbestos cement, polyethylene. The 166 is a stainless steel clamp that offers all the benefits of stainless: corrosion resistance, lightweight, flexible yet strong. The JCM 166 is especially recommended for hot soil conditions and corrosive environments.

The full circumferential gasket provides a complete repair while the molded in stainless steel bridge plate provides the full stainless steel barrier to aggressive elements.

JCM 166 Fabricated Lug All Stainless Steel Clamp Couplings with EPDM Gasket - Material Specifications

BOLTING ASSEMBLY:	18-8 Type 304 Stainless Steel
BAND:	18-8 Type 304 Stainless Steel
BOLTS AND NUTS:	18-8 Type 304 Stainless Steel
GASKET:	EPDM - has excellent resistance to aging factors including ozone, oxygen, elevated temperatures and fluctuations in weather. Recommended for service in hot water, steam and dry heat. Suitable for popular chemicals - ketones, alcohols, phosphate ester hydraulic fluids, glycols, dilute acids and alkalies. Maximum temperature 300^{o}F wet. Not suitable for petroleum.

EPDM Gasket Material

Property	**Typical Value**
Service Temperature	**275^{o}F Operating/ 300^{o}F Maximum**
Tensile Strength	**1450 psi**
Elongation	**200%**

Strong Stainless Steel Studs - permanently attached to eliminate loose parts and nuts are treated to speed installation and prevent seizing.

Thick Gridded Gasket - with long tapered ends and recessed bridge plate assure even gasket pressure throughout range - without wrinkling or crimping.

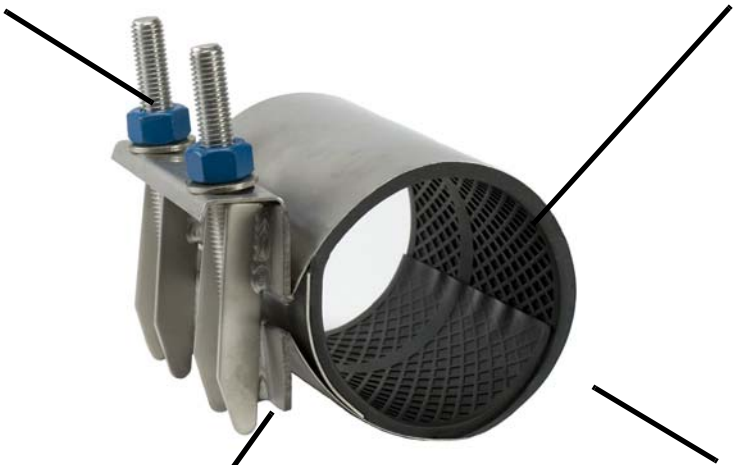


Image Reflects 7” Clamp Width

Positive Attachment of Band to Lugs - strong TIG welds eliminate mechanical weaknesses and prevents band separation. Thick stainless lifter bar plate prevents distortion or warpage during tightening.

Type 304 Stainless Steel Band - conforms to pipe irregularities, maintaining sealing pressure over the entire gasket.

NSF Certified to NSF/ANSI 61

JCM 166 Fabricated Lug Stainless Steel Universal Clamps

The JCM 166 Fabricated Lug All Stainless Steel Clamp offers an economical solution to problems such as breaks, splits, cracks, holes in all types of pipe. Available in standard sizes, the 166 is a stainless steel clamp that offers all the benefits of stainless: corrosion resistance, lightweight, flexible yet strong.

Nom. Pipe Size (IN.)	Clamp O.D. Range (IN.)	166 Stainless Steel Universal Clamp	Clamp Width - Approximate Weight					
			7”	12”	15”	18”	24”	30”
		Clamp Number	*Lbs.#*	*Lbs.#*	*Lbs.#*	*Lbs.#*	*Lbs.#*	*Lbs.#*
2 - 2-1/2	2.35 - 2.63 2.70 - 3.13	0238 0275	•	•	•	-	-	-
			5#	*8#*	*10#*			
3	3.46 - 3.70 3.73 - 4.13	0350 0400	•	•	•	-	-	-
			6#	*9#*	*11#*			
4	4.45 - 4.75 4.74 - 5.14 4.95 - 5.35 5.22 - 5.62	0450 0480 0500 0525	•	•	•	•	•	•
			7#	*10#*	*12#*	*17#*	*20#*	*24#*
6	5.95 - 6.35 6.56 - 6.96 6.85 - 7.25 7.05 - 7.45 7.45 - 7.85	0600 0663 0690 0710 0745	•	•	•	•	•	•
			9#	*13#*	*17#*	*20#*	*26#*	*34#*
8	7.95 - 8.35 8.54 - 8.94 8.99 - 9.39 9.27 - 9.67 9.90 - 10.30	0800 0863 0905 0940 1000	•	•	•	•	•	•
			11#	*16#*	*21#*	*25#*	*32#*	*44#*
10	10.60 - 11.00 11.04 - 11.44 11.34 - 11.74 11.75 - 12.15 12.00 - 12.40	1075 1110 1140 1175 1200	•	•	•	•	•	•
			15#	*18#*	*24#*	*30#*	*36#*	*50#*
12	12.60 - 13.02 13.10 - 13.50 13.40 - 13.80 13.70 - 14.10 14.00 - 14.40	1275 1320 1340 1370 1400	•	•	•	•	•	•
			17#	*20#*	*27#*	*34#*	*40#*	*56#*
		Number of Bolts	**2**	**3**	**4**	**4**	**6**	**8**

HOW TO ORDER

1. Determine O.D. of pipe.
2. Select proper clamp O.D. range and band width.
3. Determine Model Number.
4. Specify clamp number.
   Example: To fit Cast Iron pipe, 6.90 O.D. with 6” width, order: 166-0690-6

Available Options Upon Request

- Pipe sizes and ranges not listed
- Conductive Buttons
- Specialty Gaskets
- Other Sizes and Ranges

1. Clamp width should be equal to or greater than the pipe diameter for higher working pressures.
2. Not recommended for use for joining plain end pressure pipe.
3. Other ranges and widths available upon request.
4. Clamps do not prevent lateral movement of pipe. Applications in which the pipe may move out of the clamp, proper anchorage of the pipe must be provided.

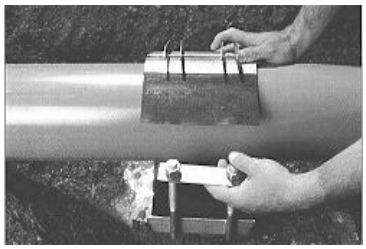
NSF
Certified to NSF/ANSI 61

JCM 166 Fabricated Lug All Stainless Steel Clamp Couplings with EPDM Gasket

INSTALLATION INSTRUCTIONS

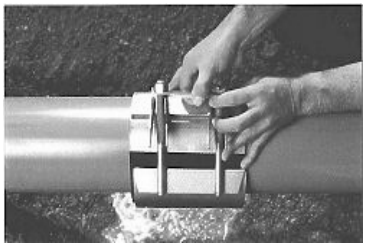
Failure to follow installation instructions will result in voided product warranty

1. Clean and scrape pipe. Remove any dirt or debris that would interfer with the complete sealing of the gasket around the pipe. Lubricate the pipe with soapy water. Do not use oil base pipe lubricant.
   Trick of the Trade: Place a mark on the pipe to each side of the damaged area equal to the width of the clamp. This presents a visual mark to center the repair clamp over the damage area (1/2 of this distance is center).



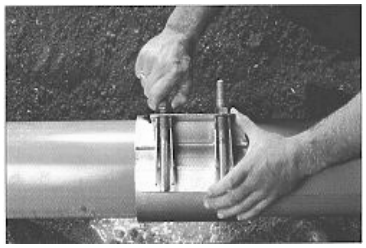
2. Inspect pipe for integrity, size and outside diameter. Confirm the proper size and range of repair clamp. Confirm proper outlet type and size.

3. Open the repair clamp by loosening (without removing) the nuts to the top of the stainless studs/bolts. Disengage the locking “C-Plate” and lift plate to open clamp. Wrap repair clamp around the pipe centering the clamp over the damaged area.



4. Tuck tapered gasket(s) in place ensuring there are no folds in the tapered edge.

5. Loosely close the clamp around the pipe by lifting the C-Plate(s) lip over the lug system stainless receiver bar, meeting the stud and fingers, and lock in place. Rotate the clamp slightly in the direction of the arrow stamped on the clamp band to ensure the tapered gasket lies flat under the clamp. **For Tapped Clamps:** Rotate tapped outlet into proper position.

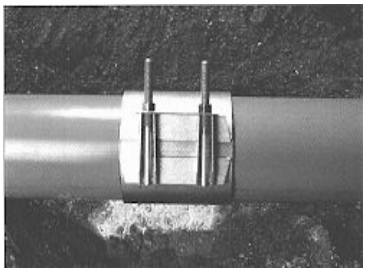


6. Complete tightening of the clamp by squeezing the lugs together and tighten the nuts. Start at the center bolt and work out toward clamp ends, alternating from one side to the other for equal gap between clamp halves. Continue tightening sequence to reach the appropriate torque levels.

7. Tighten the nuts evenly with a hand wrench to the following torque values. To ensure proper torque level, wait 15 minutes and retighten to recommended torque. *Trick of the Trade: Pneumatic wrenches could cause the stainless nuts to seize on the stainless steel studs.*

5/8” Bolts/Studs tighten to 70 Foot Pounds of Torque*

8. For JCM 163 Tapped Clamps, proceed with tapping process.



***Ensure proper torque level with a field grade torque wrench equal to the JCM 905 Torque Wrench. Thin wall, small diameter & flexible types of pipe are subject to many variables which affect torque values. Use descretion when tightening fittings on thin wall, small diameter & flexible pipe in order to not crush or severly deform the pipe.**

Note: Universal Clamp Couplings do not provide restraint of pipe ends. For applications in which pipe may pull out of clamp, external restraint must be provided.

INT1660212

JCM Industries, Inc. / P. O. Box 1220 / Nash, TX 75569-1220

Recommendations For Installation Of Fittings With Stainless Steel Bolts And Nuts

This JCM Quality Fitting is equipped with 18-8 stainless steel bolts and nuts for superior corrosion resistance. It is the nature of stainless steel fasteners to gall and freeze if not properly handled. This undesirable characteristic is due to the inherent properties of the stainless material. The galling and freezing action is often triggered by the presence of metal chips, burrs and grains of sand on the threads of the bolts and nuts.

Extra care has been taken by JCM prior to assembly and packing of this fitting to assure a trouble-free installation.

1. The nuts and bolts are made from material of different hardness so that they have different strengths.
2. Standard 5/8” and 3/4” nuts are coated with a special (antiseize) coating. Additional lubricant may be needed. Oversized stainless steel hardware is provided without lubrication to prevent a build up of dirt, sand or grit during shipment. **A Molybdenum-Base lubricant is recommended.**
3. Each nut is assembled by hand to be sure that it went on the bolt freely.
4. The bolts and nuts are handled carefully to avoid damage to the threads.
5. The bolts and nuts are made to exacting specifications to assure that the correct material is used and that the thread form is correct.

The specially coated nuts supplied by JCM help to eliminate the galling caused by overtorquing, but **the bolts must be kept clean and not pitched or thrown into the tool bucket during installation.** During field installation, the threads MUST BE KEPT CLEAN AND FREE FROM NICKS.

When a mild steel or bronze bolt is used, the low ultimate strength of the material allows the nut to tear itself free. Not so with 18-8 Stainless Steel. The ultimate strength of the material is so great, that it increases rapidly with cold work. However, once foreign matter such as a grain of sand wedges the threads, or the thread form is altered by over-torquing, the nuts cannot be removed.

NOTE: Installation of this fitting with a pneumatic wrench may cause seizure of the nut. **A JCM 901 Master Wrench or JCM 905 Torque Wrench with Deep Socket is recommended.**

Kwik Bolt 3 Expansion Anchor

1.1 Product Description

The Kwik Bolt 3 (KB3) is a torque controlled expansion anchor, which provides consistent performance for a wide range of mechanical anchor applications. This anchor series is available in carbon steel with zinc electroplated coating, carbon steel with hot dipped galvanized coating, 304 stainless steel and 316 stainless steel versions.The threaded stud version of the anchor is available in a variety of diameters ranging from 1/4" to 1" depending on the steel and coating type. Applicable base materials include normal weight concrete, structural lightweight concrete, lightweight concrete over metal deck and concrete grout filled masonry.

Guide Specifications

Anchor: Expansion anchors shall be Kwik Bolt 3 (KB3) supplied by Hilti, Inc. meeting the description in Federal Specification A-A 1923A, Type 4 and shall bear a length identification mark visible after installation. Anchor bodies shall be manufactured to meet one of the following conditions: 1. The carbon steel electroplated anchor coating shall conform to ASTM B633 with a minimum thickness of 5μm. 2. The carbon steel hot dipped galvanized anchor body, nut and washer coating shall conform to ASTM A 153, Class C. The expansion sleeve conforms to AISI 316. 3. Anchor body, nut and washer conform to AISI 304. The expansion sleeve conforms to AISI 316. 4. Anchor body, nut, washer and expansion sleeve conform to AISI 316.

Product Features

- Length identification code facilitates quality control and inspection after installation.
- Through fixture installation and variable thread lengths improve productivity and accommodate various base plate thicknesses.
- Raised impact section (Dog Point) prevents thread damage during installation.
- Anchor size is same as drill bit size for easy installation. For temporary applications anchors may be driven into drilled holes after usage.
- Mechanical expansion allows immediate load application.
- Consistent performance in concrete, lightweight concrete, lightweight over metal deck and grout filled concrete block base materials.
- Anchors tested to combined tension and shear load requirements as defined by ACI 318-02 Appendix-D.

Installation

Drill hole in concrete, structural lightweight concrete, or grout filled concrete block using a Hilti carbide tipped drill bit and a Hilti rotary hammer drill. Remove dust from the hole with oil free compressed air. Alternately for 1/2, 5/8, 3/4, and 1 inch diameter Kwik Bolt 3 anchors, the hole may be drilled using a matched tolerance Hilti DD-B or DD-C wet diamond core bit for anchoring applications. The slurry must be flushed from the diamond cored hole prior to anchor installation. The minimum hole depth must exceed the anchor embedment prior to torquing by one hole diameter. Drive the anchor into the hole using a hammer. A minimum of six threads must be below the surface of the fixture. Tighten the nut to the recommended installation torque.

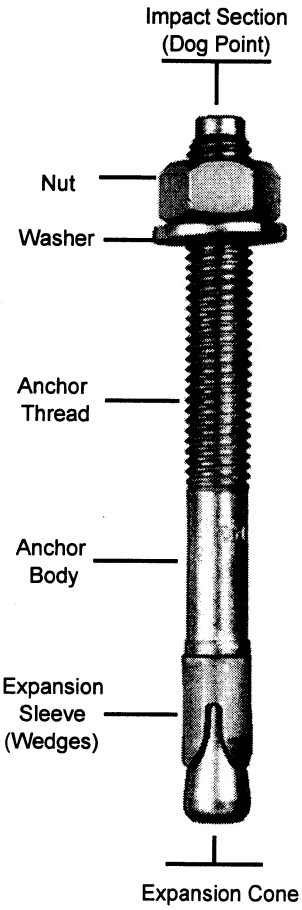
Listings and Approvals

- International Code Council (ICC-ES) Evaluation Service Report ESR-1385 Seismically recognized under AC01 dated April 2002
- City of Los Angeles Report (COLA) - approval pending
- UL 203, Pipe Hanger Equipment for Fire Protection Services
- FM Approval Standard Pipe Hanger Component for Automatic Sprinkler
- Metropolitan Dade Notice of Product Approval --approval pending

(Please refer to the reports to verify that the anchor type and diameter specified is included)

- Qualified under an NQA-1 Nuclear Quality Program

1	**Kwik Bolt 3**
1.1	Product Description
1.2	Material Specification
1.3	Technical Data
1.4	Installation Instructions
1.5	Ordering Information



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US www.us.hilti.com
Canada www.ca.hilti.com

1.2 Material Specification

Stainless Steel

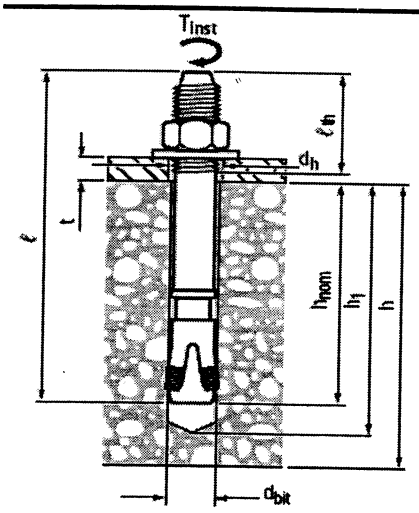
- Anchor bodies smaller than 3/4", excluding countersun Kwik Bolt Series, are produced from AISI 304 or 316 stainless steel meeting a minimum fracture load after forming:

Anchor Diameter	1/4"	3/8"	1/2"	5/8"
Fracture Load min.	2900 lbs	7200 lbs	12400 lbs	21900 lbs

- Anchor bodies 3/4" and larger and all stainless steel countersunk Kwik Bolt series are produced from AISI 304 or 316 stainless steel having minimum mechanical properties:

Anchor Diameter	< 5/8"	≥ 3/4"
Tensile Strength	90 ksi min.	76 ksi min.
Yield Strength	76 ksi min.	64 ksi min.

- Nuts meet the dimensional requirements of ASTM F 594.
- Washers meet the dimensional requirements of ANSI B18.22.1, Type A, plain.
- Expansion Sleeve for AISI 304 and 316 anchors are made from AISI 316, all nuts and washers for AISI 304 and 316 anchors are manufactured from AISI 304 and 316, respectively.



Refer to Kwik Bolt 3 Specification table under Section 1.3, for a listing and specification of anchor specific and installation variables.

See Kwik Bolt 3 anchor product line table under Section 1.5 for full list of anchor length (ℓ) and thread length (ℓ_{th}) configurations.

Combined Shear and Tension Loading

$$\left(\frac{N_d}{N_{rec}}\right)^{5/3} + \left(\frac{V_d}{V_{rec}}\right)^{5/3} \leq 1.0$$

Refer to Section 4.1.2.7 of 2005 Hilti Product Technical Guide

1.3 Technical Data

Kwik Bolt 3 Specification Tables[1]

Details: Bolt Size				in. (mm)	1/4 (6.4)			3/8 (9.5)			1/2 (12.7)		
d_{bit} nominal bit diameter[2]				in.	1/4			3/8			1/2		
h_{min} / h_{nom} / h_{deep} minimum / standard / deep embedment				in.	1 1/8	2	3	1 5/8	2 1/2	3 1/2	2 1/4	3 1/2	4 3/4
				(mm)	(29)	(51)	(76)	(41)	(64)	(89)	(57)	(89)	(121)
h_1 minimum / standard / deep hole depth				in.	1 3/8	2 1/4	3 1/4	2	2 7/8	3 7/8	2 3/4	4	5 1/4
				(mm)	(35)	(57)	(83)	(51)	(73)	(98)	(70)	(102)	(133)
d_h wedge clearance hole in plate				in. (mm)	5/16 (8)			7/16 (11)			9/16 (14)		
T_{inst} Recommended installation torque	Normal weight and Lightweight concrete	Carbon Steel Zinc / HDG		ft-lb (Nm)	4 (5.4)			20 (27)			40 (54)		
		Stainless Steel		ft-lb (Nm)	6 (8.1)			20 (27)			40 (54)		
	Grout filled Block	Carbon Steel		ft-lb (Nm)	4 (5.4)			15 (20)			25 (34)		
h Min. base material thickness				in.	3 in. (76mm) or 1.3 h_{ef}, whichever is greater								

Details: Bolt Size				in. (mm)	5/8 (15.9)			3/4 (19.1)			1 (25.4)		
d_{bit} nominal bit diameter[2]				in.	5/8			3/4			1		
h_{min} / h_{nom} / h_{deep} minimum / standard / deep embedment				in.	2 3/4	4	5 1/2	3 1/4	4 3/4	6 1/2[3]	4 1/2	6	9
				(mm)	(70)	(102)	(140)	(83)	(121)	(165)	(114)	(152)	(229)
h_1 minimum / standard / deep hole depth				in.	3 3/8	4 5/8	6 1/8	4	5 1/2	6 4/5	5 1/2	7	10
				(mm)	(86)	(117)	(156)	(102)	(140)	(173)	(140)	(178)	(254)
d_h wedge clearance hole in plate				in. (mm)	11/16 (17)			13/16 (21)			1 1/8 (29)		
T_{inst} Recommended installation torque	Normal weight and Lightweight concrete	Carbon Steel Zinc / HDG		ft-lb (Nm)	85 (115)			150 (203)			250 (339)		
		Stainless Steel		ft-lb (Nm)	85 (115)			150 (203)			235 (319)		
	Grout filled Block	Carbon Steel		ft-lb (Nm)	65 (88)			120 (163)			-		
h Min. base material thickness				in.	3 in. (76mm) or 1.3 h_{ef}, whichever is greater								

[1] See Kwik Bolt 3 anchor product line table under section 1.5 for full list of anchor length (ℓ) and thread length (ℓ_{th}) configurations.

[2] Loads for Kwik Bolt 3 are applicable for both carbide drill bits (see section 8.4.1 of 2005 Hilti Product Technical Guide) and matched tolerance Hilti DD-B or DD-C diamond core bits in sizes ranging from 1/2 inch to 1inch .

[3] Deep embedment depth for stainless steel Kwik Bolt 3 anchor is 8 inch (203 mm).

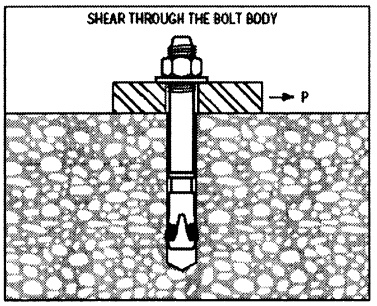
Stainless Steel Kwik Bolt 3 Allowable Loads in Concrete[1]

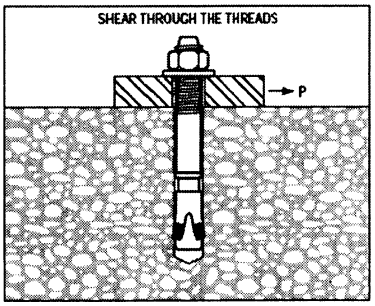
Anchor diameter in. (mm)	Embedment depth in. (mm)	f'_c= 2000 psi Tension lb (kN)	f'_c= 2000 psi Shear[2] lb (kN)	f'_c= 3000 psi Tension lb (kN)	f'_c= 3000 psi Shear[2] lb (kN)	f'_c= 4000 psi Tension lb (kN)	f'_c= 4000 psi Shear[2] lb (kN)	f'_c= 6000 psi Tension lb (kN)	f'_c= 6000 psi Shear[2] lb (kN)
1/4 (6.4)	1 1/8 (29)	260 (1.2)	595 (2.6)	320 (1.4)	675 (3)	380 (1.7)	675 (3)	470 (2.1)	675 (3)
	2 (51)	540 (2.4)		625 (2.8)		705 (3.1)		910 (4)	
	3 (76)	685 (3)		750 (3.3)		810 (3.6)		910 (4)	
3/8 (9.5)	1 5/8 (41)	605 (2.7)	880 (3.9)	670 (3)	1110 (4.9)	730 (3.2)	1345 (6)	950 (4.2)	1690 (7.5)
	2 1/2 (64)	1285 (5.7)	1655 (7.4)	1430 (6.4)	1655 (7.4)	1575 (7)	1870[3] (8.3)	1940 (8.6)	1870[3] (8.3)
	3 1/2 (89)	1620 (7.2)		1755 (7.8)		1885 (8.4)		2035 (9.1)	
1/2 (12.7)	2 1/4 (57)	1015 (4.5)	1875 (8.3)	1230 (5.5)	2130 (9.5)	1450 (6.4)	2380 (10.6)	1620 (7.2)	2740 (12.2)
	3 1/2 (89)	1445 (6.4)	3155 (14)	1975 (8.8)	3155 (14)	2510 (11.2)	3155 (14)	2655 (11.8)	3155 (14)
	4 3/4 (121)	1990 (8.9)		2250 (10)		2510 (11.2)		2985 (13.3)	
5/8 (15.9)	2 3/4 (70)	1650 (7.3)	2875 (12.8)	1755 (7.8)	3485 (15.5)	1860 (8.3)	4095 (18.2)	2335 (10.4)	4870 (21.7)
	4 (102)	2455 (10.9)	4870 (21.7)	2900 (12.9)	4870 (21.7)	3340 (14.9)	4870 (21.7)	4395 (19.5)	
	5 1/2 (140)	3480 (15.5)		3885 (17.3)		4290 (19.1)		6260 (27.8)	
3/4 (19.1)	3 1/4 (83)	1550 (6.9)	2880 (12.8)	1950 (8.7)	4260 (18.9)	2350 (10.5)	5645 (25.1)	2610 (11.6)	5645 (25.1)
	4 3/4 (121)	2510 (11.2)	5535 (24.6)	3250 (14.5)	5535 (24.6)	3870 (17.2)		4670 (20.8)	
	8 (203)	2930 (13)		3870 (17.2)		4530 (20.2)		5120 (22.8)	
1 (25.4)	4 1/2 (114)	3120 (13.9)	6080 (27)	3870 (17.2)	6770 (30.1)	4610 (20.5)	7470 (33.2)	4800 (21.4)	7470 (33.2)
	6 (152)	4400 (19.6)	7470 (33.2)	6400 (28.5)	7470 (33.2)	7200 (32)		7330 (32.6)	
	9 (229)	5600 (24.9)		8000 (35.6)		9390 (41.8)		9390 (41.8)	

[1] Intermediate load values for other concrete strengths and embedments can be calculated by linear interpolation.

[2] Unless otherwise noted, values shown are valid for the shear plane acting through either the anchor body or the anchor threads.

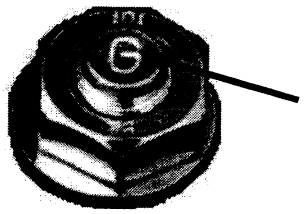
[3] Values shown are for a shear plane through the anchor body. When the shear plane is acting through the anchor threads, reduce the shear value by 10%.





Length Identification System

STAMP ON ANCHOR		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Length of anchor (ℓ) (inches)	From	1	2	2 ½	3	3 ½	4	4 ½	5	5 ½	6	6 ½	7	7 ½	8	8 ½	9	9 ½	10	11	12
	Up to but not including	2	2 ½	3	3 ½	4	4 ½	5	5 ½	6	6 ½	7	7 ½	8	8 ½	9	9 ½	10	11	12	13



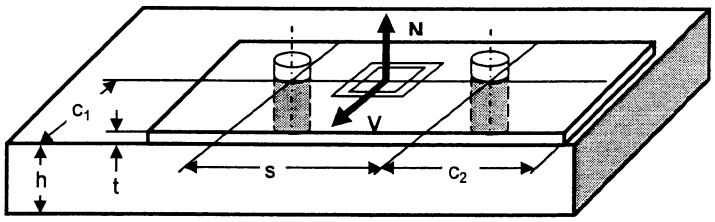
Length Identification Mark

Anchor Spacing and Edge Distance Guidelines

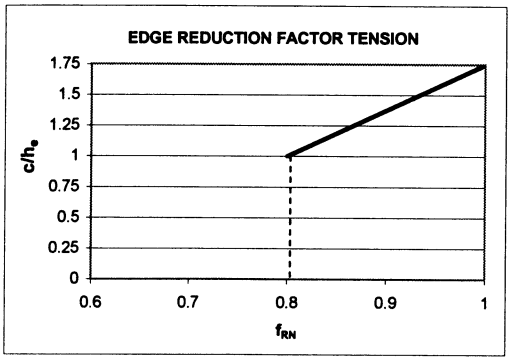
1- s = on-center fastening spacing
c = edge distance from center of bolt.

2- Apply appropriate load reduction factors for tension and shear if anchor spacing and/or edge distance is less the the critical spacing (S_{cr}) or edge distance (C_{cr}) as defined by Hilti.

3- See section 4.1.2.3 of 2005 Hilti Product Technical guide for determinig compounded spacing and edge distance reduction as well as intermediate load values for concrete strengths and embedments.

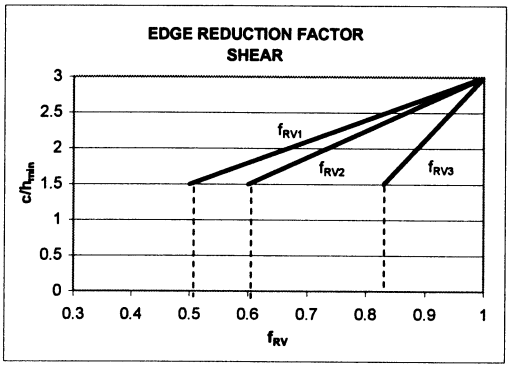


Edge Distance Adjustment Factors



Adjustment Conditions	Critical Edge Distance	Min. Edge Distance
Emb. Ratio	$c/h_e = 1.75$	$c/h_e = 1.00$
Reduction	$f_{RN} = 1.00$	$f_{RN} = 0.80$
$h_e = h_{act}$	for the following condition	$h_{min} \le h_{act} \le h_{nom}$
$h_e = h_{nom}$	for the following condition	$h_{act} > h_{nom}$

h_{act} = Actual Embedment
c = Actual Edge Distance
f_{RN} = Edge Distance Reduction Factor for Tension Loading

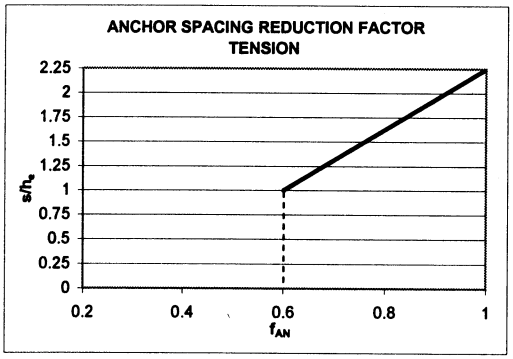


Adjustment Conditions

Shear Plane Correlation	Shear Condition	f_{RV} Reduction factor at Min. Edge Distance
f_{RV1}	shear towards edge	$f_{RV1} = 0.50$
f_{RV2}	shear parallel to edge	$f_{RV2} = 0.60$
f_{RV3}	shear away form edge	$f_{RV3} = 0.83$
embedment to edge dist ratio at critical edge dist.		$c/h_{min} = 3.00$
embedment to edge dist ratio at min edge dist.		$c/h_{min} = 1.50$

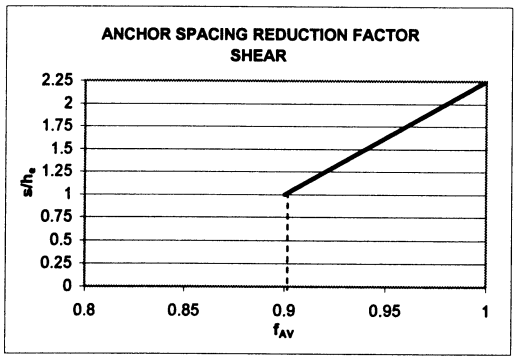
c = Actual Edge Distance
h_{min} = Min Embedment for Specific Anchor Diameter

Anchor Spacing Adjustment Factors



Adjustment Conditions	Critical Edge Distance	Min. Edge Distance
Emb. Ratio	$s/h_e = 2.25$	$s/h_e = 1.00$
Reduction	$f_{AN} = 1.00$	$f_{AN} = 0.60$
$h_e = h_{act}$	for the following condition	$h_{min} \le h_{act} \le h_{nom}$
$h_e = h_{nom}$	for the following condition	$h_{act} > h_{nom}$

h_{act} = Actual Embedment
s = Actual Anchor Spacing Distance
f_{AN} = Anchor Spacing Reduction Factor for Tension Loading



Adjustment Conditions	Critical Edge Distance	Min. Edge Distance
Emb. Ratio	$s/h_e = 2.25$	$s/h_e = 1.00$
Reduction	$f_{AV} = 1.00$	$f_{AV} = 0.90$
$h_e = h_{act}$	for the following condition	$h_{min} \le h_{act} \le h_{nom}$
$h_e = h_{nom}$	for the following condition	$h_{act} > h_{nom}$

h_{act} = Actual Embedment
s = Actual Anchor Spacing Distance
f_{AV} = Anchor Spacing Reduction Factor for Shear Loading

Influence of Edge Distance on Anchor Performance

Load Adjustment Factors for 1/4" Diameter Anchors

Anchor Diameter 1/4 in.		Spacing Tension f_{AN}		Edge Distance Tension f_{RN}		Spacing Shear f_{AV}		Edge Distance Shear ⊥ toward edge f_{RV1}	Edge Distance Shear ∥ to edge f_{RV2}	Edge Distance Shear ⊥ away from edge f_{RV3}
Emb. in.		1 1/8	≥ 2	1 1/8	≥ 2	1 1/8	≥ 2	≥ 1 1/8	≥ 1 1/8	≥ 1 1/8
Spacing (s) / Edge Distance (c), in.	1 1/8	0.60		0.80		0.90				
	1 11/16	0.76		0.93		0.94		0.50	0.60	0.83
	1 3/4	0.78		0.95		0.94		0.52	0.61	0.84
	2	0.85	0.60	1.00	0.80	0.96	0.90	0.59	0.67	0.86
	2 1/4	0.92	0.64		0.83	0.98	0.91	0.67	0.73	0.89
	2 1/2	0.99	0.68		0.87	1.00	0.92	0.74	0.79	0.91
	3	1.00	0.76		0.93		0.94	0.89	0.91	0.96
	3 3/8		0.82		0.98		0.96	1.00	1.00	1.00
	3 1/2		0.84		1.00		0.96			
	4		0.92				0.98			
	4 1/2		1.00				1.00			
	4 3/4									
	5									

Standard Anchor Embedments (in.)		
1/4	h_{min}	1 1/8
	h_{nom}	2
	h_{deep}	3
3/8	h_{min}	1 5/8
	h_{nom}	2 1/2
	h_{deep}	3 1/2
1/2	h_{min}	2 1/4
	h_{nom}	3 1/2
	h_{deep}	4 3/4

NOTE:
Tables apply for listed embedment depths. Reduction factors for other embedment depths must be calculated using equations below.

Load Adjustment Factors for 3/8" Diameter Anchors

Anchor Diameter 3/8 in.		Spacing Tension f_{AN}		Edge Distance Tension f_{RN}		Spacing Shear f_{AV}		Edge Distance Shear ⊥ toward edge f_{RV1}	Edge Distance Shear ∥ to edge f_{RV2}	Edge Distance Shear ⊥ away from edge f_{RV3}
Emb. in.		1 5/8	≥ 2 1/2	1 5/8	≥ 2 1/2	1 5/8	≥ 2 1/2	≥ 1 5/8	≥ 1 5/8	≥ 1 5/8
Spacing (s) / Edge Distance (c), in.	1 5/8	0.60		0.80		0.90				
	2	0.67		0.86		0.92				
	2 1/4	0.72		0.90		0.93				
	2 1/2	0.77	0.60	0.94	0.80	0.94	0.90	0.51	0.61	0.83
	3	0.87	0.66	1.00	0.85	0.97	0.92	0.62	0.69	0.87
	3 1/4	0.92	0.70		0.88	0.98	0.92	0.67	0.73	0.89
	3 1/2	0.97	0.73		0.91	0.99	0.93	0.72	0.77	0.90
	3 3/4	1.00	0.76		0.93	1.00	0.94	0.77	0.82	0.92
	4		0.79		0.96		0.95	0.82	0.86	0.94
	4 1/2		0.86		1.00		0.96	0.92	0.94	0.97
	5		0.92				0.98	1.00	1.00	1.00
	5 5/8		1.00				1.00			
	5 3/4									

Load Adjustment Factors for 1/2" Diameter Anchors

Anchor Diameter 1/2 in.		Spacing Tension f_{AN}		Edge Distance Tension f_{RN}		Spacing Shear f_{AV}		Edge Distance Shear ⊥ toward edge f_{RV1}	Edge Distance Shear ∥ to edge f_{RV2}	Edge Distance Shear ⊥ away from edge f_{RV3}
Emb. in.		2 1/4	≥ 3 1/2	2 1/4	≥ 3 1/2	2 1/4	≥ 3 1/2	≥ 2 1/4	≥ 2 1/4	≥ 2 1/4
Spacing (s) / Edge Distance (c), in.	2 1/4	0.60		0.80		0.90				
	2 1/2	0.64		0.83		0.91				
	3	0.71		0.89		0.93				
	3 3/8	0.76		0.93		0.94		0.50	0.60	0.83
	3 3/4	0.81	0.62	0.98	0.82	0.95	0.91	0.56	0.64	0.85
	4 1/4	0.88	0.67	1.00	0.86	0.97	0.92	0.63	0.70	0.87
	4 3/4	0.96	0.71		0.90	0.99	0.93	0.70	0.76	0.90
	5	1.00	0.74		0.91	1.00	0.93	0.74	0.79	0.91
	5 3/4		0.81		0.97		0.95	0.85	0.88	0.95
	6		0.83		1.00		0.96	0.89	0.91	0.96
	6 1/2		0.87				0.97	0.96	0.97	0.99
	7 1/4		0.94				0.99	1.00	1.00	1.00
	7 3/4		1.00				1.00			

Spacing - Tension

$h_{min} \le h_{act} \le h_{nom}$	$h_{act} \ge h_{nom}$
$f_{AN} = \frac{c/h_{act} + 0.88}{3.13}$	$f_{AN} = \frac{c/h_{nom} + 0.88}{3.13}$

Edge Distance - Tension

$h_{min} \le h_{act} \le h_{nom}$	$h_{act} \ge h_{nom}$
$f_{RN} = \frac{c/h_{act} + 2}{3.75}$	$f_{RN} = \frac{c/h_{nom} + 2}{3.75}$

Spacing - Shear

$h_{min} \le h_{act} \le h_{nom}$	$h_{act} \ge h_{nom}$
$f_{AV} = \frac{s/h_{act} + 10.25}{12.5}$	$f_{AV} = \frac{s/h_{nom} + 10.25}{12.5}$

Edge Distance - Shear

$h_{act} \ge h_{min}$	
Perpendicular Toward Edge	$f_{RV1} = \frac{c}{3h_{min}}$
Parallel to Edge	$f_{RV2} = \frac{c/h_{min} + 0.75}{3.75}$
Perpendicular Away from Edge	$f_{RV3} = \frac{c/h_{min} + 5.82}{8.82}$

Influence of Edge Distance on Anchor Performance

Load Adjustment Factors for 5/8" Diameter Anchors

Anchor Diameter 5/8 in.		Spacing Tension f_{AN}		Edge Distance Tension f_{RN}		Spacing Shear f_{AV}		Edge Distance Shear ⊥ toward edge f_{RV1}	Edge Distance Shear ∥ to edge f_{RV2}	Edge Distance Shear ⊥ away from edge f_{RV3}
Emb. in.		2 3/4	≥ 4	2 3/4	≥ 4	2 3/4	≥ 4	≥ 2 3/4	≥ 2 3/4	≥ 2 3/4
Spacing (s)/Edge Distance (c), in.	2 3/4	0.60		0.80		0.90				
	3 1/2	0.69		0.87		0.92				
	4	0.75	0.60	0.92	0.80	0.94	0.90			
	4 1/4	0.77	0.62	0.95	0.82	0.94	0.91	0.52	0.61	0.84
	4 3/4	0.83	0.66	1.00	0.85	0.96	0.92	0.58	0.66	0.86
	5 1/2	0.92	0.72		0.90	0.98	0.93	0.67	0.73	0.89
	6	0.98	0.76		0.93	0.99	0.94	0.73	0.78	0.91
	6 1/4	1.00	0.78		0.95	1.00	0.95	0.76	0.81	0.92
	7		0.84		1.00		0.96	0.85	0.88	0.95
	7 1/2		0.88				0.97	0.91	0.93	0.97
	7 3/4		0.90				0.98	0.94	0.95	0.98
	8 1/2		0.96				0.99	1.00	1.00	1.00
	9		1.00				1.00			

Load Adjustment Factors for 3/4" Diameter Anchors

Anchor Diameter 3/4 in.		Spacing Tension f_{AN}		Edge Distance Tension f_{RN}		Spacing Shear f_{AV}		Edge Distance Shear ⊥ toward edge f_{RV1}	Edge Distance Shear ∥ to edge f_{RV2}	Edge Distance Shear ⊥ away from edge f_{RV3}
Emb. in.		3 1/4	≥ 4 3/4	3 1/4	≥ 4 3/4	3 1/4	≥ 4 3/4	≥ 3 1/4	≥ 3 1/4	≥ 3 1/4
Spacing (s)/Edge Distance (c), in.	3 3/8	0.61		0.81		0.90				
	4	0.67		0.86		0.92				
	5	0.77	0.62	0.94	0.81	0.94	0.90	0.51	0.61	0.83
	5 3/4	0.85	0.67	1.00	0.86	0.96	0.92	0.59	0.67	0.86
	6 1/4	0.90	0.70		0.88	0.97	0.93	0.64	0.71	0.88
	6 1/2	0.92	0.72		0.90	0.98	0.93	0.67	0.73	0.89
	7	0.97	0.75		0.93	0.99	0.94	0.72	0.77	0.90
	7 1/2	1.00	0.79		0.95	1.00	0.95	0.77	0.82	0.92
	8 1/4		0.84		1.00		0.96	0.85	0.88	0.95
	9		0.89				0.97	0.92	0.94	0.97
	9 3/4		0.94				0.98	1.00	1.00	1.00
	10 1/4		0.97				0.99			
	10 3/4		1.00				1.00			

Load Adjustment Factors for 1" Diameter Anchors

Anchor Diameter 1 in.		Spacing Tension f_{AN}		Edge Distance Tension f_{RN}		Spacing Shear f_{AV}		Edge Distance Shear ⊥ toward edge f_{RV1}	Edge Distance Shear ∥ to edge f_{RV2}	Edge Distance Shear ⊥ away from edge f_{RV3}
Emb. Depth,		4 1/2	≥ 6	4 1/2	≥ 6	4 1/2	≥ 6	≥ 4 1/2	≥ 4 1/2	≥ 4 1/2
Spacing (s)/Edge Distance (c), in.	4 1/2	0.60		0.80		0.90				
	6	0.71	0.60	0.89	0.80	0.93	0.90			
	7	0.78	0.65	0.95	0.84	0.94	0.91	0.52	0.61	0.84
	8	0.85	0.71	1.00	0.89	0.96	0.93	0.59	0.67	0.86
	9	0.92	0.76		0.93	0.98	0.94	0.67	0.73	0.89
	9 3/4	0.97	0.80		0.97	0.99	0.95	0.72	0.78	0.91
	10 1/4	1.00	0.83		0.99	1.00	0.96	0.76	0.81	0.92
	11 1/4		0.88		1.00		0.97	0.83	0.87	0.94
	11 5/8		0.90				0.98	0.86	0.89	0.95
	12 1/2		0.95				0.99	0.93	0.94	0.97
	13		0.97				0.99	0.96	0.97	0.99
	13 1/2		1.00				1.00	1.00	1.00	1.00
	14 3/4									

Standard Anchor Embedments (in.)		
5/8	h_{min}	2 3/4
	h_{nom}	4
	h_{deep}	5 1/2
3/4	h_{min}	3 1/4
	h_{nom}	4 3/4
	h_{deep}	6 1/2[1]
1	h_{min}	4 1/2
	h_{nom}	6
	h_{deep}	9

[1] Embedment depth shown reflects embedment for carbon steel anchor, deep embedment depth for stainless steel anchor is 8 inch.

NOTE:
Tables apply for listed embedment depths. Reduction factors for other embedment depths must be clculated using equations below.

Spacing - Tension	
$h_{min} \le h_{act} \le h_{nom}$	$h_{act} \ge h_{nom}$
$f_{AN} = \frac{c/h_{act} + 0.88}{3.13}$	$f_{AN} = \frac{c/h_{nom} + 0.88}{3.13}$

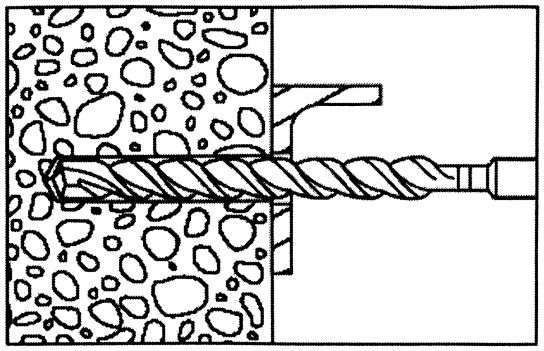
Edge Distance - Tension	
$h_{min} \le h_{act} \le h_{nom}$	$h_{act} \ge h_{nom}$
$f_{RN} = \frac{c/h_{act} + 2}{3.75}$	$f_{RN} = \frac{c/h_{nom} + 2}{3.75}$

Spacing - Shear	
$h_{min} \le h_{act} \le h_{nom}$	$h_{act} \ge h_{nom}$
$f_{AV} = \frac{s/h_{act} + 10.25}{12.5}$	$f_{AV} = \frac{s/h_{nom} + 10.25}{12.5}$

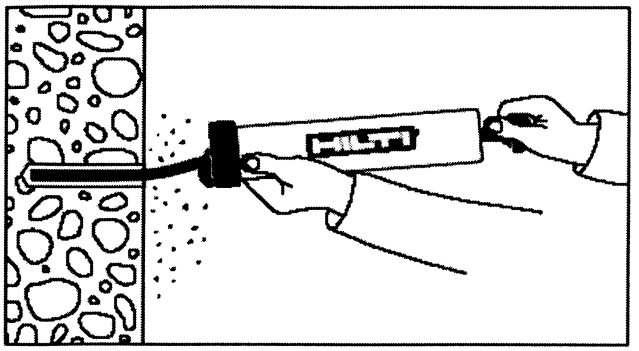
Edge Distance - Shear	
$h_{act} \ge h_{min}$	
Perpendicular Toward Edge	$f_{RV1} = \frac{c}{3h_{min}}$
Parallel to Edge	$f_{RV2} = \frac{c/h_{min} + 0.75}{3.75}$
Perpendicular Away from Edge	$f_{RV3} = \frac{c/h_{min} + 5.82}{8.82}$

1.4 Anchor Installation Instructions

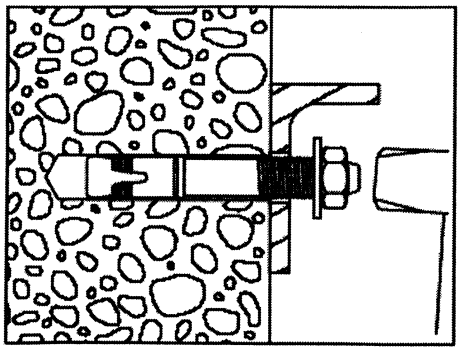
Kwik Bolt 3 Anchor Installation Instructions into normal weight and lightweight concrete



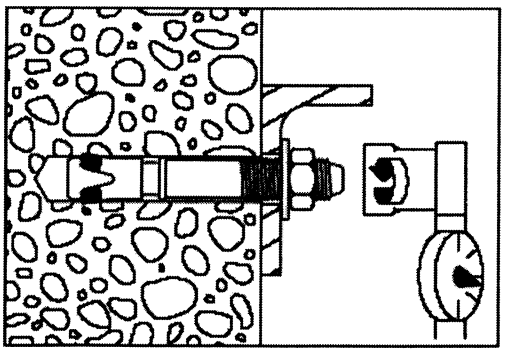
1. Hammer drill a hole to the same nominal diameter as the Kwik Bolt 3. The hole depth must exceed the anchor embedment by at least one diameter. The fixture may be used as a drilling template to ensure proper anchor location.



2. Clean hole.



3. Drive the Kwik Bolt 3 into the hole using a hammer. The anchor must be driven until at least six threads are below the surface of the fixture.



4. Tighten the nut to the recommended installation torque.

CERTIFIED QUALITY SYSTEM

Underwriters Laboratories Inc.®
FILE MH16855 Vol. 2 Secc.2

Association canadienne de normalisation
Canadian Standards Association
FILE LR87427 2M - LR108921-1

Main characteristics

Forged brass, stainless steel body.
BSP or NPT threaded connections.
Encapsulated plug-in coils.
Shape A DIN 43650 Connection. IP65 and NEMA4 Protection.
Normally closed and normally open.
Metal core diaphragm and seats with different resilient compounds, according to the fluid.

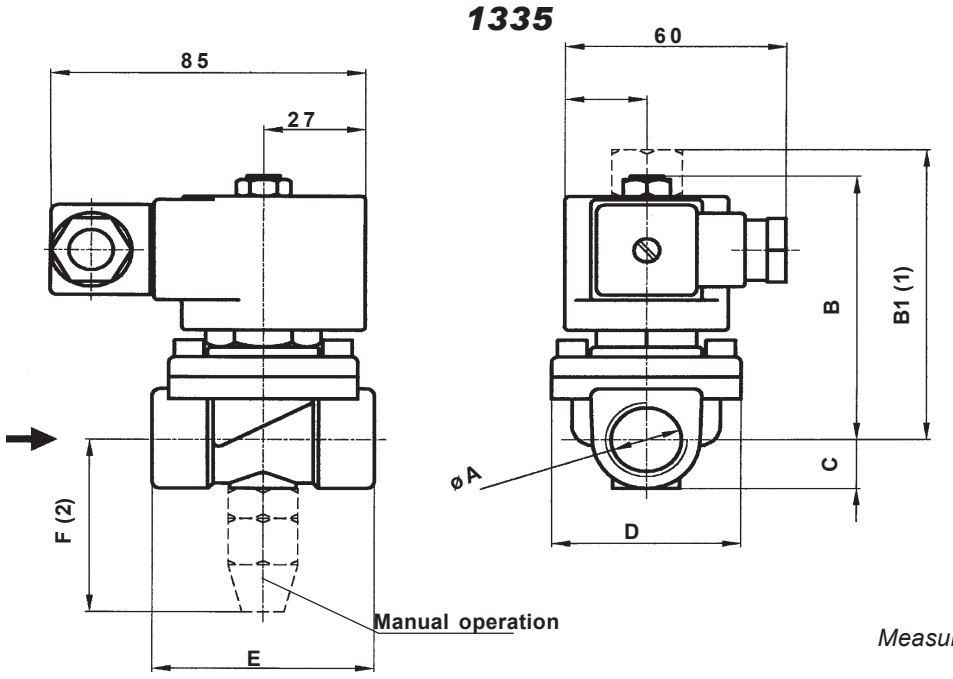
Options:
- Energized coil indicator light.
- Explosion and / or weather coils and housings.
- Manual operation.

Technical specifications

ø Connect.	ø Passage mm.	Kv Coef. m^3/h.	Weight in kg.	Maximum Temp. and catalog Nº according to seat and diaphragm materials			
				Acrylo - Nitrile	Neoprene®	Ethyl-propylene	Viton®
				80ºC	80ºC	150ºC	150ºC
Brass body - Direct acting - Normally closed - Minimum Δp : 0 bar - Maximum Δp : 0,1 bar.							
3/8"	14	2,35	0,8	1335BA3D	1335BN3D	1335BE3D	1335BV3D
1/2"	14	2,65	0,8	1335BA4D	1335BN4D	1335BE4D	1335BV4D
3/4"	18	4,30	0,9	1335BA6D	1335BN6D	1335BE6D	1335BV6D
Brass body - Servo operated - Normally closed - Minimum Δp : 0,1 bar - Maximum Δp : 10 bar.							
3/8"	14	2,35	0,8	1335BA3	1335BN3	1335BE3	1335BV3
1/2"	14	2,65	0,8	1335BA4	1335BN4	1335BE4	1335BV4
3/4"	18	4,30	0,9	1335BA6	1335BN6	1335BE6	1335BV6
Brass body - Combined acting - Normally closed - Minimum Δp : 0 bar - Maximum Δp : 7 bar.							
3/8"	14	2,35	0,8	1335BA3A	1335BN3A	1335BE3A	1335BV3A
1/2"	14	2,65	0,8	1335BA4A	1335BN4A	1335BE4A	1335BV4A
3/4"	18	4,30	0,9	1335BA6A	1335BN6A	1335BE6A	1335BV6A
Brass body - Servo operated action - Normally open - Minimum Δp : 0,1 bar - Maximum Δp : 10 bar.							
3/8"	14	2,35	0,8	1335BA3INA	1335BN3INA	1335BE3INA	1335BV3INA
1/2"	14	2,65	0,8	1335BA4INA	1335BN4INA	1335BE4INA	1335BV4INA
3/4"	18	4,30	0,9	1335BA6INA	1335BN6INA	1335BE6INA	1335BV6INA

*Investment cast AISI 316 stainless steel body; change letter "**B**" for "**I**" to catalog number. Example: 1335IV4.*

General dimensions



Measurements: mm.

Connection (A)	B	B1	C	D	E	F
R 3/8"	80	88	15	51	60	53
R 1/2"						
R 3/4"	82	90	17	58	72	55

NOTES: *(1) Normally open version*
(2) Manual operation (optional)

NPT Connections

Add suffix "**T**" to catalog Nº.
Example: 1335BA3DT.

Special constructions

•Investment cast AISI316 Body.
Change letter **B** for **I** to Catalog Nº.
Example: 1335IV4.
•Vacuum systems: Consult **Jefferson**.

Coils

CA 50 Hz: 11 W, MF11C type, for 12 V, 24 V, 110 V, 220 V, 240 V.
CA 60 Hz: 13 W, MF13C type, for 12 V, 24 V, 110 V, 120 V, 220 V, 240 V.
DC: 19 W, MF19C type, for 12 V, 24 V, 110 V, 220 V.

Options

•Explosion and weather proof coils.
Add prefix **ZC** to valve catalog.
Example: ZC1335BA4.
•Water, weather and saline corrosion proof coils. NEMA 4x.
Add prefix **YC** to valve catalog.
Example: YC1335BN4.
•Explosion and weather proof housing.
Add prefix **Z** to valve catalog.
Example: Z1335BA6A.
•Manual operation: Add suffix **-M** to catalog Nº.
Example: 1335BA4-M.
•Energized coil indicator light.
See coil section.

Recommendations for the installation

Place a strainer upstream of the valve with a porosity □ 100□.
Install the valve in any position, preferably on a horizontral pipeline with the coil upright.

Applications according to the seat and / or diaphragm material.

Seat material	Acrylo Nitrile	Neoprene®	Ethyl-Propylene	Viton®
Maximum Temperature	+80ºC	+80ºC	+150ºC	+150ºC
Uses	Water, air, light oils. Gas-oil, kerosene. Low and medium vacuum	Oxygen, alcohol, argon, other non-corrosive light gases and liquids. Freon 12.	Water steam, hot water, acetone.	Benzene, naphta, aromatics, benzene, etc.. Hot gases. High vacuum.

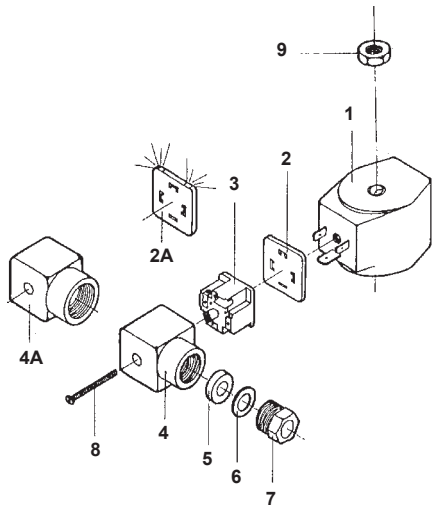
Electrical installation

All the coils are for continuous use - permanent or high frequency operation.
Check that the coil supplied with the valve has the correct tension and current required. If not, replace it with the adequate coil without changing the valve.
The allowed tension variation that does not affect the performance of the valve is -15% to +10% of the nominal tension for AC and -10% to +10% for DC.
Except for valve series 1312, 1314, 1344, 1356S, 1388 which are provided with “S” coils, and 1326 series with “C” coils, the other Jefferson models are generally supplied with Shape A or B DIN 43650 Connection (ISO 4400) encapsulated coils.

Mechanical installation

•Verify that the working conditions are within the range of differential pressure and temperature indicated on the nameplate of the valve.
•Place a strainer immediately upstream from the valve with the adequate capacity and a mesh smaller than 100 µ.
•The most favorable mounting position is on a horizontal pipeline with the coil upright.
•Pipelines upstream from the valve must be carefully and exhaustively cleaned even before the strainer, by means of purges with compressed air or any other system that guarantees the disposal of solid elements as well as welding bits, mud, dirt, etc.., especially with new pipelines.
•Follow the arrow that indicates the flow direction in the valve’s body. The input pressure must always be equal or greater than the output pressure.

Plug-in coils - DIN 43650 Connection (ISO 4400). IP65 Protection.



1 Coil
2 Gasket
2a Gasket with energized coil indicator light. (Upon request).
3 Electric terminals block. Maximum wiring section AWG14 (1.6 mm.)
4 Cover with opening for armored cable. Strain relief “PG9”, cableexternal f from 6 to 8 mm.. Cover with indicator light upon request.
4a Cover with opening for conduit. ½ NPT Connection. (Part No 3189-2). Cover with indicator light upon request.
5 Strain relief gasket.
6 Washer.
7 Strain relief.
8 Fixing screw.
9 Coil fixing nut.

Instructions for the electrical connection with strain relief.

1.Unscrew the screw (8) to reach the block (3), where the terminals are. The system is designed to use armored cables with 3 “PG9” conductors. Carry out Neutral - Live - Ground connections.
2.Insert the terminal block into the cover (4) according to the desired entrance angle, in any of the four possible positions: Left, Right, Above, Below.
3.Insert the coil blades into the connector. Fasten it with the screw (8).
4.Finally but very important, tighten the strain relief (7) to make sure that it is hermetic. Otherwise, moisture may enter and cause a short-circuit between the terminals.

Instructions for the cover with an opening for ½ NPT conduit.

1.Follow instructions 1, 2 and 3 for strain relief connector.
2.It is important to be sure that the interconnection is hermetic, so we recommend the use of a sealant or gasketing tape over the threads.

Coil fixing

The nut (9) that fixes the coil to the core-tube must be 5 Nm / 0,5 kpm / 3.75 lbf, to prevent the coil from turning round. Avoid unnecessary tension that may damage the core-tube due to excess of torsion.

Note:
All this is valid both for shape “A” and shape “B” connectors (2026, 2036 and 2073 series).

Failure analysis

Many times solenoid valves fail due to an inadequate selection for certain applications.
In other cases the failures are caused by a defective installation, not having followed the manufacturer’s recommendations. In many other cases, because of lack of maintenance, which should be adequate for the kind of job or the efforts the valve is subjected to.
Most of the failures that occur when starting a new installation are the result of lack of cleanness in the pipelines between the filter and the valve, due to left-owers of packaging, teflon, welding residue, dirt, etc..
However, in spite of having made a good choice, a good installation and the adequate maintenance, some contingent factors may occur after the installation and disturb a suitable operation.
offers its complete sales service by phone or fax to assist the end user in studying and finding a solution to the failure.
The following page shows the most common failures with their possible causes and solution.

PROBLEM	POSSIBLE CAUSES	SOLUTIONS
MAKE SURE IN EVERY CASE THAT THE VOLTAGE ENERGY EFFECTIVELY REACHES THE COIL TERMINALS AND CHECK THAT THE FILTERING MESH OF THE STRAINER BEFORE THE VALVE IS IN GOOD CONDITION.		
1.Valves do not open when energized (NC) or when de-energized (NO).	**For direct acting valves** 1. Tension less than 15% of the nominal voltage. 2. Too high a differential pressure for that model. 3. Burnt coil (with the circuit open). 4. Plunger jammed with solids. 5. Damaged plunger. **For servo operated action valves** **The same as above plus:** 6. Differential pressure too low. 7. Jammed servo piston. 8. Damaged servo piston, servo piston rings or diaphragm. 9. Pilot orifice blocked. 10. Pilot gasket damaged or mis-aligned. 11. Excessive viscosity.	1. Check the coil voltage, which must not be less than 85% of the indicated nominal tension. If this is the case, adjust the source to the adequate value. 2. Reduce pressure to the maximum shown on the valve nameplate or change it for a more adequate one. 3. See Burnt Coils. 4. Clean the plunger's core tube and the valve. If the system lacks an adequate strainer before the valve, the problem will substist and service will shut down. 5. Replace the damaged part. Damage may be caused by fluid abrasive elements or high operation frequency over a long period of time and exceeding the element's life. 6. This factor should be considered when choosing a valve. It may occur due to over-sizing or reduction of differential pressure. If differential pressure cannot be increased by increasing the flow, the valve must be changed for an adequate one. 7. Check that solids have not affected the piston's movement. After cleaning, check that it is not damaged. A strainer must be placed upstream from the valve to eliminate the problem. 8. Change damaged parts. Check that the cause is not dirt. Point 1.4.1. is applicable in this case. 9. Clean the orifice. See 1.4.1., if the orifice is damaged consult Jefferson. 10. This is caused by poor assembly. Change the damaged part and assemble the valve correctly. The O-ring must be correctly fitted. 11. Fluids with vicosities exceeding 60 CST cannot be used with servo operated valves. If not, change the valve model.
2.The valve remains open	**For direct acting valves** 1. The coil was not de-energized (NC valve) or energized (NO valve). 2. Plunger jammed with solids. **For servo assisted valves** The same as above plus: 3. The pilot orifice does not close. 4. Compensation orifice blocked. 5. Jammed servo piston. 6. Servo piston, servo piston rings or diaphragm damaged. 7. Excessive viscosity.	1. Check the control circuits. 2. Clean the plunger's core tube and the valve. If the system lacks an adequate strainer before the valve, the problem will substist and service will shut down. 3. Check that the plunger is not jammed or the seats damaged. In the first case, clean it, in the second case, change it. If the orifice seat is damaged, consult Jefferson. 4. Clean the orifice. See 1.4.1., if the orifice is damaged consult Jefferson. 5. Check that solids have not affected the piston's movement. After cleaning, check that it is not damaged. A strainer must be placed upstream from the valve to eliminate the problem. 6. Change the damaged parts. Check that the cause is not dirt. Point 1.4.1. is applicable in this case. 7. Fluids with vicosities exceeding 60 cSt cannot be used with servo operated valves. If not, change the valve model.
3. The coil gives off a burning smell after working for a short period or it burns up frequently.	1. Excessive voltage. 2. Only for AC: Too high a pressure that does not allow the pilot to open, therefore, only inrush current is present, which doubles the holding current. 3. The coil's nominal tension is less than the source's or does not correspond to its cycling. 4. Excessive fluid or ambient temperature. 5. Moisture entering the interior of the coil. 6. Lack of part of the electromagnetic package when it is not integrated to the coil. 7. It is energized outside the valve (AC only).	1. The voltage must not exceed 10% of the nominal tension, and only for brief periods. Correct the voltage. 2. Adjust the maximum working pressure to the maximum shown on the nameplate. If pressure is within the parameters, check that voltage is not less than 85% of the nominal tension. 3. Check that the tension and current type is as indicated on the coil. 4. The fluid, atmosphere and power of the coil determine the internal temperature. As a general rule, the fluid temperature + ambient temperature must not exceed 210ºC. The fluid temperature cannot be above 180ºC. When handling hot fluids and the ambient exceeds 30ºC, it is advisable to fit the valve in the most ventilated area. 5. Check that DIN coils' strain relief is tight and the armored cable corresponds to the connector Pg. For S coils, check that the housing and connection are closed. See mounting recommendations. 6. Replace the missing parts because they are part of the magnetic circuits and their absence results in an increase of the intensity which reduces the force of the magnetic attraction. 7. Do not energize the coil if it is not fitted to the valve.
4.The coil vibrates when energized.	1. Insufficient voltage. 2. Dirty fixed core and plunger surfaces, they have scales.	1. Adjust the tension within the permitted parameters. 2. Clean the surfaces. If scales remain there, change the components.
5-Fluid leakage when closed.	1. Main or pilot seat damaged or dirty.	1. Clean or change seats. If the orifice seats are damaged, consult Jefferson.
6-It operates slowly or fails.	1. Compensation or pilot orifice partially blocked. 2. Excessive fluid viscosity. 3. Temporary excess or lack of differential pressure.	1. In case of dirt, clean the orifices. In case of damage, consult Jefferson. 2. The fluid's viscosity must not exceed 60 cSt. See 1.11. 3. Check that both differential and opening pressure differential are within the limits indicated in the valve nameplate.

General Catalog / 1

Product Data and Specifications

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Magnetic Level Switches

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Montevideo - 11200 - Uruguay
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Venezuela
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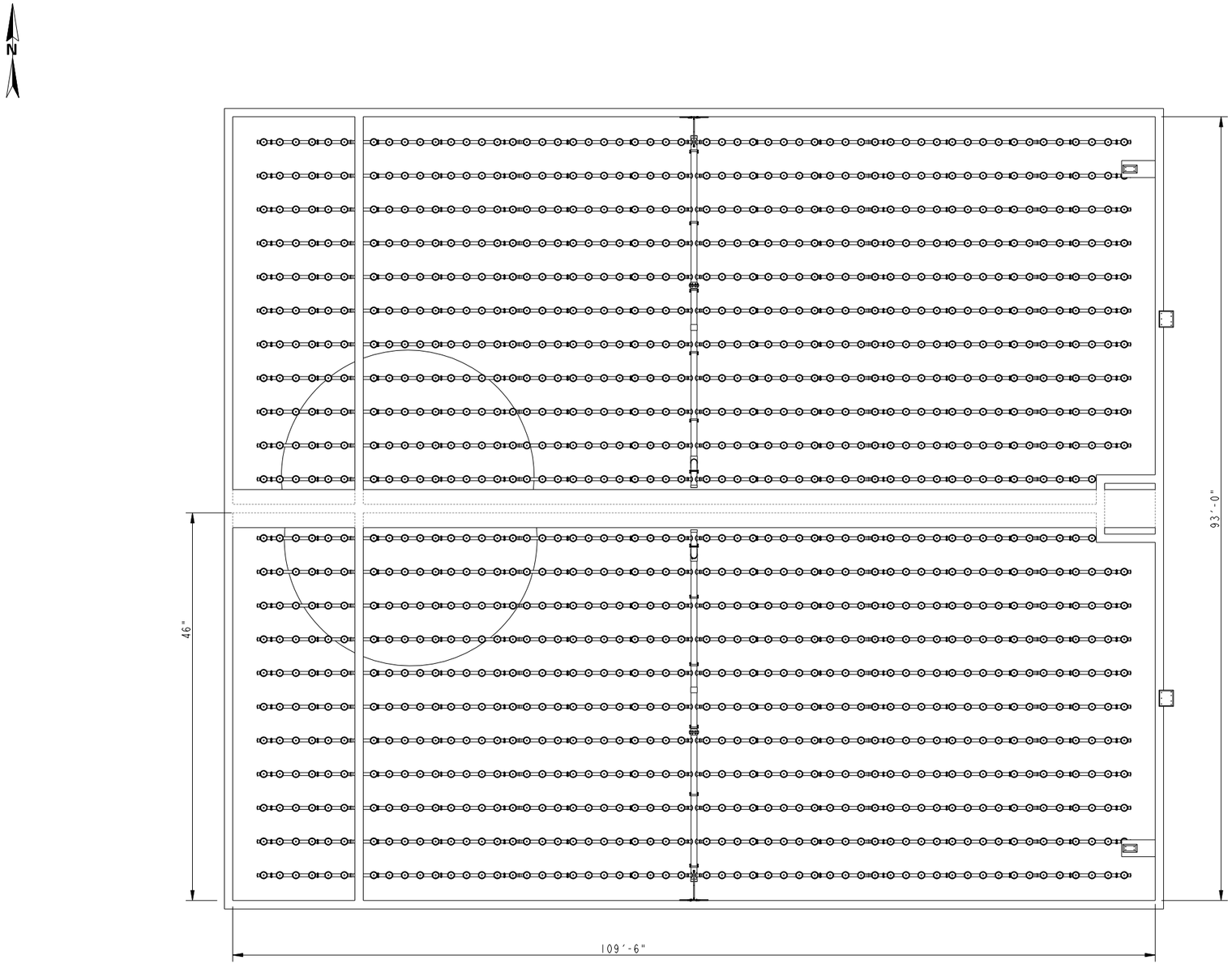
Av. Santiago de Chile - Quinta 01-24
Los Caobos - Caracas - Venezuela
Tel.: (582) 7818764
Fax: (582) 7933036



08/31/15	MEMBRANE DISC AERATION SYSTEM MATERIAL AND MANUFACTURING SPECIFICATIONS (304L, PVC)		
ITEM	MATERIAL SPECIFICATION	MANUFACTURING SPECIFICATION	NOTES
DROPLEG	304L STAINLESS STEEL ASTM A240	FITTINGS: ASTM A774 TUBULAR PRODUCTS: ASTM A778 DIMENSIONS: ASTM A554	150# DRILLING FOR TERMINATION FLANGE CONNECTION. SCH 5S OR 10S WALL THICKNESS ON DROPLEG. *SEE BELOW
SUPPORTS	304L STAINLESS STEEL SHEET & PLATE PER ASTM A240 THREADED ROD PER ASTM A276	———	"L" GRADE NOT REQUIRED FOR NON-WELDED PARTS
BOLTS, NUTS, WASHERS	18-8 STAINLESS STEEL	———	———
FIXED JOINT O-RING	NATURAL RUBBER/SBR	———	45±5 DUROMETER SHORE A COMPRESSION SET 5% MAX
MANIFOLD & LOWER DROPLEG	PVC, ASTM D1784 COMPOUND 12454-B	PIPE: ASTM D1785 FITTINGS: ASTM D2466	———
AIR DISTRIBUTORS	PVC, ASTM D3915 COMPOUND 124524	PIPE: ASTM D3034 FITTINGS: ASTM D3034	MINIMUM 2% TITANIUM DIOXIDE
DIFFUSER HOLDER SUBPLATE, RETAINING RING	PVC, ASTM D3915 COMPOUND 124524	———	MINIMUM 2% TITANIUM DIOXIDE
DIFFUSER ELEMENT	EPDM	———	———
PVC SOLVENT WELDING	ASTM D2564	ASTM D2855	———

*STAINLESS STEEL DROPLEG FABRICATION
FACTORY WELD ONLY WITH MIG, TIG, OR PLASMA-ARC WELDING INERT GAS PROCESSES, FULL PENETRATION BUTT WELDS, ER 316L FILLER WIRE. AFTER FABRICATION FINISH CLEAN ALL WELDED STAINLESS STEEL ASSEMBLIES BY FULL IMMERSION CLEANING TECHNIQUES IN ACCORDANCE TO 6.2.11 OF ASTM A380. THE ACID FOR USE DEFINED BY TABLE A2.1 OF ANNEX A2 OF ASTM A380. FINAL RINSE AND DRY IN ACCORDANCE TO SECTION 8.3 OF ASTM A380. ALL WELDED SURFACES TO CONFORM TO AISI NO. 2D FINISH.

XX / X — VIEW, SECTION, OR DETAIL NUMBER; SHEET NUMBER ON WHICH VIEW, SECTION, OR DETAIL IS FOUND

KEY PLAN (1)

1 REQ'D AS SHOWN

NOTE:
PLEASE VERIFY ALL DIMENSIONS AND ELEVATIONS, INCLUDING: INSIDE TANK DIMENSIONS, DROPLEG LOCATIONS, ELEVATIONS OF DROPLEGS CONNECTIONS, FACE OF FLANGES, DIFFUSER ELEVATIONS, FLAT FLOOR AND HIGHPOINT/LOWPOINT ELEVATIONS OF SLOPED FLOOR.

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07/16/25

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AUMSVILLE, OREGON
WASTEWATER TREATMENT PLANT

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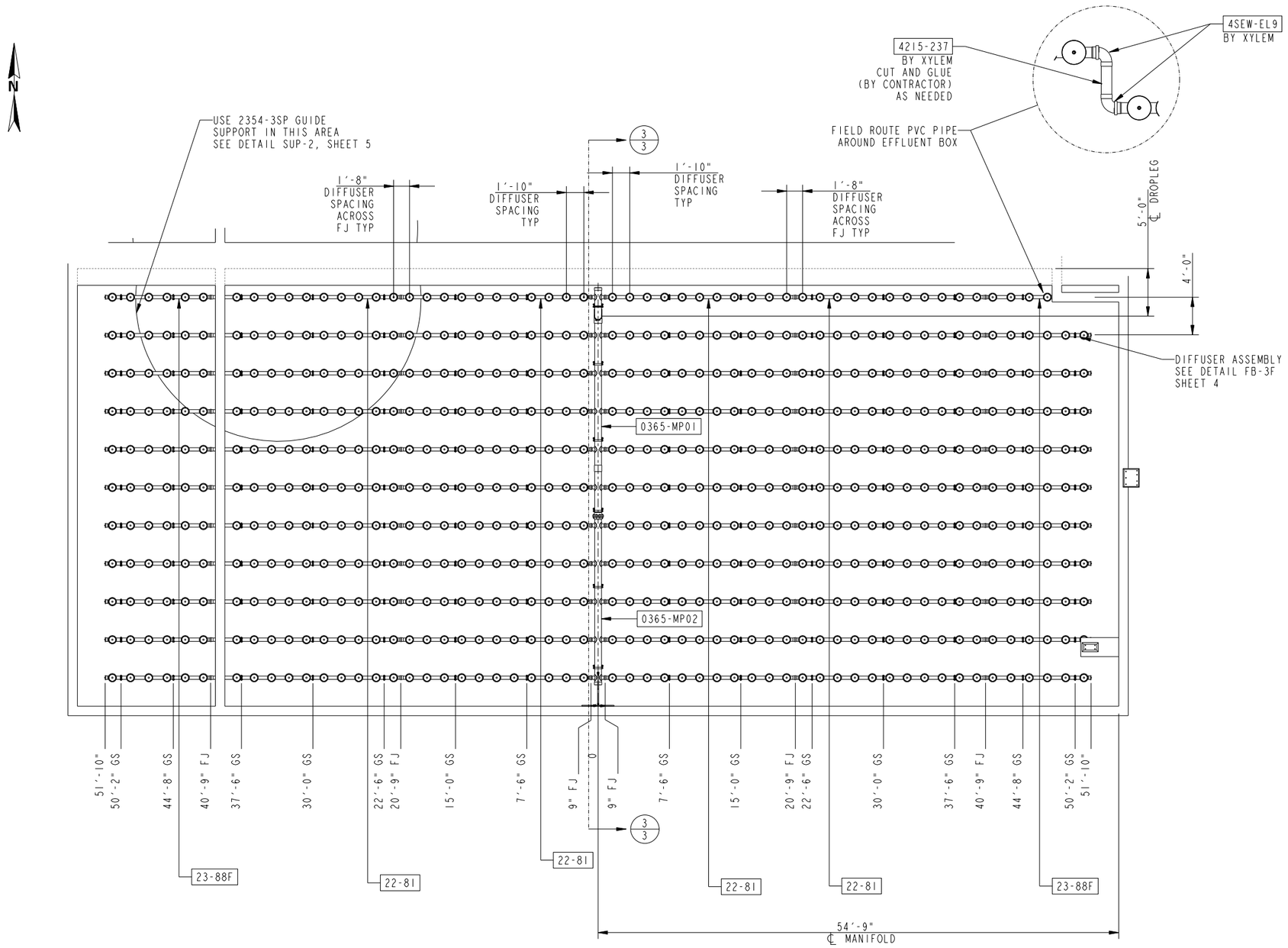
KEY PLAN

SANITAIRE
a xylem brand
WAUKESHA, WISCONSIN 53188

DRWN BY MJS DATE 07/16/25	EQUIP.	JOB NO. 25-0365A	SHEET 1 OF 5
CHKD BY FBM DATE 07/17/25	STD.		
APPVD BY FBM DATE 07/17/25	SIZE D REV. -	DWG. NO. E-1	



PLAN VIEW (2)

1 REQ'D AS SHOWN
1 REQ'D MIRROR IMAGE

NOTE: SUPPORT SPACING

Every attempt has been made to ensure locational dimensions of the supports are correct. However, after one line of air distributor anchors for any grid type have been installed, the locations must be checked for proper clearances by installing the supplied air headers. Spacing between lines must be checked for fit with the cross manifold. Any discrepancies or interferences must be brought to the attention of XYLEM prior to further installation.

The actual support anchor locations must be indexed from the centerline of the manifold. The actual accumulative dimensional error from the manifold to the anchor bolt must not exceed ± 3/4".

GRID TYPE 'I'
2-TANK(S)
1-GRID(S) PER TANK
11-AIR DISTRIBUTORS PER GRID
56-DIFFUSER HOLDERS PER DISTRIBUTOR
56-DIFFUSER ELEMENTS PER DISTRIBUTOR
616-DIFFUSER ELEMENTS INSTALLED PER GRID
1232-TOTAL DIFFUSER ELEMENTS INSTALLED FOR THIS GRID TYPE

LEGEND

FJ - FIXED JOINT
SEE DETAIL FB-10A
SHEET-4

GS - GUIDE SUPPORT
SEE DETAIL SUP-1
SHEET-5

\- FOR TYPICAL AIR DISTRIBUTOR SECTION
SEE DETAIL FB-22K
SHEET-4

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PLAN VIEW 1

NOTE:
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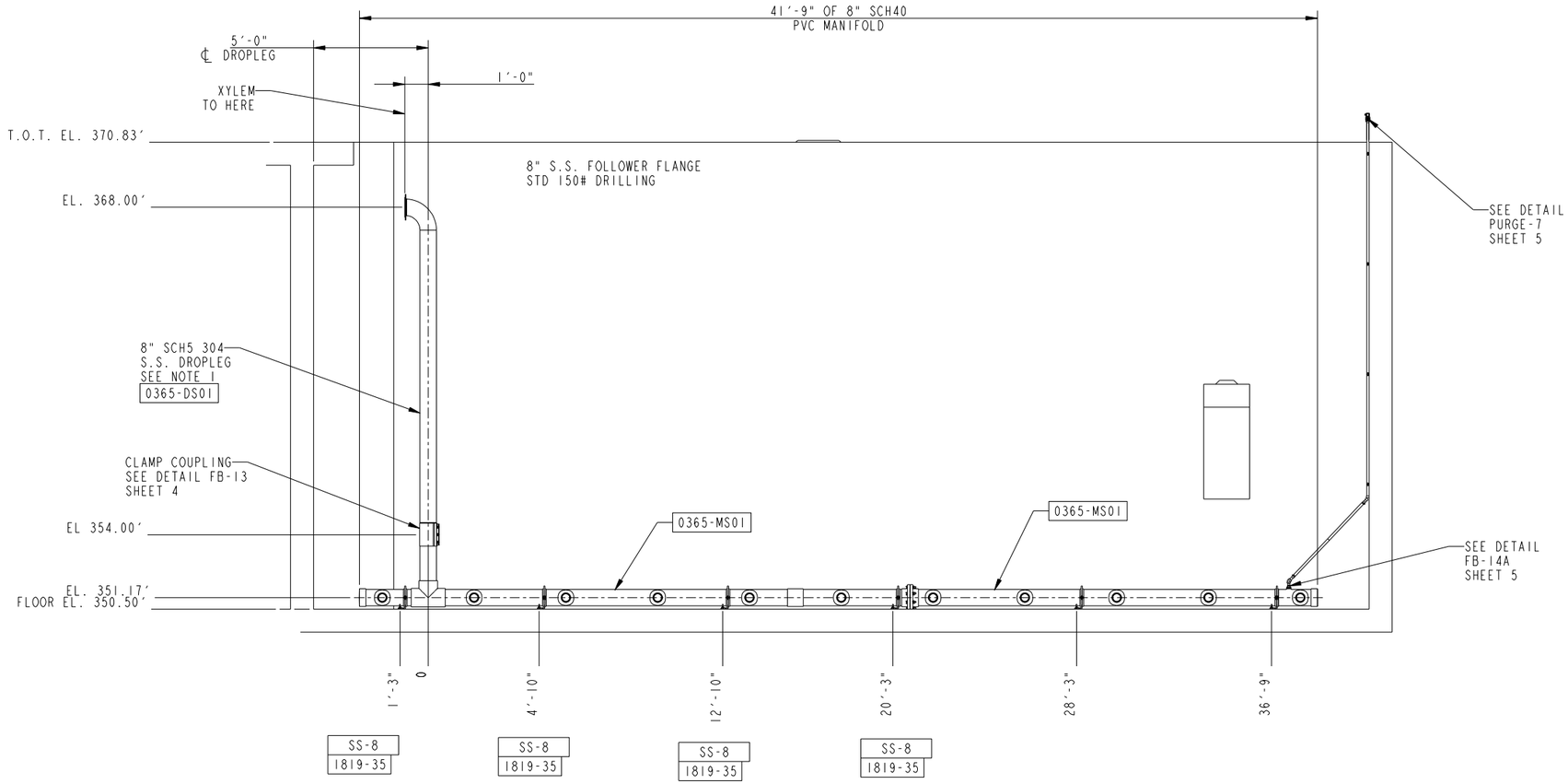
SANITAIRE
a xylem brand
WAUKESHA, WISCONSIN 53188

DRWN BY MJS DATE 07/16/25	SCALE:	JOB NO. 25-0365A	SHEET 2 OF 5
CHKD BY FBM DATE 07/17/25	STD.		
APPVD BY FBM DATE 07/17/25	SIZE D REV. -	DWG. NO. E-2	



SECTION 3

1 REQ'D AS SHOWN
1 REQ'D MIRROR IMAGE

NOTES:

1. INSTALLATION OF THE DROPLEG REQUIRES A PROPERLY SUPPORTED AIR MAIN AND CONNECTION.
2. PVC DROPLEG WILL BE SHIPPED TO JOBSITE LONGER THAN REQUIRED, TO ACCOUNT FOR TANK VARIANCES. CONTRACTOR TO CUT TO SUIT AND SOLVENT WELD INTO MANIFOLD TO MAINTAIN 1/8" MAXIMUM GAP BETWEEN STAINLESS STEEL AND PVC DROPLEGS.
3. FB-X / RSP-XXXX — REFERS TO THE MANIFOLD SUPPORT SIZE AND CORRESPONDS TO THE TABLE SHOWN WITH THE SUPPORT DETAIL. INDICATES THE SUPPORT STAND PART NUMBER.

NOTE:
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MANIFOLD SECTION 1

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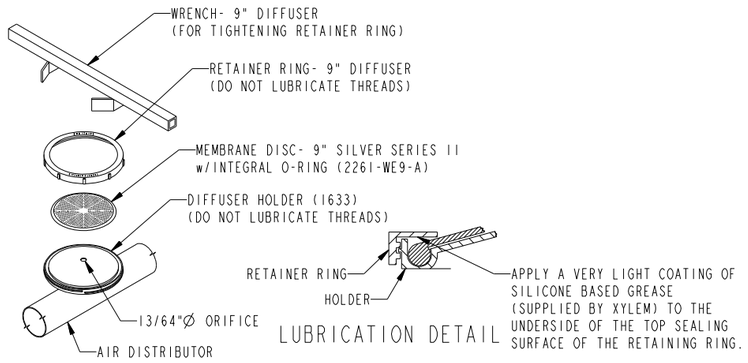
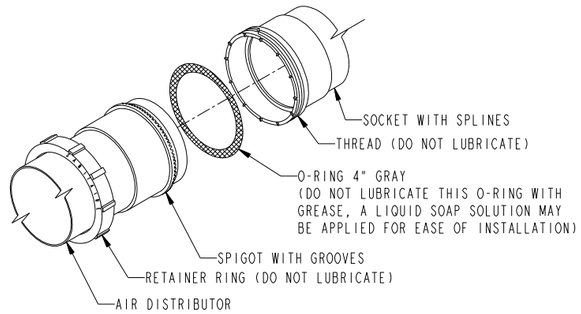
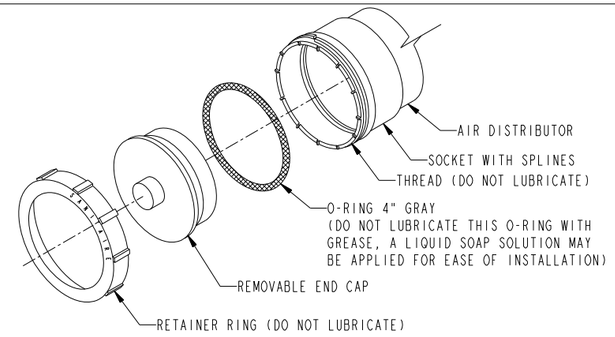
CHKD BY FBM DATE 07/17/25	STD.		
APPVD BY FBM DATE 07/17/25	SIZE D REV. -	DWG. NO. E-3	



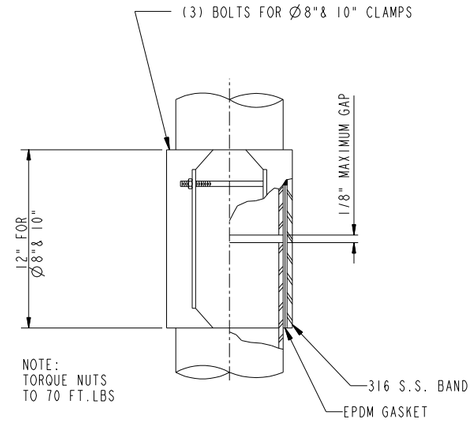
9" EPDM SSII WE DIFFUSER ASSEMBLY
DETAIL FB-3F



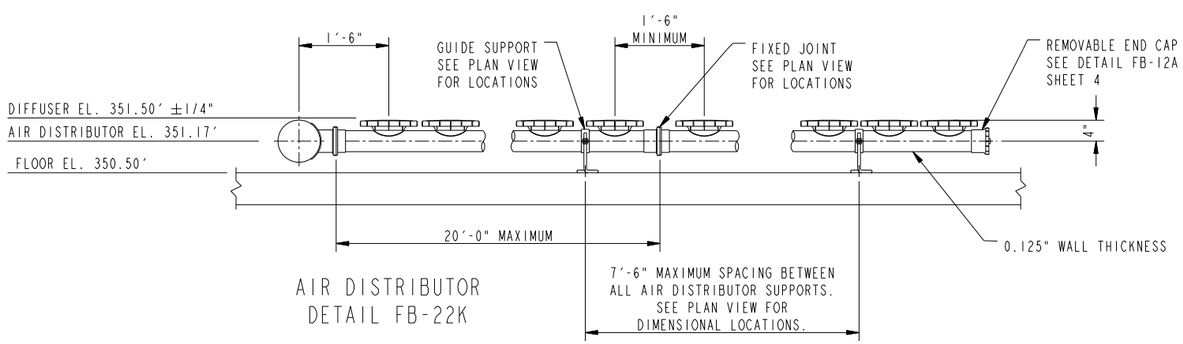
FIXED JOINT
DETAIL FB-10A



REMOVABLE END CAP
DETAIL FB-12A



CASCADE CLAMP COUPLING
DETAIL FB-13B



AIR DISTRIBUTOR
DETAIL FB-22K

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DETAIL VIEWS

SANITAIRE
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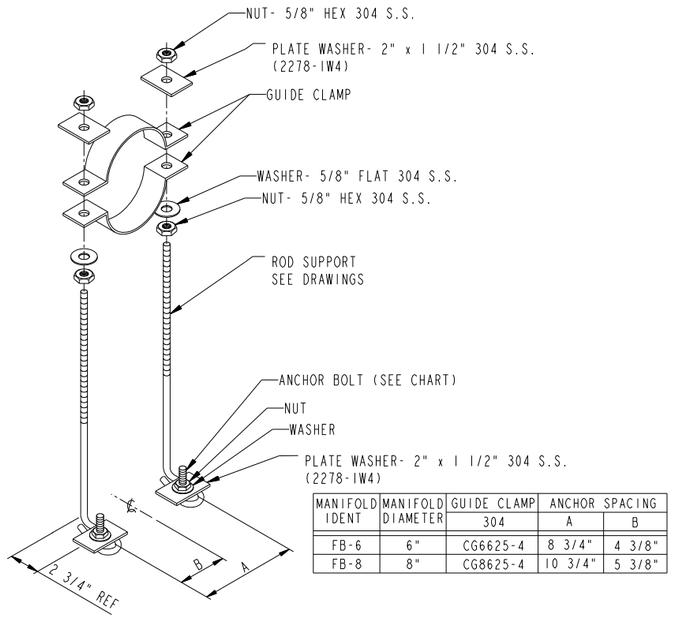
WAUKESHA, WISCONSIN 53189

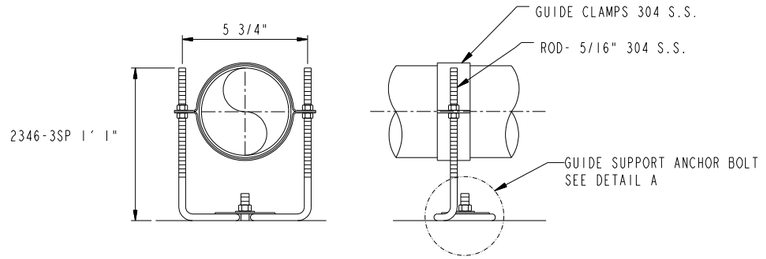
DRWN BY MJS DATE 07/16/25	SOUP.	JOB NO.	25-0365A
CHKD BY FBM DATE 07/17/25	STD.	DRWG NO.	E-4
APPVD BY FBM DATE 07/17/25	SIZE D REV. -		

SHEET 4 OF 5

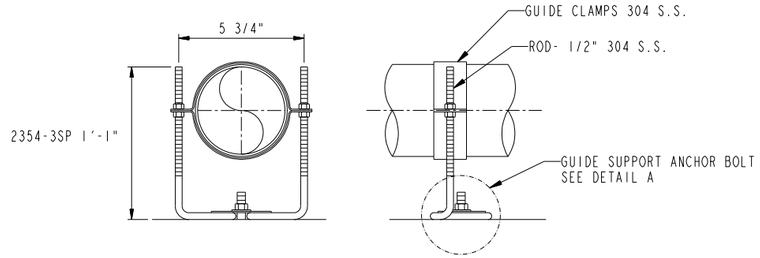


MANIFOLD IDENT	MANIFOLD DIAMETER	GUIDE CLAMP 304	ANCHOR SPACING A	ANCHOR SPACING B
FB-6	6"	CG6625-4	8 3/4"	4 3/8"
FB-8	8"	CG8625-4	10 3/4"	5 3/8"

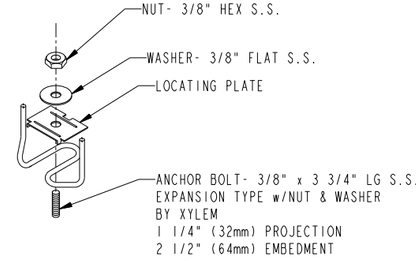
SIMPLE SUPPORT
DETAIL SUP-10



GUIDE SUPPORT
DETAIL SUP-1



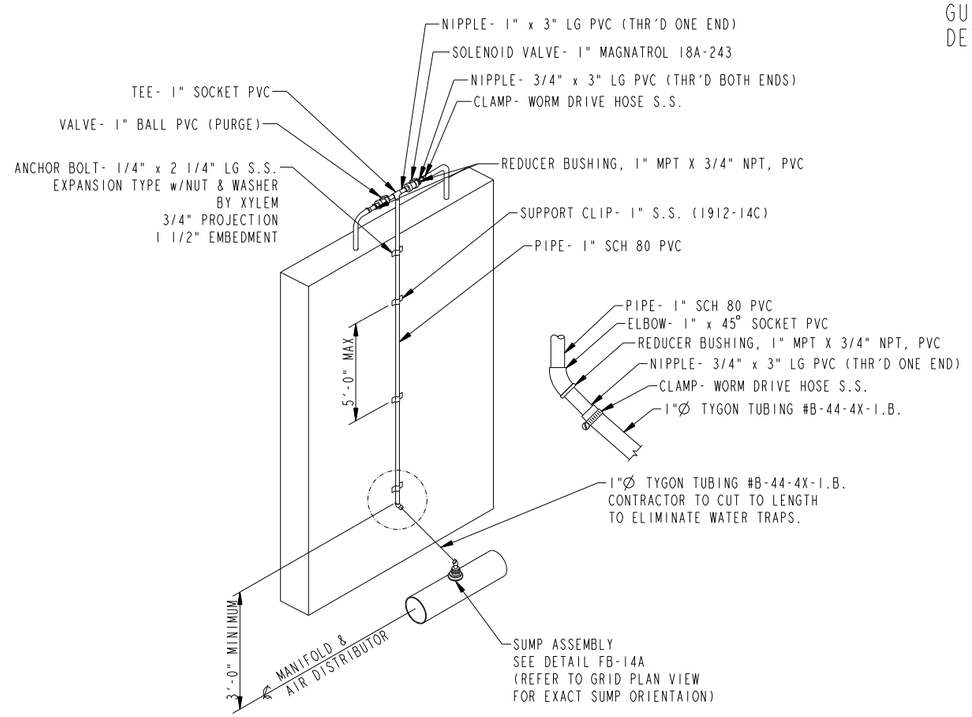
GUIDE SUPPORT
DETAIL SUP-2



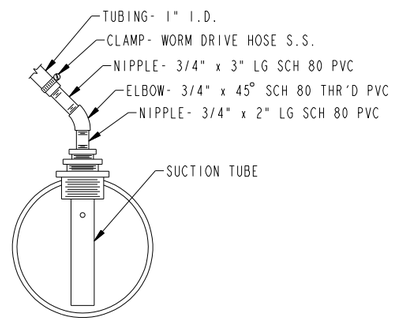
ANCHOR BOLT
DETAIL A

FINE BUBBLE AERATION SYSTEM EXPANSION ANCHOR CHART			
MANIFOLD OR DROPLEG DIA.	ANCHOR BOLT	PROJECTION HOLD	EMBEDMENT
4"Ø (100) - 8"Ø (200)	1/2"Ø X 4 1/2"	1 3/4" (45)	2 3/4" (70)

NOTE: FOR 1/2"Ø & 5/8"Ø ANCHORS THAT ARE USED ON SUPPORT STIFFENING STRUTS OR WALL SUPPORT AND FLOOR PLATES INCREASE THE EMBEDMENT TO 3 1/4", TO REDUCE THE PROJECTION BY 1/2".



PURGE ASSEMBLY
STRAIGHT WALL
DETAIL PURGE-7



PURGE SUMP
DETAIL FB-14A

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DETAIL VIEWS

SANITAIRE
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WAUKESHA, WISCONSIN 53189

DRWN BY	MJS	DATE 07/16/25	EQUIP.	JOB NO.	25-0365A
CHKD BY	FBM	DATE 07/17/25	STD.	DRWG NO.	E-5
APPVD BY	FBM	DATE 07/17/25	SIZE D	REV. -	SHEET 5 OF 5

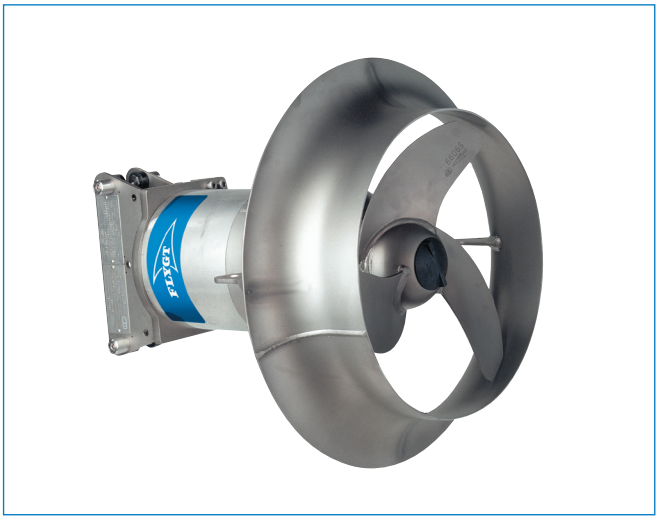
FLYGT
a xylem brand

4660

Submersible Mixer

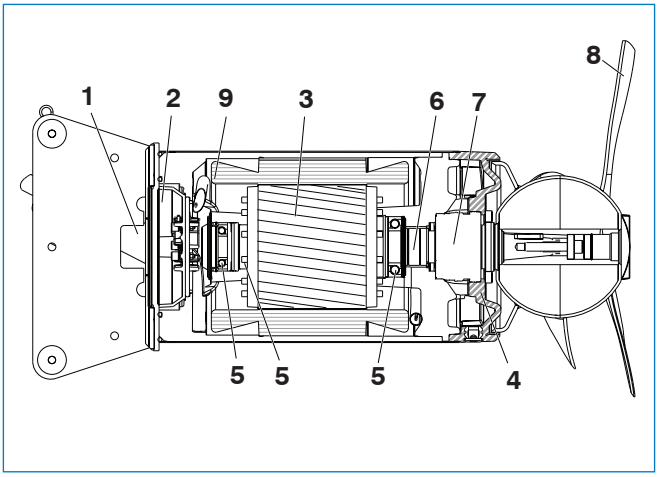
Heavy duty, direct drive mixer

Nominal Thrusts: 1,320 to 3,300 N



Applications:

4660 mixers are used in industrial processes such as Pulp & Paper, Chemicals, Food & Beverage and more. Also found in Municipal and Industrial waste treatment, Mining, Marine and Agricultural uses.



Materials of Construction:

Available in a choice of the following:

- 304 Stainless Steel
- 316 Stainless Steel

Approvals:

CSA tested and approved to UL Standard for Safety #778.

Factory Mutual Research tested and approved.
Suitable for use in:

Class I Div 1 groups C and D
Class II Div 1 groups E; F and G
Class III Div 1 Hazardous locations

Factory Mutual System Approved

US

Specifications

1. Cable Entry

Cable entry consists of two compressible rubber bushings to seal off motor area and relieve strain on the cable. Twice as many sealing bushings as previous designs means high reliability in difficult applications.

2. Junction Box

Box is completely sealed off from surrounding liquid and stator casing via terminal board and an O-ring.

3. Motor

Squirrel cage, 3 phase induction shell type design NEMA B motors are specifically designed for each mixer frame size. Non-overloading for full performance range. Motor insulation is Class H with a maximum working temperature of 180°C (356°F). Combined service factor of 1.10. Motors can be run continuously or intermittently. The stator is cooled by the surrounding mixed media.

4. Oil Casing

An environmentally friendly white paraffin based, FDA approved, non-toxic oil lubricates and cools the seals and acts as an additional barrier to prevent liquid from penetrating the motor area. Pressure build-up within the casing is reduced by an inner and outer oil compartment design which transports any foreign liquids away from rotating components.

5. Bearings

Bearings are of a preloaded design rated in excess of 100,000 hours of operation (B-10 rated life). Shaft is supported by a single row angular contact ball bearing and single row cylindrical roller bearing, plus a heavy duty single row angular contact ball bearing on the propeller side.

6. Shaft

Motor shaft and rotor are a single integral unit. Shaft is completely isolated and cannot come in contact with the mixed media.

7. Active Shaft Seals

Outer mechanical seal isolates the oil housing and surrounding liquids and is tungsten carbide lapped end faced running in oil. Inner mechanical seal operates between oil casing and stator casing. Only seal faces operate in the mixed media, all other components are within motor housing. One seal face of the inner seal pair has laser etched spiral grooves. As the seal rotates, these grooves act to pump any leakage back into the oil casing from out of the stator housing.

8. Propeller

Three bladed, 316 stainless steel or optional high chrome propeller. Blades have large width, thin profile and smooth surface with a back swept design for optimum efficiency and non clogging operation. The blades are laser cut to exacting tolerances.

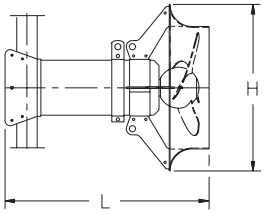
9. Monitoring Equipment

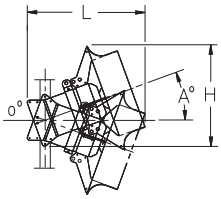
The stator incorporates three thermal switches connected in series (one in each phase) which open at 260°F (125°C).

Flygt products are affiliated with the following associations:

Submersible Wastewater Pump Association SWPA
WE DIG AMERICA
AEM Association of Equipment Manufacturers
NMA The American Resource
ARA american rental association

4660





ALL DIMENSIONS IN INCHES

DIMENSIONAL CHART

A°	-20	-10	0	+10	+20
H	32 1/2	31 5/8	32 1/8	31 5/8	32 1/2
L	43 1/8	41 3/4	39 1/4	41 3/4	43 1/8

WEIGHT(LBS)
460

Propeller Performance

Model 4660	*Prop. Code	Ø	Poles	Max. Motor HP Rating	Shaft HP	% Full Load	Power Input (kW)	Prop. Speed (RPM)	Prop. Dia. (inches)	Blade Angles (Degree)	Nominal Thrust (N)
	125803SJ	3	12	11.0	5.6	51	5.27	585	22 13/16"	3°	1320
	125805SJ	3	12	11.0	6.5	59	6.10	585	22 13/16"	5°	1650
	125807SJ	3	12	11.0	7.7	70	7.25	585	22 13/16"	7°	2020
	125809SJ	3	12	11.0	9.4	85	8.72	585	22 13/16"	9°	2420
Mixer With Jet Ring	125803SJ	3	12	15.0	5.9	39	5.40	575	22 13/16"	3°	1320
	125805SJ	3	12	15.0	6.9	46	6.40	575	22 13/16"	5°	1650
	125807SJ	3	12	15.0	8.1	54	7.60	575	22 13/16"	7°	2020
	125809SJ	3	12	15.0	9.5	63	8.80	575	22 13/16"	9°	2420
	125811SJ	3	12	15.0	11.3	75	10.50	575	22 13/16"	11°	2860
	125813SJ	3	12	15.0	13.2	88	12.30	575	22 13/16"	13°	3330
	125803SF	3	12	11.0	7.4	67	6.90	585	22 13/16"	3°	1300
	125805SF	3	12	11.0	9.1	83	8.52	585	22 13/16"	5°	1930
Mixer Without Jet Ring	125803SF	3	12	15.0	7.4	49	6.90	575	22 13/16"	3°	1600
	125805SF	3	12	15.0	9.2	61	8.52	575	22 13/16"	5°	1930
	125807SF	3	12	15.0	10.8	72	10.10	575	22 13/16"	7°	2270
	125809SF	3	12	15.0	12.6	84	11.80	575	22 13/16"	9°	2600

* Propellers also available in high chrome.

Motor Data

Rated Output Power HP (kW)	Ø	Volts nom.	Full Load Amps	Locked Rotor Amps	Locked Rotor KVA	NEC Code Letter	Rated Input Power kW	Poles/RPM	Cable Size	Cable Part Number	Max. Cable Length (FT.)
		200	47	174	60	F			4G10+S(2x0.5) 25.0 mm (0.98")	94 19 81	150
11 (8.2)	3	230	41	154	61	F	10.3	12/575	"	"	200
		460	23	90	72	H			4G6+2x1.5 24.0 mm (0.94")	94 20 56	455
		575	18	70	70	H			4G2.5+2x1.5 17.5 mm (0.69")	94 20 59	300
		200	58	178	62	D			4G16+S(2x0.5) 27.0mm (1.06")	94 19 82	165
15 (11.2)	3	230	51	156	62	D	14.0	12/575	"	"	210
		460	27	84	67	D			4G6+2x1.5 24.0 mm (0.94")	94 20 56	340
		575	22	71	71	E			"	"	520

Power Cable for Warm Liquid Mixers - HCR cable - to 195°F (90°C)

HP	Volts	Cable Size	Part No.
11	200/230	4G16+2x1.5 - 20.5 mm (0.81")	94 20 95
11	460/575	7G6.0 - 16.7 mm (0.66")	94 20 94
15	200/230/460	4G16+2x1.5 - 20.5 mm (0.81")	94 20 96
15	575	7G6.0 - 16.7 mm (0.66")	94 20 94

Liquid Temperatures: Mixers constructed in 316SS are assembled using components that will withstand liquid temperatures up to 195°F. Cable sizes shown above are based on max. liquid temperature of 104°F. Choose warm liquid power cable for liquid temperatures exceeding 104°F from the table to the left.

	Efficiency			Power Factor			Electrical Service Specifications
HP	100% Load	75% Load	50% Load	100% Load	75% Load	50% Load	
11.0	79.5	79.5	77.0	0.56	0.47	0.36	Voltage Tolerances: ±5% (Rated Output), ±10% (without overheating)
15.0	79.5	78.0	73.0	0.64	0.56	0.44	Frequency Tolerance: ±5%
							Voltage Balance (Phase to Phase): ±1%
							VFD Compatible

Xylem Inc., Flygt products, reserves the right to modify performance, specifications or design without notice.

Xylem Inc., U.S.A.

Flygt/WEDECO products, 14125 South Bridge Circle, Charlotte, NC 28273. Tel. (704) 409-9700 Fax.(704) 295-9080
Leopold, 227 S. Division Street Zelienople, PA 16063 Tel (724) 452-6300 Fax (724) 452-1377,
Sanitaire, 9333 N. 49th Street Brown Deer, WI 53223-1472 Tel (414) 365-2200 Fax (414) 365-2210.

xylem Let's Solve Water

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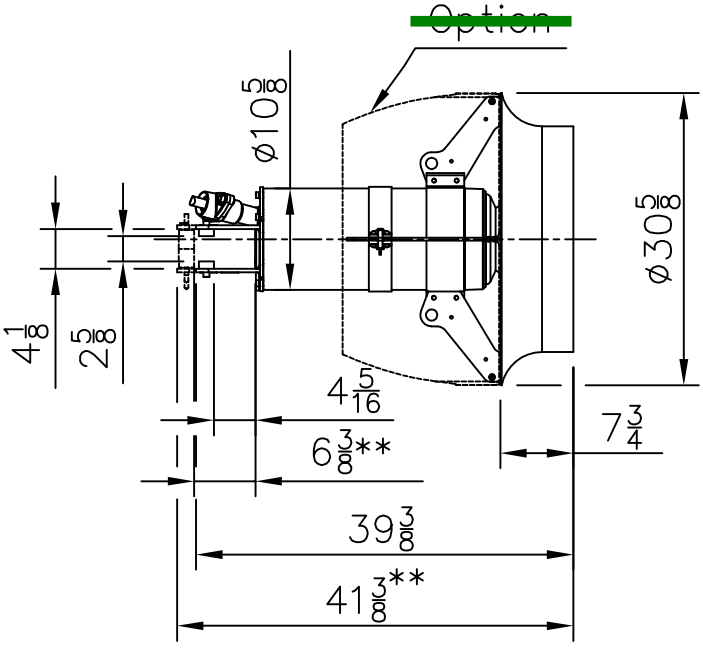
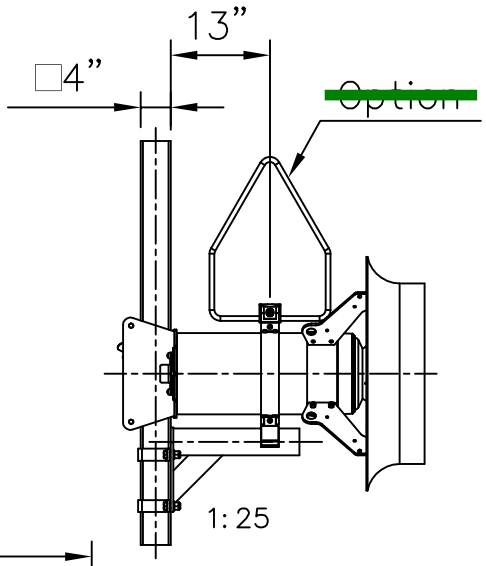
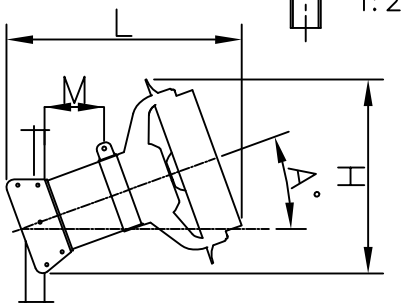
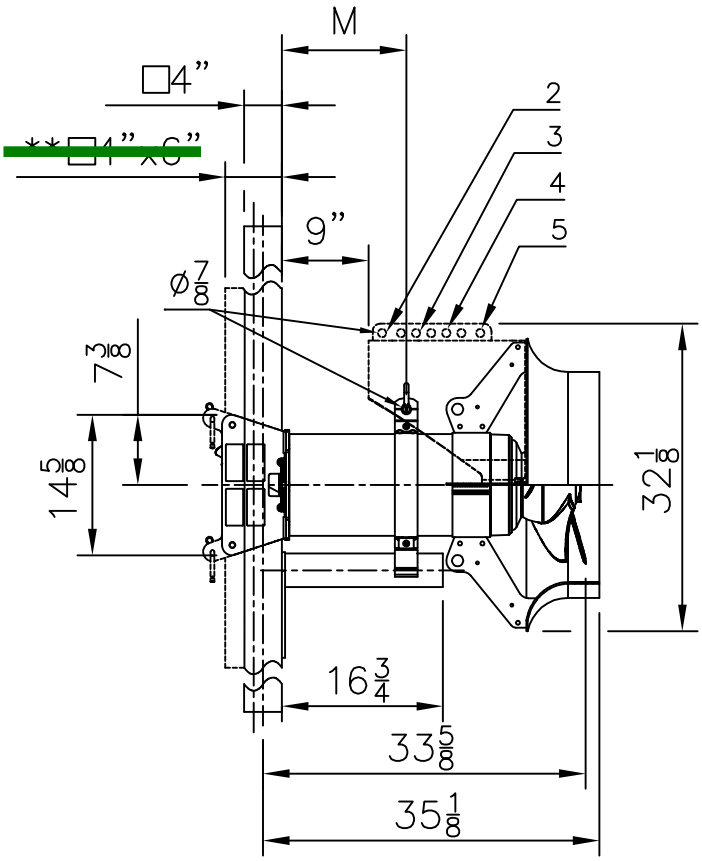
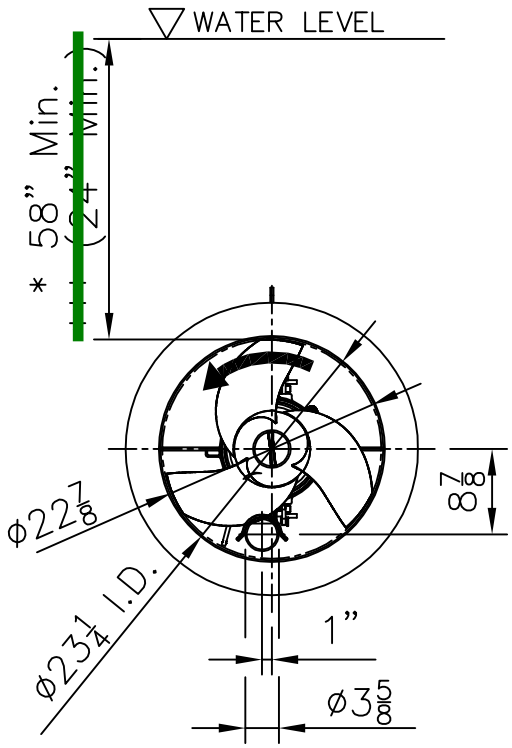










Dimensional chart					
A°	−20	−10	0	10	20
H	34 1/8	30”	30 5/8	30”	34 1/8
L	43 3/8	42 1/4	39 3/8	42 1/4	43 3/8
M without vortex shield	14 21/32	13 19/32	13”	14 1/8	13 1/8
Hole Ø7/8 (with vortex shield)	—	2	3	4	5

* Guideline value, recommended minimum submergence can be lower. Contact Xylem Water Solutions for more information.

*** With vortex protection shield.

** Optional

Weight (lbs)
Mixer
600

TOLERANCE: UNLESS OTHERWISE SPEC. ±3/16

	SR	4660	Scale 1:20	Date 200810
Single guide bar Jetring			Drawing number 5999300	Revision 16

4600 Series Mixers

Features & Materials of Construction

Components	304 Stainless Steel Mixer	~~316 Stainless Steel Mixer~~
Inner Stator Base:	+*Cast Iron (AISI A-48 No. 35B)	^ +*Cast Iron (AISI A-48 No. 35B)
Outer Stator Jacket:	+316 Stainless Steel	^ +316 Stainless Steel
Sliding Bracket/ Cable Entry & Mixer Top:	+304 Stainless Steel	+316 Stainless Steel
Mixer Fixing Plate:	^ 304 Stainless Steel	^ 316 Stainless Steel
Propeller:	+316 Stainless Steel	^ +316 Stainless Steel
Jet Ring:	+304 Stainless Steel	+316 Stainless Steel
Mixer Lifting Device:	+316 Stainless Steel	+316 Stainless Steel
Shaft:	+420 Stainless Steel	^ +420 Stainless Steel
Oil Housing Cover:	+Vinylester (Fiberglass Reinforced)	^ +Vinylester (Fiberglass Reinforced)
Propeller Cover:	+Vinylester (Fiberglass Reinforced)	^ +Vinylester (Fiberglass Reinforced)
Mixer Guiding "Rollers":	304 Stainless Steel	316 Stainless Steel
O-Ring:	+Nitrile Rubber	^ +Fluorinated Rubber
Cable Entry Grommets:	+Nitrile Rubber	^ +Fluorinated Rubber
Outer Mechanical Seal:	+Tungsten Carbide	^ +Tungsten Carbide
Inner Mechanical Seal:	+Tungsten Carbide	Δ ^ +Tungsten Carbide
Motor Cable:	+Chloroprene Rubber Jacket	^ +Chloroprene Rubber Jacket

***** The stator housing is an internal component protected by the outer stator jacket, therefore, the inner stator base never comes in contact in the mixed media.

+ Features and materials of construction used on Mast Mounted Mixers.

^ Features and materials of construction used on Flange Mounted Mixers.

Δ The inner seal for 4630/40 is constructed with tungsten carbide/aluminum oxide material faces.

Flygt System 4
Mixer Mounting System (with 4" Mast)

FLYGT's SYSTEM 4 (4" Mixer Mast)
This system was designed to mount mixer models **4650, 4660, 4670, 4680**.

The System 4 is a corrosion resistant 316 stainless steel mixer mounting system designed by FLYGT to be used with our standard and explosion-proof mixers.

Construction of the System 4 enables the operator to position and lock the 4" x 4" mounting mast and mixer at different operating angles along the horizontal and vertical planes respectively.

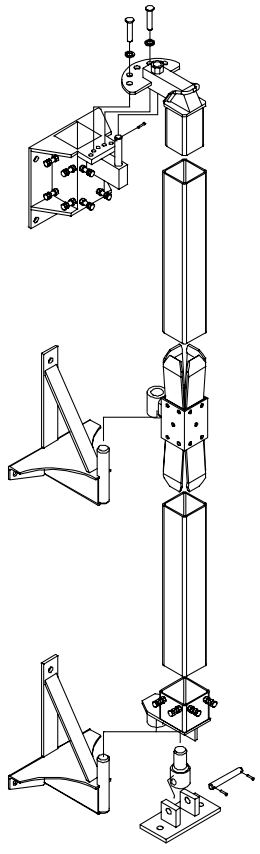
The System 4 is an extremely versatile mixer mounting system designed and tested to meet and exceed a variety of customer requirements, such as:

1. **Tanks with sloped walls and floors**
   The mast mounting brackets are designed for stepless adjustment, and as a result they can be fastened to straight or sloping surfaces.

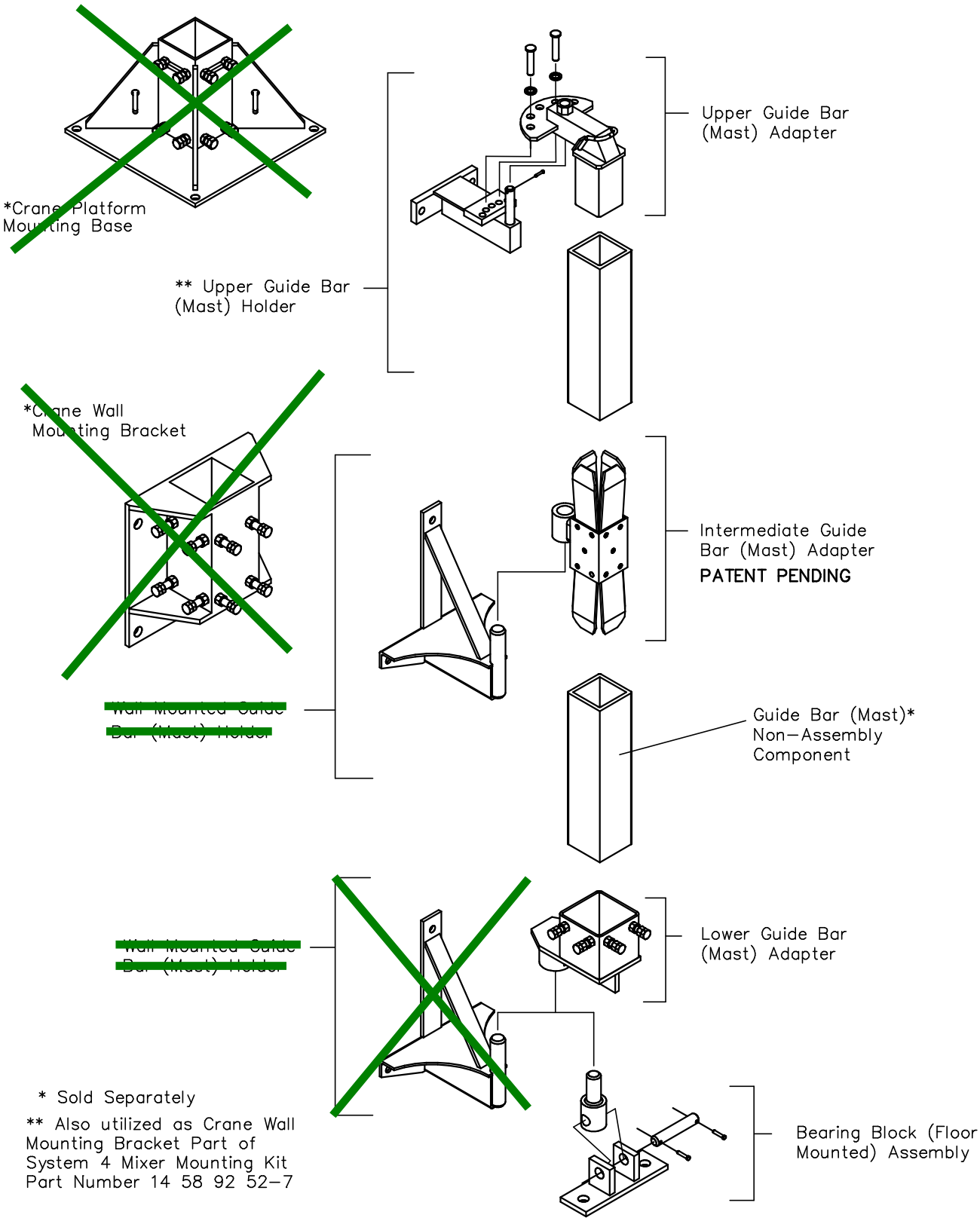
2. **Deep tanks**
   Lengthy mixer mounting masts will include the use of additional intermediate mast mounting brackets, therefore permitting mixer installation in deep tanks by preventing mast deflection.

3. **Closed tanks**
   By utilizing the adjustable 316 stainless steel cable, the mixer can be supported at the desired operating level, thus allowing the platform mounted power assisted crane's lifting cable to be slackened and removed from the winch. This feature enables the power assisted crane lifting cable to be stored below the roof of the tank which in turn permits the tank roof doors to be closed during mixer operation.

4. **Mast length flexibility**
   The System 4 mast length is currently limited only by the depth at which a particular Flygt mixer may be installed and retrieved. Please consult **Operating Guidelines** in section 5 for data applicable to your installation.



Floor or Wall Mounted 4” System 4 Mixer Mast Assembly - with 4" Mast - (without provision for crane mounting)

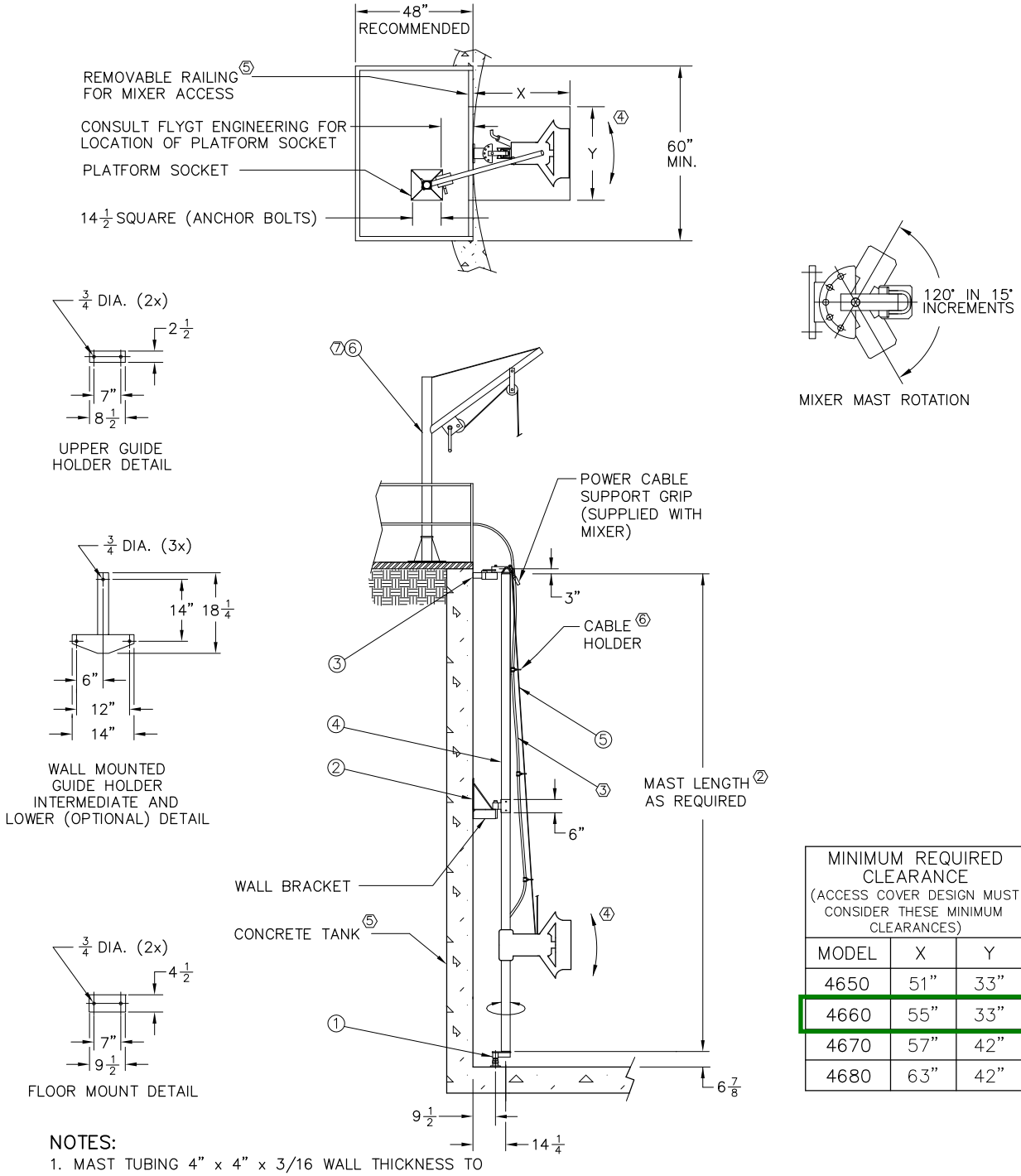


* Sold Separately

** Also utilized as Crane Wall Mounting Bracket Part of System 4 Mixer Mounting Kit Part Number 14 58 92 52-7

Installation and Platform Requirements

Floor Mounted 4" System 4



MINIMUM REQUIRED CLEARANCE (ACCESS COVER DESIGN MUST CONSIDER THESE MINIMUM CLEARANCES)		
MODEL	X	Y
4650	51"	33"
4660	55"	33"
4670	57"	42"
4680	63"	42"

NOTES:

1. MAST TUBING 4" x 4" x 3/16 WALL THICKNESS TO BE SUPPLIED AND CUT TO APPROPRIATE LENGTH BY CONTRACTOR.
2. CONSULT MIXER MATRIX CHART IN ACCESSORY SECTION TO DETERMINE HOW MANY INTERMEDIATE SUPPORTS ARE NECESSARY, DEPENDING UPON LENGTH AND MIXER SELECTED.
3. POWER CABLE TO BE CLEAR OF ALL SHARP SURFACES.
4. SEE MIXER DRAWINGS FOR WEIGHTS, DIMENSIONS, AND ANGLE SETTINGS.
5. PARTS AND DESIGN DETAIL BY OTHERS.
6. PLACE CABLE HOLDERS EVERY 5 FT.
7. SEE ACCESSORY SECTION FOR CRANE SELECTION.

ITEM NO.	DESCRIPTION	QUANTITY
6	POWER ASSISTED CRANE	1
5	CABLE ASSEMBLY (LOAD CARRYING)	1
4	MAST 4" x 4" x 3/16	AS REQ.
3	GUIDE HOLDER (UPPER)	1
2	GUIDE HOLDER (MIDDLE)	1
1	GUIDE HOLDER (LOWER)	1

Intermediate Guide Bracket

For 4" System 4

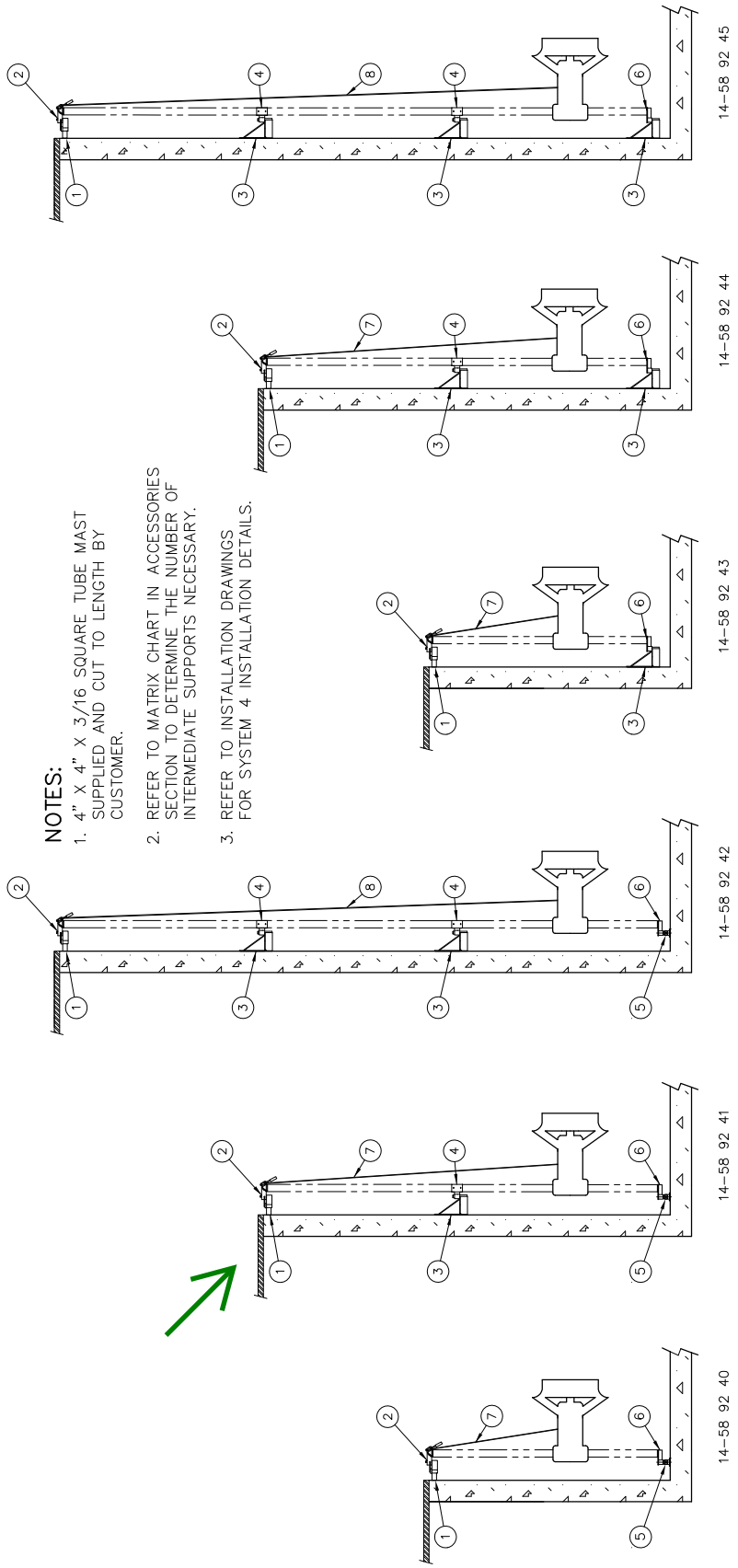
4" SYSTEM 4							
Maximum Allowable Mast Length Between Supports							
Mixer Models	**13 FEET**	**14 FEET**	**15 FEET**	**16 FEET**	**17 FEET**	**18 FEET**	**19 FEET**
4650							
4650 LSPM						P35811xx	P35807xx P35809xx
4660					125813xx	125811xx	125809xx
4670					167709xx 167711xx	167707xx	167705xx
4680	167717xx 167718xx	167715xx 167714xx	167711xx 167713xx	167709xx		167707xx	167705xx

4" SYSTEM 4							
Maximum Allowable Mast Length Between Supports							
Mixer Models	**20 FEET**	**21 FEET**	**22 FEET**	**23 FEET**	**24 FEET**	**25 FEET**	
4650		125805xx	125803xx				
4650 LSPM	P35805xx		P35803xx				
4660	125807xx	125805xx	125803xx				
4670							
4680							

NOTE:
Numbers listed in "LENGTH" columns are mixer model propeller codes.

MIXER MOUNTING KITS

4" System 4 SST 316



NOTES:

1. 4" X 4" X 3/16 SQUARE TUBE MAST SUPPLIED AND CUT TO LENGTH BY CUSTOMER.
2. REFER TO MATRIX CHART IN ACCESSORIES SECTION TO DETERMINE THE NUMBER OF INTERMEDIATE SUPPORTS NECESSARY.
3. REFER TO INSTALLATION DRAWINGS FOR SYSTEM 4 INSTALLATION DETAILS.

MIXER MOUNTING KITS – 4" SYSTEM 4 STAINLESS STEEL 316

ITEM	DESCRIPTION	14-58 92 40 KIT, FLOOR MOUNTED (W/O INTER. SUPPORT) QUANTITY	14-58 92 41 KIT, FLOOR MOUNTED (W/1 INTER. SUPPORT) QUANTITY	14-58 92 42 KIT, FLOOR MOUNTED (W/2 INTER. SUPPORT) QUANTITY	14-58 92 43 KIT, WALL MOUNTED (W/O INTER. SUPPORT) QUANTITY	14-58 92 44 KIT, WALL MOUNTED (W/1 INTER. SUPPORT) QUANTITY	14-58 92 45 KIT, WALL MOUNTED (W/2 INTER. SUPPORT) QUANTITY
1	UPPER GUIDE BAR HOLDER	1	1	1	1	1	1
2	UPPER GUIDE BAR ADAPTOR	1	1	1	1	1	1
3	WALL MOUNTED GUIDE BAR HOLDER	0	1	2	1	2	3
4	INTERMEDIATE GUIDE BAR ADAPTOR	0	1	2	0	1	2
5	BEARING BLOCK ASSEMBLY	1	1	1	0	0	0
6	LOWER GUIDE BAR ADAPTOR	1	1	1	1	1	1
7	WIRE ROPE ASSY 20 FT 316 SST	1	1	0	1	1	0
8	WIRE ROPE ASSY 40 FT 316 SST	0	0	1	0	0	1

ANCHOR BOLTS NOT INCLUDED

Leakage Sensors

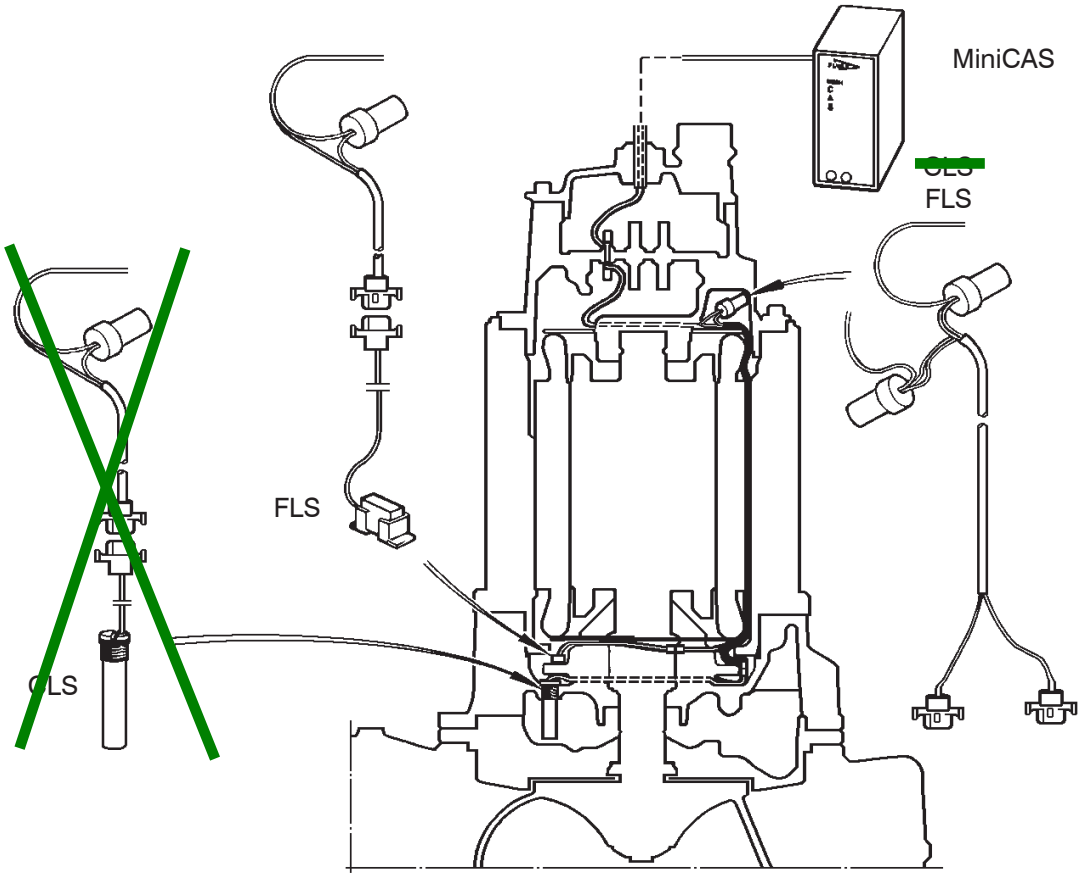
Select Flygt pumps are available with leakage sensors for sensing the presence of water in the oil and/or stator housing. A plate in the junction box indicates that the pump is equipped with sensors.

The Flygt FLS sensor is a miniature float switch for the detection of water and/or oil in the stator housing. Due to its design, it is meant to be used for pumps that will be oriented in the standard vertical position. The FLS sensor is mounted in the bottom of the stator housing. The FLS is the only sensor that can be used for intrinsically safe designs which is required for explosion-proof installations.

The FLS is connected to the Flygt Mini CAS (Control and Status) monitoring unit. The FLS is wired in series with the thermal switches, thus, eliminating additional control leads. The Mini CAS unit monitors the current allowable to flow from both the temperature switches and FLS sensor. On the front of the Mini CAS there are two indication lamps, one for supply and temperature and one for leakage. Only two wires are needed between the pump and the Mini CAS.

The Flygt CLS-30 is a capacitive type leakage sensor for the detection of water in the oil casing. This sensor actuates an alarm when the oil contains 30% water. The CLS-30 sensor is mounted in the bearing cage and sticks into the oil casing. The FLS and CLS sensors can be used together in the same pump, connected in parallel. The parallel connected sensors are then connected in series with the thermal switches and finally connected to the Mini CAS unit.

A typical connection of FLS and CLS sensors to a Mini CAS is shown below. (see Mini CAS or optional MAS 711 for appropriate connection details).



Leakage Sensors

TESTING PROCEDURES:

The **CLS** cannot be tested with a regular meter. **Flygt** provides a test device for **CLS**/**FLS** (P/N 10-45 17 00).

An alternative is to test the **CLS** with the **Mini CAS II** relay, measuring the current in through the **CLS**. Wrong polarity will give a zero current reading.

Refer to the **Mini CAS II** manual for additional information.

24 VAC power supply/12 VDC to sensor

MiniCAS Term.	No power	Normal condition	Stator high temp	Leakage
1-3	Open	Closed	Open	Closed
1-4	Closed	Open	Open	Open
11-8	Closed	Closed	Closed	Open
11-9	Open	Open	Open	Closed
mADC	0	7mADC	0	30mADC
Green LED	Off	On	Off	On
Red LED	Off	Off	Off	On

For FLS in parallel with CLS the current readings are:

MiniCAS Term.	No power	Normal condition	Stator high temp	Leakage
mADC	0	14.5mADC	0	45mADC

Caution: Never apply more than 14VDC to the CLS - a higher voltage can destroy the sensor.

Leakage Sensors

FLS LEAKAGE SENSOR

DESCRIPTION

The FLS is a sensor designed to detect water presence into the stator housing. FLS is designed for CP/DP model pumps, which are installed in a vertical position.
The FLS is an electro-mechanical type device. The FLS has a rigid aluminum frame, with two small fixed resistors. Two wires are provided for device connection. Inside the frame, a mobile float element can move up and down guided by a shaft. The float contains a permanent magnet which, on the uppermost float position, causes the "reed-switch" closure. The FLS-10 is a similar device used with the new generation of N-pumps.

Note: When ordering FLS leakage sensor, a Mini CAS II or MAS 711 unit should be ordered with the pump. (See Mini CAS or optional MAS 711 for appropriate connection details).

MODE OF OPERATION

In normal conditions, the float element will rest at the bottom of the frame. Across the connection wires, the FLS resistance is about 1500 ohms. The FLS-10 resistance is 1,200 Ohms.
When water or any liquid enters the stator housing, the float element and magnet will raise and finally touch the upper side of the frame. The "reed-switch" will close and add a 375 ohms resistor in parallel with a 1500 ohms resistor. The resulting resistance across FLS leads is 300 ohms.
In the FLS-10 leak detector, supplied with the new generation of pumps introduced in 2000, the resistor values are 430 ohms in series with a 770 ohm resistor. The "reed-switch" will close and drop out the 770 Ohm resistor from the circuit resulting in a resistance value of 430 Ohms. An ITT Flygt supervising device such as Mini CAS II or MAS711, will be activated by this change of resistance and provide a "leakage" signal or turn off the motor.

INSTALLATION

The FLS is usually installed in C/D 3000 series pumps, at the bottom of the stator housing, on the top of bearing housing, bonded to it with an epoxy-based adhesive. The FLS can also be used to check for water intrusion in the junction box for big pumps and hydroturbine generators.
When used with the Mini CAS II supervision relay, the FLS is connected in series with pump motor thermal switches, so only two wires are required to connect both leakage and thermal sensors. If a CLS sensor is also used, the FLS and CLS are connected in parallel.

FLS

FLS TECHNICAL DATA, DIMENSIONS & PART NUMBERS

Technical data:
- Signal: 8mA off-duty current, 36mA alarm current
- Supply voltage: 12VDC
- Max temperature: 90˚C, 1h
- Test temperature: 115˚C, 1h
- Max duty temperature 70˚C
- Material: aluminum

Dimensions
- Length: 27 mm (1.06 in.)
- Width: 16 mm (.63 in.)
- Height: 16 mm (.63 in.)

Part numbers
- FLS: 518 89 02
- FLS-10: 663 04 00

TESTING PROCEDURES

The FLS can be tested with a standard ohm-meter.

The FLS resistance should be:
- De-activated - about 1500 ohms;
- Activated - about 300 ohms.

The FLS-10 resistance should be:
- De-activated: about 1200 ohms
- Activated: about 430 ohms

Caution: Never apply more than 14VDC to the sensor. A higher voltage can destroy the sensor.

Storage

General Information	Issued: 2/88	Supersedes:

Each Flygt mixer leaves the factory properly assembled and prepared to perform even after a reasonable idle time in storage. However, as prolonged idle time can be detrimental to any rotating machinery, the procedures outlined below should be followed in order to insure that the equipment is in top condition to operate when finally installed. Whenever possible, store mixers in a dry environment free of extreme temperatures and strong direct sunlight.

Storage 6 to 24 months:

In general, rotating machinery left idle for extended periods of time, tends to establish a “set” position due to inaction of the moving parts. Some of these areas may be damaged (especially seals) from the sudden fast breakaway of start-up after a prolonged idle time. To insure that all rotating parts are free for final installation and start-up, it is good practice to rotate the propeller by hand once a month. It is also good practice to relieve the tension on the cable entry sealing grommet by backing off the cable entry compression screws slightly. If this is done, it is most important that a clear note be attached as a reminder to ***Re-Tighten Cable Entry Compression Screws Before Installation.***

Before storing a used mixer for an extended period of time, the unit should be dismantled, checked for any defects, repaired where necessary and reassembled. At reassembly, follow instructions in the Service Manual especially regarding seal assemblies.

In all cases, it is good practice to check all external bolts, nuts and screws for tightness before final installation after extended storage.

Controls

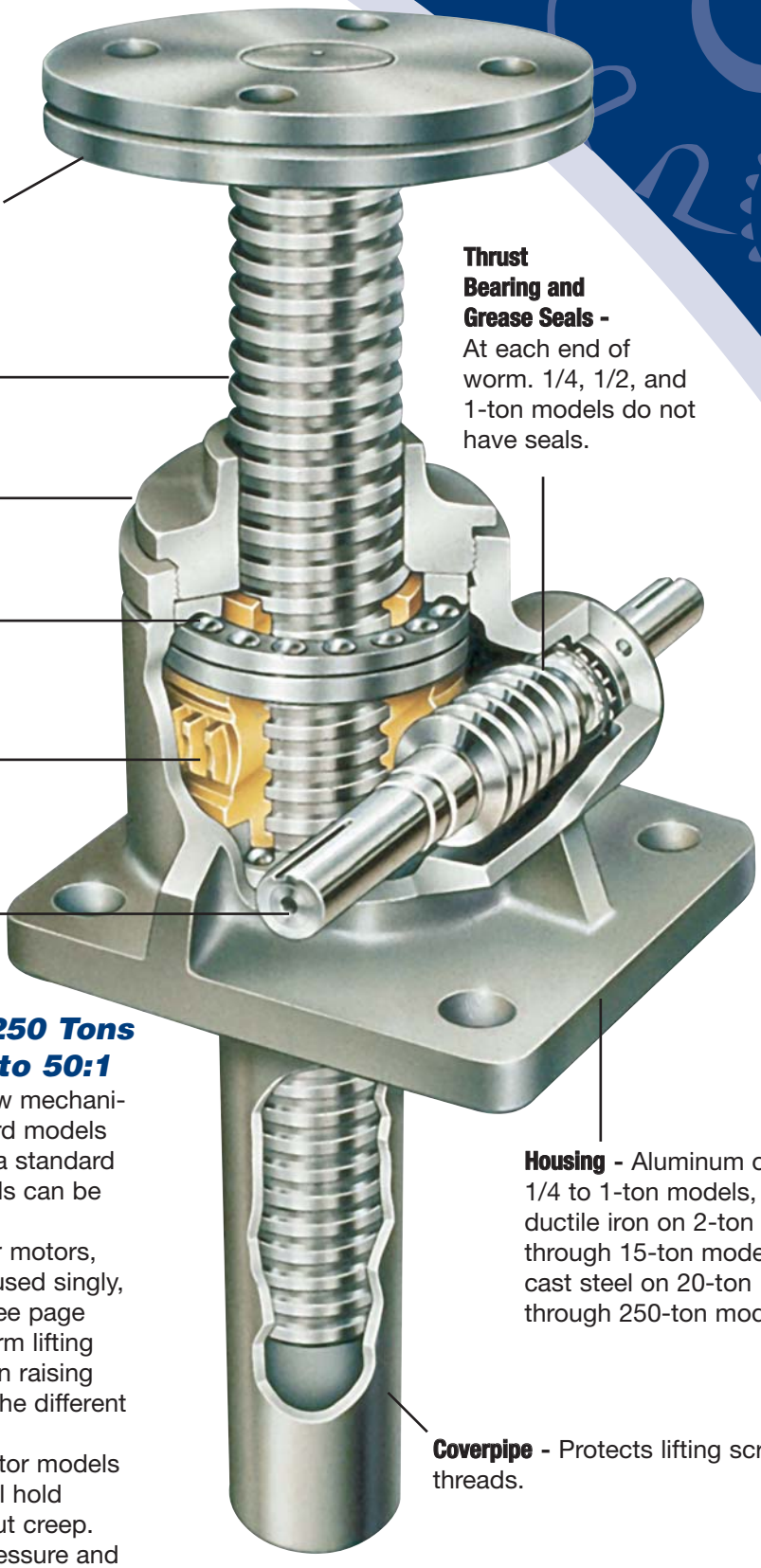
It is most important to make sure that Electrical Controls, when subjected to extended storage, be stored in a protected dry environment free from any corrosive atmosphere. Moisture in any form, including condensation, can cause serious corrosion problems to the contact point surfaces as well as terminal connections.

Even though all terminal connections have been made tight on initial assembly at the factory, they may not remain 100% tight over an extended storage period due to the compressibility of the copper wire and possible movement due to variations in ambient temperature. The problem will vary in degree depending on wire size and whether the terminal connection is of solid or stranded wire. To insure proper operation, recheck all terminal connection screws for tightness prior to putting the control on line.

Machine Screw Actuators

Features

- Positive, mechanical positioning
- Uniform lifting speed
- Multiple arrangements
- Anti-backlash (optional)



Top Plate - Must be bolted to lifting member to prevent rotation except when screw is keyed.

Lifting Screw - Available with threaded end or clevis end instead of top plate.

Shell Cap - Locked into place by set screws.

Load Bearings - Bearings, top and bottom to take loads in either direction.

Worm Gear - Wear resistant bronze. Accurately hobbed for greater gear contact.

Worm - Available with double or single shaft extension.

Thrust Bearing and Grease Seals - At each end of worm. 1/4, 1/2, and 1-ton models do not have seals.

Housing - Aluminum on 1/4 to 1-ton models, ductile iron on 2-ton through 15-ton models, cast steel on 20-ton through 250-ton models.

Coverpipe - Protects lifting screw threads.

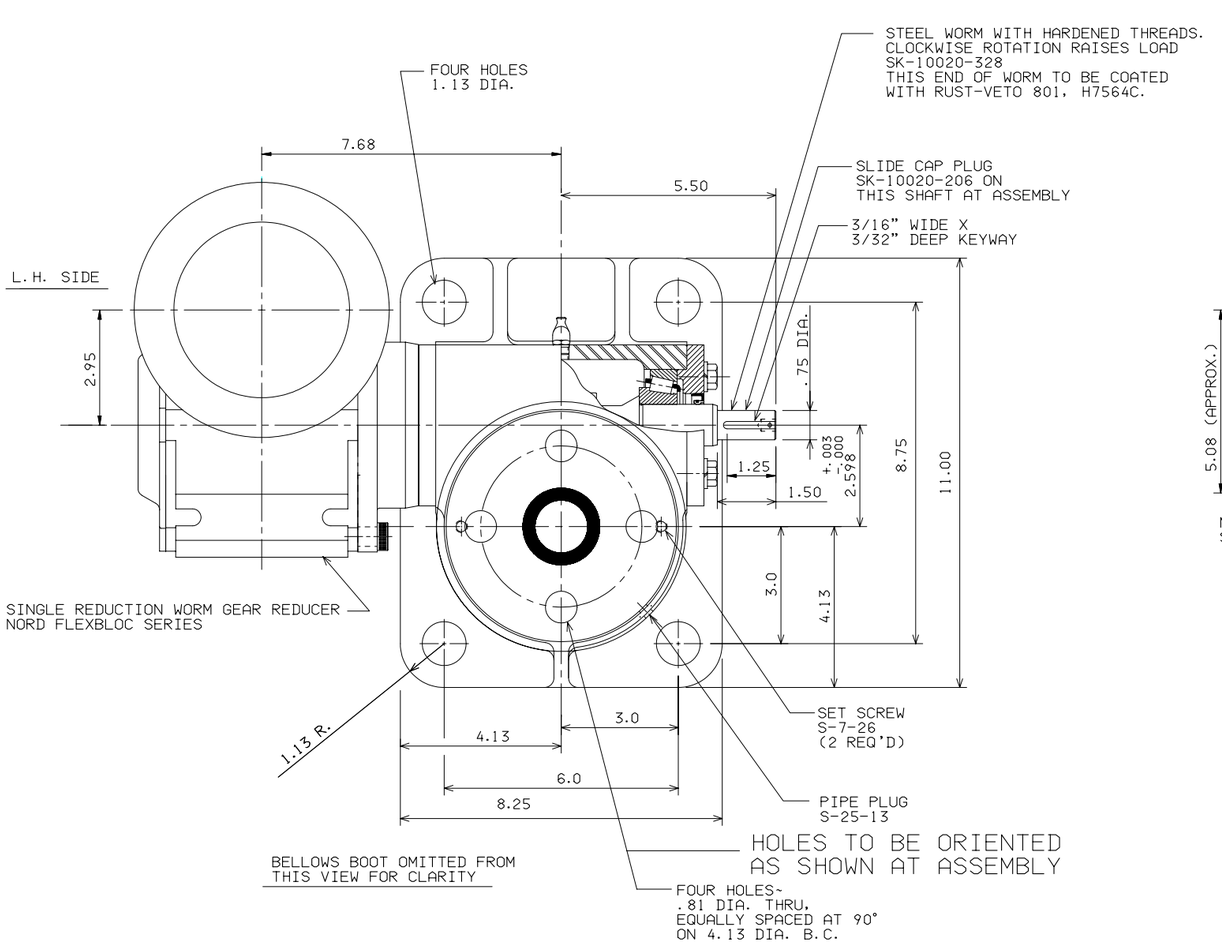
Capacities from 1/4 Ton to 250 Tons
Worm Gear Ratios from 5:1 to 50:1

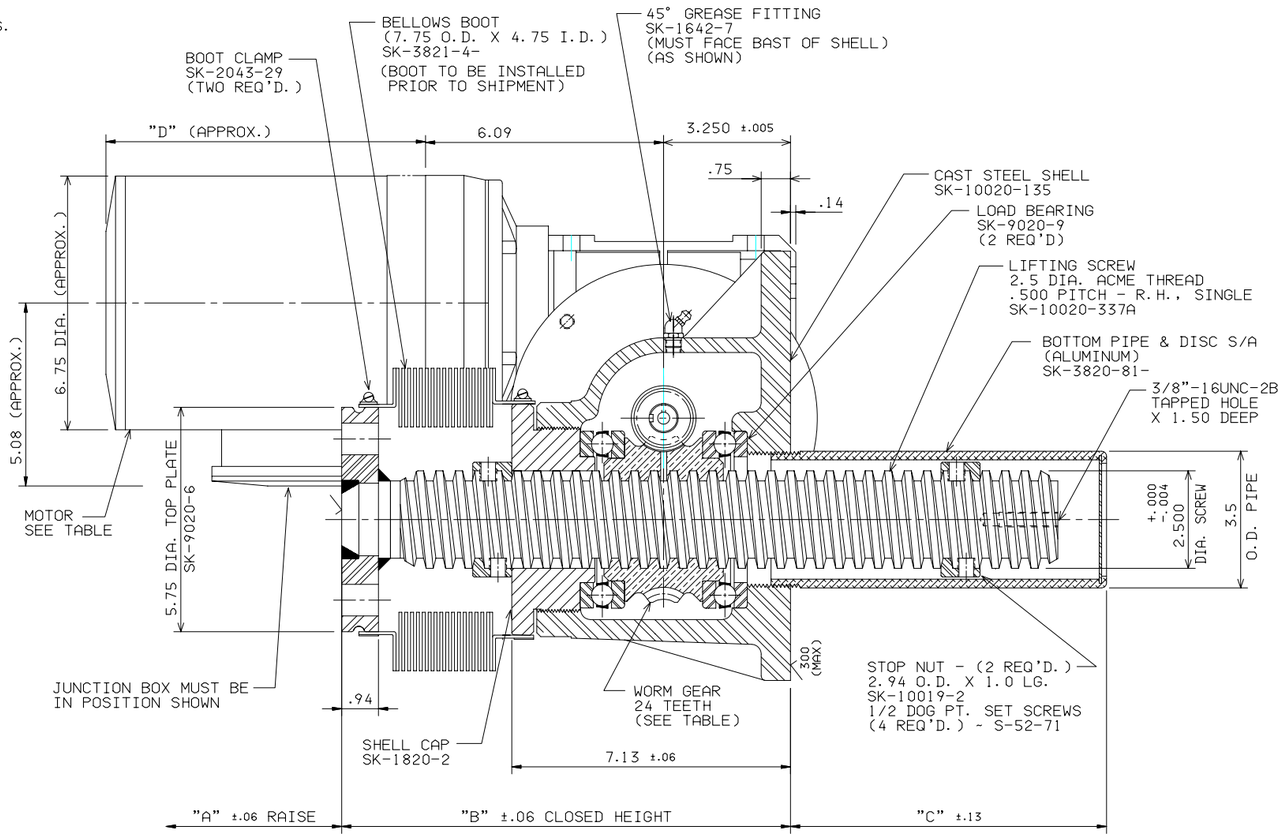
Because the Duff-Norton machine screw mechanical actuator is produced in many standard models with a wide range of capacities, there is a standard model for almost any requirement. Models can be furnished to 250 tons capacity.

Operated manually or by means of gear motors, machine screw actuator models can be used singly, in tandem or in multiple arrangements (see page 133). Since most capacities have a uniform lifting speed, added economy can be realized in raising unevenly distributed loads by operating the different capacities in union.

Most Duff-Norton machine screw actuator models with higher ratios are self-locking and will hold heavy loads in position indefinitely without creep. They can be used to push, pull, apply pressure and as linear actuators. They are furnished with standard raises in increments of 1 inch. Depending upon size and type of load, models are available with raises up to 20 feet.

NAME PLATE MARK	WORM GEAR RATIO	TURNS OF WORM FOR 1" TRAVEL	"A"	"B"	"C"	"D"	SPEED REDUCER RATIO	LIFTING SPEED INCHES/MIN.	LIFTING CAPACITY TONS	REMARKS	MOTOR SIDE/POSITION	WORM GEAR PART NO. AND MATERIAL
M-10020-423B	24:1	48	43.0	11.5	48.0	9.13	20:1	1.8	10	STERLING ELECTRIC 3/4 H.P. STAINLESS STEEL ELECTRIC MOTOR, 1725 R.P.M., 575 VOLT/3PH/60HZ, TENV, 56C FACE WITH BASE, DUFF-NORTON MN07-5SS-1 Ⓒ	L.H. SIDE/POS. #2	SK-10020-300 CDA67300 MANGANESE BRONZE
M-10020-424B	24:1	48	66.0	11.5	71.0	7.72	20:1	1.8	10	LEESON #191208, 3/4 H.P. ALL STAINLESS ELECTRIC MOTOR, 208-230/460V-3PH-60HZ & 190/380V-3PH-50HZ, 1725 RPM, TENV, 56C FRAME, DUFF-NORTON SK900046-1	L.H. SIDE/POS. #2	SK-10020-300 CDA67300 MANGANESE BRONZE
M-10020-441B	24:1	48	43.0	11.5	48.0	9.3	20:1	1.43	10	NORD 3/4 H.P. ELECTRIC MOTOR, 208-230/415 VOLT-3PH-50HZ, 1375 RPM, 56C FRAME, IP66 ENCLOSURE, WITH CONDENSATION DRAIN HOLES, DUFF-NORTON MN07-4WH-1	L.H. SIDE/POS. #2	SK-10020-300 CDA67300 MANGANESE BRONZE





NOTE:

AT ASSEMBLY, ORIENTATION OF TOP PLATE HOLES TO BE SET AS SHOWN. TOP STOP NUT TO BE SET AT 11.5" CLOSED HEIGHT; BOTTOM STOP FOR 43" OF TRAVEL.
(BOTH CLOSED AND TRAVEL DIMENSIONS TO BE WITHIN ± 06")

IMPORTANT

ACTUATOR IS RATED AT 20 TONS

SK-10020-R-171

NOTES:
1) MAXIMUM PERMISSIBLE BENDING MOMENT ON EXTENDED LIFTING SCREW EQUALS 12,000 IN/LBS WHEN JACK IS LOADED TO RATED CAPACITY.
2) LIFTING SCREW IS NOT KEYED. MUST BE HELD TO PREVENT ROTATION.
3) WIPE ALL METAL SURFACES WITH SUPERCLEAN 900 AND SUPERCLEAN API PRIOR TO PAINTING TO REMOVE ALL CONTAMINANTS.
4) BOTTOM PIPE TO BE PROTECTED WITH CARDBOARD TUBE (TUBE TO BE PLACED OVER PIPE BEFORE SHIPPING.)

Ⓐ
5) ACTUATOR ASSEMBLY (WITH EXCEPTION OF THE MOTOR REDUCER & PIPE & DISC S/A) TO BE PAINTED WITH BASHFUL GRAY POLYURETHANE PAINT PAINT PER DNPS73C (DO NOT PAINT MOTOR, REDUCER AND PIPE & DISC S/A).
6) REDUCER IS PERMANENTLY LUBRICATED BY NORD
7) LIFTING SCREW TO BE COATED WITH RUST-VETO 801 #H7564C AND COATED WITH GREASE #S-98-2C PRIOR TO INSTALLATION OF BOTTOM PIPE.
8. ACTUATOR TO BE LUBRICATED WITH MOBILITH SHC-220 GREASE, S-98-2C. (NO SUBSTITUTE)
9. WORM END TO BE COATED WITH RUST-VETO 801 PRIOR TO ASSEMBLING WINSMITH REDUCER ON IT.
10. REMOVE ALL MOTOR DRAIN PLUGS BEFORE SHIPPING. PLACE PLUGS IN PLASTIC BAG AND SHIP WITH ACTUATOR.

ECO	REV	NOTE CHANGE	DATE	BY
104085	C	WAS 3/4HP WASHGUARD MOTOR SK-10010-513	8/26/09	BM
103966	B	M-10020-441B ADDED	7-14-09	TJ
102959	A	NOTE #5 REVISED	8/7/08	BM
102384	—	INITIAL RELEASE	3/11/08	BM

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TOLERANCE ON MACHINED DIMENSIONS (UNLESS OTHERWISE SPECIFIED)

DIMENSIONS	.X	.XX	.XXX	.XXXX
DECIMAL DIM.	±.020	±.010	±.005	±.001

SURFACE ROUGHNESS 150 MICRO INCH WHEN FINISH IS SHOWN BY SYMBOL √

ANGLES ±1/2° INSIDE CORNER RADIUS .03 BREAK SHARP CORNERS .02

DUFF-NORTON
CHARLOTTE, NORTH CAROLINA

20 TON UPRIGHT MACHINE SCREW ACTUATOR

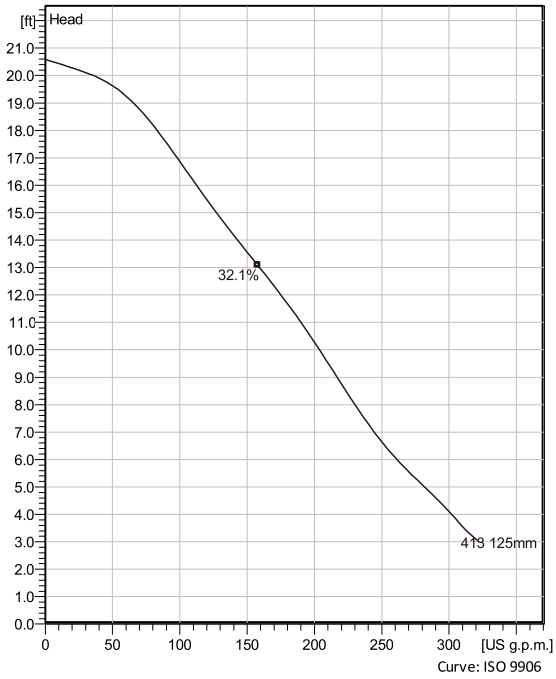
MATERIAL	TOP PLATE MODEL				
STOCK SIZE		DRN.	BM	CHK.	BM APPD.
PATT. NO.		DATE	3/11/08	SCALE	HALF
HEAT TREAT		SK-10020-R-171			

DP 3069 LT 3~ 413

Portable pumps with vortex impellers ideal for applications in which the water or liquid contains concentrations of abrasives when clogging problems can occur.

Technical specification

Curves according to: Sludge TS 2% [100%],50 °F,62.43 lb/ft³



Curve: ISO 9906

Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Configuration

Motor number
D3069.090 13-08-4BB-W 2.4hp

Installation type
P - Semi permanent, Wet

Impeller diameter
125 mm

Discharge diameter
3 inch

Pump information

Impeller diameter
125 mm

Discharge diameter
3 inch

Inlet diameter
80 mm

Maximum operating speed
1665 rpm

Number of blades
6

Throughlet diameter
3 inch

Max. fluid temperature
40 °C

Materials

Impeller
Grey cast iron

Stator housing material
Grey cast iron

Project		**Created by**			
Block	0	**Created on**	4/2/2025	**Last update**	4/2/2025

DP 3069 LT 3~ 413

Technical specification

Motor - General

Motor number D3069.090 13-08-4BB-W 2.4hp	**Phases** 3~	**Rated speed** 1665 rpm	**Rated power** 2.4 hp
ATEX approved FM	**Number of poles** 4	**Rated current** 4.1 A	**Stator variant** 12
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** F	**Type of Duty** S1
Version code 090			

Motor - Technical

Power factor - 1/1 Load 0.78	**Motor efficiency - 1/1 Load** 71.3 %	**Total moment of inertia** 0.214 lb ft²	**Starts per hour max.** 15
Power factor - 3/4 Load 0.68	**Motor efficiency - 3/4 Load** 71.9 %	**Starting current, direct starting** 17 A	
Power factor - 1/2 Load 0.54	**Motor efficiency - 1/2 Load** 68.6 %	**Starting current, star-delta** 5.67 A	

Project		**Created by**			
Block	0	**Created on**	4/2/2025	**Last update**	4/2/2025

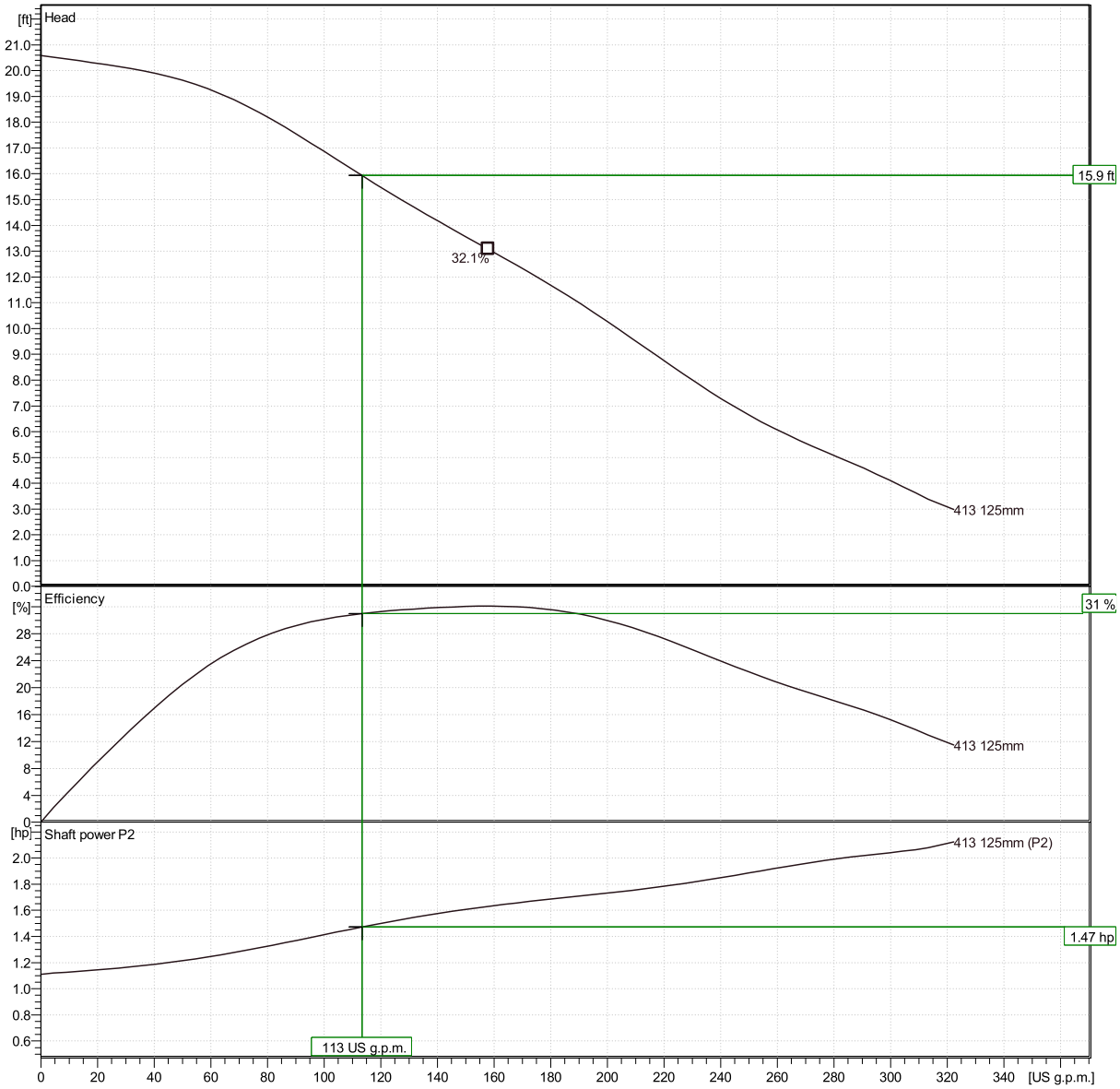
DP 3069 LT 3~ 413

Performance curve

Duty point

Flow	Head
113 US g.p.m.	15.9 ft

Curves according to: Sludge [100%],50 °F,62.43 lb/ft³,1.69E-5 ft²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

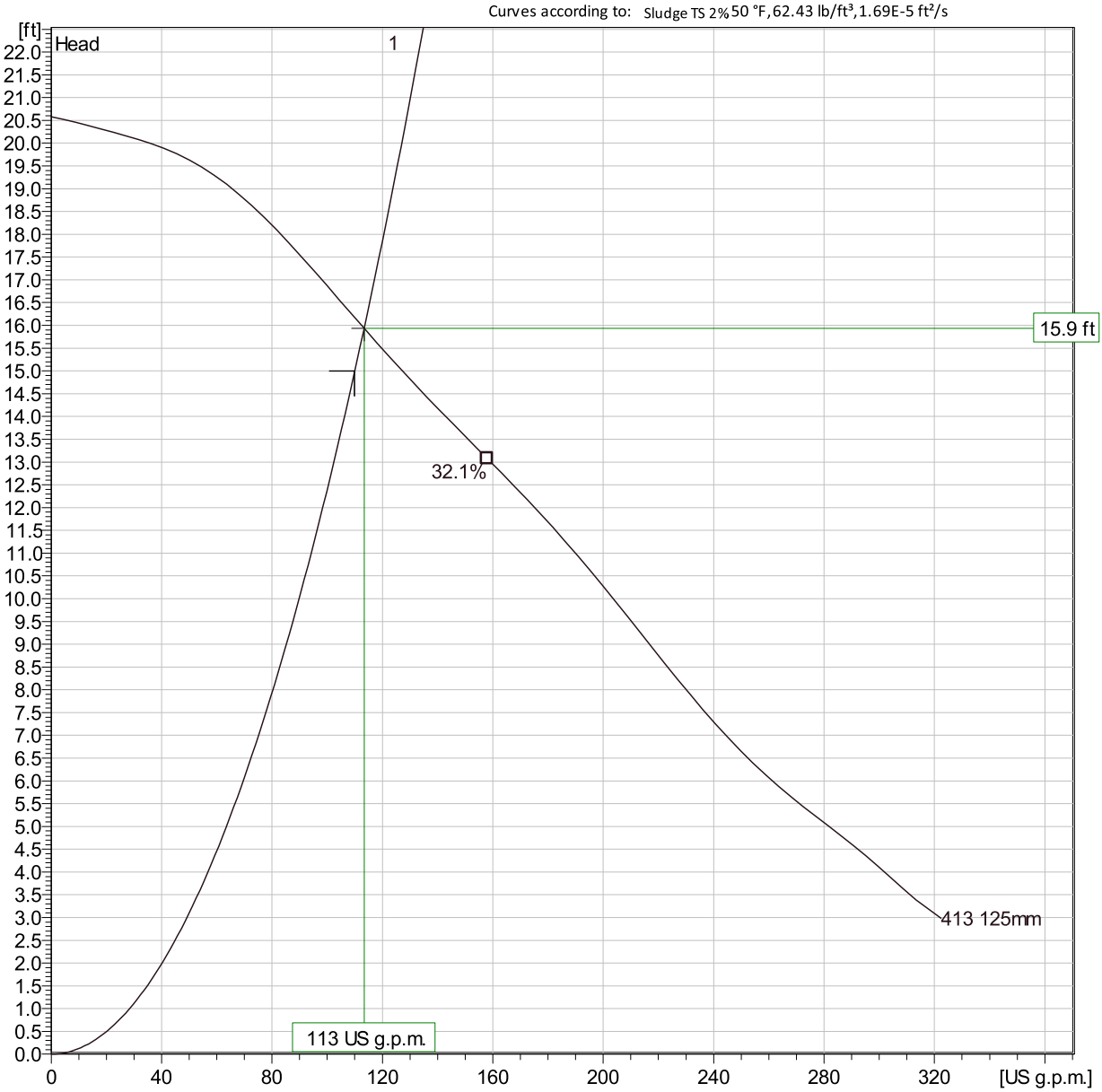
Curve: ISO 9906

Project		**Created by**			
Block	0	**Created on**	4/2/2025	**Last update**	4/2/2025

DP 3069 LT 3~ 413

Duty Analysis

Curves according to: Sludge TS 2% 50 °F, 62.43 lb/ft³, 1.69E-5 ft²/s



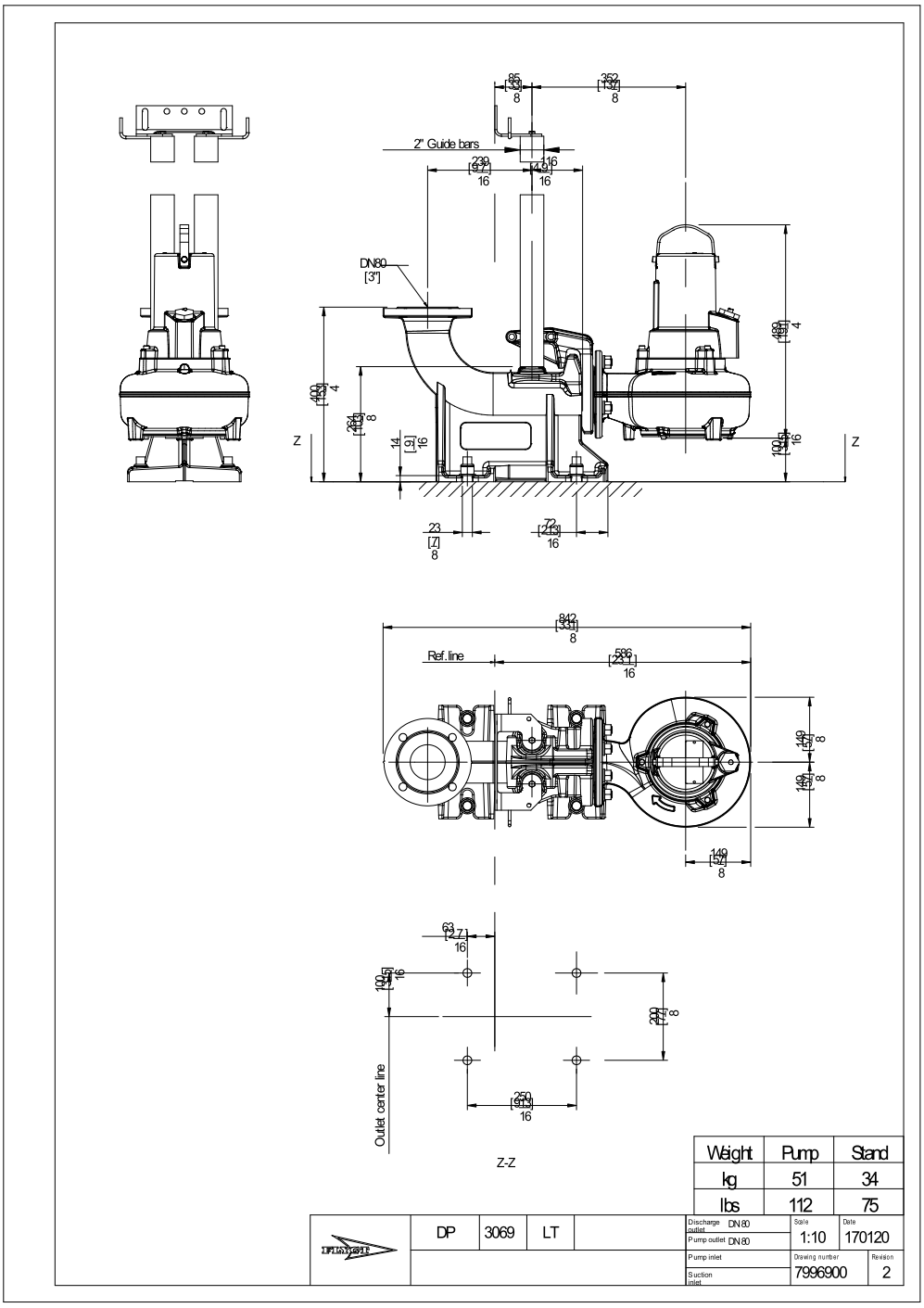
Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific Energy	NPSHre
1	113 US g.p.m.	15.9 ft	1.47 hp	113 US g.p.m.	15.9 ft	1.47 hp	31 %	228 kWh/US M	

Project		**Created by**			
Block	0	**Created on**	4/2/2025	**Last update**	4/2/2025

DP 3069 LT 3~ 413

Dimensional drawing



Project		**Created by**	
Block	0	**Created on**	4/2/2025 **Last update** 4/2/2025

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KIT CATALOG

886826_1.0

3069

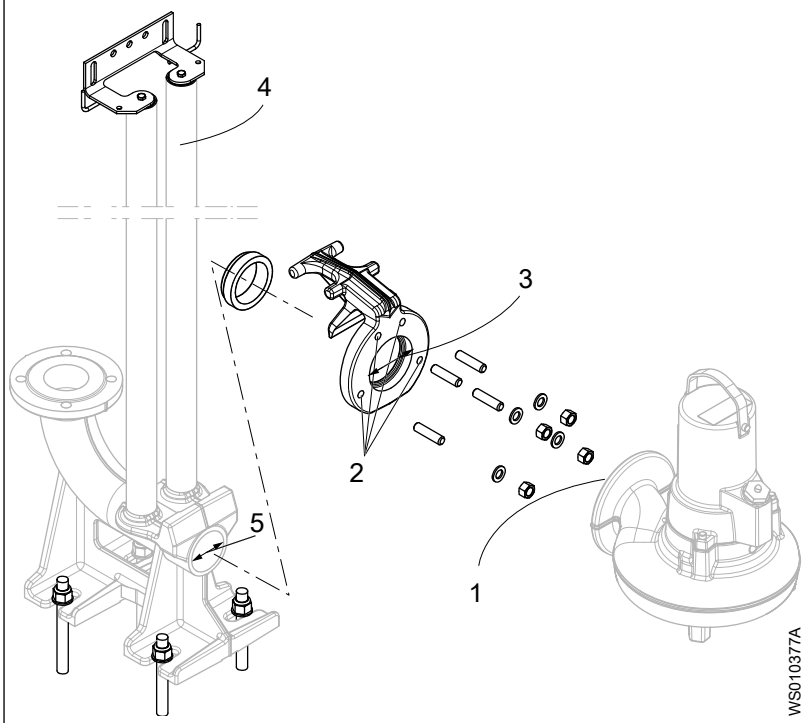
Installation Kits, US market

1 Practical Information

1.1 Definitions

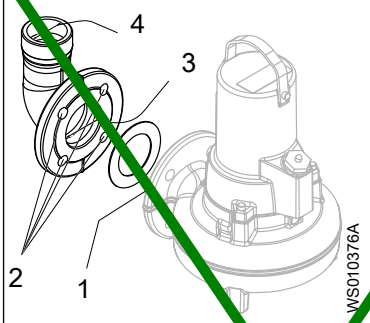
The kits listed include parts of the installation equipment needed. For the parts not included in the kits, contact the sales and service representative.

P-installations



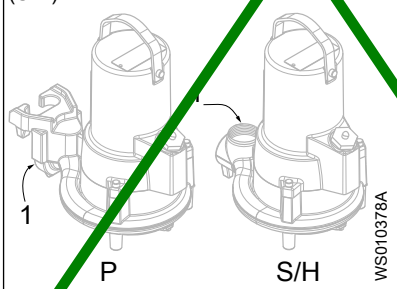
1. Pump outlet
2. Flange drilling standard
3. Flange size
4. Guide pipes
5. Discharge connection inlet

F, and H-installations



1. Pump outlet
2. Flange drilling standard
3. Flange size
4. Coupling type

M and F pumps with built-in bracket (P) or threaded outlet (S/H)



1. Pump outlet

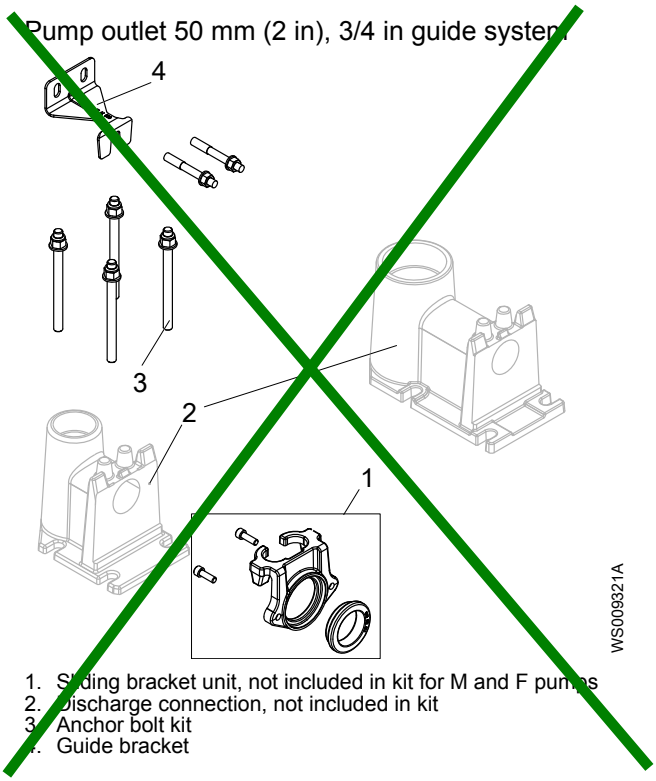
Guide bracket material	Material standard
316	ASTM/AISI 316L, 316Ti EN 10088-2/3:2005, EN 10250-4:1999

2 P-installation Kits

2.1 Semipermanent wet installation

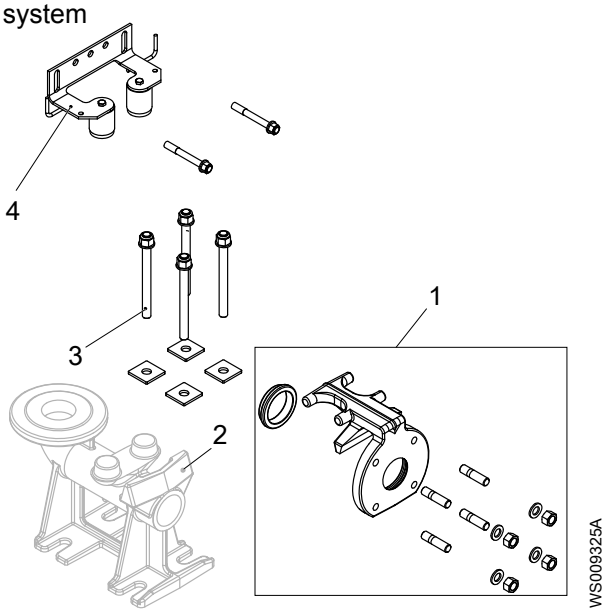
P-installation

Pump outlet 50 mm (2 in), 3/4 in guide system



1. Sliding bracket unit, not included in kit for M and F pumps
2. Discharge connection, not included in kit
3. Anchor bolt kit
4. Guide bracket

Pump outlet 65 mm (2.5 in), and 80 mm (3 in), 2 in guide system



1. Sliding bracket unit
2. Discharge connection, not included in kit
3. Anchor bolt kit
4. Guide bracket

Part no	Pump outlet, mm (in)	Pump hydraulic version	Guide pipe dimension	Guide bracket material	Discharge connection inlet
8070100	50 (2)	M	3/4 in	316	DN 50
8069900	50 (2)	N, D	3/4 in	316	DN 50
8071110	65 (2.5)	N, D	2 in	316	DN 65
8071920	80 (3)	N, D	2 in	316	DN 80

2.2 Discharge connections

The discharge connections are ordered separately.

Part no	Pump outlet, mm (in)	Guide pipe dimension	Inlet, mm (in)	Outlet	Applicable to installation kit part number
4865500	50 (2)	3/4 in	50 (2)	2 in ISO	8069900
					8070100
4865501	50 (2)	3/4 in	50 (2)	2 in NPT	8069900
					8070100
5554800	50 (2)	3/4 in	50 (2)	3 in ISO	8069900
					8070100
5554801	50 (2)	3/4 in	50 (2)	3 in NPT	8069900
					8070100
4931706	65 (2.5)	2 in	65 (2.5)	EN/ANSI	8071100
					8071110
4446807	80 (3)	2 in	80 (3)	EN	8071920
					8071900
4446805	80 (3)	2 in	80 (3)	ANSI	8071920
					8071900

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Fax: +46-471-24 47 01
http://tpi.xyleminc.com
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886826_1.0_en-US_2017-04_Kit_3069_US

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Let's Solve Water

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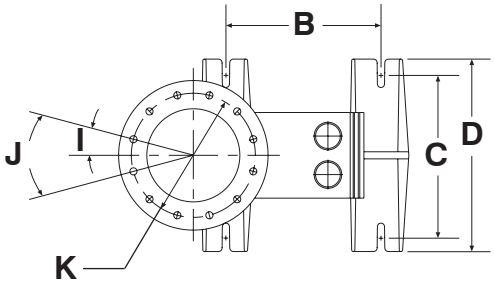
Issued: 6/18 Supersedes: 10/17

Standard CP/NP Discharge Connections (Cast Iron)

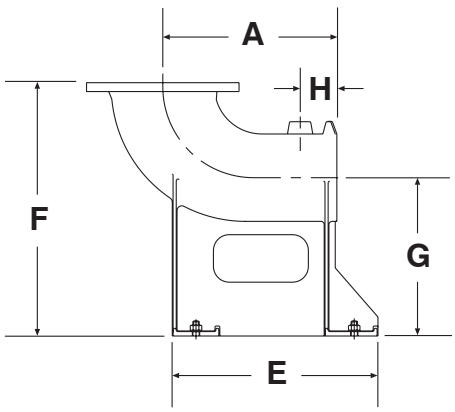
All dimensions (inches)

Pump Model	Part Number	Disch. Inlet	Disch. Outlet	A	B	C	D	E	F	G	H	I	J	K
2" - 3045, 3057, NP/DP/MP 3069*	486 55 01	2"	2"-11 1/2 NPT	3 13/16	4	4 1/2	5 1/2	7 1/4	6 3/4	3 15/16	7/8	---		---
2 1/2" - NP/DP 3069*	493 17 06	2 1/2"	2 1/2"	11 5/8			7 7/8	11 7/16	9 7/8	6 1/2	4 9/16	45°	90° x 4	5 5/8
3" - 3045, 3057, CNP/DP/MP	555 48 01	2	3-8 NPT	6 3/4	5 1/2	4 1/8	5 1/2	10 3/4	6 3/4		7/8	---	---	---
3" - NP/DP 3069*,	444 68 05	3"	3"	14	9 7/8	8	10 5/8	15 3/8	15 3/4	7 7/8	4 9/16	45°	90° x 4	6
4" - 3085, 3102, 3127,3153, 3202, 6020*	540 13 05	4"	4"	14 3/8	9 7/8	8	10 5/8	15 3/8	15 3/4	7 7/8	4 9/16	22.5°	45° x 8	7 1/2
6" - 3102, 3127(MT), 6020*	444 70 06	5 1/2"	6"	15 9/16	11	10	12 3/16	15 3/8	17 3/4	9 7/8	4 9/16	22.5°	45° x 8	9 1/2
6" - 3153, 3171, 3202.	602 33 06	5 1/2"	6"	15 9/16	11	10	12 3/16		17 3/4	9 7/8	4 9/16	22.5°	45° x 8	9 7/16
6" - R3231	388 25 06	6"	6"	20 11/16	19 3/4	15 3/4	19 3/4	23 5/8	15 3/4	7 7/8	6 7/8	22.5°	45° x 8	9 7/16
6" - 3127(LT), 3301, 3315.	604 56 06	6"	6"	15 9/16	11 1/8	10	12 3/16	15 15/16	18	10 1/8	4 9/16	22.5°		9 7/16

Note: Alternative discharge connections may be available, contact Flygt Application Engineering.
* Requires installation kit



Caution:
Contact Flygt applications engineering department when making a pump/ discharge connection combination other than those paired in the chart above.



Note:
The discharge connection shown here is typical in appearence for most pumps.

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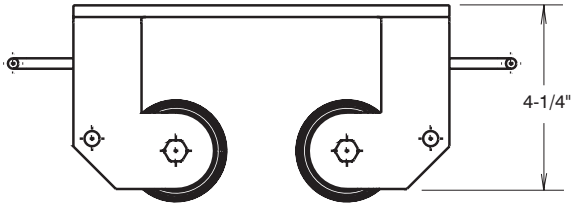
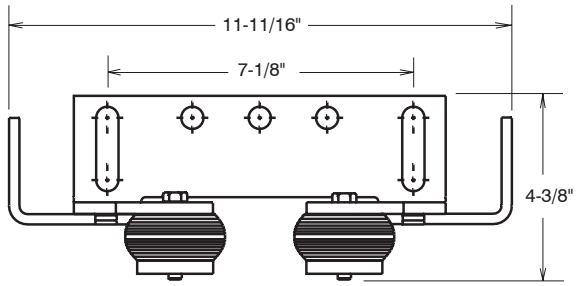
Issued: 6/15 Supersedes: 6/14

Upper Guide Bar Bracket (for 3000, 5500 & 8000 Series Pumps)

2" UPPER GUIDE BAR BRACKET

~~613 68 00~~	~~Galvanized Steel~~
613 68 04	316 Stainless Steel

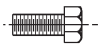




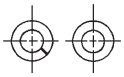
Note: use with 2" nominal guide bars

MOUNTING HARDWARE
14-59 00 00 (stainless steel)

3/8"-16 LATERAL NUT
14-46 37 05



HEX. HEAD BOLT (2),
3/8"-16 x 7/8"
14-46 20 25



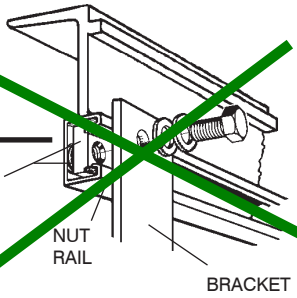
3/8" PLAIN WASHER (2)
14-46 50 07

3/8" LOCK
WASHER (2)
14-46 50 67

Standard for the following pumps:

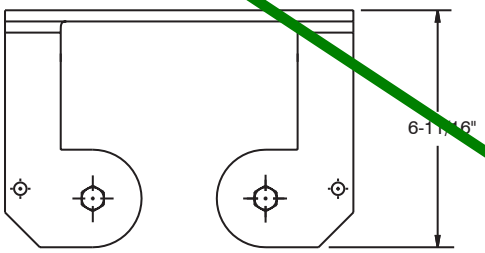
DP-3068
DP-3080
CP/DP/FP/NP-3085
CP/FP/NP-3102
CP/FP/NP-3127
NP/FP-3153
NP/FP-3171
HP-5520, 5530
DP-8050, 8053, 8056, 8058

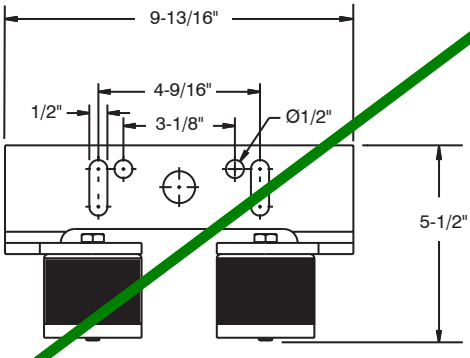
OPTIONAL:
NUT RAIL FEATURE



3" UPPER GUIDE BAR BRACKET

661 54 00	Galvanized Steel
661 54 01	316 Stainless Steel



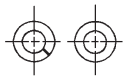


Note: use with 3" nominal guide bars

MOUNTING HARDWARE
14-59 00 00 (stainless steel)

3/8"-16 LATERAL NUT
14-46 37 05

HEX. HEAD BOLT (2),
3/8"-16 x 7/8"
14-46 20 25



3/8" PLAIN WASHER (2)
14-46 50 07

3/8" LOCK
WASHER (2)
14-46 50 67

Standard for the following pumps:

NP/FP-3171	**CP-3351**
NP/FP-3202	**CP/NP-3356**
CP/NP/RP-3231	**CP/NP-3400**
CP-3240	**CP-3501**
NP-3301	**CP/NP-3531**
CP/NP-3306	**CP-3602**
CP/NP-3312	**CP-3800**
NP-3315	**HP-5570**

Leakage Sensors

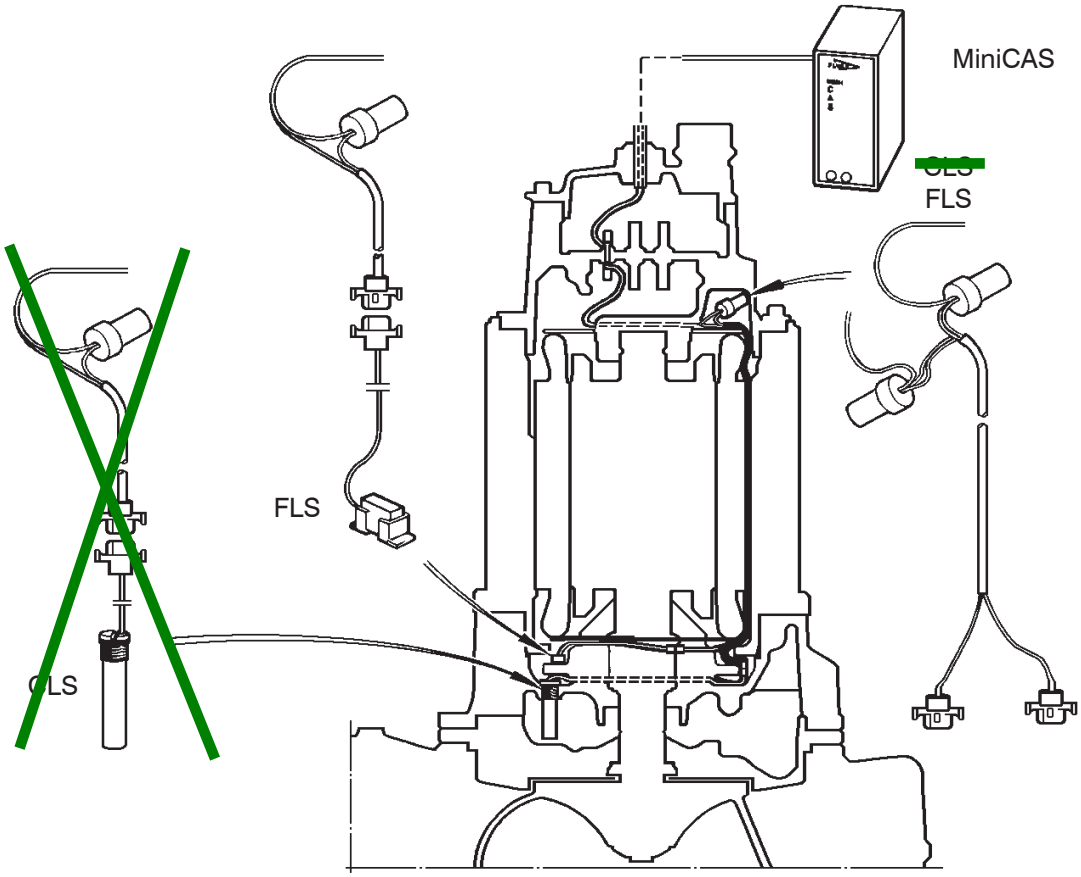
Select Flygt pumps are available with leakage sensors for sensing the presence of water in the oil and/or stator housing. A plate in the junction box indicates that the pump is equipped with sensors.

The Flygt FLS sensor is a miniature float switch for the detection of water and/or oil in the stator housing. Due to its design, it is meant to be used for pumps that will be oriented in the standard vertical position. The FLS sensor is mounted in the bottom of the stator housing. The FLS is the only sensor that can be used for intrinsically safe designs which is required for explosion-proof installations.

The FLS is connected to the Flygt Mini CAS (Control and Status) monitoring unit. The FLS is wired in series with the thermal switches, thus, eliminating additional control leads. The Mini CAS unit monitors the current allowable to flow from both the temperature switches and FLS sensor. On the front of the Mini CAS there are two indication lamps, one for supply and temperature and one for leakage. Only two wires are needed between the pump and the Mini CAS.

The Flygt CLS-30 is a capacitive type leakage sensor for the detection of water in the oil casing. This sensor actuates an alarm when the oil contains 30% water. The CLS-30 sensor is mounted in the bearing cage and sticks into the oil casing. The FLS and CLS sensors can be used together in the same pump, connected in parallel. The parallel connected sensors are then connected in series with the thermal switches and finally connected to the Mini CAS unit.

A typical connection of FLS and CLS sensors to a Mini CAS is shown below. (see Mini CAS or optional MAS 711 for appropriate connection details).



Leakage Sensors

TESTING PROCEDURES:

The **CLS** cannot be tested with a regular meter. **Flygt** provides a test device for **CLS**/**FLS** (P/N 10-45 17 00).

An alternative is to test the **CLS** with the **Mini CAS II** relay, measuring the current in through the **CLS**. Wrong polarity will give a zero current reading.

Refer to the **Mini CAS II** manual for additional information.

24 VAC power supply/12 VDC to sensor

MiniCAS Term.	No power	Normal condition	Stator high temp	Leakage
1-3	Open	Closed	Open	Closed
1-4	Closed	Open	Open	Open
11-8	Closed	Closed	Closed	Open
11-9	Open	Open	Open	Closed
mADC	0	7mADC	0	30mADC
Green LED	Off	On	Off	On
Red LED	Off	Off	Off	On

For FLS in parallel with CLS the current readings are:

MiniCAS Term.	No power	Normal condition	Stator high temp	Leakage
mADC	0	14.5mADC	0	45mADC

Caution: Never apply more than 14VDC to the CLS - a higher voltage can destroy the sensor.

Leakage Sensors

FLS LEAKAGE SENSOR

DESCRIPTION

The FLS is a sensor designed to detect water presence into the stator housing. FLS is designed for CP/DP model pumps, which are installed in a vertical position.
The FLS is an electro-mechanical type device. The FLS has a rigid aluminum frame, with two small fixed resistors. Two wires are provided for device connection. Inside the frame, a mobile float element can move up and down guided by a shaft. The float contains a permanent magnet which, on the uppermost float position, causes the "reed-switch" closure. The FLS-10 is a similar device used with the new generation of N-pumps.

Note: When ordering FLS leakage sensor, a Mini CAS II or MAS 711 unit should be ordered with the pump. (See Mini CAS or optional MAS 711 for appropriate connection details).

MODE OF OPERATION

In normal conditions, the float element will rest at the bottom of the frame. Across the connection wires, the FLS resistance is about 1500 ohms. The FLS-10 resistance is 1,200 Ohms.
When water or any liquid enters the stator housing, the float element and magnet will raise and finally touch the upper side of the frame. The "reed-switch" will close and add a 375 ohms resistor in parallel with a 1500 ohms resistor. The resulting resistance across FLS leads is 300 ohms.
In the FLS-10 leak detector, supplied with the new generation of pumps introduced in 2000, the resistor values are 430 ohms in series with a 770 ohm resistor. The "reed-switch" will close and drop out the 770 Ohm resistor from the circuit resulting in a resistance value of 430 Ohms. An ITT Flygt supervising device such as Mini CAS II or MAS711, will be activated by this change of resistance and provide a "leakage" signal or turn off the motor.

INSTALLATION

The FLS is usually installed in C/D 3000 series pumps, at the bottom of the stator housing, on the top of bearing housing, bonded to it with an epoxy-based adhesive. The FLS can also be used to check for water intrusion in the junction box for big pumps and hydroturbine generators.
When used with the Mini CAS II supervision relay, the FLS is connected in series with pump motor thermal switches, so only two wires are required to connect both leakage and thermal sensors. If a CLS sensor is also used, the FLS and CLS are connected in parallel.

FLS

FLS TECHNICAL DATA, DIMENSIONS & PART NUMBERS

Technical data:
- Signal: 8mA off-duty current, 36mA alarm current
- Supply voltage: 12VDC
- Max temperature: 90˚C, 1h
- Test temperature: 115˚C, 1h
- Max duty temperature 70˚C
- Material: aluminum

Dimensions
- Length: 27 mm (1.06 in.)
- Width: 16 mm (.63 in.)
- Height: 16 mm (.63 in.)

Part numbers
- FLS: 518 89 02
- FLS-10: 663 04 00

TESTING PROCEDURES

The FLS can be tested with a standard ohm-meter.

The FLS resistance should be:
- De-activated - about 1500 ohms;
- Activated - about 300 ohms.

The FLS-10 resistance should be:
- De-activated: about 1200 ohms
- Activated: about 430 ohms

Caution: Never apply more than 14VDC to the sensor. A higher voltage can destroy the sensor.

Storage

Each Flygt pump leaves the factory properly assembled and prepared to perform even after a reasonable idle time in storage. However, as prolonged idle time can be detrimental to any rotating machinery, the procedures outlined below should be followed in order to insure that the equipment is in top condition to operate when finally installed. Whenever possible, store pumping units in a dry environment free of extreme temperatures and strong direct sunlight.

NEW pumps:

Storage 6 to 12 months:
In general, rotating machinery left idle for extended periods of time, tends to establish a "set" position due to inaction of the moving parts. Some of these areas may be damaged (especially seals) from the sudden fast breakaway of start-up after a prolonged idle time. To insure that all rotating parts are free for final installation and start-up, it is good practice to rotate the impeller by hand once a month. It is also good practice to relieve the tension on the cable entry sealing grommet by backing off the cable entry compression screws slightly. If this is done, it is most important that a clear note be attached as a reminder to:
Re-Tighten Cable Entry Compression Screws Before Installation.

Storage 12 to 24 months:
In addition to the above, apply a protective spray coating of silicone or rust inhibiting oil to the impeller and inside of the volute by spraying in through the volute outlet and up through the volute inlet. Also coat the volute outlet flange face.

USED pumps:

Before storing a used pump for an extended period of time, the unit should be dismantled, checked for any defects, repaired where necessary and reassembled. At reassembly, follow instructions in the ***Service Manual***, especially regarding seal assemblies. Protect the impeller and volute as mentioned in the paragraph above.

In all cases, it is good practice to check all external bolts, nuts and screws for tightness before final installation after extended storage.

CONTROLS:

It is most important to make sure that Electrical Controls, when subjected to extended storage, be stored in a protected dry environment free from any corrosive atmosphere. Moisture in any form, including condensation, can cause serious corrosion problems to the contact point surfaces as well as terminal connections.

Even though all terminal connections have been made tight on initial assembly at the factory, they may not remain 100% tight over an extended storage period due to the compressibility of the copper wire and possible movement due to variations in ambient temperature. The problem will vary in degree depending on wire size and whether the terminal connection is of solid or stranded wire. To insure proper operation, recheck all terminal connection screws for tightness prior to placing the control on line.

SERIES DB PORTABLE HOIST

HALLIDAY PRODUCTS
www.HallidayProducts.com
Phone 800–298–1027
Fax 407–298–4534
Sales@HallidayProducts.com

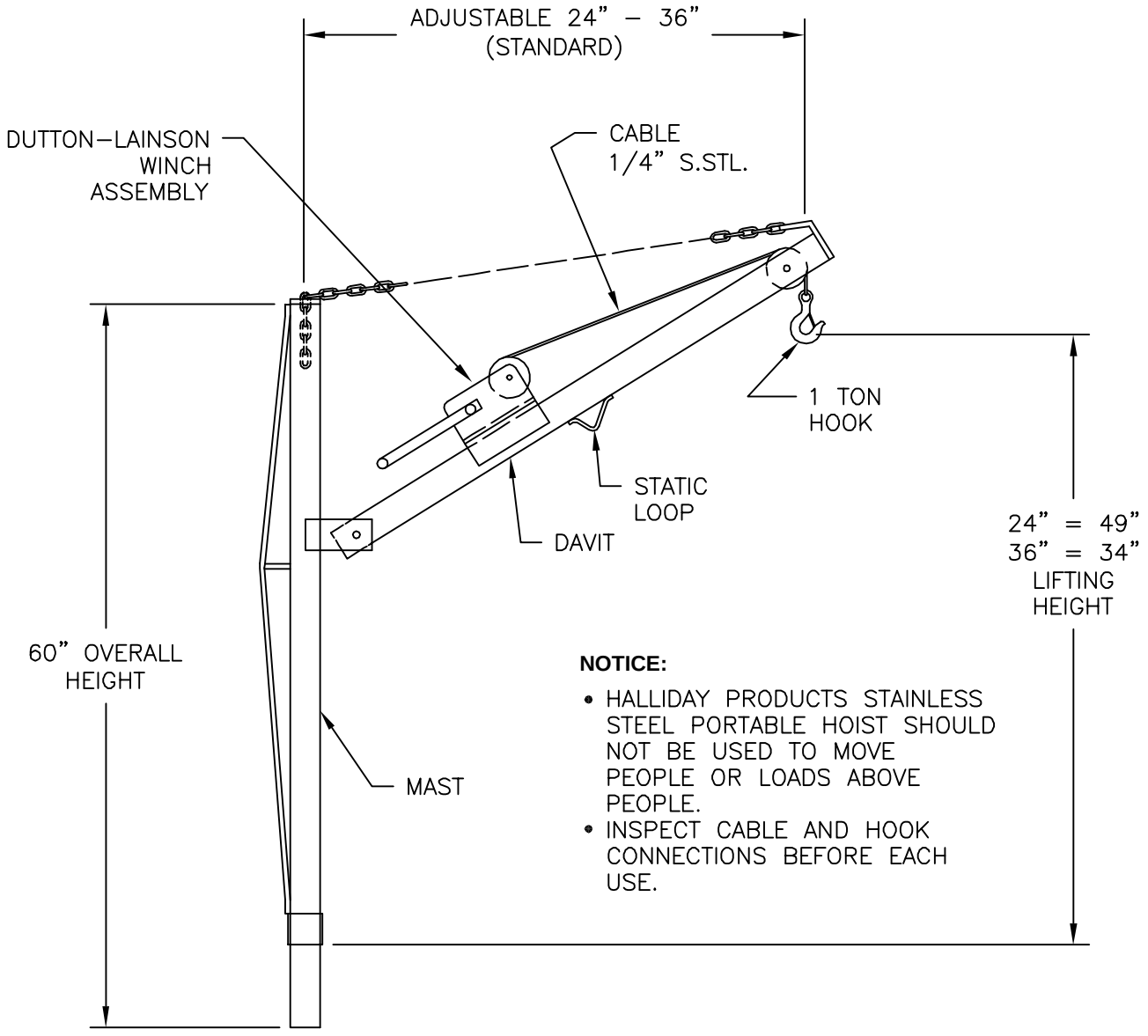
STANDARD FEATURES:

- TYPE–304 STAINLESS STEEL CONSTRUCTION
- 30 FEET OF 1/4 STAINLESS STEEL CABLE
- ~~GALVANIZED 1 TON HOOK~~
- DUTTON–LAINSON MARINE GRADE BRAKE WINCH
- ADJUSTABLE REACH IN 1" INCREMENTS

OPTIONS:

- ~~TYPE 316 CONSTRUCTION~~
- ~~ADDITIONAL CABLE AVAILABLE (SPECIFY LENGTH)~~
- ~~STAINLESS STEEL WINCH~~
- STAINLESS STEEL HOOK
- ~~OTHER REACHES AVAILABLE UPON REQUEST (CONSULT FACTORY)~~

QTY.	MODEL NO.	MAST DIA.	LOAD (MAX.)	UNIT WT. (LBS.)
~~1~~	~~D1B36C~~	~~2 3/8"~~	~~300 LBS.~~	~~73~~
1	D2B36D	3 1/2"	1000 LBS.	96
~~1~~	~~D3B36E~~	~~4"~~	~~1330 LBS.~~	~~136~~



NOTICE:

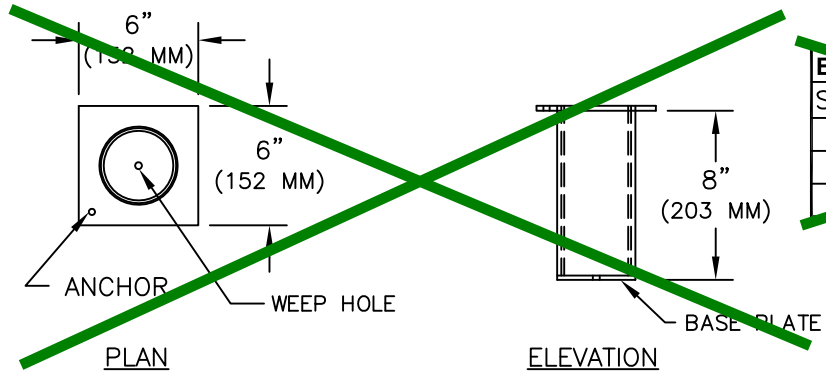
- HALLIDAY PRODUCTS STAINLESS STEEL PORTABLE HOIST SHOULD NOT BE USED TO MOVE PEOPLE OR LOADS ABOVE PEOPLE.
- INSPECT CABLE AND HOOK CONNECTIONS BEFORE EACH USE.

SERIES D HOIST SOCKETS

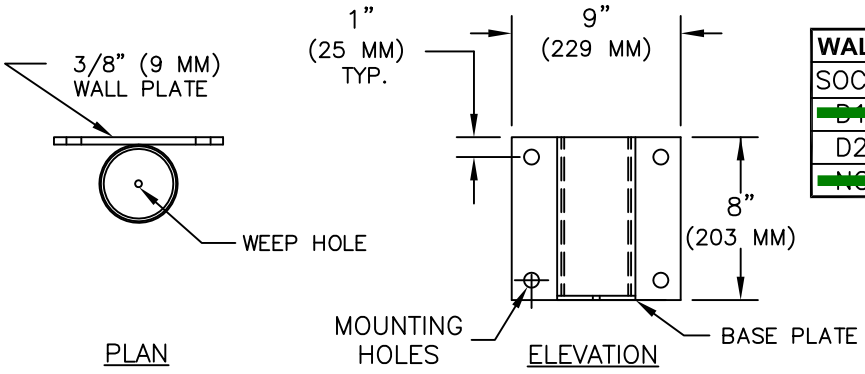
HALLIDAY PRODUCTS
www.HallidayProducts.com
Phone 800-298-1027
Fax 407-298-4534
Sales@HallidayProducts.com

STANDARD FEATURES:

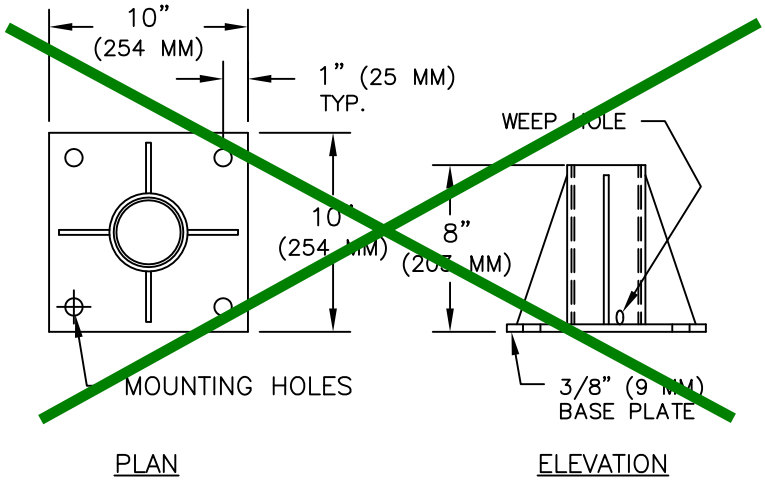
- STAINLESS STEEL TYPE-304 (STANDARD) ~~OR TYPE 316 (OPTIONAL) CONSTRUCTION~~
- AVAILABLE IN 3 STYLES
- SUPPLIED WITH POLYMER LINING FOR SMOOTHER ROTATION
- 3 YEAR GUARANTEE



EMBED STYLE HOIST SOCKETS	
SOCKET MODEL #	FOR HOIST MODELS
D1R LINED	D1A AND D1B
D2R LINED	D2A AND D2B
D3R LINED	D3A AND D3B



WALL STYLE HOIST SOCKETS	
SOCKET MODEL #	FOR HOIST MODELS
D1V LINED	D1A AND D1B
D2V LINED	D2A AND D2B
NOT AVAILABLE	D3A AND D3B



FLOOR STYLE HOIST SOCKETS	
SOCKET MODEL #	FOR HOIST MODELS
D1S LINED	D1A AND D1B
D2S LINED	D2A AND D2B
D3S LINED	D3A AND D3B

NOTES:
MOUNTING HOLES ARE ø3/4" (ø19 MM)

SANITAIRE PROJECT:
Aumsville, OR
Wastewater Treatment Plant

SANITAIRE PROJECT NUMBER:
25-0365A

ELECTRICAL SUBMITTAL ITEMS:

Specification Section 11300

1. SUBMITTAL COMMENTS
2. GENERAL SPECIFICATIONS
3. FUNCTIONAL DESIGN SPECIFICATION
4. BILL OF MATERIALS
5. ELECTRICAL DRAWINGS
6. MOTOR CONTROL CENTER
7. DISSOLVED OXYGEN ANALYZERS
8. LEVEL TRANSDUCERS
9. FLOAT SWITCHES

PURCHASER:
City of Aumsville
595 Main Street
Aumsville, OR 97325
PO # Signed Agreement

ENGINEER:
Westech Engineering, Inc.
Salem, OR

REPRESENTATIVE:
Beaver Equipment, LLC
15112 NE 198th Street
Woodinville, WA 98072

SUPPLIER:
Xylem – Sanitaire Products
N19W23993 Rigdeview Parkway West, Suite 200
Waukesha, WI 53188 USA

SUBMITTAL DATE:
July 11th, 2025

SANITAIRE
a xylem brand

Project: Aumsville, OR WWTP **Sanitaire #:** 24-0365A

ELECTRICAL SUBMITTAL COMMENTS

1) The cut sheets for the electrical components listed on our Bill of Materials can be provided upon request.

2) Xylem will provide a webport inside our control panel cabinet and requests that an internet connection be provided to the control panel. The webport is used for troubleshooting and software updates once the project has been commissioned.

    a) Please note that the first year of service for the EWON is free. After the first year, the plant will need to sign up for a paid subscription if they wish to continue having remote connectivity of the EWON. Before shipping the panel, Xylem will require a valid e-mail address for the city and a name for the account. The name should be the plant superintendent. If the plant does not have personnel for the plant during construction, then Xylem will set up a free email account at OUTLOOK.com and forward that information to the city.

3) This control system is designed for a three-phase, 4-wire, solidly grounded, wye connected service. Please confirm that this is the case.

4) Xylem recommends that the contractor include a three-phase disconnect for the decanter motors. This can be helpful to troubleshoot and isolate issues at commission and in the future.

5) Xylem's standard short circuit rating on the main control panel is 10kAIC. Please confirm if this is acceptable. If this is not acceptable, please specify the required rating.

6) IP addresses are required from the systems integrator before Xylem's factory acceptance testing and shipping.

7) The MCC is designed for a bottom-feed power connection. Please confirm if this is acceptable.

8) Specification Section 17090, Parts 2.1B.9. and 2.B.10. specifies the panel OIT (HMI) display size as 12" and to be conformal coated. Xylem is proposing to supply its standard offering, which is an Allen-Bradley PanelView Plus 7 Performance. This unit has a 15-inch display and is not conformal coated. Xylem requests this deviation be approved as submitted.

9) Specification Section 17090, Part 2.2O.3. specifies the push-to-test function for the panel indicator lights. Xylem is proposing to supply its standard offering, which is Allen-Bradley series 800, 22mm, indicator lights that do not have a push-to-test feature. Xylem requests this deviation be approved as submitted.

If there are any questions about these comments or anything else regarding this project, please do not hesitate to contact me.

Best regards,
Xylem, Inc.

Frank B. Maier, P.E., PMP
Senior Project Engineer

General Specifications

Control Cabinet Fabrication:

1. National Electrical Code, Nema, U.L. and CSA Standards apply. The system shall be shipped with a C/UL label.

2. All wires shall be stranded cable, insulation shall be MTW or better for control wires and THW or better for power wires. The panel fabrication shop will use approved wiring methods that meet all code requirements and represent good wiring practice. This will include the proper use of wiring ducts, wire wrap and hardware as required.

3. Color and Size Code:

AC Control ----------	RED ----------	#16AWG (or larger)
DC Control ----------	BLUE --------	#16AWG (or larger)
120VAC Power ------	BLACK ------	#14AWG (or larger)
480VAC Power ------	BLACK ------	#10AWG (or larger)
External Control ------	YELLOW ---	#16AWG (or larger)
Ground ----------	GREEN ------	#14AWG (or larger)
Neutral ----------	WHITE ------	#14AWG (or larger)
Shielded ----------		#18AWG (or larger)

4. All conductors internal to the control cabinet will be identified by a permanent wire marker in accordance with the wire identification shown on the drawings. Wire markers shall not rotate or slide on the wire and shall be positioned with the number facing so they can be read. Numbers shall be the same at both ends and shall be to the following protocol: (1) PLC I/O address; (2) Terminal Number; (3) Component Terminal Number.

5. Wiring bundles that cross door hinge areas must be protected from chafing with a plastic spiral wrap or other suitable material.

6. Panel wiring is to be grounded to the ground bus or other suitable ground per NEC requirements. Each panel must be connected to the ground bus with a dedicated grounding screw.

7. Exposed live components of 240VAC and over that might be touched while making adjustments must be shielded by a suitable high dielectric material. A clear plastic sheet covering the entire high voltage area is acceptable. A label indicating "DANGER, HIGH VOLTAGE" shall be installed on the cover.

8. MOV type transient suppressers are to be used across the coils of all starters and relays size 00 or larger and where shown on the schematics. The suppressers are to be appropriately sized for the coil size.

9. Any small plug in relays that are driven from a TRIAC type output and have an impedance greater than 2500 ohms shall have a 4200 ohm, 5Watt wire wound resistor installed across the coil. These resistors shall be mounted in a group away from the relays so they will get adequate cooling and so the produced will not effect other components.

General Specifications

10. Use #16AWG wire for the Programmable Controller(s) I/O. The PLC I/O terminals shall have only one wire per terminal, if multiple connections are needed use the terminal block. The PLC is to be grounded per the manufacturers instructions. Insure that the PLC ventilation passages are not blocked and have enough cooling clearance as specified in the manufacturers manual.

11. All components are to be those specified on the Bill of Materials and drawings unless approved otherwise in writing by Sanitaire/ABJ Group. Any request for a substitution of manufacturer or component must be accompanied by engineering information and specifications.

12. Component location and alignment are per drawings with shop adjustments as required for manufacturers requirements and recommendations for heat dissipation and wire clearances. Layout must insure there is no interference with other components.

13. All components are to be identified with their tag number on label mounted on the control cabinet back panel or door and located near the component.

14. Pilot devices are to have legend plated engraved with the legends shown on the engraving drawings.

15. Pilot devices are to be mounted with the keyed locating ring or tang engaged into the appropriate notch to prevent rotation.

Testing and Crating

1. A power on test shall be performed by the panel fabricator and later verified by an Sanitaire/ABJ Group representative. The test must show that all circuits function properly including all Inputs and Outputs to the PLC and all control circuits for lamps, switches, relays, starters, circuit breakers, etc.

2. The control cabinet and the MCC must be crated and mounted on a pallet for shipping. All exterior surfaces and control devices must be protected. All control elements inside the cabinets such as transformers, PLC, etc., must be fastened to prevent movement during shipping.

Functional Design Specification (FDS)

ICEAS®

(Intermittent Cycle Extended Aeration System)

Sequencing Batch Reactor (SBR)

With OSCAR™ Process Performance Optimizer

Aumsville WWTP

Aumsville, OR USA

Project no: 25-0365

Xylem
Sanitaire products
Waukesha, Wisconsin, USA

July 2025

SANITAIRE
a xylem brand

Issue, Revision, and Approval Record

Issue	Date	Sections Changed	Description of Changes	Changes Made By	Approved By
	06/24/25	All	Original Project	CB	

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1 Introduction

Xylem is the provider of Sanitaire process equipment and control systems. This functional design specification (FDS) details the control of each system component, interlocks between components, operating ranges and how to change control setpoints through the operator interface. This FDS is specific to the following plant:

Project name	Aumsville WWTP
Project Location	Aumsville, OR USA
Sanitaire Number	25-0365
Process	NDN, 2-basin

This document will be used in conjunction with the Operational Description for the system, which provides the process overview and recommended setpoint values. All abbreviations associated with this FDS can be found in the Operational Description.

2 OSCAR™ Control System

Sanitaire has provided a complete OSCAR™ control system for operating the process. An overview of the OSCAR™ control system is provided in the Operational Description. In general, the control system consists of the main control panel, programmable logic controller (PLC) and an operator interface, which will be the human-machine interface (HMI) as detailed in the following sections.

2.1 Programmable Logic Controller (PLC)

The PLC contains the logic to operate the process equipment when the equipment is in automatic "Auto" control. The PLC sends and receives signals and is connected to a modem/webport for remote access.

Notice – Inclusion of third-party PLCs and associated software

This product includes a Programmable Logic Controller (PLCs) to enable automated control of the system. Each PLC manufacturer may use certain software in its PLC that are subject to be potentially vulnerable to cyber threats. Xylem strongly advises that end users are engaged to understand any support and security requirements of the PLC, including reviewing the support site at one of the web addresses provided below. Any software updates that may be required to this PLC due to a potential vulnerability must be performed in coordination between the end user and PLC manufacturer.

Xylem Product Cybersecurity

Xylem values your system security and the availability of your critical services. For more information on Xylem cybersecurity practices or to contact the cybersecurity team please visit xylem.com/security.

- *Rockwell Automation https://www.rockwellautomation.com/global/support/overview.page?*
- *Schneider Electric https://www.schneider-electric.us/en/work/support/*
- *Siemens https://new.siemens.com/us/en/products/services/industry/corrective-services/support-and-consulting-services.html*

2.2 Operator Interface (HMI)

The HMI, an Allen Bradley PanelView Plus touch screen, is the operator interface that communicates with the PLC to display the system status, allow setpoint adjustments, allow control mode changes, and perform alarm handling. It is located on the main control panel door and allows the operator to navigate through the different screens to monitor and control the process. The HMI provides a graphic display of the process parameters and equipment status. From the alarm screens the operator will be able to acknowledge and clear faults.

For details on using the HMI refer to the HMI O&M manual.

2.3 Equipment Status Conventions

The following list of icons will be shown to represent the equipment's status on the HMI operator interface.

ICON Shown	Status Options
Animation (rotation)	Running
White Hand	Not in Auto
Red Alarm Bell	Alarm

2.4 Motor Control Center (MCC)

The motor control center contains the motor starters and VFDs for the equipment to be controlled. The PLC communicates with MCC to signal the motor starters when to run or stop. The PLC will provide a speed refence signal to the VFDs and controls the operation and speed of the decanter, blowers, mixers, and waste pump motors.

3 ICEAS® Continuous Feed Operating Mode

The process is configured to operate in ICEAS® or Continuous feed mode. In a continuous feed system, any influent valves or gates will remain in the open position to allow all basins to receive continuous influent flow.

4 Basin Air Valves

Each basin has an air valve for controlling when air is allowed into the basin's aeration system. An electrical actuator operates the air valve and limit switches on the valve signal the PLC if it is completely open or completely closed. Each air valve has a COAO (close-off-auto-open) selector switch and "Open" and "Closed" pilot lights located on a local control station at the basin. Pilot lights indicates the current position of the air valve.

The operator interface will display the current status of each air valve by one of the:

Parameter Displayed	Status Options
Air Valve Status	*"Open", "Closed", "Opening"," Closing", or "Faulted"*

To manually open, close, or turn off the air valve, the operator selects the desired position on the COAO switch. When the COAO switch is in the "auto" position, the valve will operate based on the logic in the PLC program.

In automatic control, the air valve will only open for a basin if the cycle timeline is in an aeration or "air on" period of the react phase. When the air periods for the two basins are back-to-back, the air valves will alternate positions such that when one valve is open, the other is closed and vice versa. When an air valve is going to close, there is a 45 second time delay before the "call to close" occurs to allow another air valve to open (if selected to do so). This sequence allows blowers to run continuously if the air valves on the basins share blowers.

4.1 Air Valve, Permissive Conditions

To operate the air valve automatically, the following conditions must exist:

Action	Permissive Conditions
Call to Open	▪ *Air valve in "auto" position at* COAO *switch* ▪ *Air valve called to open from PLC based on cycle timeline* ▪ *Decanter interlocks satisfied (see NOTE below)* ▪ *Basin float switch not tripped* ▪ *High DO setpoint is not reached in basin (see DO Control System)*

Action	Permissive Conditions
Call to Close	▪ *Air valve in "auto" position at* COAO *switch* ▪ *Air valve called to close from PLC based on cycle timeline*

NOTE: Two (2) interlocks exist between the air valve and the decanter. The air valve is allowed to open if the decanter meets one of the following conditions:

1.) the decanter has reached the park position OR

2.) the decanter has been raising for a minimum of four (4) minutes in the "auto" position AND the decanter is not faulted.

4.2 Air Valve Faults

The air valve will be in faulted status when one of the following conditions exists:

Status	Status Conditions
Faulted	▪ *Fail to open* ▪ *Fail to close* ▪ *Position fault (Both open and closed position limit switches are tripped at the same time.)*

5 Aeration Control

The aeration control system regulates the Dissolved Oxygen (DO) in the basins by controlling the blower operation based on operator adjustable setpoints. Each basin has a dissolved oxygen (DO) sensor and analyzer that communicates with the PLC. The operator adjustable parameters will be displayed on the operator interface as follows:

Parameter Displayed	Selection Options
High O2 Setpoint	0 – 9.9 mg/L
O2 Setpoint	0 – 9.9 mg/L
Low O2 Setpoint	0 – 9.9 mg/L
Blower Off Delay	0 – 60 Minutes
O2 Off Blower Speed	50 – 100 %
Blower Startup Speed	40 – 100%

The operator interface will display the current DO concentration in milligrams per liter (mg/L), which is the same as parts per million (ppm).

Parameter Displayed	Status Options
O2 Concentration	0 – 9.9 mg/L

The aeration control system can be turned “on” or “off” at the operator interface as follows:

Parameter Displayed	Selection Options
Aeration Control	“On” or “Off”

When Aeration Control is enabled or “on”, the PLC program will automatically control the blower(s) operation to maintain a target or limited range of DO in the basin during aeration. When the DO Control is disabled or “off”, the blower(s) will operate based on the amount of time selected for the “air on” period and by a manual speed setpoint.

Recommended DO setpoints based on design parameters are located in the Operational Description.

If the air time is set for less than 100 percent of the air period as described in the blower run time section, the reduced time will take priority over the automatic DO control. When the reduced air time has expired, the basin air valve will close and the blower will stop running until the next air period.

When Aeration Control is on, the PLC will turn the blower(s) off if the DO is too high. When the DO concentration rises above the Basin High DO Concentration setpoint for longer than the Blower Off Delay time, the PLC will turn the blower off until the DO concentration decreases below the Basin Low DO Concentration Setpoint.

When using DO sensors on IQ Sensornet, additional features are enabled including Sensor Fault and Maintenance Mode. Operation is as follows:

DO Sensor Fault – When a fault occurs, an alarm will display on the Alarm Screen, the sensor graphic on the process screen will display a flashing red alarm bell, and the DO control will change to a safe operating mode (Blower Manual Speed). To turn Aeration Control on after a sensor fault, the operator needs to correct the problem and reset the alarm using the Alarm Reset button on the HMI screen.

DO Sensor Maintenance Mode –When the DO sensor is placed into "Maintenance Mode" for cleaning, a Priority 3 alarm will display in the alarm screen. The PLC will change to a safe operating mode, Manual Blower Speed. If the sensor is in maintenance mode less than 60 minutes, the PLC will return control to the previous operating mode, DO Control. If the sensor is in maintenance mode longer than 60 minutes, a Priority 2 alarm will be displayed on the alarm screen and will not allow the control mode to be turned on until the sensor fault is cleared. To turn Aeration Control on after a sensor fault, the operator needs to correct the problem and reset the alarm using the Alarm Reset button on the HMI screen.

Status	Status Conditions
Faulted	*DO Sensor Faulted*
Maintenance	*DO Sensor Maintenance Mode*
Maintenance Too Long	*DO Sensor Maintenance Mode Too Long*

6 Blowers

Blowers will operate to deliver air to the process to satisfy the oxygen requirements. An (HOA) "hand-off-auto" selector switch for each blower located on the main control panel allows the operator to select "hand", "off", or "auto" positions. In the "off" position, the blower will not run and in the "auto" position the blower will operate based on the logic in the PLC program. In the "hand" position, the blower will run continuously without permissive conditions or interlocks from the PLC. **Manual blower operation requires the operator to be aware of basin air valve positioning to prevent forcing air against a closed valve.**

The operator interface will display the following information for each blower in the system. An elapsed time meter (ETM) will display each blower's run time in hours and after 99,999 hours of operation, the ETM will reset to zero.

Parameter Displayed	Status Options
Blower Status	*"Auto", "Running", or "Faulted"*
ETM	*Run time in hours*

If "auto" and "running" are not active as a status option, the equipment is likely in the "off" position on the selector switch. If "auto" is not active and "running" is shown, the equipment is likely in the "hand" position on the selector switch.

6.1 Positive Displacement Blower Operation

Positive displacement blowers will operate to deliver air to the process. There is a motor winding over temperature switch that is wired in series with the starter and will stop the motor if it overheats. Automatic blower operation allows the operator to control the amount of air fed to the system by time, motor speed with a variable frequency drive (VFD) or a combination of both.

A VFD will regulate the speed of the blower motor based on an operator setpoint or by the automatic Process Control System such as dissolved oxygen (DO) control – refer to the Process Control System section. To control the blower manually by selecting the speed reference, the Process Control System must be "off". The minimum speed which the blower is allowed to run is 50 percent. The operator will select a "Blower Speed" setpoint from the operator interface for manual speed control as follows:

Parameter Displayed	Selection Options
Blower Speed	*"50 – 100%"*

6.2 2-Basin, 3-Blower System (1 Lead Duty, 1 Lag Duty, 1 Standby)

Three (3) blowers, each capable of delivering 50 percent of the process air requirements, are connected to the two (2) basins by a common manifold. The system can be operated with one or two duty blowers when aeration is required in the process cycle for each of the two basins. One duty blower is called the "Lead Duty" blower and the other blower is called the "Lag Duty" blower. The third blower is called the "Standby" blower. At the operator interface, the plant operator can select the number of duty blowers to run and the delay time for the "Lag Duty" blower to begin operation as follows:

Parameter Displayed	Selection Options
Number of Duty Blowers	*"1" or "2"*
Lag Blower Start Delay	*0 – 10 minutes*

Initially with all three blowers HOA selector switches in the "off" position, the first blower set to "auto" will be the "Lead Duty" blower. The next sequentially numbered blower that is available will be the "Lag Duty" blower when placed into "auto". The next sequentially numbered blower that is available will be the "Standby" blower when placed into "auto". The following table summarizes the sequence based on the first blower selected in "auto".

1st Selected (Lead)	2nd Selected (Lag)	3rd Selected (Standby)
Blower 1	Blower 2	Blower 3
Blower 2	Blower 3	Blower 1
Blower 3	Blower 1	Blower 2

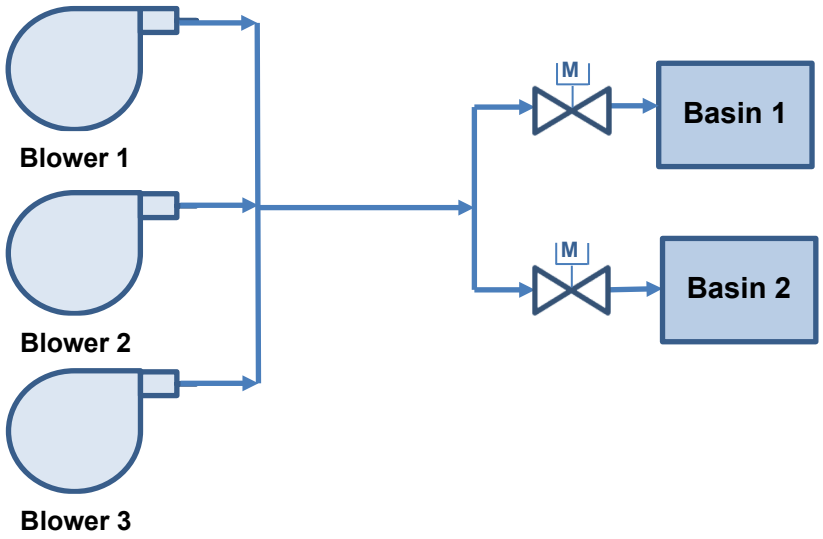
When the PLC calls for a blower to operate, the "Lead Duty" blower will start. After the "Lag Blower Start Delay" time has expired, the "Lag Duty" blower will begin to run if two duty blowers are selected on the operator interface. Once the two blowers are running, they will remain in operation unless called to stop. The third blower serves as a standby if either duty blower is unable to operate (faulted) or is taken out of the "auto" position. When a "Standby" blower is called to run, it becomes the "Lag Duty" blower and the other operating blower becomes or remains the "Lead Duty" blower.

Every week the blowers switch positions to allow equal run time on all three blowers. The "Lead Duty" blower becomes the "Standby" blower, the "Lag Duty" blower becomes the "Lead Duty" blower, and the "Standby" blower becomes the "Lag Duty" blower. When one blower is turned off, one of the two remaining blowers will be "Lead Duty" blower and the other will be the "Lag Duty" blower and alternate status on a weekly basis.

The operator interface will display the status of each blower as follows:

Parameter Displayed	Status Options
Blower 1 Position	*Lead Duty, Lag Duty, Standby*
Blower 2 Position	*Lead Duty, Lag Duty, Standby*
Blower 3 Position	*Lead Duty, Lag Duty, Standby*

The schematic below shows the general arrangement of the blowers.



6.2.1 Lead and lag duty blower control.

When the PLC calls for a blower to operate, the “Lead Duty” blower will start. After the “Lag Blower Start Delay” time has expired, the “Lag Duty” blower will begin to run, if two duty blowers are selected on the operator interface. Both blowers will start at the blower startup speed. Once the two blowers are running, both blowers will be operated at the same speed. The number of blowers operating will be controlled by the DO control.

If 2 blowers are operating at 50% speed or lower, and the DO control is calling for less air, the lag duty blower will stop and the lead blower will increase to 95%, at which point the system will revert to DO control reducing and increasing the speed of the single lead duty blower.

If one blower is operating and is at 100% output and the DO control is calling for more air, the lead blower will reduce output to 50% and the lag blower will start up at 50%. The DO control will then control both blowers operating at the same VFD speeds to increase and decrease the blower speed.

6.3 NDN/NDNP Blower Run Times

When the blower and air valve are in automatic control, the duration of time the air valve is open and the blower is running is based on the programmed time for each air period. Typically, there are four (4) 24-minute air periods that are each programmable from zero (0) to 24 minutes. Depending on the react phase arrangement, there can be as many as seven (7) air periods. From the operator interface, the operator can select the duration of each air period as follows:

Parameter Displayed	Selection Options
React Phase Air Time 1	*0 – 24 minutes*
React Phase Air Time 2	*0 – 24 minutes*
React Phase Air Time 3	*0 – 24 minutes*
React Phase Air Time 4	*0 – 24 minutes*
React Phase Air Time 5	*0 – 24 minutes*
React Phase Air Time 6	*0 – 24 minutes*
React Phase Air Time 7	*0 – 24 minutes*

Refer to the Operational Description for the recommended cycle times and the cycle charts. When blowers are shared for multiple basins, certain air periods cannot overlap. The entered air time will be overwritten by the PLC to a "0" if it overlaps with another basin's designated air time. Being able to select more aeration time is an added control feature however the Operational Description should be consulted first to understand how the system was designed to operate.

Blower operation will be affected if DO Control is on. Refer to Aeration Control Section.

6.4 Blower Permissive Conditions

To operate the blowers automatically, the following conditions must exist:

Action	Permissive Conditions
Call to Run	▪ *Blower in "auto" position at HOA switch* ▪ *Air valve is open, in "auto", and not faulted* ▪ *Blower is not faulted* ▪ *Blower Restart Delay expired if applicable (see NOTE below)*

NOTE: There is a restart delay on each blower to prevent the blower from restarting too often when in automatic control. The blower restart delay will be factory set per the blower manufacturer's recommended parameters. When the blower restart delay has been initiated, the operator interface will flash an hour glass animation until the timer expires.

6.5 Blower Faults

The blower will be in faulted status when one of the following conditions exists:

Status	Status Conditions
Faulted	▪ *Run Fault* ▪ *Motor over temperature* ▪ *VFD Fault*

Regardless of the blower operating status (automatic or manual), there is a “Winding Over Temperature Switch” that is wired in series with the blower starter coil and will stop the motor from running if the motor overheats.

7 Aeration System Purge/Depressurization Valve

A solenoid valve connected to the aeration system will periodically open to allow the aeration system to purge and depressurize. Purging of the system takes place at the beginning of the first air period in the react phase of the cycle. The solenoid valve will open to purge the system when the open limit switch for the air valve has been confirmed (basin begins first air period). Depressurization of the system takes place at the completion of the last air period in the react phase of the cycle. The solenoid valve will open to depressurize the system when the closed limit switch for the air valve has been confirmed (basin has completed last air period).

The duration that the solenoid valve is open for each basin for purging and depressurizing is operator adjustable on the operator interface as follows:

Parameter Displayed	Selection Options
Purge Time	*0 – 15 minutes*
Depressurization Time	*0 – 120 seconds*

The “Purge Time” and “Depressurization Time” are separate timers that are based on “real time”. The duration of these timers is independent of the process “Normal” and “High Flow” cycle clock times.

It is recommended that the purge and depressurization time be set to values that allow the operator to hear air coming out of the solenoid valve. The operator interface will display the status of each basin’s solenoid valve as follows:

Parameter Displayed	Status Options
Purge/Depressurization Valve	*“Opened” or “Closed”*

8 Mixers

Each basin has a mixer installed in the main-react zone, which operates during periods in the react phase. Located on the basin local control panel is an HOA (hand-off-auto) selector switch. In the “hand” position, the mixer will operate continuously with no interlocks or permissive conditions from the PLC. In the “off” position, the mixer will not operate and in the “auto” position, the mixer will operate according to the PLC program. Regardless of the HOA selector switch position there is a winding over temperature switch that is wired in series with the motor starter that will stop the mixer motor if it over heats.

In each react period, each mixer can be enabled or disabled by selecting “On” or “Off”, respectively through the operator interface. If a mixer is enabled, it will operate when the aeration is off. The aeration will be off in a period when the selected “Air time” is less than 24 minutes. It will also be off if aeration control is “On” and blower turn off due to “high O2”.

The following selection options are available for allowing the mixers to operate during each period in the react phase:

Parameter Displayed	Selection Options
React Phase Mixer Control 1	*“On” or “Off”*
React Phase Mixer Control 2	*“On” or “Off”*
React Phase Mixer Control 3	*“On” or “Off”*
React Phase Mixer Control 4	*“On” or “Off”*
React Phase Mixer Control 5	*“On” or “Off”*
React Phase Mixer Control 6	*“On” or “Off”*
React Phase Mixer Control 7	*“On” or “Off”*

When a mixer is selected to operate during a period where the selected “Air Time” is more than 0 minutes and less than 24 minutes, the operator can also select if the mixer or aeration will operate first during that period as follows:

Parameter Displayed	Selection Options
React Phase Mixer Control (1-7)	*“Air First” or “Mix First”*

The operator interface will display the current status of each mixer by one of the following:

Parameter Displayed	Status Options
Mixer	*“Auto”, “Running”, or “Faulted”*

If “auto” and “running” are not active as a status option, the equipment is likely in the “off” position on the selector switch. If “auto” is not active and “running” is shown, the equipment is likely in the “hand” position on the selector switch.

8.1 Mixer Permissive Conditions

To operate the mixers automatically, the following conditions must exist:

Action	Permissive Conditions
Call to Run	▪ *Mixer in "auto" position at HOA switch* ▪ *Mixer called to run from PLC based on cycle timeline ("On" in react phase)* ▪ *Mixer is not faulted* ▪ *Basin float switch not tripped* ▪ *Air valve is closed* ▪ *Decanter interlocks satisfied (see NOTE below)*

NOTE: Two (2) interlocks exist between the mixer and the decanter. The mixer is allowed to operate if the decanter meets one of the following conditions: 1.) the decanter has reached the park position OR 2.) the decanter has been raising for a minimum of four (4) minutes in the "auto" position AND the decanter is not faulted.

8.2 Mixer Faults

The mixer will be in faulted status when one of the following conditions exists:

Status	Status Conditions
Faulted	▪ *Run Fault* ▪ *Mixer over temperature*

If an over temperature condition is detected, the problem must be corrected prior to the mixer being allowed to resume operation.

8.3 Mixer Leak Sensing

Located in the motor housing on each mixer is a sensor that is wired to a relay mounted in the main control panel. The sensor will provide two levels of protection: leak detection and housing over temperature. An over temperature alarm will result in the mixer ceasing operation and the mixer will be in "faulted" status as displayed in the Faults section above. A detected leak means that liquid has entered the inside of the mixer housing and the operator will be notified by an alarm, which is a warning only and the mixer will continue to operate.

Mixers with leak sensing equipment will show the following additional status condition:

Status	Status Conditions
Mixer Warning	*Mixer leak detected*

9 Decanters

Each basin has a decanter installed on one of the walls. An electro-mechanical actuator controls the movement of the decanter. A selector switch is located on the decanter's local control station with the following positions: lower, off, auto, or raise. To manually operate the decanter up or down, the operator must select "raise" or "lower", respectively. To stop the decanter from operating, the operator must select "off". In the "auto" position, the decanter will operate based on the PLC program.

An electro-mechanical actuator is driven by a VFD to control the speed of the decanter. In manual operation, the decanter will travel at full speed in the direction selected. In automatic control, the decanter's lowering speed is controlled by the VFD to maintain a constant vertical travel rate for the decanter weir, which results in a constant effluent discharge rate. When the decanter is rising, it will travel at full speed.

The decanter has magnetic upper and lower limit switches to define the range of motion and end of travel in either direction. There are four (4) limit switches, two (2) at the top called raised and secondary raised and two (2) at the bottom called lowered and secondary lowered. The secondary limit switches operate as backups in case the first limit switch fails to operate.

9.1 Decanter Travel Time

The decant phase in the normal cycle is 72 minutes in duration to remove the supernatant, which is defined from top water level (TWL) to bottom water level (BWL). The decanter is located in the park position, three (3) inches above the TWL when it is not in operation. To allow for travel time from park position to TWL, the total decanter lowering time is slightly longer than 72 minutes. For each project and applicable operating mode, the time needed to travel from the park position to the TWL is calculated and incorporated into the decanter lowering time. Also, to ensure that the decanter reaches BWL and subsequently rises above the liquid level before aeration or mixing starts, the decanter starts to descend an additional 4 minutes prior to the start of the decant cycle shown on the HMI.

To set the total decanter lowering travel time, there is an operator adjustable value called "decanter speed" on the operator interface. The decanter speed represents a percentage of the average lowering speed and is selectable from 10 to 100 percent as follows:

Parameter Displayed	Selection Options
Decanter Speed	*10 – 100%*

The VFD will receive the selected decanter speed from the PLC and lower the decanter accordingly. The time it takes the decanter to complete travel to the BWL will be displayed on the operator interface along with a suggested decanter speed as follows:

Parameter Displayed	Status Options
Decanter Time	*0 – 72 minutes*
Decanter Suggested Speed	*10 – 100%*

If the decanter travel time is not in the desired decant time range of 70 to 73 minutes, the operator will have to adjust the decanter speed accordingly. If the decant time is less than the desired time, the decanter speed must be decreased, whereas, if the decant time is more than the desired time, the

decanter speed must be increased. The decanter suggested speed is displayed to assist the operator in selecting a decanter speed that will achieve the decant time in the desired range.

After the decanter has reached BWL, it will begin rising at full speed until reaching the raised limit switch or “Park Position”.

9.2 Decanter Permissive Conditions

To operate the decanters automatically, the following conditions must exist:

Action	Permissive Conditions
Call to Lower	▪ *Decanter in “auto” position at the local selector switch* ▪ *Decanter called to lower from PLC based on cycle timeline (decant phase)* ▪ *Basin air valve closed* ▪ *Mixer not running*

Action	Permissive Conditions
Call to Raise	▪ *Decanter in “auto” position at the local selector switch* ▪ *Decanter not called to lower from PLC* ▪ *Decanter not at park position (raised limit switch) when basin is not in decant phase*

If the decanter’s lower limit switch is not reached before the beginning of the react phase, the decanter will “time out” and then begin raising to reach the park position.

If the decanter is taken out of “auto” when it is traveling between limit switches, it will continue to lower if switched back into “auto” before the end of the decant time. If the decanter is not switched back to “auto” within the decant time and is switched to “auto” during the other phases in the cycle, it will begin to raise to reach the park position.

9.3 Decanter Faults and Warnings

The operator interface will display a fault or warning when the decanter has one of the following conditions:

Status	Status Conditions
Faulted	▪ *Top Fault (decanter failed to raise from BWL to park position within 30 minutes)* ▪ *VFD fault* ▪ *Move fault (VFD not running)*

Status	Status Conditions
Warning	▪ *Decanter secondary raised limit switch (raised limit switch failed)* ▪ *Decanter secondary lowered limit switch (lowered limit switch failed)*

When a warning is displayed, the decanter will continue to operate and the operator must correct the condition to clear the warning.

9.4 Decanter Lubrication Alarm

Located on the operator interface will be a pop-up alarm box that will flash to alert the operator that it is time to lubricate the decanter actuators. This alarm will occur every 30 days of plant operation. This alarm is only a reminder and is not intended to alert the operator of all the maintenance items required for the decanters. Refer to the O&M manual for the decanters. All other equipment maintenance should be completed as detailed in the O&M manual.

The lubrication alarm will be as follows:

Parameter Displayed	Status Options
Decanter Lubrication	*"Reminder: Lubricate Decanter Actuators" (see O&M manual for other maintenance items)*

The operator can acknowledge the reminder alarm by selecting the following:

Parameter Displayed	Selection Options
Decanter Lubrication	*"Acknowledge"*

10 Waste Activated Sludge (WAS) Pumps

Waste activated sludge (WAS) pumps operate to waste sludge from the process. Located on the basin local control panel is a HOA (hand-off-auto) selector switch for each WAS pump. In the “hand” position, the WAS pump will operate continuously with no interlocks or permissive conditions from the PLC program. In the “off” position, the WAS pump will not operate and in the “auto” position, the WAS pump will operate according to the PLC program. Regardless of the HOA selector switch position, there is a winding over temperature switch that is wired in series with the motor starter that will stop the WAS pump motor if it over heats.

The operator interface will display the current status of each WAS pump by one of the following:

Parameter Displayed	Status Options
WAS Pump	*“Auto”, “Running”, or “Faulted”*

If “auto” and “running” are not active as a status option, the equipment is likely in the “off” position on the selector switch. If “auto” is not active and “running” is shown, the equipment is likely in the “hand” position on the selector switch.

The operator can adjust the WAS pump operation by selecting the minute in the cycle that the pump should start and the run time of the pump. During “High Flow” mode, the actual pump run time is reduced proportionally to match the cycle time, which results in the same amount of sludge wasted per day in all cycle modes. The WAS pump can be selected to run up to three separate times during the cycle and the operator can select the time between the wasting periods. The purpose of running the pump more than one time per cycle is to avoid pumping clear water as biomass close to the pump is removed. The WAS pump start time, run time, number of run periods and time between the run times are operator adjustable on the operator interface as follows:

Parameter Displayed	Selection Options
Start Time	*Minute 0 –288*
Run Time	*0 – 99.9 minutes (0.1-minute increments)*
No of Runs	*1-3*
Time Between	*0 – 99.9 minutes (0.1-minute increments)*

The total cycle time is displayed to guide the operator on the selection of the minute in the cycle that the pump should start.

Parameter Displayed	Status Options
Cycle End	*Minute 0 - 288*

The WAS pump start time will be shown on the cycle timeline on the operator interface as a green arrow. The WAS pump stop time will be shown on the cycle timeline on the operator interface as a red arrow. Once the operator selects the WAS pump setpoints, the arrows will display on the timeline graphic and assist the operator in making setpoint adjustments.

Recommended setpoints based on design parameters are located in the Operational Description.

10.1 WAS Pump Permissive Conditions

To operate the WAS pumps automatically, the following conditions must exist:

Action	Permissive Conditions
Call to Run	▪ *WAS pump in "auto" position at HOA switch* ▪ *WAS pump called to run from PLC based on start time setpoint* ▪ *WAS pump is not faulted*

10.2 WAS Pump Faults

The WAS pump will be in faulted status when one of the following conditions exists:

Status	Status Conditions
Faulted	▪ *Run Fault* ▪ *WAS pump over temperature*

If an over temperature condition is detected, the problem must be corrected prior to the WAS pump being allowed to resume operation.

10.3 WAS Pump Leak Sensing

Located in the motor housing is a sensor that is wired to a relay mounted in the main control panel. The sensor will provide two levels of protection: leak detection and housing over temperature. An over temperature alarm will result in the WAS pump ceasing operation and the WAS pump will be in "faulted" status as displayed in the Faults section above. A detected leak means that liquid has entered the inside of the WAS pump housing and the operator will be notified by an alarm, which is a warning only and the WAS pump will continue to operate.

WAS pumps with leak sensing equipment will show the following additional status condition:

Status	Status Conditions
Warning	*WAS pump leak detected*

11 High Flow Mode Transition and Operation

The operator interface will display the current basin operating cycle as follows:

Parameter Displayed	Status Options
Basin Operating Cycle	*"Normal Cycle", "High Flow" or "Very High Flow"*

After a high flow mode is initiated, the system will stay in the high flow mode until the basin that indicated high flow water levels has completed one (1) full cycle in high flow mode (end of decant phase). At the completion of the high flow mode cycle for that basin, the system will switch back to normal cycle operation if no basins indicate high flow water levels. If a basin detects high flow water levels, the system will stay in the high flow mode until normal water levels return. The system can switch into the high flow mode at any time in the cycle within the high flow or very high flow windows. The system cannot, however, automatically switch from high flow mode back to normal cycle until the completion of one (1) full high flow mode for the initiating basin.

The operator can force the system back into a normal cycle manually by selecting the "High Flow Release" icon. The system will remain in the normal cycle if high flow levels are not present in the basins. The operator can speed up the cycle time manually by selecting the "Fast Advance" icon. Both of these icons are located on the operator interface as follows:

Parameter Displayed	Selection Options
High Flow Release	*Click on Icon*
Fast Advance	*Click on Icon*

Each basin's water level is measured by the level sensing equipment, which includes a level transducer and a float switch.

11.1 High Flow Control Based on Level Transducer

Each basin has a level transducer that will provide the basin water level and can be used to calculate the rate of change of the water level. The rate of change calculation can be turned on or off through the operator interface as follows:

Parameter Displayed	Selection Options
[Very] High Flow Status	*"On" or "Off"*

When the rate of change is enabled or "on", the PLC program uses the basin level to calculate an "Average Rate of Change" in feet per minute (ft/min), which is averaged over a 15-minute period. The "Average Rate of Change" is compared to the "High Flow Activation Rate of Change", which is a value that corresponds to a flow at or above Maximum Flow for a Normal Cycle duration. After cycle clock is greater than Minute 20 and when the "Average Rate of Change" is at or above the "High Flow Activation Rate of Change" and the level in the basin is above the "High Flow Activation Level" for that time in the cycle, the system will transition into the high flow mode.

When the rate of change is disabled or "off", the rate of change will only be displayed and not used to make system changes. The operator interface will display the following:

Parameter Displayed	Status Options
Level	*0 – 20 ft*
Average Rate of Change	*"xxx" ft/min*
Activation Rate of Change	*"xxx" ft/min*
Activation Level at Min xxx	*"xxx" ft*

If the level sensor is out of range, a process alarm will occur. An alarm will display on the Alarm Screen, the sensor graphic on the process screen will display a flashing red alarm bell, and High Flow control will be turned off. To turn High Flow Control on after a process alarm, the operator needs to correct the problem and reset the alarm using the Alarm Reset button on the HMI screen.

11.2 High Flow Control Based on Float Switch

A float switch is used as a backup level sensing device to the level transducer. The float switch is positioned so when it is tripped, it will allow 30 minutes of time before the water overtops the decanter. If the level transducer has not signaled for the system to transition into the high flow mode (failed or disabled), the float switch will signal the transition when it is tripped. Another function of the float switch is to stop aeration or mixing if it is tripped during the react phase. This allows a minimum of 30 minutes of settling prior to the water overtopping the decanter. When the float switch is tripped during the react phase, it will send a message called "Forced Settle" to the operator interface. When the float switch is tripped, it will display on the operator interface as follows:

Parameter Displayed	Status Options
Basin Float Switch	*"Tripped" or "Not Tripped" graphic*

High Flow Mode Permissive Conditions

The system will transition into the high flow mode when the following conditions exist:

Action	Permissive Conditions
Transition to High Flow mode	▪ "Average Rate of Change" at or above the "High flow Activation Rate of Change" and Basin Level at or above the "High flow Activation Level" at that basin minute and at least 20 minutes into the react phase or ▪ Float switch tripped within 30 minutes of water overtopping decanter
Transition to Normal Cycle	▪ No basins with "Average Rate of Change" values at or above "High flow Activation Rate of Change" ▪ One (1) full high flow mode complete (end of decant phase for initiating basin) ▪ No float switches tripped

The system switches from high flow mode operation to Very High flow mode operation when the level sensing equipment in a basin detects a water level that corresponds to a flow that is above the

Maximum Flow for a Minimum Cycle Duration. After the Very High flow cycle is initiated, the system will stay in the Very High flow cycle until the basin that indicated a high flow event has completed its cycle (end of decant phase) and completed another full high flow cycle. When the system is in a high flow cycle, it can switch into the Very High flow cycle at any time to accommodate addition flow.

When the high flow mode or Very High flow mode is initiated, the operator interface will generate a warning, which will include the cycle time that the transition to high flow mode took place. Also when the float switch is tripped, a “Forced Settle” message will be generated. The status conditions will be displayed on the operator interface as follows:

Status	Status Conditions
Warning Message	*“High flow mode” (cycle time displayed)* *“Forced Settle” (no aeration or mixing in react phase)*

11.3 High Flow Mode Additional Settling Option

For high flow modes with settling phases less than 45 minutes, there is an option to disable or turn “off” the last react period activity prior to the settling phase. This option will allow additional settling time in the event that a high flow mode is initiated. During the high flow mode, all activity (aeration, mixing, etc.) in the last period before the settle phase will be turned “off” if the “Off” icon is selected. The following selection option will be displayed on the operator interface:

Parameter Displayed	Selection Options
Last Period Activity (High Flow mode)	*“On” or “Off”*

12 Process Instrumentation

Process instrumentation consists of sensors and analyzers located in the plant. Refer to the Operational Description for instrument names, parameter measured and the locations within the plant. Refer to the Equipment List in the Operation & Maintenance Manual for the quantity, manufacturer and model numbers for the instrumentation. The analyzer sends signals received from the sensors to the PLC. The operator interface will display the instrument reading.

Each sensor and analyzer will send a fault signal to the PLC if there is an issue with the instrument. The operator interface will display the fault as follows:

Status	Status Conditions
Faulted	▪ *Instrument faulted OR* ▪ *Signal Out of Range*

Select process instrumentation will have additional information available through a pop-up screen on the operator interface. This additional information is called IQ SensorNet Information and includes the following items:

Parameter Displayed	Value Description
Sensor Number	Unique IQ Sensornet identifier
Sensor Model	Instrument model number. Value Provided by IQ Sensornet
Sensor Status	Value Provided by IQ Sensornet
Main Value	Instrument Read Out Value
Main Value State	Value Provided by IQ Sensornet
Second Value	Instrument Second Read Out Value
Second Value State	Value Provided by IQ Sensornet
Status Info	Value Provided by IQ Sensornet

This information can be used when troubleshooting or when seeking technical support. Alarm messages for specific sensor faults based on the Status Info will display in the alarm screen. The instrument model number can be used for finding the correct manual.

When an instrument is in “Maintenance Mode”, the operator interface will display the status as follows:

Parameter Displayed	Status Options
Instrument Status	*Maintenance Mode*

The instrument Main Value and Second Value will flash when in Maintenance Mode.

When an instrument is in “Maintenance Mode” a Priority 3 alarm will display in the alarm screen. If the sensor is in maintenance mode longer than 60 minutes, a Priority 2 alarm will display in the alarm screen. Operation of specific controls and associated process instruments for maintenance mode will be handled as described in process control sections for Dissolved Oxygen control, NURO control, and SIMS control.

12.1 Basin Level Transducer

A Basin Level Transducer indicates the level of wastewater in an aeration basin. The transducer sends the level reading to the PLC. The level is continuously indicated at the operator interface as follows:

Parameter Displayed	Status Options
Basin Level	*"XX" ft.*

The following will be displayed on the operator interface if the level transducer has a fault:

Status	Status Conditions
Faulted	▪ *Meter faulted* ▪ *Signal Out of Range*

13 Take a Basin Out of Service

To take a basin out of service, the operator must manually select “off” on each component’s HOA selector switch for the basin to be taken out of service. If a component has a local control station or local selector switch, the operator must also select the “off” position on these items.

At a minimum, the following components should be manually turned to the “off” position on the basin to be taken out of service:

Equipment to Turn “off”

- Decanter
- Air Valve
- Mixer
- WAS Pump

NOTE: All equipment will still have energy to it and should be locked and tagged out according to the plant’s safety procedure.

The logic in the PLC program will continue to control the operation of the remaining equipment that is in the “auto” position and not faulted.

AUMSVILLE, OR (25-0365A)

MAIN PANEL MATERIAL LIST

REV.	TAGS	QTY	CATALOG	MFG	DESCRIPTION
	CONT-1	1	1769-L33ER	AB	1769 COMPACTLOGIX SERIES, 1769 5370 L3 CONTROLLER 2.0MBYTES USER MEMORY, SHIPPED W/1GB SD CARD 32 ETHERNET I/O IP NODES, 16 COMPACT I/O MODULES MAX
	LOCAL: 1, 2, 3, 4	4	1769-IA16	AB	COMPACT LOGIX PLC AC INPUT MODULE, DISCRETE INPUT 110-120 VAC 16 POINT INPUT
	LOCAL: 5, 6	2	1769-OW16	AB	COMPACT LOGIX PLC, I/O MODULE, DISCRETE OUTPUT N.O. CONTACTS 16 POINT RELAY OUT
	LOCAL: 7	1	1769-IF8	AB	COMPACT LOGIX, I/O MODULE, OUTPUT 0-21mA 8-CH ANALOG INPUT, CURRENT
	LOCAL: 8	1	1769-OF8C	AB	COMPACT LOGIX, I/O MODLE ANALOG OUTPUT 0-21mA 8-CH ANALOG OUTPUT, CURRENT
	PLC-PWS1	1	1769-PB4	AB	1769 COMPACLOGIX POWER SUPPLY 24vdc INPUT 4A
	ECR	1	1769-ECR	AB	END CAP, TERMINATOR,COMPACTLOGIX, 1769 RIGHT BANK
	NSW	1	1783-LMS8	AB	STRATIX LIGHTLY MANAGED SWITCH 8X10/100BASET PORTS
A	VPN	1	E7C133K_01MA	EWON	WEB PORT MODEM WEBPORT REMOTE ACCESS, MODEM ETHERNET 4 PORT SWITCH, CELLULER INTERNET ROUTER
	DC-PWS2	1	CS3.241	PULS	POWER SUPPLY, SWITCHING, CLASS 2, 80 WATT, 120/240VAC IN/24VDC, 3.3A OUT
	DC-PWS1	1	CP10.241	PULS	POWER SUPPLY, SWITCHING,240 WATT, 120VAC IN/24VDC, 10A OUT
	CONT. FUSE	1	709-591	WAGO	SPARE FUSE HOLDER
	MAIN-CB	1	1489-M2D300	AB	CIRCUIT BREAKER, 2 POLE, 30A, 480Y/277V
	MAIN-CB	1	1489-AMRA3	AB	AUXILIARY CONTACT, 1 C/O FOR 1489 CIRCUIT BREAKERS
	PLC-CB	1	1489-M1D150	AB	CIRCUIT BREAKER, 1 POLE, 15A, 120/240V
	*-CB	2	1489-M1D100	AB	CIRCUIT BREAKER, 1 POLE, 10A, 120/240V
A	AV*-FU	2	CCMR005	LITTEL FUSE	FUSE, 10 AMP, 600 V, 250 V, 10.3mm x 38.1mm, 0.41" x 1.5", FOR MOTORS
A	AV*-FU	2	LPSC001ID	LITTEL FUSE	FUSE BLOCK, 1 POLE, INDICATING, 30 AMP, CLASS-CC
	PLC-UPS	1	2320283	PHOENIX CONT.	UPS, 900W WITH REMOTE MONITORING,PURE SINE WAVE BACKUP & SURGE PROTECTION
	PLC-UPS BATTERIES	2	1274117	PHOENIX CONT.	BATTERIES - PHOENIX UPS, 2320283
	UPS-CR	1	100-C23D200	AB	RELAY, 120VAC, 23AMP, 2 N.O. 2 N.C.
	UPS-CR	1	100-FSC280	AB	SURGE SUPRESSOR, 110-280VAC, 50/60Hz FOR 100-C CONTACTOR
	UPS-TR	1	700-FEM6TU23	AB	700-FE GENERAL PURPOSE ECONOMY TIMING RELAY, MULTI-FUNCTION MULTI-RANGE, 0.05 S TO 10 HR (6 SETTING), 1 form C, 24-48V DC / 24-240V 50/60HZ
	UPS-RECP	1	0804509	PHOENIX CONT.	SINGLE OUTLET, ON-LIGHT INDICATOR, DIN RAIL MOUNT, 125 V AC, 20 A
	RECP	1	330036	EMPHATEC	DUPLEX OUTLET, DIN RAIL MOUNT, 125V, 15A
	-CR	31	46.52.8.120.0040	FINDER	RELAY, MINIATURE, 8A, 2-POLE, FORM C, 120VAC, 1/4 HP
	-CR	31	99.02.0.230.98	FINDER	VARISTOR MODULE, 110-240V,
	-CR	31	97.02.SPA	FINDER	RELAY SOCKET, DIN RAIL MOUNT
	-CR	2	RY2S-ULDC24V	IDEC	RELAY, MINIATURE, 3A, 24VDC WITH INDICATOR
	-CR	2	SY2S-05C	IDEC	RELAY SOCKET, DIN RAIL MOUNT FOR RY2S
	*-FU	21	1492-H4	AB	120V AC FUSE BLOCK
	*-FU	22	MDA-1	BUSSMAN	FUSE, 1/4 X 1-1/4 , 1 AMPS
	*-FU	1	MDA-2	BUSSMAN	FUSE, 1/4 X 1-1/4 , 2 AMPS
	*-FU	2	MDA-3	BUSSMAN	FUSE, 1/4 X 1-1/4 , 3 AMPS
	*-FU	1	MDA-4	BUSSMAN	FUSE, 1/4 X 1-1/4 , 4 AMPS
	*-FU	5	1492-H5	AB	24V DC FUSE BLOCK
	*-FU	3	1492-N37	AB	END BARRIER FOR FUSE BLOCK, CLASS 1/4 X 1-1/4
	ISB-*	2	KFD2-STC4-EX1	PEPPERL+FUCHS	INTRINSIC BARRIER, ANALOG, 1 CHANNEL
	ISB-*	2	KFU8-SR-EX2.W	PEPPERL+FUCHS	INTRINSIC BARRIER, RELAY, 2 CHANNEL

REV.	TAGS	QTY	CATALOG	MFG	DESCRIPTION
	ISTB	12	XBUT4BU	EATON	TERMINAL BLOCK, 26-10 AWG, 30A, 600V, SCREW, BLUE
	PLCTB, ISTB	4	XBUT4PE	EATON	TERMINAL BLOCK, 26-10 AWG, 30A, 600V, SCREW, GROUND
A	TB2, TB1, YSITB	209	XBUT4	EATON	TERMINAL BLOCK, 26-10 AWG, 30A, 600V, SCREW
A	*TB*	5	XBACUT10	EATON	END BARRIER FOR XBUT4
	AITB, AOTB	14	3214301	PHOENIX CONT.	TERMINAL BLOCK, 2-LEVEL WITH GROUND, 26-10 AWG, 30A, 600V, SCREW
	AITB, AOTB	2	3214314	PHOENIX CONT.	END BARRIER FOR 3214301 AND 3214259, 3-LEVEL
A	*TB*	42	XBAES35C	EATON	END ANCHOR, UNIVERSAL, 9.5 MM
	GND BAR	1	EB10AL	NVENT	GROUND BAR, 10 TERMINAL, #4-14
	GND LUG	1	L70	T&B	GROUND LUG, 14 SOL-4 STRANDED

ENCLOSURE MATERIAL LIST

	ENCLR	1	A84XM7818FTC	HOFFMAN	ENCLOSURE, FREE-STANDING TYPE 12 TWO-DOOR, 3-POINT LATCHING MECHANISM, WITH WHITE SUBPANEL
	PLC-HMI	1	2711P-T15C22D9P-B	AB	PANELVIEW PLUS, HMI, 15" SCREEN
	BLO*-SS	3	800FP-HM32	AB	SELECTOR SWITCH, 3 POSITION, PLASTIC, MAINTAINED, BLACK, KNOB LEVER, 22MM
	BLO*-SS	3	800F-ALP	AB	MOUNTING BASE, 800F, PLASTIC LATCH
	BLO*-SS	6	800F-X10	AB	CONTACT BLOCK, 1 N.O., 22MM, NO LATCH, SCREW
	*-LT	3	800FD-P4N5	AB	PILOT LIGHT, RED, 120VAC, 22MM, LED

SPARE PARTS

	5 SPARE CONTROL FUSES REQUIRED FOR EACH SIZE				
	1 SET SPARE POWER FUSES REQUIRED FOR EACH SIZE				
	DCNT-RB	2	14-611207	ICC	LIMIT SWITCHES, SPARE

DECANTER ENCLOSURES

	*FU	4	1492-H4	AB	120V AC FUSE BLOCK
	*FU	2	1492-N37	AB	END BARRIER FOR FUSE BLOCK, CLASS 1/4 X 1-1/4
	*FU	2	MDA-3	BUSSMAN	FUSE, 1/4 X 1-1/4 , 3 AMPS
	*FU	2	MDA-1	BUSSMAN	FUSE, 1/4 X 1-1/4 , 1 AMPS
	TB	80	XBUT4	EATON	TERMINAL BLOCK, 26-10 AWG, 30A, 600V, SCREW
	TB	4	XBAES35C	EATON	END ANCHOR, UNIVERSAL, 9.5 MM
	TB	2	XBACUT10	EATON	END BARRIER FOR XBUT4
	DCNT*-CR*	8	38.51.3.125.0060	FINDER	RELAY, 6A, 1-FORM C, 120VAC
	DCNT*-ENCLR	2	CSD20206	HOFFMAN	SINGLE-DOOR ENCLOSURE, TYPE 4X, 12, 13, SIZE 20 x 20 x 6 IN, STAINLESS STEEL
	DCNT*-ENCLR	2	CP2020	HOFFMAN	BACK PANEL, 18.20 X 18.20, STEEL, 14 GAUGE W/WHITE FINISH
	DCNT*-SS, 'AV*-SS	4	800FP-HM42	AB	SELECTOR SWITCH, 4 POSITION, PLASTIC, MAINTAINED, BLACK, KNOB LEVER, 22.5MM
	DCNT*-SS, 'AV*-SS	4	800F-ALP	AB	MOUNTING BASE, 800F, PLASTIC LATCH
	DCNT*-SS, 'AV*-SS	8	800F-X10	AB	CONTACT BLOCK, 1 N.O., 22.5MM, NO LATCH, SCREW
	DCNT*-SS, 'AV*-SS	4	800F-X01B	AB	CONTACT BLOCK, 1 N.C.E.B, 22.5MM, NO LATCH, SCREW
	B*WSP-SS, B*MIX-SS, D*WSP-SS.	4	800FP-HM32	AB	SELECTOR SWITCH, 3 POSITION, PLASTIC, MAINTAINED, BLACK, KNOB LEVER, 22MM

REV.	TAGS	QTY	CATALOG	MFG	DESCRIPTION
	B*WSP-SS, B*MIX-SS, D*WSP-SS.	4	800F-ALP	AB	MOUNTING BASE, 800F, PLASTIC LATCH
	B*WSP-SS, B*MIX-SS, D*WSP-SS.	8	800F-X10	AB	CONTACT BLOCK, 1 N.O., 22MM, NO LATCH, SCREW
	*-LT	2	800FD-P3N5	AB	PILOT LIGHT, GREEN, 120VAC, 22MM, LED
	*-LT	6	800FD-P4N5	AB	PILOT LIGHT, RED, 120VAC, 22MM, LED
	GND LUG	2	L70	T&B	GROUND LUG, 14 SOL-4 STRANDED
	DCNT*-RB	2	9020MAG	ICC	MAGNET KIT, 9020 ACTUATOR
	DCNT*-RB	4	DCNT-LS	ICC	LIMIT SWITCH BOX ASSY

PURCHASED PARTS

	B*WSP*-LOTD,B*MIX-LOTD, D*WSP*-LOTD	6	1400000407129	FLYGT	MINI-CASII/FUS, LEAK SENSING MODULE.
	B*WSP*-LOTD,B*MIX-LOTD, D*WSP*-LOTD	6	SR3P-05C	IDEC	SOCKET, MINI-CASII/FUS, LEAK SENSING MODULE
	MIQ/TC 2020 XT	1	470 020Y	YSI	System 2020XT Terminal/Controller only. Used as redundant (back up) controller. Complete with USB interface. No Modules Included.
	MIQ/MC3	1	471 020Y	YSI	Module IQ/microcontroller for system 2020 XT, 2 free IQ SensorNet connections, in module housing, with automatic barometric pressure compensation, USB interface (IP67), Ethernet RJ45 interface (IP 67)
	MIQ/PS	2	480 004Y	YSI	Power Supply Module, IQ, 100-240 VAC, 18 Watts. 3 IQ Sensor Net Connections.
	MIQ/BB1	2	207 001Y	YSI	CLASS 1 DIV 2 DO INTRINSIC BOX
	SSH/IQ	2	109 295Y	YSI	IQ Sun Shield, Plastic, for 2020 & 282 module mounting, also used for mounting air cleaning box.
	MR/SD 170	2	109 286Y	YSI	Rail mounting kit for SD/M 170, SD/K 170 and SSH/IQ sun shields(dia. 25-60 mm)
	SNCIQ-250	1	480 070Y	YSI	IQ Cable, 2 Wire w/Shield, 250 Meter Roll (820 ft.)
	SNCIQ	1	480 046YM-XX	YSI	IQ Cable, 2 Wire w/Shield, Specify length in meters, 1 = length in meters (1 meter = 3.28 feet)
	SACIQ-15.0	2	480 044Y	YSI	Sensor Connection cable, IQ, 15 m, 49.2 ft
	SMK	2	245 8000Y	YSI	Quick Release Stainless Steel Handrail Mounting Bracket for Sensors with 1.5 inch PVC couplers and end cap
	FDO 700 IQ H	2	207 065Y	YSI	Class I, Division 2 rated, groups A, B, C, D T6, Optical DO probe for IQ System, 0-20.00 mg/l
	Conduit Adapter	4	480053USY	YSI	Metric to English conduit adapters

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AUMSVILLE, OR.
WASTEWATER TREATMENT PLANT

PROJECT No. 25-0365A

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06/16/2025
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AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

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DRWN BY IKS 06/16/2025 | APPVD BY CB | SIZE D | REV. A | SCALE | QTY. | JOB. 25-0365A | DWG. 0365-TC01 | SHT. A OF J

ELECTRICAL SYMBOLS

AH — ALARM HORN

CB — CIRCUIT BREAKER

CONTACT (NORMALLY OPEN)
* SOME CONTACT FUNCTIONS
CR = CONTROL RELAY
M = MOTOR CONTACTOR

CONTACT (NORMALLY CLOSED)
* SOME CONTACT FUNCTIONS
CR = CONTROL RELAY
M = MOTOR CONTACTOR

CT — CURRENT TRANSFORMER

DB — DISTRIBUTION BLOCK

FTR — DV/DT FILTER

WLT — ENCLOSURE LIGHT

FS — FLOAT SWITCH/STORM
CLOSES ON RAISING LEVEL

FS — FLOAT SWITCH
OPENS ON RAISING LEVEL

FU — FUSE

GROUND OR PE

GND-BUS — GROUND BUS

LS — LIMIT SWITCH (NORMALLY CLOSED)

LS — LIMIT SWITCH (NORMALLY OPEN)

LR — LINE\LOAD REACTOR

OL — OVERLOAD (MOTOR)

MCP — MOTOR CIRCUIT PROTECTOR

MOV — METAL OXIDE VARISTOR (SURGE ARRESTER)

LT — PILOT LIGHT

PBLT — PILOT LIGHT
INDICATING LIGHT PUSH TO TEST

PB — PUSH BUTTON

PB — PUSH BUTTON (MUSHROOM HEAD)

ISO — POWER ISOLATOR

PS — PRESSURE SWITCH
CLOSES WITH PRESSURE

PS — PRESSURE SWITCH
OPENS WITH PRESSURE

SENSORS — PROCESS SENSORS

RECEPT / UPS-RECP — RECEPTACLE

×-CR× — RELAY – BASIC SYMBOL
* SOME RELAY FUNCTIONS
AV* = AERATION VALVE
DCNT* = DECANTER
WSP*– = WASTE SLUDGE PUMP

SS — SELECTOR SWITCH
(X = CLOSED CONTACT)
(O = OPEN CONTACT)

MSS — SOFT START (MOTOR)

SOL — SOLENOID VALVE

TR — TIMER (NORMALLY OPEN)

TR — TIMER (NORMALLY CLOSED)

TS — TEMPERATURE SWITCH
OPENS ON RAISING TEMPERATURE

TS — TEMPERATURE SWITCH
CLOSES ON RAISING TEMPERATURE

TB — TERMINAL BLOCK

TB — TERMINAL BLOCK (BY OTHERS)

XF — TRANSFORMER

VFD — VARIABLE FREQUENCY DRIVE

SHLD — SHIELDED CABLE
(TWISTED PAIR)

SHLD — SHIELDED CABLE
(TWISTED PAIR GROUNDED)

FIELD WIRING
AND FIELD DEVICES

WIRING INSIDE ENCLOSURES

NEW EQUIPMENT/CHANGED

DECOMMISSIONED/REMOVED

RESERVED FOR INTRINSIC WIRING

A — REVISION DESIGNATION LETTER
(TO BE PLACED WITH REVISION CLOUD)

NOT FOR CONSTRUCTION

ABBREVIATIONS

AA – ANAEROBIC
AC – ALTERNATING CURRENT
ACT – ACTUATOR
AD – AUTO DIALER
AH – ALARM HORN
ALRM – ALARM
ALT – ALTERNATOR
AN – ANOXIC
ANSI – AMERICAN NATIONAL STANDARDS INSTITUTE
AR – AEROBIC
AUTO – AUTOMATIC CONTROL
AV – AERATION VALVE

BLO – BLOWER

CB – CIRCUIT BREAKER
CF – COOLING FAN
CL – CHLORINE
CNTL – CONTROL
COMP – COMPUTER
CP – CONTROL POWER
CR – CONTROL RELAY
CT – CURRENT TRANSFORMER

DB – DISTRIBUTION BLOCK
DC – DIRECT CURRENT
DCNT – DECANTER
DIG – DIGESTER
DISC – DISCONNECT SWITCH
DO – DISSOLVED OXYGEN

EFF – EFFLUENT
EFFV – EFFLUENT VALVE
ENC – CONTROL ENCLOSURE
EQ – EQUALIZATION
EQP – EQUALIZATION PUMP
ESD – EMERGENCY STOP DEVICE
ETM – ELAPSED TIME METER

FLM – FLOW METER
FLS – FLOAT SWITCH
FU – FUSE
FVNR – FULL VOLTAGE NON–REVERSING
FVR – FULL VOLTAGE REVERSING
FTR – DV/DT FILTER

GND – GROUND

HMI – HUMAN MACHINE INTERFACE
HTR – HEATER

INFV – INFLUENT VALVE
INFP – INFLUENT PUMP
INST – INSTRUMENT
I/O – INPUTS/OUTPUTS
ISB – INTRINSIC BARRIER
ISO – ISOLATOR
ISOP – POWER ISOLATOR
ISOV – ISOLATION VALE

K – POTASSIUM

L – LOWERED
LOS – LOCAL STATION
LOTD – LEAK/OVERTEMP DETECTOR
LOTS – LEAK/OVERTEMP SENSOR
LR – LINE/LOAD REACTOR
LS – LIMIT SWITCH
LSLT – LIMIT SWITCH LIGHT
LT – PILOT LIGHT
LVT – LEVEL TRANSDUCER

M – MOTOR STARTER
MA – MAIN
MCC – MOTOR CONTROL CENTER
MCP – MOTOR CIRCUIT PROTECTOR
MIX – MIXER
MLSS – MIXED LIQUOR SUSPENDED SOLIDS
MOV – METAL OXIDE VARISTOR
MSS – MOTOR SOFT STARTER
MTR – MOTOR

ABBREVIATIONS CONTINUED

NFPA 70 – NATIONAL ELECTRICAL CODE (NEC)
NH4(+) – AMMONIUM
NO3(–) – NITRATE
NEUT – NEUTRAL
NSW – NETWORK SWITCH

OD – OXIDATION DITCH
OL – MOTOR OVERLOAD
ORP – OXIDATION REDUCTION POENTIAL
OVF – OVERFLOW

ϕ – ELECTRICAL POWER PHASE
PB – PUSH BUTTON
PBLT – PUSH BUTTON LIGHT
PC – PERSONAL COMPUTER
PEQ – POST EQ TANK
PH – POTENTIAL of HYDROGEN
PHL – PHASE LOSS RELAY
PLC – PROGRAMMABLE LOGIC CONTROLLER
PNL – CONTROL ENCLOSURE SUBPANEL
PO4 – PHOSPHATE
PS – PRESSURE SWITCH
PREQ – PRE EQ TANK
PT – PRESSURE TRANSDUCER
PV – PURGE VALVE
PWR – POWER
PWS – POWER SUPPLY

R – RAISED
RAS – RETURN ACTIVATED SLUDGE
RASP – RETURN ACTIVATED SLUDGE PUMP
RECP – RECEPTACLE
RM – REDUNDANCY MODULE
RS – RAW SEWAGE
RVSS – REDUCED VOLTAGE SOFT START

SBR – SEQUENCING BATCH REACTOR
SCADA – SUPERVISORY CONTROL AND DATA ACQUISITION
SCR – SILICON CONTROLLED RECTIFIER
SHLD – SHIELD
SHT – SLUDGE HOLDING TANK
SL – SECONDARY LOWERED
SOL – SOLENOID
SPWR – SERVICE POWER
SR – SECONDARY RAISED
SS – SELECTOR SWITCH
STP – SLUDGE TRANSFER PUMP
STRM – STORM

TB – TERMINAL BLOCK
TDS – TREATED & DISINFECTED SEWAGE
TR – TIMER
TS – TEMPERATURE SWITCH
TSS – TOTAL SUSPENDED SOLIDS
TT – TEMPERATURE TRANSDUCER

UPS – UNINTERRUPTIBLE POWER SUPPLY
UV – ULTRA VIOLET DISINFECTION SYSTEM
UVP – UV DISINFECTION PUMP

VFD – VARIABLE FREQUENCY DRIVE
VPN – VIRTUAL PRIVATE NETWORK

WAS – WASTE ACTIVATED SLUDGE
WLT – ENCLOSURE LIGHT
WS – WASTE SLUDGE
WSP – WASTE SLUDGE PUMP
WSV – WASTE SLUDGE VALVE

XF – CONTROL TRANSFORMER

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06/16/2025
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AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

ELECTRICAL SYMBOLS & ABBREVIATIONS

DRWN BY IKS 06/16/2025 | APPVD BY CB | SIZE D | REV. A | SCALE | QTY. | JOB. 25-0365A | DWG. 0365-SA01 | SHT. B OF J

STANDARD ELECTRICAL NOTES :

1) — — — — DASHED LINES INDICATE A FIELD DEVICE OR FIELD WIRING.

2) ———— SOLID LINES INDICATE WIRING INSIDE CONTROL PANEL.

3)

REVISION CLOUDS WITH REV. DESIGNATOR INDICATE NEW / CHANGES.

4) ELECTRICAL CONTRACTOR IS TO PROVIDE LOCAL DISCONNECTS AS REQUIRED BY LOCAL AND FEDERAL LAWS.

5) INCLUDE 10% SPARE WIRE PER CONDUIT RUN 2 WIRES MIN.

6) INDIVIDUAL CONDUITS ARE TO BE RUN FOR 600V, 480V, 208V, 120V AND ANALOG WIRING.

7) SINGLE LINE DIAGRAM DEPICTS ONLY DEVICES CONTROLLED BY SANITAIRE CONTROL PANEL.

8) VFD POWER CABLE FROM TERMINALS IN THE ENCLOSURE TO MOTORS MUST BE PROPERLY RATED VFD CABLE. THHN WIRE IS NOT APPROVED.

9) CONTACT RATING FOR FINDER RELAYS
46.52 SERIES, 2- POLE = 8A @ 250VAC & 6A @ 30VDC
55.33 SERIES, 3- POLE = 10A @ 250VAC & 10A @ 24VDC
55.34 SERIES, 4- POLE = 7A @ 250VAC & 7A @ 24VDC

ELECTRICAL CONTRACTOR WIRING COLOR CODE

600/480/380/220/208 VOLT 3Ø	BLACK
480 VOLT 1Ø	BLACK
220/208/120 VOLT 3Ø	BLACK
120 VOLT (EXT-DERIVED)	ORANGE
AC CONTROL SIGNAL	RED
DC SIGNAL/CONTROL	BLUE
DC COMMON	BLUE/WHITE
NEUTRAL	WHITE
GROUND	BARE OR GREEN/YELLOW
SHIELDED	BARE
SHIELDED CABLE (+)	BLACK
SHIELDED CABLE (-)	WHITE

LABEL ALL SIGNAL/CONTROL WIRES WITH WIRE NUMBERS AS SHOWN ON APPROVED SCHEMATICS.

PROJECT SPECIFIC ELECTRICAL NOTES :

1) ALL ENCLOSURES WITH TWO OR MORE POWER OR CONTROL CIRCUIT COMPONENTS WILL BE UL LISTED AND LABELED.

REVISION NOTES

REV. A :- PER SUBMITTAL COMMENTS FROM CUSTOMER:

1) PROVIDE 22kAIC RATING ON THE CABINET

2) REMOVE ALARM HORN

3) ADD INTERLOCK FROM LOCAL DISCONNECT SWITCHES FOR ALL 3-PHASE MOTORS

4) REVISE SINGLE LINE AS MARKED

5) PROVIDE CELLULAR EWON. REMOVE WAN SIDE CABLE.
REPLACE EC133 WITH E7C133K_01MA ATT OR T-MOBILE COMPATABLE.

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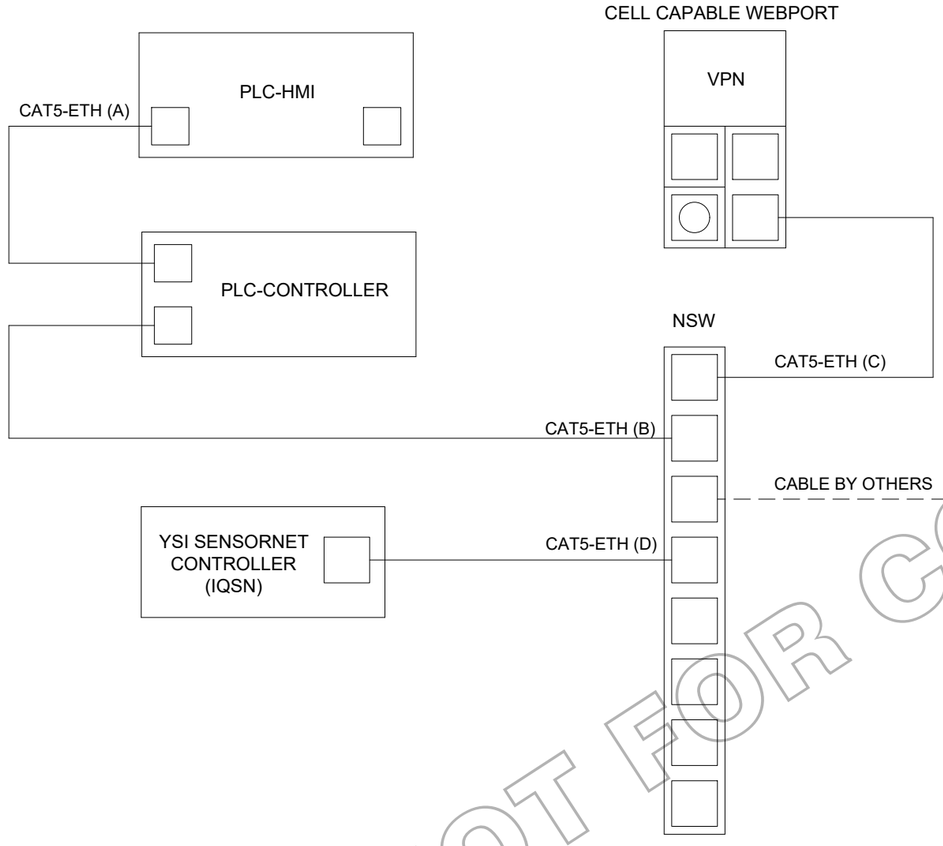
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

ELECTRICAL NOTES

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. C OF J
APPVD BY CB | REV. A | QTY. | DWG. 0365-NO01



PLANT NETWORK

IP ADDRESS SCHEDULE				
ITEM	ADDRESS			
VPN				
PLC-CONTROLLER				
YSI SENSORNET CONT. (IQSN)				
HMI				
SPARE				
SUBNET MASK	255	255	255	0

NOTE:
IP ADDRESSES MUST BE ASSIGNED BY THE INTEGRATOR / OWNER PRIOR TO FACTORY ACCEPTANCE TESTING.

TO SCADA NETWORK

NOT FOR CONSTRUCTION

CAT 5 - CONNECTOR AND CABLE

CAT 5 - CONNECTOR AND CABLE (BY OTHERS)

CAT 5 - "WAN" CONNECTOR AND CABLE (BY OTHERS)

FIBER - CONNECTOR AND CABLE (BY OTHERS)

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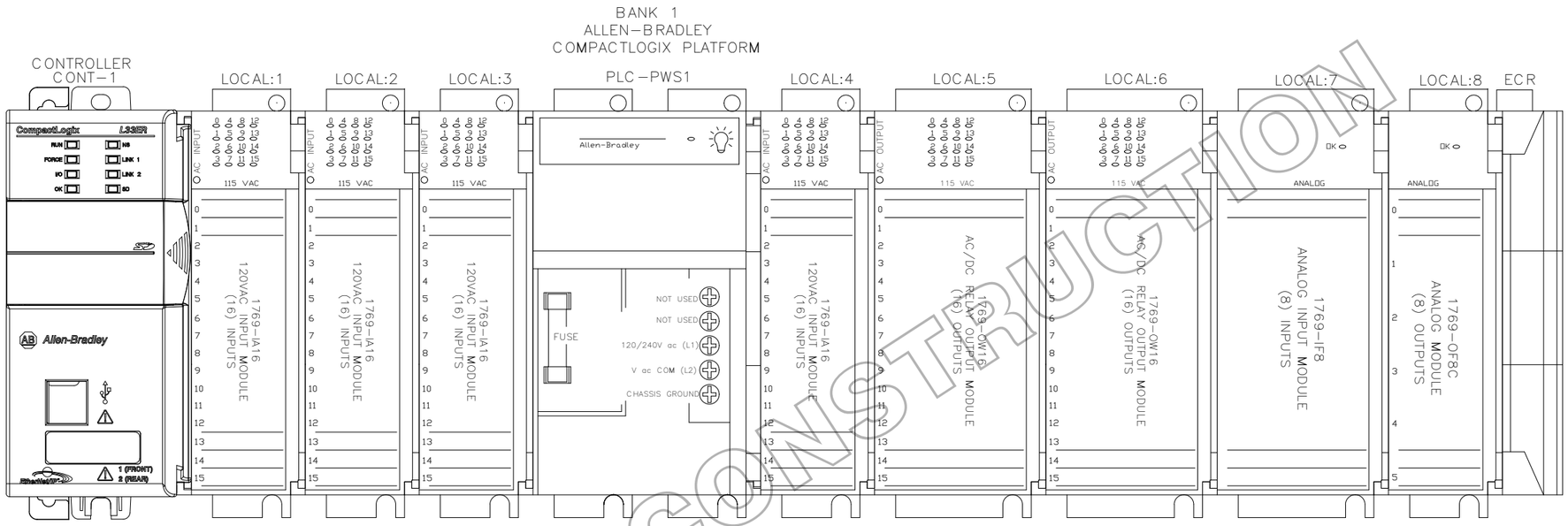
06/16/2025
XYLEM

AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

NETWORK LAYOUT

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. D OF J
APPVD BY CB | REV. A | QTY. | DWG. 0365-NT01



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AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
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PLC
BACKPLANE CONFIGURATION

DRWN BY IKS 06/16/2025 | APPVD BY CB | SIZE D | REV. A | SCALE | QTY. | JOB. 25-0365A | DWG. 0365-PL01 | SHT. E OF J

Installation:	Location:	PLC Tag: LOCAL:1	1769-IA16 16PT INPUT			
ADDR	DESCRIPTION	DESCRIPTION2	DESCRIPTION3	TERM	LINE	WIRE
				COM	0667	N
I:0	SBR BLOWER 1	AUTO SELECT		IN 0	0301	0301
I:1	SBR BLOWER 1	RUNNING		IN 1	0340	0337
I:2	SBR BLOWER 1	VFD FAULT		IN 2	0342	0342
I:3	SBR BLOWER 2	AUTO SELECT		IN 3	0401	0401
I:4	SBR BLOWER 2	RUNNING		IN 4	0440	0437
I:5	SBR BLOWER 2	VFD FAULT		IN 5	0442	0442
I:6	SBR BLOWER 3	AUTO SELECT		IN 6	0501	0501
I:7	SBR BLOWER 3	RUNNING		IN 7	0540	0537
I:8	SBR BLOWER 3	VFD FAULT		IN 8	0542	0542
I:9	BASIN 1	WASTE SLUDGE PUMP	REMOTE SELECT	IN 9	0941	0941
I:10	BASIN 2	WASTE SLUDGE PUMP	REMOTE SELECT	IN 10	1441	1441
I:11	BASIN 1	MIXER	REMOTE SELECT	IN 11	1141	1141
I:12	BASIN 2	MIXER	REMOTE SELECT	IN 12	1641	1641
I:13	SPARE			IN 13	0601	0601
I:14	SPARE			IN 14	0604	0604
I:15	CONTROL POWER OK			IN 15	0666	3L1

Installation:	Location:	PLC Tag: LOCAL:2	1769-IA16 16PT INPUT			
ADDR	DESCRIPTION	DESCRIPTION2	DESCRIPTION3	TERM	LINE	WIRE
				COM	0608	N
I:0	BASIN 1	STORM FLOAT	ACTIVATED	IN 0	0785	0785A
I:1	BASIN 1	DECANTER	AUTO SELECT	IN 1	0703	0703
I:2	BASIN 1	DECANTER	RAISE LIMIT	IN 2	0751	0751
I:3	BASIN 1	DECANTER	SECONDARY RAISE LIMIT	IN 3	0754	0754
I:4	BASIN 1	DECANTER	LOWER LIMIT	IN 4	0757	0757
I:5	BASIN 1	DECANTER	SECONDARY LOWER LIMIT	IN 5	0760	0760
I:6	BASIN 1	DECANTER	VFD RUNNING	IN 6	0833	0833A
I:7	BASIN 1	DECANTER	VFD FAULT	IN 7	0835	0835
I:8	BASIN 1	WASTE SLUDGE PUMP	AUTO SELECT	IN 8	0902	0902A
I:9	BASIN 1	WASTE SLUDGE PUMP	OVERTEMP DETECTED	IN 9	0911	0909
I:10	BASIN 1	WASTE SLUDGE PUMP	LEAKAGE DETECTED	IN 10	0915	0915
I:11	BASIN 1	WASTE SLUDGE PUMP	RUNNING	IN 11	0937	0937A
I:12	BASIN 1	AERATION VALVE	AUTO SELECT	IN 12	1002	1002A
I:13	BASIN 1	AERATION VALVE	OPENED	IN 13	1033	1033A
I:14	BASIN 1	AERATION VALVE	CLOSED	IN 14	1035	1035
I:15	SPARE			IN 15	0607	0607

Installation:	Location:	PLC Tag: LOCAL:3	1769-IA16 16PT INPUT			
ADDR	DESCRIPTION	DESCRIPTION2	DESCRIPTION3	TERM	LINE	WIRE
				COM	0613	N
I:0	BASIN 2	STORM FLOAT	ACTIVATED	IN 0	1285	1285A
I:1	BASIN 2	DECANTER	AUTO SELECT	IN 1	1203	1203
I:2	BASIN 2	DECANTER	RAISE LIMIT	IN 2	1251	1251
I:3	BASIN 2	DECANTER	SECONDARY RAISE LIMIT	IN 3	1254	1254
I:4	BASIN 2	DECANTER	LOWER LIMIT	IN 4	1257	1257
I:5	BASIN 2	DECANTER	SECONDARY LOWER LIMIT	IN 5	1260	1260
I:6	BASIN 2	DECANTER	VFD RUNNING	IN 6	1333	1333A
I:7	BASIN 2	DECANTER	VFD FAULT	IN 7	1335	1335
I:8	BASIN 2	WASTE SLUDGE PUMP	AUTO SELECT	IN 8	1402	1402A
I:9	BASIN 2	WASTE SLUDGE PUMP	OVERTEMP DETECTED	IN 9	1411	1409
I:10	BASIN 2	WASTE SLUDGE PUMP	LEAKAGE DETECTED	IN 10	1415	1415
I:11	BASIN 2	WASTE SLUDGE PUMP	RUNNING	IN 11	1437	1437A
I:12	BASIN 2	AERATION VALVE	AUTO SELECT	IN 12	1502	1502A
I:13	BASIN 2	AERATION VALVE	OPENED	IN 13	1533	1533A
I:14	BASIN 2	AERATION VALVE	CLOSED	IN 14	1535	1535
I:15	SPARE			IN 15	0612	0612

Installation:	Location:	PLC Tag: LOCAL:4	1769-IA16 16PT INPUT			
ADDR	DESCRIPTION	DESCRIPTION2	DESCRIPTION3	TERM	LINE	WIRE
				COM	0632	N
I:0	BASIN 1	MIXER	AUTO SELECT	IN 0	1102	1102A
I:1	BASIN 1	MIXER	OVERTEMP DETECTED	IN 1	1111	1109
I:2	BASIN 1	MIXER	LEAKAGE DETECTED	IN 2	1115	1115
I:3	BASIN 1	MIXER	RUNNING	IN 3	1137	1137A
I:4	BASIN 2	MIXER	AUTO SELECT	IN 4	1602	1602A
I:5	BASIN 2	MIXER	OVERTEMP DETECTED	IN 5	1611	1609
I:6	BASIN 2	MIXER	LEAKAGE DETECTED	IN 6	1615	1615
I:7	BASIN 2	MIXER	RUNNING	IN 7	1637	1637A
I:8	UPS GENERAL ALARMS			IN 8	0675	0675
I:9	UPS BATTERY FAULT			IN 9	0678	0678
I:10	SPARE			IN 10	0616	0616
I:11	SPARE			IN 11	0619	0619
I:12	SPARE			IN 12	0622	0622
I:13	SPARE			IN 13	0625	0625
I:14	SPARE			IN 14	0628	0628
I:15	SPARE			IN 15	0631	0631

Installation:	Location:	PLC Tag: LOCAL:5	1769-OW16 16PT OUTPUT			
ADDR	DESCRIPTION	DESCRIPTION2	DESCRIPTION3	TERM	LINE	WIRE
				VAC/VDC2	0617	3L1
				VAC/VDC1	0306	3L1
O:0	SBR BLOWER 1	CALL TO RUN		OUT 0	0307	0304
O:1	SBR BLOWER 2	CALL TO RUN		OUT 1	0407	0404
O:2	SBR BLOWER 3	CALL TO RUN		OUT 2	0507	0504
O:3	SPARE			OUT 3	0602	0602
O:4	SPARE			OUT 4	0605	0605
O:5	SPARE			OUT 5	0608	0608
O:6	SPARE			OUT 6	0611	0611
O:7	SPARE			OUT 7	0614	0614
O:8	SPARE			OUT 8	0618	0618
O:9	SPARE			OUT 9	0621	0621
O:10	SPARE			OUT 10	0624	0624
O:11	SPARE			OUT 11	0627	0627
O:12	SPARE			OUT 12	0630	0630
O:13	SPARE			OUT 13	0633	0633
O:14	SPARE			OUT 14	0652	0652
O:15	PLC ALARM OUTPUT	ENERGIZED ON FAULT		OUT 15	0658	0658

Installation:	Location:	PLC Tag: LOCAL:6	1769-OW16 16PT OUTPUT			
ADDR	DESCRIPTION	DESCRIPTION2	DESCRIPTION3	TERM	LINE	WIRE
				VAC/VDC2	1206	3L1
				VAC/VDC1	0706	3L1
O:0	BASIN 1	DECANTER	CALL TO RAISE	OUT 0	0708	0708
O:1	BASIN 1	DECANTER	CALL TO LOWER	OUT 1	0711	0711
O:2	BASIN 1	WASTE SLUDGE PUMP	CALL TO RUN	OUT 2	0907	0907
O:3	BASIN 1	AERATION VALVE	CALL TO OPEN	OUT 3	1005	1004
O:4	BASIN 1	AERATION VALVE	CALL TO CLOSE	OUT 4	1008	1007
O:5	BASIN 1	PURGE VALVE	CALL TO OPEN	OUT 5	1052	1052
O:6	BASIN 1	MIXER	CALL TO RUN	OUT 6	1107	1107
O:7	SPARE			OUT 7	0636	0636
O:8	BASIN 2	DECANTER	CALL TO RAISE	OUT 8	1208	1208
O:9	BASIN 2	DECANTER	CALL TO LOWER	OUT 9	1211	1211
O:10	BASIN 2	WASTE SLUDGE PUMP	CALL TO RUN	OUT 10	1407	1407
O:11	BASIN 2	AERATION VALVE	CALL TO OPEN	OUT 11	1505	1504
O:12	BASIN 2	AERATION VALVE	CALL TO CLOSE	OUT 12	1508	1507
O:13	BASIN 2	PURGE VALVE	CALL TO OPEN	OUT 13	1552	1552
O:14	BASIN 2	MIXER	CALL TO RUN	OUT 14	1607	1607
O:15	SPARE			OUT 15	0639	0639

Installation:	Location:	PLC Tag: LOCAL:7	1769-IF8 8CH ANALOG INPUT			
ADDR	DESCA	DESCB	DESCC	TERM	LREF	WIRENO
I.CH0	SBR BLOWER 1	SPEED FEEDBACK		I in 0+	0329	0329
				V/I in 0-	0331	0331
I.CH1	SBR BLOWER 2	SPEED FEEDBACK		I in 1+	0429	0429
				V/I in 1-	0431	0431
I.CH2	SBR BLOWER 3	SPEED FEEDBACK		I in 2+	0529	0529
				V/I in 2-	0531	0531
I.CH3	SPARE			I in 3+	1853	1853
				V/I in 3-	1855	1855
I.CH4	SPARE			I in 4+	1860	1860
				V/I in 4-	1862	1862
I.CH5	BASIN 1	LEVEL		I in 5+	1709	1709A
				V/I in 5-	1711	1711
I.CH6	BASIN 2	LEVEL		I in 6+	1730	1730A
				V/I in 6-	1732	1732
I.CH7	SPARE			I in 7+	1867	1867
				V/I in 7-	1869	1869

Installation:	Location:	PLC Tag: LOCAL:8	1769-OF8C 8CH ANALOG OUTPUT			
ADDR	DESCA	DESCB	DESCC	TERM	LREF	WIRENO
O.CH0	SBR BLOWER 1	VFD SPEED COMMAND		I OUT 0+	0333	0333
				ANLG COM	0335	0335
O.CH1	SBR BLOWER 2	VFD SPEED COMMAND		I OUT 1+	0433	0433
				ANLG COM	0435	0435
O.CH2	SBR BLOWER 3	VFD SPEED COMMAND		I OUT 2+	0533	0533
				ANLG COM	0535	0535
O.CH3	SPARE			I OUT 3+	1852	1852
				ANLG COM	1854	1854
O.CH4	SPARE			I OUT 4+	1859	1859
				ANLG COM	1861	1861
O.CH5	BASIN 1	DECANTER	SPEED COMMAND	I OUT 5+	0827	0827
				ANLG COM	0829	0829
O.CH6	BASIN 2	DECANTER	SPEED COMMAND	I OUT 6+	1327	1327
				ANLG COM	1329	1329
O.CH7	SPARE			I OUT 7+	1866	1866
				ANLG COM	1868	1868

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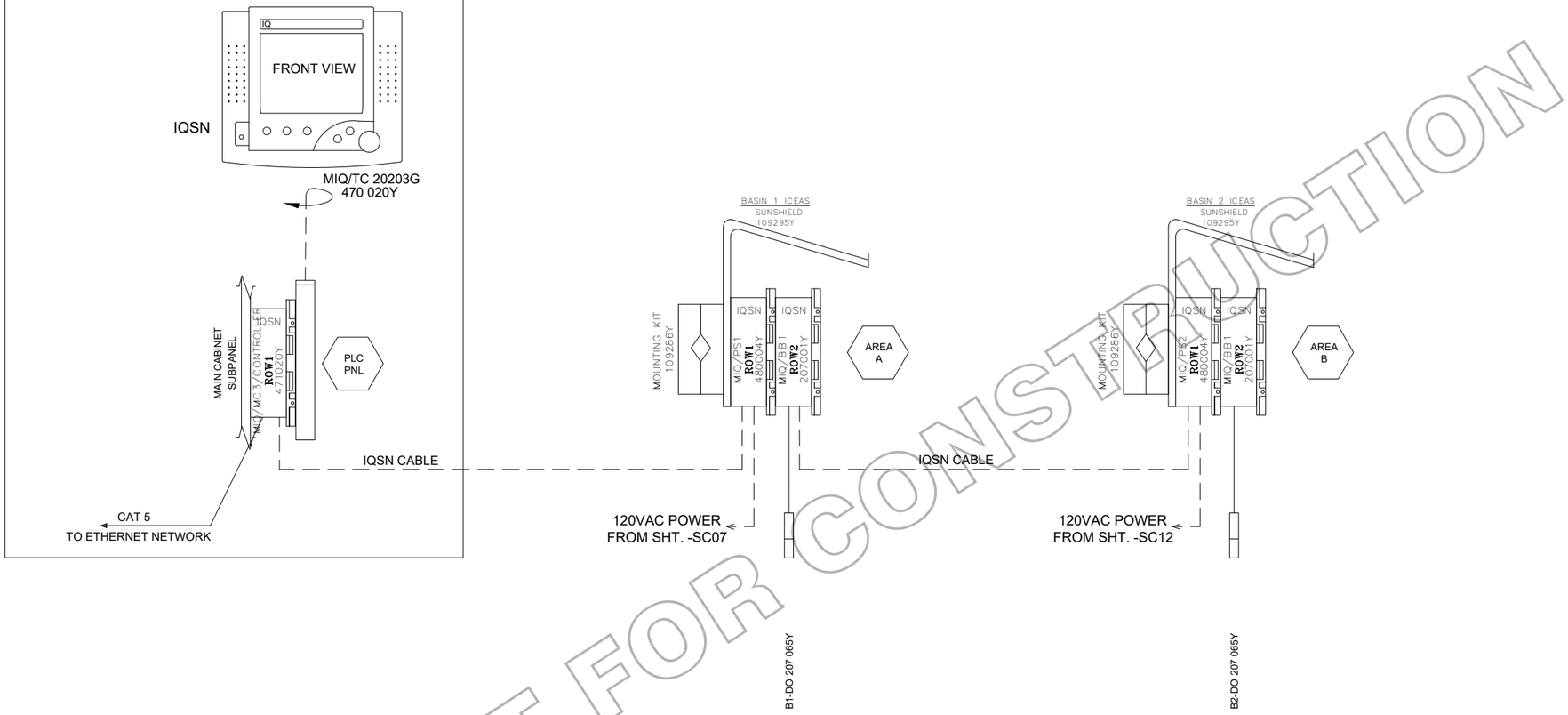
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

PLC I/O LAYOUT
LOCAL:1 - LOCAL:8

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

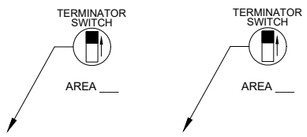
DRWN BY IKS 06/16/2025 | APPVD BY CB | SIZE D | REV. A | SCALE | QTY. | JOB. 25-0365A | DWG. 0365-PL02 | SHT. F OF J

NOTES:
1) FOR STACK MOUNTING BOXES REMOVE BACK LABEL AND INSTALL CONTACT CARRIER AND SCREWS
2) XYLEM WILL PROVIDE 250 M OF IQ SENSORNET (IQSN) CABLE 480 046YM-XX, (XX=LENGTH IN METERS), ADDITIONAL CABLE MUST BE PURCHASED BY THE CONTRACTOR.
3) ONLY ONE(1) WIRE ALLOWED IN EACH IQSN TERMINAL
4) TERMINATING SWITCHES SET TO "ON" BY XYLEM STARTUP PERSONNEL.
5) DO NOT ASSEMBLE ANY IQ SENSORS OR OPEN ANY SOLUTION BOTTLES.KEEP SOLUTIONS FROM FREEZING.
6) CONTRACTOR TO INSTALL SENSOR CABLES ONLY, DO NOT INSTALL IQ SENSORS UNITIL A XYLEM REPRESENTATIVE IS ON SITE. EXCEPTIONS ARE 4-20mA DEVICES CONNECTED TO MIQ/IC2.
7) XT TERMINAL 20203G IS A PORTABLE SCREEN DEVICE AND ABLE TO BE ATTACHED TO ALL MIQ/* MODULES. STANDARD STORAGE INSIDE THE MAIN CABINET, AREA PLC PNL.
8) CONTRACTOR TO RECORD ALL YSI CABLE RUNS AND LENGTH OF RUNS.



FOR DAISY CHAIN CONFIGURATIONS
COMMUNICATION TERMINATING SWITCH ARE FIELD SET AT THE ELECTRICAL POINT OF THE NETWORK FURTHEST FROM THE MC3 CONTROLLER. AND AT THE MC3 CONTROLLER
THIS IS BASED ON NETWORK CABLE LENGTHS.

FOR STAR CONFIGURATIONS
COMMUNICATION TERMINATING SWITCHES ARE FIELD SET AT THE TWO ELECTRICAL POINTS OF THE NETWORK FURTHEST FROM THE MC3 CONTROLLER.
THIS IS BASED ON NETWORK CABLE LENGTHS.



AREA X — SEE DWG -SN02 FOR DETAILS

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WASTE WATER TREATMENT PLANT

YSI NETWORK LAYOUT

REV	DATE	REVISION DESCRIPTION	BY
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ROW 1

ROW 2

ROW 3

PLC PNL

IQSN

MIQ/MC3

X6 RED | X5 SHIELD | X4 GREEN | ON TERMINATOR | X3 RED | X2 SHIELD | X1 GREEN

USB

ETHERNET

SENSORNET 2 | OFF | SENSORNET 1

NOTE:
USE "SCNIQ" CABLE ONLY
(480 046Y)

FRONT CONTACTS

X3 (RED) X2 (SHIELD) X1 (GRN)

X3 YSITB X2 YSITB X1 YSITB

TO AREA A ROW 1

AREA A

SEE SHT. -SC09

FROM LINE 0748 FROM LINE 0749

N 0749

IQSN-PS1 MIQ/120VAC POWER SUPPLY

X11 N | X10 120V | 120 V AC | X9 RED | X8 SHIELD | X7 GREEN | X6 RED | X5 SHIELD | X4 GREEN | ON TERMINATOR | X3 RED | X2 SHIELD | X1 GREEN

POWER INPUT | SENSORNET 3 | SENSORNET 2 | OFF | SENSORNET 1

FROM PLC PNL ROW 1

FRONT CONTACTS

BACK CONTACT CARRIER INSTALLED

MIQ/BB1

X12 RED | X11 SHIELD | X10 GREEN | HAZLOC | X6 RED | X5 SHIELD | X4 GREEN | ON TERMINATOR | X3 RED | X2 SHIELD | X1 GREEN | SENSORNET 2 | OFF | SENSORNET 1

B1-DO PROBE

TO AREA B ROW 1

FRONT CONTACTS

AREA B

SEE SHT. -SC14

FROM LINE 1248 FROM LINE 1249

N 1249

IQSN-PS2 MIQ/120VAC POWER SUPPLY

X11 N | X10 120V | 120 V AC | X9 RED | X8 SHIELD | X7 GREEN | X6 RED | X5 SHIELD | X4 GREEN | ON TERMINATOR | X3 RED | X2 SHIELD | X1 GREEN

POWER INPUT | SENSORNET 3 | SENSORNET 2 | OFF | SENSORNET 1

FROM AREA A ROW 2

FRONT CONTACTS

BACK CONTACT CARRIER INSTALLED

MIQ/BB1

X12 RED | X11 SHIELD | X10 GREEN | HAZLOC | X6 RED | X5 SHIELD | X4 GREEN | ON TERMINATOR | X3 RED | X2 SHIELD | X1 GREEN | SENSORNET 2 | OFF | SENSORNET 1

B2-DO PROBE

FRONT CONTACTS

BASIN 1

BASIN 2

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YSI NETWORK DETAIL

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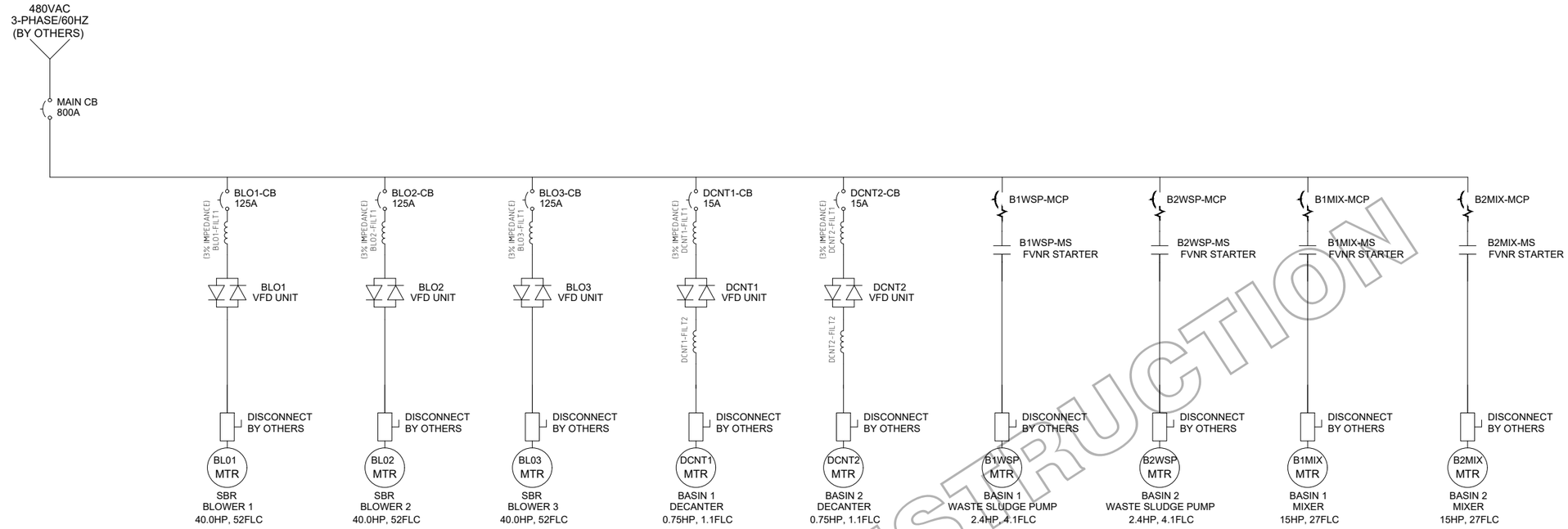
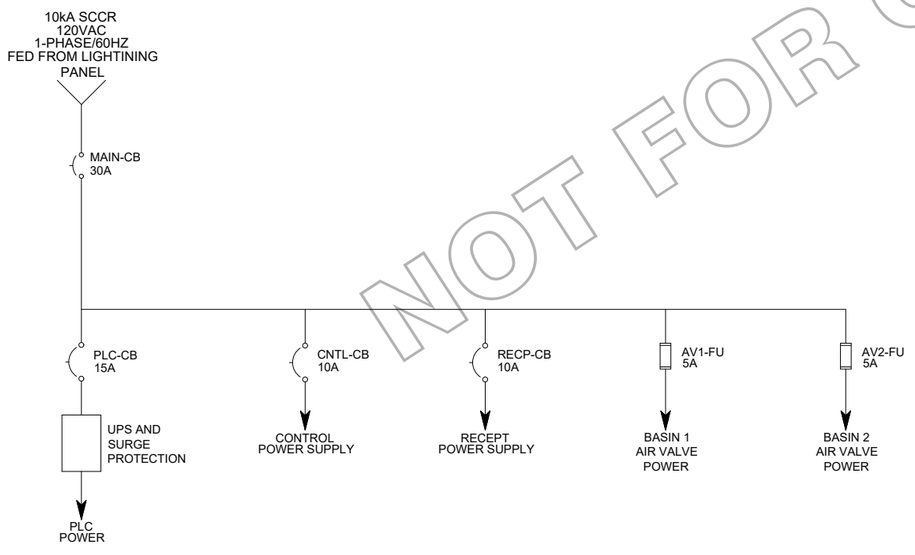
APPVD BY CB | REV. A | QTY. | DWG. 0365-SN02



MCC BY SANITAIRE

SBR CONTROL CABINET



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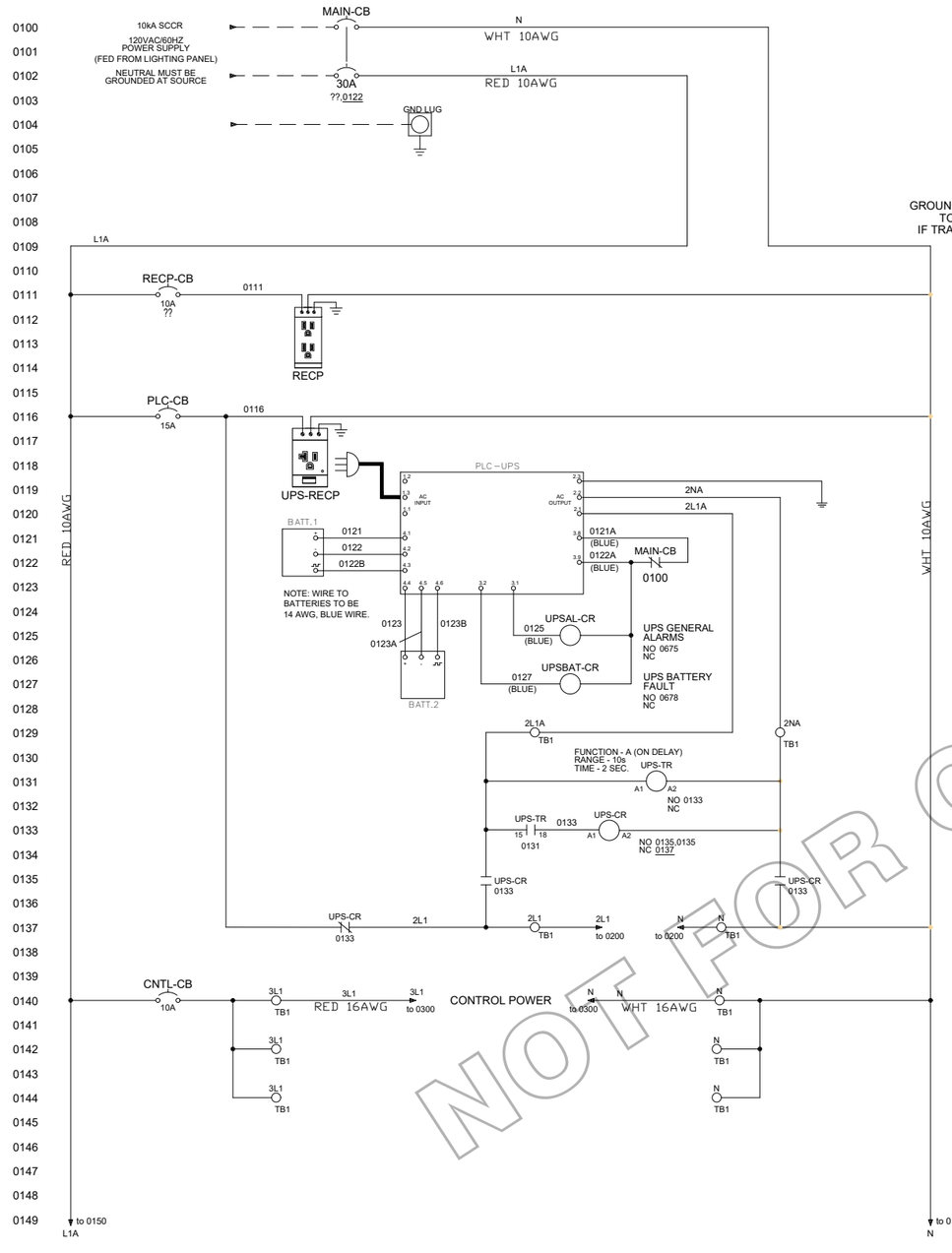
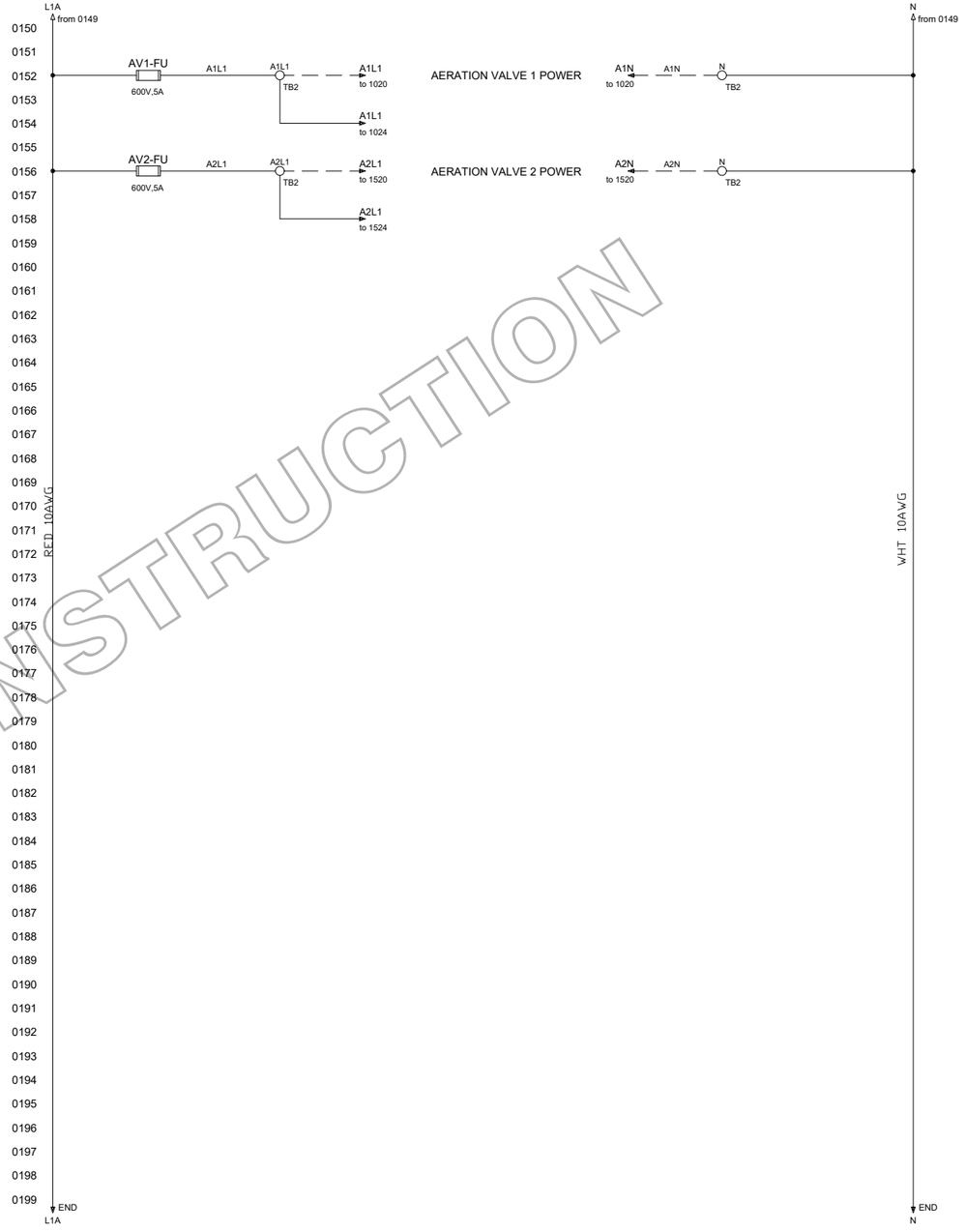
SINGLE LINE DIAGRAM

DRWN BY IKS 06/16/2025 | APPVD BY CB | SIZE D | REV. A | SCALE | QTY. | JOB. 25-0365A | DWG. 0365-SL01 | SHT. J OF J





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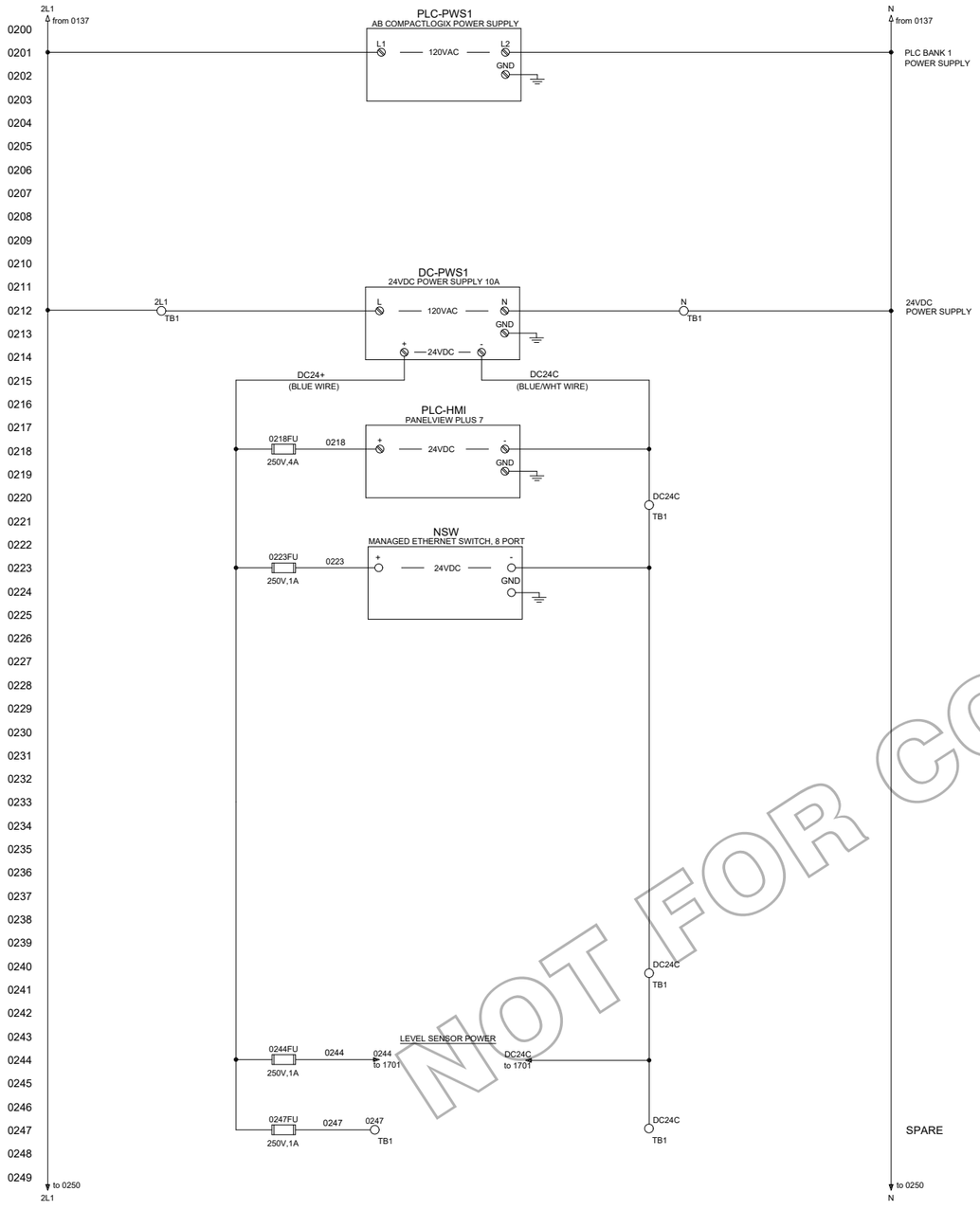
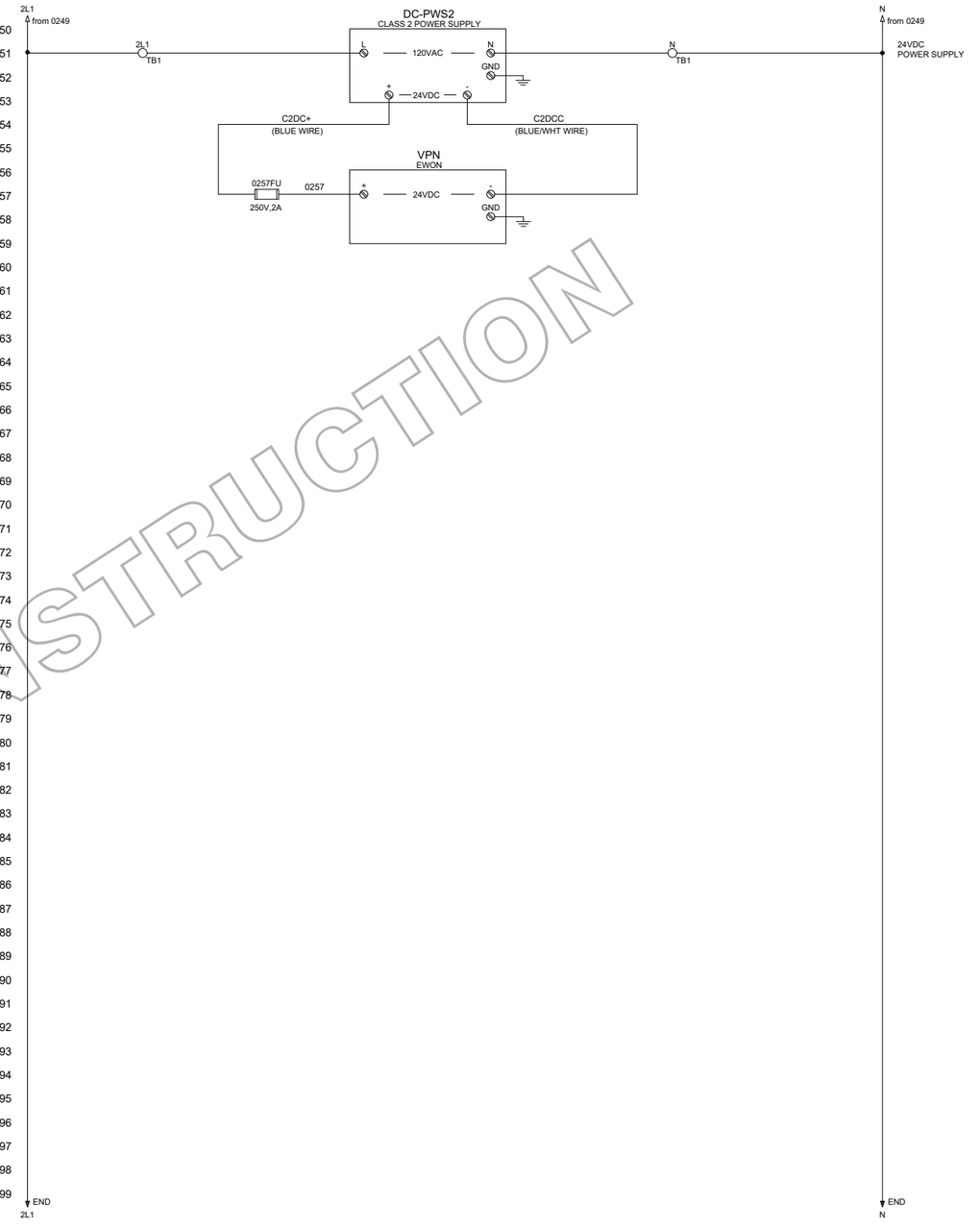
CONTROL POWER
120VAC

DRWN BY IKS 06/16/2025 | APPVD BY CB | SIZE D | REV. A | SCALE | QTY. | JOB. 25-0365A | DWG. 0365-SC01 | SHT. 1 OF 22

PLC POWER





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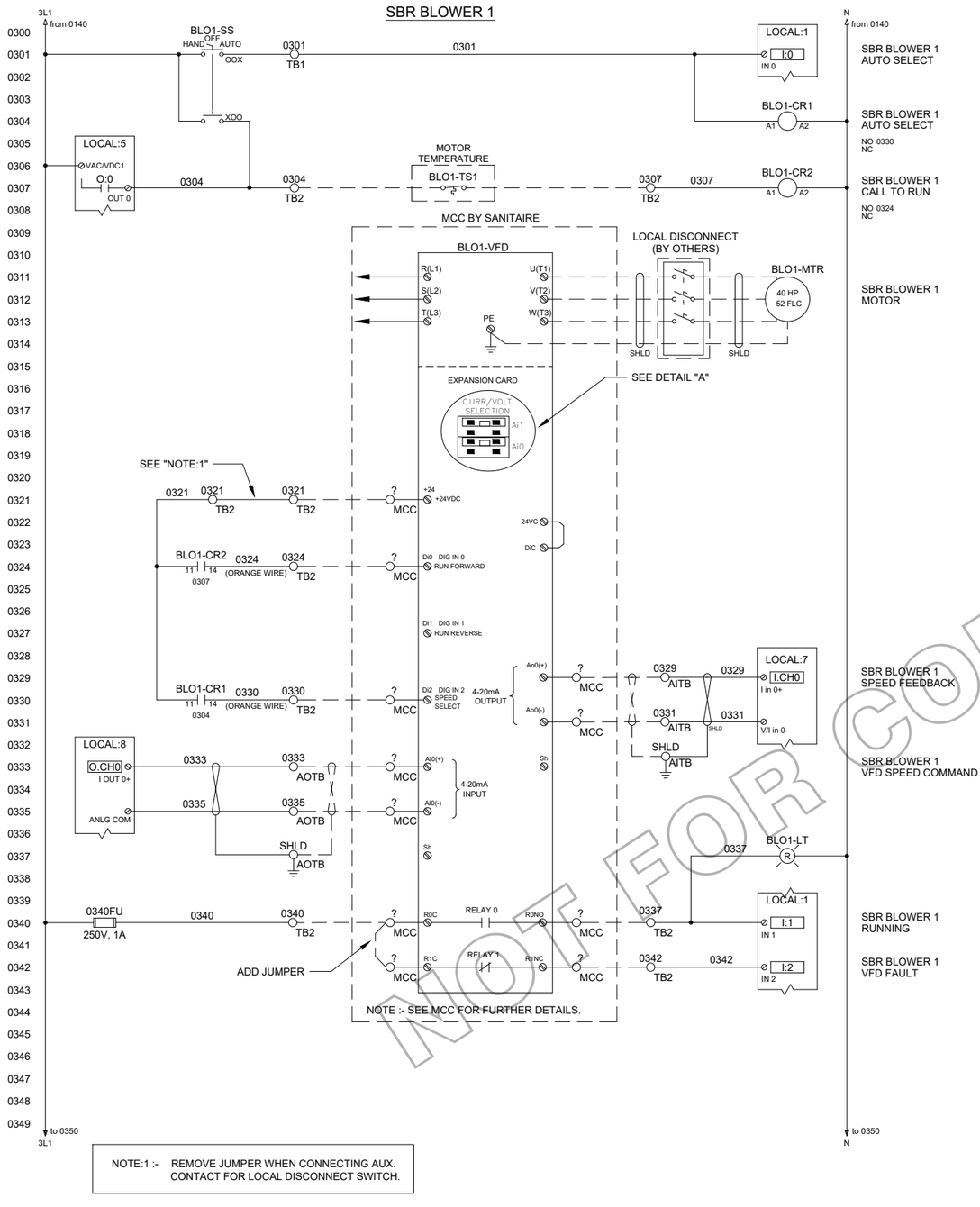
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

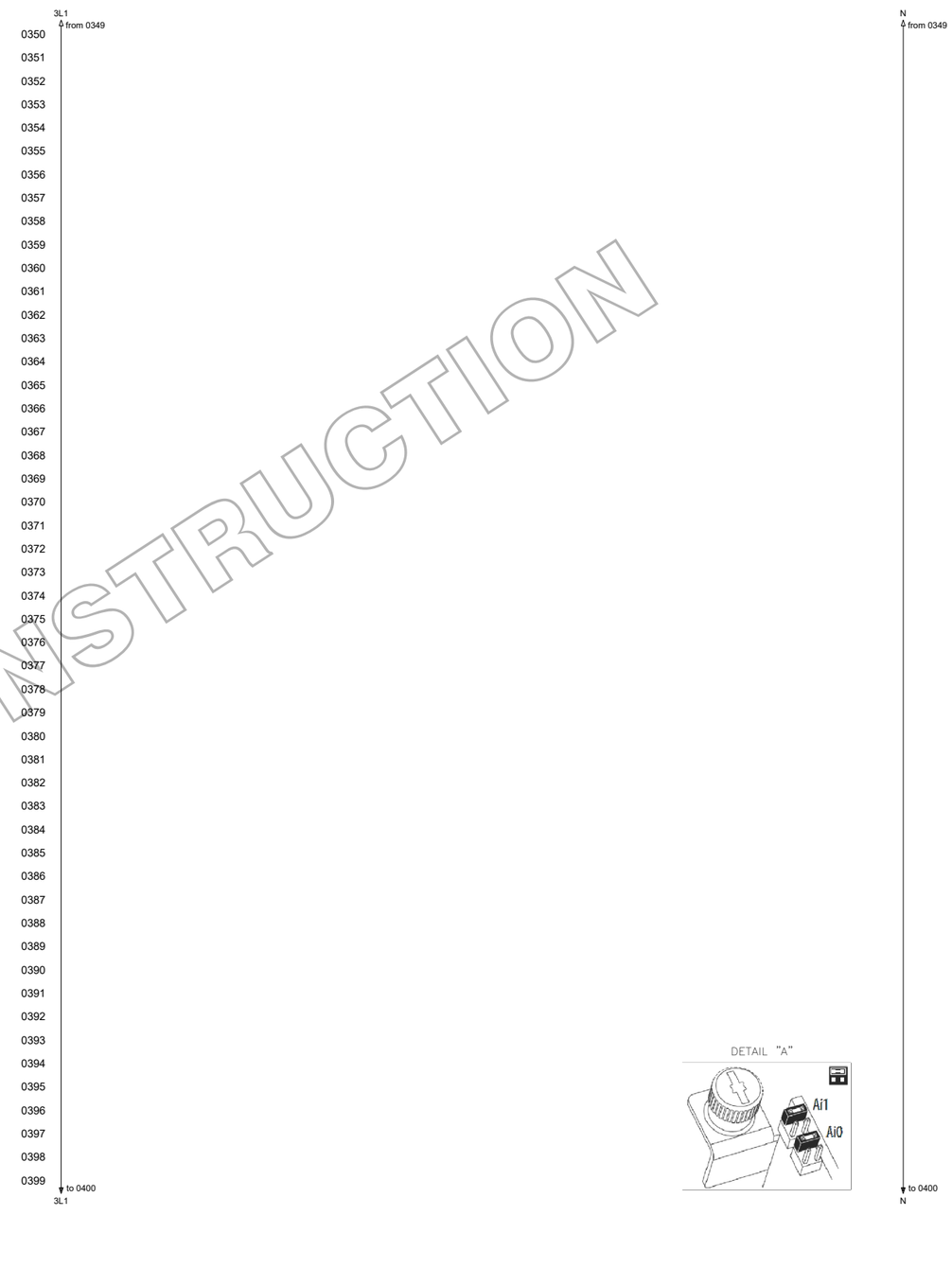
REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

CONTROL POWER
PLC AND 24V POWER SUPPLY

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 2 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-SC02

SBR BLOWER 1





NOTE:1 :- REMOVE JUMPER WHEN CONNECTING AUX. CONTACT FOR LOCAL DISCONNECT SWITCH.

DETAIL "A"

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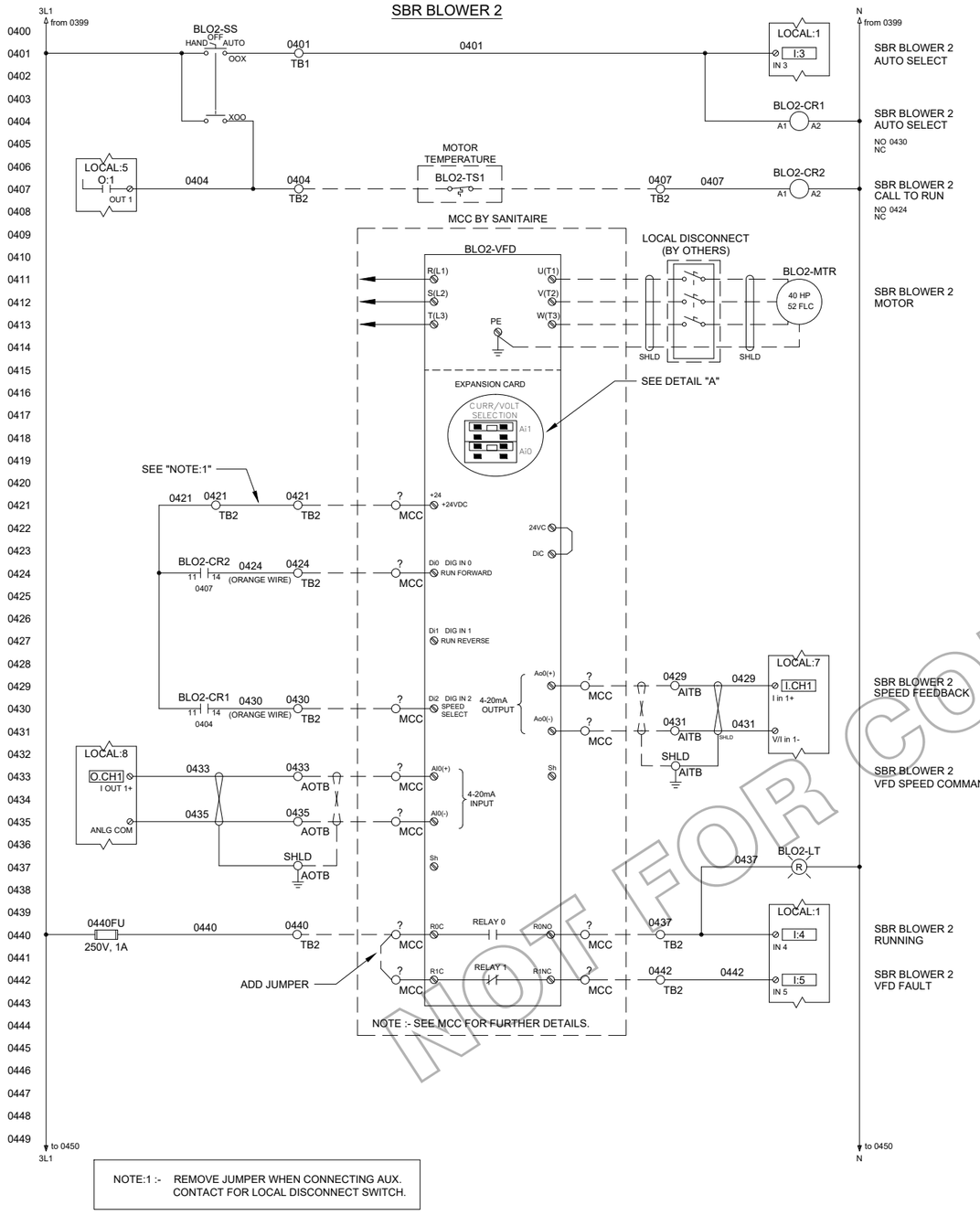
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

SBR BLOWER 1
VFD AND CONTROLS

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 3 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-SC03

SBR BLOWER 2



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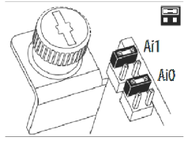

NOTE:1 :- REMOVE JUMPER WHEN CONNECTING AUX. CONTACT FOR LOCAL DISCONNECT SWITCH.

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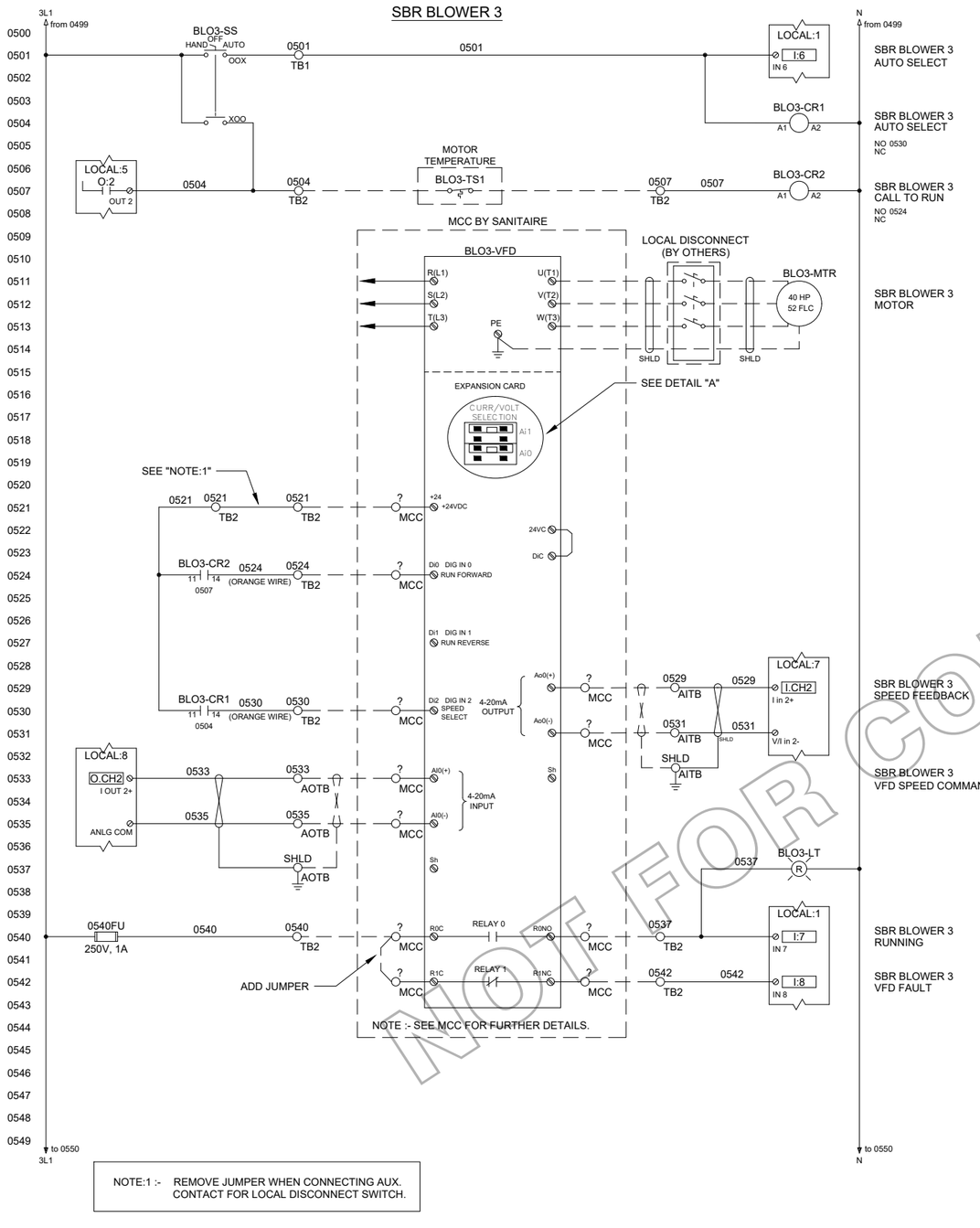
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

SBR BLOWER 2
VFD AND CONTROLS

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 4 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-SC04

SBR BLOWER 3



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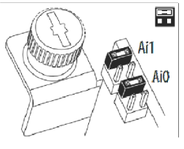

NOTE:1 :- REMOVE JUMPER WHEN CONNECTING AUX. CONTACT FOR LOCAL DISCONNECT SWITCH.

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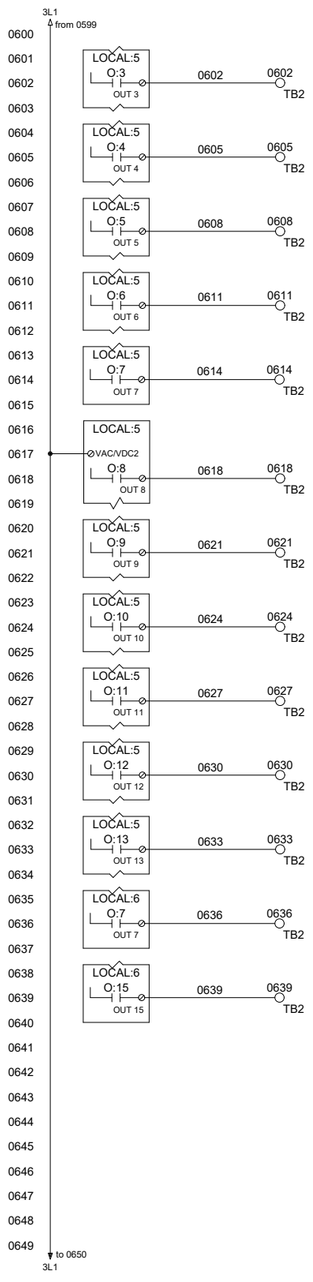
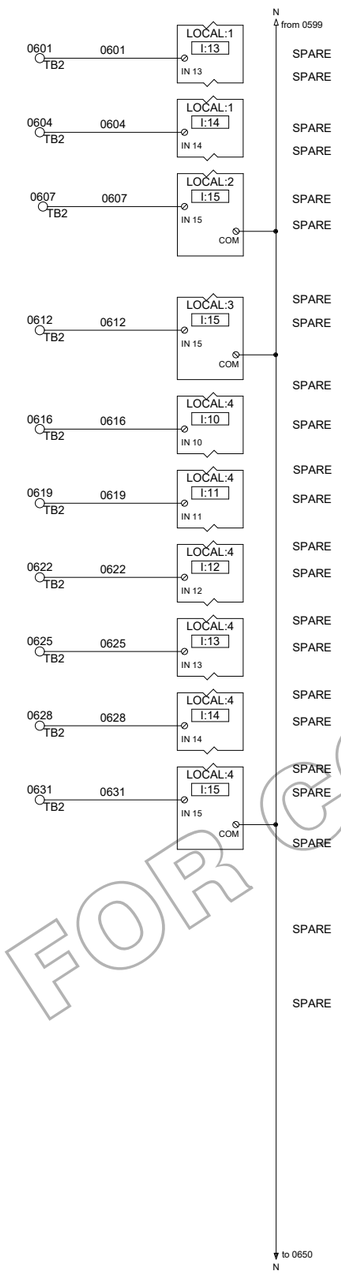
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

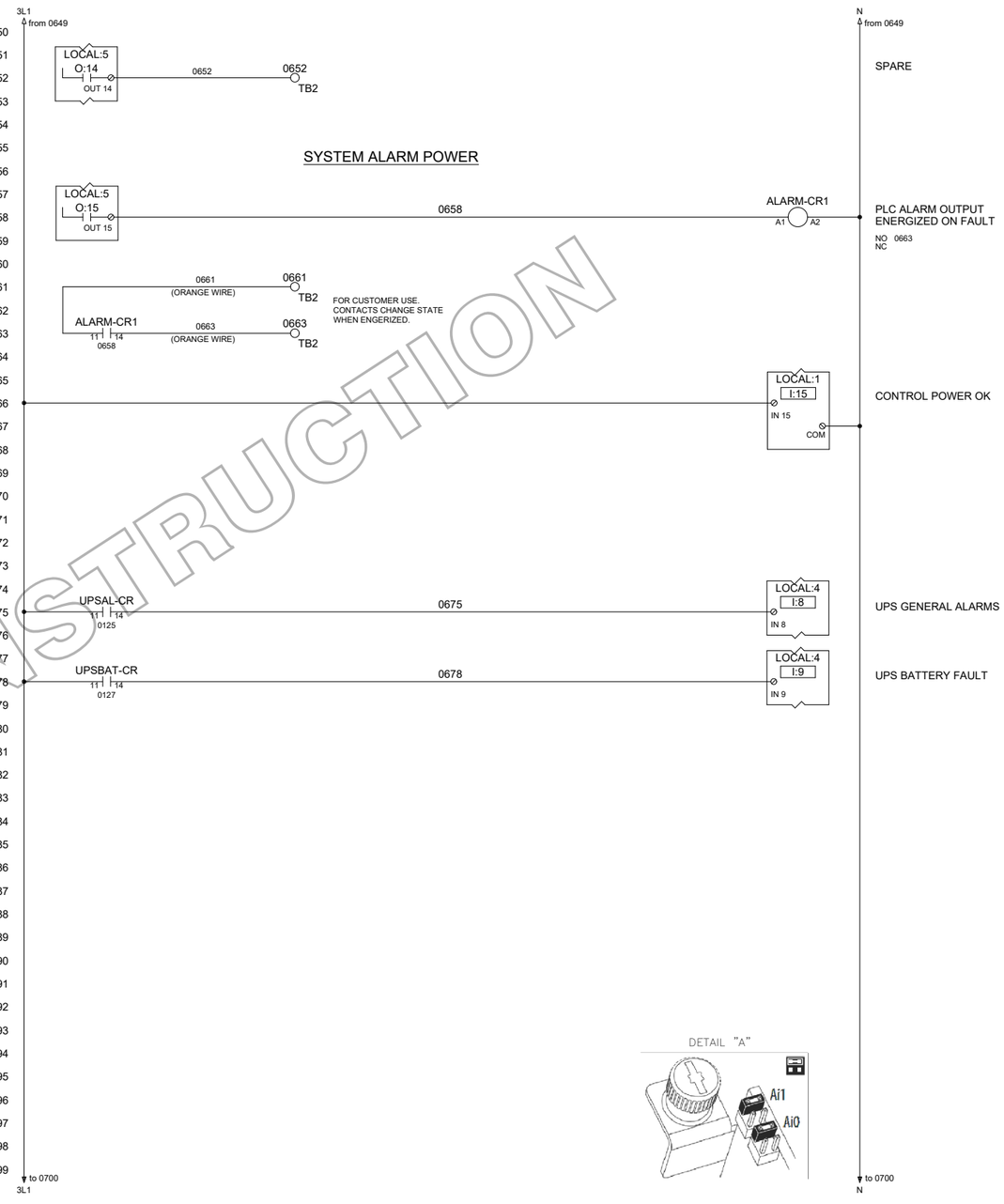
REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

SBR BLOWER 3
VFD AND CONTROLS

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 5 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-SC05







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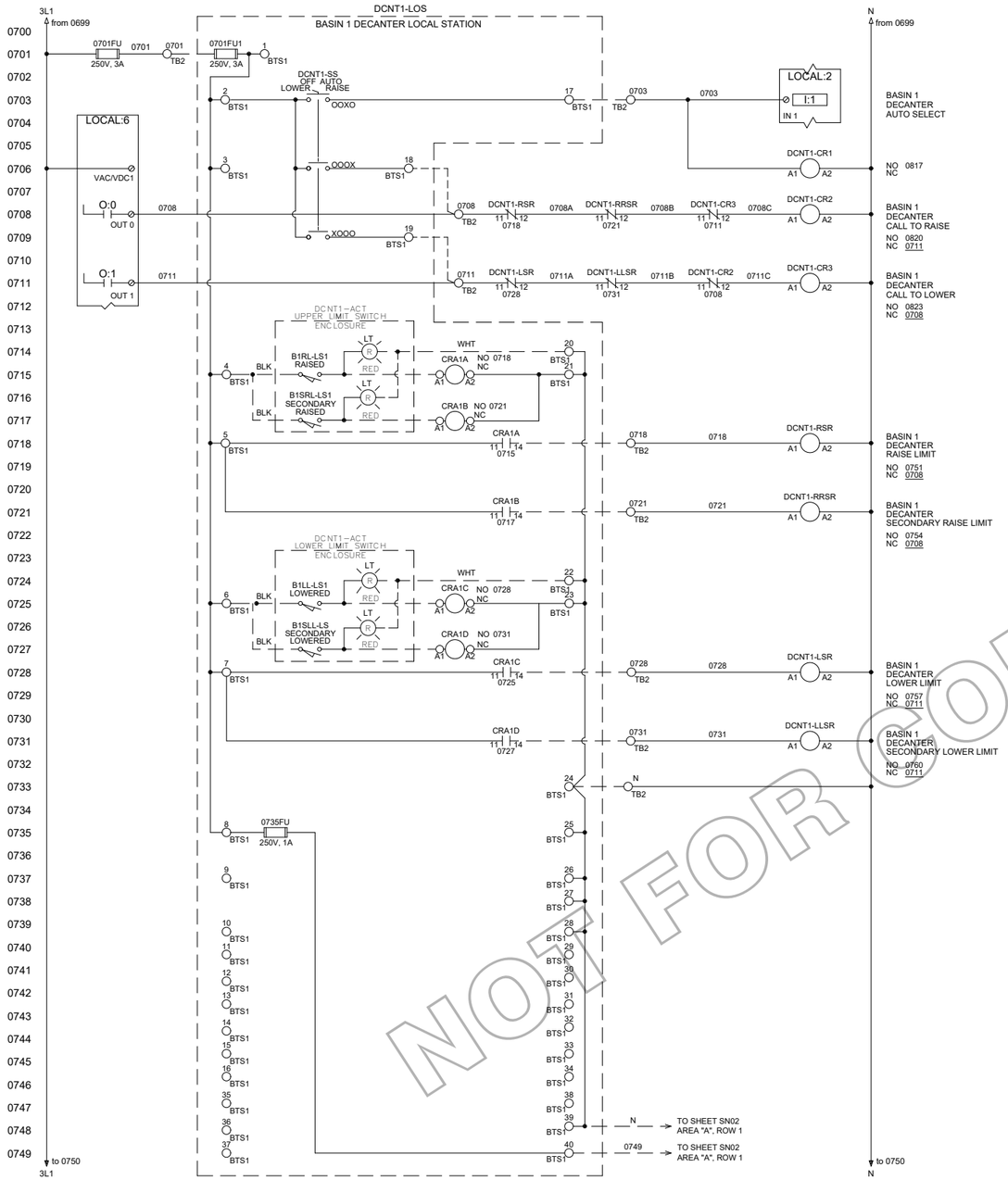
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

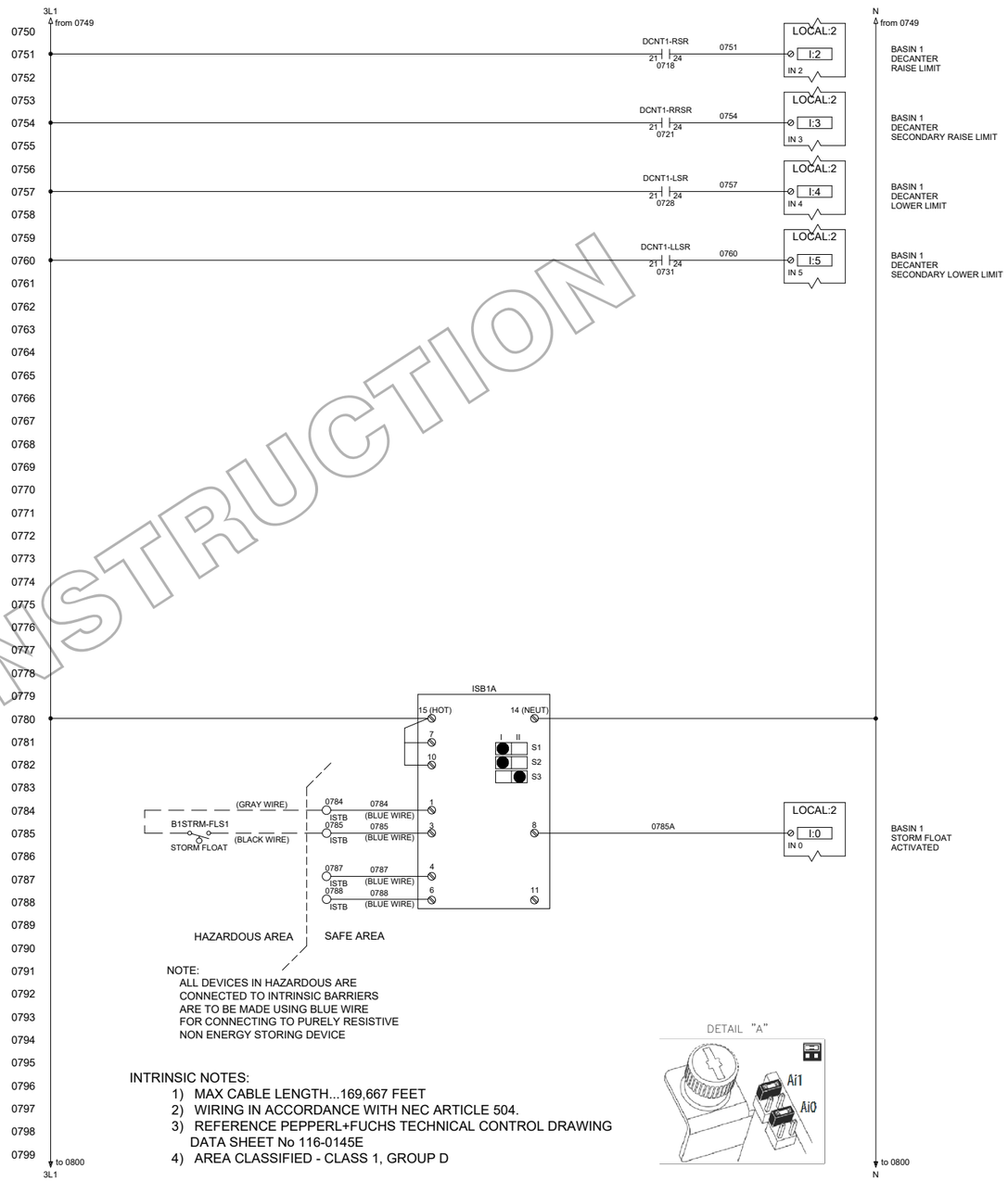
REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

SPARE IO
SYSTEM ALARM POWER

DRWN BY IKS 06/16/2025 | APPVD BY CB | SIZE D | REV. A | SCALE | QTY. | JOB. 25-0365A | DWG. 0365-SC06 | SHT. 6 OF 22

BASIN 1 DECANTER





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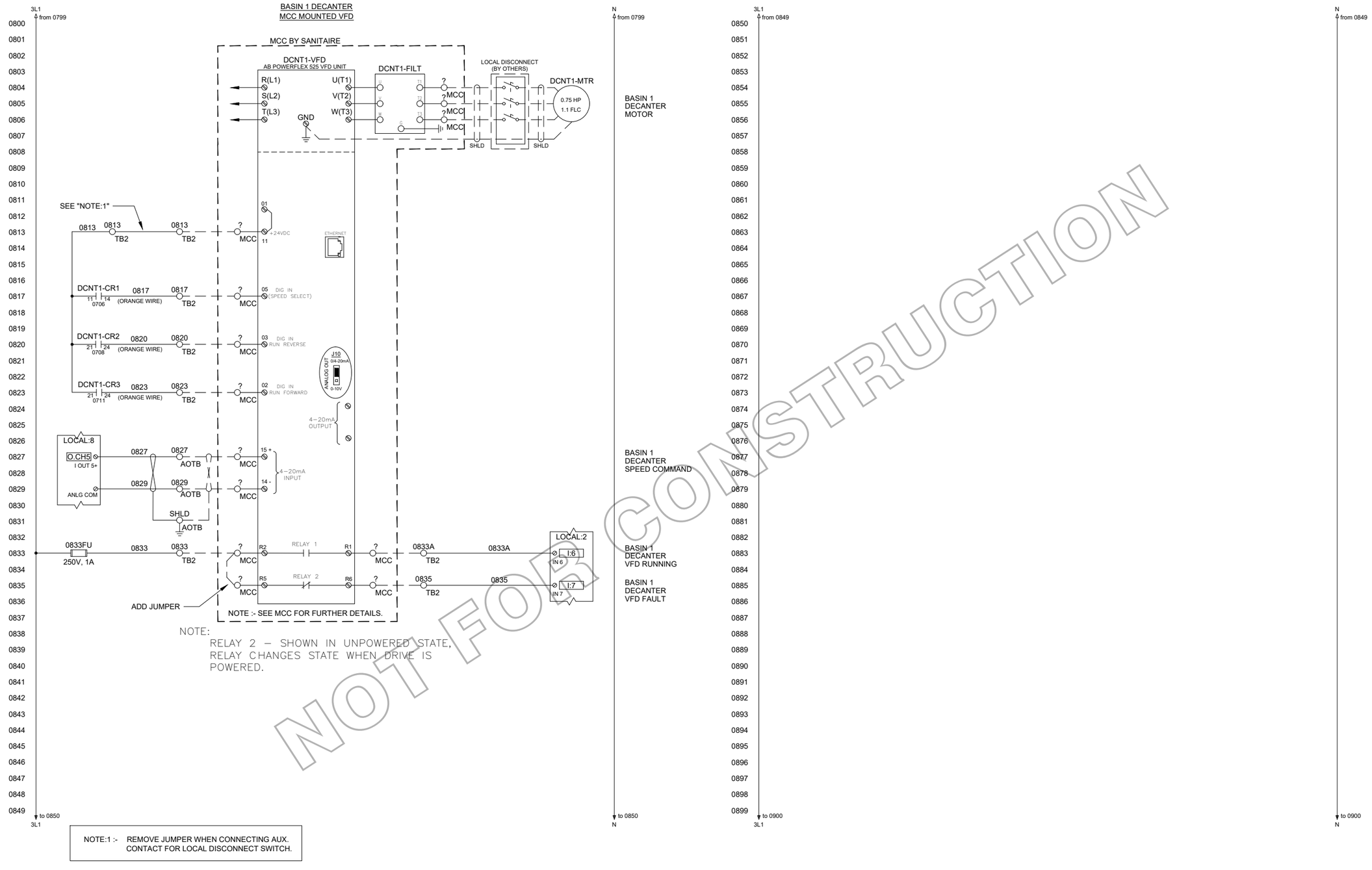
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

BASIN 1
DECANTER LOCAL STATION

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 7 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-SC07



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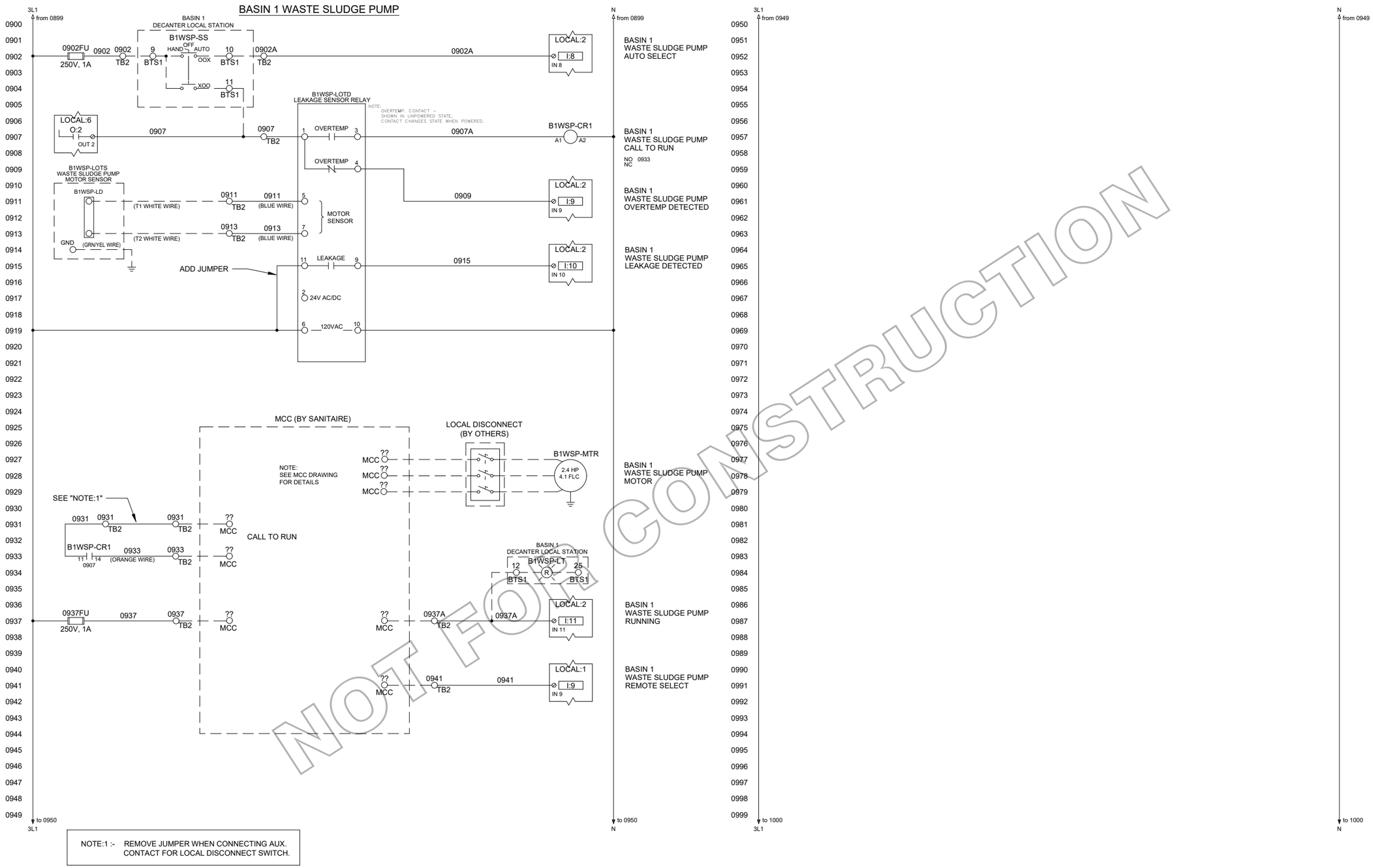
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

BASIN 1
DECANTER VFD

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 8 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-SC08

BASIN 1 WASTE SLUDGE PUMP



NOTE:1 :- REMOVE JUMPER WHEN CONNECTING AUX. CONTACT FOR LOCAL DISCONNECT SWITCH.

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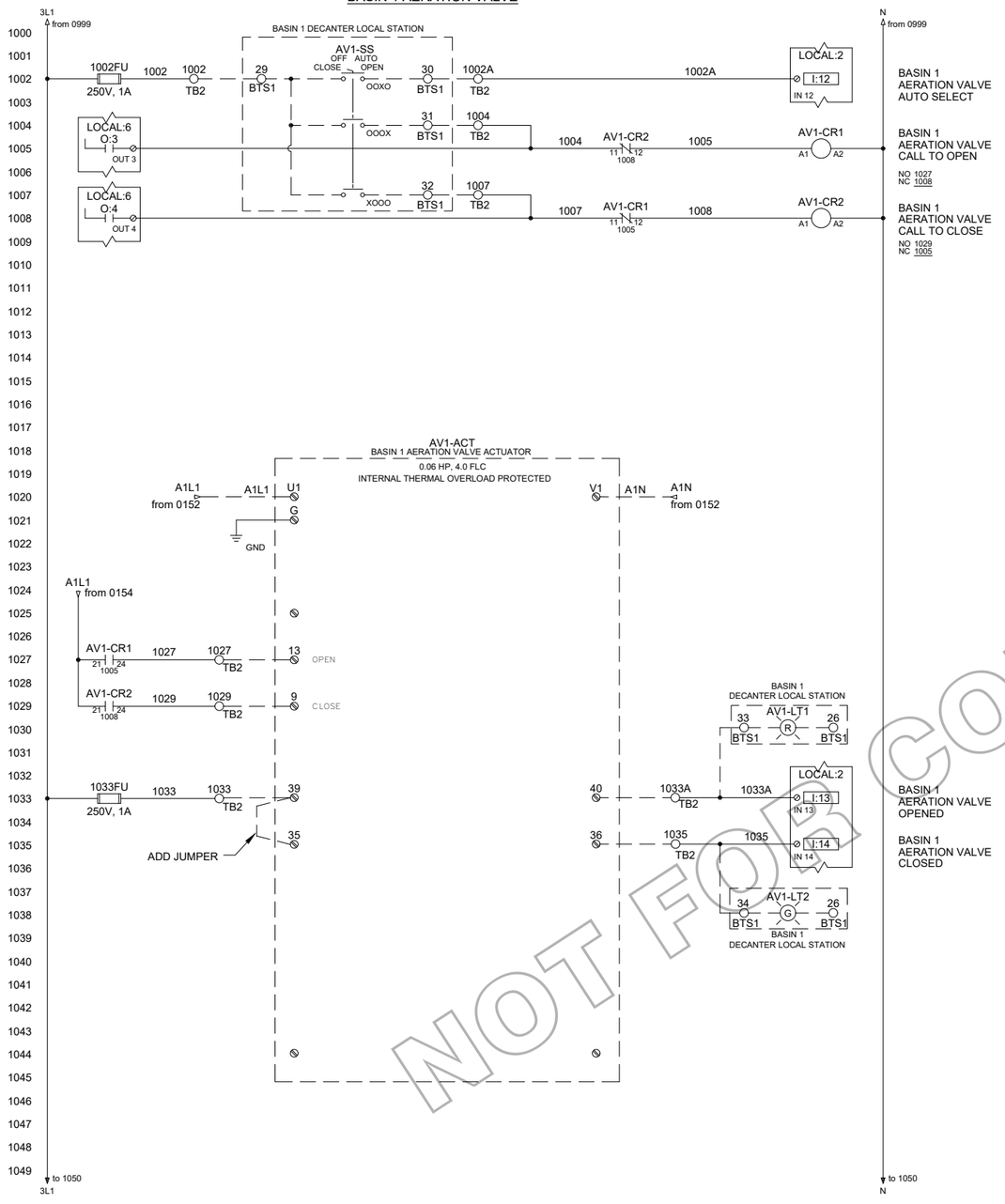
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

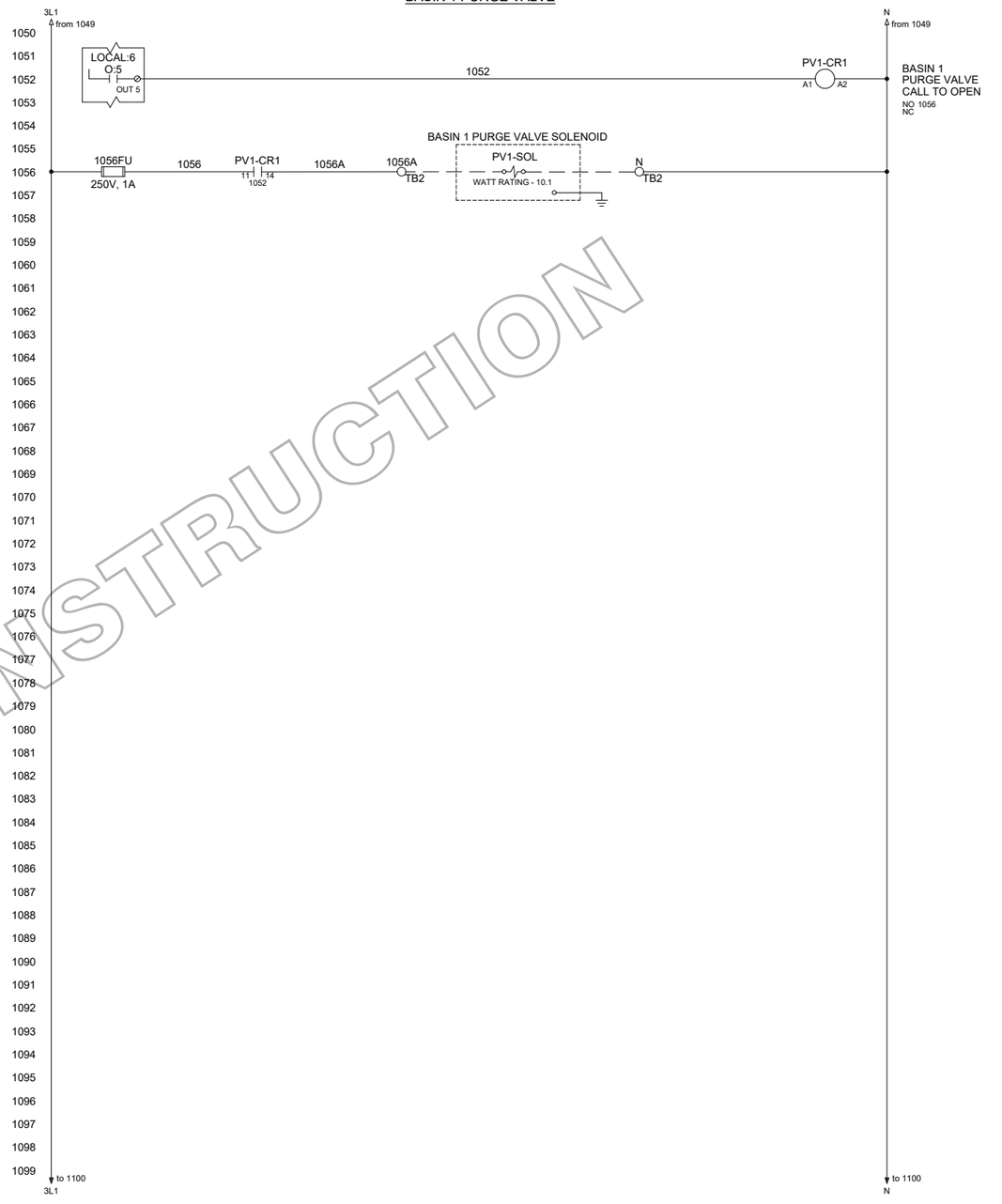
BASIN 1
WASTE SLUDGE PUMP

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 9 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-SC09

BASIN 1 AERATION VALVE



BASIN 1 PURGE VALVE



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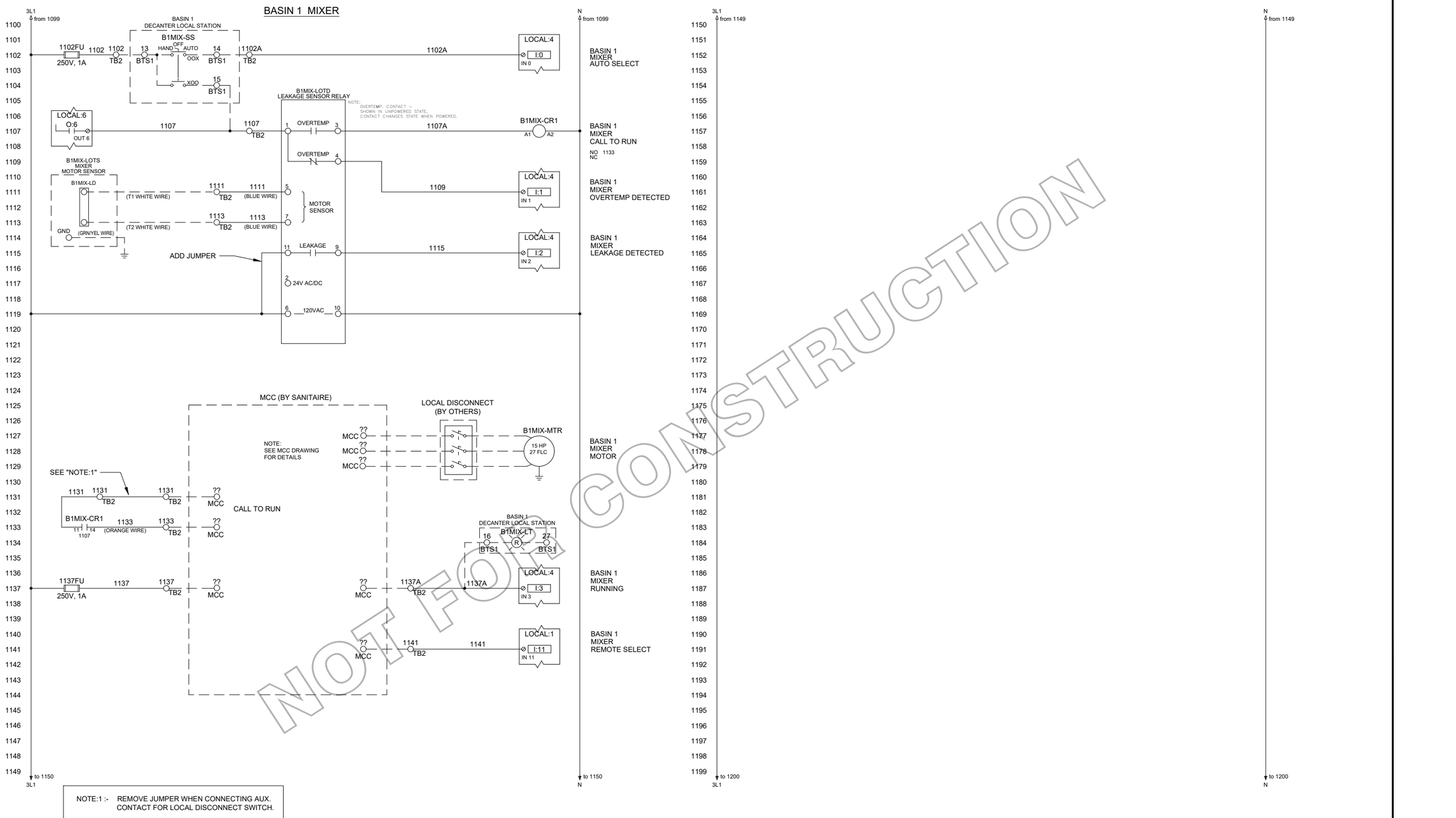
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

BASIN 1
AERATION VALVE AND
PURGE VALVE

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 10 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-SC10

BASIN 1 MIXER



NOTE:1 :- REMOVE JUMPER WHEN CONNECTING AUX. CONTACT FOR LOCAL DISCONNECT SWITCH.

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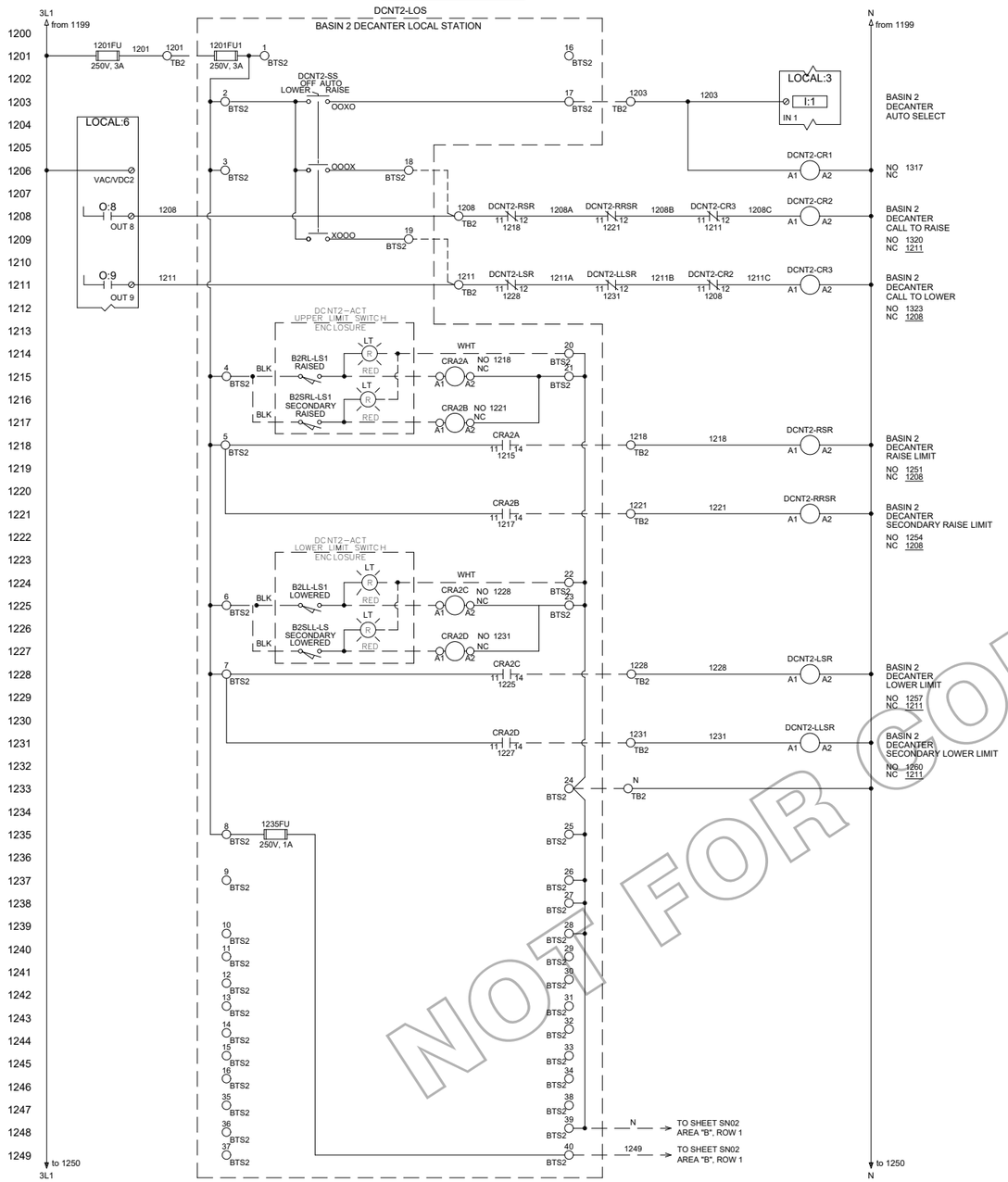
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

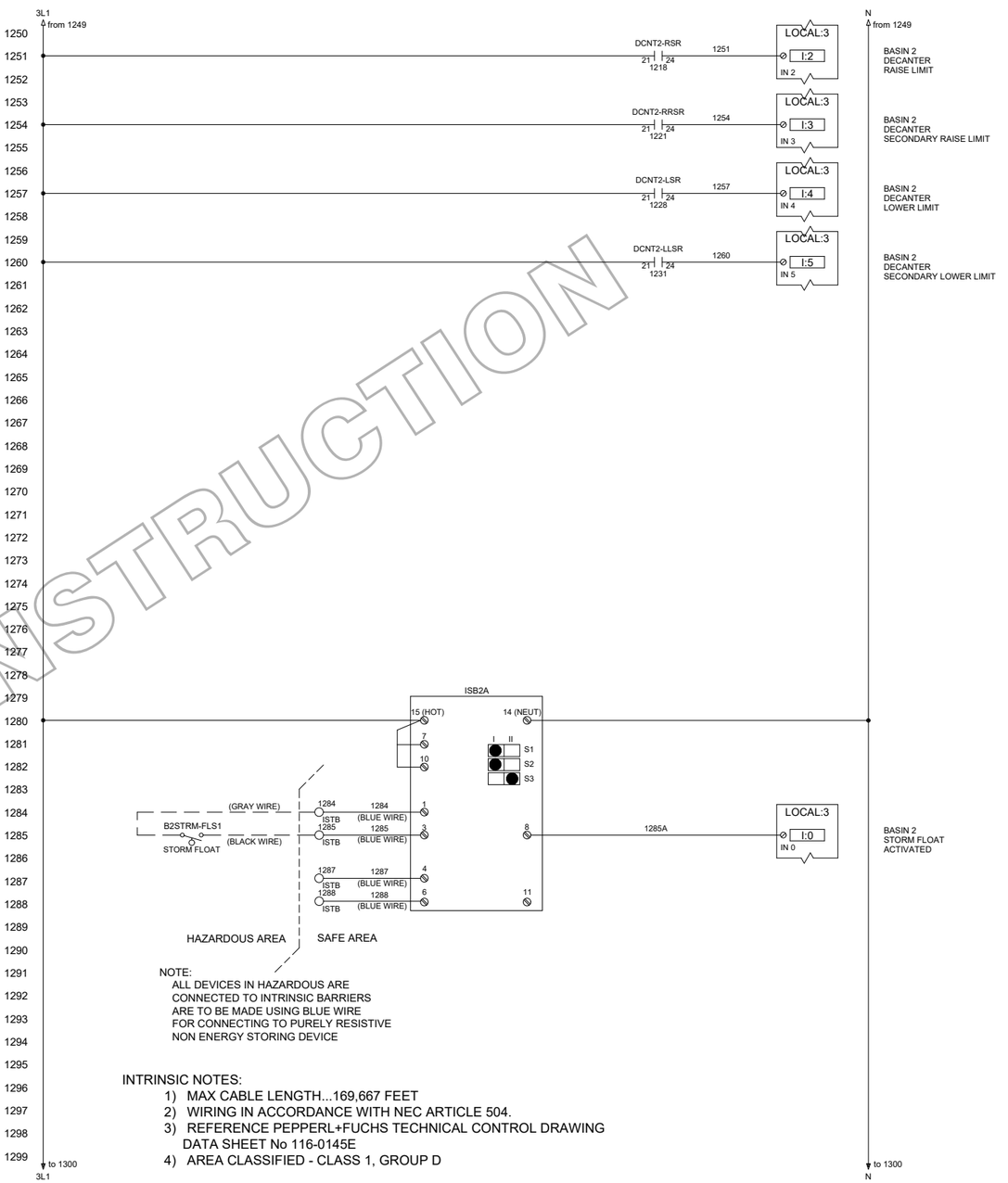
REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

BASIN 1
MIXER

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 11 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-SC11

BASIN 2 DECANTER





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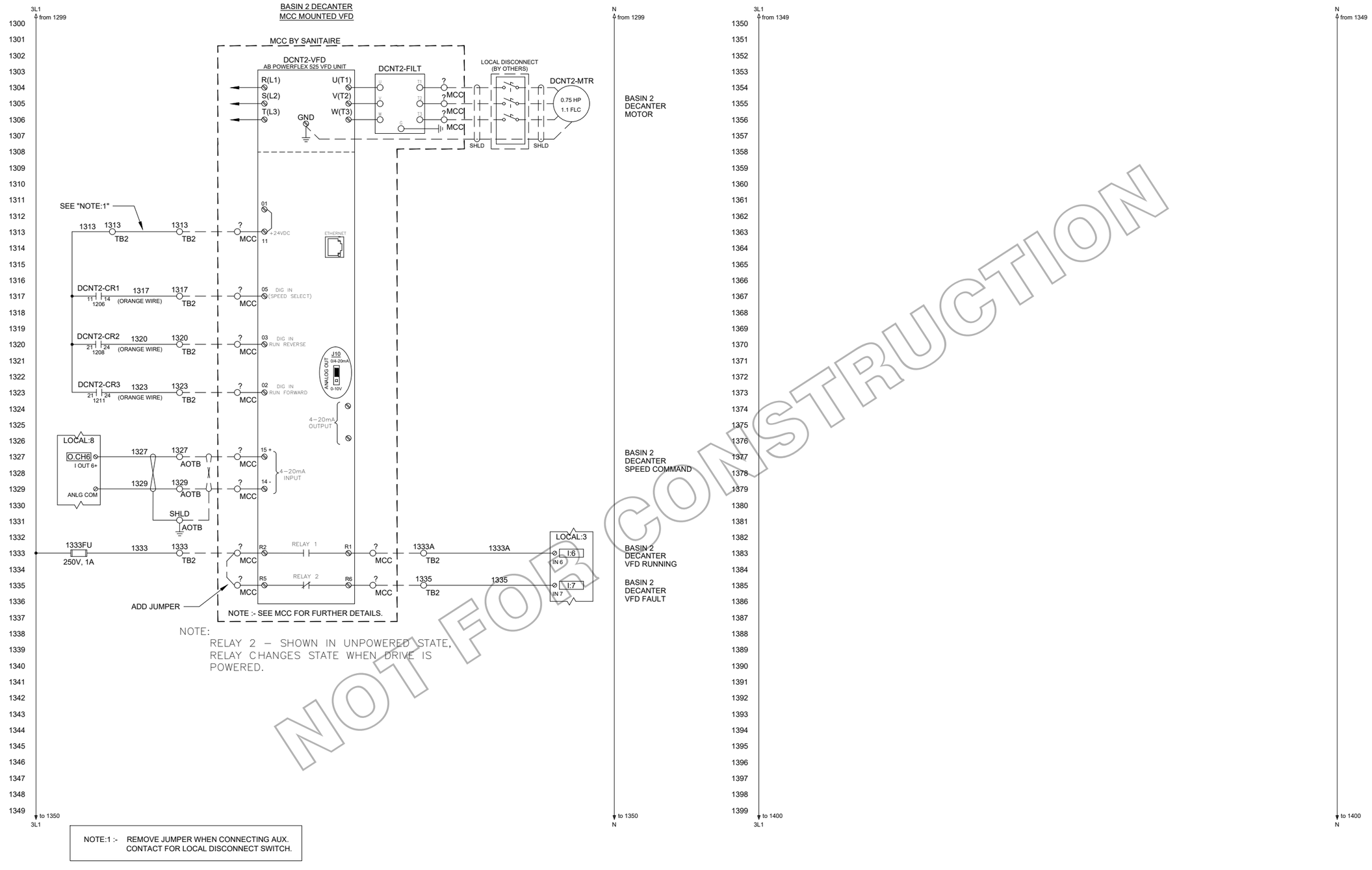
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

BASIN 2
DECANTER LOCAL STATION

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 12 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-SC12



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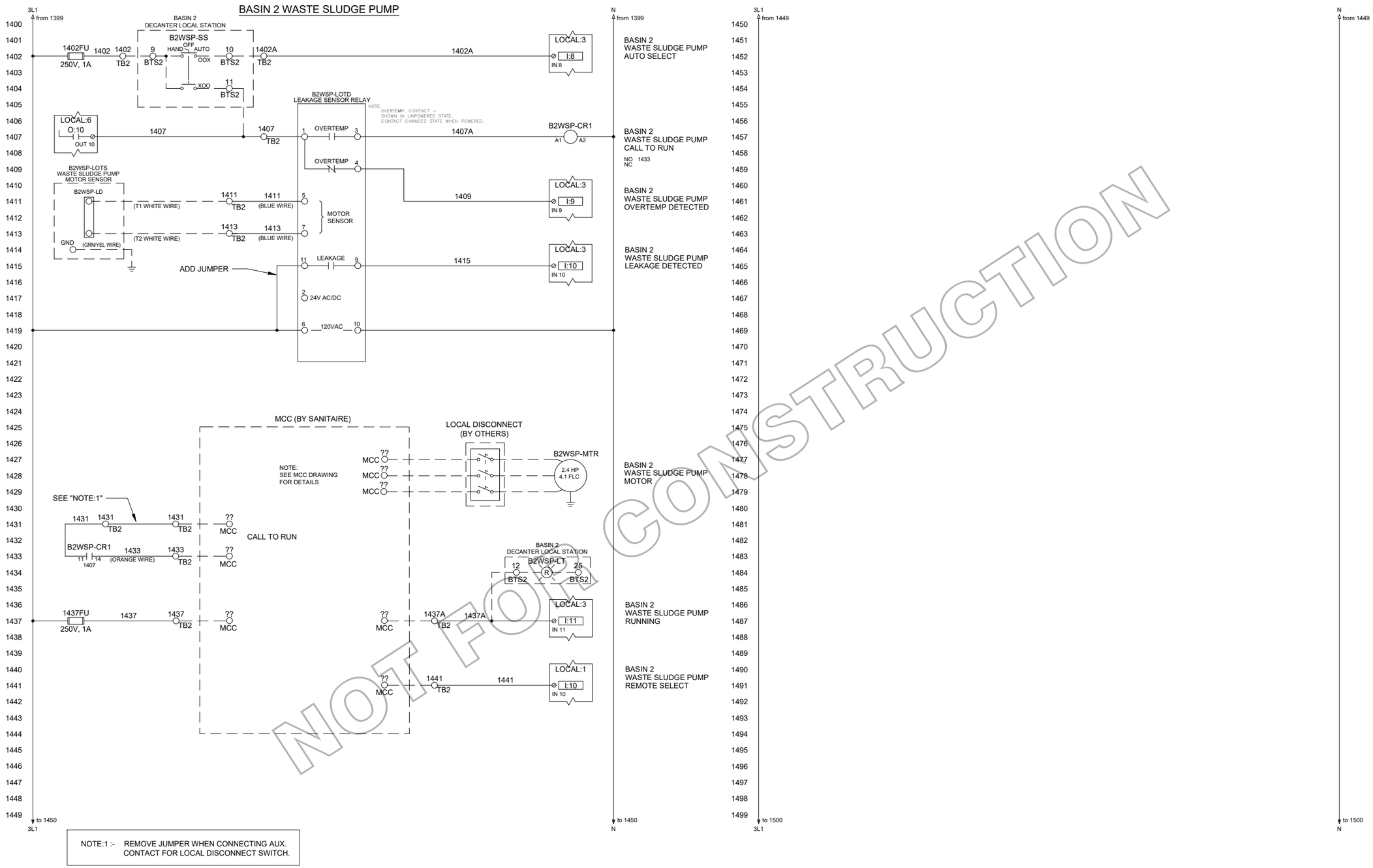
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

BASIN 2
DECANTER VFD

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 13 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-SC13

BASIN 2 WASTE SLUDGE PUMP



NOTE:1 :- REMOVE JUMPER WHEN CONNECTING AUX. CONTACT FOR LOCAL DISCONNECT SWITCH.

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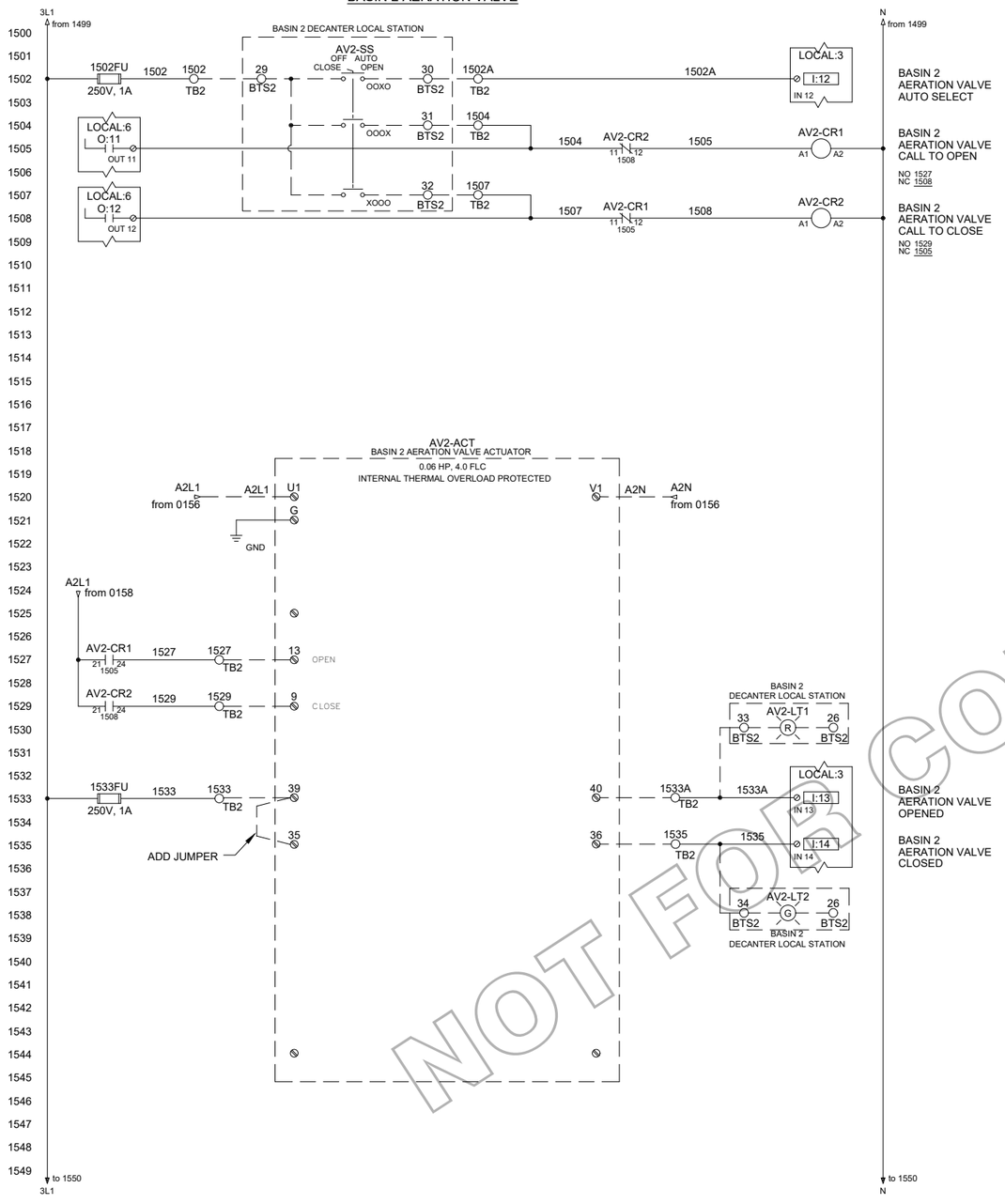
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

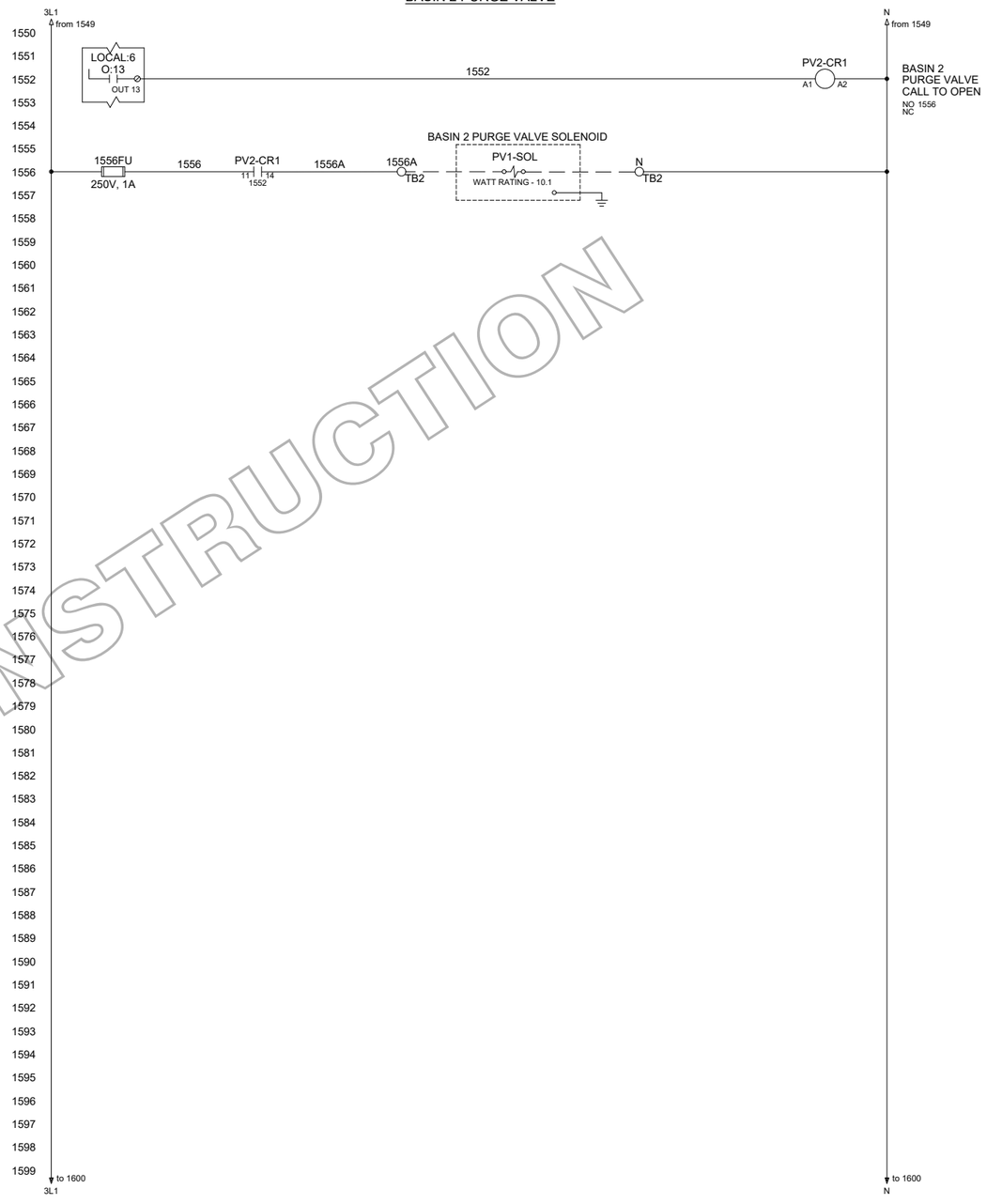
BASIN 2
WASTE SLUDGE PUMP

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 14 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-SC14

BASIN 2 AERATION VALVE



BASIN 2 PURGE VALVE



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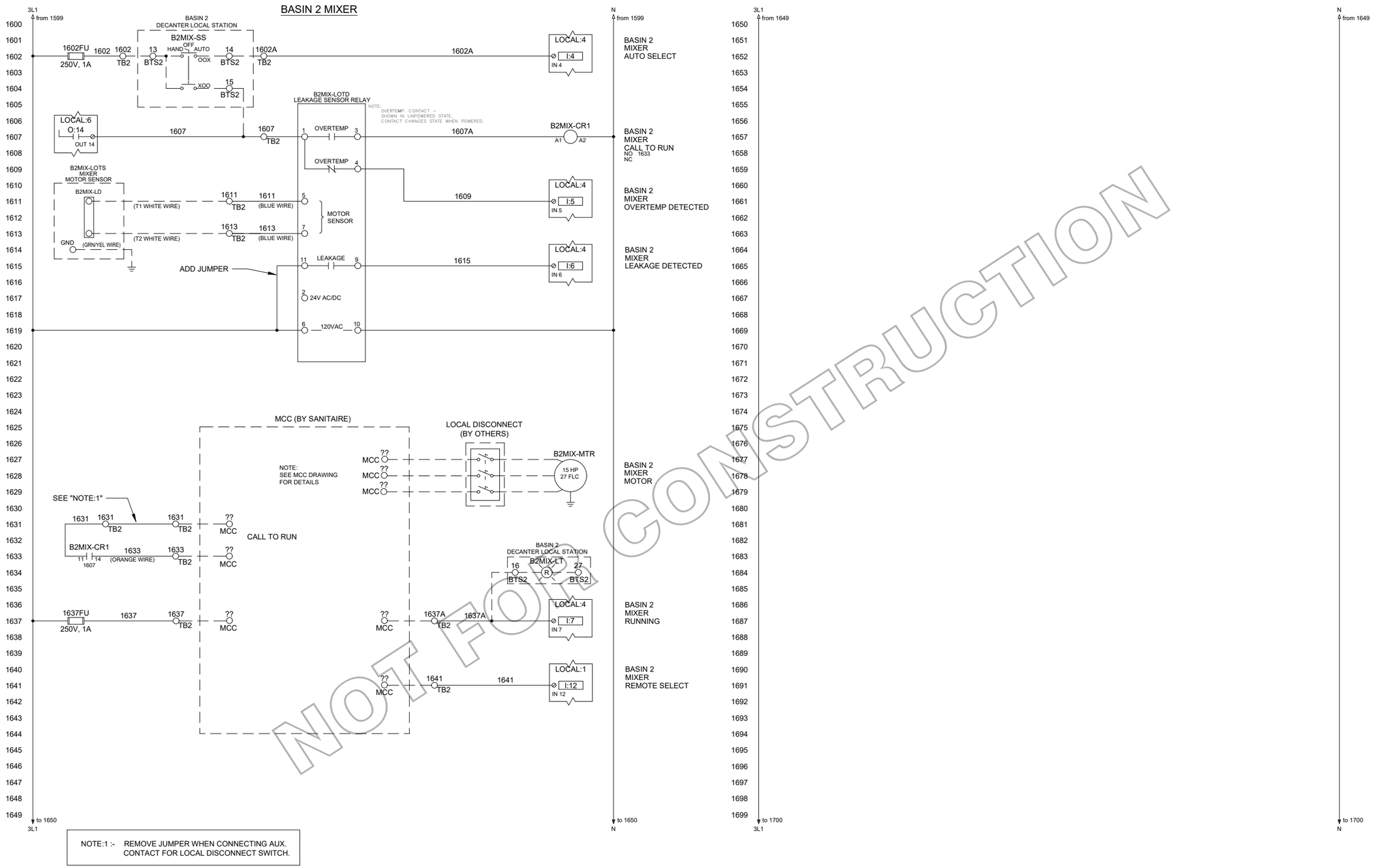
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

BASIN 2
AERATION VALVE AND
PURGE VALVE

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 15 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-SC15

BASIN 2 MIXER



NOTE:1 :- REMOVE JUMPER WHEN CONNECTING AUX. CONTACT FOR LOCAL DISCONNECT SWITCH.

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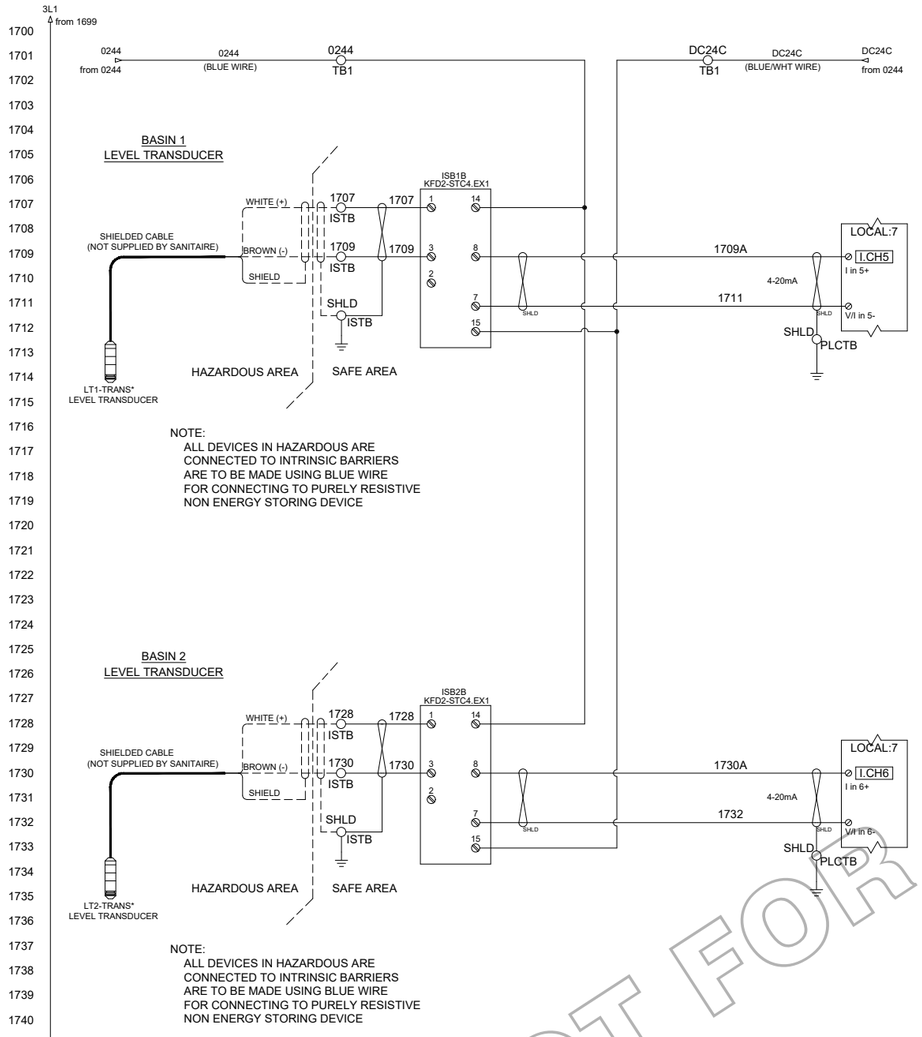
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

BASIN 2
MIXER

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 16 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-SC16



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FOR APPROVAL
ONLY

06/16/2025
XYLEM

AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

DRWN BY IKS 06/16/2025
APPVD BY CB
SIZE D
REV. A
SCALE
QTY.
JOB. 25-0365A
DWG. 0365-SC17

BASIN
LEVEL TRANSDUCERS

SHT. 17 OF 22

3L1
from 1799

1800 1801 1802 1803 1804 1805 1806 1807 1808 1809 1810 1811 1812 1813 1814 1815 1816 1817 1818 1819 1820 1821 1822 1823 1824 1825 1826 1827 1828 1829 1830 1831 1832 1833 1834 1835 1836 1837 1838 1839 1840 1841 1842 1843 1844 1845 1846 1847 1848 1849

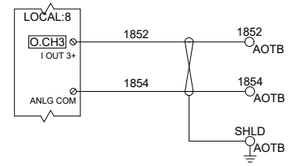
to 1850
3L1

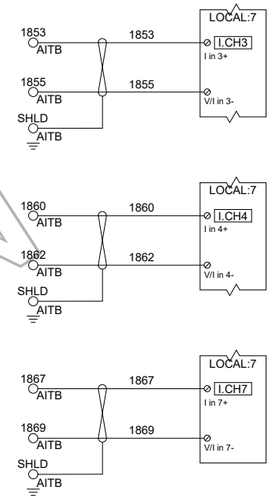
N
from 1799

to 1850
N

3L1
from 1849

1850 1851 1852 1853 1854 1855 1856 1857 1858 1859 1860 1861 1862 1863 1864 1865 1866 1867 1868 1869 1870 1871 1872 1873 1874 1875 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894 1895 1896 1897 1898 1899





N
from 1849

SPARE
SPARE
SPARE
SPARE
SPARE
SPARE

to 1900
3L1

to 1900
N

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AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

SPARE I/O

REV	DATE	REVISION DESCRIPTION	BY
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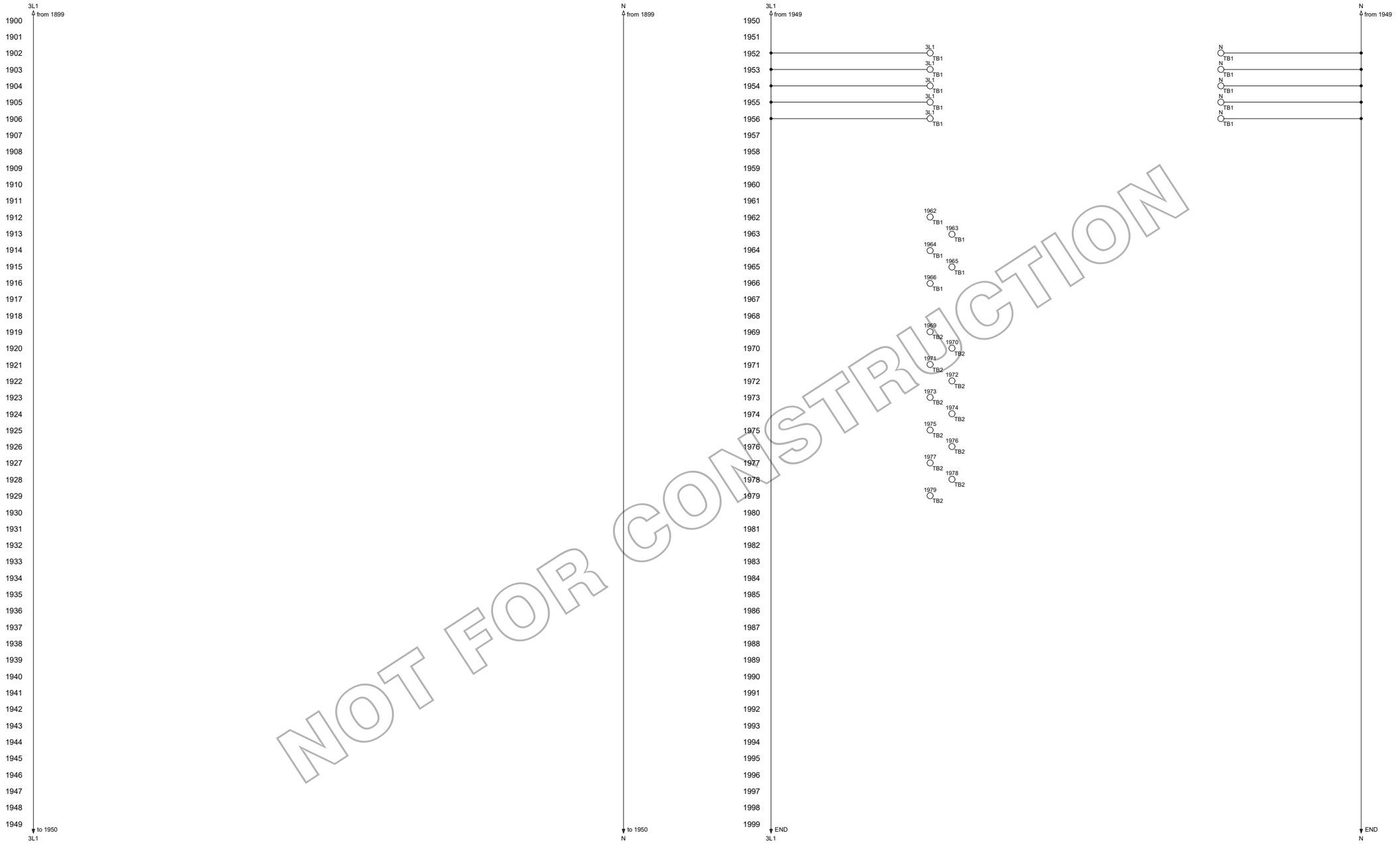
DRWN BY IKS 06/16/2025 | APPVD BY CB | SIZE D | REV. A | SCALE | QTY. | JOB. 25-0365A | DWG. 0365-SC18 | SHT. 18 OF 22



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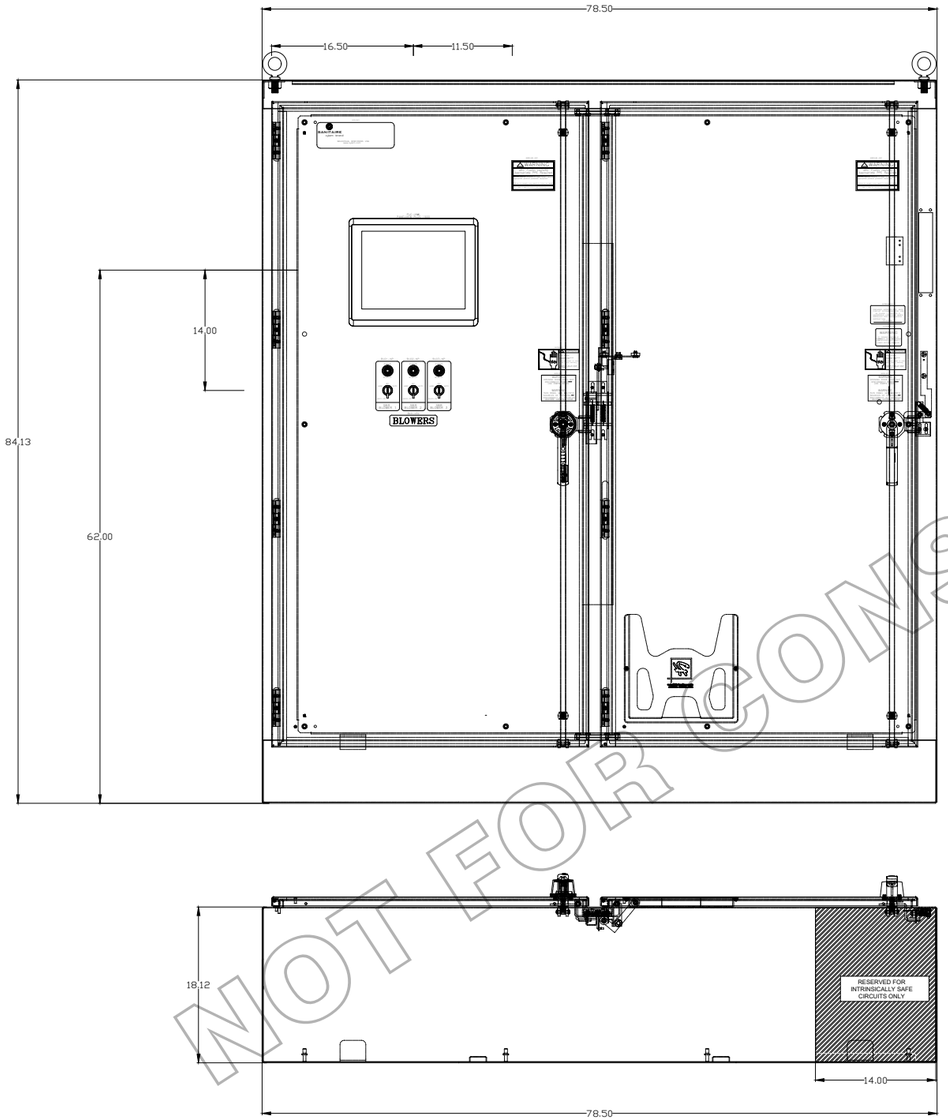
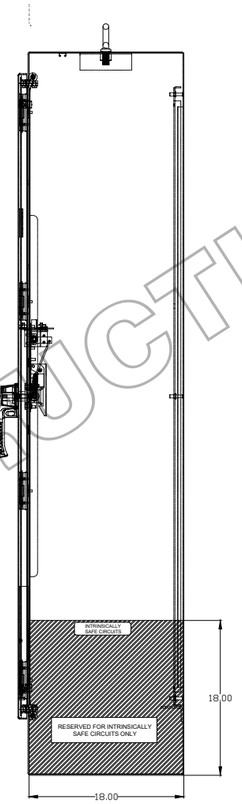
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

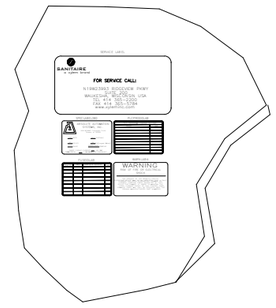
SPARE TERMINALS

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 19 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-SC19





LABELS TO BE
MOUNTED ON LEFT INSIDE
ABOVE HANDLE OF MASTER DOOR



NOTE:
1) ALL DIMENSIONS ARE IN INCHES
UNLESS OTHERWISE INDICATED.

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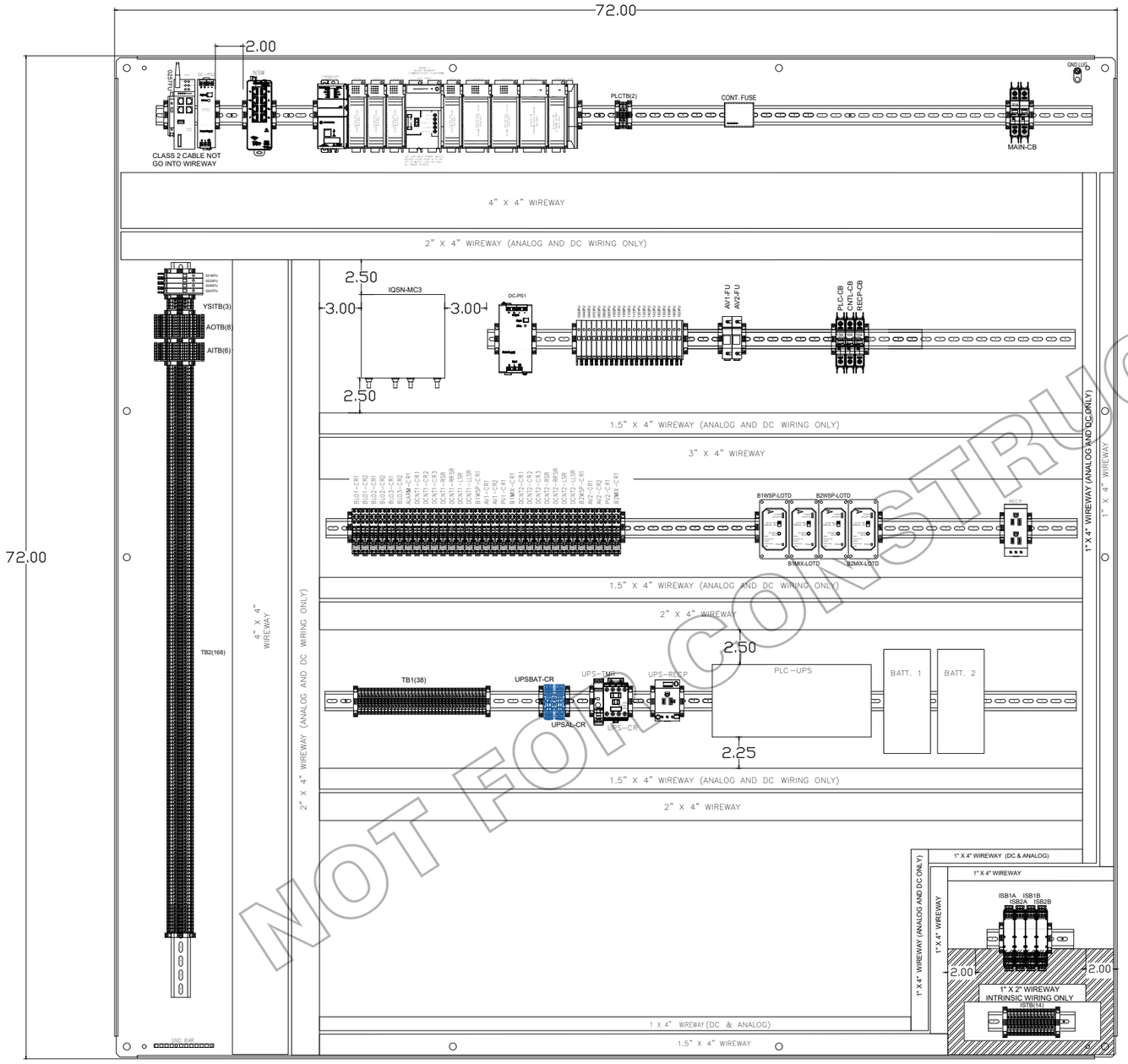
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

CONTROL ENCLOSURE
EXTERNAL LAYOUT

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 20 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-CP01



NOT FOR CONSTRUCTION

INTRINSICALLY SAFE EQUIPMENT FOR FIELD CONNECTION TO THE INTRINSIC SAFETY BARRIERS WITHIN THE PANEL MUST HAVE INTRINSICALLY SAFE ENTITY PARAMETERS CONFORMING WITH THE TABLE BELOW.

REQUIRED RELATIONSHIP BETWEEN I.S. EQUIPMENT AND I.S. BARRIER ENTITY PARAMETERS

(e.g.-ENTITY LISTED I.S. EQUIPMENT ENTITY PARAMETERS	REQUIRED RELATIONSHIP ENTITY PARAMETERS	I.S. LISTED I.S. BARRIER ENTITY PARAMETERS
V max (or Ui)	≥	Voc or Vt (or Uo)
I max (or Ii)	≥	Isc or It (or Io)
P max. (Pi)	≥	Po
Ci + Ccable	≥	Ca (or Co)
Li + Lcable	≥	La (or Lo)

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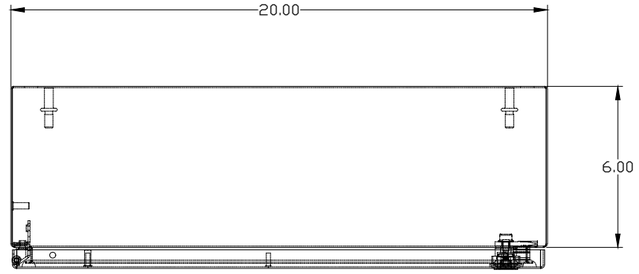
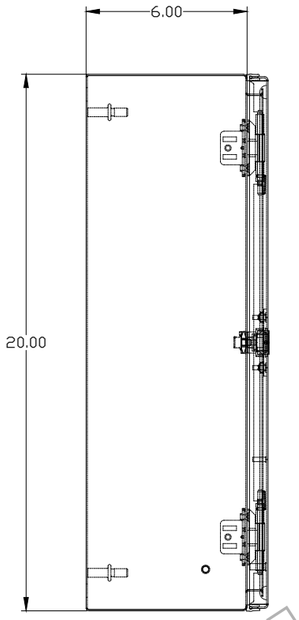
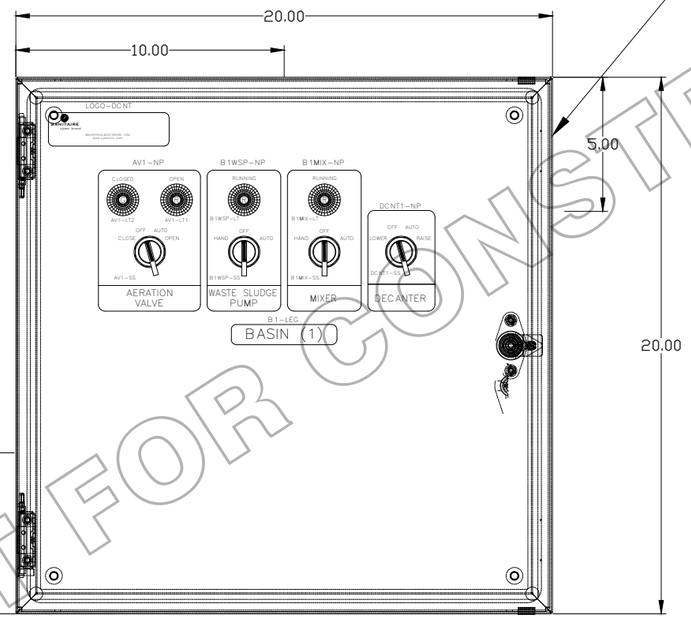
AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

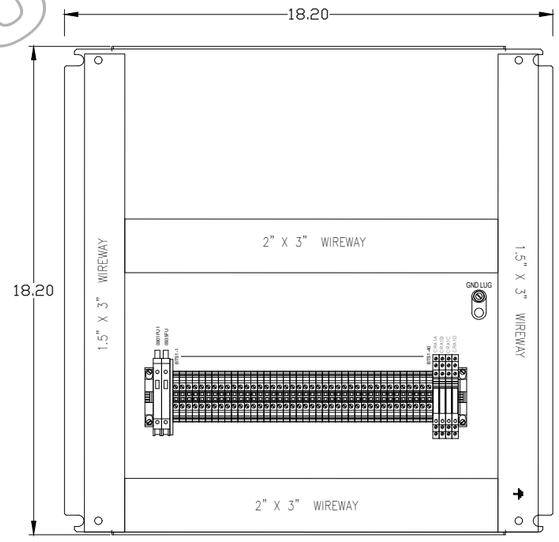
DRWN BY IKS 06/16/2025 | APPVD BY CB | SIZE D | REV. A | SCALE | QTY. | JOB. 25-0365A | DWG. 0365-CP02 | SHT. 21 OF 22







LABEL TO BE LOCATED ON LATCH SIDE OF ENCLOSURE



BASIN No.1 SHOWN
(2 REQUIRED)

B1-LEG
BASIN 1

B2-LEG
BASIN 2

NOTE:
1) ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE INDICATED.

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AUMSVILLE, OR.
WASTE WATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY
A	04/30/2026	PER SUBMITTAL COMMENTS	DRP

DECANTER
LOCAL STATION

DRWN BY IKS 06/16/2025 | SIZE D | SCALE | JOB. 25-0365A | SHT. 22 OF 22
APPVD BY CB | REV. A | QTY. | DWG. 0365-CP03

Rockwell Automation

Centerline 2100 Motor Control Center

MCC Details

The details of the proposed motor control center are as follows:

Category	Description
Total Section(s)	4
Total Shipping Block(s)	3
Section Depth	Front Mounted, 20" Deep
Section Height	90" High
Enclosure	1G - with Gasketed Doors
Designed For Use With	Power System Type: Wye, 3-phase, 3-wire with solidly grounded neutral
MCC Connection Type	Main Circuit Breaker
Incoming Cable Entry	Bottom, Section 1
Main Bus Rating	800A
Main Bus Material	Copper / Tin Plated
Main Bus Bracing	65kA (rms symmetrical)
Horizontal Ground Bus	1/4" X 1", Bottom, Unplated Copper
Vertical Ground Bus	Plug-in Zinc Plated Steel
Stab Opening Protection	Automatic Shutters
Master Nameplate	No

Rockwell Automation

Centerline 2100 Motor Control Center

Structure and Unit Specifications

Network Type: Ethernet
Unit Diagram Location: Central location

STANDARD STRUCTURE / SECTION SPECIFICATIONS

Line Voltage / Frequency: 480 Volts / 60 Hertz
Class I Wiring Type: B-T Control and Power Terminal Blocks
NEMA Enclosure Type: 1G - with Gasketed Doors

QTY	STANDARD STRUCTURE / SECTION SPECIFICATION	DELIV PROG
1	POWER SYSTEM - WYE, 3-PHASE, 3-WIRE WITH SOLIDLY GROUNDED NEUTRAL	SCII
2	GRD BUS SPLICE, (1) 0.25" × 1" (CU/UNPLATED)	SCII
2	HORIZ PWR BUS SPLICE, 800A, CU/TIN	SCII
4	DIRECT ENET CABLING (NO ENET VWW ADAPTERS), 24V CABLING W/ 24V VWW ADAPTERS	SCII
4	AUTOMATIC SHUTTERS FOR STAB OPENINGS	SCII
1	BASE SECT 25" WIDE W/9" WIREWAY FOR PLUG-IN UNITS	SCII
4	SECT DEPTH 20"	SCII
4	NEMA ENCL TYPE 1 W/GASKET (DOORS ONLY)	SCII
3	BASE SECTION	SCII
4	EXPORT PACK	SCII
4	HORIZ GRD BUS, 0.25" X 1" CU/UNPLATED(Bottom)	SCII
4	HORIZ PWR BUS, 800A, CU/TIN	SCII
4	BUS BRACING 65KA RMS SYMMETRICAL	SCII
4	VERT PWR BUS, 300A, CU/TIN	SCII
4	VERT GRD BUS, PLUG-IN, STEEL/ZINC PLATED	SCII
4	WIREWAY TIE BAR(S)	SCII

STARTER / UNIT SPECIFICATIONS

ID	QTY	CATALOG NUMBER	SPACE FACTOR	DELIV PROG
1	1	2193MB-FKC-54TMM	2.5	FT1
2	2	2163WB-4P0KB-14DFCC-14HBA3-37TGM-751S	2	ENG
-	1	*Filter,dv/dt,4A,480-600V,60Hz,Open (Nema 1 & 1G Only),DVSP0004E* *CMOD Note Text - For space adder see EPB 15-1 (page106)*	-	ENG
-	3	*I/O Wiring to terminal blocks within a PLC, SLC or ControlLogix unit (per wire)* *CMOD Note Text - See EPB notes for proper application.*	-	ENG
-	1	*1.0 Space Factor Adder* *CMOD Note Text - See EPB notes for proper application.*	-	FT1
3	3	2163UB-065HKB-14DA2R2-14GER-14HBA6-46TGM-751S	3	ENG
-	3	*I/O Wiring to terminal blocks within a PLC, SLC or ControlLogix unit (per wire)* *CMOD Note Text - See EPB notes for proper application.*	-	ENG
4	1	2100-EPS8KBH-30TGM-751S	1	SC

5	1	2100-ESW5220K-T10BRP-751S	1	PE
6	1	2100-BK05	0.5	SC
7	2	2113B-BAB-6P-7FE3EJCN3CR-17-38TGA-751S-900	1	PE
8	2	2113B-CAB-6P-7FE3EJCN6CR-17-42TGA-751S-900	1	PE
9	2	2100-BK10	1	SC

		DOCUMENTATION - CENTRAL LOCATION

	15	Acrylic - Black letters on white - Stainless Steel Screws	SC

Total Space Factors Used = 24

Delivery Program Type = ENG

Rockwell Automation

Centerline 2100 Motor Control Center

Unit List

ID	QTY	Catalog Number / Unit Description
1	1	2193MB-FKC-54TMM / Main Circuit Breaker - 800A Frame Rating - Bottom Mounted with 800A Trip
2	2	2163WB-4P0KB-14DFCC-14HBA3-37TGM-751S / PowerFlex 525 AC Drive w/CB - 2 HP with Circuit Breaker Thermal Magnetic (15A Trip)
3	3	2163UB-065HKB-14DA2R2-14GER-14HBA6-46TGM-751S / PowerFlex 753 AC Drive w/CB - 40 HP with Circuit Breaker Thermal Magnetic (125A Trip)
4	1	2100-EPS8KBH-30TGM-751S / Ethernet Power Supply Unit with Circuit Breaker Thermal Magnetic (15A Trip)
5	1	2100-ESW5220K-T10BRP-751S / Stratix 5200 20-Port
6	1	2100-BK05 / Blank Unit Door - 0.5 Space Factor
7	2	2113B-BAB-6P-7FE3EJCN3CR-17-38TGA-751S-900 / Full Voltage Non-Reversing Starter w/CB - 3 HP with Circuit Breaker Instantaneous MCP (15A Trip)
8	2	2113B-CAB-6P-7FE3EJCN6CR-17-42TGA-751S-900 / Full Voltage Non-Reversing Starter w/CB - 15 HP with Circuit Breaker Instantaneous MCP (50A Trip)
9	2	2100-BK10 / Blank Unit Door - 1.0 Space Factor

Rockwell Automation

Centerline 2100 Motor Control Center

Unit Description Summary

General Information

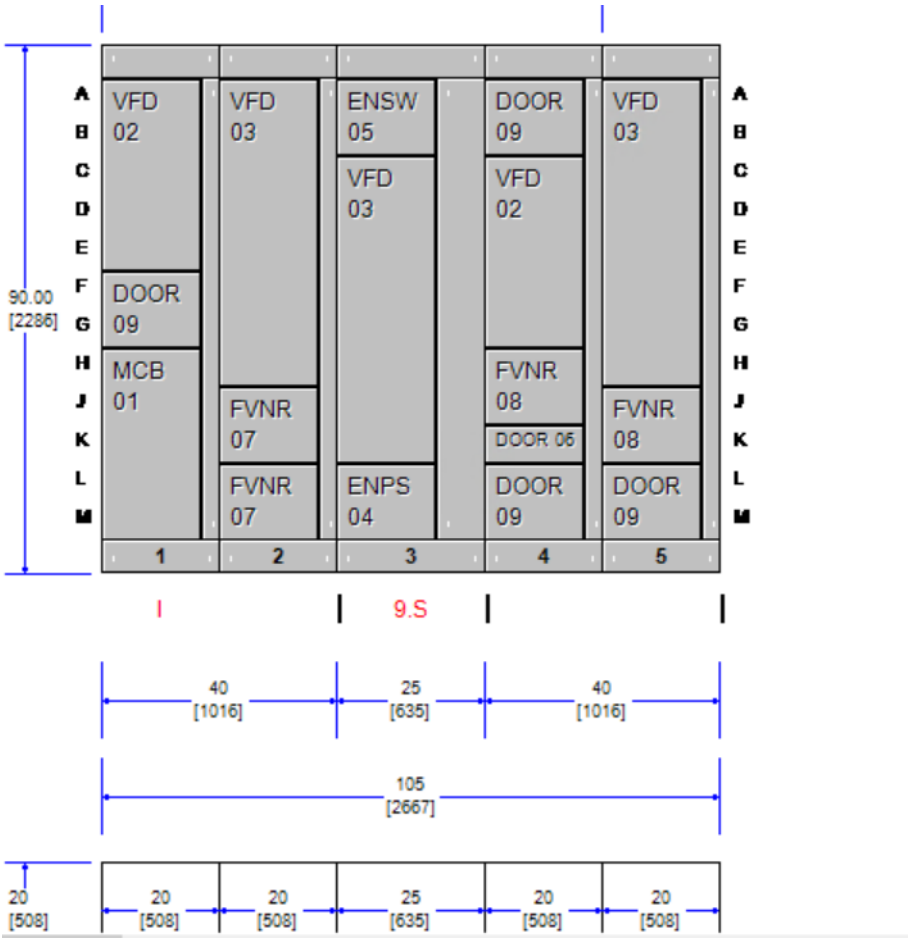
Line Voltage / Frequency:	480 Volts / 60 Hertz
Power System Configuration:	Wye, 3-phase, 3-wire with solidly grounded neutral
Class I Wiring Type:	B-T Control and Power Terminal Blocks
NEMA Enclosure Type:	1G - with Gasketed Doors
Available Fault Current:	50,001 to 65,000 A
Unit Nameplate Type:	Acrylic - Black letters on white - Stainless Steel Screws
Delivery Program:	ENG

Unit Information

Description	Unit Features
Unit ID: 1 **Del Prog: FT1** **Unit Loc: 01H** **Qty: 1** MCB - Main Circuit Breaker **Rating** 800A **Wiring Diagram** 10003993518	**Catalog Number: 2193MB-FKC-54TMM** Total Space Factor = 2.5 Circuit Breaker: Electronic (LSI), 65kA at 480V (800) with Frame Rating of 800A (M6H Frame), Bottom Mounted, 800A Trip Lugs Supplied: Std Mech/Lug Pads, 350 kcmil Size Wire, 3 Cables per Phase **Engineered Spec(s)/Modification(s)** (1) Custom Unit Diagram (1) Engineered Modification and/or Custom Diagram
Unit ID: 2 **Del Prog: ENG** **Unit Loc: 03E, 04J** **Qty: 2** VFD - PowerFlex 525 AC Drive w/CB **Rating** 2 HP **Wiring Diagram** 10007005035	**Catalog Number: 2163WB-4P0KB-14DFCC-14HBA3-37TGM-751S** Total Space Factor = 2 Wiring: NEMA Type B wiring Output Current Rating: 4.0A Circuit Breaker: Thermal Magnetic, 65kA at 480V (G6C Frame) (15A Trip) Human Interface Module: Drive HIM LCD Door display-num keypad Control: Transformer with Secondary Fuse, Standard Capacity, Primary Fusing, 120V/60Hz Control Wiring: #16 AWG MTW(TEW) Cu **Features Included** Drive I/P fuses - Class CC (-14DFCC) Sleeve Type Markers (-751S) **Engineered Spec(s)/Modification(s)** WITH 3% LINE REACTORS (1) Filter,dv/dt,4A,480-600V,60Hz,Open (Nema 1 & 1G Only),DVSP0004E (1) Engineered Modification and/or Custom Diagram (3) I/O Wiring to terminal blocks within a PLC, SLC or ControlLogix unit (per wire) (1) Custom Unit Diagram (1) 1.0 Space Factor Adder

Unit ID: 3 **Del Prog: ENG** **Unit Loc: 01A, 02A, 02G** **Qty: 3** VFD - PowerFlex 753 AC Drive w/CB **Rating** 40 HP (Heavy Duty)	**Catalog Number: 2163UB-065HKB-14DA2R2-14GER-14HBA6-46TGM-751S** Total Space Factor = 3 Wiring: NEMA Type B wiring Output Current Rating: 52.0A Circuit Breaker: Thermal Magnetic, 65kA at 480V (G6C Frame) (125A Trip) Human Interface Module: Drive HIM LCD Door display-num kypd(753) Control: Transformer with Secondary Fuse, Standard Capacity, Primary Fusing, 120V/60Hz Control Wiring: #16 AWG MTW(TEW) Cu **Features Included** Drive 24VDC w/ I/O (-14DA2R2) Dual port DLR Ethernet communication module. Mounted internal to drive. (-14GER) Sleeve Type Markers (-751S) **Engineered Spec(s)/Modification(s)** WITH 3% LINE REACTORS (3) I/O Wiring to terminal blocks within a PLC, SLC or ControlLogix unit (per wire) (1) Engineered Modification and/or Custom Diagram (1) Custom Unit Diagram
Unit ID: 4 **Del Prog: SCII** **Unit Loc: 03L** **Qty: 1** ENPS - Ethernet Power Supply Unit **Rating** 125A **Wiring Diagram** 10004071286	**Catalog Number: 2100-EPS8KBH-30TGM-751S** Total Space Factor = 1 Circuit Breaker: Thermal Magnetic, 65kA at 480V (G6C3 Frame) (15A Trip) Disconnect Type = Circuit Breaker Control: Transformer with Secondary Fuse, Standard Capacity, Primary Fusing, V/60Hz Control Wiring: #16 AWG MTW(TEW) Cu **Features Included** Sleeve Type Markers (-751S)
Unit ID: 5 **Del Prog: PEII** **Unit Loc: 03A** **Qty: 1** ENSW - Stratix 5200 20-Port **Wiring Diagram** 10007644214	**Catalog Number: 2100-ESW5220K-T10BRP-751S** Total Space Factor = 1 Base Stratix 5200 Firmware DLR (Device Level Ring) Power Adapters (w/Unit Mtg) **Features Included** Sleeve Type Markers (-751S)
Unit ID: 6 **Del Prog: SCII** **Unit Loc: 01G** **Qty: 1** DOOR - Blank Unit Door	**Catalog Number: 2100-BK05** Total Space Factor = 0.5
Unit ID: 7 **Del Prog: PEII** **Unit Loc: 04E, 04G** **Qty: 2** FVNR - Full Voltage Non-Reversing Starter w/CB **Rating** 3 HP **Overload Relay(s)** E300 Comm Based Overload (7FE3) E300 Communication Option = EtherNet/IP E300 Voltage Code = 24V DC E300 Control Module = Control Only E300 Sensing Module = 0.5-30A Current Only E300 Operator Station = Electronic Reset E300 Expansion Module = Not Available Motor RPM = 1800 Motor Full Load Current (FLC) = 4.52 Motor Service Factor = 1.15	**Catalog Number: 2113B-BAB-6P-7FE3EJCN3CR-17-38TGA-751S-900** Size: NEMA Size 1 Total Space Factor = 1 Wiring: NEMA Type B wiring Circuit Breaker: Instantaneous MCP, 100kA at 480V (G8P Frame) (15A Trip) Control: Transformer with Secondary Fuse, Standard Capacity, Primary Fusing, 120V/60Hz Control Wiring: #16 AWG MTW(TEW) Cu **Features Included** Std Capacity Control Power Transformer W/Primary Fuses (-6P) Contactor Surge Suppressor (-17) Sleeve Type Markers (-751S) 2 NO on Starter (-900)

Unit ID: 8 Del Prog: PEII **Unit Loc: 03C, 04C** **Qty: 2** FVNR - Full Voltage Non-Reversing Starter w/CB **Rating** 15 HP **Overload Relay(s)** E300 Comm Based Overload (7FE3) E300 Communication Option = EtherNet/IP E300 Voltage Code = 24V DC E300 Control Module = Control Only E300 Sensing Module = 6-60A Current Only E300 Operator Station = Electronic Reset E300 Expansion Module = Not Available Motor RPM = 1800 Motor Full Load Current (FLC) = 20.22 Motor Service Factor = 1.15	**Catalog Number: 2113B-CAB-6P-7FE3EJCN6CR-17-42TGA-751S-900** Size: NEMA Size 2 Total Space Factor = 1 Wiring: NEMA Type B wiring Circuit Breaker: Instantaneous MCP, 100kA at 480V (G8P Frame) (50A Trip) Control: Transformer with Secondary Fuse, Standard Capacity, Primary Fusing, 120V/60Hz Control Wiring: #16 AWG MTW(TEW) Cu **Features Included** Std Capacity Control Power Transformer W/Primary Fuses (-6P) Contactor Surge Suppressor (-17) Sleeve Type Markers (-751S) 2 NO on Starter (-900)
Unit ID: 9 Del Prog: SCII **Unit Loc: 03J, 04A** **Qty: 2** DOOR - Blank Unit Door	**Catalog Number: 2100-BK10** Total Space Factor = 1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VFD 03
ENSW 05
VFD 03
DOOR 09
VFD 02
VFD 03
DOOR 09
MCB 01
FVNR 07
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FVNR 08
DOOR 06
DOOR 09
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1 2 3 4 5
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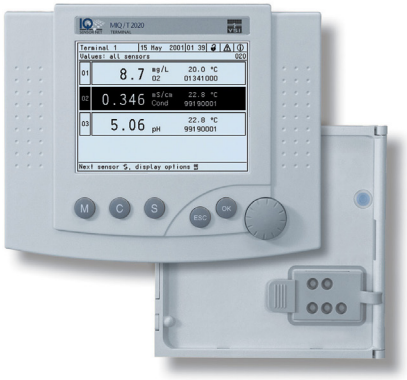
SPECIFICATIONS

DOCUMENT #W100



YSI IQ SensorNet 2020 XT

Continuous Water Quality Monitoring for Process Control

Powerful yet simple, the YSI **IQ SensorNet 2020 XT** is a modular water quality system for complete process control designed for wastewater. The 2020 XT network can accept additional sensors easily at any time and grow as your facility grows. Benefits include better network visibility and management, early detection of network failures, improved compliance with regulatory targets, and cost savings (energy, pump/blower maintenance, labor).

Parameters:

Dissolved Oxygen (optical or electrochemical)
pH
ORP/Redox
Conductivity/Salinity
Temperature
Turbidity*
TSS (total suspended solids)*
Ammonium
Nitrate
Potassium
COD (chemical oxygen demand)*
TOC (total organic carbon)*
DOC (dissolved organic carbon share of TOC)*
SAC (spectral absorption coefficient)*
BOD (biochemical oxygen demand)*

* ultrasonic cleaning for sensors

- 3-year instrument warranty
- User-replaceable cables and sensors. Many sensors provide ultrasonic cleaning.
- Centralized power supply along entire network; 2-wire cable provides power and communications
- Lightning protection along network
- 2020 XT provides tactile buttons; easily use while wearing gloves
- Modular expansion from 1 to 20 sensors; ability to extend network with additional modules
- Up to 48 output channels are possible
- LED status light
- Programmable access permission
- System redundancy if two terminals are used; use in one location or move from point to point

Building a system is easy...choose the IQ SensorNet 2020 XT, determine which modules are needed (control, communications, etc.), determine distances for cabling and select parameters.

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IQ SensorNet 2020 XT Terminal/Controller Specifications

Certifications	ETL, cETL (conforms with relevant UL and Canadian standards), CE
Electromagnetic Compatibility	EN 61326, Class B; FCC Class A, EMC for indispensable operation
Integrated Lightning Protection	According to EN 61326 enhanced over-voltage protection for *entire system*, implemented in each component
Cable	2-wire with shield for power supply and communications; resistant to polarity reversal; comprehensive EMC shield control; cable topology within network can be in the form of a line, tree, star or multiple star
	Total cable length max. = 1000 m (3280 ft) without signal amplifying; with signal amplifying module MIQ/JBR add an additional 1000 m
Radio	Radio transmission Class 1 with a range of 100 m (328 ft); max 300 m (984 ft)
Module Coupling at Rear	Combined mechanical and electrical connection for rapid coupling to modules; no wiring required
USB Interface	USB-A (host)
Display	Graphic display; resolution 320 x 240 pixels; visible area 114 x 86 mm (4.49 x 3.39 in); backlit
Control Keys/Buttons	5 operation keys: 3 master keys for Measurement (M), Calibration (C), Set/System settings (S)
	2 function keys for confirmation/switching menu OK (OK) and Escape (ESC)
	4 directional button for quick selection of software functions and input of alphanumeric values
Datalogger	MIQ/TC 2020 XT; data memory for up to 525,600 data sets
Electrical	Directly via the IQ SensorNet when coupled to an MIQ module
Temperature Conditions	Operating Temperature: -4 to 131 °F (-20 to 55 °C)
	Storage Temperature: -13 to 149 °F (-25 to 65 °C)
Enclosure	Material: ASA (Acrylonitrile-Styrene-Acryloesterpolymer)
	Rating: IP-66, equivalent to NEMA 4X (not suitable for conduit connection)
	Dimensions: 210 W x 170 H x 40 D mm (8.27 W x 6.69 H x 1.57 D in)
	Weight: 0.7 kg (1.54 lbs)
	Warranty: 3 years

IQ SensorNet 2020 XT Module (MIQ) Specifications

Module Coupling at Front	Combined mechanical and electrical connection for rapid docking and removal of the terminal and docking additional modules
Module Coupling at Rear	Combined mechanical and electrical connection for docking additional modules; a total of 3 modules as a stacked mounted unit
Cable Feeds	4 screw cable glands M 16 x 105
Terminal Connections	Screw terminal strips; terminal area for solid connectors 0.2 to 4.0 mm for flexible connectors 0.2 to 2.5 mm; accessible through cover Used for connecting sensors or as an input/output or for looping through/branching of the IQ SensorNet cable
Additional Functions	Two LEDs (yellow and red) for monitoring the operating voltage; lightning protection; connection resistant to reversed polarity; integrated local identity; integrated switchable terminal resistor (SN terminator)
Enclosure	Material: PC 20% GF (Polycarbonate with 20% fiberglass)
	Rating: IP-66, equivalent to NEMA 4X (not suitable for conduit connection)
	Dimensions: 144 W x 144 H x 52 D mm (5.67 W x 5.67 H x 2.05 D in)
	Weight: 0.5 kg (1.1 lbs)
	Warranty: 3 years

IQ SensorNet 2020 XT Ordering Information (order 2020 XT, modules, cables, sensors separately)

MIQ/TC 2020 XT Item #470 000Y	Central terminal/controller unit only. Required to be installed once at any point, remains in the system and cannot be removed. Operation mode is shown through status LED. Up to 20 sensors can be connected.
MIQ/TC 2020 XT-H3 #470 016Y	Multiparameter system consisting of 2020 XT, MIQ/CR3 (3 analog and 3 relays) and MIQ/PS (power supply). Up to 20 sensors can be connected. Item
MIQ/TC 2020 XT-H3 C6 #470 017Y	Multiparameter system consisting of 2020 XT, MIQ/C6 (6 analog outputs) and MIQ/PS (power supply). Up to 20 sensors can be connected. Item

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SPECIFICATIONS

DOCUMENT #W115

YSI IQ SensorNet FDO H®

Optical Dissolved Oxygen Sensor, certified for *Hazardous locations* (Class 1, Div. 2) according to NFPA 820

The FDO H is an optical, luminescent based DO sensor for the IQ SensorNet system that has been certified for use in Class 1, Division 2 hazardous locations according to NFPA 820.

The FDO's optical-based sensor provides continuous and precise dissolved oxygen measurements without regular maintenance requirements allowing for effective aeration control. This helps improve plant efficiency while lowering energy costs.

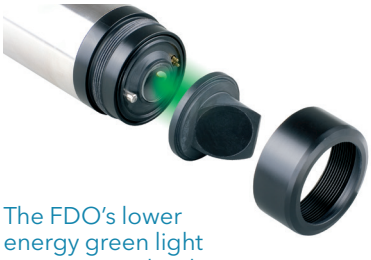
Parameters:
Dissolved Oxygen (optical)
Temperature

- Intelligent Sensor Cap
  The sensor cap is individually factory calibrated. Calibration data is stored on a chip that is embedded in the sensor cap. No need to enter calibration coefficients. When a new cap is installed, the coefficients are recognized and sent directly to the controller terminal eliminating the need to manually enter information.

- Equal Path Reference System
  The optical measurement and reference paths are identically designed. This allows for identical aging of the components which enables accurate compensation and eliminates calibrations. That's correct, there is no calibration required.

- Green Light Technology
  Softer, low-intensity excitation light increases the lifetime of the cap. This translates into a two year warranty on the standard cap.

- 2-year Warranty



The FDO's lower energy green light excitation technology extends the sensor cap lifetime.

IQ SensorNet FDO H Optical Dissolved Oxygen General Specifications

Sensor Cap Replacement	Yes; the cap, can be replaced. Automatic recognition by the sensor of the cap including the factory calibration	
Calibration Capability	Yes; not required, factory calibrated	
Interferences	None; Non-sensitive to against hydrogen sulfide, chlorine, ionogenic substances	
Minimum Flow Rate	None; no flow requirement	
Response Time at 25 °C	700 IQ H - T90 = <150 seconds; T95 = <200 seconds 701 IQ H - T90 = <60 seconds; T95=<80 seconds	
Signal Output	Digital	
Lightning Protection	Yes	
Power Consumption	0.7 watts	
Maximum Pressure	10 bars (145 psi); with sensor connection cable	
Electrical Connections	2-wire shield cable with quick sensor connection	
Conformance/Certifications Electrical	UL 61010-1, CAN/CSA C22.2 #61010.1	
Hazardous Location Ratings	Conforms to: ANSI/ISA-12.12.01, CAN/CSA C22.2 #213 for the following location rating: Class 1 Division 2, Groups A, B, C, D T6, Class 1 Zone 2, Group IIC T6 (must be used with the IQ SensorNet cable and MIQ/BB2 barrier box)	
Temperature Conditions	700 IQ H: Operating Temperature: 23 to 122 °F (-5 to 50 °C)	701 IQ H: 23 to 104 °F (-5 to 40 °C)
	Storage Temperature: 14 to 122 °F (-10 to 50 °C)	14 to104 °F (-10 to 40 °C)
Sensor	Material:	Housing - VA steel 1.4571; Sensor Cap and Locking Cap - POM (Polyoxmethylene), PVS, silicone, PMMA
	Rating:	IP-68; waterproof
	Dimensions: (length x diameter)	400 L x 40 D mm (15.75 L x 1.57 D in)
	Weight:	900 g (1.98 lbs)
	Warranty:	2 years

IQ SensorNet FDO H Optical Dissolved Oxygen Technical Specifications

Dissolved Oxygen Range		
	Concentration	0 to 20.00 mg/L
	Saturation	0 to 200.0%
Dissolved Oxygen Resolution		
	Concentration	0.01 mg/L
	Saturation	0.1%
Temperature		
	Measurement	23 to 122 °F (-5 to 50 °C)
	Compensation	23 to 122 °F (-5 to 50 °C)

IQ SensorNet FDO H Ordering Information (order 2020 XT terminal, modules, cables, sensors separately)

FDO 700 IQ H (#207 065Y)	Optical DO sensor for monitoring and control in Class 1 Div. 2 locations; includes 1 factory calibrated sensor cap
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
MIQ/BB1 (#207 001Y)	Barrier box for connecting FDO H 700/1 to an IQ SensorNet - Class 1 Div 2, Groups A,B,C,D, Zone 2 Group IIC

The Barrier Box (MIQ/BB1) must be used for connection of the FDO H. Refer to the following documents for proper installation:

- Control drawing, YSI document no. 28123 (seeMIQ/BB1 operating manual)
- MIQ/BB1 operating manual
- All applicable electrical code regulations

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Installation, Operation, and
Maintenance manual

885830_2.0

LTU 801

FLYGT
a xylem brand

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1 Introduction and Safety

1.1 Introduction

Purpose of the manual

The purpose of this manual is to provide necessary information for installation, operation, and maintenance of the unit.

Read and keep the manual

Save this manual for future reference, and keep it readily available at the location of the unit.

CAUTION:

Read this manual carefully before installing and using the product. Improper use of the product can cause personal injury and damage to property, and may void the warranty.

The equipment, and its functioning, may be impaired if used in a manner not specified by the manufacturer.

Intended use

WARNING:

Operating, installing, or maintaining the unit in any way that is not covered in this manual could cause death, serious personal injury, or damage to the equipment and the surroundings. This includes any modification to the equipment or use of parts not provided by Xylem. If there is a question regarding the intended use of the equipment, please contact a Xylem representative before proceeding.

1.2 Safety terminology and symbols

About safety messages

It is extremely important that you read, understand, and follow the safety messages and regulations carefully before handling the product. They are published to help prevent these hazards:

- Personal accidents and health problems
- Damage to the product and its surroundings
- Product malfunction

Hazard levels

Hazard level	Indication
DANGER:	A hazardous situation which, if not avoided, will result in death or serious injury
WARNING:	A hazardous situation which, if not avoided, could result in death or serious injury
CAUTION:	A hazardous situation which, if not avoided, could result in minor or moderate injury

Hazard level	Indication
NOTICE:	Notices are used when there is a risk of equipment damage or decreased performance, but not personal injury.

Special symbols

Some hazard categories have specific symbols, as shown in the following table.

Electrical hazard	Magnetic fields hazard
Electrical Hazard:	CAUTION:

1.3 User safety

Introduction

All government regulations, local health and safety directives must be observed.

Prevent danger due to electricity

All danger due to electricity must be avoided. Electrical connections must always be carried out in compliance with the following:

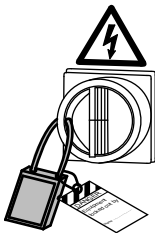
- The standard connections shown in the product documentation that is delivered together with the product
- All international, national, state, and local regulations. (For details, consult the regulations of your local electricity supplier.)

For more information about requirements, see sections dealing specifically with electrical connections.

Power lock-out

DANGER: Electrical Hazard

Before starting work on the unit, make sure that the unit and the control panel are isolated from the power supply and cannot be energized. This applies to the control circuit as well.



Qualification of personnel

WARNING: Electrical Hazard

Risk of electrical shock or burn. A certified electrician must supervise all electrical work. Comply with all local codes and regulations.

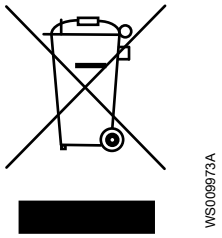
All work on the product must be carried out by certified electricians or Xylem authorized mechanics.

Xylem disclaims all responsibility for work done by untrained, unauthorized personnel.

1.4 End of life product disposal

Handle and dispose of all waste in compliance with local laws and regulations.

EU only: Correct disposal of this product – WEEE Directive on waste electrical and electronic equipment

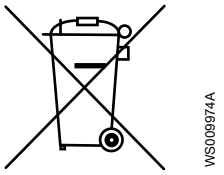


This marking on the product, accessories or literature indicates that the product should not be disposed of with other waste at the end of its working life.

To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate these items from other types of waste and recycle them responsibly to promote the sustainable reuse of material resources.

Waste from electrical and electronic equipment can be returned to the producer or distributor.

EU only: Correct disposal of batteries in this product



This marking on the battery, manual or packaging indicates that the batteries in this product should not be disposed of with other waste at the end of its working life. Where marked, the chemical symbols Hg, Cd or Pb indicate that the battery contains mercury, cadmium or lead above the reference levels in EC Directive 2006/66. If batteries are not properly disposed of, these substances can cause harm to human health or the environment.

To protect natural resources and to promote material re-use, please separate batteries from other types of waste and recycle them through your local, free battery return system.

1.5 Spare parts

CAUTION:

Only use the manufacturer's original spare parts to replace any worn or faulty components. The use of unsuitable spare parts may cause malfunctions, damage, and injuries as well as void the warranty.

1.6 Warranty

For information about warranty, see the sales contract.

1.7 Support

Xylem only supports products that have been tested and approved. Xylem does not support unapproved equipment.

2 Product Description

2.1 Product design

The unit is a submersible level transmitter that measures and transmits liquid levels. The unit includes a sensor and a cable holder.

The preset measuring range is changed using a USB (Universal Serial Bus) interface and a computer software.

Intended use

The unit is used in these locations.

- Pump stations
- Sewage treatment plants
- Public utilities
- Industrial processing tanks
- Drains
- Open channels

Media applications

The unit is used in these media.

- Wastewater
- Process water
- Acids, bases and ferric chloride

  However, a pH value of less than 4 can reduce the lifespan of the unit. For more information, contact the local sales and service representative.

Parts

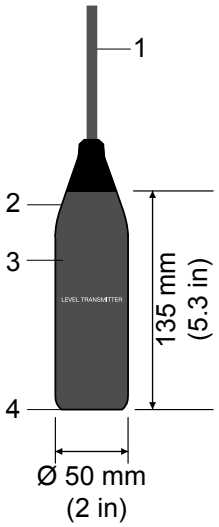


Figure 1: Without threaded top

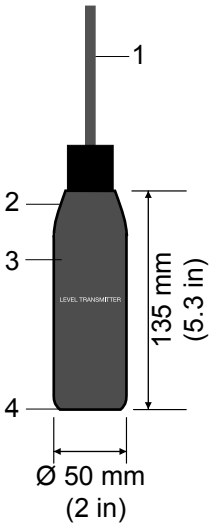


Figure 2: With threaded top

Part	Denomination	Material
1	Cable	PUR (polyurethane)
2	Housing	Ryton PPS (polyphenylene sulfide)
3	Measurement cell packing	Silicone
4	Diaphragm	99.9% pure ceramic (Al_2O_3)

2.2 Technical data

Electrical specifications

Data	Description
Stability and linearity	Maximum ± 0.2% full scale (FS)
Measurement range accuracy	Maximum ± 0.1% FS at 10–30°C (50–86°F) Maximum ± 0.2% FS at full temperature range
Measurement principle	Relative pressure with a ceramic diaphragm
Long-term stability	Maximum ± 0.1% FS per year
Power supply	10–30 V DC, 12–30 V DC for cable lengths more than 110 m (360.9 ft)
Output signal	2-wire 4–20 mA, passive signal
Degree of protection	IP 68

Temperature specifications

Feature	Description
Range	-10–70°C (14–158°F)
Zero drift deviation	Maximum ± 0.02% per °C
FS deviation	Maximum ± 0.01% per °C

Cable specifications

Data	Description
Diameter	Ø 8.75 mm (0.34 in) Minimum 8.5 mm (0.33 in), maximum 9.0 mm (0.35 in) tolerance
Wire specification	2 x 0.5 mm^2 (20 AWG) for pressure 5 x 0.15 mm^2 (24 AWG) for data
Length	For more information, see *Technical Reference* on page 14 .

2.3 Approvals and standards

Directive	Description
EMC 2014/30/EU	EN 61326-1, EN 61326-2-3 EN 55011, 61000-4-2, 61000-4-3, 61000-4-4, 61000-4-5, 61000-4-6, 61000-4-8, EN 61000-6-4, EN 61000-6-2
ATEX 2014/34/EU	EN 60079-0, EN 60079-11 II 2G Ex ia IIC T6 (-20°C≤Ta≤40°C) II 2G Ex ia IIC T5 (-20°C≤Ta≤50°C) II 2G Ex ia IIC T4 (-20°C≤Ta≤80°C)
UL	UL 913 UL 60079-0, UL 60079-11 by UL 913

If the unit is installed in an explosive atmosphere, then use an approved Zener barrier or isolator.

E254912

3 Mechanical Installation

3.1 Precautions

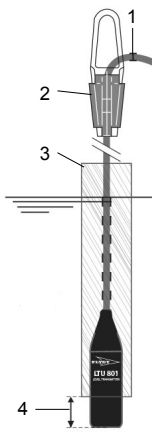
Before starting work, make sure that the safety instructions in the chapter *Introduction and Safety* on page 2 have been read and understood.

3.2 Install the unit

Follow these guidelines to avoid damaging the unit.

- Do not drop the unit into the liquid.
- Do not allow sharp objects to penetrate the diaphragm.
- Avoid overpressure. For more information, see *Technical Reference* on page 14 .

3.2.1 Install without threaded top



1. Cable, diameter 8.5–9.0 mm (0.33–0.35 in)
2. Cable bracket
3. Protective pipe, nominal diameter ≥ 75 mm (3 in)
4. Height clearance between the pipe and unit bottom, 25–50 mm (1–2 in)

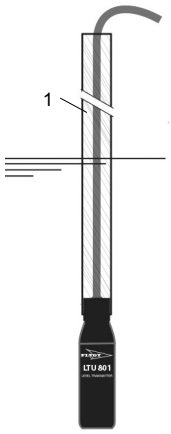
1. Attach a hook above the location of measurement.

   The hook has to be strong enough to support the weight of the cable.
2. Carefully lower the unit until it is at the bottom of its range, ≥ 4 mA.

   Do not exceed the depth range of the unit.
3. If necessary, attach the unit correctly to the cable bracket.
4. If the unit is used in a location with turbulence, then install a pipe. The pipe protects the unit from hitting the walls or other objects.

   The pipe cannot cover at least 25 mm (0.98 in) of the bottom of unit.

3.2.2 Install with threaded top



1. Protective pipe, nominal diameter 25.4 mm (1 in)

1. Install the unit onto a pipe.
2. Install the pipe tightly at the measuring location.
3. Lower the unit carefully into the liquid.

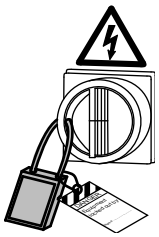
4 Electrical Installation

Precautions

Before starting work, make sure that the safety instructions in the chapter *Introduction and Safety* on page 2 have been read and understood.

DANGER: Electrical Hazard

Before starting work on the unit, make sure that the unit and the control panel are isolated from the power supply and cannot be energized. This applies to the control circuit as well.



DANGER: Electrical Hazard

All electrical equipment must be grounded (earthed). Test the ground (earth) lead to verify that it is connected correctly and that the path to ground is continuous.

WARNING: Electrical Hazard

Risk of electrical shock or burn. A certified electrician must supervise all electrical work. Comply with all local codes and regulations.

WARNING: Electrical Hazard

There is a risk of electrical shock or explosion if the electrical connections are not correctly carried out, or if there is fault or damage on the product. Visually inspect equipment for damaged cables, cracked casings or other signs of damage. Make sure that electrical connections have been correctly made.

CAUTION: Electrical Hazard

Prevent cables from becoming sharply bent or damaged.

4.1 Wiring

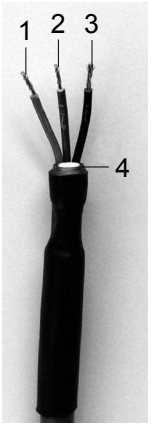


Figure 3: A cable that is delivered from the factory

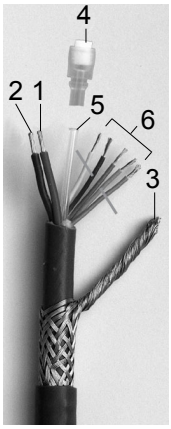


Figure 4: A cable that is cut and stripped

Number	Color	Description
1	Red or white	10–30 V DC
2	Brown	4–20 mA, out
3	Black	Protective earth (PE) connection (ground), screen
4	–	Moisture filter keeps moisture out of the air pressure compensation tube and the internal electronics of the unit
5	Transparent	Air pressure compensation tube
6	–	Programming wires

The red or white, brown, and black wires are numbered 1, 2 and 3 in the factory.

4.1.1 Prepare the cable

Do not connect any of the programming wires to avoid damage to the unit.

Do not connect a programming wire to the unit or try to program the unit while it is located in a hazardous area.

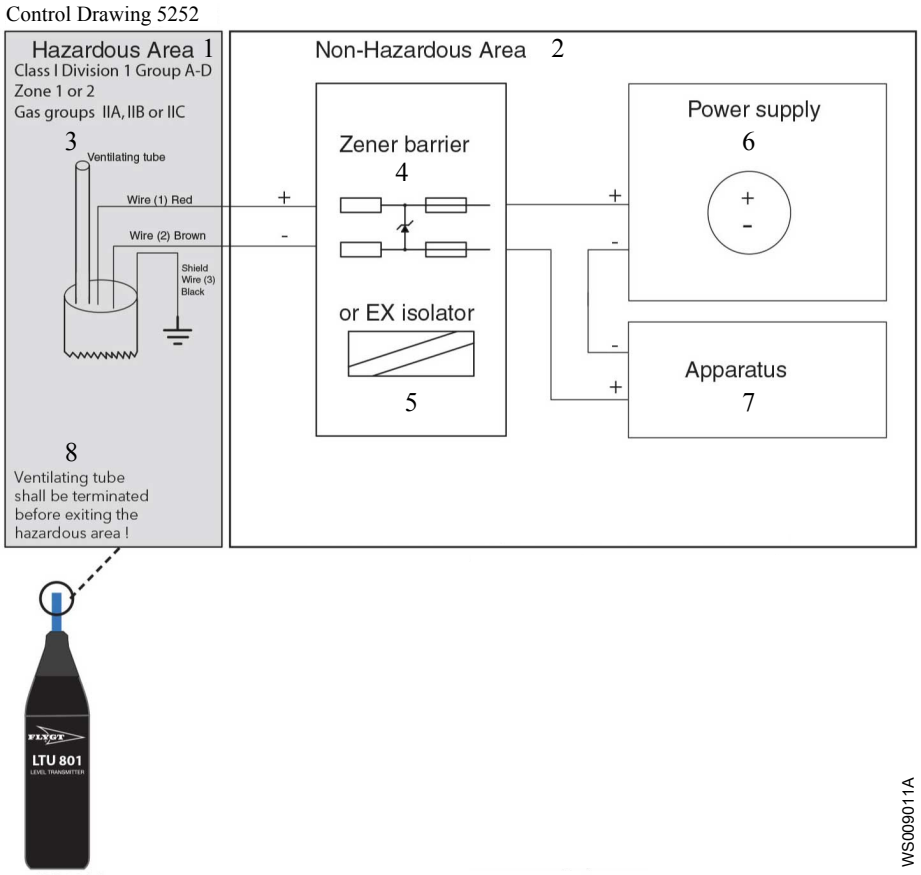
Do not block or squeeze the air pressure compensation tube.

Make sure that no moisture enters the air pressure compensation tube.

Do not cut or remove the moisture filter.

- If the cable is cut and stripped, then connect the shield as wire number 3.
- Cut the programming wires in different lengths to prevent them from short circuit.
- If the cable is cut or spliced, then carefully reposition the moisture filter.

4.1.2 Zener barrier connection



1. Hazardous Area, Class I Division 1 Group A-D, Zone 1 or 2, Gas groups IIA, IIB, or IIC, T4/T5/T6
2. Non-hazardous Area
3. Ventilation tube
4. Zener barrier
5. EX Isolator
6. Power supply
7. Apparatus
8. The ventilation tube must be terminated before it leaves a hazardous area

Characteristics

Data	Value
Maximum input voltage	30 V DC
Maximum input electric current	0.101 A
Maximum input power	0.75 W
Internal capacitance (Ci)	3.5 nF/m + capacitance cable
Internal inductance (Li)	7 µH + inductance cable
Capacitance (C) cable	0.8 nF/m
Inductance (L) cable	1.5 µH/m

Parameters

These parameters apply:

- When the Ci and Li of the connected unit exceeds 1% of the Co, external capacitance, and Lo, external inductance, parameters, excluding the cable. Then 50% of the Co and Lo parameters apply and cannot be exceeded.
- The maximum cable length is calculated based on the internal capacity, 3.5 nF, and internal self-induction, 7 µH, of the unit. The cable capacity, 0.8 nF/m, and self-induction, 1.5 µH/m, is added.

- These two values are added to calculate the total capacity and total self-induction.
- The maximum capacity and self-induction for the connection are indicated on the Zener barrier or isolator.

  These two values cannot be exceeded.

4.2 Connect the unit

1. Connect the red or white wire to the power supply output.
2. Connect the brown wire to the 4–20 mA analog input.
3. Connect the black wire to the signal ground connection.

4.3 Increase the cable length

When the cable is extended, the complete capacity and self-induction cannot exceed the maximum specifications.

Use a shielded cable to prevent electrical disturbances.

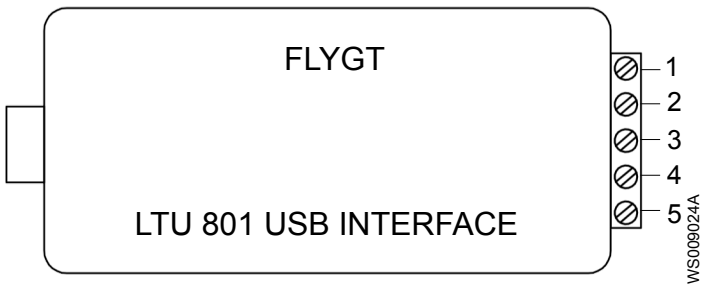
Do not allow signal cables in the proximity of power cables.

- Splice it with another cable.
- Use a junction box to extend the cable.

  The pressure equalization hose in the cable makes a direct splice impossible. For more information, contact the sales and service representative.

4.4 Prepare to rescale the measuring range

The unit must have a separate supply of 10–30 V DC from the installation.



1. Green
2. Brown
3. Gray
4. White
5. Yellow

Figure 5: Wiring connection

The unit can be programmed to any measuring range, 0–0.3 m (0–0.98 ft) to 0–300 m (0–984.2 ft).

1. Install the computer software from http://tpi.xyleminc.com. For more information, contact the sales and service representative.
2. Connect the USB interface to the computer.
3. Disconnect and reconnect the USB interface to the computer.
4. Connect the programming wires from the unit to the USB interface.

   The unit is ready for changes in the settings.

   The computer software automatically finds the USB interface.
5. Click **Read**.
6. Select a new range for the unit.

   The range is 30–100%.
7. Follow the instructions in the computer software to transfer the information to the unit.

5 Maintenance

5.1 Precautions

Before starting work, make sure that the safety instructions in the chapter *Introduction and Safety* on page 2 have been read and understood.

Cleaning

If the unit has buildup or a clogged diaphragm, clean the unit by rinsing it with a mild detergent.

6 Technical Reference

Measuring ranges

Table 1: Without threaded top

Measuring range, m	Overpressure, bar	Cable length, m	UL certification	Part number
0–2	6	12	-	84 62 30
0–5	10	12	-	84 62 31
0–5	10	30	-	84 62 33
0–5	10	50	-	84 62 34
0–10	10	12	-	84 62 35
0–10	10	25	-	84 62 36

Table 2: With threaded top

Measuring range, m	Overpressure, bar	Cable length, m	UL certification	Part number
0–5	10	12	-	84 62 32

Options

- Free computer software for USB interface that is downloadable from TPI
- Non-standard cable lengths
- Non-standard measuring range

For more information, contact the local sales and service representative.

Accessories and spare parts

Item	Accessory	Spare part	Part number
Operator panel for level indication	x	-	83 45 30
Junction box, including: • Protection for cable ends and air tube for cable splicing • Surge arrestor • VFD (variable frequency drive) noise or interference protection • Extra moisture protection The junction box is rated IP 67 and can be mounted outdoors.	x	-	83 95 05
Zener barrier for installation in hazardous areas	x	-	84 30 55
USB interface	x	-	85 00 43
Cable holder	-	x	83 21 74 or 83 73 88

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1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services, and agricultural settings. With its October 2016 acquisition of Sensus, Xylem added smart metering, network technologies and advanced data analytics for water, gas and electric utilities to its portfolio of solutions. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

For more information on how Xylem can help you, go to www.xylem.com

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The original instruction is in English. All non-English instructions are translations of the original instruction.

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Let's Solve Water

Technical Specification

891480_17.0

ENM 10

Level switch

FLYGT
a xylem brand

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1 Product Description

1.1 Product design

Usage

ENM-10 is a level regulator for level control applications. The level regulator starts and stops a pump or activates an alarm device when the liquid level reaches the regulator.

Materials

Denomination	Standard version	Ex version
Regulator casing	Polypropylene	Polypropylene with black conductive casing
Bend relief	EPDM rubber	NBR-PVC rubber
Cable sheath	PVC	NBR-PVC rubber

The plastic components are welded and screwed together.

1.2 Technical data

Application limits

Feature	Value
Liquid temperature	Minimum 0°C (32°F) Maximum 60°C (140°F)
Liquid density	Minimum 0.65 g/cm^3 Maximum 1.5 g/cm^3

Electrical specifications

Feature	Value
Degree of protection	IP68, 20 m (65 ft), 2 bars
Interrupting capacity of micro switch	AC, resistive load, 250 V 10 A AC, inductive load, 250 V 3 A cos ϕ = 0.5 DC, 30 V 5 A
Interrupting capacity of gold-plated micro switch	AC, resistive load, 250 V 10 A AC, inductive load, 250 V 3 A cos ϕ = 0.5 DC, 24 V 10 mA

Voltage limits are subject to local regulations.

Density ranges

Density g/cm^3	Regulator length mm (in.)	Diameter mm (in.)
0.65 – 0.80	194 (7 10/16)	100 (4)
0.80 – 0.95	177 (7)	100 (4)
0.95 – 1.10	162 (6 3/8)	100 (4)
1.05 – 1.20	142 (5 9/16)	100 (4)
1.20 – 1.30	133 (5 1/4)	100 (4)
1.30 – 1.40	130 (5 2/16)	100 (4)

Density g/cm^3	Regulator length mm (in.)	Diameter mm (in.)
1.40 – 1.50	126 (5)	100 (4)

Weight

A regulator with standard density and 20 m cable weighs approximately 2 kg (4.5 lb).

1.3 Cables

Lengths

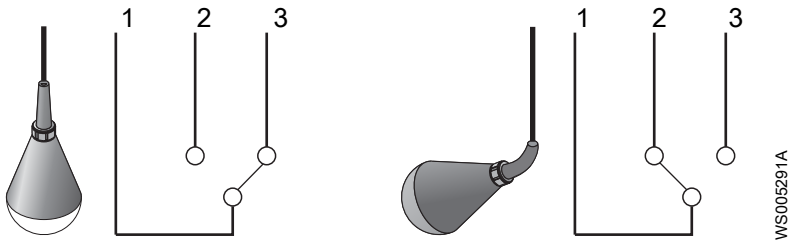
For liquids with specific density between 0.95 and 1.10 g/cm^3, the following cables are available:

Version	Lengths m (ft)
Standard	• 6 m (20 ft) • 13 m (42 ft) • 20 m (65 ft) • 30 m (100 ft) • 50 m (167 ft)
Ex	• 6 m (20 ft) • 13 m (42 ft) • 20 m (65 ft) • 30 m (98 ft) • 50 m (164 ft)

Diameter

The cable diameter for all product variants is 6.7 mm (0.26 in), +/- 0.2 mm (0.00787 in).

Color codes



Cable	1	2	3
Color	Grey	Black	Brown

1.4 Approvals and standards

Standard approvals

LVD approval according to EN61058
CSA approval: Certificate Number 1330172
Cl. I Zone 0, Gr. IIC
CL.I Div.1 Gr A, B, C and D
Cl.II Gr. E, F, and G

Ex approvals

IECEx ia IIC T4 Ga: -20°C≤Ta≤60°C
IECEx NEMKO 09.0008
ATEX II 1G Ex ia IIC T4 Ga

NEMKO 10 ATEX 1082

Applied standards for ATEX and IEC

- EN 60079-0:2012 / IEC 60079-0:2011
- EN 60079-11:2012 / IEC 60079-11:2011

Intrinsically safe circuits are required for the automatic control system. Use a Zener barrier, for example, part number 84 01 07.

The electrical connections must comply with the Ex regulations of the national submitter.

2 References

2.1 Chemical resistance tables

The tables show the degree of resistance the level regulator has to different chemicals at two different temperatures. The density of the liquid determines the buoyancy of the regulator.

Acids

Acid	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Acetic acid 50%	1	2	0	0
Acetic acid 75%	2	2	0	0
Benzoic acid	2	2	0	0
Boric acid 5%	0	–	0	0
Butyric acid	2	2	2	2
Chromic acid 10%	0	2	2	2
Citric acid	0	1	0	0
Hydrobromic acid 5%	1	2	0	0
Hydrochloric acid 10%	0	1	0	1
Hydrochloric acid 37%	1	2	0	2
Hydrocyanic acid 10%	0	0	1	2
Hydrofluoric acid 5%	0	2	0	1
Hypochloric acid	1	2	2	2
Maleic acid	2	2	2	2
Nitric acid 5%	1	1	1	1
Nitric acid 65%	2	2	2	2
Oleic acid	1	2	2	2
Oxalic acid 50%	1	1	1	2
Phosphoric acid 25%	0	0	1	2
Phosphoric acid 85%	0	0	1	2
Sulphuric acid 10%	1	2	1	2
Sulphuric acid 78%	2	2	2	2
Tannic acid	0	0	0	0
Tartaric acid	1	1	1	1

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

Alkalis

Alkali	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Ammonium hydroxide	0	–	0	0
Calcium hydroxide	0	0	0	0

Alkali	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Potassium hydroxide	1	2	0	0
Sodium hydroxide	1	2	0	0

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

Salts

Salt	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Aluminum chloride	0	0	0	0
Calcium sulphate	0	0	0	0
Calcium chloride	0	0	0	0
Calcium nitrate	0	0	0	0
Copper chloride	0	0	0	0
Copper sulphate	0	0	0	0
Ferric chloride	0	0	0	0
Ferrous sulphate	0	0	0	0
Magnesium chloride	0	0	0	0
Potassium sulphate	0	0	0	0
Potassium nitrate	0	0	0	0
Potassium carbonate	1	1	1	1
Potassium bicarbonate	0	0	0	0
Sodium sulphate	0	0	0	0
Sodium chloride	0	0	0	0
Sodium nitrate	0	0	0	0
Sodium bicarbonate	0	0	0	0
Sodium carbonate	0	0	0	0
Tin chloride	1	1	1	1
Zinc sulphate	0	0	0	0
Zinc chloride	0	0	0	0

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

Oils

Oil	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Castor oil	1	1	1	1
Coconut oil	0	–	0	2
Corn oil	2	2	2	2
Diesel oil	2	2	2	2
Linseed oil	2	2	2	2
Mineral oils	2	2	2	2
Olive oil	1	1	1	1
Silicone oils	0	0	0	0

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

Solvents and miscellaneous

Chemical	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Acetone	2	2	2	2
Aniline	2	2	1	2
Benzene	2	2	2	2
Butyl alcohol	2	2	0	1
Carbon tetrachloride	2	2	2	2
Chlorobenzene	2	2	2	2
Chloroform	2	2	2	2
Ethyl alcohol	2	2	0	1
Ethyl ether	2	2	2	2
Ethyl acetate	2	2	2	2
Ethylene dichloride	2	2	2	2
Ethylene chloride	2	2	2	2
Formaldehyde 37%	1	2	0	0
Gasoline	2	2	2	2
Kerosene	2	2	2	2
Methyl alcohol	2	2	0	0
Methyl ethyl ketone	2	2	2	2
Methylene chloride	2	2	2	2
Nitrobenzene	2	2	2	2
Phenol	2	2	2	2
Toluene	2	2	2	2
Trichlorethylene	2	2	2	2
Turpentine	2	2	2	2
Xylene	2	2	2	2

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

Gases

Gas	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Carbon dioxide	0	0	0	0
Carbon monoxide	0	0	0	0
Chlorine – wet	2	2	2	2
Hydrogen sulfide	0	0	1	1
Sulphur dioxide – wet	1	1	2	2

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

2.2 Product range

Version	For density (g/cm^3)	Color of level switch	Length of cable (m)	Type of cable[1]	Approvals	For market
582 88 00	0.65–0.80	Blue	20	1	CE	International
582 88 01	0.80–0.95	Blue	20	1	CE	International
582 88 02	0.95–1.10	Blue	6	1	CE	International
582 88 03	0.95–1.10	Blue	13	1	CE	International
582 88 04	0.95–1.10	Blue	20	1	CE	International
582 88 05	1.05–1.20	Blue	20	1	CE	International
582 88 06	1.20–1.30	Blue	20	1	CE	International
582 88 07	1.30–1.40	Blue	20	1	CE	International
582 88 08	1.40–1.50	Blue	20	1	CE	International
582 88 09	0.65–0.80	Gray	20	3	CSA/CE	Canada
582 88 10	0.80–0.95	Gray	20	3	CSA/CE	Canada
582 88 11	0.95–1.10	Gray	6	3	CSA/CE	Canada
582 88 12	0.95–1.10	Gray	13	3	CSA/CE	Canada
582 88 13	0.95–1.10	Gray	20	3	CSA/CE	Canada
582 88 14	1.05–1.20	Gray	20	3	CSA/CE	Canada
582 88 15	1.20–1.30	Gray	20	3	CSA/CE	Canada
582 88 16	1.30–1.40	Gray	20	3	CSA/CE	Canada
582 88 17	1.40–1.50	Gray	20	3	CSA/CE	Canada
582 88 18	0.65–0.80	Gray	20	1	CSA/CE	Canada
582 88 19	0.80–0.95	Gray	20	1	CSA/CE	Canada
582 88 20	0.95–1.10	Gray	6	1	CSA/CE	Canada
582 88 21	0.95–1.10	Gray	13	1	CSA/CE	Canada
582 88 22	0.95–1.10	Gray	20	1	CSA/CE	Canada
582 88 23	1.05–1.20	Gray	20	1	CSA/CE	Canada
582 88 24	1.20–1.30	Gray	20	1	CSA/CE	Canada
582 88 25	1.30–1.40	Gray	20	1	CSA/CE	Canada
582 88 26	1.40–1.50	Gray	20	1	CSA/CE	Canada
582 88 36	0.95–1.10	Gray	30	3	CSA/CE	Canada
582 88 37	0.95–1.10	Gray	50	3	CSA/CE	Canada
582 88 38	0.95–1.10	Gray	100	3	CSA/CE	Canada
582 88 39	0.95–1.10	Gray	150	3	CSA/CE	Canada
582 88 51	0.95–1.10	Red	65	2	CE	International
582 88 52	0.95–1.10	Red	6	2	CE	International
582 88 53	0.95–1.10	Red	13	2	CE	International
582 88 54	0.95–1.10	Red	20	2	CE	International
582 88 57	0.95–1.10	Red	20	2	CE	Canada
582 88 70	0.65–0.80	Blue	20	3	CE	International
582 88 71	0.80–0.95	Blue	20	3	CE	International
582 88 72	0.95–1.10	Blue	6	3	CE	International
582 88 73	0.95–1.10	Blue	13	3	CE	International

[1] See *Type of cables* on page 9.

Version	For density (g/cm^3)	Color of level switch	Length of cable (m)	Type of cable[1]	Approvals	For market
582 88 74	0.95–1.10	Blue	20	3	CE	International
582 88 75	1.05–1.20	Blue	20	3	CE	International
582 88 76	1.20–1.30	Blue	20	3	CE	International
582 88 77	1.30–1.40	Blue	20	3	CE	International
582 88 78	1.40–1.50	Blue	20	3	CE	International
582 88 79	0.95–1.10	Blue	65	1	CE	International
582 88 80	0.95–1.10	Blue	30	1	CE	International
582 88 81	0.95–1.10	Blue	50	1	CE	International
582 88 82	0.95–1.10	Gray	30	1	CSA/CE	Canada
582 88 83	0.95–1.10	Gray	50	1	CSA/CE	Canada
582 88 86	0.95–1.10	Red	30	2	CE	International
582 88 87	0.95–1.10	Red	50	2	CE	International
582 88 90	0.95–1.10	Blue	30	3	CE	International
582 88 91	0.95–1.10	Blue	50	3	CE	International
582 88 92	0.95–1.10	Red	6	2	CE	Japan
582 88 93	0.95–1.10	Red	13	2	CE	Japan
582 88 94	0.95–1.10	Red	20	2	CE	Japan
582 88 95	0.95–1.10	Blue	6	1	CE	Japan
582 88 96	0.95–1.10	Blue	13	1	CE	Japan
582 88 98	0.95–1.10	Blue	50	1	CE	Japan
594 79 10	0.95–1.10	Blue	70	3	CE	International
594 79 13	0.95–1.10	Blue	100	3	CE	International
594 79 18	0.95–1.10	Blue	150	3	CE	International
594 79 19[2]	0.95–1.10	Blue	20	3	CE	International
594 79 20[2]	0.95–1.10	Gray	20	3	CSA/CE	International
594 79 21 [2]	0.95–1.10	Transparent	6	3	CE	For demonstration only.
594 79 40[2]	0.95–1.10	Black	6	3	ATEX/IECEx[3]	International
594 79 41[2]	0.95–1.10	Black	13	3	ATEX/IECEx[3]	International
594 79 42[2]	0.95–1.10	Black	20	3	ATEX/IECEx[3]	International
594 79 49[2]	0.95–1.10	Black	30	3	ATEX/IECEx[3]	International
594 79 50[2]	0.95–1.10	Black	50	3	ATEX/IECEx[3]	International

Type of cables

Type of cable	Jacket	Color coding of wires
1	Blue polyvinyl chloride (PVC)	Grey/Brown/Black
2	Red PVC	Grey/Brown/Black
3	Black nitrile rubber (NBR)/PVC	Grey/Brown/Black

1 See *Type of cables* on page 9.
2 Designed for low current, slow movements and oil. Includes micro switch with gold plated contacts.
3 Zener barrier 84 01 07 required.

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1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services settings. Xylem also provides a leading portfolio of smart metering, network technologies and advanced analytics solutions for water, electric and gas utilities. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

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SBR EQUIPMENT PROCUREMENT CONTRACT PROPOSAL

City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

RFP Due Date: 12/12/2024

Proposal Prepared for:

Westech Engineering

Proposal By:

Xylem Water Solutions USA, Inc.

N19W233993 Ridgeview Pkwy, Suite 200

Waukesha, WI 53188

Sanitaire Project No. 30323-23A

Local Sales Representative:

Beaver Equipment

Woodinville, WA

SANITAIRE

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City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

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City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Section 1: Bid Forms

A. Bid Form
B. Bid Security

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BID FORM FOR PROCUREMENT CONTRACT

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 1—BUYER AND BIDDER

1.01 This Bid is submitted to:

The City of Aumsville
595 Main Street
Aumsville, OR 97325

Note: Proposals shall be submitted to Westech Engineering, Inc. as noted in the Invitation for Proposals.

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into a Procurement Contract with Buyer in the form included in the Procurement Bidding Documents, and to furnish the following Goods and Special Services as specified or indicated in the Procurement Bidding Documents, for the prices and within the times indicated in this Bid, and in accordance with the other terms and conditions of the Procurement Bidding Documents.

(Check only one box)

☒ Sequencing Batch Reactor and Digester Equipment for the Aumsville Wastewater Treatment Plant

☐ Dissolved Air Floatation Equipment for the Aumsville Wastewater Treatment Plant

Proposers submitting proposals for both the Sequencing Batch Reactor (SBR) and the Dissolved Air Floatation (DAF) system shall submit separate sealed proposals for each system.

ARTICLE 2—BASIS OF BID

2.01 *Lump Sum Bids*

A. Bidder will furnish the Goods and Special Services in accordance with the Procurement Contract Documents for the following Procurement Contract Price(s):

1. Lump Sum Bid Price

*$167,342 of Lump Sum Bid Price is Non-BABA compliant.
**Price deductions available by selecting additional non-BABA compliant components identified as "OPTIONAL" on attachment to Manufacturer's Certification of Compliance Form.

Lump Sum Bid Price	$ 1,945,509.00

2.02 *Buyer's Contingency Allowance*

A. The Bid Price is supplemented by the following Buyer's Contingency Allowance, as described in the General Conditions, Paragraph 11.06:

Buyer's Contingency Allowance	$75,000

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2.03 *Total Bid Price*

A. The following Total Bid Price is the sum of the Lump Sum Bid Price from Paragraph 2.01and the Buyer's Contingency Allowance. The Total Bid Price, if accepted and incorporated in the Procurement Contract to be awarded, will be subject to any Buyer-accepted Alternates and to final Unit Price and Buyer's Contingency Allowance adjustments.

Total Bid Price	$ 2,020,509.00

ARTICLE 3—TIME OF COMPLETION

3.01 Bidder agrees that the furnishing of Goods and Special Services will conform to the schedule of Procurement Contract Times set forth in Article 2 of the Procurement Agreement.

3.02 Bidder accepts the provisions of the Procurement Agreement as to liquidated damages.

ARTICLE 4—ATTACHMENTS TO THIS BID

4.01 The following documents are attached to and made a condition of this Bid:

A. Required Bid security in the form prescribed in the Instructions to Bidders.

B. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids.

C. Information to document compliance with prequalification requirements listed in the Invitation for Proposals.

D. Manufacturer's Certification of Compliance form (see Instructions To Bidders) to demonstrate compliance with the Build American Buy American Act requirements of this contract.

E. If Bid amount exceeds $10,000, signed Compliance Statement (RD-400-6) Refer to specific equal opportunity requirements set forth in the Supplementary Conditions of the Construction Contract (EJCDC P-800).

F. If bid amount exceeds $25,000, signed Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – Lower Tier Covered Transactions (AD-1048).

G. If Bid amount exceeds $100,000, signed RD Instruction 1940-Q Exhibit A-1, Certification for Contracts, Grants, and Loans.

H. Sworn Statement of Good Faith Effort with Small, Women, or Minority Business Utilization Requirements.

I. ARPA/SLFRF Required Contract Clauses.

J. Certification Regarding Lobbying

K. Submittals required with the Proposal as described in Section 11300 Packaged SBR and Digester Equipment and Section 11400 Packaged DAF Equipment.

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ARTICLE 5—BIDDER'S ACKNOWLEDGMENTS

5.01 Bidder accepts all terms and conditions of the Instructions to Bidders. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period that Bidder may agree to in writing upon request of Buyer.

5.02 Bidder has examined and carefully studied the Procurement Bidding Documents, the related data identified in the Procurement Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged:

Addendum No.	Addendum Date
Addendum No. 1-25	11/14/2024
Addendum No. 2-18	11/19/2024

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Bidder's Representations*

A. In submitting this Bid, Bidder represents that:

1. Bidder has examined and carefully studied the Procurement Contract Documents.

2. If required by the Instructions to Bidders to visit the Point of Destination and the site where the Goods are to be installed or Special Services will be provided, or if, in Bidder's judgment, any observable local or site conditions may affect the delivery, cost, progress, or furnishing of the Goods and Special Services, then Bidder has visited the Point of Destination and site where the Goods are to be installed or Special Services will be provided (as applicable) and become familiar with and is satisfied as to the observable local and site conditions that may affect delivery, cost, progress, and furnishing of the Goods and Special Services.

3. Bidder is familiar with and is satisfied as to all Laws and Regulations that may affect the cost, progress, and performance of Seller's obligations under the Procurement Contract, including all Domestic Preference requirements.

4. Bidder has carefully studied, considered, and correlated the information known to Bidder with respect to the effect of such information on the cost, progress, and performance of Seller's obligations under the Procurement Contract.

5. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Procurement Contract Documents, and the written resolution (if any) thereof by Engineer is acceptable to Bidder.

6. The Procurement Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance of Seller's obligations under the Procurement Contract.

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7. The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of the Bidding Requirements, that without exception the Bid (including all Bid prices) is premised upon furnishing the Goods and Special Services as required by the Procurement Contract Documents.

6.02 *Bidder's Certifications*

A. Bidder certifies that:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

3. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Procurement Contract. For the purposes of this Paragraph 6.02.A.4:

   a. "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;

   b. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Buyer, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Buyer of the benefits of free and open competition;

   c. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Buyer, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

   d. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process.

5. The Bidder understands the manner of payment for the cost of the Goods and Special Services;

6. The undersigned Bidder certifies their bidder status as follows (as defined in ORS 279A.120):

   Oregon Resident Bidder: YES ☐ NO ☒

   If the bidder is a nonresident bidder, indicate the percent of preference given to resident bidders in the state in which you reside. N/A - Xylem is not a contractor %

7. The undersigned Bidder certifies that it has not discriminated and will not discriminate against minority, women or emerging small business enterprises in obtaining any required subcontracts.

8. The undersigned Bidder certifies that the surety issuing all required bonds is duly authorized and licensed to transact surety business in the state of Oregon.

9. The provisions of ORS 305.385, relating to Oregon tax laws will be complied with.

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10. Bidder acknowledges that in the event the any or all bids are rejected or deemed non-responsive, that Bidder, sub-bidders or suppliers shall have no claim for recovery of bidding costs, or loss of anticipated profits or revenue or other economic loss arising out of or resulting from such rejection, including lost opportunity costs.

11. The undersigned Bidder agrees & certifies that any Performance Bond provided will also remain in full force and effect as a maintenance/warranty bond during the entire guaranty/warranty period, unless a separate warranty/maintenance bond acceptable to the Owner is provided by the Contractor as applicable.

12. Bidder accepts the provisions of the Agreement as to liquidated damages, and agrees that liquidated damages in the amounts listed in the Agreement, accruing on a daily basis, are part of the consideration for the bid and that this amount is a reasonable sum for such damages.

13. Bidder agrees to be responsible for all patent and/or royalty payments associated with completion of the work, as applicable.

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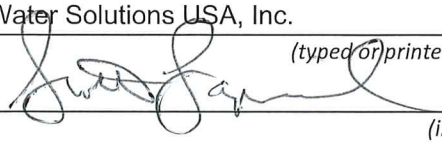
This Bid is offered by:

Bidder:

Xylem Water Solutions USA, Inc.

(typed or printed name of organization)

By: 

(individual's signature)

Date: 12/10/2024

(date signed)

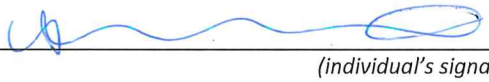
Name: Scott J. Lapcewich

(typed or printed)

Title: Vice President

(typed or printed)

(If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: 

(individual's signature)

Title: EXE. ADMINISTRATIVE ASSISTANT

(typed or printed)

Address for giving notices:

Xylem Water Solutions USA, Inc.

N19 W23993 Ridgeview Pkwy STE 200

Waukesha WI 53188

Designated Representative:

Name: Eric Hunter - Beaver Equipment

(typed or printed)

Title: Sales Engineer

(typed or printed)

Address:

Beaver Equipment

15112 NE 198th St

Woodinville, WA 98072

Phone: Office: (855) 878-6386 Direct:801.803.2082

Email: EricH@Beaver-Equipment.com

License No.: N/A

Classification: N/A

Limitation: Manufacturer's Representative

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XYLEM WATER SOLUTIONS U.S.A., INC.

*****

UNANIMOUS CONSENT OF THE BOARD OF DIRECTORS

WHEREAS, the undersigned, constituting all of the members of the Board of Directors of Xylem Water Solutions U.S.A., Inc., a Delaware corporation formed pursuant to the laws of the State of Delaware (the "Corporation"), do hereby consent, pursuant to Section 141(f) of the General Corporation Law of the State of Delaware, to the adoption of the resolutions set forth below, with the same effect as if said actions were taken by unanimous approving vote at a meeting at which all of the directors were present in person:

RESOLVED: That the lawful actions taken by the current and former officers of the Corporation, in the name of and on behalf of the Corporation are hereby adopted, ratified, and approved.

RESOLVED FURTHER: That the following named persons are appointed as officers of the Corporation in the capacities indicated opposite their respective names, to serve as officers from this date forward until their resignation, removal, termination of employment with the Corporation or its affiliates, or death or until their successors are duly appointed.

Individuals	**Office (s)**
David Alban	Vice President
Ken Albaugh	Vice President
Nitin Bhate	Vice President
Peter Bilelis	Vice President & Assistant Secretary
Todd Boyle	Vice President
Christopher Carapella	Vice President & Assistant Treasurer
Scott A. Holzborn	Vice President
Todd Huffman	Vice President
Scott J. Lapcewich	Vice President
Matthew Latino	Vice President & Treasurer
Chad Lawrence	Vice President
Roger Lobo	Vice President
Josheph McCausland	Vice President & Assistant Treasurer
Michael J. McGann	President
Adam McNeill	Vice President
Stewart Nix	Vice President
Richard Pangrazzi	Vice President
Sean Petraitis	Vice President
Justin Allen Pifer	Vice President & Secretary
Christopher Peterson	Vice President
Randy Stewart	Vice President
Christine Valencia	Vice President

RESOLVED: That any previous appointments of officers for the Corporation are hereby revoked.

RESOLVED FURTHER: That this Unanimous Written Consent may be executed in any number of counterparts, each of which when so executed shall be deemed to be an original and all of which when taken together shall constitute one and the same document, and that the different directors of the Corporation need not be signatories to the same counterpart.

This Unanimous Written Consent of the Board of Directors is effective on November 25, 2024.

[Signature page follows.]

Docusign Envelope ID: 9CDB6241-DA78-4208-8EA6-9259FA70B425

Signed by:
Justin Allen Pifer
38B510D38D9F476...

Justin Allen Pifer

Matthew Latino

Michael J. McGann

November 27, 2024

Renee Davey
XYLEM WATER SOLUTIONS USA, INC.
4828 Parkway Plaza Boulevard, Suite 200
Charlotte, NC 28217

Re: THE CITY OF AUMSVILLE, OREGON
Project: Sequencing Batch Reactor and Digester Equipment for the Aumsville Wastewater Treatment Plant, Aumsville, Oregon
Estimated Contract Price: $2,275,270.00
Bid Date: 12/12/2024
Surety: LIBERTY MUTUAL INSURANCE COMPANIES

Dear Renee Davey:

Enclosed please find the above captioned bid bond, executed per your request.

The bid bond must be signed by an authorized representative of your company, notarized and sealed with the corporate seal if applicable. It is your responsibility to ensure the bid bond conforms with your needs and instructions to us, including but not limited to the correct coverages and parties, and with any laws applicable to your operations and/or the contract requiring the bid bond, and to advise us immediately, in writing, if the bid bond form so executed does not contain the proper information. Accordingly, it is incumbent upon you to carefully review the bond, and we will expect that you will, double-check all information, including signatures, dates, amounts and job descriptions for accuracy, and to verify that the bid bond form we executed is the form required by the specification. This will avoid the possibility of having a low bid rejected because of a clerical error. We will also expect you to verify that anything unusual that has been requested by the obligee is attached.

If, following your review of the bond, you do not advise us in writing of any problem or deficiency in its terms and information but submit the bond as is, your submission will constitute your verification, and we will justifiably assume, that the bond form as issued is correct and appropriate for the purpose for which it is being submitted. You further understand that we will have no liability for any deficiencies or discrepancies not brought to our attention in accordance with this letter.

The bid bond authorization is based upon your original estimate. **If the actual bid price exceeds this estimate by 10% or more, you must contact us for additional authority!**

Please call our office if you should have any questions or need any further assistance.

Good Luck on your Bid.

Sincerely,

Anthony Madsen

Anthony Madsen
Record #2982950

Your bid results are very important, please mail this information back to the address below, or email your Aon representative within 5 days of the bid opening.

	Contractors Name		**Contract Price**
1.	_____	$	_____
2.	_____	$	_____
3.	_____	$	_____

Where did you place _____ And your price $ _____

If awarded contract, is final bond required? Yes ☐ No ☐

BID BOND

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER *(Name and Address)*: Xylem Water Solutions USA, Inc.

4828 Parkway Plaza Boulevard, Suite 200, Charlotte, NC 28217

SURETY *(Name, and Address of Principal Place of Business)*:

Liberty Mutual Insurance Company

175 Berkeley Street, Boston, MA 02116

OWNER *(Name and Address)*: The City of Aumsville, 595 Main Street, Aumsville, OR 97325

BID

Bid Due Date: 12/12/2024

Description (check only one box):

☑ Sequencing Batch Reactor and Digester Equipment for the Aumsville Wastewater Treatment Plant, Aumsville, Oregon

☐ Dissolved Air Floatation Equipment for the Aumsville Wastewater Treatment Plant, Aumsville, Oregon

BOND (amount not to be less than 10% of the bid total)

Bond Number: N/A

Date: 11/27/2024

Penal sum Ten Percent of Amount Bid (Words) $ 10% of Amount Bid (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

BIDDER	**SURETY**
Xylem Water Solutions USA, Inc. (Seal)	Liberty Mutual Insurance Company (Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: J. Stewart Nix	By: Anne Potter
Signature	Signature (Attach Power of Attorney)
J. Stewart Nix	Anne Potter
Print Name	Print Name
Vice President	Attorney-in-Fact
Title	Title
Attest: Eve Renee Davey	Attest: Beverly A. Woolford
Signature	Signature Beverly A. Woolford
Title Service Coordinator	Title Surety Analyst

Note: Addresses are to be used for giving any required notice.
Provide execution by any additional parties, such as joint venturers, if necessary.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

3.2 All Bids are rejected by Owner, or

3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

Certificate No: 8210937- 015009

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Debra A. Deming, Sandra Diaz, Vilma Gonzalez, Peter Healy, Pablo Garcia Horcajo, Jennifer L. Jakaitis, Francesca Kazmierczak, Aklima Noorhassan, Anne Potter, Frances Rodriguez, Valorie Spates, Susan A. Welsh, Beverly A. Woolford

all of the city of New York state of NY each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 6th day of November, 2023.

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company
West American Insurance Company

By: _____
David M. Carey, Assistant Secretary

State of PENNSYLVANIA
County of MONTGOMERY ss

On this 6th day of November, 2023 before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at Plymouth Meeting, Pennsylvania, on the day and year first above written.

Commonwealth of Pennsylvania - Notary Seal
Teresa Pastella, Notary Public
Montgomery County
My commission expires March 28, 2025
Commission number 1126044
Member, Pennsylvania Association of Notaries

By: _____
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS: Section 12. Power of Attorney.
Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts: Section 5. Surety Bonds and Undertakings.
Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 27th day of November, 2024.

By: _____
Renee C. Llewellyn, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

For bond and/or Power of Attorney (POA) verification inquiries, please call 610-832-8240 or email HOSUR@libertymutual.com.

Liberty Mutual SURETY

LIBERTY MUTUAL INSURANCE COMPANY

FINANCIAL STATEMENT – DECEMBER 31, 2023

Assets		Liabilities	
Cash and Bank Deposits	$1,850,245,073.00	Unearned Premiums	$10,298,963,305.00
*Bonds – U.S Government	$3,859,565,383.00	Reserve for Claims and Claims Expense	$28,848,537,243.00
*Other Bonds	$21,048,805,773.00	Funds Held Under Reinsurance Treaties	$360,714,151.00
*Stocks	$19,937,271,802.00	Reserve for Dividends to Policyholders	$1,310,198.00
Real Estate	$122,228,711.00	Additional Statutory Reserve	$296,126,000.00
Agents' Balances or Uncollected Premiums	$8,208,660,427.00	Reserve for Commissions, Taxes and Other Liabilities	$7,622,413,466.63
Accrued Interest and Rents	$186,906,667.00	**Total**	**$47,428,064,363.63**
Other Admitted Assets	$15,677,869,683.63	Special Surplus Funds	$209,508,757.00
Total Admitted Assets	**$70,891,553,519.63**	Capital Stock	$10,000,075.00
		Paid in Surplus	$13,834,867,488.00
		Unassigned Surplus	$9,409,112,836.00
		Surplus to Policyholders	$23,463,489,156.00
		Total Liabilities and Surplus	**$70,891,553,519.63**

* Bonds are stated at amortized or investment value; Stocks at Association Market Values.
The foregoing financial information is taken from Liberty Mutual Insurance Company's financial statement filed with the Massachusetts Department of Insurance.

I, TIM MIKOLAJEWSKI, Assistant Secretary of Liberty Mutual Insurance Company, do hereby certify that the foregoing is a true, and correct statement of the Assets and Liabilities of said Corporation, as of December 31, 2023, to the best of my knowledge and belief.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of said Corporation at Seattle, Washington, this 8th day of March, 2024.

LIBERTY MUTUAL INSURANCE COMPANY INCORPORATED 1912 MASSACHUSETTS

Timothy A. Mikolajewski

Timothy A. Mikolajewski, Assistant Secretary

LMS-1262/LMIC

City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Section 2: Evidence of Authority

to do Business in the state of Oregon

SANITAIRE

a xylem brand

BIDDER QUALIFICATION INFORMATION (updated 4/06/2020)
Xylem Water Solutions USA, Inc.

Corporate Office: 4828 Parkway Plaza Blvd., Suite 200, Charlotte, NC 28217 (Main # 704-504-8872)

XYLEM WATER SOLUTIONS USA, INC. FIN # 45-2080074
D&B # 067087450
SIC Code: 5099
NAICS #: 333911 (Pumps) NAICS # 221320 (Sewage Treatment Equipment)
CAGE Code #: 6SCZ5
E-verify # 188800 (authorized 2/9/2009)
State of Incorporation – Delaware Date of Incorporation May 4, 2011

Remit to:
Xylem, Inc.
26717 Network Place
Chicago, IL 60673-1267

SAM.Gov (System Forward Management)
search by D&B # and CAGE Code

Website: www.xyleminc.com

Parent Company: Xylem Inc. (FIN # 45-2080495)
1 International Drive
Rye Brook, NY 10573

Business Type: Manufacturer

Officers (partial list):

Joseph Johnston	President
Matthew Fisher	Vice President and Treasurer
Joseph McCausland	Vice President
Kyle Foushee	Vice President

Previous Name: ITT Corporation

Branches: See Attached
Xylem does business in all 50 stated and Canada as well as 150 other countries

US Locations: 29
US Employees: ~ 599

Credit References: See Attached

Financial Information:
Xylem is a publicly held company with over USD$3.8 billion in sales and investment-grade credit ratings from Moody's (Baa2), Standard and Poor's (BBB) ad Fitch (BBB)
The financial information requested is proprietary and will not be provided
Our Annual Report can be reviewed at www.xyleminc.com

Board of Directors www.xyleminc.com/en-us/about.us/boardofdirectors

Bank Reference:
Citibank, 388 Greenwich Street, New York, NY 10013
Ralph Brown - Phone: 212-693-3302

Bonding Agent:
Aon Risk Services, 199 Water Street, New York, NY 10038
Cynthia Farrell Phone: 212-479-3723
Current Bonding Capacity: $35M
Bond Cost = .35 – 0.45%
Surety: Arch / Liberty Mutual / Travelers / Chubb

Insurance Carriers:
Aon: Specialty Insurance
Marsh: GL / Auto / WC / Umbrella / Excess Liability

City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Section 3: Prequalification Documents

SANITAIRE
a xylem brand

PREQUALIFICATION FORM

Prequalification Form for the (check only one box)

☒ Sequencing Batch Reactor Equipment for the Aumsville Wastewater Treatment Plant

☐ Dissolved Air Floatation Equipment for the Aumsville Wastewater Treatment Plant

Mail or hand-deliver completed form prior to Bid opening, by 2:00 p.m., local time, by the deadline indicated in the Advertisement for Proposals, to the Engineer (Christopher J. Brugato, P.E., Westech Engineering, Inc., 3841 Fairview Industrial Drive, SE Suite 100, Salem, Oregon 97333, cbrugato@westech-eng.com PH 503.585.2474). This form may be emailed to the Engineer, instead of mailed or hand-delivered, although it is the responsibility of the Proposer emailing the form to confirm its receipt by phone. Email completed form to: cbrugato@westech-eng.com

Name of Proposer: Jeremy Jensen, P.E. - Sanitaire Territory Manager West Region Xylem

Phone: O: 1.414.365.5996 | M: 1.979.436.7407

Email: jeremy.jensen@xylem.com

1. SBR Equipment Supplier: List at least five locations in Oregon or Washington where proposer's equipment is installed and operating. Provide contact name, email, and telephone.

2. DAF Equipment Supplier: List at least five locations in the United States where proposer's equipment is installed and operating. Provide contact name, email, and telephone.

3. Indicate production capacity for each. Each installation must have a treatment capacity of at least 0.5 million gallons per day (mgd) on an average dry weather basis for the Sequencing Batch Reactor supplier and 200 gallons per minute for the Dissolved Air Floatation System supplier.

4. Indicate startup date for each. Each installation must have been operating for a minimum of 2 years since the equipment was placed into service.

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1. Jefferson, OR | Kyle Ward | (541) 971-0953 | kward@jeffersonoregon.org

ADWF = 0.652 MGD | PWWF = 4.820 MGD | Commissioned 2010

2. McCleary, WA | Kevin Trewhella | (360) 495-3217 | kevint@cityofmccleary.com

ADWF = 0.570 MGD | PWWF = 1.310 MGD | Commissioned 2005

3. Sutherlin, OR | Jody Gardner | O: (541) 459-5768 M: (541) 315-6565 | j.gardner@ci.sutherlin.or.us

ADWF = 1.800 MGD | PWWF = 7.00 MGD | Commissioned 2020

4. Coquille, OR | Gary Dagit | (541) 396-4336 | gdagit@cityofcoquille.org

ADWF = 2.040 MGD | PWWF = 6.120 MGD | Commissioned 2013

5. Gold Beach, OR | Ron Hansen | (541) 247-7459 | rhanson@goldbeachoregon.gov

ADWF = 0.630 MGD | PWWF = 3.150 MGD | Commissioned 2012

6. Netarts-Oceanside Sanitary District | Brian Mello | (503) 842-8231 ext 5 | brian@nosd.us

ADWF = 0.700 MGD | PWWF = 2.530 MGD | Commissioned 2013

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City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Section 4: Manufacturer's Certification of Compliance

SANITAIRE
a xylem brand

MANUFACTURER'S CERTIFICATION OF COMPLIANCE

Date: 12/4/2024

Company Name: Xylem Water Solutions USA, Inc.

Company Address: N19 W23993 Ridgeview Pkwy STE 200, Waukesha WI 53188

Subject: Domestic Preference Requirements Certification for:

City of Aumsville, Oregon Wastewater Treatment Plant Improvement Project

I hereby certify that the following product(s) and/or material(s) shipped or provided for the subject project are in full compliance with the Build America, Buy America Act (BABAA) requirements under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58 ,§§ 70901-70953.

Common Name of Items, Products and/or Materials:

1.) ICEAS SBR Mixers

2.) ICEAS SBR Blowers

3.) ICEAS SBR Aeration equipment

4.) Air control valves and valve actuators

5.) ICEAS SBR Decanter

6.) ICEAS SBR Waste Sludge Pumps

7.) Digester Blowers

8.) Digester Aeration equipment

9.) Digested Sludge Pumps

*See attached for Non-BABA compliant or optional BABA compliant items

These products and/or materials were manufactured in the following location(s):

Sartell, MN; Cannonsburg, PA; Sedalia, MO; Blandon, PA; Marshfield, WI; Des Plaines, IL; Germantown, WI; Augusta, GA; Marietta, GA; Pittsburg, PA; Pewaukee, WI

City, State

Authorized Company Representative (Signature and Printed Name)

Scott J. Lapcewich - Vice President

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MANUFACTURER'S CERTIFICATION OF COMPLIANCE
Non-BABA or optional BABA Compliant Items

1.) ICEAS SBR Decanter (Optional)

2.) ICEAS SBR Decanter Actuator

3.) Air Control Valves and Actuators (Optional)

4.) Instrumentation (DO sensors, level sensors, float switches)

5.) Motor Control Center

6.) Packaged Control Panel for ICEAS SBR and Aerobic Digesters

7.) Local Operation stations

City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Section 5: Xylem Officer Signed Forms

A. Compliance Statement RD-400-6
B. Lower Tier Covered Transactions (AD-1048)
C. Certification for Contracts, Grants and Loans (1940-Q Exhibit A-1)
D. Sworn Statement of Good Faith Effort with Small, Women, or Minority Business Utilization Requirements
E. ARPA/SLFRF
F. Certification Regarding Lobbying

SANITAIRE
a xylem brand

USDA
Form RD 400-6
(Rev.12-09)

Form Approved
OMB No. 0575-0018

COMPLIANCE STATEMENT

This statement relates to a proposed contract with The City of Aumsville, Oregon

_____,
(Name of borrower or grantee)

who expects to finance the contract with assistance from either the Rural Housing Service (RHS), Rural Business-Cooperative Service (RBS), or the Rural Utilities Service (RUS) or their successor agencies, United States Department of Agriculture (whether by a loan, grant, loan insurance, guarantee, or other form of financial assistance). I am the undersigned bidder or prospective contractor, I represent that:

*Form does not apply to equipment manufacturer.

1. I ☐ have, ☐ have not, participated in a previous contract or subcontract subject to Executive Order 11246 (regarding equal employment opportunity) or a preceding similar Executive Order.

2. If I have participated in such a contract or subcontract, I ☐ have, ☐ have not, filed all compliance reports that have been required to file in connection with the contract or subcontract.

☐ If the proposed contract is for $50,000 or more: or ☐ If the proposed nonconstruction contract is for $50,000 or more and I have 50 or more employees, I also represent that:

3. I ☐ have, ☐ have not previously had contracts subject to the written affirmative action programs requirements of the Secretary of Labor.

4. If I have participated in such a contract or subcontract, ☐ I have, ☐ have not developed and placed on file at each establishment affirmative action programs as required by the rules and regulations of the Secretary of Labor.

I understand that if I have failed to file any compliance reports that have been required of me, I am not eligible and will not be eligible to have my bid considered or to enter into the proposed contract unless and until I make an arrangement regarding such reports that is satisfactory to either the RHS, RBS or RUS, or to the office where the reports are required to be filed.

I also certify that I do not maintain or provide for my employees any segregated facilities at any of my establishments, and that I do not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I certify further that I will not maintain or provide for my employees any segregated facilities at any of my establishments, and that I will not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I agree that a breach of this certification is a violation of the Equal Opportunity clause in my contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and wash rooms, restaurants and other eating areas time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. I further agree that (except where I have obtained identical certifications for proposed subcontractors for specific time periods) I will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause; that I will retain such certifications in my files; and that I will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays the valid OMB control number. The valid OMB control number for this information collection is 0575-0018. The time required to complete this information collection is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR CERTIFICATIONS OF NON-SEGREGATED FACILITIES

A certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32F.R. 7439, may 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding $ 10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

*Form does not apply to equipment manufacturer.

DATE 12/10/2024

(Signature of Bidder or Prospective Contractor)

Scott J. Lapcewich - Vice President

N19 W23993 Ridgeview Pkwy STE 200, Waukesha WI 53188

Address (including Zip Code)

This form is available electronically.

OMB Control No. 0505-0027
Expiration Date: 04/30/2022

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion Lower Tier Covered Transactions

AD-1048

The following statement is made in accordance with the Privacy Act of 1974 (5 U.S.C. § 552a, as amended). This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, and 2 C.F.R. §§ 180.300, 180.335, Participants' responsibilities. The regulations were amended and published on August 31, 2005, in 70 Fed. Reg. 51865-51880. Copies of the regulations may be obtained by contacting the Department of Agriculture agency offering the proposed covered transaction.

According to the Paperwork Reduction Act of 1995 an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0505-0027. The time required to complete this information collection is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. The provisions of appropriate criminal, civil, fraud, privacy, and other statutes may be applicable to the information provided.

(Read instructions on page two before completing certification.)

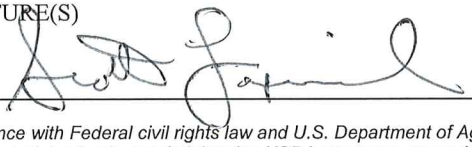
A. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency;

B. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

ORGANIZATION NAME	PR/AWARD NUMBER OR PROJECT NAME
Xylem Water Solutions USA Inc	Aumsville, OR SBR Equipment

NAME(S) AND TITLE(S) OF AUTHORIZED REPRESENTATIVE(S)

Scott J Lapcewich - Vice President

SIGNATURE(S)	DATE
	12/10/2024

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at How to File a Program Discrimination Complaint (https://www.ascr.usda.gov/filing-program-discrimination-complaint-usda-customer) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442.

Instructions for Certification

(1) By signing and submitting this form, the prospective lower tier participant is providing the certification set out on page 1 in accordance with these instructions.

(2) The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension or debarment.

(3) The prospective lower tier participant shall provide immediate written notice to the person(s) to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(4) The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549, at 2 C.F.R. Parts 180 and 417. You may contact the department or agency to which this proposal is being submitted for assistance in obtaining a copy of those regulations.

(5) The prospective lower tier participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

(6) The prospective lower tier participant further agrees by submitting this form that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

(7) A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the System for Award Management (SAM) database.

(8) Nothing contained in the foregoing shall be construed to require establishment of a system of records to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(9) Except for transactions authorized under paragraph (5) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

CERTIFICATION FOR CONTRACTS, GRANTS AND LOANS

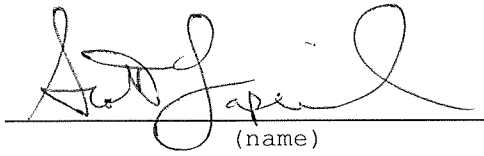
The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant or Federal loan, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant or loan.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant or loan, the undersigned shall complete and submit Standard Form - LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including contracts, subcontracts, and subgrants under grants and loans) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.



(name)

12/10/2024
(date)

Scott J. Lapcewich - Vice President
(title)

oOo

SWORN STATEMENT OF GOOD FAITH EFFORT WITH SMALL, WOMEN, OR MINORITY BUSINESS UTILIZATION REQUIREMENTS

Although this project does not have specific MBE/WBE/SBRA participation requirements, the funding agency requires that the prime contractor must engage in outreach, recruitment or other race/gender-neutral activities as a part of their good faith efforts to achieve a fair share of contracts by minority and women owned businesses as well as small businesses in rural areas. The prime contractor may select various outreach, recruitment or other race/gender neutral activities for a particular contract, but at a minimum, the prime contractor must take six steps:

1. Include qualified MBEs, WBEs and SBRAs on solicitation list;

2. Assure that MBEs, WBEs and SBRAs are solicited whenever they are potential sources;

3. Divide total requirements, when economically feasible, into small tasks or quantities to permit maximum participation of MBEs, WBEs and SBRAs;

4. Establish delivery schedules, where the requirements of the work permit, which will encourage participation by MBEs, WBEs and SBRAs;

5. Use the services and assistance of the Small Business Administration and the Minority Business Development Agency, U.S. Department of Commerce, as appropriate; and

6. If the prime contractor awards subcontracts/procurement, require the subcontractor to take the affirmative steps in numbers 1 through 5 above.

* *

A list of contacted Minority, Women and Small Businesses must be attached to this form indicating which minority, women and small businesses were contacted by the bidder, a phone number, the name of a contact person, , whether or not they are being utilized, along with their reasons for non-participation.

By signing this form, the contractor swears that she or he has taken all the steps listed above to obtain participation by minority, women and small business enterprises.

***Due to the heavily engineered and specialty nature of the equipment being provided by Xylem and the tooling required, it is not possible to change existing vendors to MBE/WBE vendors.**

Signature

12/10/2024
Date

Printed name and title of signer

Scott J. Lapcewich - Vice President

List of Minority, Women and Small Businesses Contacted and/or Utilized

Name of Business	Contact Person	Phone Number	Date of Contact	Utilized or Not? (Yes/No) Reason for Non-participation if No (ie. not low bid, did not submit bid, etc.)

ARPA/SLFRF Required Contract Clauses

*Form does not apply to equipment manufacturer.

Purpose: The purpose of this reference is to assist ARPA grant award recipients by summarizing required contract clauses consistent with the federal Uniform Guidance requirements that are applicable to the State and Local Fiscal Recovery Funds (SLFRF) program as part of the American Rescue Plan Act (ARPA).
As described in this document a "recipient" is a recipient of an APRA funded grant award from Business Oregon.

The SLFRF awards are generally subject to the requirements set forth in the **The Office of Management and Budget's (OMB) Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards** (commonly called "Uniform Guidance"). The "Uniform Guidance" is the set of federal rules (administrative requirements, cost principles, and audit guidelines) that apply to federal money. This includes requirements such as the treatment of eligible uses of funds, procurement, and reporting requirements. Please see the SLFRF Compliance and Reporting Guidance page 12 for full Award terms and conditions.

It is the recipient's responsibility to ensure all SLFRF award funds are used in compliance with these requirements. In addition, recipients should be mindful of any additional compliance obligations that may apply – for example, additional restrictions imposed upon other sources of funds used in conjunction with SLFRF award funds, or statutes and regulations that may independently apply to water and sewer infrastructure projects.

Contract Clause Checklist

Directions:
Appendix II of 2 CFR 200 (The Uniform Guidance) outlines the contract provisions that you must place in contracts with your contractors, and in contracts with subrecipients (if any). The checklist below contains these standard clauses for inclusion in contracts needed to utilize ARPA funds.

Clauses for All Contracts:

Creating a contract that complies with ARPA requirements must include the below sections as verbatim:

☐ **Contractor must be registered in SAM.gov.** - The Contractor shall register in the System for Award Management (SAM), which is the primary registrant database for the U.S. Federal Government and shall update the information at least annually after the initial registration and maintain its status in the SAM through the Term of this

*Form does not apply to equipment manufacturer.

Agreement. Information regarding the process to register in the SAM can be obtained at Sam.gov

☐ **Whistleblower -** Contractor receiving ARPA funds shall under or through this contract post notice of the rights and remedies provided to whistleblowers under No Fear Act Pub. L. 107-174. 29 CFR § 1614.703 (d).

☐ **Inspections; Information** - Contractor shall permit, and cause its subcontractors to allow the State of Oregon, the federal government and any party designated by them to:

- Examine, visit and inspect, at any and all reasonable times, the property, if any, constituting the Project.
- Inspect and make copies of any accounts, books and records, including, without limitation, its records regarding receipts, disbursement, contracts, and any other matters relating to the Project, and to its financial standing, and shall supply such reports and information as reasonably requested.
- Interview any officer or employee of the Contractor, or its subcontractors, regarding the Project.

☐ **Equal Opportunity -** Contractor shall comply with Executive Order 11246 of September 24, 1965, entitled "Equal Employment Opportunity," as amended by Executive Order 11375 of October 13, 1967, and as supplemented in Department of Labor regulations (41 CFR chapter 60).

☐ **Copeland "Anti-Kickback" Act -** Contractor shall comply with the Copeland "Anti-Kickback" Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). The Act provides that each contractor or subrecipient must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency.

☐ **Debarment and Suspension (Executive Orders 12549 and 12689)** - A contract award (see 2 CFR 180.220) must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension." SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

☐ **Prohibition on purchasing telecommunications or surveillance equipment, services, or systems.** As required by 2 CFR 200.216, federal grant or loan recipients and subrecipients

*Form does not apply to equipment manufacturer.

are prohibited from obligating or expending loan or grant funds to procure or obtain; extend or renew a contract to procure or obtain; or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that use covered telecommunications equipment, video surveillance services or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities). Prohibitions extend to the use of Federal funds by recipients and subrecipients to enter into a contract with an entity that "uses any equipment, system, or service that uses covered telecommunications equipment or services" as a substantial or essential component of any system, or as critical technology as part of any system. Certain equipment, systems, or services, including equipment, systems, or services produced or provided by entities subject to the prohibition are recorded in the System for Award Management exclusion list.

☐ **Preference to United States made goods.** - As appropriate and to the extent consistent with law, the contractor should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award. For purposes of this section:
(1) "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.
(2) "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

Additional Clauses for Contracts Over $10,000:

Creating a contract over $10,000 that complies with ARPA requirements must include the additional below sections as verbatim:

☐ **Procurement of recovered materials over $10,000. -** The Contractor must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000 or the value of the quantity acquired during the preceding fiscal year exceeded $10,000; procuring solid waste management services in a manner that

*Form does not apply to equipment manufacturer.

maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

☐ **Termination for cause and for convenience** - Contractor shall address termination for cause and for convenience, including the manner by which it will be affected and the basis for settlement.
The Contract Owner shall have the option, in its sole discretion, to terminate this Agreement, at any time during the term hereof, for convenience and without cause. The Contract Owner shall exercise this option by giving Contractor written notice of termination. The notice shall specify the date on which termination shall become effective.

Additional Clauses for Contracts Over $100,000:

Creating a contract over $100,000 that complies with ARPA requirements must include the additional below section(s) as verbatim:

☐ **Certification form located in Appendix I. Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)** - Contractors that apply or bid for an award exceeding $100,000 must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.

☐ **Note: Only include for contracts that involve the employment of mechanics or laborers.** The Contract Work Hours and Safety Standards Act requires all contractors—prime and sub—to pay laborers and mechanics performing on a federal service contract and federal and federally assisted construction contract over $100,000, 1.5 times their basic rate of pay for all hours worked over 40 in a workweek. Employers are liable to employees for these unpaid wages. The failure of a contractor to comply with this Act may also result in liability under the False Claims Act. Employees who are due unpaid wages under the Contract Work Hours and Safety Standards Act may file a complaint with the Wage and Hour Division within the U.S. Department of Labor. The DOL may then enforce the provisions of the Act against violators.

Additional Clauses for Contracts Over $150,000:

*Form does not apply to equipment manufacturer.

Creating a contract over $150,000 that complies with ARPA requirements must include the additional below section(s) as verbatim:

☐ Contractor shall comply with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 U.S.C. 1857(h)), section 508 of the Clean Water Act (33 U.S.C. 1368), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR part 15).

Additional Clauses for Contracts Over $250,000 (the simplified acquisition threshold as of 2022):

Creating a contract over $250,000 that complies with ARPA requirements must include the additional below section(s) as verbatim:

☐ Contracts for more than the simplified acquisition threshold, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. 1908, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate. Upon any breach of this Agreement by Contractor, the Contract Owner shall have all remedies available to it both in equity and/or at law.

Appendix I

Certification Regarding Lobbying
(Awards to Contractors and Subcontractors in Excess of $100,000)

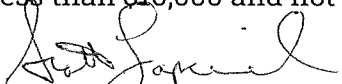
The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Signed: 

Title: Scott J. Lapcewich - Vice President

Date: 12/10/2024

City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Section 6: Xylem Bid Proposal

SANITAIRE

a xylem brand

Xylem Water Solutions USA, Inc.
N19 W23993 Ridgeview Parkway, Suite 200
Waukesha, WI 53188
Tel 414.365.2200 Fax 414.365.2210

SANITAIRE
a xylem brand

DATE: **December 5, 2024**

TO: **Bidding Contractors**

RE: **Aumsville WWTP, OR**
Wastewater Treatment Facility Improvements
Bid Date: December 12, 2024
Sanitaire #30323-20a

Xylem Water Solutions USA is pleased to present this bid proposal for the supply and startup of a complete Sanitaire® Intermittent Cycle Extended Aeration System (ICEAS™) for the Aumsville WWTP, OR WTF. Sanitaire is proposing equipment for the following specification sections:

Section 11300	Sequential Batch Reactor System
Section 11300	Digester Aeration Equipment
Section 16090	Packaged Electrical System Requirements
Section 16447	Low Voltage Motor Control Centers
Section 17090	Packaged Control System Requirements

A. PROCESS DESIGN DETAILS

The Sanitaire ICEAS (SBR) system is designed around the following influent conditions:

ADWF	1,750,000	gpd
PDWF	2,620,000	gpd
PWWF	5,240,000	gpd
BOD_5 (at 20°C)*	127.4	mg/L
TSS*	106.9	mg/L
TKN*	17.5	mg/L
Total Phosphorus*	0	mg/L
Alkalinity required (minimum)	85	mg/L
Wastewater Temperature (Range)	8 - 25	°C

*Concentrations based on design mass loading at ADWF

The process design is based on meeting the following effluent criteria (defined by a monthly average):

BOD_5 Conc. (at 20°C)	10	mg/L
TSS Conc.	10	mg/L
NH_3–N Conc.	1	mg/L
Total Nitrogen Conc.	10	mg/L
Total Phosphorus Conc.*		mg/L

*May require chemical addition.

B. EQUIPMENT AND SERVICE:

The Sanitaire scope of supply for this project includes the following equipment and services:

1. **ICEAS Blower:** Three (3) positive displacement blowers for air supply to the ICEAS basins. Each complete blower package will be supplied with all necessary accessories, including:
   - 40 HP – 1800 RPM – TEFC – 3-phase 1.15 S.F. Motor
   - Discharge check valve
   - Inlet/discharge flexible connectors
   - Discharge butterfly valve
   - V-Belt Drive with guard
   - Inlet Air Filter/Silencer
   - Discharge Silencer
   - Weight Relief Valve
   - Discharge pressure gauge
   - Discharge thermometer
   - Elevated Steel Base
   - VFD-Variable Frequency Drive
   - Sound Enclosure

2. **Digester Blower:** Two (2) positive displacement blowers for air supply to the Digester basins. Each complete blower package will be supplied with all necessary accessories, including:
   - 40 HP – 1800 RPM – TEFC – 3-phase 1.15 S.F. Motor
   - Discharge check valve
   - Inlet/discharge flexible connectors
   - Discharge butterfly valve
   - V-Belt Drive with guard
   - Inlet Air Filter/Silencer
   - Discharge Silencer
   - Weight Relief Valve

- Discharge pressure gauge
- Discharge thermometer
- Elevated Steel Base

3. **Air Control Valve:** Two (2) 8" diameter air control valves, one (1) for each one for each ICEAS tank. Each valve will be supplied with 120 V, 1 Ph, 60 Hz electric operator, compartment heaters and handwheel for manual operation. Valves will be DeZurik BRS with an AUMA three-phase actuator.

4. **ICEAS Fine Bubble Aeration:** A complete SANITAIRE Fine Bubble aeration system for each ICEAS basin. There is one (1) grid per ICEAS tank. Equipment for each grid will include:

- One 304L stainless steel and PVC vertical drop pipe including flange for connection at the top of the tank and bottom connection to the air manifold.
- One 304L stainless steel manifold with connections for each 4 inch diameter air distribution header.
- 304 Stainless steel manifold supports with hold down clamp and washer.
- Four-inch diameter PVC air distribution headers including:
    - Fixed anti-rotational joint connection to the air manifold.
    - Factory installed (solvent welded) diffuser holders.
    - Positive locking fixed anti-rotational joint connections.
- 304L Stainless steel air distribution header support stands with header hold down clamp and locating plate.
- Fine Bubble Diffuser Elements with gaskets and retainer rings.
- Flanges, bolts, nuts and neoprene gaskets necessary to assemble the system.
- One automated moisture purge system for the SBR aeration system.
- One manual moisture purge system for the digester aeration system.
- Stainless steel anchor bolts for the manifold and header supports.

NOTE: Anchor bolts are designed for installation in 4000 PSI Concrete per ACI Committee 350 ("Concrete Sanitary Engineering Structures).

5. **Digester Fine Bubble Aeration:** A complete SANITAIRE Fine Bubble aeration system for each Digester basin. There is one (1) grid per ICEAS tank. Equipment for each grid will include:

- One 304L stainless steel and PVC vertical drop pipe including flange for connection at the top of the tank and bottom connection to the air manifold.
- One 304L stainless steel manifold with connections for each 4 inch diameter air distribution header.
- 304 Stainless steel manifold supports with hold down clamp and washer.
- Four-inch diameter PVC air distribution headers including:
    - Fixed anti-rotational joint connection to the air manifold.
    - Factory installed (solvent welded) diffuser holders.
    - Positive locking fixed anti-rotational joint connections.

- 304 Stainless steel air distribution header support stands with header hold down clamp and locating plate.
- Fine Bubble Diffuser Elements with gaskets and retainer rings.
- Flanges, bolts, nuts and neoprene gaskets necessary to assemble the system.
- One automated moisture purge system for the SBR aeration system.
- One manual moisture purge system for the digester aeration system.
- Stainless steel anchor bolts for the manifold and header supports.

NOTE: Anchor bolts are designed for installation in 4000 PSI Concrete per ACI Committee 350 ("Concrete Sanitary Engineering Structures).

6. **Decant Mechanism:** Two (2) stainless steel decanters, (1) per ICEAS basin. Each decanter will include a 35 foot long stainless steel trough, scum exclusion float, downcomer pipes, swivel joint, wall connection, and anchors. Each decanter drive assembly will be provided with electro-mechanical actuator decanter drive with 3/4 HP, 460V, 3 phase 60 Hz variable speed drive duty motor, decanter drive support, boot and end position limit switches.

7. **Submersible Mixers:** Two (2) submersible mixers, one (1) per basin. Each mixer will come equipped with 15 Hp, 460 V, 3 Ph, 60 Hz motor. Hoist socket, power cable and lifting cable will be provided for each mixer. Leak detection for the mixers will be provided. One portable hoist will be provided and hoist sockets for each mixer.

8. **ICEAS Pump:** Two (2) submersible pumps, one (1) for each ICEAS basin. Each pump will come equipped with 2.4 Hp, 460 V, 3 Ph, 60 Hz motor, discharge base, guide rail brackets, lifting cable and power cable. One portable hoist will be provided and hoist sockets for each mixer. **Guide rails, discharge piping and valves by others.**

9. **Level Indicators:** Two (2) level transducers, one (1) per ICEAS basin. The transducer shall have a stainless steel body with a head-pressure-sensing bottom Teflon faced diaphragm and an internal precision, gage pressure transducer assembly. The transducer shall be cable mounted and factory calibrated for the basin depth. The transducer shall be a 2-wire type and produce a 4-20ma signal in direct proportion to the measured level.

10. **High Level Storm Float:** Two (2) high level non-mercury float switches, one (1) per ICEAS basin.

11. **Motor Control Center:** Motor Control Center (MCC) for ICEAS motors and other electrical devices. MCC will be provided with motor starters and spare parts as specified.

12. **Control System:** One (1) NEMA 12 control panel with software as required for proper control of the ICEAS process, including all equipment listed in this scope. The system will be supplied with the following items:

    - Allen Bradley Human Machine Interface – Touchscreen HMI

- Allen Bradley Programmable Logic Controller (PLC) – Compact Logix
- Control Switches
- Pilot Lights
- Uninterruptable Power Supply (UPS)
- A local control station for each SBR decanter

13. **DO Control:** Two (2) dissolved oxygen probes, one (1) analyzer and control system.

14. **Digester Pumps:** Two (2) submersible pumps, one (1) for each SHT basin. Each pump will come equipped with 2.4 Hp, 460 V, 3 Ph, 60 Hz motor, discharge base, guide rail brackets, lifting cable and power cable. One portable hoist will be provided and hoist sockets for each mixer. **Guide rails, discharge piping and valves by others.**

15. **Spare Parts:** included as specified in 11300 2.6 n. with the exception of 10 Diffuser holders. Holders are factory solvent welded to distributor header piping and can not be installed in the field. (3) sections of air distributor piping will include holders.

16. **Engineering Drawings:** Required sets of engineering drawings.

17. **O & M Manuals:** Required sets of O & M Manuals.

18. **Field Installation Guidance and Start-Up Services:**

The following services will be provided as specified.

Start-Up, Training	Two (2) Trips, Twenty (20) Days
Process Training/Follow-up	One (1) Trip, Three (3) Days

Additional days available at $1,700 per day.

C. EXCLUSIONS

The following from are specifically excluded from our proposal:

1. Equipment unloading or storage at jobsite.

2. Concrete tank or building design and installation.

3. Field installation or painting of equipment.

4. All influent piping and influent piping supports (including those in-basin). All effluent piping downstream of the decanter effluent including through the wall piping. Effluent vent piping outside basin where required. All yard piping and valves not listed in Section A including influent, effluent and supernatant

piping/valves. Any splitter boxes.

5. Air supply piping between the blower isolation valves and the ICEAS basins at top of basin drop pipes including any valves not listed in Section A.

6. All bolts, gaskets and connectors for attaching drop pipe to upper air main piping.

7. Inside and outside basin sludge piping and valves. All waste sludge piping and valves (including check and plug valves) downstream of each pump discharge elbow/slide-away fitting. Sludge pump guide rails.

8. Guide rails, discharge piping and valves for ICEAS WAS pumps and digested sludge pumps.

9. Local display for level transducers (not available for proposed equipment).

10. All level transducer stilling well and mounting hardware.

11. High level float switch bracket.

12. Stainless steel junction box for high level floats.

13. Field wiring and conduits, field wireways, local disconnect switches.

14. Anchor bolts and other embedded materials except for anchor bolts specifically included in the Section A of this proposal.

15. Platforms, gratings (including those over the influent flow splitter box), handrails, ladders, and stairs.

16. Power, water, chemical and labor for operating equipment.

17. Any field and laboratory testing.

18. Any instrumentation including flow meters, or equipment including disinfection or chemical feed equipment not specifically listed in Section A.

19. All costs associated with video recording services.

20. All field testing (all anchor bolt and support pull-out, leakage, aeration system level, uniformity, mixing and pressure testing, if required)

21. All costs associated with providing seismic calculations. If required for any Xylem supplied equipment a change order will be executed.

22. All costs associate with equipment reinforcements due to seismic requirements. If required for any Xylem equipment a change order will be executed.

D. ESTIMATED SUBMITTALS AND DELIVERIES:

The submittal schedule begins after acceptance of purchase order by Xylem Sanitaire. Delivery schedule begins after receipt of approved drawings; Assume four week turnaround of submittals by the review engineer.

Certified engineered equipment drawings: 14-16 weeks

Equipment Shipment (after release for fabrication): 18-22 weeks*
*Approximately 36 weeks for MCC, all other equipment as noted above

E. PRICING:

Pricing for the equipment and field services outlined in this proposal, DAP Jobsite per Incoterms 2020, Full freight allowed to destination:

$_____

F. PRICE NOTES

1. Taxes are not included. Purchaser to pay directly all applicable taxes separate from purchase order to Xylem Water Solutions USA.

2. All prices quoted shall be valid for 45 days from the date of bidding.

3. The prices are based on the equipment being released for shipment by the 2nd Quarter, 2025.

4. Prices on orders received after the above deadline or specifying later shipping dates shall be subject to review and possible adjustment in line with the then existing economic conditions.

5. Terms of Payment:

   10% Net 30 days following initial submittal for approval
   80% Net 30 days following shipment
   5% Net 30 days NTE 150 days – following installation (whichever comes first)
   5% Net 30 days NTE 180 days – following start-up (whichever comes first).

6. An interest charge of 1 1/2% per month will be added to past due accounts.

7. This order is subject to the Standard Terms and Conditions of Sale – Xylem Americas effective on the date the order is accepted. Terms are available at http://www.xyleminc.com/en-us/Pages/terms-conditions-of-sale.aspx and incorporated herein by reference and made a part of the agreement between parties. Different terms are hereby rejected unless expressly assented to in writing.

G. WARRANTY

Xylem Water Solutions USA warrants all parts to be free from defective material and workmanship for a period of one (1) year after startup or eighteen (18) months after shipment (whichever comes first) and to furnish to the Owner replacements for any such items found to be defective within that period.

We appreciate your interest in Sanitaire and look forward to providing Sanitaire-ICEAS process equipment and fully-integrated control system for your treatment plant. If you should have any questions, please do not hesitate to contact us.

Very truly yours,

Odishoo, Daphne - Xylem

cc: **Sanitaire Representative:**
Beaver Equipment

Rev. 5/5/2015
ABJ Bid Proposal

EXHIBIT A

SANITAIRE STANDARD WARRANTY

Seller warrants that the goods sold to Contractor hereunder (with the exception of membranes, seals, gaskets, elastomer materials, coatings and other "wear parts" or consumables all of which are not warranted except as otherwise provided in the Proposal) will be (i) be built in accordance with the specifications referred to in the Proposal, if such specifications are expressly made a part of this Agreement, and (ii) free from defects in material and workmanship for a period of one (1) year from the date of start-up or eighteen (18) months from the date of shipment, whichever occurs first, unless a longer period is provided by law or is specified in the product documentation (the "Warranty").

Except as otherwise provided by law, Seller shall, at its option and at no cost to Contractor, either repair or replace any product which fails to conform with the Warranty; provided, however, that under either option, Seller shall not be obligated to remove the defective product or install the replaced or repaired product and Contractor shall be responsible for all other costs, including, but not limited to, service costs, shipping fees and expenses. Seller shall have complete discretion as to the method or means of repair or replacement. Contractor's failure to comply with Seller's repair or replacement directions shall constitute a waiver of its rights and render all warranties void. Any parts repaired or replaced by Seller under the Warranty are warranted only for the balance of the warranty period on the parts that were repaired or replaced. The Warranty is conditioned on Contractor giving written notice to Seller of any defects in material or workmanship of warranted goods within ten (10) days of the date when any defects are first manifest. Seller shall have no warranty obligations to Contractor with respect to any product or parts of a product that: (a) have been repaired by third parties other than Seller or without Seller's written approval; (b) have been subject to misuse, misapplication, neglect, alteration, accident, or physical damage; (c) have been used in a manner contrary to Seller's instructions for installation, operation and maintenance; (d) have been damaged from ordinary wear and tear, corrosion, or chemical attack; (e) have been damaged due to abnormal conditions, vibration, failure to properly prime, or operation without flow; (f) have been damaged due to a defective power supply or improper electrical protection; or (g) have been damaged resulting from the use of accessory equipment not sold by Seller or not approved by Seller in connection with products supplied by Seller hereunder. In any case of products not manufactured by Seller, there is no warranty from Seller; however, Seller will extend to Contractor any warranty received from Seller's supplier of such products.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ANY AND ALL OTHER EXPRESS OR IMPLIED WARRANTIES, GUARANTEES, CONDITIONS OR TERMS OF WHATEVER NATURE RELATING TO THE GOODS PROVIDED HEREUNDER, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY EXPRESSLY DISCLAIMED AND EXCLUDED. EXCEPT AS OTHERWISE PROVIDED BY LAW, BUYER'S EXCLUSIVE REMEDY AND SELLER'S AGGREGATE LIABILITY FOR BREACH OF ANY OF THE FOREGOING WARRANTIES ARE LIMITED TO REPAIRING OR REPLACING THE PRODUCT AND SHALL IN ALL CASES BE LIMITED TO THE AMOUNT PAID BY THE BUYER HEREUNDER. IN NO EVENT IS SELLER LIABLE FOR ANY OTHER FORM OF DAMAGES, WHETHER DIRECT, INDIRECT, LIQUIDATED, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY OR SPECIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFIT, LOSS OF ANTICIPATED SAVINGS OR REVENUE, LOSS OF INCOME, LOSS OF BUSINESS, LOSS OF PRODUCTION, LOSS OF OPPORTUNITY OR LOSS OF REPUTATION.

City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Section 7: Manufacturer Information

SANITAIRE

a xylem brand

Manufacturer History

Xylem Overview

Xylem is a leading global water technology provider, enabling customers to transport, treat, test and efficiently use water in public utility, residential and commercial building services, industrial and agricultural settings. We do business in more than 150 countries through a number of market-leading product brands, and our people bring broad applications expertise with a strong focus on finding local solutions to the world's most challenging water and wastewater problems.

Xylem's treatment business offers a portfolio of products and systems designed to effectively meet the demands and challenges of treating water and wastewater. From smarter aeration to advanced filtration to chemical-free disinfection, Xylem leverages its well-known Treatment brands, Flygt, Leopold, Sanitaire, and Wedeco, to offer hundreds of solutions backed by a comprehensive, integrated portfolio of services designed to ensure we can meet our customers' needs in a number of different industries including municipal water and wastewater, aquaculture, biogas and agriculture, food and beverages, pharmaceuticals, and mining.

Our scientists and engineers utilize their in-depth applications expertise and continually listen and learn from our customers' situations to create solutions that not only use less energy and reduce life-cycle costs, but also promote the smarter use of water.

SANITAIRE
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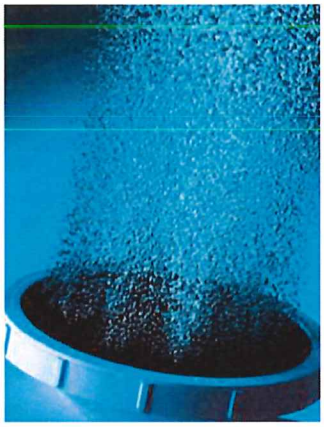
Sanitaire

Aeration is the most energy intensive process in a wastewater treatment plant, consuming as much as 65% of the plant's overall energy requirement. Sanitaire has been the global leader in the wastewater industry supplying innovative, energy-efficient aeration solutions for over 50 years. Sanitaire is a leading innovator for aeration technology being the first company to develop stainless steel wide band coarse bubble diffused aeration systems in the early 1960s, then energy efficient ceramic disc diffuser system in 1970s including in-situ cleaning systems and pressure monitoring. Sanitaire was the first US manufacturer of membrane disc diffuser systems in late 1980s and the first to introduce high grade EPDM membranes with a life of over 15 years. Since 1978, more than 20 million Sanitaire fine bubble diffusers have been installed in treatment plants around the world.



Sanitaire Aeration Products – Our fine bubble diffusers set the industry standard for sustained energy efficiency and mechanical reliability. Our vast applications experience allows us to recommend the appropriate product for a myriad of special applications, customizing the design and materials to meet specific application requirements. Xylem-Sanitaire guarantees aeration performance with clean water oxygen transfer testing per ASCE or EN standard methods in our state-of-the-art test facility in Brown Deer, WI, USA. After installation, we offer aftermarket support, including our patent-pending liquid cleaning system (LCS) and digital pressure monitoring system (DPM), to extend diffuser life and reduce operating costs for high-fouling applications.

Sanitaire Process Solutions – The Sanitaire portfolio also includes process solutions such as the ICEAS, advanced sequencing batch reactor (SBR), Bioloop, a flexible oxidation ditch process, and Vorelodos for optimized aerobic digestion. All Sanitaire process solutions are designed for energy efficiency, effective process optimization and to be user friendly. Complementing our aeration and process product lines is our library of control solutions known as OSCAR, the process performance optimizer. OSCAR combines our expertise in process and controls, with our outstanding Sanitaire and Flygt equipment lines, to deliver low life cycle costs while achieving treatment objectives with minimal operation intervention.

For more information please visit us on our homepage:

www.xylem.com

SANITAIRE
a xylem brand

SANITAIRE

COMPANY HISTORY

Sanitaire began operation in 1967 to provide solutions for wastewater treatment and water pollution problems in industrial and municipal applications. Today, Sanitaire markets aeration products under the SANITAIRE® and AERCOR® trademarks and wastewater treatment plants under the SANITAIRE® and ABJ™ trademarks to help meet the needs of the industry. The aeration products include ceramic and membrane fine bubble disc systems, ceramic and membrane fine bubble tube systems, ceramic fine bubble dome systems, and coarse bubble diffuser systems. The wastewater treatment plant products include package activated sludge treatment plants, field erected activated sludge treatment plants, oxidation ditches and sequential batch reactors to name a few.

Located in a suburb of Milwaukee, Wisconsin, Sanitaire is a group of dedicated engineers and other professionals focused on providing cost-effective solutions to wastewater treatment problems. When Sanitaire equipment is considered for a project, these dedicated professionals begin the task of working with the consulting engineer and the treatment plant owner and carry it through design, fabrication, construction, start-up and training.

Over the years, Sanitaire has had several milestones. The most recent milestone in 1999 was the purchase of Sanitaire by ITT Industries, Inc. The fact that Sanitaire is now a division of ITT allows it to utilize the financial strength of a large corporation while continuing to provide the personalized service and reputation that has been the hallmark of the company. Sanitaire realizes that servicing the needs of its customers is vitally important. Its customer commitment has remained unchanged. A report prepared for the Washington Suburban Sanitary Commission (WSSC) said the following:

> "*Conclusion: SANITAIRE stands alone among suppliers of aeration equipment, either coarse, medium or fine bubble devices, in that they have never designed or marketed a product which performed poorly in the field. Comparative studies of aeration equipment consistently show that SANITAIRE products perform as represented and exhibit high mechanical integrity. The company has the experience and financial strength to back its warranties.*"

This statement was prepared by Elson T. Killam, Inc. in association with D. H. Houck Associates, Inc. The original report was prepared in 1985 and updated in 1987. It evaluated the application of various fine bubble diffuser systems for five treatment plants operated by the Washington Suburban Sanitairy Commission. D.H. Houck and Associates has also conducted extensive investigations of fine bubble aeration systems in North America and Europe.

A second significant milestone occurred in 1994. This was the year that Sanitaire purchased the assets of AUSTGEN BIOJET CORPORATION from Broken Hill Properties. ABJ is a world leader in sequencing batch reactor technology with over 175 installations in the United States and over 500 installations worldwide. ABJ developed a continuous flow SBR called ICEAS® in the 1970's. This technology was brought to the U.S. in 1983. The first plant to begin operation was located in Tullahoma, TN. It began operating in 1985 and is still in operation today. The ICEAS® process can be applied to any flow rate. The largest continuous flow SBR in the world is based on the ICEAS® technology and can be found in Kunming, China. It is designed to treat peak flows of 80 MGD. ABJ has also designed large SBR systems such as a plant now under construction in Dublin, Ireland, which will be designed to treat an average flow of 200 MGD.

A third significant milestone occurred in 1997. Sanitaire purchased the assets and technology of AERATION ENGINEERING RESOURCES CORPORATION. Frank Schmit, (Chairman of the Board of Sanitaire in 1997) said in a news release: "The capability of the AERCOR people greatly expand the resources of Sanitaire to continue its goal toward becoming recognized worldwide as the most competent and complete source of aeration technology and products."

Sanitaire is proud to be recognized as the leader in the design and development of a variety of systems ranging from reliable coarse bubble aeration equipment, energy saving ceramic and membrane fine pore aeration systems to complete activated sludge treatment plants.

City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

MANUFACTURER LOCATION/CONTACT INFORMATION:

Xylem Waukesha (Sanitaire)
N19 W23993 Ridgeview Pkwy STE 200
Waukesha, WI 53188
(414) 365-2200

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City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

XYLEM HAS BEEN IN BUSINESS SINCE 2011

THE SANITAIRE DIVISION OF XYLEM HAS BEEN IN BUSINESS CONTINUOUSLY SINCE 1967

SANITAIRE HAS BEEN MANUFACTURING SEQUENCING BATCH REACTORS SINCE THE ACQUISITION OF AUSTGEN BIOJET CORPORATION IN 1994

SANITAIRE

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City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

PROJECT MANAGER NAME:

Xylem Sanitaire project managers are not assigned until a purchase order has been received and contract documents are executed.

SANITAIRE

a xylem brand

City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

XYLEM SERVICE LOCATIONS:

Xylem Portland (Flygt)
9625 SW Tualatin Sherwood Rd
Tualatin, OR 97062
(503) 647-4738

Beaver Equipment
15112 NE 198th Street
Woodinville, WA 98072
(855) 878-6386

Xylem Waukesha (Sanitaire)
N19 W23993 Ridgeview Pkwy STE 200
Waukesha, WI 53188
(414) 365-2200

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City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Section 8: Manufacturer Experience

SANITAIRE

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US INSTALLATIONS 2012-2022: 233

SANITAIRE INSTALLATION LIST - BIOLOGICAL SYSTEMS

Project Number	Wastewater Treatment Plant Name	State / Province / Department / Region	Country	Plant Type	Operating Mode	Average Dry Weather Flow (ADWF), *MGD*	Peak Wet Weather Flow (PWWF), *MGD*	PWWF / ADWF
22-9897A	Osawatomie (Phase Upgrade 2)	KS	United States	ICEAS	NDN	*0.400*	*1.880*	4.70
21-9847A	Clemson	SC	United States	SBR	NDN	*0.450*	*0.813*	1.81
21-9834A	Nunda	NY	United States	ICEAS	NIT	*0.200*	*0.450*	2.25
21-9816AV	Mondovi	WI	United States	ICEAS	NDNP	*0.240*	*0.558*	2.33
21-9800A	Turbotville	PA	United States	ICEAS	NDNP	*0.020*	*0.055*	2.74
21-9775A	Cherokee County - Woodstock (Fitzgerald Creek WPCP - Phase Expansion 1)	GA	United States	ICEAS / SBR	NDNP	*12.000*	*21.500*	1.79
21-9762A	Mascoutah	IL	United States	ICEAS	NDNP	*1.750*	*2.625*	1.50
21-9759A	Bruceton Mills	WV	United States	ICEAS	NDN	*0.100*	*0.231*	2.31
21-9749A	Middleburgh	NY	United States	ICEAS	NIT	*0.180*	*0.540*	3.00
21-9712A	Pearland - John Hargrove WRF	TX	United States	ICEAS	NIT	*6.000*	*12.000*	2.00
20-9702A	Huron	SD	United States	ICEAS	NIT	*2.840*	*5.187*	1.83
20-9702A	Huron	SD	United States	ICEAS	NIT	*2.840*	*3.900*	1.37
20-9695AV	La Veta	CO	United States	ICEAS	NDN	*0.087*	*0.350*	4.04
20-9687A	Viola	AR	United States	ICEAS	NDN	*0.100*	*0.500*	5.00
20-9680A	Star City	AR	United States	ICEAS	NIT	*0.365*	*2.200*	6.03
20-9678A	Adel	IA	United States	SBR	NDNP	*0.980*	*3.500*	3.57
20-9663A	Greencastle/Antrim	PA	United States	ICEAS	NDN	*1.200*	*4.800*	4.00
20-9653A	Bloomfield	NM	United States	ICEAS	NDN	*0.930*	*2.660*	2.86
20-9651A	Breakneck Creek	PA	United States	ICEAS	NDN	*6.300*	*13.650*	2.17
20-9645A	Eldorado	OH	United States	ICEAS	NDNP	*0.100*	*0.775*	7.75
20-9642A	Big Lake	TX	United States	ICEAS	NIT	*0.875*	*3.210*	3.67
20-9634A	Four Corners WWTP - Bozeman	MT	United States	ICEAS	NDNP	*0.440*	*0.813*	1.85
20-9613A	Tomball ISD	TX	United States	ICEAS	NIT	*0.044*	*0.175*	3.98
20-9607A	Tanner's Bidge / Bethlehem	GA	United States	ICEAS	NIT	*1.500*	*3.500*	2.33
20-9595AV	Indian Land	SC	United States	ICEAS	NDNP	*5.000*	*10.000*	2.00
20-9576A	Millbottom	MD	United States	ICEAS	NDNP	*0.150*	*0.299*	1.99
19-9574A	Northampton County - Bath Borough Authority	PA	United States	ICEAS	NDN	*0.500*	*3.000*	6.00
19-9573A	Pageland	SC	United States	ICEAS	NIT	*1.500*	*3.750*	2.50
19-9564A	Shiloh	OH	United States	ICEAS	NIT	*0.150*	*0.725*	4.83
19-9560A	Pembroke Corfu	NY	United States	ICEAS	NIT	*0.150*	*0.400*	2.67
19-9553A	Greenfield Township	PA	United States	ICEAS	NIT	*0.140*	*0.350*	2.50
19-9553A	Roscoe	NY	United States	ICEAS	NIT	*0.014*	*0.018*	1.25
19-9551A	Erwin	NY	United States	ICEAS	NDN	*2.150*	*5.375*	2.50
19-9536A	Morrison	CO	United States	ICEAS	NDNP	*0.350*	*1.050*	3.00
19-9530A	Alexandria Bay - Boldt Castle	NY	United States	ICEAS	NIT	*0.012*	*0.042*	3.51
19-9529A	Pikeville - Bledsoe Prison	TN	United States	ICEAS	NDNP	*0.850*	*1.140*	1.34
19-9501A	Humboldt	TN	United States	ICEAS	NIT	*5.000*	*15.000*	3.00
19-9494A	Jimmy Mixon WWTP - Ridgeland	SC	United States	ICEAS	NIT	*1.600*	*4.000*	2.50
19-9491A	Chapmanville	WV	United States	ICEAS	NIT	*0.600*	*2.000*	3.33
19-9470A	Sycamore	IL	United States	ICEAS	NDNP	*6.500*	*12.420*	1.91
19-9447A	Oak Grove	AR	United States	ICEAS	NDN	*0.300*	*0.900*	3.00
18-9437A	Upper Sandusky	OH	United States	ICEAS	NDNP	*2.000*	*7.083*	3.54
18-9426A	Santa Rosa	CA	United States	SBR	NIT	*5.000*	*9.350*	1.87
18-9413A	Montgomery County - MUD #8	TX	United States	ICEAS	NDNP	*1.250*	*6.600*	5.28
18-9395A	Lebanon	IL	United States	ICEAS	NDNP	*0.878*	*3.000*	3.42
18-9387A	Lake Ronkonkowa	NY	United States	ICEAS / SBR	NDN	*0.049*	*0.094*	1.92
18-9378A	Oceana	WV	United States	ICEAS	NIT	*0.750*	*3.400*	4.53
18-9348A	Sutherlin	OR	United States	ICEAS	NIT	*1.800*	*7.000*	3.89
18-9344A	Kimmswick - Rock Creek PSD (Phase Upgrade 4)	MO	United States	ICEAS	NDNP	*4.800*	*16.700*	3.48
18-9335A	Folsom	LA	United States	ICEAS	NIT	*0.200*	*0.400*	2.00
18-9333A	Nesconset - Eagle Rock STP	NY	United States	ICEAS	NDN	*0.030*	*0.120*	4.00
18-9327A	Sheldon	IA	United States	ICEAS	NDN	*1.779*	*3.950*	2.22
18-9292A	Fresenius Kabi - Grand Island	NY	United States	ICEAS	NIT	*0.358*	*0.288*	0.80
17-9258A	Palm Coast - Dunes	FL	United States	ICEAS	NIT	*0.210*	*0.650*	3.10
17-9253A	Franklin County - Carnesville	GA	United States	ICEAS	NIT	*0.300*	*1.200*	4.00
17-9245A	Fayette County - Smithfield (Fairchance - Georges STP - Phase Expansion 1)	PA	United States	ICEAS				
17-9231A	Furlow	AR	United States	ICEAS	NIT	*0.075*	*0.300*	4.00
17-9208A	Fallsburgh - Raleigh Hotel	NY	United States	ICEAS	NDN	*0.137*	*0.335*	2.45
17-9184A	Williamstown	WV	United States	ICEAS	NIT	*0.090*	*0.225*	2.50
17-9151A	Quaker City	OH	United States	ICEAS	NIT	*0.100*	*0.400*	4.00
17-9138A	Bennett	CO	United States	ICEAS	NDN	*0.400*	*1.150*	2.88
17-9125A	Mercer	PA	United States	ICEAS	NDN	*0.795*	*2.500*	3.14
17-9123A	Pleasantville	IA	United States	ICEAS	NDNP	*0.260*	*0.870*	3.35
17-9100A	Orange City	IA	United States	ICEAS	NDNP	*2.450*	*2.450*	1.00
17-9099A	St. Mary's	PA	United States	ICEAS	NIT	*2.115*	*12.000*	5.67
17-9062A	Drain	OR	United States	ICEAS	NDN	*0.370*	*1.800*	4.86
17-9060A	Pennsboro	WV	United States	ICEAS	NIT	*0.394*	*2.100*	5.33
17-9055A	Blue Lake	NY	United States	ICEAS / SBR	NDN	*0.150*	*0.375*	2.50
17-9055A	West Nyack - Blue Lake	NY	United States	ICEAS / SBR	NDN	*0.150*	*0.375*	2.50
17-9054A	Minden	NV	United States	SBR	NDN	*0.720*	*1.170*	1.63
17-9052A	Salt Rock (Ona)	WV	United States	ICEAS	NIT	*2.500*	*10.000*	4.00
16-9008A	Coos Bay	OR	United States	ICEAS	NIT	*2.090*	*6.310*	3.02
16-9007A	The Seasons at Elwood	NY	United States	ICEAS	NDN	*0.060*	*0.232*	3.87
16-8999A	Livingston	MT	United States	ICEAS	NDN	*2.180*	*2.720*	1.25
16-8998A	Loveland - Sunrise Ranch WWTF	CO	United States	ICEAS	NDN	*0.034*	*0.068*	1.99
16-8977A	Pearland - Reflection Bay	TX	United States	ICEAS	NIT	*6.000*	*24.000*	4.00
16-8974A	Ledyard	CT	United States	ICEAS / SBR	NIT	*0.284*	*0.800*	2.82
16-8959A	Berthoud	CO	United States	ICEAS	NIT	*0.063*	*0.242*	3.84
16-8949A	Breezewood	PA	United States	ICEAS	NDNP	*0.380*	*0.760*	2.00
16-8937A	Ball Ground	GA	United States	SBR	NDNP	*1.000*	*3.000*	3.00

16-8910A	Hamilton	NY	United States	ICEAS / SBR	NDN	1.500	4.000	2.67
16-8903A	Knoxville - Melton Hill	TN	United States	ICEAS / SBR	NDN	6.000	15.000	2.50
16-8888A	Arcade	NY	United States	ICEAS	NIT	1.125	2.550	2.27
16-8887A	Elgin (Spears Creek)	SC	United States	ICEAS	NDN	12.000	30.000	2.50
16-8866A	Santa Teresa (West Mesa)	NM	United States	ICEAS	NDN	0.300	0.600	2.00
16-8862A	Pacific City	OR	United States	ICEAS	NDN	0.230	1.200	5.22
16-8845A	Big Sky	MT	United States	ICEAS	NDN	0.050	0.198	3.96
16-8826A	Georgetown	SC	United States	ICEAS	NIT	6.000	12.000	2.00
16-8818A	Mammoth Springs	AR	United States	ICEAS	NDN	0.150	0.400	2.67
16-8790A	Philadelphia	NY	United States	ICEAS	NDN	0.156	1.600	10.26
16-8787TC	Martinsburg	PA	United States	ICEAS	NDN	0.700	2.100	3.00
16-8760A	Leakey	TX	United States	ICEAS	NIT	0.250	1.000	4.00
15-8757A	Nesconset (Amber Court)	NY	United States	ICEAS	NDN	0.015	0.030	2.00
15-8755A	Geneva on the Lake	OH	United States	ICEAS	NDN	0.600	1.200	2.00
15-8693A	Livingston Manor	NY	United States	ICEAS	NDN	0.400	1.200	3.00
15-8685A	Berthoud	CO	United States	ICEAS	NDN	0.063	0.177	2.81
15-8681A	Middle Island	NY	United States	ICEAS	NDN	0.063	0.242	3.84
15-8681A	Sandy Hills	NY	United States	ICEAS / SBR	NDN	0.063	0.242	3.84
15-8678A	Harris County - Cypress (Cypress Hill MUD #1 WTF - Phase Expansion 1)	TX	United States	ICEAS	NIT	1.000	3.000	3.00
15-8676A	McHenry	IL	United States	ICEAS	NDN	1.200	4.000	3.33
15-8641A	Piperton	TN	United States	ICEAS	NDN	0.500	2.000	4.00
15-8628A	Cedaredge	CO	United States	ICEAS	NIT	0.375	0.750	2.00
15-8625A	New Wilmington	PA	United States	ICEAS	NIT	0.780	3.000	3.85
15-8620TC	Sinton	TX	United States	ICEAS	NIT	0.800	2.400	3.00
15-8620A	Sinton	TX	United States	ICEAS	NIT	0.800	2.400	3.00
15-8608A (ABJ2422)	Roaring Springs	PA	United States	ICEAS	NIT	0.700	1.750	2.50
15-8608A	Roaring Springs	PA	United States	ICEAS	NIT	0.700	1.750	2.50
15-8568A	Keyser	WV	United States	ICEAS	NDN	2.400	10.000	4.17
15-8557TC	Red House	NY	United States	ICEAS	NIT	0.040	0.160	4.00
15-8554A	McCain Foods	ID	United States	ICEAS	NIT	0.029	0.040	1.38
15-8536A	St. Thomas	PA	United States	ICEAS				#DIV/0!
15-8516TC	Barnsborough N. Cambria	PA	United States	ICEAS	NDN	0.900	2.250	2.50
14-8495A	Claywood Park	WV	United States	ICEAS	NIT	0.100	0.600	6.00
14-8476A	Clewiston	FL	United States	SBR	NIT	0.301	0.302	1.00
14-8460A	Canton	GA	United States	ICEAS	NDNP	4.000	7.200	1.80
14-8445A	Glendive	MT	United States	ICEAS	NDN	1.760	3.830	2.18
14-8430A	Monticello	NY	United States	ICEAS	NDN	2.500	8.297	3.32
14-8401A	Cortland	NY	United States	ICEAS	NDN	6.500	13.000	2.00
14-8336A	Rocket Center	WV	United States	ICEAS	NIT	0.200	0.500	2.50
14-8331A	Elmwood	WI	United States	ICEAS	NDN	0.105	0.218	2.07
14-8328A	Lyons	CO	United States	ICEAS	NDN	0.381	1.016	2.67
14-8322A	Titusville	PA	United States	ICEAS	NIT	4.000	16.000	4.00
14-8311A	Phillipsburg	NJ	United States	ICEAS	NIT	3.500	7.000	2.00
14-8283A	Bernardsville	NJ	United States	ICEAS	NIT	0.172	1.250	7.29
14-8278A	Millbottom	MD	United States	ICEAS	NDN	0.111	0.220	1.98
14-8277A	Raeford (Hoke)	NC	United States	ICEAS	NDNP	1.500	3.750	2.50
14-8248A	Abbotsford	WI	United States	ICEAS	NDNP	0.638	2.304	3.61
14-8242A	Redbank TWP	PA	United States	ICEAS	NIT	0.200	0.500	2.50
14-8242A	Hawthorn	PA	United States	ICEAS	NIT	0.200	0.500	2.50
14-8236A	Franklinton	LA	United States	ICEAS	NIT	0.800	2.200	2.75
13-8445A	Glendive	MT	United States	ICEAS / SBR	NDNP	1.760	3.830	2.18
13-8198A	N & S Shenango (Jamestown)	PA	United States	ICEAS	NDNP	0.444	1.600	3.60
13-8197A	Curwensville	PA	United States	ICEAS	NDN	1.100	1.900	1.73
13-8186A	Zerbe (Trevorton)	PA	United States	ICEAS	NDNP	0.500	0.800	1.60
13-8155A	Whitney Point	NY	United States	ICEAS	NDN	0.150	0.500	3.33
13-8147A	Suffolk County - Gurwin Jewish Senior Residence STP	NY	United States	SBR	NDN	0.025	0.085	3.40
13-8137A	Marengo	IL	United States	ICEAS	NDNP	0.900	3.600	4.00
13-8121A	Cayuga	NY	United States	ICEAS	NDN	0.130	0.520	4.00
13-8116A	Powers	OR	United States	ICEAS	NDNP	0.096	0.148	1.54
13-8107A	Glendive	MT	United States	ICEAS	NDNP	1.760	3.830	2.18
13-8069A	Evans City	PA	United States	ICEAS	NDNP	0.850	3.400	4.00
13-8063A	Broken Arrow (Green Cty)	OK	United States	ICEAS	NIT	0.750	2.000	2.67
13-8038A	Wewahitchka	FL	United States	ICEAS	NDNP	0.240	0.720	3.00
13-7993A	Dansville	NY	United States	ICEAS	NDNP	2.600	6.000	2.31
13-7981A	Maybrook	NY	United States	ICEAS	NDNP	0.600	1.200	2.00
13-7959A	Greenbrier	AR	United States	ICEAS	NDNP	1.000	3.000	3.00
12-7943A	Georgetown	OH	United States	ICEAS	NDNP	1.100	4.000	3.64
12-7941A	Union City	TN	United States	ICEAS	NIT	4.400	12.070	2.74
12-7934A	Dunes (Palm Coast)	FL	United States	ICEAS	NIT	0.500	1.250	2.50
12-7932A	Leechburg (Kiski Valley)	PA	United States	ICEAS	NDN	7.000	31.000	4.43
12-7930A	California	PA	United States	ICEAS	NIT	1.200	4.800	4.00
12-7928A	Birnamwood	WI	United States	ICEAS	NIT	0.201	0.423	2.10
12-7927A	Penn (Jeanette)	PA	United States	ICEAS	NIT	1.800	5.590	3.11
12-7927A	Jeannette	PA	United States	ICEAS	NIT	1.800	5.590	3.11
12-7921A	Big Lake	TX	United States	ICEAS	NIT	0.175	0.643	3.67
12-7906A	Point Pleasant (Lakin)	WV	United States	ICEAS	NIT	0.315	1.000	3.17
12-7892A	York Springs	PA	United States	ICEAS	NDNP	0.400	1.600	4.00
12-7885A	Monroe County - Tobyhanna Army Depot	PA	United States	ICEAS	NDNP	0.900	1.800	2.00
12-7878A	German Twp	PA	United States	ICEAS	NIT	0.180	0.720	4.00

12-7862A	Cape Girardeau	MO	United States	ICEAS	NIT	2.750	5.210	1.89
12-7857A	Harwood (Southern HS)	MD	United States	ICEAS	NIT	0.028	0.134	4.79
12-7856AC	Aliquippa - Raccoon Creek WPCP	PA	United States	ICEAS	NIT	1.750	8.000	4.57
12-7834A	Smith Haven Mall	NY	United States	ICEAS	NDN	0.100	0.372	3.72
12-7826A	Inlet	NY	United States	ICEAS / SBR	NDNP	0.020	0.126	6.30
12-7822A	Altamont	NY	United States	ICEAS	NIT	0.270	1.850	6.85
12-7811A	Morrison	CO	United States	ICEAS	NDNP	0.350	1.050	3.00
12-7785A	Slippery Rock	PA	United States	ICEAS	NIT	1.200	5.200	4.33
12-7785A	Slippery Rock (Hines Rd. WWTP)	PA	United States	ICEAS	NIT	1.200	5.200	4.33
12-7783A	Montville	CT	United States	SBR	NIT	3.960	12.000	3.03
12-7766A (01-4946A)	Connellsville (Dunbar Twp)	PA	United States	ICEAS	NIT	0.450	1.125	2.50
12-7759A	Vogel State Park (Blairsville)	GA	United States	SBR	NIT	0.011	0.041	3.68
12-7756A (06-6404A)	Leipsic	OH	United States	ICEAS	NIT	1.500	3.000	2.00
12-7752A	Hooks - Texamericas Center East WWTP	TX	United States	ICEAS	NIT	1.500	4.500	3.00
12-7734A	Jerseyville	IL	United States	ICEAS / SBR	NDNP	2.030	7.200	3.55
12-7732A	Cairo	NY	United States	ICEAS	NIT	0.178	0.400	2.25
12-7727A	Chatham	NY	United States	ICEAS	NIT	0.548	1.500	2.74
12-7716A	Box Elder	SD	United States	ICEAS	NIT	4.300	8.700	2.02
11-7714A	Marine Corps Base Camp Pendleton Northern Regional P-1043	CA	United States	SBR	NDNP	4.000	11.450	2.86
11-7713A	Preston County - Hazelton (Phase Expansion)	WV	United States	ICEAS	NIT	0.750	2.625	3.50
11-7706A	Perry County - Millerstown	PA	United States	ICEAS	NDNP	0.120	0.300	2.50
11-7699A	Atlanta - Phase Upgrade	TX	United States	ICEAS	NIT	2.000	5.000	2.50
11-7696A	Piperton	TN	United States	ICEAS	NDN	0.250	1.000	4.00
11-7692A	Canton - Phase Upgrade	GA	United States	ICEAS	NDNP	3.330	7.200	2.16
11-7686A	Jefferson County - Cape Vincent	NY	United States	ICEAS / SBR	NIT	0.500	2.364	4.73
11-7663A	Mercer County - Sandy Lake (Lakeview Joint Sewer Authority WWTP - Phase Upgrade)	PA	United States	SBR	NIT	0.450	1.350	3.00
11-7661A	Coquille	OR	United States	ICEAS	NDNP	2.040	6.120	3.00
11-7657A	Donalsonville	GA	United States	SBR	NDNP	1.000	2.500	2.50
11-7653A	Blair County - Hollidaysburg (Phase Upgrade 2)	PA	United States	ICEAS	NDNP	3.728	15.000	4.02
11-7652A	Harris County - Katy (Weston MUD WWTP)	TX	United States	ICEAS	NDNP	0.700	2.800	4.00
11-7647A	Alamogordo	NM	United States	ICEAS	NDN	3.000	7.800	2.60
11-7637A	Chisholm - Central Iron Range Sanitary Sewer District	MN	United States	SBR	NDNP	2.500	5.000	2.00
11-7633A	Osawatomie (Phase Upgrade 1)	KS	United States	ICEAS	NIT	0.560	1.800	3.21
11-7620A / 11-7684A	Socorro - Phase Upgrade	NM	United States	ICEAS	NIT	1.300	3.250	2.50
11-7604A	Ulster County - Ellenville	NY	United States	ICEAS	NIT	1.100	2.380	2.16
11-7599A	Butler County - Evans City (Hidden Acres Walnut Square & Wilsons Ridge STP)	PA	United States	ICEAS	NIT	0.094	0.213	2.27
11-7596A	Kimmswick - Rock Creek PSD (Phase Upgrade 3)	MO	United States	ICEAS	NDNP	4.800	16.700	3.48
11-7595A	Gold Beach	OR	United States	ICEAS	NDN	0.630	3.150	5.00
11-7583A	Tucker Unit - Arkansas Department of Corrections	AR	United States	ICEAS	NDNP	0.500	1.500	3.00
11-7577A	Allegheny County - McKeesport	PA	United States	ICEAS / SBR	NDNP	7.000	36.000	5.14
11-7553A	Montville - Phase Upgrade 2	CT	United States	ICEAS	NIT / NDN	3.960	12.000	3.03
11-7550A	Pikeville - Bledsoe County Correctional Complex	TN	United States	ICEAS	NDNP	0.322	0.644	2.00
11-7547A	Middleton	ID	United States	ICEAS	NDNP	1.500	8.400	5.60
11-7545A	Washington County - Burgettstown (Hanover Township Sewer Authority)	PA	United States	ICEAS	NIT	0.180	0.450	2.50
11-7541A	Allegany County - Belmont	NY	United States	ICEAS	NDNP	0.250	0.850	3.40
11-7540A	Suffolk County - Brookhaven (Selden - County Sewer District #11 STP - Phase Upgrade)	NY	United States	ICEAS / SBR	NDN	0.893	2.039	2.28
11-7532A	Loudoun County - Selma Estates	VA	United States	ICEAS	NDNP	0.090	0.230	2.56
11-7522A	Nucor-Yamato Steel Company - Blytheville WWTP (Phase Upgrade)	AR	United States	ICEAS	NIT	0.234	0.234	1.00
11-7505A	Franklin County - Waynesboro (Mont Alto Municipal Authority'	PA	United States	ICEAS	NDNP	0.300	0.750	2.50
10-7480A	Westmoreland County - Mount Pleasant	PA	United States	ICEAS	NIT	0.330	0.850	2.58
10-7471A	Sullivan City (Agua SUD - West WWTP)	TX	United States	ICEAS	NIT	1.400	4.767	3.40
10-7460A	Netarts-Oceanside Sanitary District	OR	United States	ICEAS	NIT	0.700	2.530	3.61
10-7446A	Hopkinton (Phase Upgrade)	IA	United States	ICEAS / SBR	NIT	0.150	0.270	1.80
10-7439A	Washington County - Brownsville / Centerville (Center-West STP)	PA	United States	ICEAS	NIT	0.280	1.120	4.00
10-7416A	Crawford County - Linesville Pine Joint Municipal Authority	PA	United States	ICEAS	NDNP	0.360	2.125	5.90
10-7397A	Sullivan County - Woodridge	NY	United States	ICEAS	NDNP	0.800	2.400	3.00
10-7396A	Essex County - Essex	NY	United States	ICEAS	NDNP	0.065	0.162	2.49
10-7390A / 11-7506A / 11-7507A	Luzerne County - SCI Dallas	PA	United States	ICEAS	NDNP	0.500	1.000	2.00
10-7380A	Mifflin County - Lewistown (Granville Township Main STP - Phase Upgrade 3)	PA	United States	SBR	NDNP	0.500	1.600	3.20
10-7377A	Acoma Pueblo - Acomita WWTP (Phase Upgrade 2)	NM	United States	ICEAS	NDN	0.075	0.225	3.00
10-7373A	Washington County - Centerville Borough (Richeyville STP - Phase Upgrade)	PA	United States	ICEAS	NIT	0.170	0.540	3.18
10-7371A	Northampton County - Nazareth Borough (Phase Expansion)	PA	United States	ICEAS	NDNP	2.100	4.200	2.00
10-7355A	Tompkins County - Dryden	NY	United States	ICEAS	NDNP	0.710	2.500	3.52
10-7345A	Sweetwater	TN	United States	ICEAS	NDNP	1.500	4.000	2.67
10-7334A	Cleveland - Hiwassee River WWTP (Phase Upgrade 2)	TN	United States	ICEAS	NIT	22.390	33.000	1.47

10-7326A	Kimmswick - Rock Creek PSD (Phase Upgrade 2)	MO	United States	ICEAS	NDNP	*4.800*	*16.700*	3.48
10-7325A	Hartford - White River Junction WWTF	VT	United States	ICEAS / SBR	NIT	*1.450*	*4.750*	3.28
10-7315A	Bono (Phase Upgrade)	AR	United States	ICEAS	NIT	*0.300*	*0.500*	1.67
10-7303A	Lennox	SD	United States	SBR	NIT	*0.670*	*0.670*	1.00

US INSTALLATIONS 2012-2022: 233

* Installation list includes US installations only. Xylem has additional installations outside of the US.

**Installation list spans 10 years from 2012 - 2022 and does not include more recent installations that are in progress or have not been entered into internal database.

Xylem ICEAS SBR Reference List - Oregon/Washington

1. Jefferson, OR | Kyle Ward | (541) 971-0953 | kward@jeffersonoregon.org

   ADWF = 0.652 MGD | PWWF = 4.820 MGD | Commissioned 2010

2. McCleary, WA | Kevin Trewhella | (360) 495-3217 | kevint@cityofmccleary.com

   ADWF = 0.570 MGD | PWWF = 1.310 MGD | Commissioned 2005

3. Sutherlin, OR | Jody Gardner | O: (541) 459-5768 M: (541) 315-6565 | j.gardner@ci.sutherlin.or.us

   ADWF = 1.800 MGD | PWWF = 7.00 MGD | Commissioned 2020

4. Coquille, OR | Gary Dagit | (541) 396-4336 | gdagit@cityofcoquille.org

   ADWF = 2.040 MGD | PWWF = 6.120 MGD | Commissioned 2013

5. Gold Beach, OR | Ron Hansen | (541) 247-7459 | rhanson@goldbeachoregon.gov

   ADWF = 0.630 MGD | PWWF = 3.150 MGD | Commissioned 2012

6. Netarts-Oceanside Sanitary District | Brian Mello | (503) 842-8231 ext 5 | brian@nosd.us

   ADWF = 0.700 MGD | PWWF = 2.530 MGD | Commissioned 2013

City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Section 9: Exceptions; Missing Items; Recommendations

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AGREEMENT BETWEEN BUYER AND SELLER FOR PROCUREMENT CONTRACT

This Procurement Agreement is by and between **The City of Aumsville, Oregon** ("Buyer") and **[formal name of entity]** ("Seller").

Terms used in this Procurement Agreement have the meanings stated in the General Conditions of the Procurement Contract and the Supplementary Conditions of the Procurement Contract.

Buyer and Seller hereby agree as follows:

ARTICLE 1—PROCUREMENT CONTRACT

1.01 *Goods and Special Services*

A. Seller shall furnish the Goods and Special Services as specified or indicated in the Procurement Contract Documents. The Goods and Special Services are generally described as follows (check only one box and delete the other):

☒ Sequencing Batch Reactor and Digester Equipment for the Aumsville Wastewater Treatment Plant

☐ Dissolved Air Floatation Equipment for the Aumsville Wastewater Treatment Plant

1.02 *The Project*

A. The Project, of which the Goods and Special Services are a part, is generally described as follows: **The Aumsville Wastewater Treatment Plant Improvements**.

1.03 *Engineer*

A. Buyer has retained **Westech Engineering, Inc.** ("Engineer"), to prepare Procurement Contract Documents and act as Buyer's representative. Engineer assumes all duties and responsibilities and has the rights and authority assigned to Engineer in the Procurement Contract Documents in connection with Seller's furnishing of Goods and Special Services.

1.04 *Point of Destination*

A. The Point of Destination is designated as: The Aumsville Wastewater Treatment Plant, 955 Olney Street SE, Aumsville, Oregon 97325.

ARTICLE 2—PROCUREMENT CONTRACT TIMES

2.01 *Time of the Essence*

A. All time limits for Milestones, including the submittal of Shop Drawings and Samples, the delivery of Goods, and the furnishing of Special Services as stated in the Procurement Contract Documents, are of the essence of the Procurement Contract.

2.02 *Schedule of Procurement Contract Times*

A. The following schedule sets forth the Procurement Contract Times:

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Milestone	Date or Days	Notes
Provide submittal information as specified under the heading "Submittals Required After Notice of Award" in the relevant equipment specification sections.	11245 days after notice to proceed	(16 weeks)
Deliver acceptable Goods to Point of Destination	August 27, 2026	The actual delivery date shall be coordinated with the General Contractor for the construction and installation of the treatment plant.

2.03 *Shop Drawings and Samples*

A. *Submittal of Shop Drawings and Samples*: Seller shall submit all Shop Drawings and Samples required by the Procurement Contract Documents to Engineer for its review and approval. A manufacturer's Certification letter must be included in the submittal for each item subject to Domestic Preference requirements. Refer to the Manufacturer's certification form is included in the Instructions to Bidders.

B. *Engineer's Review*: It is the intent of the parties that Engineer will conduct its review of Shop Drawings and Samples and issue its approval, or a denial accompanied by substantive comments regarding information needed to gain approval, within **20** days after Seller's submittal of such Shop Drawings and Samples, or within such longer period that is needed because of the quantity and quality of such submittals. Resubmittals will be limited whenever possible. Engineer's review and approval of a Shop Drawing or Sample shall include review of Manufacturer's Certifications in order to document compliance with Domestic Preference requirements, as applicable.

2.04 *Liquidated Damages*

A. Buyer and Seller recognize that time is of the essence as stated in Paragraph 2.01, and that Buyer will suffer financial and other losses if the Goods are not delivered to the Point of Destination and ready for receipt of delivery by Buyer within the time specified in Paragraph 2.02, plus any extensions thereof allowed in accordance with this Procurement Contract. The parties also recognize that the timely performance of services by others involved in the Project is materially dependent upon Seller's specific compliance with the delivery requirements of Paragraph 2.02. Further, the parties recognize the time, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the loss (whether direct, consequential, or otherwise) suffered by Buyer if complete, acceptable Goods are not delivered on time. Accordingly, instead of requiring any such proof, Buyer and Seller agree that as liquidated damages for delay (but not as a penalty) Seller shall pay Buyer $**1,500** for each day that expires after the time specified in Paragraph 2.02 for delivery of acceptable Goods. Irrespective of the foregoing, no liquidated damages will be assessed against Seller unless Seller is actually late in delivering equipment according to the mutually agreed upon delivery schedule and Seller's late delivery adversely impacts Buyer's overall Project critical path schedule. Payment of liquidated damages shall be Seller's sole liability and Buyer's sole remedy for late delivery. In no event shall the total liquidated damages amount exceed ten percent (10%) of the Procurement Contract price.

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ARTICLE 3—PROCUREMENT CONTRACT PRICE

3.01 *Procurement Contract Price and Total Price*

A. The Procurement Contract Price is comprised of the Lump Sum and Unit Price amounts set forth in the following paragraphs.

B. Buyer shall pay Seller a Lump Sum of $**[amount]** for furnishing the Goods and Special Services (other than any Unit Price Goods and Special Services) in accordance with the Procurement Contract Documents. Such Lump Sum amount accounts for the following Buyer-accepted alternates: **None.**

C. Buyer's Contingency Allowance is stipulated as $**75,000**. Buyer's use of such allowance, including resulting compensation of Buyer, is governed by Paragraph 11.06 of the General Conditions.

D. The Total Price is $**[amount]**. Such Total Price is comprised of the Lump Sum amount (taking into account any accepted alternates), Unit Price Goods and Special Services amount (if any) (subject to final adjustment), and Buyer's Contingency Allowance (if any) (subject to final adjustment).

ARTICLE 4—PAYMENT PROCEDURES

4.01 *Submittal and Processing of Applications for Payment*

A. Seller shall submit Applications for Payment in accordance with Article 13 of the General Conditions, the Information for Proposers, and the following paragraphs. Engineer and Buyer will process such Applications for Payment in accordance with said Article 13.

4.02 *Progress Payments; Final Payment*

A. Seller may submit an Application for Payment requesting the stated percentage of Procurement Contract Price upon attainment of each of the following Payment Line Items:

Payment Line Item (Lump Sum)	Percentage of Lump Sum
1. Receipt of Approval of Shop Drawings and Samples	10
2. Delivery of Goods to Point of Destination in accordance with the Procurement Contract Documents	80
3. Completion of Startup and Commissioning Services in accordance with the Procurement Contract Documents	5
4. Final Payment: Correction of non-conformities, provision of final Operations and Maintenance manuals, submittal of warranties and other final documentation required by the Procurement Contract Documents.	5
Total Procurement Contract Price (Lump Sum)	100

B. For Unit Price Goods and Special Services, if any, or for payments owed to Seller as a result of authorizations by Buyer under the Buyer's Contingency Allowance (if any), Seller shall submit a separate Application for Payment, no more frequently than monthly, that states (1) the actual quantities of such Unit Price Goods and Special Services that have been furnished, and the applicable unit prices; and (2) the services or items performed or

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furnished under the Buyer's Contingency Allowance, and the amounts owed. If practical, and at Seller's option, Seller may apply for such unit price and Buyer's Contingency Allowance payments in a separate section of an Application for Payment submitted under Paragraph 4.02.A for lump sum items.

C. Buyer shall pay Seller the amount owed under an Application for Payment within 45 days after Engineer's presentation to Buyer of the Application for Payment and Engineer's recommendation.

ARTICLE 5—ASSIGNMENT OF PROCUREMENT CONTRACT

5.01 *Assignment of Contract*

A. Buyer has the right to assign this Procurement Contract for furnishing Goods and Special Services, but only to a person or entity with sufficient apparent ability to satisfy all of Buyer's obligations under this Procurement Contract, and Seller hereby consents to such assignment. Forms documenting the assignment of the Procurement Contract, and consent of Seller's surety to the assignment, have been executed by Buyer, Seller, and Seller's surety, and are attached as exhibits to this Procurement Agreement. If so assigned, the following provisions apply:

1. The Procurement Contract is initially executed in the name of the entity identified herein as Buyer, and will be assigned by such Buyer (as assignor) to a construction contractor (Contractor/Assignee) designated by such Buyer. The assignment will occur on the effective date of the construction contract between such Buyer (Project Owner) and the Contractor/Assignee, which is expected to occur on or about **January 15, 2026**. Commencing on the date of acceptance of assignment by the Contractor/Assignee, all references in the Procurement Contract to "Buyer" shall mean the designated Contractor/Assignee.

2. The assignment of this Procurement Contract relieves the assignor from all further obligations and liabilities under this Procurement Contract. After assignment, Seller shall become a subcontractor or supplier to the Contractor/Assignee and, except as noted herein, all rights, duties, and obligations of Buyer under the Procurement Contract become the rights, duties, and obligations of the Contractor/Assignee.

3. After assignment:

    a. The Procurement Drawings and Procurement Specifications, and any modifying Addenda will become "Contract Documents" under the construction contract.

    b. If the Procurement Drawings or Procurement Specifications, as "Contract Documents" under the construction contract, are duly modified under such construction contract, then Seller and Contractor/Assignee shall enter into a corresponding Change Order under the applicable provisions of this Procurement Contract.

    c. The Procurement Drawings and Procurement Specifications may not be modified by Seller or Contractor/Assignee, singly or in tandem, except as such Procurement Drawings or Procurement Specifications, as "Contract Documents" under the construction contract, have been duly modified under such construction contract.

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d. All performance warranties, guarantees, and indemnifications required by the Procurement Contract will continue to run for the benefit of assignor (Project Owner) and, in addition, for the benefit of the Contractor/Assignee. However, if assignor (Project Owner) and Contractor/Assignee make the same warranty or guarantee claim, then Seller shall only be liable once for such claim. Other than its remedies under such warranties, guarantees, and indemnifications, assignor will not retain direct rights under this Procurement Contract, but will have rights and remedies as a party to the construction contract, whose scope of work will encompass the Procurement Drawings, Procurement Specifications, and modifying Addenda; provided, however, that any limitations on Seller's liability in this Procurement Contract will continue to bind the original Buyer (assignor) after assignment.

e. The Contractor/Assignee shall have all the rights of the Buyer under the Performance Bond and Payment Bond.

f. Seller shall submit all Applications for Payment directly to Contractor/Assignee.

   1) Contractor/Assignee shall review each Application for Payment promptly, determine the amount that Contractor/Assignee approves for payment, and then include the amount approved in the next application for payment submitted to Project Owner (or Engineer) under the construction contract.

   2) Contractor/Assignee shall pay Seller within **30** days of receipt of payment from the Project Owner under the construction contract, but in no event later than 60 days after receipt of an undisputed invoice.

   3) After assignment Engineer will review, approve, or deny the content of Applications for Payment under the Procurement Contract only to the extent that Contractor/Assignee, as construction contractor, has incorporated such content into payment applications that Engineer reviews under the construction contract.

g. The Contractor/Assignee shall have all the rights of the Buyer under any pending Claim by Buyer.

h. All Claims and supporting documentation will be submitted directly by the claimant party (either Buyer **[Contractor/Assignee]** or Seller), to the other party, without submittal to Engineer.

   1) The other party will render a response in writing within 30 days of receipt of the last submittal of claimant.

   2) If the other party does not render a written response to a Claim within 30 days after receipt of the last submittal of the claimant, the other party shall be deemed to have approved the Claim in its entirety.

   3) The other party's written response to a Claim, or the approval of the Claim in its entirety as a function of failure to respond within 30 days, will be final and binding upon Buyer and Seller 30 days after it is issued, unless within such 30 days of issuance either Buyer or Seller appeals the result by initiating the mediation of the Claim in accordance with the dispute resolution procedures set forth in Paragraph 12.02 of the General Conditions.

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4) Any Claim by Seller that Contractor/Assignee may choose to submit, present, or forward to Project Owner must be submitted to Buyer within sufficient time for Contractor/Assignee to preserve its rights under the construction contract, notwithstanding any procedures or time limits in this Procurement Contract.

i. Seller's recovery of additional cost, time, or both cost and time for any Claim attributable to the Project Owner will be limited to the proportionate recovery by Contractor/Assignee against Project Owner for such Claim. Seller will cooperate and assist Contractor/Assignee in pursuing any Claim by Contractor/Assignee against Project Owner on behalf of Seller, including the timely preparation and delivery of supporting documentation.

j. If the pursuit of any claim by Contractor/Assignee against Project Owner on Seller's behalf requires the expenditure by Contractor/Assignee of legal or consulting fees, or results in litigation, arbitration, or any dispute resolution procedures, Seller agrees to pay for a proportionate share of attorneys' fees, consultant fees, and litigation, arbitration, and other resolution costs incurred by Contractor/Assignee in pursuing the claim on behalf of Seller, based upon the amount claimed by Seller as compared to the total value of the claim pursued by the Contractor/Assignee.

k. All rights, duties, and obligations of Engineer to Contractor/Assignee and Seller under this Procurement Contract will cease.

l. Subject to the foregoing provisions, all references in the Procurement Contract to submitting items to Engineer, or to Engineer having tasks or obligations, will be read after such an assignment as requiring submittal to Contractor/Assignee, or as Contractor/Assignee having such tasks or obligations (which Contractor/Assignee may delegate when appropriate).

m. If the Procurement Contract includes a Buyer's Contingency Allowance, upon assignment such allowance will be automatically reduced to the amount previously authorized by Buyer (Project Owner), and cease to be operational.

B. No other assignment by a party hereto of any rights under or interests in the Procurement Contract will be binding on another party hereto without the written consent of the party sought to be bound. Specifically, but without limitation, Procurement Contract payments or other money that may become due, and Procurement Contract payments or other money that are due, may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by Laws and Regulations). Unless specifically stated to the contrary in any written consent to such an assignment, such an assignment will not release or discharge the assignor from any duty or responsibility under the Procurement Contract Documents.

ARTICLE 6—PROCUREMENT CONTRACT DOCUMENTS

6.01 *List of Procurement Contract Documents*

A. The Procurement Contract Documents consist of the following:

1. Invitation for Proposals.

2. Information for Proposers.

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3. Instructions to Proposers.
4. Proposals (Bid) Form including all attachments.
5. This Procurement Agreement.
6. General Conditions of the Procurement Contract.
7. Supplementary Conditions of the Procurement Contract.
8. Procurement Specifications as listed in the Procurement Specifications table of contents.
9. Addenda Numbers **[list those Addenda that are Procurement Contract Documents]**.
10. Bonds:
    a. Performance bond (together with power of attorney).
    b. Payment bond (together with power of attorney).
11. Exhibits to this Procurement Agreement (enumerated as follows):
    a. Exhibit A, Assignment of Contract, Consent to Assignment, and Acceptance of Assignment.
    b. Exhibit B, Surety's Consent to Assignment.
    c. Documentation submitted by Seller **[identify]**; and
    d. Manufacturer's Certification of Compliance Form (see Information for Proposers) to demonstrate compliance with the Build American Buy American requirements of this contract.
    e. Submittals required with the Proposal as described in Section 11300 Packaged SBR and Digester Equipment and Section 11400 Packaged DAF Equipment.
    f. Shop Drawings and Samples.
    g. **[Other Exhibits]**.
12. The following which may be delivered or issued on or after the Effective Date of the Procurement Contract and are not attached hereto:
    a. Change Orders;
    b. Change Directives; and
    c. Field Orders.

B. The documents listed in Paragraph 6.01.A are attached to this Procurement Agreement (except as expressly noted otherwise above).

C. There are no Procurement Contract Documents other than those listed above.

D. The Procurement Contract Documents may only be amended or supplemented as provided in Paragraph 11.01 of the Procurement General Conditions.

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ARTICLE 7—SELLER'S REPRESENTATIONS AND CERTIFICATIONS

7.01 *Seller's Representations*

A. In order to induce Buyer to enter into this Procurement Agreement, Seller makes the following representations:

1. Seller has examined and carefully studied the Procurement Contract Documents.

2. If required by the Instructions to Bidders to visit the Point of Destination and the site where the Goods are to be installed or Special Services will be provided, or if, in Seller's judgment, any observable local or site conditions may affect the delivery, cost, progress, or furnishing of the Goods and Special Services, then Seller has visited the Point of Destination and site where the Goods are to be installed or Special Services will be provided (as applicable) and become familiar with and is satisfied as to the observable local and site conditions that may affect delivery, cost, progress, and furnishing of the Goods and Special Services.

3. Seller is familiar with and is satisfied as to all Laws and Regulations that may affect the cost, progress, and performance of Seller's obligations under the Procurement Contract.

4. Seller has carefully studied, considered, and correlated the information known to Seller with respect to the effect of such information on the cost, progress, and performance of Seller's obligations under the Procurement Contract.

5. Seller has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Seller has discovered in the Procurement Contract Documents, and the written resolution (if any) thereof by Engineer is acceptable to Seller.

6. The Procurement Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance of Seller's obligations under the Procurement Contract.

7. Seller's entry into this Procurement Contract constitutes an incontrovertible representation by Seller that without exception all prices in the Procurement Agreement are premised upon furnishing the Goods and Special Services as required by the Procurement Contract Documents.

8. All other representations listed in the Proposal Form.

7.02 *Seller's Certifications*

A. Seller certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Procurement Contract. For the purposes of this Paragraph 7.02:

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 Procurement Contract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Procurement Contract to the detriment of Buyer, (b) to establish bid or contract prices at artificial non-competitive levels, or (c) to deprive Buyer of the benefits of free and open competition;

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3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Buyer, 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 Procurement Contract.

B. Seller's Certifications shall include also include all Certifications listed in the Proposal Form.

ARTICLE 8—RESERVED

ARTICLE 9—MUTUAL WAIVER

9.01 *Mutual Waiver of Consequential Damages*

~~A.~~ Buyer and Seller waive against each other, and against the other's officers, directors, members, partners, employees, agents, consultants, and subcontractors, any and all claims for or entitlement to incidental, indirect, special, punitive, or consequential damages arising out of, resulting from, or related to the Procurement Contract. Further, the parties agree that the total liability of each party to the other for claims, costs, losses, and damages arising from this Contract shall be limited to the amount established in the Procurement Contract as the Contract Price. If Buyer (Project Owner) assigns this Procurement Contract to a construction contractor (Contractor/Assignee), then the terms of this Paragraph 9.01.A will be binding upon the Contractor/Assignee with respect to Seller and assignor. The terms of this mutual waiver do not apply to or limit any claim by either Buyer or Seller against the other based on any of the following: ~~(a) contribution or indemnification, (b) liquidated damages, (a~~c) costs, losses, or damages attributable to personal or bodily injury, sickness, disease, or death, or to ~~injury~~ damage to or destruction of the tangible property of others, or (b~~d~~) intentional or reckless wrongful conduct~~, or (c) rights conferred by any bond provided by Seller under this Procurement Contract~~. Upon assignment, the terms of this Paragraph 9.01 shall be binding upon the assignee with respect to Seller and assignee.

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IN WITNESS WHEREOF, Buyer and Seller have signed this Procurement Agreement. Counterparts have been delivered to Buyer and Seller.

The Effective Date of the Procurement Contract is **[date to be inserted at the time of execution]**.

Buyer	Seller
The City of Aumsville, Oregon *(typed or printed name of organization)*	_____ *(typed or printed name of organization)*
By: _____ *(individual's signature)*	By: _____ *(individual's signature)*
Date: _____ *(date signed)*	Date: _____ *(date signed)*
Name: _____ *(typed or printed)*	Name: _____ *(typed or printed)*
Title: _____ *(typed or printed)*	Title: _____ *(typed or printed)* *(If Seller is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*
Attest: _____ *(individual's signature)*	Attest: _____ *(individual's signature)*
Title: _____ *(typed or printed)*	Title: _____ *(typed or printed)*
Address for giving notices: 595 Main Street Aumsville, OR 97325	Address for giving notices:
Designated Representative: Name: Ron Harding *(typed or printed)* Title: City Administrator *(typed or printed)* Address: 595 Main Street Aumsville, OR 97325 Phone: (503) 749-2030 Email: _____ *(If Buyer is a corporation, attach evidence of authority to sign. If Buyer is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)*	Designated Representative: Name: _____ *(typed or printed)* Title: _____ *(typed or printed)* Address: Phone: _____ Email: _____

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Exceptions/additions to Standard General Conditions of the Procurement Contract P-700 – Aumsville, OR

4.04.C – add: "7. Global material shortages"

7.07 – modify to read: To the fullest extent permitted by Laws and Regulations, Seller shall indemnify and hold harmless Buyer, Engineer, Project Owner, and any assignee of Buyer, including Contractor/Assignee, and their officers, directors, members, partners, employees, agents, consultants, contractors, 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) asserted by third parties arising out of or relating to the performance of Seller's obligations under the Procurement Contract, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to ~~injury~~ damage to or destruction of tangible property (other than the Goods themselves), ~~including the loss of use resulting therefrom,~~ but only to the extent caused by any negligent act or omission of Seller, or any individual or entity directly or indirectly employed by Seller or anyone for whose acts Seller may be liable.

15.04.A – modify to read: 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 Procurement Contract, and the provisions of this paragraph will be as effective as if repeated specifically in the Procurement Contract in connection with each particular duty, obligation, right, and remedy to which they apply; however, to the extent this Procurement Agreement provides a remedy for a given default, it is the sole and exclusive remedy available in lieu of any/all other remedies available at law, in equity, or otherwise.

City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Exceptions:

A. Annotated Agreement Between Buyer and Seller for Procurement Contract (see preceding).
B. Annotations to Standard General Conditions of Procurement Contract P-700 (see preceding).
C. Section 11300 1.8 a. – the only "extra materials" supplied are the specified spares as defined in the Xylem proposal B. 14 Spare parts.
D. Section 11300 2.6 j. 4) shall be revised to read: "Design supports to allow for complete removal from the tank, less the anchor bolt, to facilitate installation of additional headers and in-tank maintenance."
E. Section 11300 2.6 m. – Xylem supplied Solenoid Valves will not be rated C1, D2 because they are mounted greater than 18" above the top of tank, which will keep them out of the hazardous zone as defined by NFPA 820.
F. Section 11300 2.7 b. – Xylem supplied decanter drives (actuators) will not be rated C1, D2 because they are mounted greater than 18" above the top of tank, which will keep them out of the hazardous zone as defined by NFPA 820.
G. Section 11300 2.9 d. – Local 3 phase disconnect to pump would be provided by electrical contractor along with Meltric plug. Xylem will provide local station that does not include 3 phase disconnect, but rather is control only.
H. Section 11300 2.9 q. 3) – Guide railsfor ICEAS WAS pumps and digested sludge pumps, valves, check valves and all discharge piping downstream of the discharge base/elbow are provided by others.
I. Section 11300 2.10 – DO probes supplied will be YSI SensorNet, the standard Xylem offering as described in prior correspondence.
J. Section 11300 2.11 c. - Local display for level transducers (not available for proposed equipment). Level display will be at the main control panel HMI.
K. Section 11300 2.11 d. & e. – All level transducer stilling well and mounting hardware are by others.

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L. Section 11300 2.12 b. & c. – Float switch bracket and stainless steel junction box are by others.
M. Section 11300 2.13 h. – Xylem will provide a single HOA for each device on the MCC.
N. Section 11300 2.13 i – Xylem will supply a UPS that only powers the PLC, HMI and network components. It will not power all 120V powered devices.
O. Section 11300 3.2.g. b) & c) – Xylem will provide separate factory trained representatives for the blowers, only. Xylem will provide trained representatives for the valves and pumps.
P. Section 16447 1.3 C. 3) – Rockwell schematics for two identical buckets will have the same schematic number, please refer to the unique Sanitaire schematic for each piece of equipment tied to the MCC.
Q. Section 16447 1.4 A. – One manufacturer (Allen Bradley) will provide the MCC, that manufacturer may choose to include circuit breakers or other similar components that are not their brand. However, motor starters and VFDs will be Allen Bradley.
R. Section 16447 1.6 D. 21. – Xylem takes exception to the external load due to the potential for a single point of failure. External load will be 120V AC. Xylem will have suitable 24VDC power supply for all 24VDC loads.
S. Section 16447 1.6 D. 23. – Xylem takes exception and will not have indicator lamps for all critical alarms in the PLC. All alarms are displayed on the local HMI and the SCADA. The alarm banner displayed on the HMI screen is displayed on top of any other graphics and easily recognizable.
T. Section 16447 1.6 E. – Xylem will conform to the project requirements as much as possible. However, Xylem will not change the numbering or component labeling within our panels, PLC tagging or HMI screens.
U. Section 16447 2.1 B. 9. – Xylem takes exception to the screen size. Our standard PanelView Performance screen is 15". Our standard will be supplied.
V. Section 16447 2.1 E. 2. – Xylem can provide a copy of the HMI software to the integrator that will allow them to see the alarm list and the associated tags, as well as the tag names for all set points and other displayed data.
W. Section 16447 3.5 A. 1. – Xylem will not provide a PDF of the PLC code without an NDA. HMI software will be provided as noted in Comment 2.1 E. 2.

Missing Items:

Recommendations:

A. Mixers are intended to keep biomass in suspension. The aeration system will completely mix the basin contents. The complete mix zone for mixers is the main react zone, not the entire basin.
B. The decanter effluent box (supplied by others) should be 6'-0" square, internal dimensions.
C. The mixers should be mounted near the Pre-React Wall and pointed toward the decanter.

D. Aeration Manifold piping is center feed (designed and accounted for in Xylem proposal/pricing) to avoid the need for expansion joints and anchor/fixed supports on distribution header piping. This simplifies the aeration grids.
E. The SBR influent should come in above TWL.
F. The decanter pedestal support will be on the effluent end wall.
G. Before Pre-React wall is constructed, contractor shall ensure that the number and spacing of openings matches the number and spacing of air distribution headers.

City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Section 10: Process Description

SANITAIRE
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Operational Description

ICEAS®

(Intermittent Cycle Extended Aeration System)

Sequencing Batch Reactor (SBR)

With OSCAR™ Process Performance Optimizer

City of Aumsville WWTP

Marion County, OR, USA

Proposal no: a30323-20

Xylem
Sanitaire products
Milwaukee, Wisconsin, USA

December 2024

SANITAIRE
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Issue, Revision, and Approval Record

Issue	Date	Sections Changed	Description of Changes	Changes Made By	Approved By
A	December 06, 2024	n/a	Preliminary for bid	APV	

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2 Introduction

Xylem is the provider of Sanitaire process and associated equipment. This operational description describes the basic operation of the process and is specific to the following plant:

Project name	City of Aumsville WWTP
Project Location	Marion County, OR, USA
Sanitaire Number	a30323-20
Process	NDN, 2-basin

This document should be used in conjunction with the Functional Design Specification (FDS) for the system. This document gives a process overview, whereas the FDS will describe in detail the control of each system component, interlocks between components, operating ranges and how to change the control setpoints.

3 Abbreviations

The following abbreviations applies to this document as well as the Functional Design Specification (FDS)

Auto	Automatic Control
BOD_5	Biochemical Oxygen Demand - 5 day test
BWL	Bottom Water Level
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
ETM	Elapsed Time Meter
FDS	Functional Design Specification
F/M	Food to Microorganism Ratio
FS	Float Switch
ft	feet
gpd	gallons per day
HMI	Human-Machine Interface
HOA	Hand-Off-Auto
HOR	Hand-Off-Remote
HRT	Hydraulic Retention Time
I/O	Inputs/Outputs
ICEAS	Intermittent Cycle Extended Aeration System
kg	Kilogram
lb	pound
LT	Level Transducer
m	Meters
m^3/day	cubic meters per day
MCC	Motor Control Center
mg/L	milligrams per Liter (parts per million, ppm)
MLSS	Mixed Liquor Suspended Solids
MLVSS	Mixed Liquor Volatile Suspended Solids
NDN	Nitrification/Denitrification Process
NDNP	Nitrification/Denitrification/Phosphorus Process
NH_3-N	Ammonia - Nitrogen
NIT	Nitrification Process
NO_2-N	Nitrite - Nitrogen
NO_3-N	Nitrate - Nitrogen
COAO	Close-Off-Auto-Open
ORP	Oxidation-Reduction Potential
PAO	Phosphorus Accumulating Organisms
PID	Proportional Integral Derivative
P&ID	Piping and Instrumentation Diagram
PC	Personal Computer
PD	Positive Displacement
PLC	Programmable Logic Controller
PO_4	Phosphate
SBR	Sequencing Batch Reactor
SCADA	Supervisory Control and Data Acquisition
SIMS	Sludge Inventory Management System
SRT	Sludge Retention Time
SVI	Sludge Volume Index
TKN	Total Kjeldahl Nitrogen
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
TWL	Top Water Level
VFD	Variable Frequency Drive
WAS	Waste Activated Sludge
WWTP	Wastewater Treatment Plant
°C	degrees Celcius

4 Plant Design Overview

An overview of the design data for the City of Aumsville WWTP is briefly described in this section. More details can be found in the contract documents. Description of plant specific settings and process are found further down in this document.

The City of Aumsville WWTP has been designed based on the following influent wastewater characteristics and site conditions. These parameters have been used for basin design and process criteria.

Influent Wastewater Characteristics and Site Conditions		
Maximum Month Flow	1,750,000	Gpd
Max 4.8h Cycle Flow	2,620,000	gpd
Max 3.6h Cycle Flow	3,493,333	gpd
Max 2.4h Cycle Flow	5,240,000	gpd
Peak Day Flow	3,130,000	gpd
Peak Hour Flow	5,240,000	gpd
BOD_5 Conc. (at 20°C)	127.44	mg/L
BOD_5 Loading	1860	lb/day
TSS Conc.	106.89	mg/L
TSS Loading	1560	lb/day
TKN Conc.	17.47	mg/L
TKN Loading	255	lb/day
Alkalinity required (minimum)	260	mg/L
Wastewater Temperature, Min	8	°C
Wastewater Temperature, Max	25	°C
Ambient Air Temperature	0 to 32	°C
pH Range	6.5 to 8.6	SU
Site Elevation – above sea level	350	ft

The activated sludge process has been designed to meet the following effluent requirements on a 30-day arithmetic average:

Effluent Quality Requirements		
BOD_5 Conc. (at 20°C)	<10	mg/L
TSS Conc.	<10	mg/L
NH_3-N Conc.	<1	mg/L
Total Nitrogen Conc.	<10	mg/L

The activated sludge process has been designed according to the following parameters in order to meet the effluent requirements.

Design Parameters for Biological Process		
Food to Mass (F/M) Ratio	0.0481	lb BOD/lb MLSS-day
Sludge Volume Index (SVI) (after 30 min settle)	150	mL/g (max)
Mixed Liquor Suspended Solids (MLSS)	4,869	mg/L
Hydraulic Retention Time (HRT)	0.69	days
Solids Retention Time (SRT)	29.02	days
Total WAS mass produced	593.37	lb/day/basin
WAS volume produced @ 0.85% solids	8,370.25	Gpd/basin

To meet the effluent requirements, the activated sludge process has the following basin dimensions:

Basin Design		
Number of Basins	2	basins
Basin Length (Excluding Pre-react wall)	108.50	ft
Basin Width	46.00	ft
Top Water Level (TWL)	18.0	ft
Bottom Water Level (BWL)	12.74	ft
Basin Working Volume at TWL	672,035	gallons
Basin Working Volume at BWL	475,651	gallons

5 Process Description

The Intermittent Cycle Extended Aeration System (ICEAS®) process is a modification of a conventional SBR. The ICEAS® process allows continuous inflow of wastewater into the treatment basins during all phases of the cycle. The continuous inflow is an advantage over conventional SBRs in that it optimizes biological treatment by supplying a constant food source for the process and equalizes the flow loadings in multiple-basin systems. A cycle consists of different phases (react, settle, and decant) during which treatment takes place. The cycles operate continuously in each basin to meet the treatment goals of the plant.

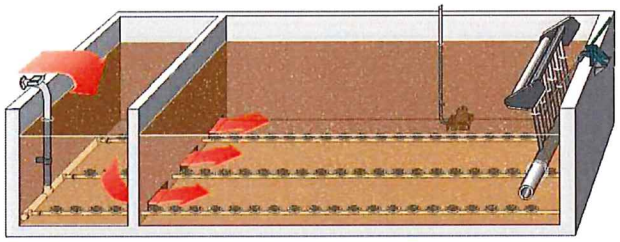
5.1 Basin Configuration

The ICEAS® basin has two compartments: a pre-react zone and a main-react zone. The pre-react zone acts as a biological selector and receives the continuous influent flow. The two compartments are separated by a baffle wall that spans the tank width and has openings at the basin floor. The baffle wall prevents short circuiting and allows the two zones to be hydraulically connected as it directs the flow to enter the main-react zone at the bottom of the basin.

5.2 ICEAS® Process Overview

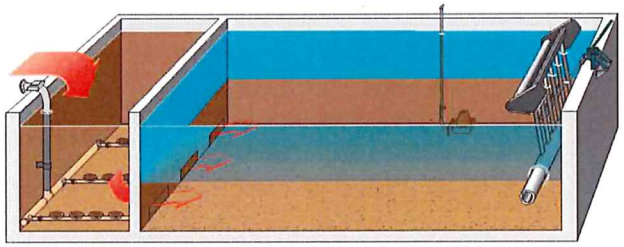
The following is a brief process overview of the three treatment phases of the ICEAS® cycle:

React Phase



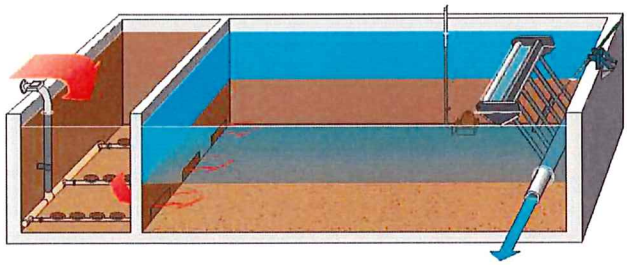
During the **react** phase, raw wastewater flows into the pre-react zone continuously to react with the mixed liquor suspended solids. Depending on the process scheme, the basin contents are aerated, anoxically mixed, allowed to react anaerobically, or a combination thereof. As the basin continues to fill, biological oxidation/reduction reactions take place simultaneously to treat the wastewater.

Settle Phase



During the **settle** phase, basin agitation from the react phase (i.e. aeration or mixing) is stopped to allow the solids to settle to the bottom of the basin. Raw wastewater continues to flow into the pre-react zone as the main-react zone settles. As the solids settle, a clear layer of water is formed on top of the basin.

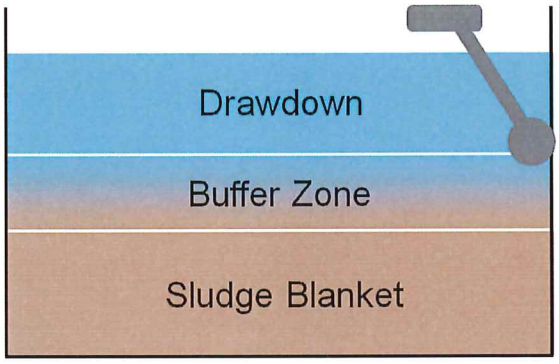
Decant Phase



During the **decant** phase, the decanter rotates downward to draw off the clarified supernatant and discharge it to the effluent line. Raw wastewater continues to flow into the pre-react zone as the main-react zone is decanted. Sludge is typically wasted from the basin during this phase in the cycle.

5.3 Basin Layers

The picture illustrates the three stratified layers that are formed in each basin at the end of the settle phase and beginning of the decant phase. The sludge blanket forms on the bottom of the basin as the mixed liquor suspended solids (MLSS) settle. A buffer zone of ~3.3 feet acts to buffer the sludge blanket from the volume that will be removed during the decant phase. The drawdown is the top layer of clear liquid that remains after the MLSS settle and is the maximum volume that will be drawn off during the decant phase.



5.4 Basin Hydraulics and Loading

The basins are designed to handle the Maximum Month Flow, the Max 4.8h Cycle Flow, and the Max 2.4h Cycle Flow as specified in the design parameters. Three time-based cycles are used to hydraulically process the flow. A normal cycle will process the Maximum Month Flow up to the Max 4.8h Cycle Flow. A high flow cycle has time periods that are 25 percent shorter than the normal cycle to process flows above the Max 4.8h Cycle Flow, up to the Max 3.6h Cycle Flow. A very high flow cycle has time periods that are 50 % shorter than the normal cycle and process flows that are above the Max 3.6h Cycle Flow, up to the Max 2.4h Cycle Flow.

During all phases of the ICEAS® cycle, raw influent (usually screened and degritted) flows into each basin. To allow equal loading, flow is split equally to all basins by a splitter box. Since influent flow is continuous, the ICEAS® process can be operated in a single basin allowing for basins to be taken out of service for maintenance or during low flow/loading conditions. Flow enters the basin continuously and the treated effluent leaves the basin intermittently (only during the decant phase).

5.5 Biological Treatment Process

The process is designed as a nitrification-denitrification (NDN) process and operates to remove BOD, TSS, ammonia-nitrogen (NH_3-N) through nitrification as well as nitrite-nitrogen (NO_2-N) and nitrate-nitrogen (NO_3-N) through denitrification. In the NDN process, the react phase consists of alternating periods of aeration and anoxic mixing. The aeration periods supply oxygen to the biomass for BOD oxidation and nitrification. The anoxic mixing periods provide minimal oxygen and mixing of the biomass to allow denitrification to occur. Additional denitrification can occur as the sludge settle during the settle phase of the cycle.

Total nitrogen removal is a two-step process which includes both nitrification and denitrification. In the nitrification process, ammonia is converted to nitrate by autotrophic bacteria. The process requires oxygen and takes place under aerobic conditions. Nitrification is largely dependent on dissolved oxygen (DO), solids retention time (SRT), temperature, pH and inhibitory compounds.

Denitrification concludes the nitrogen removal process by converting nitrate from the nitrification step to nitrogen gas which is released to the atmosphere. Denitrification occurs under anoxic conditions, relying on heterotrophic bacteria and readily available biodegradable substrate. In the absence of dissolved oxygen, these bacteria can chemically bind the oxygen in nitrate to reduce readily available biodegradable substrate.

6 Treatment Cycle

6.1 Treatment cycle times

The process will complete one normal cycle every 288 minutes or 4.8 hours. Each cycle is divided into 168 minutes of react phase, 48 minutes of settle phase, and 72 minutes of decant phase. The react phase is divided into seven 24-minute periods that can alternate between anoxic or anaerobic mixing and aeration. There are five periods of aeration or "air on", which have adjustable blower run times. The second and sixth periods are "air off" periods for anoxic or anaerobic treatment, which have adjustable mixer operation modes. The basins are staggered in their respective timelines as shown in the cycle chart below. "Air off" periods that do not overlap with "Air on" periods in another basin sharing the same blower can be aerated if needed. Aeration in period 7 can be turned off to allow extra time for settling if during high flow mode and very high flow mode. This feature can be enabled or disabled as needed using a button on the HMI.

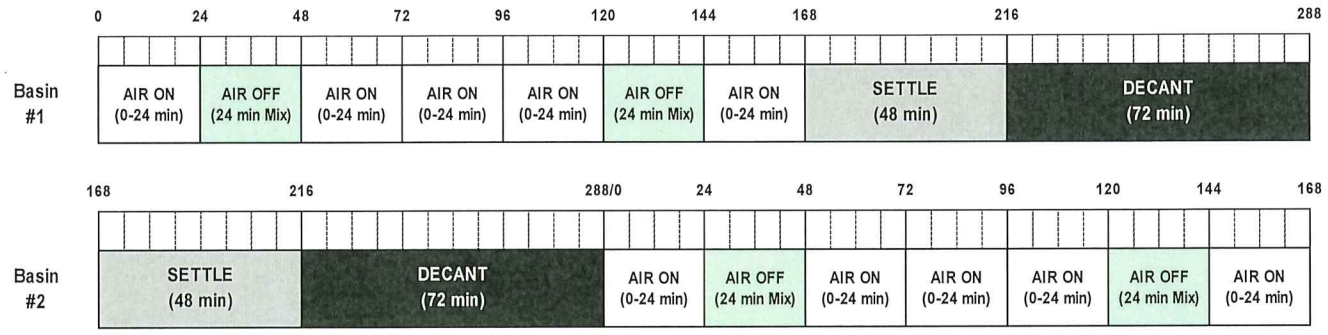
The high flow cycle is 216 minutes or 3.6 hours in duration as shown in the cycle chart below. The high flow cycle has time periods that are reduced by 25 percent of the normal cycle time periods. Each of the seven periods in the react phases are 18 minutes instead of 24 minutes, the settle phase is 36 minutes, and the decant phase is 54 minutes. The total react times per day remain the same as the normal cycle. It is only the duration per cycle that is changed to accommodate higher flows and process more flow in a shorter amount of time.

The very high flow cycle is 144 minutes or 2.4 hours in duration, as shown in the cycle chart below. The very high flow cycle has time periods that are reduced by 50 percent of the normal cycle time periods. . During the very high flow cycle, react periods 6 and 7 are converted to settle time, to allow additional settling time to avoid TSS carried away with effluent during very high flow cycle. Accordingly, the very high flow cycle has five react periods of 12 minutes, 48 minutes of settle phase, and 36 minutes of decant phase.

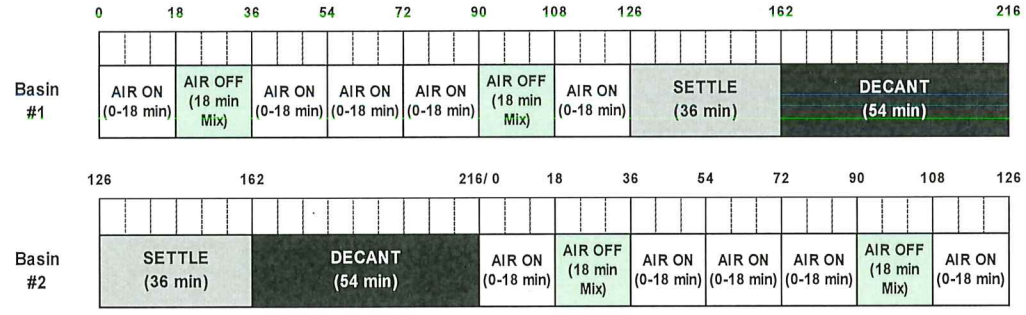
The shifting in timelines between basins allows a pair of basins to be supplied by the same blowers, since the basins never will require air at the same time. When one basin of the pair is aerated, the other is in a mixing phase or the settle and decant phase. Air will be directed to one basin at the time by the operation of motorized air control valves.

Any of the seven periods in the react phase can be re-defined as aerated or mixed, as long as this does not require two basins that share the same blowers to be aerated at the same time.

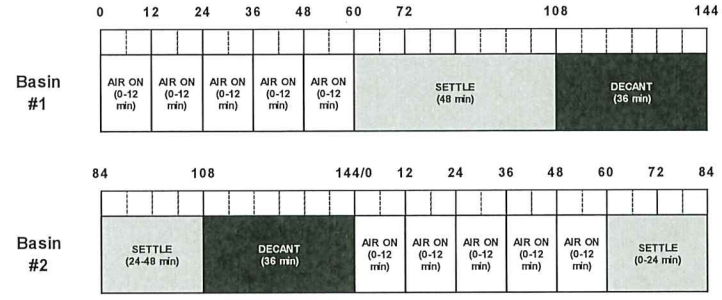
ICEAS 2-Basin NDN Normal Cycle: 288 minutes (4.8 hours)



ICEAS 2-Basin NDN High Flow Cycle: 216 minutes (3.6 hours)



ICEAS 2-Basin NDN Very High Flow Cycle: 144 minutes (2.4 hours)



** "Air Off" periods that do not overlap with the other basin can be aerated if needed.

6.2 High Flow Cycle Transitions

The system switches from normal cycle operation to high flow cycle operation when the level sensing equipment in a basin detects a water level that corresponds to a flow that is above Max 4.8h Cycle Flow. All basins always operate in the same cycle mode. After the high flow cycle is initiated, the system will stay in the high flow cycle until the basin that indicated a high flow event has completed its cycle (end of decant phase) and completed another full high flow cycle.

At the completion of the full high flow cycle for that basin, the system will switch back to normal cycle operation if no basins are indicating water levels that correspond to a flow above Max 4.8h Cycle Flow. If a basin detects high water levels that indicate a flow above Max 4.8h Cycle Flow, the system will stay in the high flow cycle until normal cycle water levels return. The system can switch into the high flow cycle at any time during the normal cycle. The system cannot, however, switch from high flow back to normal cycle until the completion of the high flow cycle for the initiating basin.

The system switches from high flow cycle operation to very high flow cycle operation when the level sensing equipment in a basin detects a water level that corresponds to a flow that is above the Max 3.6h Cycle Flow. After the very high flow cycle is initiated, the system will stay in the very high flow cycle until the basin that indicated a high flow event has completed its cycle (end of decant phase) and completed another full high flow cycle. When the system is in a high flow cycle, it can switch into the very high flow cycle at any time to accommodate addition flow.

7 Equipment Operation

The following sections contain brief descriptions of the equipment operation for the process. More detailed descriptions are found in the FDS and individual equipment manuals.

7.1 Blowers

Three positive displacement ICEAS blowers operate to supply air to the aeration systems in the ICEAS basins. Each blower is capable of delivering 50 percent of the air requirements to the process. Two blowers operate together to provide 100 percent of the air requirements to the process in one basin at a time. One blower operates as the "Lead Duty" blower and the second one operates as the "Lag Duty" blower. The third blower operates as the "Standby" blower in the event that one of the "Duty" blowers is not available. The blowers can alternate duty on a weekly basis.

Two additional positive displacement blowers are used to supply air to the aeration system in the aerobic digester. One blower is"Duty" blowers for each of the two digesters. The "Standby" blower will operate in the event that one of the "Duty" blowers is not available.

Each blower can be turned "on" or "off" using the selector switches on the panel face. Each blower also has a variable frequency drive (VFD) for controlling the output airflow, which can be adjusted through the HMI.

7.2 Diffused Aeration System

Each ICEAS basin has a diffused aeration system installed at the bottom of the basin. The aeration system operates to deliver diffused air required for the treatment process and ensures that the basin is sufficiently mixed during the aerobic treatment periods of the cycle. Air is transferred to the water though fine bubble diffusers distributed evenly on the floor of the basin.

The aerobic digester also have a complete aeration system installed at the bottom of the basin. The aeration system operates to supply dissolved oxygen through fine bubble diffusers.

The aeration system includes one or more aeration grids. Each aeration grid receives air through a dropleg pipe which leads the air from the basin surface to the basin floor. At the floor of the basin, manifold and header pipes distribute the air to the diffusers. Each aeration grid only receives air if the air valve positioned between the grid dropleg and the blowers is open.

As the aeration system operates, moisture can build up in the system leading to poor distribution of air and high pressure losses. A solenoid valve connected to the aeration system in each ICEAS basin periodically opens and closes to allow the system to purge and depressurize. In addition to the automatic purge in the ICEAS basins, each aeration grid has a manual purge valve that the operator can use to remove any trapped liquid.

7.3 Mixers

Each ICEAS basin has one mixers installed in the main-react zone, which operate during the "air off" periods of the react phase to ensure proper mixing and prevent sedimentation. The operator can enable or disable the mixers during each "air off" period through the HMI. If a reduced "air on" time is selected for an air period or if the air

shuts off due to the DO control system, the operator can select to run the mixers for these time periods as well. The aeration and mixers cannot be operating at the same time.

7.4 Air Valves

Air Valves are located on the air lines between the blowers and the aeration system in each ICEAS basin. Each basin has a motorized air valve, which is automatically controlled by the PLC to allow air to enter a basin at a certain time.

The two air valves will operate in an alternating sequence during blower operation; when one valve is open, the other one is closed, etc. The air valves divert air between the two basins when blower operation is required in the cycle. At certain times in the cycle, both basins will have the air valves closed. This will occur when one basin is in the settle or decant phase and the other basin is in an "air off" period of the react phase.

7.5 Decanters

Each ICEAS basin has a decanter installed on the wall opposite the pre-react zone. The decanter operates to remove clarified effluent from the top layer of the basin (drawdown) during the decant phase of the cycle. The drawdown is defined by the top water level (TWL) and the bottom water level (BWL). When the decanter is not operating, it remains in a parked position above the TWL, which eliminates the possibility of solids carryover during other phases in the cycle. In the park position, the decanter can act as a clarifier weir in the event of a power outage.

The decanter is mechanically operated by the use of an electro-mechanical actuator that is mounted on the basin walkway for easy access. The actuator moves the decanter between the top and bottom limit switches whenever the decanter is in operation. The decanter speed is controlled through the use of a variable frequency drive (VFD). As a result, the decanter discharge rate will be relatively constant from the time the decanter enters the water to the time it reaches the BWL.

During the end of the settle phase, the decanter will travel from the park position to the TWL. When decant phase is started, the decanter will travel from the TWL to the BWL in the allotted time to remove the drawdown volume from the basin. Since influent flow to the plant varies, the water level in the basin at the start of each decant phase will be at differing levels above BWL. Consequently, during the decant phase, the decanter will travel downward for a period of time before reaching the water surface. Also mounted on the decanter in front of the weir is a floatable scum guard that operates to exclude floating material during the decant phase.

7.6 Waste Activated Sludge (WAS) Pumps

Each ICEAS basin has a submersible pump, which operates to waste sludge from the basin during the decant phase of the cycle. The waste activated sludge (WAS) pump operation is controlled automatically by the PLC.

7.7 Process Instrumentation

7.7.1 Level Sensing Equipment

A level transducer and float switch are installed in each ICEAS basin. The level transducer continuously indicates the basin water level at the HMI. The PLC uses the water level reading to calculate the corresponding flow rate into the basin. If the basin water level indicates that a flow above the PDWF is entering the basin, the system will transition into the high flow cycle.

The float switch has two functions. One function is to signal a high level in the basin and force the system into a settle phase to allow a minimum of 30 minutes of settle time prior to the water level overtopping the decanter. The second function is to signal that the system must transition into the high flow cycle if the level transducer has not already signaled this to take place.

7.7.2 Process Instrumentation

Instrumentation is installed in the treatment plant to monitor the process and assist in equipment control. The instruments measure a parameter in the process and an analyzer sends the reading to the PLC. The readings are continuously displayed on the HMI. The table below lists the instrument, parameter measured and location.

Instrument	Parameter	Location
DO Sensor	Dissolved oxygen, Temperature	ICEAS Basins
Portable TSS Sensor*	Total suspended solids	ICEAS Basins

*Optional, not included in bid pricing

7.7.3 IQ Sensor Net

All sensors provided by WTW or YSI are connected to the IQ SensorNet (IQSN) system. The IQSN system collects readings of the instrumentation and sends them to the PLC. The system includes a user display which allows for monitoring and handling of the sensor data, sensor calibrations as well as switching sensors into maintenance mode while doing cleaning and other maintenance.

7.7.4 Process Instrument Maintenance

The following section contains brief descriptions of the **online** sensors required cleaning, calibration and maintenance. More detailed descriptions are found in the WTW/YSI Operation and Maintenance manual.

7.7.4.1 DO sensor: FDO 700 IQ

The DO sensor requires cleaning on a weekly or biweekly basis. Cleaning should be done with a soft cloth using tap water or process water with soap/detergent. Calibration of the DO sensor is not required. The sensor cap needs to be replaced as needed and has an expected lifetime of three to five years.

7.7.4.2 TSS sensor:*

The TSS sensor requires cleaning on a weekly or bi-weekly basis. Cleaning to remove sludge should be done with a soft cloth or brush and warm water with soap/detergent. If required, cleaning can also be done with a soft cloth or sponge with acetic acid 20%.

Calibration checks should be done on a weekly basis based on either a lab sample taken near the sensor location or with a handheld meter. The sensor should only be checked when the basin or sludge line is fully mixed, which for the basin sensors means that either aeration or mixing should be running. If ± 10 % difference is noticed in day 1 analysis, conduct analysis for consecutive 2 more days. Calibration is required if the IQSN TSS value is ± 10 % from the lab reading or handheld TSS sensor reading 3 times in a row.

*Optional, not included in bid pricing

8 Process Control System

The biological treatment process can be automatically controlled using feedback from process instrumentation and equipment control via the PLC. The control system for the process consists of a control panel, which contains the programmable logic controller (PLC), a human-machine interface (HMI), control switches, indicator lights, power connection, etc. The motor starters and variable frequency drives (VFDs) for the equipment are mounted in the control panel or housed in a separate motor control center (MCC). The PLC contains logic to operate the process equipment when the equipment is in automatic ("Auto") control. The HMI is an operator interface that communicates with the PLC to display system status, allow set point adjustments and perform alarm handling.

The process control options are described in the following sections.

8.1 Aeration Control

The aeration control system regulates the Dissolved Oxygen (DO) in the ICEAS basins by adjusting blower operation. The goal of the system is to achieve a constant DO concentration without over- or under-aerating the process.

Each basin has a DO sensor which indicates the DO concentration in milligrams per liter (mg/L). The target DO setpoints are selected and entered at the HMI. Blower speed is regulated by the PLC based on the difference between the DO concentration and the DO setpoints. If the DO concentration is higher than the DO setpoint, the blower will be regulated to reduce the airflow and if the DO concentration is lower than the DO setpoint the blower will be regulated to increase the airflow.

In addition, high and low DO setpoints can be selected and entered at the HMI. The purpose of the setpoints is to prevent the DO from rising to too high values in the basin. When the high DO setpoint has been reached, there is a time delay before the blower will respond that is operator adjustable through the HMI.

If the aeration control mode is off the operator can manually adjust each blower's operation through the HMI.

8.2 Waste Activated Sludge (WAS) Pump control

The WAS pump control system regulates the WAS pump operation based on operator selections in the HMI. The goal of the WAS pump control is to enable the operator to maintain a stable and healthy biomass in the system to ensure sufficient treatment is reached.

Wasting of biomass is done once per treatment cycle. In the HMI, the operator can select the duration the pump should run each time.

During wasting, running the pump for long periods of time can cause the solids near the pump to be completely removed and for the pump to start pulling clear water above the sludge blanket. This effect is commonly referred to as "coning". In some situations, this resulting drop in the WAS TSS concentration after the pump has been running increases the volume of sludge that needs to be wasted. Coning can be avoided by running the pump for several shorter periods instead of one long period during the same cycle. During the pause periods when the pump is off, the TSS concentration around the pump will increase again.

The operator can manually select to run the pump more than one time during each cycle. The number of runs per cycle and the pause time between each run is selected and entered at the HMI and the pump operation is regulated by the PLC accordingly.

8.3 HMI

The HMI is the operator interface for monitoring and adjusting the plant operation. From the HMI, the operator can navigate through the display screens to monitor the process and make setpoint changes. The HMI provides key features such as alarm management and trends of measured process variables. Alarm troubleshooting guides and electronic Xylem equipment manuals are available directly in the HMI to simplify process operation and optimization. The HMI is available remotely through PC, smartphone and tablet to enable monitoring and adjustments at the operator convenience.

More detailed information can be found in the HMI Operation and Maintenance (O&M) manual.

8.4 Data validation and Sensor Maintenance

The process control system relies on online measurements to control the process. To ensure a reliable operation, a set of data validation features are included in the process control system which automatically detect issues with any sensor or measurement. Issues that can occur include general sensor malfunctions, lack of calibration as well as fouling of the sensors. If an issue is detected, the affected control mode is automatically switched to a safe mode or operation and the operator is notified that faults or maintenance needs are detected on a specific sensor. The purpose is to continuously validate that the automatic control modes are based on accurate and reliable data to ensure a healthy process operation.

8.4.1 Data validation

Sensor faults are automatically detected though the IQSN system, which communicates to the PLC that the measurement no longer is valid. Additional data validation includes detection of fast changes or no changes in the data. If invalid measured data is detected, the affected control strategy will switch to a safe mode and a notification will be sent to the operator though the HMI.

8.4.2 Sensor Maintenance

When doing maintenance, such as cleaning, on any of the sensors used by the process control systems, the sensor should always be put into maintenance mode on the IQSN display. Once a sensor is in maintenance mode, the affected process control system automatically adjusts by using previously obtained data or switching to a safe control mode as long as the sensor readings are affected by the maintenance. Once maintenance is completed and the sensor is taken out of maintenance mode on the IQSN, the process control mode is switched back to regular operation. If a sensor remains in maintenance mode for an extended period of time, the operator will be notified though the HMI. The purpose is to ensure that all automatic control is based on reliable data at all times to certify a healthy process operation.

9 Plant Specific Processes and Settings

The following section describes specific processes and setpoint recommendations for the City of Aumsville WWTP. More details regarding the overall process at the plant can be found in the contract documents. More information about how to change setpoints can be found in the control FDS.

9.1 Aeration Control Setpoints

For nitrification to occur, it is important to maintain suitable DO concentrations in the basin during the aerobic periods in the react phase. It is also important to ensure that the DO concentration during the aeration periods is kept within reasonable levels to enable denitrification to occur during anoxic periods as well as the settle and decant periods. High DO concentrations during the aerobic phase, such as concentrations greater than 3 mg/L, can compromise the denitrification since it will take time to decrease the DO concentration to values low enough for denitrification to occur.

The following setpoints are recommended for the design conditions and can be adjusted by the operator through the HMI.

Parameter	Setpoint Value	
Aeration Control	On	
O_2 Setpoint	2.0	Mg/L
High O_2 Setpoint	3.0	Mg/L
Low O_2 Setpoint	1.0	Mg/L
Blower Off Delay	2	Min

If the Aeration Control system is "On", it will automatically adjust the blower operation to ensure the desired DO concentration is maintained in the aerobic zones. The O_2 Setpoint is the target DO concentration at the sensor location. The "High O_2 Setpoint", "Low O_2 Setpoint" and "Blower Off Delay" setpoints clamp the DO in the aerobic basin by turning the blower off if DO raises too high in the basin. If the DO concentration reach above the "High O_2 Setpoint" for more than "Blower Off Delay", the blower turn off until DO reaches below "Low O_2 Setpoint".

If the O_2 Control is "Off", the following setpoints are recommended for the design conditions and can be adjusted by the operator though the HMI.

Parameter	Setpoint Value	
Number of Blowers Running	2	
O_2 Off Blower Speed	99	%

9.2 WAS Pump Setpoints

The WAS pump operation affect the biomass concentration and solids retention time in the basin. It is therefore important to select the WAS pump settings with care to ensure a sufficient treatment capacity in the process.

The operator can select a "Start time" in the HMI which defines when in the treatment cycle the WAS pump will start running. To maximize the concentration of solids in the waste to be removed from the basin, it is recommended that the WAS pump operate near the end of the decant phase. The process decant phase takes place in each basin from minute 216 to minute 288. It is recommended that the WAS pump start 20 Minutes after the decant phase starts, corresponding to minute 182. This will allow the solids most time to settle and compact.

The WAS pump will operate based on an operator selected input "Run time" each cycle. To determine how long to operate the WAS pump, the operator must monitor the MLSS level in the basin in conjunction with the system solids retention time (SRT) and food-to-microorganism (F/M) ratio. A change in sludge settling characteristics must also be considered when selecting the WAS pump setpoints. The WAS pump selected for the plant has a capacity around 110 gpm. Based on the design parameters for the plant, it is estimated that 8,370 gallons/basin should be wasted each day at 8500 mg/l TSS. This correspond to running the WAS pump for ~15.3 minutes each cycle when running. Wasting should be selected to maintain a solids retention time of 29.02 days. During High Flow mode, the WAS pump run time will reduce proportionally to match the cycle time, which results in the same amount of sludge wasted per day in all cycle modes.

The "No. of Runs" defines how many times the WAS pump should run each wasting cycle. If a value higher than 1 is selected, the total run time for the pump each wasting cycle will be divided into several shorter runs separated by the "Time Between" setting. One wasting event is sufficient if a wasting time below five minutes is selected. Two wasting times with a ten minute break is recommended for wasting for five to fifteen minutes. If wasting is required for fifteen minutes or more, three wasting times are recommended with ten minutes breaks. If coning or a lighter wasting towards the end of the wasting time is occurring, additional wasting periods could be implemented to alleviate the problem.

The following WAS pump setpoints are recommended for design conditions and can be adjusted by the operator through the HMI.

Parameter	Setpoint Value	
Start time	182	
Total Run time	15.3	min
No. of Runs	2	
Time Between	10	Min

9.3 Sludge Digester Operation

As the WAS pumps operate to remove waste solids from the basins, the waste solids will be discharged into two digester basins for further treatment. The sludge digesters are operated aerobically to digest the material to be treated by the sludge handling facilities. Each digester also has a means to discharge supernatant back to the headworks of the plant.

9.4 Processes Preceding the Biological Treatment Process

In order to protect downstream mechanical equipment from damage, clog, wear and increased maintenance, large solids and grits are removed using physical treatment processes. Solids can include rags, paper, plastics, debris and metals while grits include sand, gravel, cinder or other heavy solids material with a higher gravity than biodegradable organics. The processes preceding the biological treatment process include:

Process	Comments
Bar Screens	Controlled by others
Influent Pumps	Controlled by others

The raw influent wastewater first passes a bar screen for removing large particles.

From the headworks, the flow is discharged into a wet well to be hydraulically raised by the dry-pit pumps to flow through the plant. From the dry-pit pumps, the flow will be directed to the splitting structure for discharge into the biological treatment basins.

9.5 Processes Following the Sanitaire System

In order to reduce the number of microorganisms, including pathogens, in the treated water before discharging to the environment, the biological treatment process is followed by tertiary treatment. After disinfection, the flow is directed for final discharge. The processes that follow the biological treatment process include:

Process	Comments
Chlorine Contact Chamber	Controlled by others

During the decant phase, the treatment flow will leave the basins trough the decanter and discharge into an equalization tank, from equalization tank flow will be be discharge into the chlorine contact chamber for disinfection contact time.

Chlorine is a strong oxidizer that oxidized most organic material including of bacteria, viruses, and other pathogens.

City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Section 11: Design Calculations

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DESIGN PROPOSAL

Aumsville WWTP, OR Sanitaire #30323-20a

Max Month*	MGD	1.75
Max 4.8hr Cycle Flow	MGD	2.62
Max 3.6hr Cycle Flow	MGD	5.24

	mg/l	lb/day
BOD_5 (20°C)	127	1860
Suspended Solids	107	1560
TKN	17	248
NH3-N	17	248

Max Wastewater Temperature	°C	25
Min Wastewater Temperature	°C	8
Ambient Air Temperature	°F	20 - 90
Site Elevation	ft	366

*** - Maximum 30 day period mass flow**

Table B: ICEAS® EFFLUENT QUALITY (MONTHLY AVERAGE)

BOD_5 (20°C)	mg/l	10
Suspended Solids	mg/l	10
NH_3-N	mg/l	1
TN	mg/l	10

Table C: ICEAS PROCESS DESIGN CRITERIA

Operating Basins		2
Operating Top Water Level	ft	18.0
F / M	BOD5/DAY/MLSS	0.048
SVI (after 30 minutes settling)	ml/g	150
MLSS at Bottom Water Level	mg/l	4,869
Waste Sludge Produced (Approx.)	lb/day	1,187
Volume of Sludge Produced (Approx., 0.85% solids)	GPD	16,700
Normal Decant Rate	GPM	3,639
Peak Decant Rate	GPM	7,278
Hydraulic Retention Time	Days	0.69
Sludge Age	Days	29.0

Sufficient Alkalinity must be provided to maintain basin pH of 6.8

Bold, italicized text indicate assumptions made by Sanitaire

Cycle Timing

		Max Month*	
		Normal	Min
Air-On	min	120	48
Air-Off	min	48	
Settle	min	48	48
Decant	min	72	36
Total	min	288	132

Table D: KEY ICEAS DESIGN DETAILS

Top Water Level	ft	18.0
Basin Width (Inside)	ft	46.0
Basin Length (Inside)	ft	108.5
Bottom Water Level	ft	12.7
No. of Sludge Holding Tanks		2
SHT Top Water Level	ft	18.0
SHT Width	ft	25.0
SHT Length	ft	46.0
Sludge Storage Time	days	16

ICEAS EQUIPMENT(Base Design)

				Motor HP	No. Req.
Decanter Mechanism	35	' Weir length			2
Decanter Drive Unit				1/2	2
ICEAS Blower	465	SCFM	8.3 PSIG	40	3
ICEAS Fine Bubble Aeration System	616	Disc Diffusers/Basin			2
Air Control Valve	8	"			2
Waste Sludge Pump	110	GPM		3.2	2
Submersible Mixer				10.0	
ICEAS Controls					1
SHT Blower	492	SCFM	8.8 PSIG	40	3
SHT Aeration System	328	Disc Diffusers/Basin			2

ICEAS POWER REQUIREMENTS

	Max Month		**(At Average Aeration Depth)**				Kwh/Day
Decant Drive Unit	0.4	BHP	2 run	@	6	Hrs/day	3.6
ICEAS Air Blowers	24.0	BHP	2 run*	@	20	Hrs/day	717.2
Waste Sludge Pump	2.6	BHP	run	@	1.3	Hrs/day	
Submersible Mixer	8.0	BHP	run	@	4	Hrs/day	
					KWH/DAY		720.8
				AVERAGE	KWH/HR		30.0

* Shared ICEAS Blowers

SHT Blower	33.70825623	BHP	2 run	@	18	Hrs/day	905.30
					KWH/DAY		1,626.10
				AVERAGE	KWH/HR		67.75

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SANITAIRE ICEAS Detailed Design Calculations
BOD Removal, Nitrification, and De-Nitrification Process

SANITAIRE Project #30323-20a
Aumsville WWTP, OR

Design Parameters

A. Flow

Max Month	1,750,000 GPD
Max 4.8hr Cycle Flow	2,620,000 GPD
Max 3.6hr Cycle Flow	5,240,000 GPD

B. Treatment

	Influent Quality	Effluent Requirement
BOD_5 (20°C), mg/l	127.44	10
Suspended Solids, mg/l	106.89	10
TKN, mg/l	17	
NH_3-N, mg/l		1
TN, mg/l		10

C. Environment

Alkalinity (Minimum Requirement)	85	mg/l
Max Wastewater Temperature	25	°C
Min Wastewater Temperature	8	°C
Ambient Air Temperature	20 - 90	°F
Site Elevation	366	ft

D. ICEAS Process Design Criteria

F / M	0.048	BOD_5 / MLSS / day
SVI (after 30 minutes settling)	150	ml/g
Number of ICEAS Basins	2	
Top Water Level	18	ft

E. Cycle Timing

		Normal	Storm
Air-On	min	120	60
Air-Off	min	48	
Settle	min	48	48
Decant	min	72	36
Total	hrs	4.8	2.4

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F. Detailed Calculations

Mass of BOD

$$BODL = \frac{Q \times BODin \times 8.34}{1{,}000{,}000} = \frac{875{,}000 \times 127 \times 8.34}{1{,}000{,}000} = \mathbf{930\ lb/day/basin}$$

where: BODL = BOD Load (lb/day/basin)
Q = Average Dry Weather Flow per basin (gal/day)
BODin = Influent BOD concentration (mg/l)
1,000,000 = Conversion (l/mg)
8.34 = Conversion (lb/gal)

Mass of Biomass

$$BMOB = \frac{BOD_L}{F/M} = \frac{930}{0.0481} = \mathbf{19{,}320\ lb/basin}$$

where: BMOB = Mass of Biomass (lb/day/basin)
F / M = Food to Microorganism ratio (day^{-1})

Volume of Biomass

$$Vbio = BMOB \times SVI = 19{,}320 \times 2.4 = \mathbf{46{,}368\ ft^3/basin}$$

where: Vbio = Volume of Biomass (ft^3/basin)
SVI = Sludge Volume Index (ft^3/lb)

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Maximum Volume Above Bottom Water Level

Peak Dry Weather Flow:

$$Vbwld = \frac{PDWF \times (NCT - NDT)}{24 \times 7.48} = \frac{1{,}310{,}000 \times (4.8 - 1.20)}{24 \times 7.48} = \mathbf{26{,}270\ ft^3/basin}$$

where: Vbwld = Maximum Volume Above BWL at Peak Dry Weather Flow (ft^3/basin)
PDWF = Peak Dry Weather Flow (gal/day)
NCT = Normal Cycle Time (hr/cycle)
NDT = Decant Time (hr/cycle)
7.48 = Conversion (gal/ft^3)
24 = Conversion (hours/day)

Peak Wet Weather Flow:

$$Vbwls = \frac{PWWF \times (SCT - SDT)}{24 \times 7.48} = \frac{2{,}620{,}000 \times (2.4 - 0.60)}{24 \times 7.48} = \mathbf{26{,}270\ ft^3/basin}$$

where: Vbwls = Maximum Volume Above BWL at Peak Wet Weather (Storm) Flow (ft^3/basin)
PWWF = Peak Wet Weather Flow (gal/day)
SCT = Storm Cycle Time (hr/cycle)
SDT = Storm Decant Time (hr/cycle)

MVAB (Maximum Volume Above Bottom Water Level) is larger of Peak Dry Weather and Peak Wet Weather Calculation

MVAB = **26,270 ft^3/basin**

Decant Rates

Peak Dry Weather Flow:

$$PDR = \frac{MVAB \times 7.48}{NDT} + \frac{PDWF}{1{,}440} = \frac{26{,}270 \times 7.48}{72.0} + \frac{1{,}310{,}000}{1{,}440} = \mathbf{3{,}639\ gal/min}$$

where: PDR = Normal Decant Rate (gal/min)
NDT = Normal Decant Time (min/cycle)
1440 = Conversion (min/day)

Peak Wet Weather Flow:

$$PWR = \frac{MVAB \times 7.48}{SDT} + \frac{PWWF}{1{,}440} = \frac{26{,}270 \times 7.48}{36.0} + \frac{2{,}620{,}000}{1{,}440} = \mathbf{7{,}278\ gal/min}$$

where: PWR = Peak Decant Rate (gal/min)
SDT = Storm Decant Time (min/cycle)

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Decanter Sizing

Peak Dry Weather Flow:

$$DLa = \frac{PDR}{\text{Weir Loading Rate} \times 7.48} = \frac{3{,}639}{20 \times 7.48} = \mathbf{24.32\ ft}$$

where: DLa = Decanter Length for Average Dry Weather Flow (ft)
20 = Weir Loading Rate (ft^3/min/ft of decanter weir)

Peak Wet Weather Flow:

$$DLp = \frac{PWR}{\text{Weir Loading Rate} \times 7.48} = \frac{7{,}278}{28 \times 7.48} = \mathbf{34.75\ ft}$$

where: DLp = Decanter Length for Peak Wet Weather (Storm) Flow (ft)
28 = Weir Loading Rate (ft^3/min/ft of decanter weir)

Design Decanter Length = **35.0 ft**

Basin Working Volume

BWV = MVAB + Vbio = 26,270 + 46,368 = **72,639 ft^3/basin**

where: BWV = Basin Working Volume (ft^3/basin)

Basin Area

$$BA = \frac{BWV}{TWL - BZ} = \frac{72{,}639}{18.0 - 3.4} = \mathbf{4{,}991\ ft^2/basin}$$

where: BA = Basin Area (ft^2)
TWL = Top Water Level (ft)
BZ = Buffer Zone (ft) (Safety Factor)

Sludge Depth

$$SD = \frac{Vbio}{BA} = \frac{46{,}368}{4{,}991} = \mathbf{9.29\ ft}$$

where: SD = Sludge Depth (ft)

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Decanter Draw Down

$$DD = \frac{MVAB}{BA} = \frac{26{,}270}{4{,}991} = \mathbf{5.26\ ft}$$

where: DD = Draw Down (ft)

Bottom Water Level

$$BWL = SD + BZ = 9.29 + 3.45 = \mathbf{12.74\ ft}$$

where: BWL = Bottom Water Level (ft)

Top Water Level

$$TWL = BWL + DD = 12.74 + 5.26 = \mathbf{18.00\ ft}$$

where: TWL = Top Water Level (ft)

Hydraulic Retention Time

$$HRT = \frac{BA \times MAFD \times 7.48}{QT}$$

where: HRT = Hydraulic Retention Time (days)
MAFD = Maximum Average Flow Depth (ft)
QT = Fill Rate at Average Dry Weather Flow (gal/day)

$$MAFD = \frac{Q \times [(NCT \times 60) - NDT]}{BA \times 1{,}440 \times 7.48} + BWL = \frac{875{,}000 \times [(4.8 \times 60) - 72.0]}{4{,}991 \times 1{,}440 \times 7.48} + 12.74 = \mathbf{16.25\ ft}$$

$$HRT = \frac{4{,}991 \times 16.25 \times 7.48}{875{,}000} = \mathbf{0.69\ days}$$

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MLSS Concentration at Bottom Water Level

$$MLSS = \frac{Mbio \times 1{,}000{,}000}{BWL \times BA \times 62.42} = \frac{19{,}320 \times 1{,}000{,}000}{12.74 \times 4{,}991 \times 62.42} = \mathbf{4{,}869\ mg/l}$$

where: MLSS = Mixed Liquor Suspended Solids concentration at Bottom Water Level (mg/l)
62.42/1E+06 = Conversion (lb/mg x l/ft^3)

Mass of Sludge Produced

$$\Delta M = \left(\frac{Y \times (BOD_{in} - BOD_{out})}{1 + (B \times \theta^{(T-20)} \times SRT)} + Zio + Zno \right) \times \frac{Q \times 8.34}{1{,}000{,}000} + Csludge$$

$$\Delta M = \left(\frac{0.6 \times (127 - 10.0)}{1 + (0.07 \times 1.02^{(8-20)} \times 29.0)} + 21.4 + 32.1 \right) \times \frac{8.8E+05 \times 8.34}{1{,}000{,}000} + 0 = \mathbf{593\ lb/day/basin}$$

(Lawrence-McCarty Equation as presented in WEF MOP/8 4th Edition, pg 11-11, Eqn. 11.7)

where:
- ΔM = Mass of Sludge Produced (lb/day/basin)
- Y = Volatile cell yield (VSS/BOD removed)
- q = Arrhenius Temperature Correction Factor
- B = Decay Rate (day^{-1})
- BOD_{out} = Anticipated Effluent BOD (mg/l)
- SRT = Solids Retention Time (days)
- Zio = Nonvolatile Influent suspended solids (mg/l)
- Zno = Volatile Non-Biodegradable solids (mg/l)
- T = Minimum Wastewater Temperature (°C)

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Volume of Sludge Produced

$$V_{ws} = \frac{\Delta M}{SFws \times 8.34} = \frac{593}{0.0085 \times 8.34} = \mathbf{8{,}370\ gal/day/basin}$$

where: Vws = Volume of Waste Sludge (gal/day/basin)
SFws = Solids Fraction in Waste Sludge
8.34 = Density (lb/gal)

Observed Yield Factor

$$Yobs = \frac{\Delta M}{BOD_L} = \frac{593}{930} = \mathbf{0.638}\ \frac{\mathbf{MLSS}}{\mathbf{BOD}}$$

Observed Yield Factor (lb/day MLSS/lb/day BODremoved)

Mean Cell Residence Time

$$MCRT = \frac{Mbio}{\Delta M + ((Q - Vws) \times TESS \times 8.34 / 1E{+}06)}$$

$$MCRT = \frac{19{,}320}{593 + ((875{,}000 - 8{,}370) \times 10.0 \times 8.34 / 1{,}000{,}000)} = \mathbf{29.0\ days}$$

where: MCRT = Mean Cell Residence Time (days)
TESS = Anticipated Effluent Total Suspended Solids (mg/l)
8.34E-06 = Conversion (lb/mg x l/gal)

Sludge Age for Nitrification

Refer to Metcalf and Eddy, Edition IV pages 614 and 705

Constants and Temperature Corrections:

Coefficient	Base Value	Theta	Temperature Corrected	Symbol
Maximum Specific Growth Rate of Nitrifying bacteria, g VSS/g VSS.day	0.75	1.07	0.333	$\mu_{nm}(T)$
Half-Velocity constant for nitrifiers	0.74	1.053	0.398	Kn(T)
Nitrifier decay rate	0.08	1.04	0.050	Kdn(T)
Dissolved Oxygen, mg/l	2		2	DO
Half-Velocity Constant for Dissolved Oxygen, mg/l	0.5		0.5	Ko
Minimum Water Temperature, °C	8		8	T
Safety Factor	1.7		1.7	SF

Calculations:

$$\mu_n = \left(\mu_{nm}(T) \times \frac{TENH_3}{TENH_3 + Kn(T)} \times \frac{DO}{DO + Ko} \right) - Kdn(T)$$

$$\mu_n = \left(0.333 \times \frac{1.0}{1.0 + 0.398} \times \frac{2.0}{2.0 + 0.5} \right) - 0.050 = \mathbf{0.141\ days^{-1}}$$

$$SRTmin = \frac{1}{\mu_n} = \frac{1}{0.141} = \mathbf{7.1\ days}$$

$$SRTaerobic = SRTmin \times SF = 7.1 \times 1.7 = \mathbf{12.1\ days}$$

$$SRToverall = \frac{SRTaerobic \times 24}{TA} = \frac{12.1 \times 24}{10.0} = \mathbf{29.0\ days}$$

Design sludge age adequate for nitrification.

where: $\mu nm(T)$ = Maximum Temperature Corrected Nitrifier Growth Rate ($days^{-1}$)

μ_n = Specific Nitrifier Growth Rate at Temperature, DO, and Effluent NH_3 (g/g-days)

SRTmin = Minimum Sludge age required for Nitrification (days)

SRTaerobic = Design Aerobic Sludge Age (days)

SF = Safety Factor

SRToverall = Sludge Age accounting for entire ICEAS cycle (days)

TA = Aeration Time (hrs/day)

$TENH_3$ = Anticipated Effluent Ammonia (mg/l)

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Denitrification Capacity

Constants and Temperature Corrections

Coefficient	Base Value	Theta	Temperature Corrected	Symbol
Base Denitrification Rate @ 20°C,NO3/MLVSS/hr	0.0025	1.09	0.0009	μ_{DN}
VSS/TSS	0.74			
Sludge Nitrogen Content	0.1			Ns
Minimum Wastwater Temperature, °C	8			T
Effluent Dissolved Organic Nitrogen, mg/l	1			EDON

Nitrogen Balance

$$N_{Avail} = TKN - EDON - TENH_3 - N_{Assim} - N_{Part} = 17 - 1 - 1.0 - 6.0 - 0.7 = \mathbf{8.3\ mg/l}$$

where: N_{Avail} = Nitrogen available for oxidation and denitrification (mg/l)

TKN = Influent Total Kjeldahl Nitrogen (mg/l)

N_{Assim} = Nitrogen assimilated into VSS in WAS (mg/l)

$$N_{Assim} = \frac{\Delta M \times Ns \times VSS/TSS \times 1{,}000{,}000}{Q \times 8.34} = \frac{593 \times 0.1 \times 0.737 \times 1{,}000{,}000}{875{,}000 \times 8.34} = \mathbf{6.0\ mg/l}$$

$$N_{Part} = TESS \times Ns \times VSS/TSS = 10.0 \times 0.1 \times 0.74 = \mathbf{0.7\ mg/l}$$

$$NO_{3(Allow)} = TN - EDON - TENH_3 - N_{Part} = 10 - 1 - 1.0 - 0.7 = \mathbf{7.3\ mg/l}$$

where: $NO_{3(Allow)}$ = Allowable NO3 concentration in effluent (mg/l)

TN = Total Nitrogen in effluent (mg/l)

N_{Part} = Nitrogen bound to VSS portion of effluent TSS (mg/l)

Required Denitrification Capacity

$$\text{Req'd Capacity} = \frac{(N_{Avail} - NO_{3(Allow)}) \times Q \times 8.34}{1{,}000{,}000} = \frac{(8.3 - 7.3) \times 875{,}000 \times 8.34}{1{,}000{,}000} = \mathbf{7\ lb/day/basin}$$

Design Denitrification Capacity

$$\text{Design Capacity} = \mu_{DN} \times VSS/TSS \times BMOB \times ART = 0.0009 \times 0.74 \times 19{,}320 \times 4.6 = \mathbf{59\ lb/day/basin}$$

where: ART = Anoxic Retention Time (hours/day)

Design denitrification Capacity exceeds required denitrification capacity.

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Waste Sludge Pump Capacity

$$WSP = \frac{Vws \times NCT}{24 \times SPT} = \frac{8{,}370 \times 4.8}{24 \times 15.22} = \mathbf{110\ gal/min}$$

where: WSP = Waste Sludge Pump Capacity(gal/min)
SPT = Sludge Pumping Time (min/cycle)

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SANITAIRE ICEAS Aeration Design Calculations
BOD Removal, Nitrification, and De-Nitrification Process

SANITAIRE Project #30323-20a
Aumsville WWTP, OR

Carbonaceous Oxygen Demand

$$AOR1 = A \times \frac{Q \times BODin}{1{,}000{,}000} \times 8.34 = 1.25 \times \frac{875{,}000 \times 127}{1{,}000{,}000} \times 8.34 = \mathbf{1{,}163\ lb/day/basin}$$

where AOR1 = Actual Oxygen Required for BOD oxidation (lb/day/basin)
A = O2 / BOD
Q = Average flow (gal/day/basin)
BODin = Influent BOD received (mg/l)
1,000,000 = Conversion (g x mg)
8.34 = Conversion (lb x gal)

Nitrification Oxygen Demand

$$AOR2 = TKNox \times 4.60 = 60.3 \times 4.60 = \mathbf{278\ lb/day/basin}$$

where AOR2 = Actual Oxygen required for Ammonia Oxidation (lb/day/basin)
TKNox = Nitrogen available for oxidation(lb/day/basin)

Constants

Coefficient	Value	Symbol
VSS/TSS	0.7371	
Sludge N	0.1	Ns
Effluent Dissolved Organic Nitrogen, mg/l	1	EDON
Expected Effluent Ammonium concentration	1	$TENH_3$

$$TKN_{ox} = (TKN - EDON - TENH_3 - N_{assim} - N_{part}) \times Q \times 8.34 \div 1{,}000{,}000$$

$$TKN_{ox} = (17 - 1 - 1 - 5.99 - 0.74) \times 875{,}000 \times 8.34 \div 1{,}000{,}000 = \mathbf{60.3\ lb/day/basin}$$

where N_{assim} = Nitrogen assimilated into biomass, (mg/l)

$$N_{assim} = BOD_{in} \times N_s \times Y_{obs} \times VSS/TSS = 127.440904419322 \times 0.1 \times 0.638 \times 0.74 = \mathbf{5.99\ mg/l}$$

where Y_{obs} = Observed Sludge Yield, (MLSS produced / BOD removed)

$$N_{part} = TESS \times N_s \times VSS/TSS = 10 \times 0.1 \times 0.74 = \mathbf{0.74\ mg/l}$$

where N_{part} = Nitrogen bound to VSS portion of effluent TSS (mg/l)
TESS = Anticipated Effluent Total Suspended Solids (mg/l)

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Denitrification Oxygen Credit

$$O_{2denit} = 2.9 \times NO3\text{-}Ndenit = 2.9 \times 58 = \mathbf{168\ lb/day/basin}$$

where O_{2denit} = Oxygen mass credit from denitrification (lb/day/basin)

NO3-Ndenit = Mass of NO3-N denitrified (lb/day/basin)

$$NO_3\text{-}N_{denit} = \mu_{DN} \times VSS/TSS \times BMOB \times ART = 0.00088 \times 0.74 \times 19{,}320 \times 4.62 = \mathbf{58\ lb/day/basin}$$

where μ_{DN} = Denitrification rate at 8°C (NO3/MLVSS/hr)

BMOB = Basin biomass (lb/basin)

ART = Anoxic Retention Time, (hrs/day)

Total Actual Oxygen Transfer

$$AOR = AOR1 + AOR2 - O_{2denit} = 1{,}163 + 278 - 168 = \mathbf{1{,}271\ lb/day/basin}$$

where AOR = Total Actual Oxygen Required (lb/day/basin)

Total Standard Oxygen Transfer

$$SOR = \frac{AOR}{AOR / SOR} = \frac{1{,}271}{0.4891} = \mathbf{2{,}598\ lb/day/basin}$$

$$\frac{AOR}{SOR} = \frac{\alpha \times \theta^{(TSite - 20)} \times (\beta \times C^{*}sat_{20} \times Psite / Pstd \times Csurf_T / Csurf_{20} - D.O.)}{C^{*}sat_{20}}$$

$$\frac{AOR}{SOR} = \frac{0.65 \times 1.024^{(25 - 20)} \times (0.95 \times 10.41 \times 14.52 / 14.70 \times 8.31 / 9.07 - 2.0)}{10.41} = \mathbf{0.4891}$$

where SOR = Standard Condition Oxygen Requirement (lb/day/basin)

α = Alpha factor

θ = Temperature coefficient

Tsite = Water temperature (°C)

β = Beta factor

Psite = Site Atmospheric Pressure

Pstd = Standard atmospheric pressure (psig)

$C^{*}sat_{20}$ = Dissolved oxygen solubility at standard conditions (mg/l)

$Csurf_T$ = Dissolved oxygen solubility at site water temperature (mg/l)

$Csurf_{20}$ = Dissolved oxygen solubility at 20°C (mg/l)

D.O. = Residual dissolved oxygen concentration (mg/l)

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Aeration System Standard Oxygen Transfer Rate

$$SOTR = \frac{SOR}{TA} = \frac{2{,}598}{10} = \mathbf{260\ lb/hr/basin}$$

where SOTR = Standard oxygen transfer rate (lb/hr/basin)
TA = Aeration Time, (hrs/day)

Aeration Depth

Average Aeration Depth

$$AADad = \frac{Q \times [(NCT \times 60) - (NDT + NST)]}{2 \times 1{,}440 \times 7.48 \times BA} + BWL$$

$$AADad = \frac{875{,}000 \times [(4.8 \times 60) - (72 + 48)]}{2 \times 1{,}440 \times 7.48 \times 4{,}990} + 12.74 = \mathbf{14.10\ ft}$$

where AADad = Average Aeration Depth at Average Dry Weather Flow (gpd)
Q = Average Dry Weather Flow (gpd/basin)
NCT = Normal Cycle Time (hr)
NDT = Normal Decant Time (min)
NST = Normal Settling Time (min)
BA = Basin Area (ft^2)
1440 = Conversion (min/day)
2 = Calculate Aeration Depth at Middle of Normal Reaction Phase (NCT - NST - NDT)
7.48 = Conversion (gal/ft^3)

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Maximum Aeration Depth

$$MADpw = \frac{PWWF \times [(SCT \times 60) - (SDT + SST)]}{1{,}440 \times 7.48 \times BA} + BWL$$

$$MADpw = \frac{2{,}620{,}000 \times [(2.4 \times 60) - (36 + 48)]}{1{,}440 \times 7.48 \times 4{,}990} + 12.74 = \mathbf{15.66\ ft}$$

where MADpw = Maximum Aeration Depth at Peak Wet Weather Flow (gpd)
PWWF Peak Wet Weather Flow (gpd/basin)
SCT = Storm Cycle Time (hr)
SDT = Storm Decant Time (min)
SST = Storm Settle time (min)
MAD = Maximum Aeration Depth (ft)

MAD is larger of MADad and MADpw

MAD = **16.83 ft**

Air Flow Requirement

$$\text{Process Air} = \frac{SOTR \times 10{,}000}{\rho \times SOTE \times Opw \times 60} = \frac{260 \times 10{,}000}{0.075 \times 26.79 \times 23.2 \times 60} = \mathbf{929\ scfm}$$

where Process Air = Process air flow requirement (scfm)
ρ = Air density (0.075 lb/day/ft³)
SOTE = Standard Oxygen Transfer Efficiency @ Submergence of 13.10 ft
Opw = Fraction of Oxygen in air by Weight
10,000 = Conversion (100% * 100%)
60 = Conversion (min/hr)

Mixing Air = MI x BA = 0.13 x 4,990 = **624 scfm**

where Mixing Air = Mixing air flow requirement (scfm)
MI = recommended air flow per unit area of basin (scfm/ft²)

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Blower Unit Capacity

Blower unit capacity (BUC) is the larger of the process air requirement and the mixing air requirement.

Process Air	929 scfm
Mixing Air	624 scfm

Use 2 blowers per tank

BUC = **465 scfm**

Blower Pressure

psig = MAD x 0.432 + H_L = 15.66 x 0.432 + 1.00 = **8.3 psig**

where psig = blower pressure (rounded to next psig)
0.432 = water density (psi/ft)
H_L = Cumulative piping and diffuser headloss (psig)

Average Blower Power

Blower power based on vendor curves, BUC, and Average Aeration Depth (13.10 ft)

$Power_{avg}$ = **24.0 bhp**

City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Section 12: Design Criteria & Equipment List

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DESIGN PROPOSAL

Aumsville WWTP, OR Sanitaire #30323-20a

Max Month*	MGD	1.75	
Max 4.8hr Cycle Flow	MGD	2.62	
Max 3.6hr Cycle Flow	MGD	5.24	
		mg/l	lb/day
BOD_5 (20°C)		127	1860
Suspended Solids		107	1560
TKN		17	248
NH3-N		17	248
Max Wastewater Temperature	°C	25	
Min Wastewater Temperature	°C	8	
Ambient Air Temperature	°F	20 - 90	
Site Elevation	ft	366	

*** - Maximum 30 day period mass flow**

Table B: ICEAS® EFFLUENT QUALITY (MONTHLY AVERAGE)

BOD_5 (20°C)	mg/l	10
Suspended Solids	mg/l	10
NH_3-N	mg/l	1
TN	mg/l	10

Table C: ICEAS PROCESS DESIGN CRITERIA

Operating Basins		2
Operating Top Water Level	ft	18.0
F / M	BOD5/DAY/MLSS	0.048
SVI (after 30 minutes settling)	ml/g	150
MLSS at Bottom Water Level	mg/l	4,869
Waste Sludge Produced (Approx.)	lb/day	1,187
Volume of Sludge Produced (Approx., 0.85% solids)	GPD	16,700
Normal Decant Rate	GPM	3,639
Peak Decant Rate	GPM	7,278
Hydraulic Retention Time	Days	0.69
Sludge Age	Days	29.0

Sufficient Alkalinity must be provided to maintain basin pH of 6.8

Bold, italicized text indicate assumptions made by Sanitaire

Cycle Timing

		Max Month*	
		Normal	Min
Air-On	min	120	48
Air-Off	min	48	
Settle	min	48	48
Decant	min	72	36
Total	min	288	132

Table D: KEY ICEAS DESIGN DETAILS

Top Water Level	ft	18.0
Basin Width (Inside)	ft	46.0
Basin Length (Inside)	ft	108.5
Bottom Water Level	ft	12.7
No. of Sludge Holding Tanks		2
SHT Top Water Level	ft	18.0
SHT Width	ft	25.0
SHT Length	ft	46.0
Sludge Storage Time	days	16

ICEAS EQUIPMENT(Base Design)

					Motor HP	No. Req.
Decanter Mechanism	35	' Weir length				2
Decanter Drive Unit					1/2	2
ICEAS Blower	465	SCFM	8.3	PSIG	40	3
ICEAS Fine Bubble Aeration System	616	Disc Diffusers/Basin				2
Air Control Valve	8	"				2
Waste Sludge Pump	110	GPM			3.2	2
Submersible Mixer					10.0	
ICEAS Controls						1
SHT Blower	492	SCFM	8.8	PSIG	40	3
SHT Aeration System	328	Disc Diffusers/Basin				2

ICEAS POWER REQUIREMENTS

	Max Month		**(At Average Aeration Depth)**				Kwh/Day
Decant Drive Unit	0.4	BHP	2	run	@	6 Hrs/day	3.6
ICEAS Air Blowers	24.0	BHP	2	run*	@	20 Hrs/day	717.2
Waste Sludge Pump	2.6	BHP		run	@	1.3 Hrs/day	
Submersible Mixer	8.0	BHP		run	@	4 Hrs/day	
						KWH/DAY	720.8
					AVERAGE	KWH/HR	30.0

* Shared ICEAS Blowers

SHT Blower	33.70825623	BHP	2	run	@	18 Hrs/day	905.30
						KWH/DAY	1,626.10
					AVERAGE	KWH/HR	67.75

Project Name: Aumsville, OR
Sanitaire Number: 30323-20a

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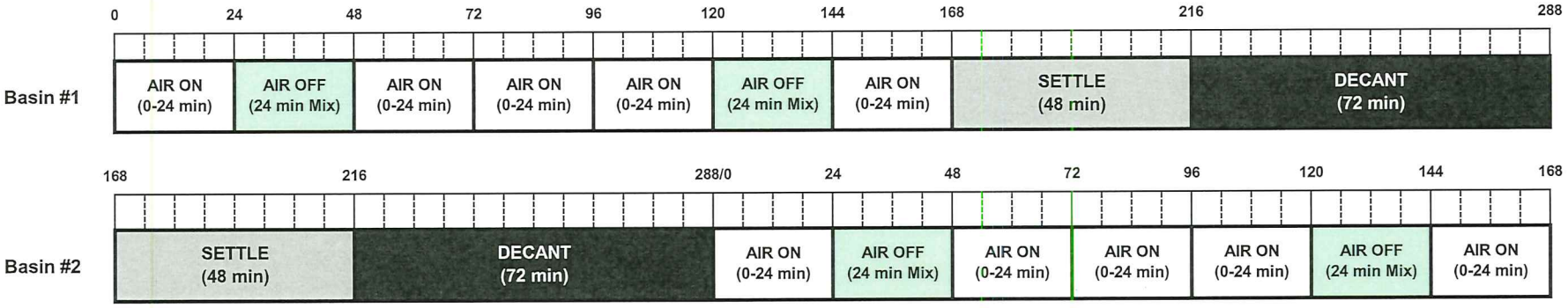
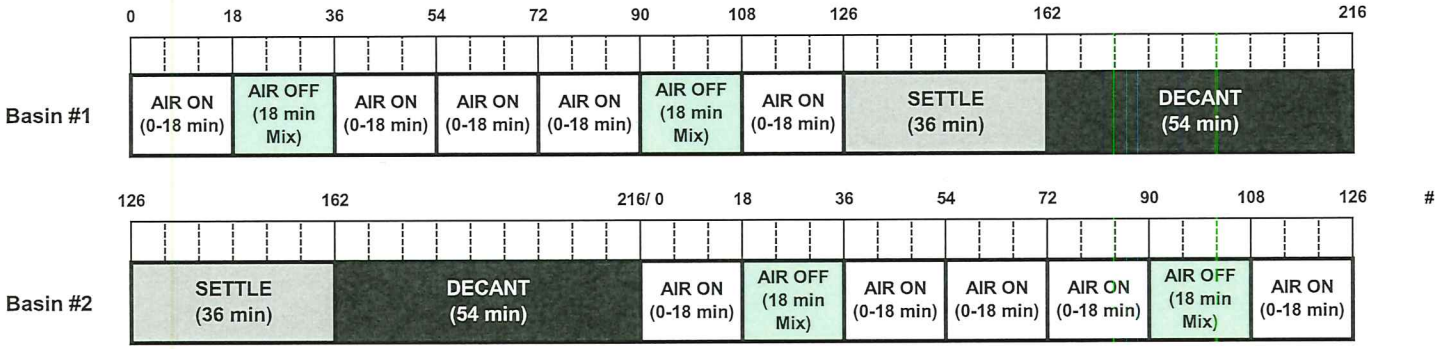
ICEAS 2-Basin NDN Normal Cycle 288 mins (4.8 hours)



Notes:
Each basin fills continuously over entire cycle. Basins #1 and #2 share a blower and Basins #3 has a designated blower.
** "Air Off" periods that do not overlap with the other basin can be aerated if needed.
"Air On" periods in the react phase are programmable from 0 to 24 minutes.
Sludge wasting occurs during the decant phase, pump run time is programmable.

ICEAS 2-Basin NDN High Flow Mode 216 mins (3.6 hours)



Notes:

Each basin fills continuously over entire cycle. Basins #1 and #2 share a blower and Basins #3 has a designated blower.

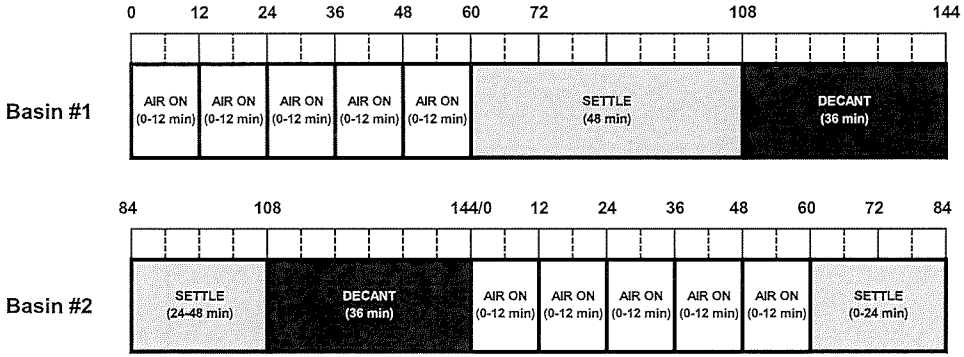
** "Air Off" periods that do not overlap with the other basin can be aerated if needed.

"Air On" periods in the react phase are programmable from 0 to 18 minutes.

Sludge wasting occurs during the decant phase, pump run time is programmable.

During the storm cycle, the time segments are reduced by 25% to accommodate additional flow.

ICEAS 2-Basin NDN Second High Flow Mode 144 mins (2.4 hours)



Notes:

Each basin fills continuously over entire cycle. Basins #1 and #2 share a blower and Basins #3 has a designated blower.

** "Air Off" periods that do not overlap with the other basin can be aerated if needed.

"Air On" periods in the react phase are programmable from 0 to 12 minutes.

Sludge wasting occurs during the decant phase, pump run time is programmable.

During the storm cycle, the time segments are reduced by 25% to accommodate additional flow.

Last air period is forced blocked to allow for additional settling.

City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Equipment:

1. **ICEAS Blower:** Three (3) positive displacement blowers for air supply to the ICEAS basins. Each complete blower package will be supplied with all necessary accessories, including:
   - 40 HP – 1800 RPM – TEFC – 3-phase 1.15 S.F. Motor
   - Discharge check valve
   - Inlet/discharge flexible connectors
   - Discharge butterfly valve
   - V-Belt Drive with guard
   - Inlet Air Filter/Silencer
   - Discharge Silencer
   - Weight Relief Valve
   - Discharge pressure gauge
   - Discharge thermometer
   - Elevated Steel Base
   - VFD-Variable Frequency Drive
   - Sound Enclosure

2. **Digester Blower:** Two (2) positive displacement blowers for air supply to the Digester basins. Each complete blower package will be supplied with all necessary accessories, including:
   - 40 HP – 1800 RPM – TEFC – 3-phase 1.15 S.F. Motor
   - Discharge check valve
   - Inlet/discharge flexible connectors
   - Discharge butterfly valve
   - V-Belt Drive with guard
   - Inlet Air Filter/Silencer
   - Discharge Silencer
   - Weight Relief Valve
   - Discharge pressure gauge
   - Discharge thermometer
   - Elevated Steel Base

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3. **Air Control Valve:** Two (2) 8" diameter air control valves, one (1) for each one for each ICEAS tank. Each valve will be supplied with 120 V, 1 Ph, 60 Hz electric operator, compartment heaters and handwheel for manual operation. Valves will be DeZurik BRS with an AUMA three-phase actuator.

4. **ICEAS Fine Bubble Aeration:** A complete SANITAIRE Fine Bubble aeration system for each ICEAS basin. There is one (1) grid per ICEAS tank. Equipment for each grid will include:

- One 304L stainless steel and PVC vertical drop pipe including flange for connection at the top of the tank and bottom connection to the air manifold.
- One 304L stainless steel manifold with connections for each 4 inch diameter air distribution header.
- 304 Stainless steel manifold supports with hold down clamp and washer.
- Four-inch diameter PVC air distribution headers including:
    - Fixed anti-rotational joint connection to the air manifold.
    - Factory installed (solvent welded) diffuser holders.
    - Positive locking fixed anti-rotational joint connections.
- 304L Stainless steel air distribution header support stands with header hold down clamp and locating plate.
- Fine Bubble Diffuser Elements with gaskets and retainer rings.
- Flanges, bolts, nuts and neoprene gaskets necessary to assemble the system.
- One automated moisture purge system for the SBR aeration system.
- One manual moisture purge system for the digester aeration system.
- Stainless steel anchor bolts for the manifold and header supports.

NOTE: Anchor bolts are designed for installation in 4000 PSI Concrete per ACI Committee 350 ("Concrete Sanitary Engineering Structures).

5. **Digester Fine Bubble Aeration:** A complete SANITAIRE Fine Bubble aeration system for each Digester basin. There is one (1) grid per ICEAS tank. Equipment for each grid will include:

- One 304L stainless steel and PVC vertical drop pipe including flange for connection at the top of the tank and bottom connection to the air manifold.
- One 304L stainless steel manifold with connections for each 4 inch diameter air distribution header.
- 304 Stainless steel manifold supports with hold down clamp and washer.
- Four-inch diameter PVC air distribution headers including:
    - Fixed anti-rotational joint connection to the air manifold.
    - Factory installed (solvent welded) diffuser holders.
    - Positive locking fixed anti-rotational joint connections.
- 304 Stainless steel air distribution header support stands with header hold down clamp and locating plate.

- Fine Bubble Diffuser Elements with gaskets and retainer rings.
- Flanges, bolts, nuts and neoprene gaskets necessary to assemble the system.
- One automated moisture purge system for the SBR aeration system.
- One manual moisture purge system for the digester aeration system.
- Stainless steel anchor bolts for the manifold and header supports.

NOTE: Anchor bolts are designed for installation in 4000 PSI Concrete per ACI Committee 350 ("Concrete Sanitary Engineering Structures).

6. **Decant Mechanism:** Two (2) stainless steel decanters, (1) per ICEAS basin. Each decanter will include a 35 foot long stainless steel trough, scum exclusion float, downcomer pipes, swivel joint, wall connection, and anchors. Each decanter drive assembly will be provided with electro-mechanical actuator decanter drive with 3/4 HP, 460V, 3 phase 60 Hz variable speed drive duty motor, decanter drive support, boot and end position limit switches.

7. **Submersible Mixers:** Two (2) submersible mixers, one (1) per basin. Each mixer will come equipped with 15 Hp, 460 V, 3 Ph, 60 Hz motor. Hoist socket, power cable and lifting cable will be provided for each mixer. Leak detection for the mixers will be provided. One portable hoist will be provided and hoist sockets for each mixer.

8. **ICEAS Pump:** Two (2) submersible pumps, one (1) for each ICEAS basin. Each pump will come equipped with 2.4 Hp, 460 V, 3 Ph, 60 Hz motor, discharge base, guide rail brackets, lifting cable and power cable. One portable hoist will be provided and hoist sockets for each mixer. **Guide rails, discharge piping and valves by others.**

9. **Level Indicators:** Two (2) level transducers, one (1) per ICEAS basin. The transducer shall have a stainless steel body with a head-pressure-sensing bottom Teflon faced diaphragm and an internal precision, gage pressure transducer assembly. The transducer shall be cable mounted and factory calibrated for the basin depth. The transducer shall be a 2-wire type and produce a 4-20ma signal in direct proportion to the measured level.

10. **High Level Storm Float:** Two (2) high level non-mercury float switches, one (1) per ICEAS basin.

11. **Motor Control Center:** Motor Control Center (MCC) for ICEAS motors and other electrical devices. MCC will be provided with motor starters and spare parts as specified.

12. **Control System:** One (1) NEMA 12 control panel with software as required for proper control of the ICEAS process, including all equipment listed in this scope. The system will be supplied with the following items:

    - Allen Bradley Human Machine Interface – Touchscreen HMI
    - Allen Bradley Programmable Logic Controller (PLC) – Compact Logix
    - Control Switches

- Pilot Lights
- Uninterruptable Power Supply (UPS)
- A local control station for each SBR decanter

13. **DO Control:** Two (2) dissolved oxygen probes, one (1) analyzer and control system.

14. **Digester Pumps:** Two (2) submersible pumps, one (1) for each SHT basin. Each pump will come equipped with 2.4 Hp, 460 V, 3 Ph, 60 Hz motor, discharge base, guide rail brackets, lifting cable and power cable. One portable hoist will be provided and hoist sockets for each mixer. **Guide rails, discharge piping and valves by others.**

15. **Spare Parts:** included as specified in 11300 2.6 n. with the exception of 10 Diffuser holders. Holders are factory solvent welded to distributor header piping and can not be installed in the field. (3) sections of air distributor piping will include holders.

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ICEAS SBR Blower

Sutorbilt Legend - 6MDSL

Product Information

CORRECTED VALUES	ORIGINAL UNITS	ENGLISH UNITS	METRIC UNITS
Ambient Pressure	366 ALTI-FT	14.498 PSIA	1 bar a
Elevation	366 ALTI-FT	366 ALTI-FT	112 alti-m
Inlet Pressure	14.498 PSIA	-0.000 PSIG	0 bar g
Inlet Pressure Loss	0.3 PSIG	0.300 PSIG	0.021 bar g
Inlet Temp	100 F	100 °F	38 °C
Inlet Flow	490 SCFM	547 ICFM	929 m³/h
Discharge Pressure	8.3 PSIG	8.300 PSIG	0.572 bar g
Discharge Pressure Loss	0.2 PSIG	0.200 PSIG	0.014 bar g
MEASURED VALUES	**ORIGINAL UNITS**	**ENGLISH UNITS**	**METRIC UNITS**
Speed	1786 RPM	1786 RPM	1786 RPM
RPM % Of Max	76	76	76
Power	28.5 HP	28.5 HP	21.252 kW
Discharge Temp	223 °F	223 °F	106 °C
Temp % of Max	68	68	68
Noise	88 dBa	88 dBa	88 dBa
Pressure % of Max	63	63	63
Adiabatic Efficiency	61.24%	61.24%	61.24%

PHYSICAL	
Weight	330 lbs.
Gear Diameter / Center Distance	6 in.
Connection Size	5i/5d in.
Case Length	8 in.
WR^2	5.09 lb-ft²
Orientation	horizontal

PERFORMANCE	
Max Delta P	14 PSI
Max Temp	325 °F
Max Speed	2350 RPM
Min Speed	637 RPM
Max Case Pressure	25 PSIG
Max Delta T	225 °F

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AMBIENT GAS PARAMETERS	ENGLISH UNITS	METRIC UNITS
Molecular Weight	28.700 lbm/lbmol	28.700 kg/kgmol
R Value	53.833 ft.lbf/lbm.R	0.290 kJ/kg.K
Density	0.069 lbm/ft ^{3}	1.110 kg/m^3

GAS MIX:	VOL
Air	100%

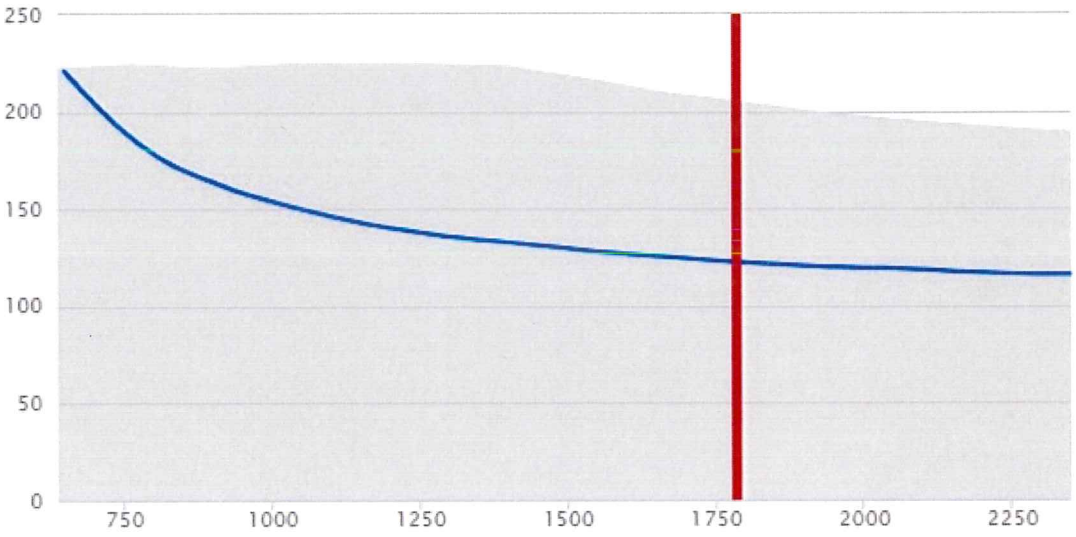
Performance Curves

Temperature Rise

DEFINED CONDITIONS
123 F

RPM
1786

Published Data
Defined Conditions

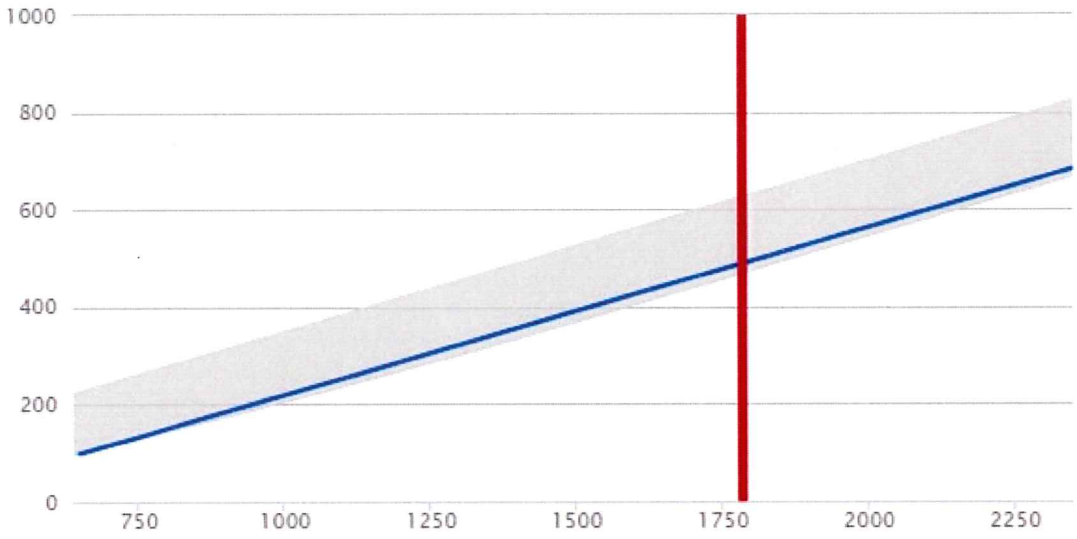


Flow

DEFINED CONDITIONS
489 SCFM

RPM
1786

Published Data
Defined Conditions



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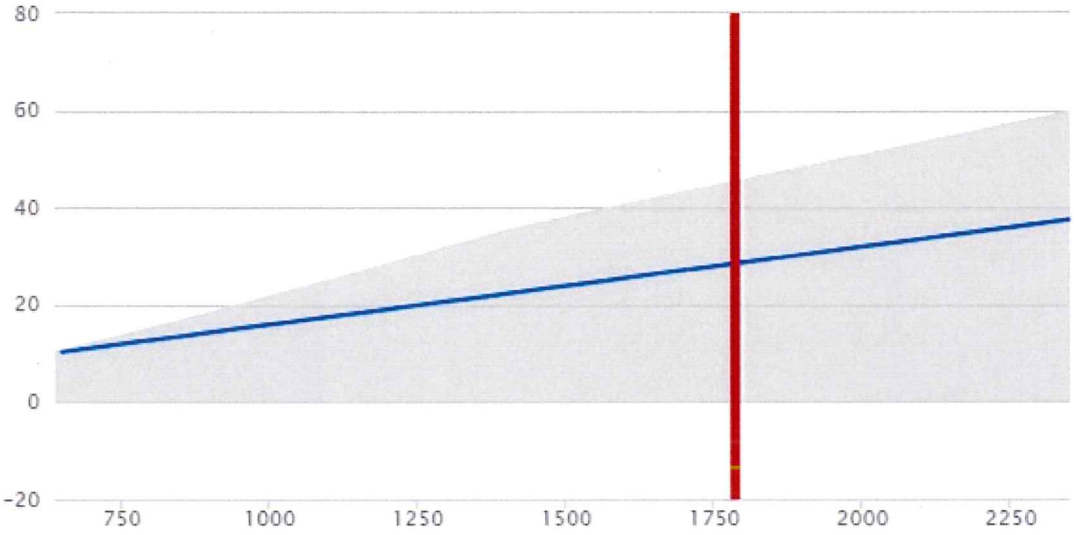
Performance Curves

Power

DEFINED CONDITIONS
28.5 HP

RPM
1786

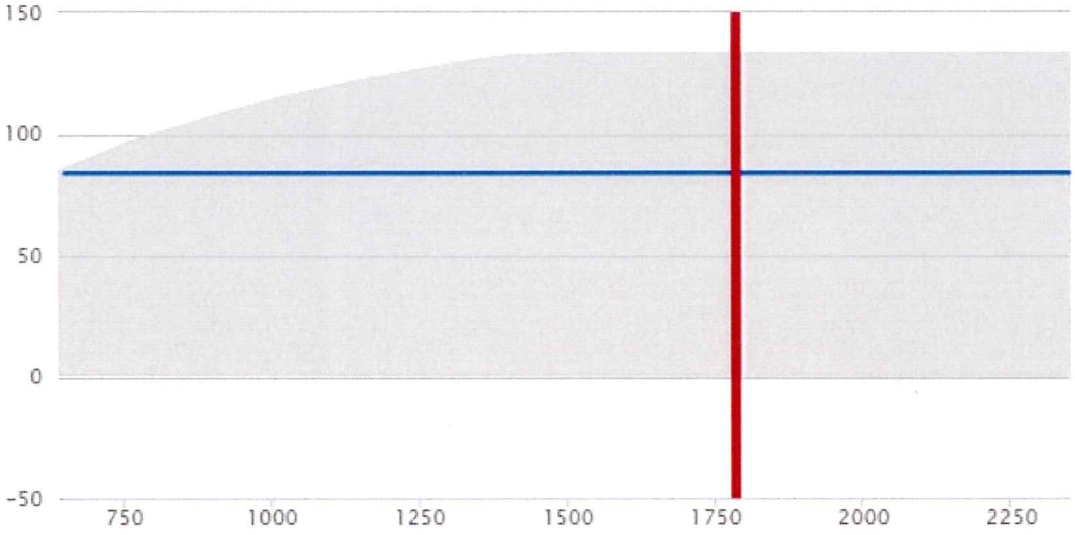


Published Data
Defined Conditions

Torque

DEFINED CONDITIONS
83.8 ft-lb

RPM
1786



Published Data
Defined Conditions

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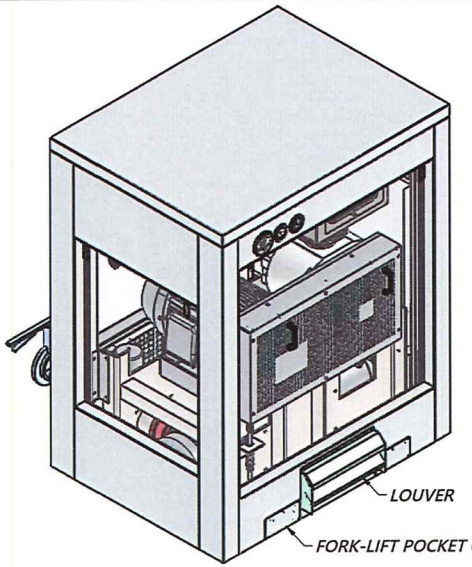
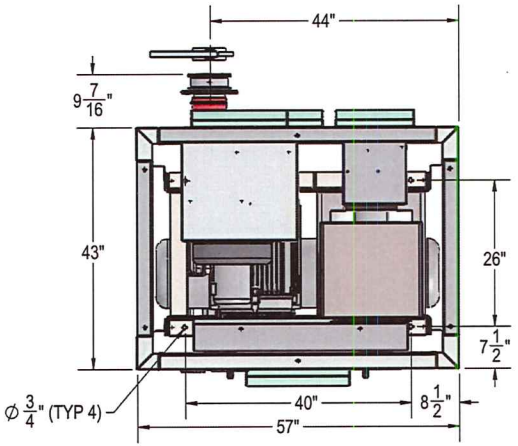
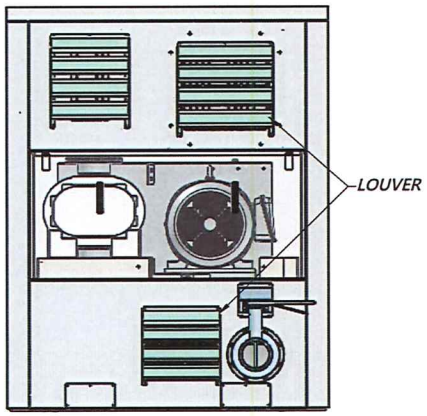


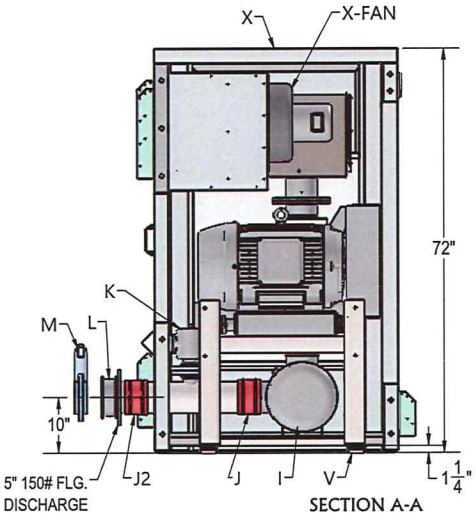


TOP VIEW
(ROOF REMOVED)

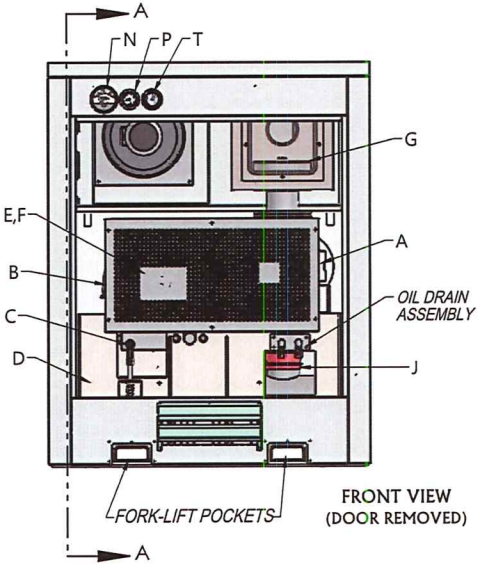
ITEM	DESCRIPTION
A	BLOWER: , SCFM / ICFM @ PSIG, RPM
B	MOTOR: HP, 1800 RPM, T, TEFC, 230/460/3/60
C	MOTOR TILT BASE
D	ELEVATED STEEL BASE
E	V-BELT DRIVE
	BLOWER SHEAVE:
	MOTOR SHEAVE:
	BELTS: C.D. = "
F	BELT GUARD: STEEL
G	INLET FILTER SILENCER: XL-IFS-5"
I	DISCHARGE SILENCER: PROGENTEX DRS-SP-5", GRADE I
J	FLEXIBLE PIPE CONNECTOR: FLEX-FAB TYPE II & III
J2	FLEXIBLE PIPE CONNECTOR: FLEX-FAB TYPE III
K	RELIEF VALVE: 2 1/2", SET @ PSI
L	CHECK VALVE: 5"
M	BUTTERFLY VALVE: 5"
N	DIFFERENTIAL PRESSURE GAUGE: DWYER 2020 0-20"WC
P	PRESSURE GAUGE: WIKA 213.53, 0-15 PSI
T	TEMPERATURE GAUGE:
V	VIBRATION ISOLATION PADS: VMC CORK-RIBBED, 1"THICK
X	NOISE ENCLOSURE: ALUMINUM EXTERIOR W/ACOUSTIC FOAM, 4 TILT-OUT LATCHING DOORS & EXHAUST FAN (1/15 HP, 115/1/60, 1.0 FLA) W/ T-STAT



BACK VIEW



SECTION A-A



FRONT VIEW
(DOOR REMOVED)

BLOWER ROTATION: CCW
ESTIMATED BLOWER PACKAGE WEIGHT: 2,100#
TOLERANCE: ± 1/2"
DISCHARGE PIPING MUST BE INDEPENDENTLY SUPPORTED.
COMPONENTS J2, L, & M WILL SHIP LOOSE.

NOTE:
ATTACH FORKLIFT POCKET COVERS & ENCLOSURE LOUVERS AFTER PACKAGE IS INSTALLED.

REV.	DATE	DESCRIPTION	BY
1	02/29/2024	UPDATE REVIEWS.	GS
0	10/05/2022	ISSUE PRELIMINARY DRAWING.	TK

EXCELSIOR BLOWER SYSTEMS
BLANDON, PENNSYLVANIA

PRELIMINARY DRAWING
STANDARD

DATE: 10/05/2022 SCALE: 1:22

DWG#: #5 COMPACT REV#: 1

QuickPik™

Digester Blower

Sutorbilt Legend - 6MDSL

Product Information

CORRECTED VALUES	ORIGINAL UNITS	ENGLISH UNITS	METRIC UNITS
Ambient Pressure	366 ALTI-FT	14.498 PSIA	1 bar a
Elevation	366 ALTI-FT	366 ALTI-FT	112 alti-m
Inlet Pressure	14.498 PSIA	-0.000 PSIG	0 bar g
Inlet Pressure Loss	0.3 PSIG	0.300 PSIG	0.021 bar g
Inlet Temp	100 F	100 °F	38 °C
Inlet Flow	486 SCFM	542 ICFM	921 m³/h
Discharge Pressure	8.8 PSIG	8.800 PSIG	0.607 bar g
Discharge Pressure Loss	0.2 PSIG	0.200 PSIG	0.014 bar g

MEASURED VALUES	ORIGINAL UNITS	ENGLISH UNITS	METRIC UNITS
Speed	1784 RPM	1784 RPM	1784 RPM
RPM % Of Max	76	76	76
Power	30.1 HP	30.1 HP	22.446 kW
Discharge Temp	231 °F	231 °F	111 °C
Temp % of Max	71	71	71
Noise	89 dBa	89 dBa	89 dBa
Pressure % of Max	66	66	66
Adiabatic Efficiency	60.28%	60.28%	60.28%

PHYSICAL	
Weight	330 lbs.
Gear Diameter / Center Distance	6 in.
Connection Size	5i/5d in.
Case Length	8 in.
WR^2	5.09 lb-ft²
Orientation	horizontal

PERFORMANCE	
Max Delta P	14 PSI
Max Temp	325 °F
Max Speed	2350 RPM
Min Speed	637 RPM
Max Case Pressure	25 PSIG
Max Delta T	225 °F

Created: 10-17-2024

QuickPik™

AMBIENT GAS PARAMETERS	ENGLISH UNITS	METRIC UNITS
Molecular Weight	28.700 lbm/lbmol	28.700 kg/kgmol
R Value	53.833 ft.lbf/lbm.R	0.290 kJ/kg.K
Density	0.069 lbm/ft ^{3}	1.110 kg/m^3

GAS MIX:	VOL
Air	100%

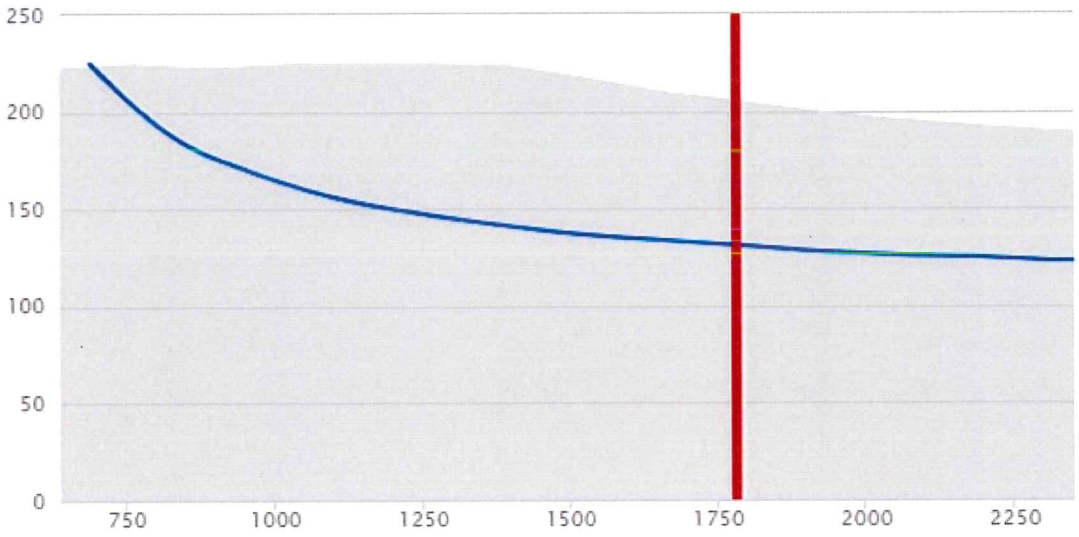
Performance Curves

Temperature Rise

DEFINED CONDITIONS
131 F

RPM
1784

Published Data
Defined Conditions

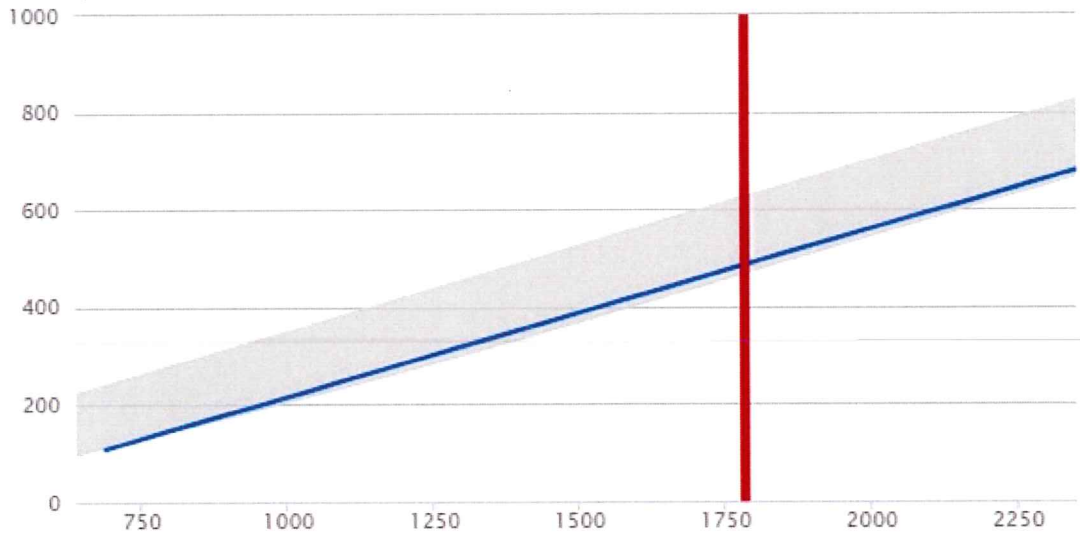


Flow

DEFINED CONDITIONS
486 SCFM

RPM
1784

Published Data
Defined Conditions



Created: 10-17-2024

QuickPik™

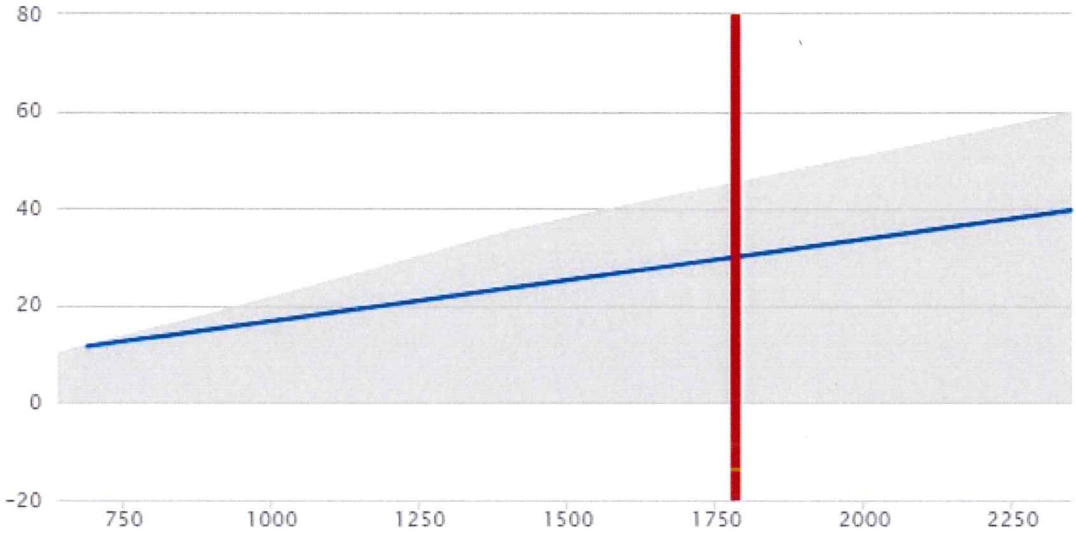
Performance Curves

Power

DEFINED CONDITIONS
30.1 HP

RPM
1784

Published Data
Defined Conditions



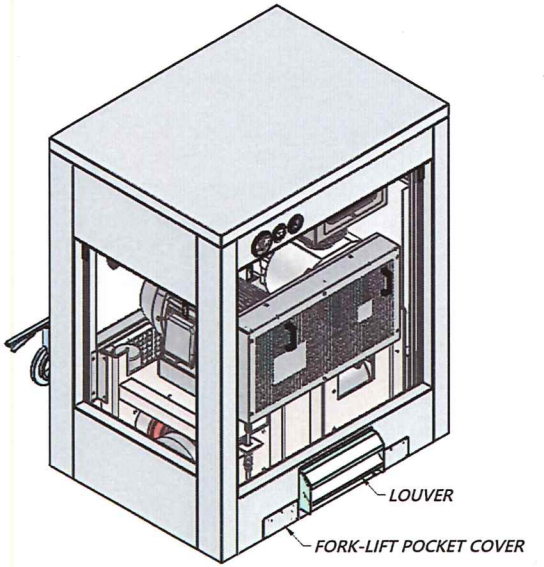
Torque

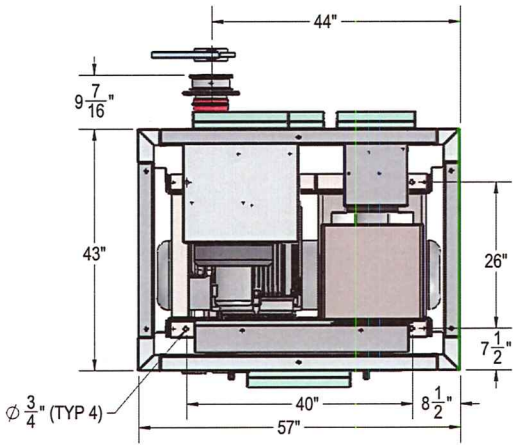
DEFINED CONDITIONS
88.6 ft-lb

RPM
1784

Published Data
Defined Conditions

Created: 10-17-2024





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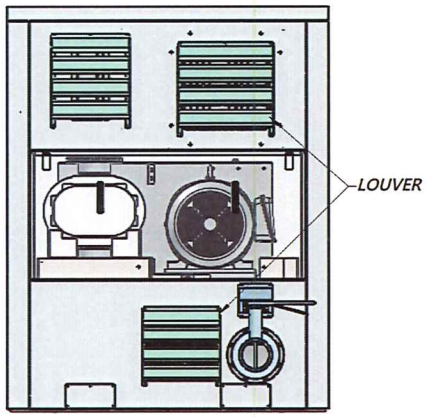
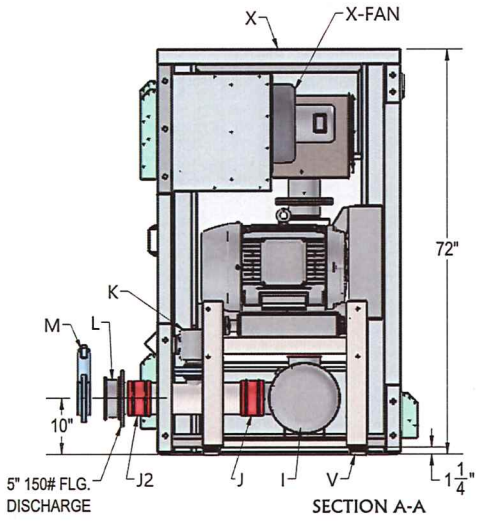
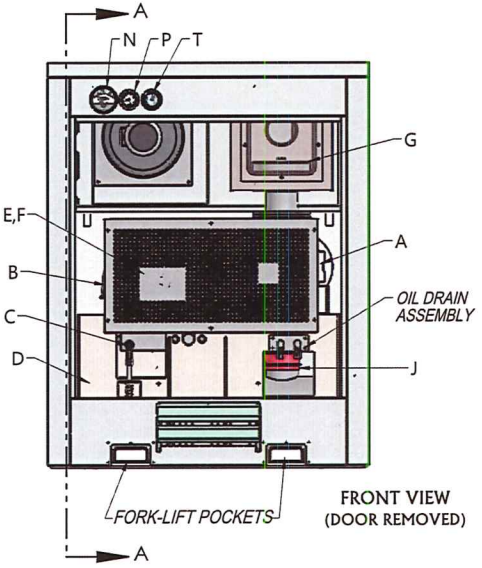


BACK VIEW



SECTION A-A



FRONT VIEW
(DOOR REMOVED)

BLOWER ROTATION: CCW
ESTIMATED BLOWER PACKAGE WEIGHT: 2,100#
TOLERANCE: ± 1/2"
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COMPONENTS J2, L, & M WILL SHIP LOOSE.

NOTE:
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REV.	DATE	DESCRIPTION	BY
1	02/29/2024	UPDATE REVIEWS.	GS
0	10/05/2022	ISSUE PRELIMINARY DRAWING.	TK

EXCELSIOR BLOWER SYSTEMS
BLANDON, PENNSYLVANIA

PRELIMINARY DRAWING
STANDARD

DATE: 10/05/2022 SCALE: 1:22

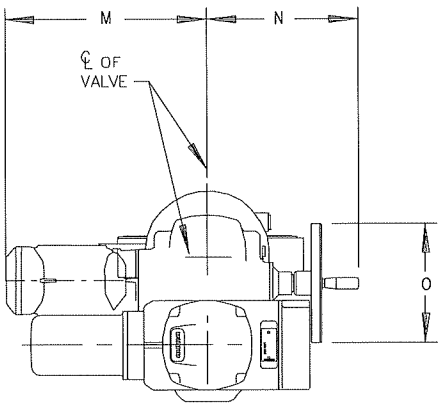
DWG#: #5 COMPACT REV#: 1

VALVE SIZE		DIMENSIONS INCHES / MILLIMETERS							
IN	MM	A	B	C	D	E	F	G	H
2	50	1.62 / 41	3.69 / 94	2.22 / 56	5.50 / 140	2.84 / 72	.656 / 16.66	4.75 / 121	2.00 / 51
2-1/2	62	1.75 / 44	4.19 / 106	2.47 / 63	6.00 / 152	3.34 / 85	.656 / 16.66	5.50 / 140	2.50 / 64
3	75	1.75 / 44	4.88 / 124	2.81 / 71	6.25 / 159	4.03 / 102	.656 / 16.66	6.00 / 152	3.00 / 76
4	100	2.00 / 51	6.06 / 154	3.41 / 87	7.00 / 178	5.16 / 131	.656 / 16.66	7.50 / 191	4.00 / 102
5	125	2.12 / 54	7.06 / 179	4.03 / 102	7.50 / 191	6.16 / 156	.781 / 19.84	8.50 / 216	5.75 / 146
6	150	2.12 / 54	8.12 / 206	4.53 / 115	8.00 / 203	7.02 / 178	.781 / 19.84	9.50 / 241	7.75 / 197
8	200	2.50 / 64	10.50 / 267	5.75 / 146	9.50 / 241	9.47 / 241	.781 / 19.84	11.75 / 298	7.45 / 189
10	250	2.50 / 64	12.75 / 324	7.12 / 181	10.75 / 273	11.47 / 291	.906 / 23.01	14.25 / 362	9.53 / 242
12	300	3.00 / 76	14.88 / 378	8.12 / 206	12.25 / 311	13.47 / 342	.906 / 23.01	17.00 / 432	11.47 / 291
14	350	3.00 / 76	17.05 / 433	9.38 / 238	13.62 / 346	15.28 / 388	1.031 / 26	18.75 / 476	13.04 / 331

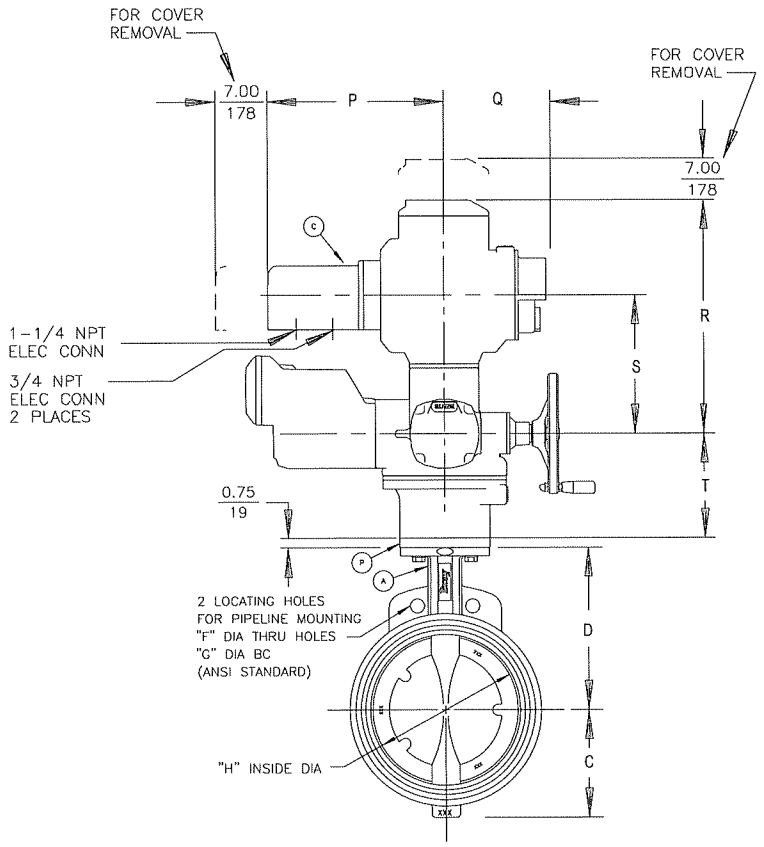
NOTE:

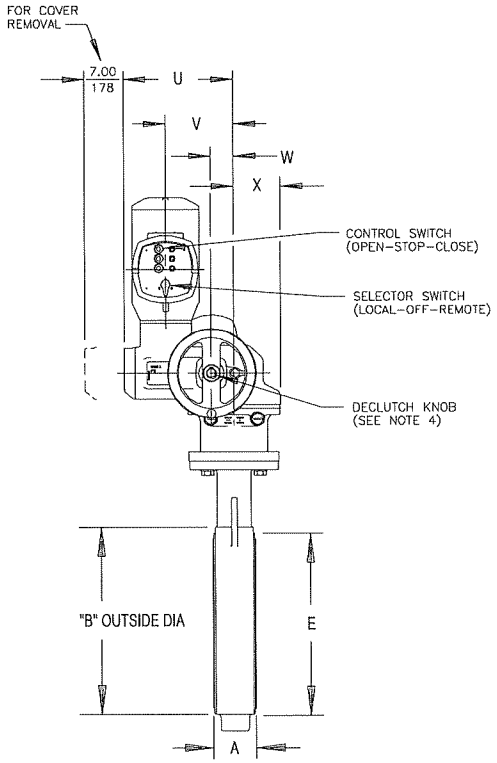
1. FLANGES ARE FLAT FACED WITH DIAMETER AND DRILLING TO CLASS 125 ANSI STANDARD B16.1
2. ACTUATOR SHOWN MOUNTED IN STANDARD POSITION. ACTUATOR MAY BE ROTATED IN 30° INCREMENTS.
3. PUSH KNOB TO ENGAGE FOR MANUAL OPERATION. UNIT REMAINS IN HAND OPERATION UNTIL MOTOR IS ENERGIZED.

A	VALVE
C	MOTOR & GEAR UNIT
P	CONNECTING PARTS



ACTUATOR NUMBER	DIMENSIONS INCHES / MILLIMETERS											
	M	N	O	P	Q	R	S	T	U	V	W	X
SQ(R)05/7.2	13.50 / 343	9.80 / 249	6.30 / 160	11.73 / 298	6.73 / 171	13.27 / 337	9.13 / 232	5.28 / 134	9.37 / 238	5.63 / 143	1.57 / 40	2.48 / 63
SQ(R)10.2	13.50 / 343	10.00 / 254	7.87 / 200	11.73 / 298	6.73 / 171	13.27 / 337	9.13 / 232	5.94 / 151	9.76 / 248	6.02 / 153	1.97 / 50	3.15 / 80
SQ(R)12.2	13.50 / 343	10.00 / 254	7.87 / 200	11.73 / 298	6.73 / 171	13.27 / 377	9.13 / 232	6.89 / 175	9.76 / 248	6.02 / 153	1.97 / 50	4.13 / 105
SQ(R)14.2	13.50 / 343	10.00 / 254	7.87 / 200	11.73 / 298	6.73 / 171	13.27 / 337	9.13 / 232	8.27 / 210	9.76 / 248	6.02 / 153	1.97 / 50	4.45 / 113





REVISION	CODE	DATE

DORNER VALVES & AUTOMATION

BRAY SERIES 30 BUTTERFLY VALVES SIZE 2" – 14" WAFER ENDS
AUMA SQ_.2 AM02.1 MATIC C ELECTRIC ACTUATOR SINGLE PHASE

DOCT. CODE	DRAWN	APPROVED	
C1	MJK	TGR	DDC57308740
	CHECKED TGR	DATE 5/12/15	

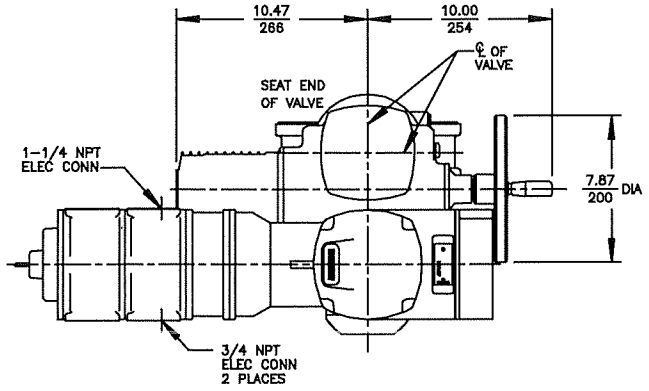
VALVE SIZE	DIMENSIONS INCHES / MILLIMETERS							
	A	B	C	D	E	F	G	H
6	2.31 / 59	8.88 / 226	6.50 / 165	8.25 / 210	5.75 / 146	.781 / 19.84	9.50 / 241	1.20 / 30
8	2.50 / 64	11.00 / 279	7.59 / 193	9.50 / 241	7.00 / 178	.781 / 19.84	11.75 / 298	1.38 / 35
10	2.93 / 74	13.75 / 349	8.78 / 223	11.19 / 284	8.31 / 211	.906 / 23.0	14.25 / 362	1.64 / 42

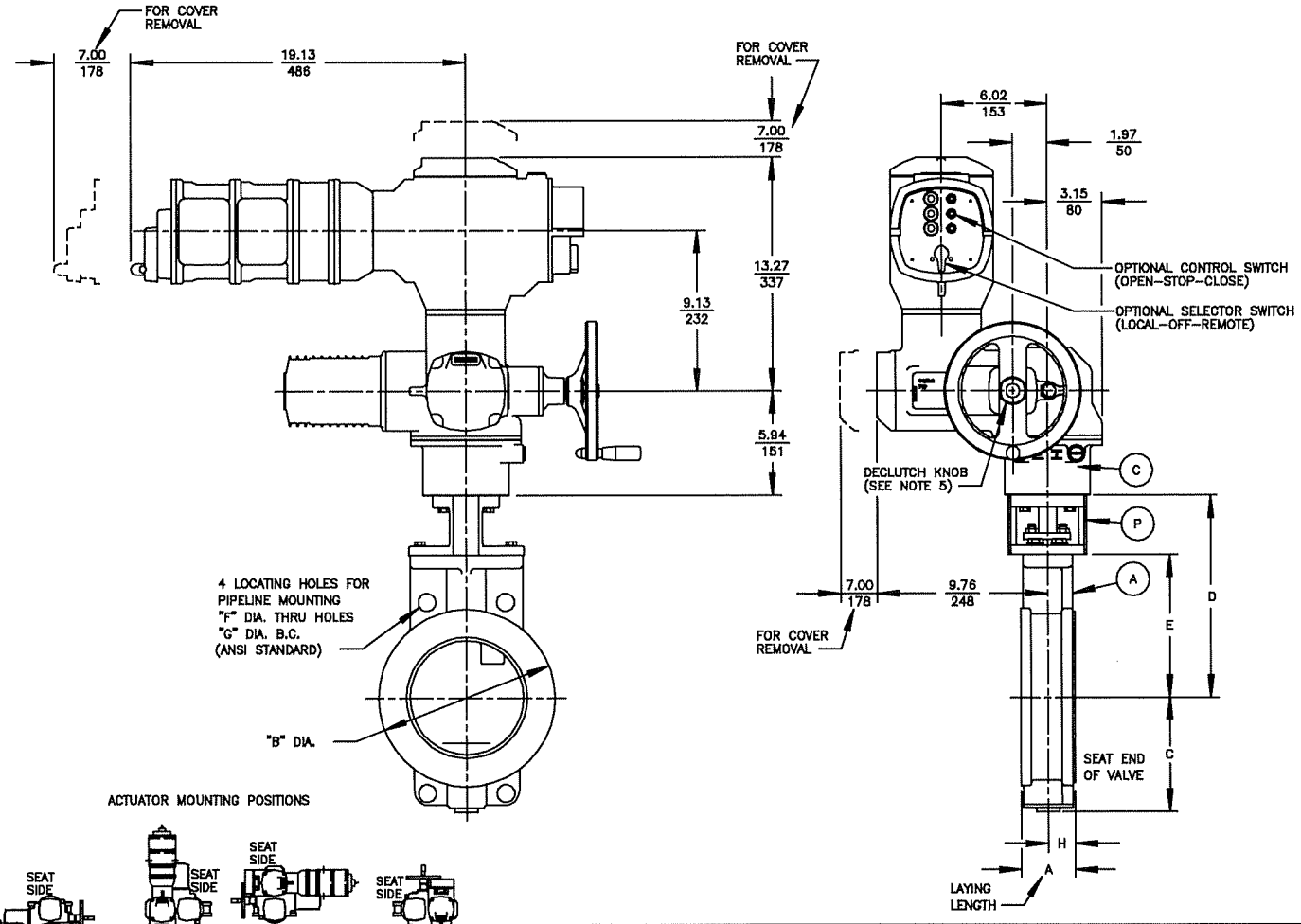
VALVE–PIPELINE INSTALLATION	
SEAT STYLE	HIGHEST PRESSURE WHEN CLOSED
TTS2	MUST BE AT SEAT END
S2	RECOMMENDED AT SEAT END
TI & TT	RECOMMENDED AT SEAT END

A	VALVE
C	MOTOR
P	CONNECTING PARTS

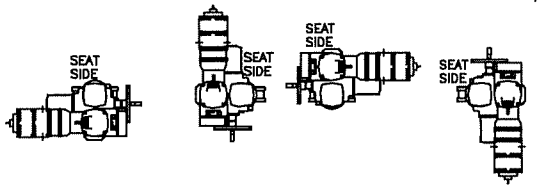
NOTE:

1. MATING PIPE FLANGE I.D. MUST BE EQUIVALENT TO ANSI CLASS 150 WELD NECK OR SLIP ON FOR SCHEDULE 40 PIPE.
2. DRAWING SHOWS LOCATING HOLES FOR MOUNTING WITH ANSI CLASS 150 FLANGES.
3. WHEN USING OTHER THAN ANSI FLANGES SEE A17936 FOR DIMENSIONS.
4. FLOW MAY BE IN EITHER DIRECTION. SEE VALVE INSTALLATION CHART FOR END OF VALVE TO BE PRESSURIZED WHEN VALVE IS IN THE CLOSED POSITION.
5. PULL OUT KNOB TO ENGAGE FOR MANUAL OPERATION. UNIT REMAINS IN HAND OPERATION UNTIL UNIT IS ENERGIZED.





ACTUATOR MOUNTING POSITIONS



STANDARD POSITION SHOWN ON THIS DRAWING | 90° POSITION | 180° POSITION | 270° POSITION

DeZURIK
Sartell, MN USA 56377
www.dezurik.com

BHP BUTTERFLY VALVES SIZE 6–10 CLASS 150 WAFER
AUMA SQ(R)10.2 AUMA MATIC MOTOR ACTUATOR
WITH DISCONNECT SWITCH (DOUBLE SEAL)

DOCT. CODE	DRAWN	APPROVED	
C1	BMP	BV	J49960
	CHECKED BV	DATE 06/01/15	

auma®
Solutions for a world in motion

Product Configuration (AUMSVILLESQEXC10.2)

Configured by: Dorner Company
Configured on: 11/22/2024
Printed: 11/22/2024

DESCRIPTION	SQEX10.2/AMEXC01.1
INDUSTRY	
Industry code	Industry & Marine
DEVICE CHARACTERISTICS	
AUMA product	Quarter-turn electric actuator
Rated output torque [lbs.ft.]	450
Rated output torque [inch.lbs.]	5,400
Rated output torque [Nm]	610
Approximate weight (lbs.)	120
SERVICE CONDITIONS	
Version	Explosive atmosphere
Version Ex	FM division system according to US NEC article 500
Explosion protection	(345) FM Division 1, Class I Groups C,D; Class II Groups E,F,G; Class III; T4 (135°C)
Operating mode	OPEN - CLOSE duty
Enclosure protection	Hazardous (classified) locations, indoors and outdoors (NEMA type 6)
Color	AUMA silver-grey (similar to RAL 7037)
Ambient temperature	-30 °C to +40 °C (-22 °F to +104 °F)
Nameplates	English - aluminum (US-AL)
Sealing elements	NBR - Nitrile Butadiene Rubber
Corrosion protection	KS
ELECTRICAL DATA	
Mains voltage	120 Volts AC
Phase	1-Ph
Frequency	60 Hz
Type of duty	S2 - 10 min.
Motor protection	(W-1T-O140) 1Ph-1 thermal switch 140°C N.C., class F insulation, tropicalized winding
MOTOR DATA	
Caution	Ensure that the power conductors, and power source are sized according to the max. current Imax [A].
Motor designation	SWX0063-4-0,02
Nominal power (HP)	1/16
Nominal power (kW)	0.02
Nominal speed (RPM)	1,680
Nominal current In [A]	1.7
Max. current Imax [A]	1.8

Starting current Ia [A]	4.9
COS	0.84
Capacitor uF	35

ACTUATOR FEATURES

SQ model	SQEx 10.2
Valve coupling	Unbored extended valve shaft coupling
Swing angle	Setting range 75 - 105 degrees
Set to degrees	92
Operation time	50 seconds for 90°
Valve attachment	FA12, US flange with female pilot
Coupling type	(ST-L30) steel, extended by 30mm
Mechanical position indicator	(11) with symbols OPEN and CLOSED, continuous
Torque switches	(6) single switches Ag (1 NC/1 NO) for each direction
Limit switches	(9.4) DUO-tandem intermediate switches Ag (2 NC/2 NO), tandem switches Ag (2 NC/2 NO) for each direction (4 gear train 16 contacts)
Position transm.	(0) Without
Reduction gearing	(10.1) Gearing with fixed reduction ratio
Reduction ratio	13.5:1
Heater	(22.1) 110 V-250 V AC/DC self regulating PTC element: 5-20 W
Motor heater	(0) without
Torque switching	Setting range 150-450 lbs.ft.
Set to close lbs.ft.	450
Set to open lbs.ft.	450
Handwheel	7.9" (200mm)
Close direction	RH - clockwise
Limit switching	(330) SQ with DUO limit switching
Lubricant	F15 Shell ALVANIA 1029
Special version TPA	(000) without
Electrical connection	(S0-000) actuator plug for mounting AM/SEM/AC

ACTUATOR CONTROLS

Enclosure	AMExC 01.1
Mounting position	Position A
Controls	(41.00) Standard interface board
Type of signal	(46.14) 110 - 125 V AC internal, or external supply •
Input signals	(42.02) OPEN - STOP - CLOSE •
Power supply unit	(49.2100P) Transformer, customer output: 115 V AC
Motor controls	(B00.01) Reversing contactors for power class A1
Motor protection	(54.01) Thermal switch
Selector switch	(51.02) 3 positions, 2 levels
LOCAL operation	Push buttons OPEN, STOP, CLOSE
Indication lights	OPEN-red, FAULT-yellow, CLOSE-green •
Control elements	(52.19) Push buttons OPEN-STOP-CLOSE; 3 indicating lights; OPEN: Red, FAULT: Yellow, CLOSE: Green
Mounting pos. local controls	Position A, selector switch at 6 o'clock in relation to base of controls (standard for SA/SQ)
Face plate	English-Spanish-French text: Open-Stop-Close/ Local-Off-Remote •
Output signals	(44.03) OPEN-CLOSE/LOCAL-REMOTE
Version logic	Lights illuminated in mid travel

Seating CLOSED	Limit switch
Seating OPEN	Limit switch
Fault signal	Torque included in collective fault signal (S2 '6'=ON)
Self locking LOCAL	With
Self locking REMOTE	Without
Heater	(53.21) Control unit heater internally supplied, without blinker
2nd digit	(A) Torque switch by-pass for both directions with plug/socket
Electrical connection	(SE-59-FM) 135mm plug/socket connector, 2 x 1" NPT; 1 x 1 ¼" NPT •

OPTIONAL EXTRAS

Padlock on selector switch	Yes

DRAWINGS

POINT-TO-POINT WIRING DWG	MSPEAD0KC5--F2JE1TPA01R1AH-001-A30
OUTPUT DRIVE/MOUNTING FLANGE DWG	SK099594
ACTUATOR DIMENSIONAL DWG	DDX00000433ADC011

Unavailable drawings will be generated upon receipt of order

OPERATION MANUALS

WIRING DIAGRAM LEGEND	Legend for AUMA MATIC AM(ExC) 01.1/AM 02.1
ACTUATOR OPERATION MANUAL	SQEx 05.2 - SQEx 14.2/SQREx 05.2 - SQREx 14.2 with actuator controls AUMA MATIC AMExC 01.1
SUPPLEMENT_ELECTRIC_INSTALL	Electrical installation guide

MIXING SELECTION REPORT

Quote Number: 3556-241204-001 (Rev. 0)
Project:
Position:

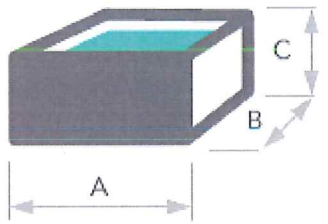
Attention! Consult with Application Engineer if CFD should be used to secure and optimize system functionality. Please ask your Sales Representative to raise a CFD request in Sales Force.

INPUT DATA

Wastewater Treatment > Biological Treatment Mixing	
Biological Treatment	Anox/Ox - Aeration turned off
Type of pre-treatment	Screen <= ½ inch, no primary sedimentation
Outlet location in tank	Bottom
Recommended average velocity	0.85 ft/s
Accept recommended avg. velocity	Yes
Type of diffuser	9" Sanitaire (Fine)
Diffusers per aerated area	0.14 #/ft²
Covered bottom area fraction	100 %
Covered bottom area	4289.5 ft²
Total number of diffusers	616
Number of aerated zones	1

TANK DIMENSIONS

Rectangular	
[A] Length	93.25 ft
[B] Width	46 ft
[C] Depth	12.69 ft



PRODUCT DATA

Mixer type	4660 with Jetring
Number of mixers	1
Thrust produced/mixer	2427 N
Total thrust produced	2427 N
Total thrust required	1901 N
Power uptake / mixer	9.27 kW (13 % margin to input power)
Total power uptake	9.27 kW
Propeller diameter	22.83 in
Propeller speed	575 RPM
Number of blades	3
Rec. min Submergence	4.27ft
Hub design	Shielded
Propeller material	Stainless steel
Propeller code	125809SJ

MOTOR DATA

Rated Shaft Power	11 Hp
Mains frequency	60 Hz
Number Of Phases	3
Rated voltage	460 V Y
Number Of Poles	12
Max Input Power	10.6 kW
Approval	STD
Rated Temperature	40 °C / 104 °F

ISO 21630 VALUES

Nominal thrust	2420 N
ISO Input Power	8.66 kW
Efficiency	279 N/kW

Mixer performance data are based on the configuration 400 V Y for 50 Hz and 460 V Y for 60 Hz, for other configurations the data may be different. For mixer performance tolerances, refer to the mixer data chart. Xylem guarantees that the proposed mixer selection will perform the specified duty when all mixers are operating positioned according to Xylem's recommendation. The selection is a function of the input data and the supplier of the data is fully responsible for its correctness.

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Covered bottom area	4289.5 ft²
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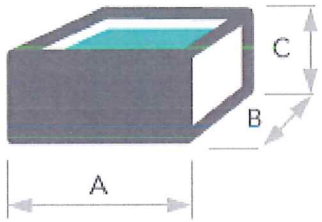
TANK DIMENSIONS

Rectangular	
[A] Length	93.25 ft
[B] Width	46 ft
[C] Depth	18 ft



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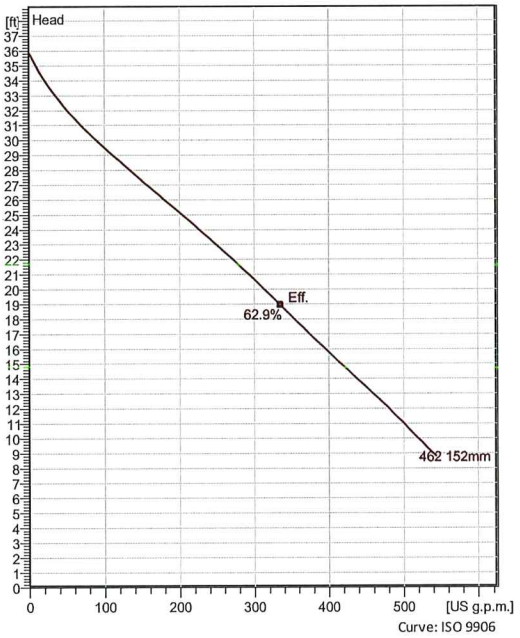
NP 3085 MT 3~ Adaptive 462

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

FLYGT
a xylem brand

Technical specification

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Configuration

Motor number
N3085.070 15-10-4AL-W 3hp

Installation type
P - Semi permanent, Wet

Impeller diameter
152 mm

Discharge diameter
3 inch

Pump information

Impeller diameter
152 mm

Discharge diameter
3 inch

Inlet diameter
100 mm

Maximum operating speed
1700 rpm

Number of blades
2

Max. fluid temperature
40 °C

Material

Impeller
Hard-Iron ™

Stator housing material
Grey cast iron

Project	Xylect-20304344	**Created by**	Daphne Odishoo		
Block		**Created on**	12/6/2024	**Last update**	12/6/2024

NP 3085 MT 3~ Adaptive 462

Technical specification

FLYGT
a xylem brand

Motor - General

Motor number	Phases	Rated speed	Rated power
N3085.070 15-10-4AL-W 3hp	3~	1700 rpm	3 hp
ATEX approved	**Number of poles**	**Rated current**	**Stator variant**
FM	4	4.3 A	12
Frequency	**Rated voltage**	**Insulation class**	**Type of Duty**
60 Hz	460 V	H	S1
Version code			
070			

Motor - Technical

Power factor - 1/1 Load	Motor efficiency - 1/1 Load	Total moment of inertia	Starts per hour max.
0.83	78.1 %	0.475 lb ft²	30
Power factor - 3/4 Load	**Motor efficiency - 3/4 Load**	**Starting current, direct starting**	
0.77	79.1 %	22 A	
Power factor - 1/2 Load	**Motor efficiency - 1/2 Load**	**Starting current, star-delta**	
0.66	77.4 %	7.34 A	

Project	Xylect-20304344	**Created by**	Daphne Odishoo		
Block		**Created on**	12/6/2024	**Last update**	12/6/2024

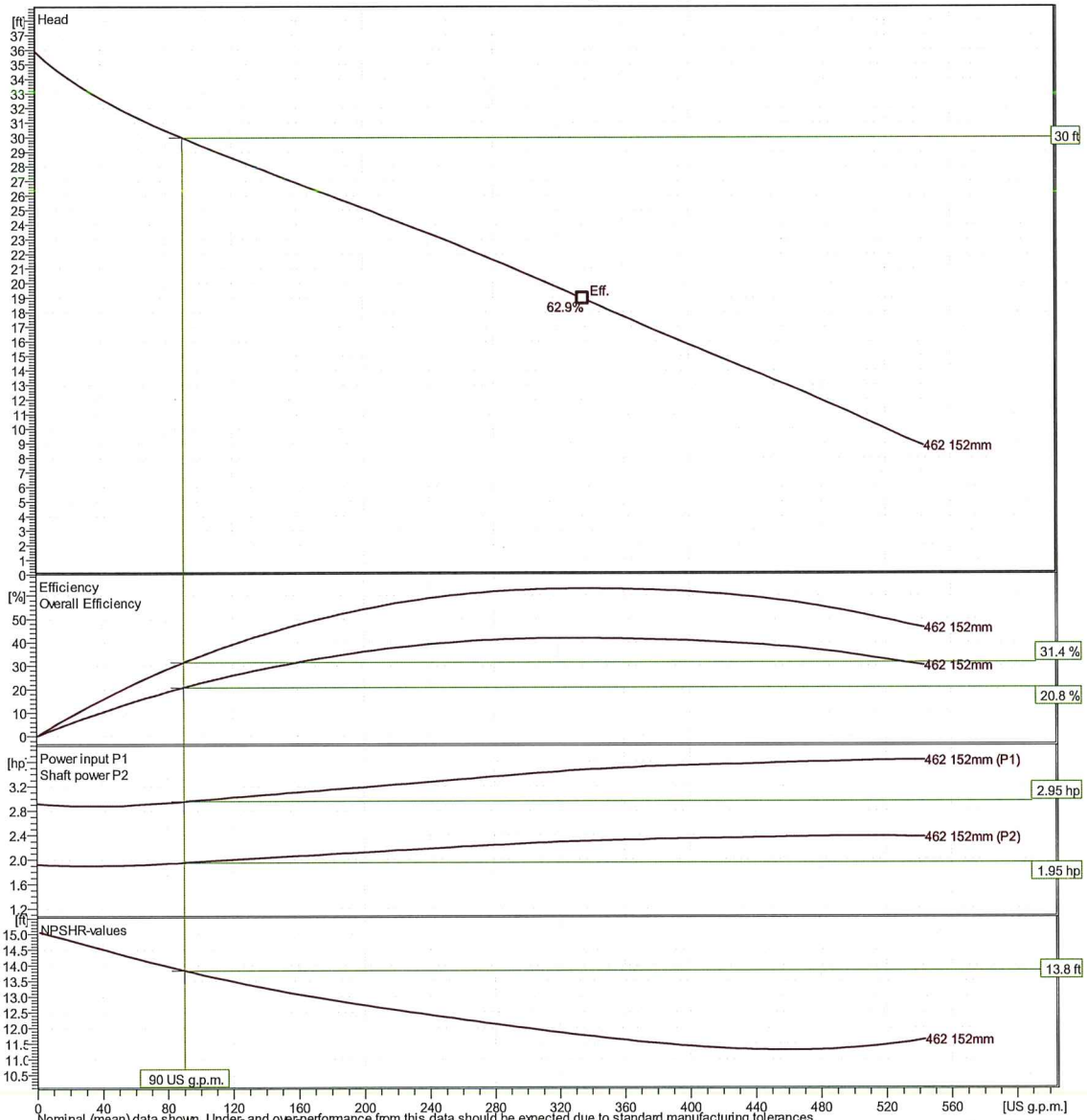
NP 3085 MT 3~ Adaptive 462

Performance curve

Duty point

Flow	Head
90 US g.p.m.	30 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Curve: ISO 9906

Xylect-20304344

Daphne Odishoo

Created on 12/6/2024 **Last update** 12/6/2024

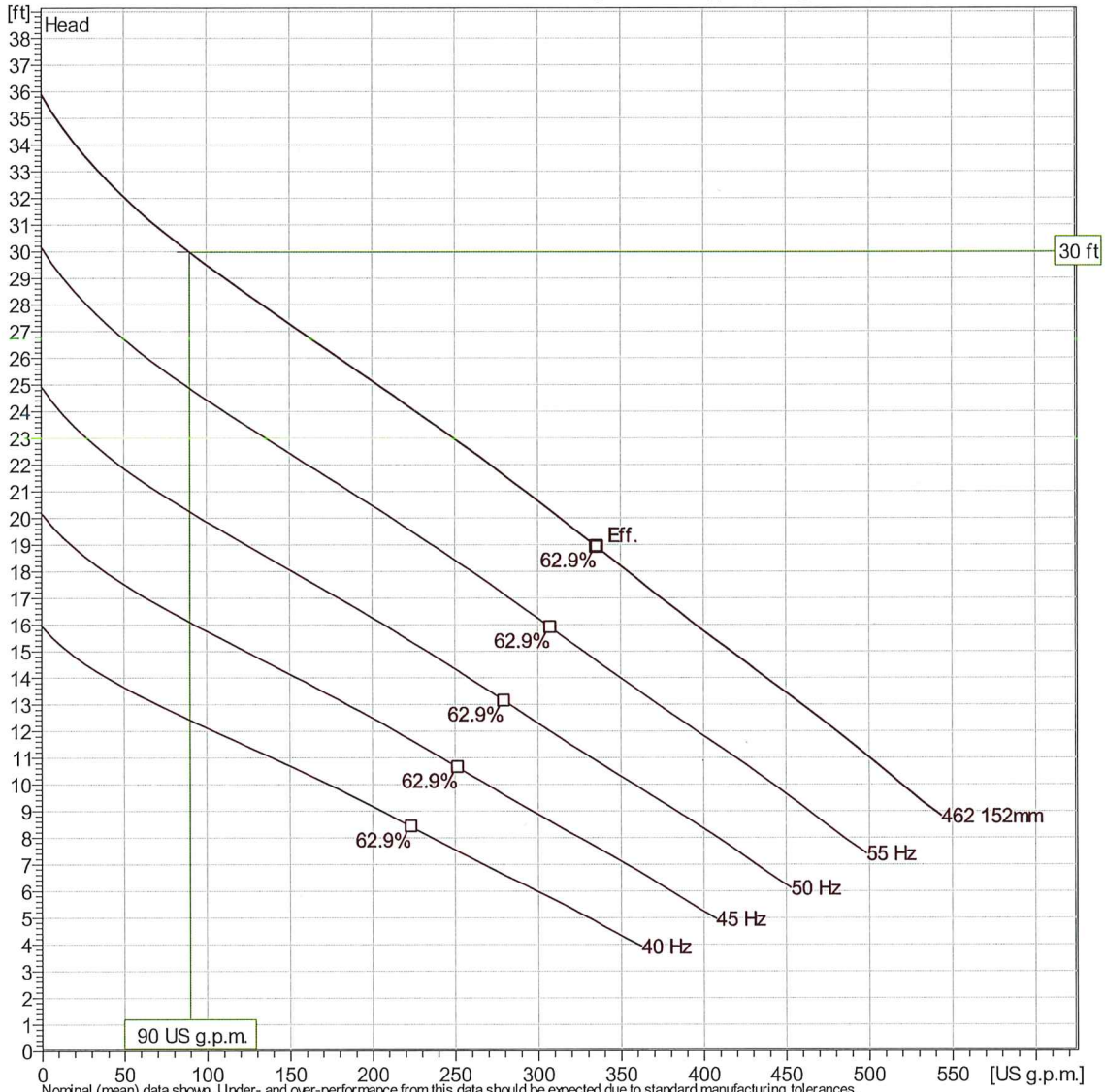
Program version	Data version	User group(s)
75.0 - 11.6.2024 (Build 274)	12/2.2024 16:17 A12P12	Xylem:USA- INT

NP 3085 MT 3~ Adaptive 462

Duty Analysis

FLYGT
a xylem brand

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	90	30	1.95	90	30	1.95	31.4 %	408	13.8

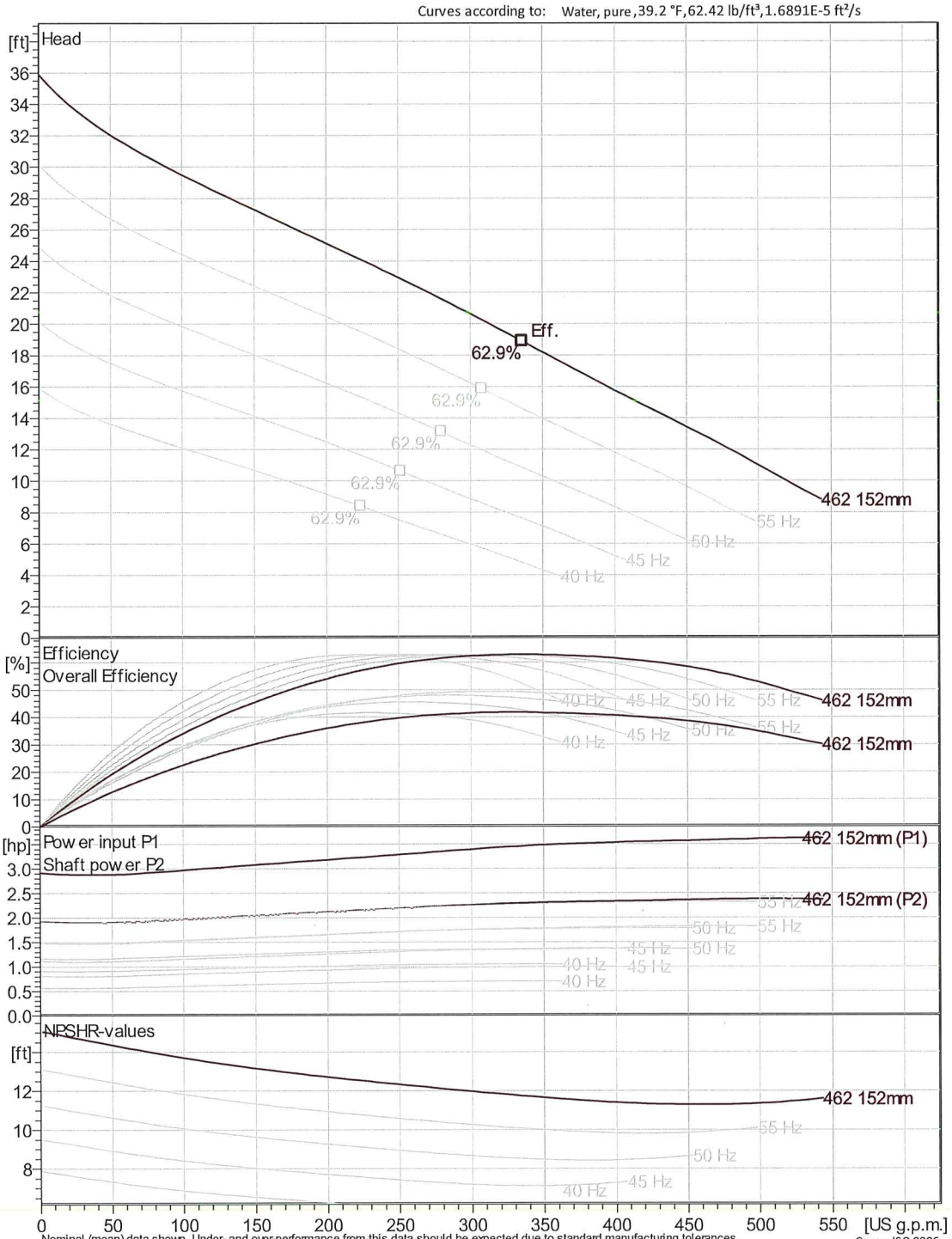
Project		**Created by**	Daphne Odishoo		
Block	Xylect-20304344	**Created on**	12/6/2024	**Last update**	12/6/2024

NP 3085 MT 3~ Adaptive 462

VFD Curve

FLYGT
a xylem brand

Curves according to: Water, pure, 39.2 °F, 62.42 lb/ft³, 1.6891E-5 ft²/s



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Please consult your local Flygt representative for performance guarantees.

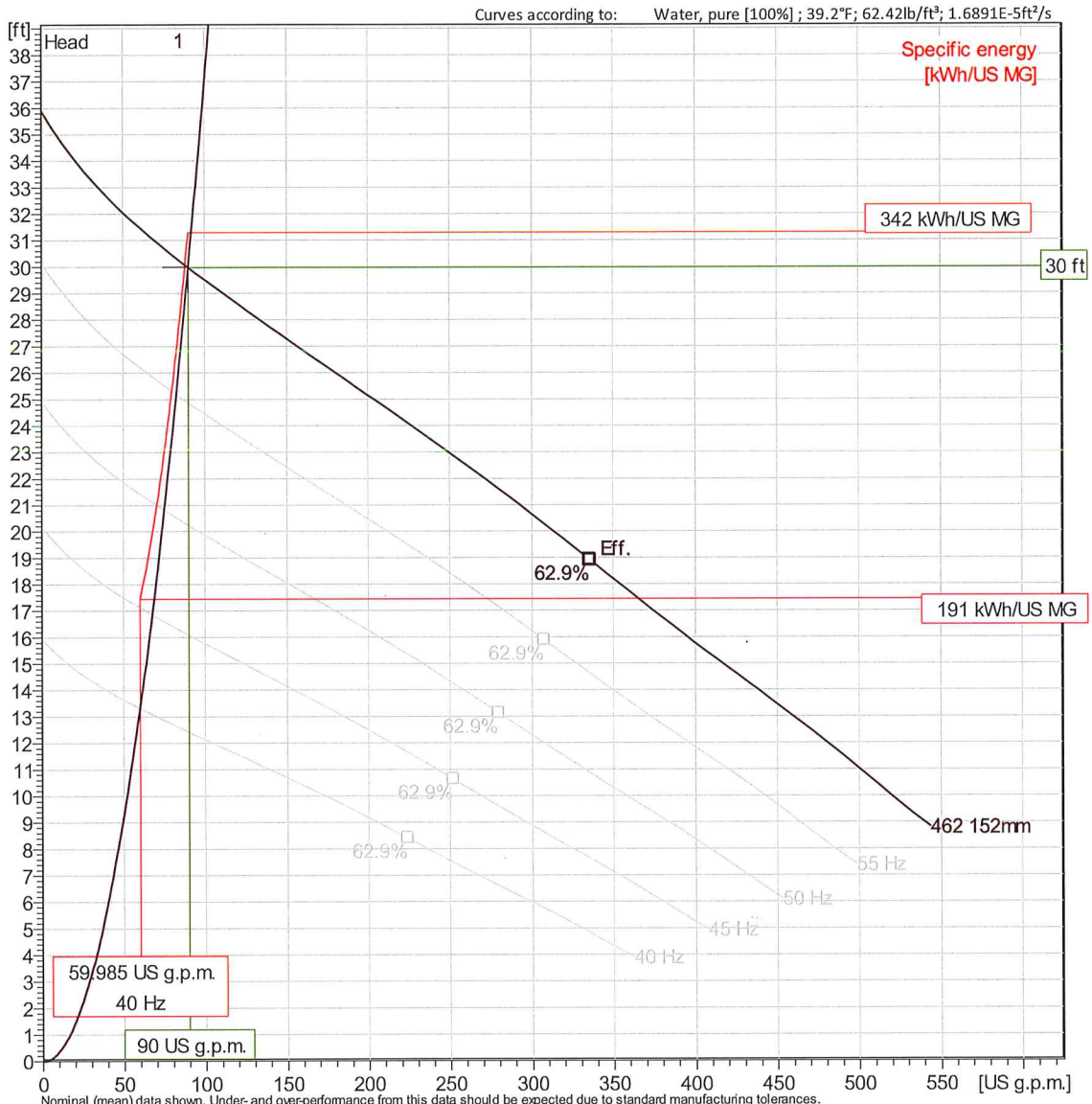
Curve: ISO 9906

Project	Xylect-20304344	**Created by**	Daphne Odishoo		
Block		**Created on**	12/6/2024	**Last update**	12/6/2024

NP 3085 MT 3~ Adaptive 462

VFD Analysis

FLYGT
a xylem brand



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Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	90	30	1.95	90	30	1.95	31.4 %	408	13.8
1	55 Hz	82.5	25.2	1.51	82.5	25.2	1.51	31.4 %	293	12
1	50 Hz	75	20.8	1.13	75	20.8	1.13	31.4 %	252	10.3
1	45 Hz	67.5	16.9	0.825	67.5	16.9	0.825	31.4 %	218	8.73

Project	Xylect-20304344	**Created by**	Daphne Odishoo		
Block		**Created on**	12/6/2024	**Last update**	12/6/2024

NP 3085 MT 3~ Adaptive 462

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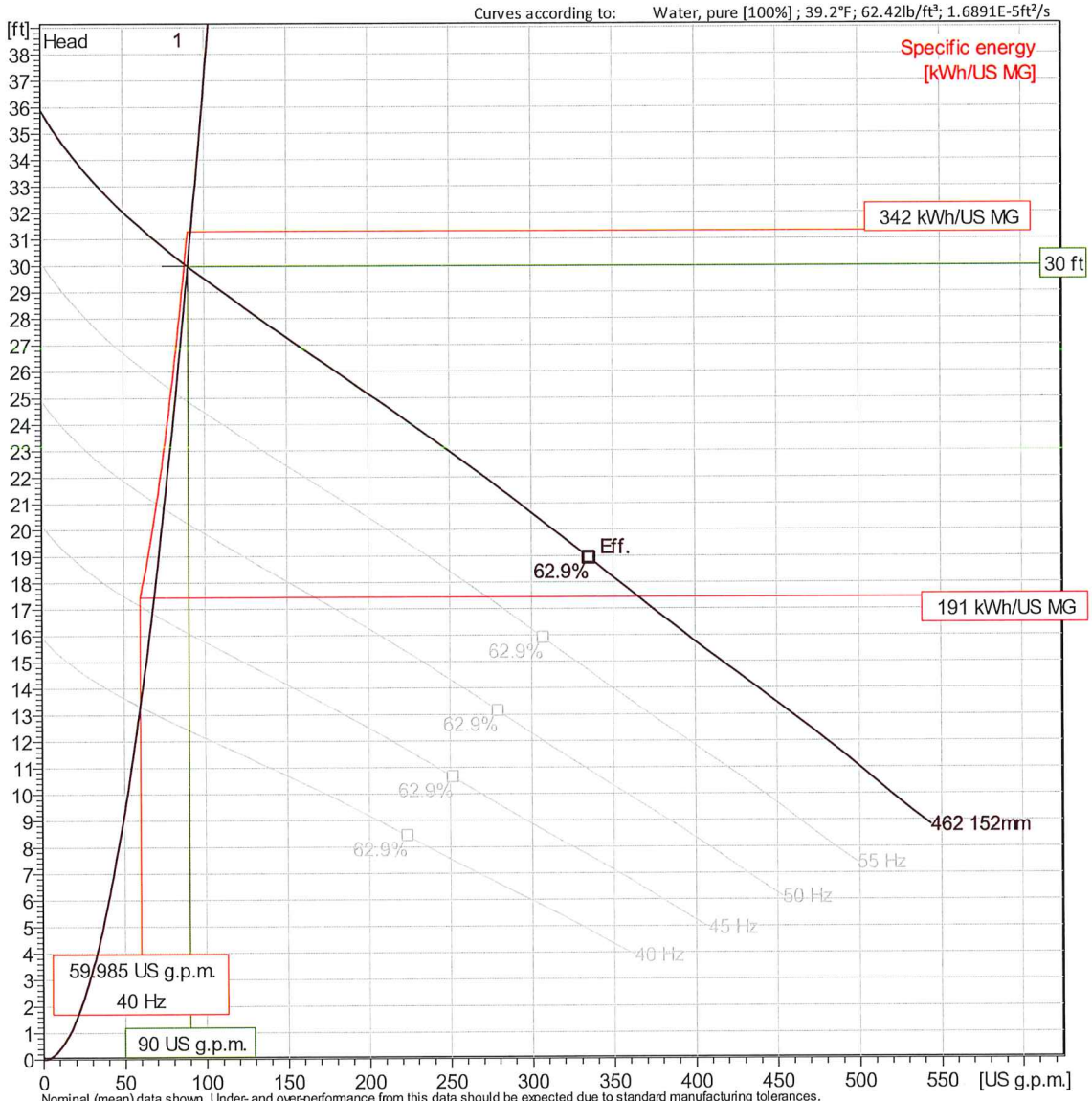

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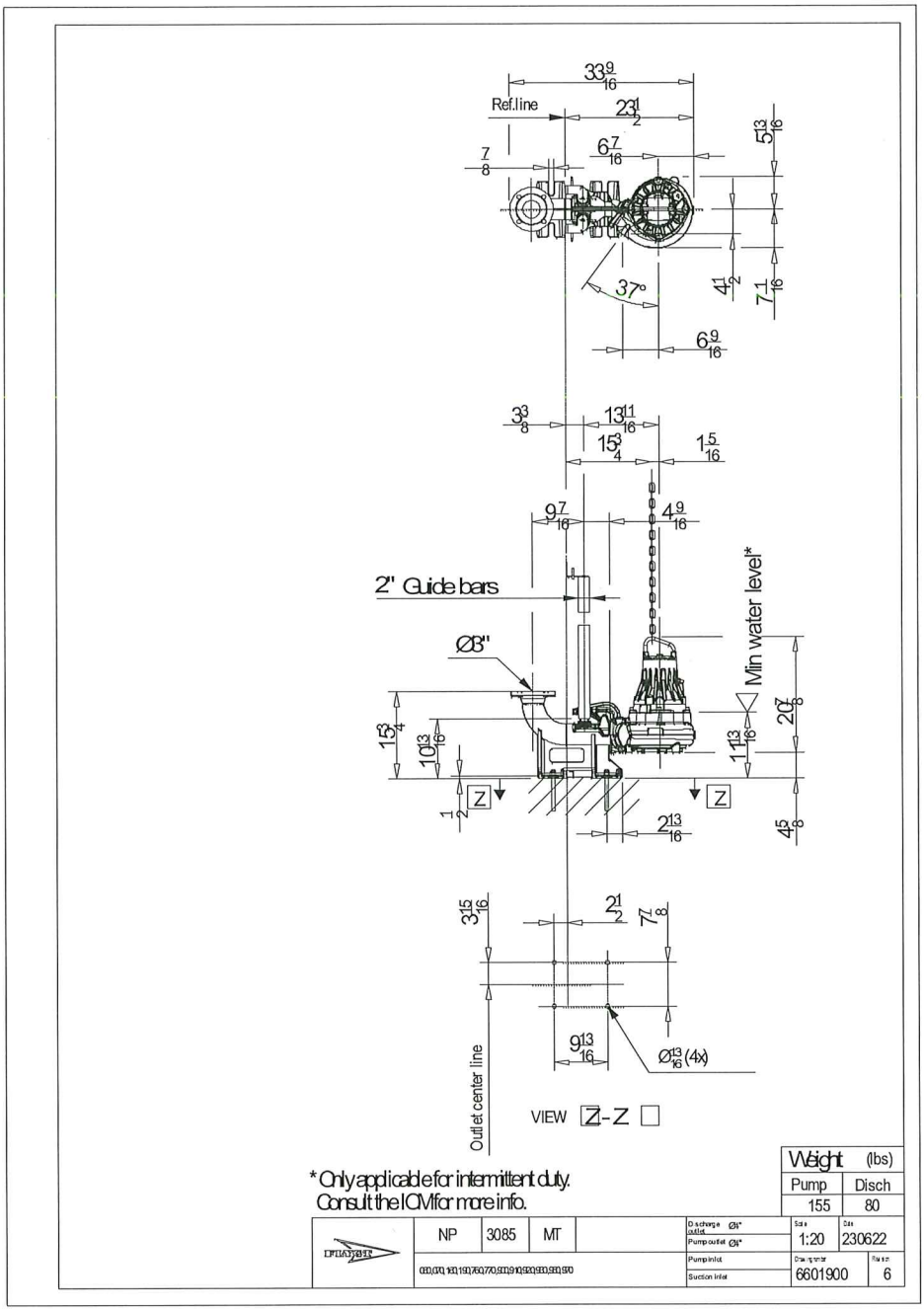
Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	40 Hz	60	13.3	0.579	60	13.3	0.579	31.4 %	191	7.23

Project	Xylect-20304344	**Created by**	Daphne Odishoo		
Block		**Created on**	12/6/2024	**Last update**	12/6/2024

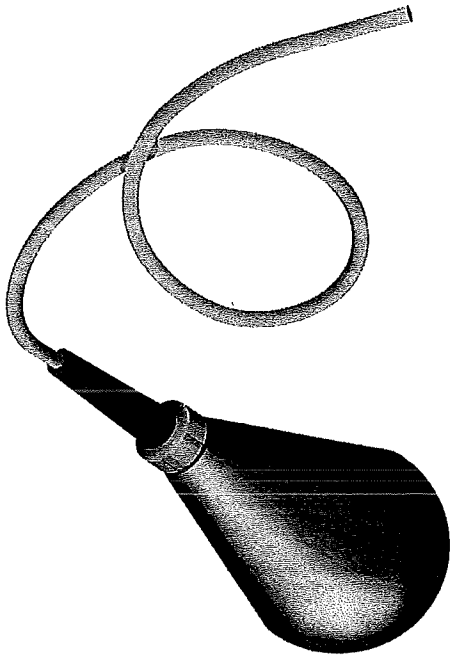
NP 3085 MT 3~ Adaptive 462

Dimensional drawing



Project	Xylect-20304344	**Created by**	Daphne Odishoo
Block		**Created on**	12/6/2024 **Last update** 12/6/2024

Technical
specification



ENM-10 Level regulator

FLYGT
a xylem brand

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Product range....9

PRODUCT DESCRIPTION

Product description

The simplest possible method for level control! A mechanical switch in a plastic casing, freely suspended at the desired height from its own cable. When the liquid level reaches the regulator, the casing will tilt and the mechanical switch will close or break the circuit, thereby starting or stopping a pump or actuating an alarm device. No wear, no maintenance! In sewage pumping stations, for ground water and drainage pumping – in fact, for most level control applications – the ENM-10 is the ideal solution.

The regulator casing is made of polypropylene and the cable is sheathed with a special PVC or Nitrile/PVC rubber compound. The plastic components are welded and screwed together. Adhesive is never used. Impurities and deposits will not adhere to the smooth casing.

This level regulator is available in different versions, depending upon the medium in which it is to be used. As standard, the regulator can be obtained with 6, 13, 20, 30 or 50 metres (20, 42, 65, 100 or 167 feet) of cable for liquids with specific density between 0.95 and 1.10 g/cm3; for other specific densities and for the Ex-version, the regulator is only available with 20 metres (65 ft) of cable. The regulator can withstand up to 60°C (140°F).

Technical data

Liquid temperature:	min. 0°C (32°F) max. 60°C (140°F)
Liquid density:	min. 0.65 g/cm^3 max. 1.5 g/cm^3
Degree of protection:	IP68, 20 m (65 ft)
Interrupting capacity of micro switch:	AC, resistive load, 250V 10A AC, inductive load, 250V 3A cos ϕ = 0.5 DC, 30V 5A
With gold plated micro switch:	same as above, except: DC, 24V 10mA

Note that local regulations may limit the voltage.

Materials

Body:	Polypropylene
Bending relief:	EPDM rubber
Cable:	special compound PVC or NBR/PVC nitrile/PVC rubber

Dimensions

Table 1

For density g/cm^3	Regulator length mm (in.)	Diameter mm (in.)
0.65–0.80	194 (7 10/16)	100 (4)
0.80–0.95	177 (7)	100 (4)
0.95–1.10	162 (6 3/8)	100 (4)
1.05–1.20	142 (5 9/16)	100 (4)
1.20–1.30	133 (5 1/4)	100 (4)

For density g/cm³	Regulator length mm (in.)	Diameter mm (in.)
1.30–1.40	130 (5 2/16)	100 (4)
1.40–1.50	126 (5)	100 (4)

Weight: approx. 2 kg (4.5 lb) for a standard density regulator with 20 m cable.

Approvals

CE, CSA, SEMKO, NEMKO, DEMKO, EX

LVD approval according to EN61058

CSA approval: Cert no. 1330172

Cl.I Zone 0, Gr. IIC;

CL.I Div.1 Gr A, B, C&D

Cl.II Gr. E, F&G

Cl.III when installed to the certified Intrinsically Safe relay, Ex ia, rated for the locations per submitter control drawing and installation manual.: CE, CSA, SEMKO, NEMKO, DEMKO

Ex approval

IECEx ia IIC T4 Ga: -20°C < Ta < 60°C

IECEx NEMKO 09.008

ATEX II 1G ia IIC T4

NEMKO 10ATEX 1082

The applied standards are:

EN 60079-0:2009/IEC 60079-0:2007

EN 60079-11:2007/IEC 60079-0:2006

EN 60079-26:2007/IEC 60079-26:2006

Intrinsically safe circuits are required for the automatic control system. - Use a EX-safety barrier (e.g. Prod. no. 84 01 07).

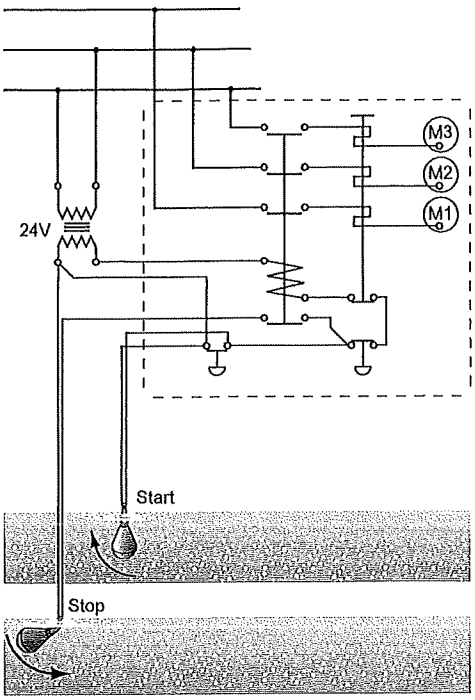
Figure 1

Wiring alternative

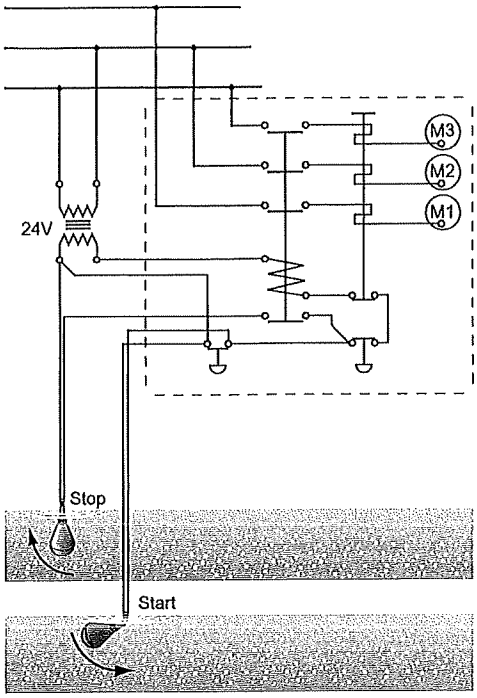
To conform to local regulations, the level regulators are normally connected through a transformer to a low-tension control circuit.

Two regulators are used; one for starting and one for stopping. A third regulator can be connected if an alarm is required at a given level.

Identical regulators can be used for all functions.



Connect the gray and black leads.



Connect the gray and brown leads.

Insulate the brown lead.
Figure 2: Connected for emptying

Insulate the black lead.
Figure 3: Connected for emptying

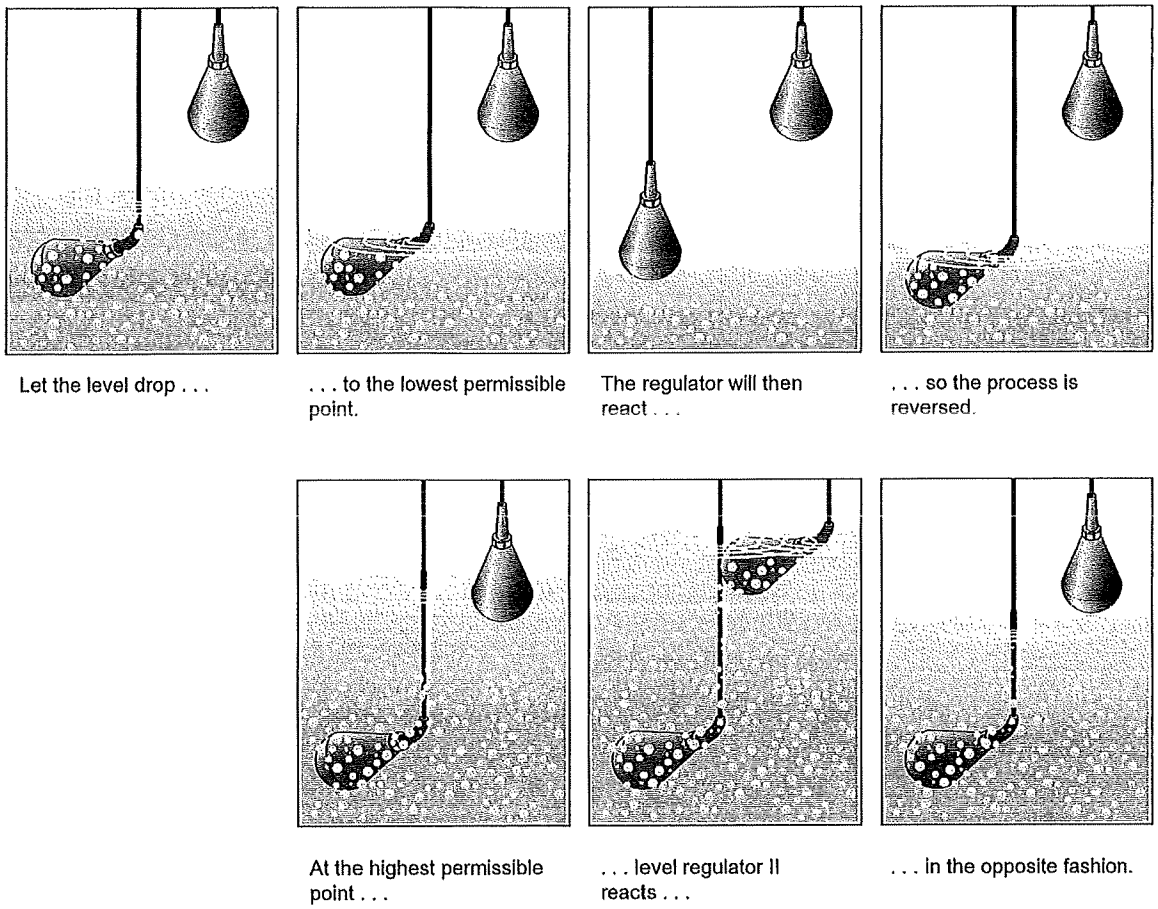


Figure 4

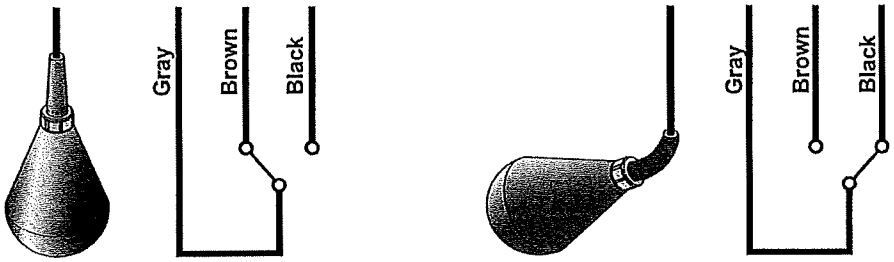


Figure 5: Colour code

Maintenance and repair

ENM-10 is very durable and practically maintenance free. You only have to check on it occasionally, to ensure its continual operation.

- It is recommended to occasionally clean ENM-10, and especially when fat/grease covers the plastic surface.
- At the same time, make an occular inspection of the regulator to make sure neither cable, protective sleeve or plastic casing show any signs of damage.

- A damaged ENM-10 cannot be repaired in any way, due to the hermetic encapsulation. If the unit is found to be damaged, replace it with a new one.
- For Ex-installations, also make absolutely sure that the Ex-barrier (e.g. Prod. no. 84 01 07) is operating correctly - The LED changes when the switch is toggled.

The manufacturers reserve the right to alter performance specification or design without notice.

CHEMICAL RESISTANCE LIST

Chemical resistance list

The liquid in which level regulation is practiced most frequently is, of course, water. Of the millions of regulators in use all over the world today, it is estimated that nine out of ten work in water.

However, with a float body of polypropylene, a cable of PVC or NBR/PVC nitrile/PVC rubber and a bending relief of EPDM rubber, the ENM-10 is virtually insensitive to many aggressive liquids.

The table shows how resistant the ENM-10 equipped with either PVC or NBR/PVC nitrile/PVC rubber cable, is to different chemicals at two different temperatures.

The classification is broken down into the following categories:

0 = No effect, 1 = Minor to moderate and 2 = Severe effect. The sign – means that information is not available.

Keep in mind also that the density of the liquid determines the bouyancy of the regulator. The ENM-10 is made for seven different densities. See *Product description* (page 2).

Always observe local regulations:

Take particular note of:

- risk of fire/explosion
- hygiene requirements

Acids	PVC cable		NBR/PVC nitrile/PVC rubber cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Acetic Acid 50%	1	2	0	0
Acetic Acid 75%	2	2	0	0
Benzoic Acid	2	2	0	0
Boric Acid 5%	0	—	0	0
Butyric Acid	2	2	2	2
Chromic Acid 10%	0	2	2	2
Citric Acid	0	1	0	0
Hydrobromic Acid 5%	1	2	0	0
Hydrochloric Acid 10%	0	1	0	1
Hydrochloric Acid 37%	1	2	0	2
Hydrocyanic Acid 10%	0	0	1	2
Hydrofluoric Acid 5%	0	2	0	1
Hypochloric Acid	1	2	2	2
Maleic Acid	2	2	2	2
Nitric Acid 5%	1	1	1	1
Nitric Acid 65%	2	2	2	2
Oleic Acid	1	2	2	2
Oxalic Acid 50%	1	1	1	2
Phosphoric Acid 25%	0	0	1	2
Phosphoric Acid 85%	0	0	1	2
Sulphuric Acid 10%	1	2	1	2
Sulphuric Acid 78%	2	2	2	2
Tannic Acid	0	0	0	0
Tartaric Acid	1	1	1	1
Bases				
Ammonium Hydroxide	0	—	0	0
Calcium Hydroxide	0	0	0	0
Potassium Hydroxide	1	2	0	0
Sodium Hydroxide	1	2	0	0

Salts	PVC cable		NBR/PVC nitrile/PVC rubber cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Aluminium Chloride	0	0	0	0
Calcium Sulphate	0	0	0	0
Calcium Chloride	0	0	0	0
Calcium Nitrate	0	0	0	0
Copper Chloride	0	0	0	0
Copper Sulphate	0	0	0	0
Ferric Chloride	0	0	0	0
Ferrous Sulphate	0	0	0	0
Magnesium Chloride	0	0	0	0
Potassium Sulphate	0	0	0	0
Potassium Nitrate	0	0	0	0
Potassium Carbonate	1	1	1	1
Potassium Bicarbonate	0	0	0	0
Sodium Sulphate	0	0	0	0
Sodium Chloride	0	0	0	0
Sodium Nitrate	0	0	0	0
Sodium Bicarbonate	0	0	0	0
Sodium Carbonate	0	0	0	0
Tin Chloride	1	1	1	1
Zinc Sulphate	0	0	0	0
Zinc Chloride	0	0	0	0
Oils				
Castor Oil	1	1	1	1
Cocoanut Oil	0	—	0	2
Corn Oil	2	2	2	2
Diesel Oil	2	2	2	2
Linseed Oil	2	2	2	2
Mineral Oils	2	2	2	2
Olive Oil	1	1	1	1
Silicone Oils	0	0	0	0

Solvents and miscellaneous	PVC cable		NBR/PVC nitrile/PVC rubber cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Aceton	2	2	2	2
Aniline	2	2	1	2
Benzene	2	2	2	2
Butyl Alcohol	2	2	0	1
Carbon Tetrachloride	2	2	2	2
Chlorobenzene	2	2	2	2
Chloroform	2	2	2	2
Ethyl Alcohol	2	2	0	1
Ethyl Ether	2	2	2	2
Ethyl Acetate	2	2	2	2
Ethylene Dichloride	2	2	2	2
Ethylene Chloride	2	2	2	2
Formaldehyde 37%	1	2	0	0
Gasoline	2	2	2	2
Kerosene	2	2	2	2
Methyl Alcohol	2	2	0	0
Methyl Ethyl Ketone	2	2	2	2
Methylene Chloride	2	2	2	2
Nitrobenzene	2	2	2	2
Phenol	2	2	2	2
Toluene	2	2	2	2
Trichlorethylene	2	2	2	2
Turpentine	2	2	2	2
Xylene	2	2	2	2
Gases				
Carbon Dioxide	0	0	0	0
Carbon Monoxide	0	0	0	0
Chlorine (wet)	2	2	2	2
Hydrogen Sulphide	0	0	1	1
Sulphur Dioxide (wet)	1	1	2	2

0 = No effect, 1 = Minor to moderate, 2 = Severe effect. – = No information available.

Figure 6

PRODUCT RANGE

Product range

Table 2

Version	For density (g/cm^3)	Color of level switch	Length of cable (m)	Type of cable	Approvals	For market	Notes
582 88 00	0.65 - 0.80	Blue	20	1	CE		
582 88 01	0.80 - 0.95	Blue	20	1	CE		
582 88 02	0.95 - 1.10	Blue	6	1	CE		
582 88 03	0.95 - 1.10	Blue	13	1	CE		
582 88 04	0.95 - 1.10	Blue	20	1	CE		
582 88 05	1.05 - 1.20	Blue	20	1	CE		
582 88 06	1.20 - 1.30	Blue	20	1	CE		
582 88 07	1.30 - 1.40	Blue	20	1	CE		
582 88 08	1.40 - 1.50	Blue	20	1	CE		
582 88 09	0.65 - 0.80	Grey	20	5	CSA/CE	Canada	
582 88 10	0.80 - 0.95	Grey	20	5	CSA/CE	Canada	
582 88 11	0.95 - 1.10	Grey	6	5	CSA/CE	Canada	
582 88 12	0.95 - 1.10	Grey	13	5	CSA/CE	Canada	
582 88 13	0.95 - 1.10	Grey	20	5	CSA/CE	Canada	
582 88 14	1.05 - 1.20	Grey	20	5	CSA/CE	Canada	
582 88 15	1.20 - 1.30	Grey	20	5	CSA/CE	Canada	
582 88 16	1.30 - 1.40	Grey	20	5	CSA/CE	Canada	
582 88 17	1.40 - 1.50	Grey	20	5	CSA/CE	Canada	
582 88 18	0.65 - 0.80	Grey	20	1	CSA/CE	Canada	
582 88 19	0.80 - 0.95	Grey	20	1	CSA/CE	Canada	
582 88 20	0.95 - 1.10	Grey	6	1	CSA/CE	Canada	
582 88 21	0.95 - 1.10	Grey	13	1	CSA/CE	Canada	
582 88 22	0.95 - 1.10	Grey	20	1	CSA/CE	Canada	
582 88 23	1.05 - 1.20	Grey	20	1	CSA/CE	Canada	
582 88 24	1.20 - 1.30	Grey	20	1	CSA/CE	Canada	
582 88 25	1.30 - 1.40	Grey	20	1	CSA/CE	Canada	
582 88 26	1.40 - 1.50	Grey	20	1	CSA/CE	Canada	
582 88 27	0.65 - 0.80	Blue	20	2	CE	USA	
582 88 28	0.80 - 0.95	Blue	20	2	CE	USA	
582 88 29	0.95 - 1.10	Blue	6	2	CE	USA	
582 88 30	0.95 - 1.10	Blue	13	2	CE	USA	
582 88 31	0.95 - 1.10	Blue	20	2	CE	USA	
582 88 32	1.05 - 1.20	Blue	20	2	CE	USA	
582 88 33	1.20 - 1.30	Blue	20	2	CE	USA	

Version	For density (g/cm^3)	Color of level switch	Length of cable (m)	Type of cable	Approvals	For market	Notes
582 88 34	1.30 - 1.40	Blue	20	2	CE	USA	
582 88 35	1.40 - 1.50	Blue	20	2	CE	USA	
582 88 36	0.95 - 1.10	Grey	30	5	CSA/CE	Canada	
582 88 37	0.95 - 1.10	Grey	50	5	CSA/CE	Canada	
582 88 38	0.95 - 1.10	Grey	100	5	CSA/CE	Canada	
582 88 39	0.95 - 1.10	Grey	150	5	CSA/CE	Canada	
582 88 51	0.95 - 1.10	Red	65	3	CE		
582 88 52	0.95 - 1.10	Red	6	3	CE		
582 88 53	0.95 - 1.10	Red	13	3	CE		
582 88 54	0.95 - 1.10	Red	20	3	CE		
582 88 55	0.95 - 1.10	Red	6	3	CSA/CE	Canada	
582 88 56	0.95 - 1.10	Red	13	3	CSA/CE	Canada	
582 88 57	0.95 - 1.10	Red	20	3	CSA/CE	Canada	
582 88 58	0.95 - 1.10	Red	6	4	CE	USA	
582 88 59	0.95 - 1.10	Red	13	4	CE	USA	
582 88 60	0.95 - 1.10	Red	20	4	CE	USA	
582 88 70	0.65 - 0.80	Blue	20	5	CE		
582 88 71	0.80 - 0.95	Blue	20	5	CE		
582 88 72	0.95 - 1.10	Blue	6	5	CE		
582 88 73	0.95 - 1.10	Blue	13	5	CE		
582 88 74	0.95 - 1.10	Blue	20	5	CE		
582 88 75	1.05 - 1.20	Blue	20	5	CE		
582 88 76	1.20 - 1.30	Blue	20	5	CE		
582 88 77	1.30 - 1.40	Blue	20	5	CE		
582 88 78	1.40 - 1.50	Blue	20	5	CE		
582 88 79	0.95 - 1.10	Blue	65	1	CE		
582 88 80	0.95 - 1.10	Blue	30	1	CE		
582 88 81	0.95 - 1.10	Blue	50	1	CE		
582 88 82	0.95 - 1.10	Grey	30	1	CSA/CE	Canada	
582 88 83	0.95 - 1.10	Grey	50	1	CSA/CE	Canada	
582 88 84	0.95 - 1.10	Blue	30	2	CE	USA	
582 88 85	0.95 - 1.10	Blue	50	2	CE	USA	
582 88 86	0.95 - 1.10	Red	30	3	CE		
582 88 87	0.95 - 1.10	Red	50	3	CE		
582 88 90	0.95 - 1.10	Blue	30	5	CE		
582 88 91	0.95 - 1.10	Blue	50	5	CE		
582 88 92	0.95 - 1.10	Red	6	3	CE	Japan	
582 88 93	0.95 - 1.10	Red	13	3	CE	Japan	
582 88 94	0.95 - 1.10	Red	20	3	CE	Japan	

Version	For density (g/cm^3)	Color of level switch	Length of cable (m)	Type of cable	Approvals	For market	Notes
582 88 95	0.95 - 1.10	Blue	6	1	CE	Japan	
582 88 96	0.95 - 1.10	Blue	13	1	CE	Japan	
582 88 97	0.95 - 1.10	Blue	20	1	CE	Japan	
582 88 98	0.95 - 1.10	Blue	50	1	CE	Japan	
594 79 10	0.95 - 1.10	Blue	70	5	CE		
594 79 13	0.95 - 1.10	Blue	100	5	CE		
594 79 18	0.95 - 1.10	Blue	150	5	CE		
594 79 19	0.95 - 1.10	Blue	20	5	CE		*
594 79 20	0.95 - 1.10	Grey	20	5	CSA/CE		*
594 79 40	0.95 - 1.10	Black	6	5	ATEX/ IECEx		* Zener barrier 84 01 07 required
594 79 41	0.95 - 1.10	Black	13	5	ATEX/ IECEx		* Zener barrier 84 01 07 required
594 79 42	0.95 - 1.10	Black	20	5	ATEX/ IECEx		* Zener barrier 84 01 07 required
594 79 21	0.95 - 1.10	Transparent	6	5	CE		

Type of cables:

1. Blue PVC jacket with color coding of conductors: grey- brown - black
2. Blue PVC jacket with color coding of conductors: red - white - black
3. Red PVC jacket with color coding of conductors: grey- brown - black
4. Red PVC jacket with color coding of conductors: red - white - black
5. Black NBR/PVC jacket with color coding of conductors: grey- brown - black

Comments:

* Designed for low current, slow movements and oil - Includes micro switch with gold plated contacts.

Xylem |'zīləm|

1) The tissue in plants that brings water upward from the roots
2) A leading global water technology company

We're 12,000 people unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

For more information on how Xylem can help you, go to xyleminc.com

xylem
Let's Solve Water

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174 87 Sundbyberg
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Tel. +46-8-475 60 00
Fax +46-8-475 69 00
http://tpi.xyleminc.com

Visit our Web site for the latest version of this document and more information

The original instruction is in English. All non-English instructions are translations of the original instruction.

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Utility Solutions

IQ SensorNet FDO®

OPTICAL DISSOLVED OXYGEN SENSOR

The FDO's lower energy green light excitation technology extends the sensor cap lifetime.

Accurate dissolved oxygen monitoring for optimal performance

The FDO is an optical, luminescent-based DO sensor for YSI's IQ SensorNet system that continuously monitors dissolved oxygen in water. The FDO is a reliable, long-term solution that can help optimize aeration control and lower energy costs. Minimize sensor maintenance and maximize accuracy with a calibration-free design, smart sensor cap, and angled measurement.

Calibration-Free
Microchip technology stores the factory calibration, which is automatically recognized when the sensor cap is replaced.

No Drift
The measurement and reference path are identical, eliminating drift over the lifetime of the sensor.

Hassle-Free Maintenance
Simply replace the sensor cap every 2-5 years, no tools or solutions required.

Innovative Design
Angled sensor cap deflects air bubbles from the face of the sensor, mitigating false high DO readings.

YSI
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IQ SensorNet FDO® OPTICAL DISSOLVED OXYGEN SENSOR

SPEC SHEET XA00253-ENG

FDO Sensor Options

Sensor options are available for salt water applications, Class I, Div 2 hazardous locations, and faster response times.

FDO 700 IQ
Optical dissolved oxygen

FDO 701 IQ
Fast response optical dissolved oxygen

FDO 70x IQ SW
Salt water optical dissolved oxygen

FDO 70x IQ H
Class I, Division 2 optical dissolved oxygen (certified for use in hazardous locations)

The FDO sensor is easy to maintain, requiring sensor cap replacement only every 2-5 years.

FDO® General Specifications

Calibration Capability	Yes; not required, factory calibrated
Interferences	None; non-sensitive to hydrogen sulfide, chlorine, ionogenic substances
Minimum Flow Rate	None; no flow requirement
Response Time at 25 °C (77 °F)	FDO 700 IQ x - T90 = <150 seconds; T95 = <200 seconds FDO 701 IQ x - T90 = <60 seconds; T95 = <80 seconds
Signal Output	Digital
Lighning Pretection	Yes
Power Consumption	0.7 watts
Maximum Pressure	10 bars (145 psi) with sensor connection cable
Electrical Connections	2-wire shield cable with quick sensor connection
Conformance/ Certifications	EN 61326, Class B, FCC Class A; intended for indispensable operation, CE, cETLus UL 61010-1, CAN/CSA C22.2 #61010.1 FDO 70x IQ H: Conforms to ANSI/ISA-12.12.01, CAN/CSA C22.2 #213 for the following location rating - Class 1 Division 2, Groups A, B, C, D, T6; Class 1 Zone 2, Group IIC T6 (must be used with the IQ SensorNet cable and MIQ/BB2 barrier box)
Temperature Conditions	FDO 700 IQ x - Operating Temperature: 23 to 122 °F (-5 to 50 °C); Storage Temperature: 14 to 122 °F (-10 to 50 °C) FDO 701 IQ x - Operating Temperature: 23 to 104 °F (-5 to 40 °C); Storage Temperature: 14 to 104 °F (-10 to 40 °C)
Material	Housing: FDO 70x IQ & 70x IQ H - VA steel 1.4571; FDO 70x IQ SW - POM (Polyoxmethylene) Sensor Cap and Locking Cap: POM, PVS, silicone, PMMA
Protection Class	IP-68; waterproof
Dimensions	400 L x 40 D mm (15.75 L x 1.57 D in) FDO 70x IQ SW: 400 L x 59.5 D mm (15.75 L x 2.34 D in)
Weight	900 g (1.98 lbs) FDO 70x IQ SW: 1,500 g (3.31 lbs)
Warranty	2 years

FDO® Optical Dissolved Oxygen Technical Specifications

Dissolved Oxygen Range	Concentration: 0 to 20.00 mg/L Saturation: 0 to 200.0%
Dissolved Oxygen Resolution	Concentration: 0.01 mg/L Saturation: 0.1%
Temperature Sensor	Measurement: 23 to 122 °F (-5 to 50 °C) Compensation: 23 to 122 °F (-5 to 50 °C) Accuracy: ± 0.5 K Resolution: 0.1 K

YSI, a Xylem brand
1725 Brannum Lane
Yellow Springs, OH 45387

+1.937.767.7241
info@ysi.com
YSI.com/IQSN

YSI Municipal Water

YSI.com/FDO

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City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Section 13: Excluded Items

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City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Exclusions:

A. Equipment unloading or storage at jobsite.
B. Concrete tank or building design and installation.
C. Field installation or painting of equipment.
D. All influent piping and influent piping supports (including those in-basin). All effluent piping downstream of the decanter effluent including through the wall piping. Effluent vent piping outside basin where required. All yard piping and valves not listed in Section A including influent, effluent and supernatant piping/valves. Any splitter boxes.
E. Air supply piping between the blower isolation valves and the ICEAS basins at top of basin drop pipes including any valves not listed in Section A.
F. All bolts, gaskets and connectors for attaching drop pipe to upper air main piping.
G. Inside and outside basin sludge piping and valves. All waste sludge piping and valves (including check and plug valves) downstream of each pump discharge elbow/slide-away fitting. Sludge pump guide rails.
H. Guide rails, discharge piping and valves for ICEAS WAS pumps and digested sludge pumps.
I. Local display for level transducers (not available for proposed equipment).
J. All level transducer stilling well and mounting hardware.
K. High level float switch bracket.
L. Stainless steel junction box for high level floats.
M. Field wiring and conduits, field wireways, local disconnect switches.
N. Anchor bolts and other embedded materials except for anchor bolts specifically included in the Section A of this proposal.
O. Platforms, gratings (including those over the influent flow splitter box), handrails, ladders, and stairs.
P. Power, water, chemical and labor for operating equipment.
Q. Any field and laboratory testing.

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R. Any instrumentation including flow meters, or equipment including disinfection or chemical feed equipment not specifically listed in Section A.
S. All costs associated with video recording services.

T. All field testing (all anchor bolt and support pull-out, leakage, aeration system level, uniformity, mixing and pressure testing, if required)
U. All costs associated with providing seismic calculations. If required for any Xylem supplied equipment a change order will be executed.
V. All costs associate with equipment reinforcements due to seismic requirements. If required for any Xylem equipment a change order will be executed.

City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Section 14: Drawings and P&ID

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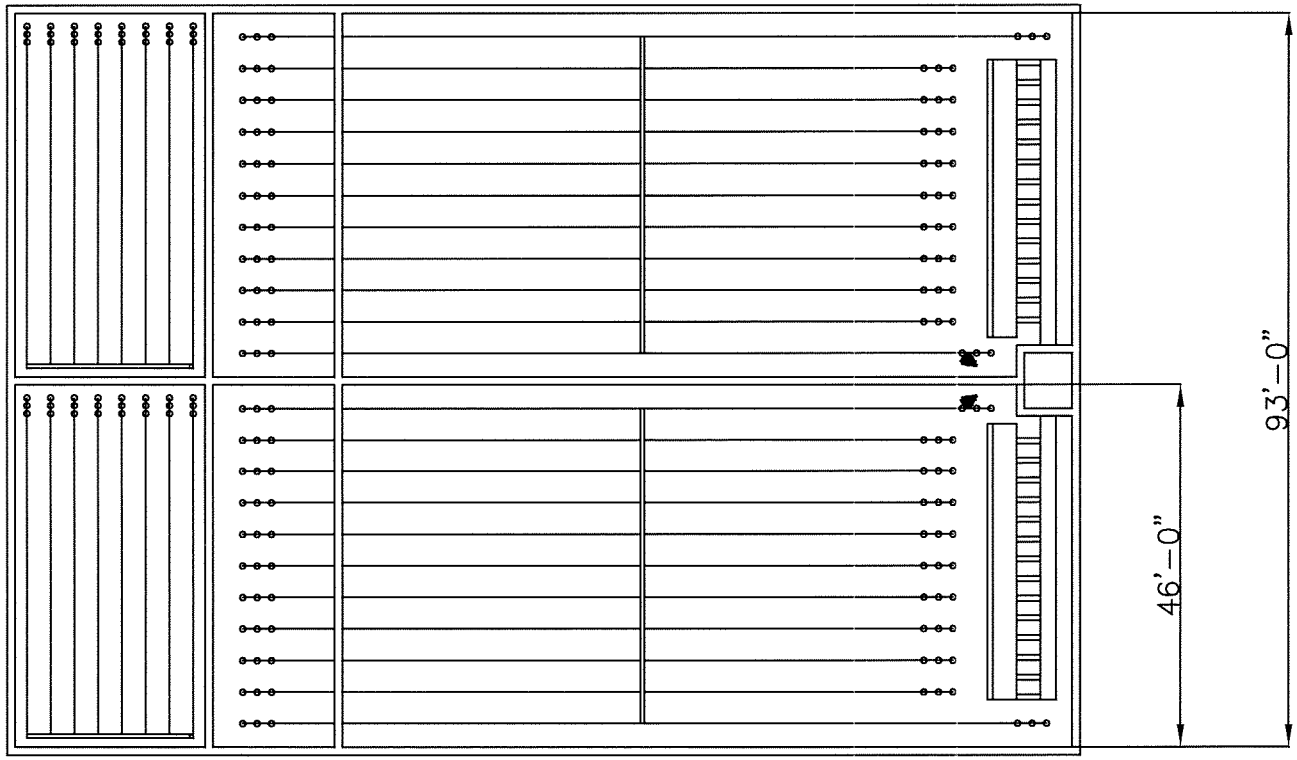

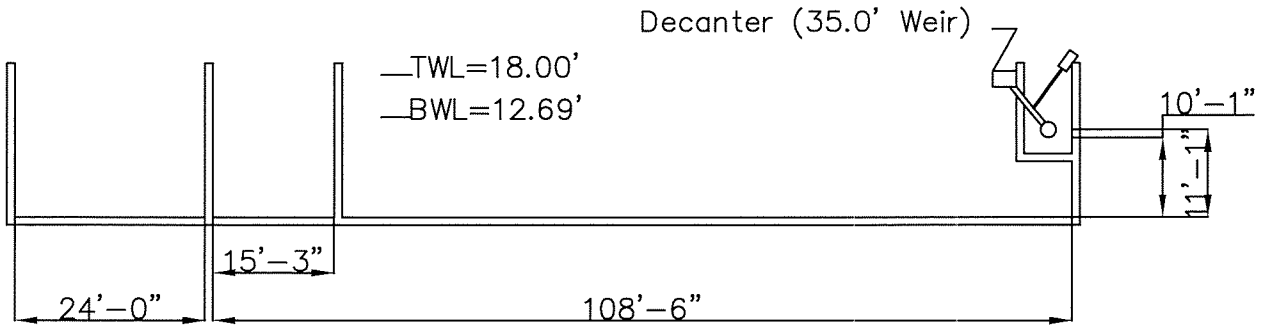

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Sanitaire a xylem brand BROWN DEER, WISCONSIN 53223	CUST NO. DWG NO.	THIS DRAWING IS THE PROPERTY OF XYLEM AND IS SUBMITTED IN CONFIDENCE. IT IS NOT TO BE DISCLOSED, USED OR DUPLICATED WITHOUT PERMISSION OF XYLEM.	Aumsville WWTP, OR PRELIMINARY LAYOUT ICEAS System	DRAWN BY PS CHKD BY APPVD BY	DATE 12/4/24 DATE DATE	MODEL	JOB 30323–20a SHEET

NOTE:

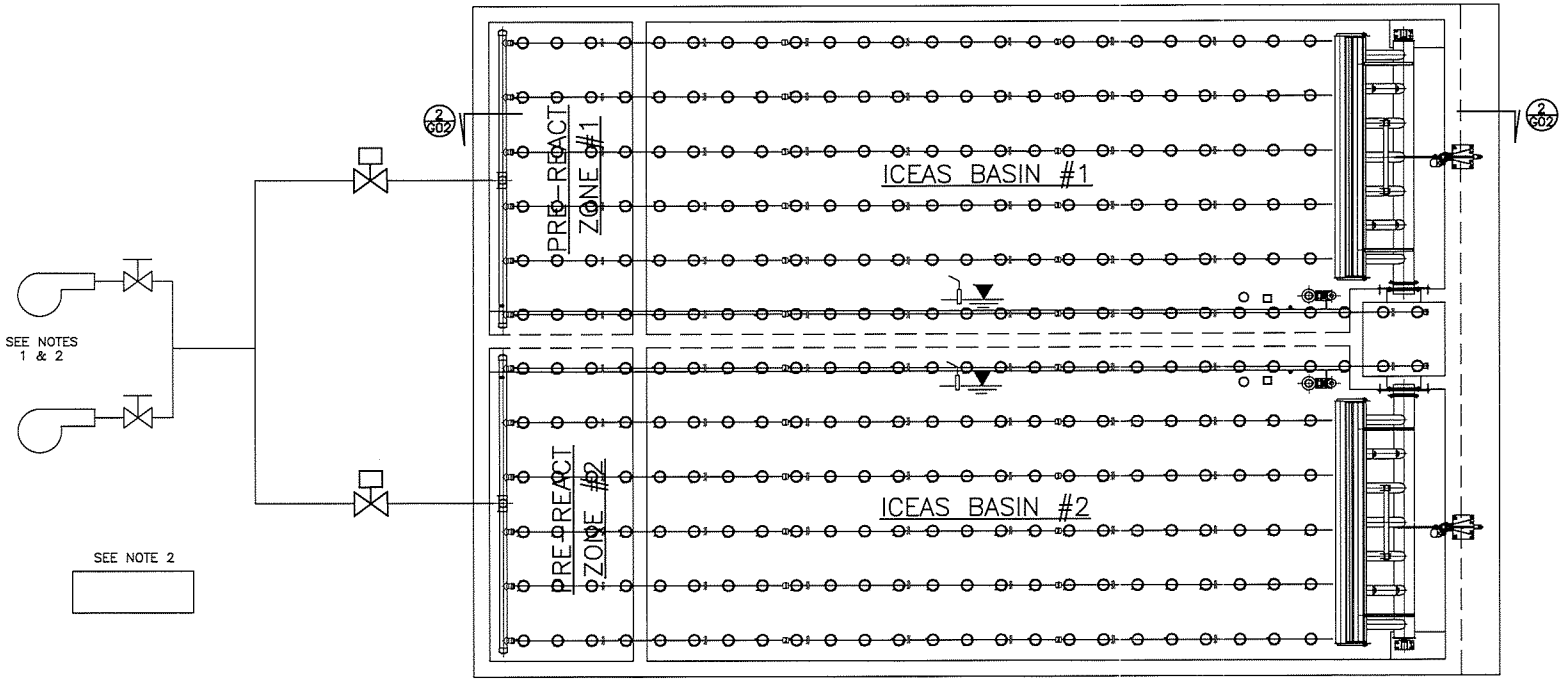
1) INTERCONNECTING AIRMAIN PIPING BETWEEN BLOWERS AND CONTROL VALVES IS PROVIDED BY OTHERS.

2) CONTROL PANEL AND BLOWERS SHOWN FOR REFERENCE ONLY. EXACT LOCATION TO BE DETERMINED BY OTHERS.

3) THE PUMPS AND FLOATS SHOULD BE LOCATED AS NECESSARY TO PROVIDE SUFFICIENT ACCESS.

4 ENGINEER/CONTRACTOR TO PROVIDE ADEQUATE VENTING OF PIPING DOWNSTREAM OF DECANTER DISCHARGE.

ITEM	QT'Y	SPARES	DESCRIPTION	MANUFACTURER	REF. DWGS
1	2	0	DECANTER XXXX WEIR	XYLEM	M20
2	2	0	X"ø WALL PIPE	XYLEM	C10
3	2	0	ACTUATOR MODEL 9002	DUFF NORTON	M20
4	2	0	STORM FLOAT SWITCH	FLYGT	M21
5	2	0	WASTE SLUDGE PUMP	FLYGT	M50
6	2	0	SUBMERSIBLE MIXER	FLYGT	M60
7	1	0	HOIST	HALLIDAY	M50 & M60
8	4	0	HOIST ANCHOR (WALL MOUNTED)	HALLIDAY	M50 & M60
9	2	0	DISSOLVED OXYGEN SENSOR AND ANALYZER	YSI	M70
10	2	0	LEVEL TRANSDUCER	FLYGT	M21
11	2	0	X"ø AIR CONTROL VALVE W/AUMA ACTUATOR	DORNER	SEE VALVES
12	2	0	ICEAS FINE BUBBLE AERATION SYSTEM	XYLEM	SEE AERATION
13	2	0	ICEAS BLOWER	EXCELSIOR	SEE BLOWERS
14	1	0	CONTROL PANEL	XYLEM	SEE ELECTRICAL
15	2	0	SLUDGE HOLDING TANK FINE BUBBLE AERATION SYSTEM	XYLEM	SEE AERATION
16	2	0	SLUDGE HOLDING TANK BLOWER	EXCELSIOR	SEE BLOWERS



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a xylem brand
BROWN DEER, WISCONSIN 53223

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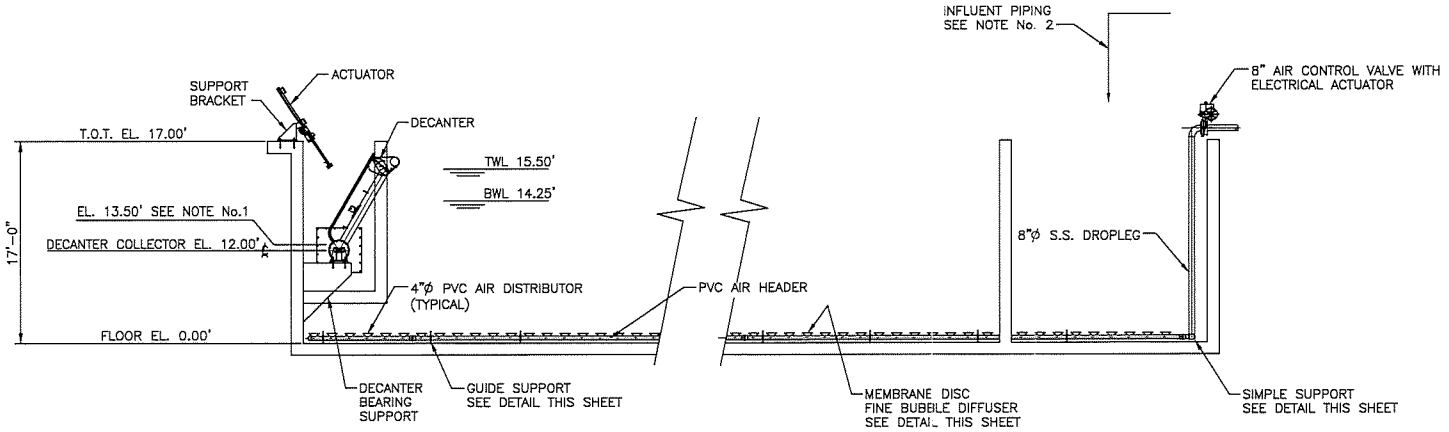
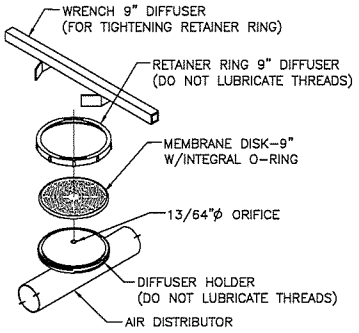
APPVD BY	DATE	SIZE D	REV.	DWG.



NOTES:

1. WATER LEVEL SHOULD NOT EXCEED THIS ELEVATION AT PEAK FLOW CONDITIONS.
2. INFLUENT TO COME IN ABOVE TOP WATER LEVEL (TWL)

GENERAL EQUIPMENT ARRANGEMENT SECTION (2)



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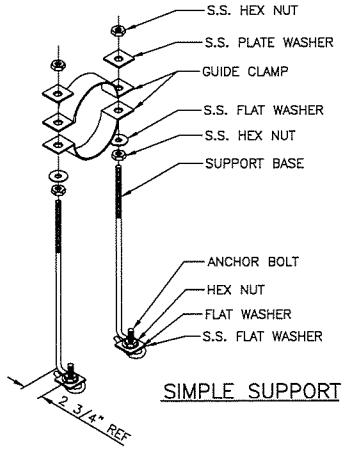
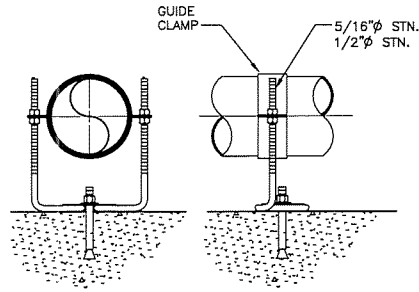


SIMPLE SUPPORT



GUIDE SUPPORT

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DRWN BY	DATE	CHKD.		SHT.	
CHKD BY	DATE	STD.		OF	
APPVD BY	DATE	SIZE D	REV.	DWG.	

AUMSVILLE, OR
WASTEWATER TREATMENT PLANT
SANITAIRE-ICEAS®

PRELIMINARY

PROJECT No. A30323-20

DATE: DECEMBER 06, 2024

Sanitaire
xylem brand

WAUKESHA, WISCONSIN 53188
www.xyleminc.com

DRAWING DESCRIPTION	DRAWING NO.	SH	REV
ELECTRICAL SYMBOLS AND ABBREVIATIONS	30323-SA01_	1	_
ENCLOSURE 90" X 40" X 18"	30323-CP01_	2	_
HMI AND ALARM HORN NAMEPLATE DETAIL	30323-CP02_	3	_
LOCAL STATION PANEL (DECANTER ACTUATOR)	30323-CP03_	4	_
SBR LEVEL AND FLOAT INTRINSIC BOX AND DIGESTER LEVEL INTRINSIC BOX	30323-CP04_	5	_
SINGLE LINE DIAGRAM	30323-SL01_	6	_
PROCESS PIPING AND INSTRUMENTATION	30323-PD01_	7	_
INSTRUMENTATION DIAGRAM	30323-PD02_	8	_

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12/06/24
XYLEM

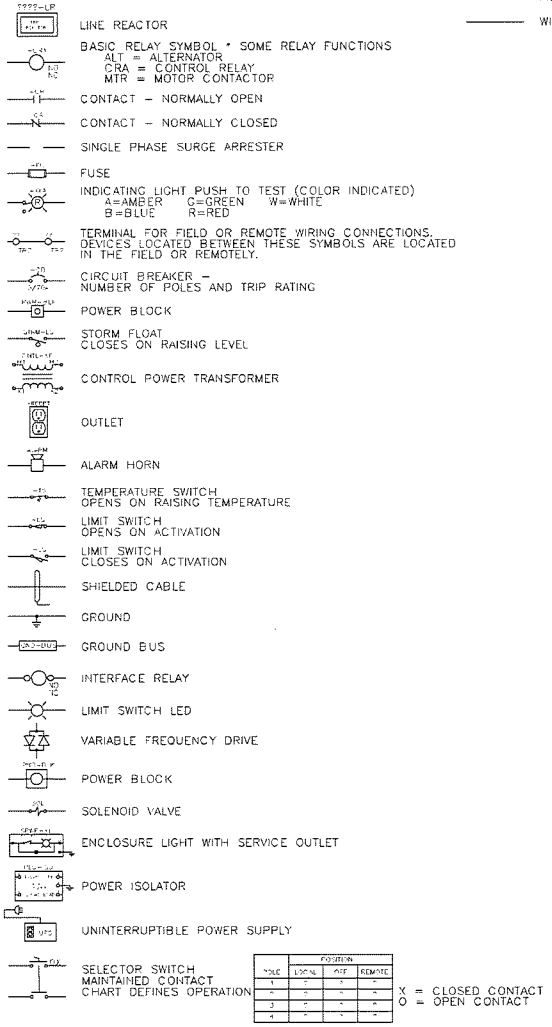
AUMSVILLE, OR
WASTEWATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY

TABLE OF CONTENTS

DRWN BY: IKS 12/05/24 | SIZE D | SCALE | JOB. A30323-20 | SH 1 OF 1
APPV'D BY | REV. _ | QTY. | DWG. 30323-TC01_

ELECTRICAL SYMBOLS



ABBREVIATIONS

AC – ALTERNATING CURRENT
ACT – ACTUATOR
ALRM – ALARM
ANSI – AMERICAN NATIONAL STANDARD INSTITUTE
AUTO – AUTOMATIC
AV – AERATION VALVE

BLO – AERATION BLOWER

CB – CIRCUIT BREAKER
CR – CONTROL RELAY

CNTL – CONTROL POWER
CNTL–XF – CONTROL TRANSFORMER

DC – DIRECT CURRENT
DCNT – DECANTER
DIG – DIGESTER
DISC – DISCONNECT
DO – DISSOLVED OXYGEN

EFF – EFFLUENT
EQ – EQUALIZATION BASIN
EQP – EQUALIZATION PUMP

FI – FLOW INDICATOR
FS – FLOAT SWITCH
FT – FLOW TRANSMITTER
FU – FUSE
FVNR – FULL VOLTAGE NON–REVERSING
FVR – FULL VOLTAGE REVERSING

GND – GROUND

H–O – HAND/OFF
H–O–A – HAND/OFF/AUTOMATIC
H–O–R – HAND/OFF/REMOTE
HS – HAND SWITCH

INFV – INFLUENT VALVE
INFP – INFLUENT PUMP

LD – LEAK DETECTOR
L–O–A–R – LOWER/OFF/AUTO/RAISE
L/R – LOCAL/REMOTE PANEL
LR – LINE REACTOR
LS – LIMIT SWITCH
LT – LEVEL TRANSMITTER

MCC – MOTOR CONTROL CENTER
MOV – SURGE ARRESTER
MS – MOTOR STARTER
MTR – MOTOR
MXR – MIXER

N – NEUTRAL

O–A – OFF/AUTOMATIC
O/F – OVERFLOW
O/L – OVERLOAD

PH – PHASE
PI – PRESSURE INDICATOR
PLC – PROGRAMMABLE LOGIC CONTROLLER
PLC–DLR – AUTO DIALER
PM – PANELMATE
PS – POWER SUPPLY
PT – PRESSURE TRANSMITTER
PV – PURGE VALVE
PWR – POWER
PWR–BLK – POWER BLOCK
PWR–CR – PHASE LOSS RELAY

ABBREVIATIONS CONTINUED

QA – QUIET ALARM

RS – RAW SEWAGE
RVSS – REDUCED VOLTAGE SOLID STATE STARTER

SBR – SEQUENCING BATCH REACTOR
SCR – SCREENED SEWAGE
SHLD – SHIELD
SHT – SLUDGE HOLDING TANK
SOL – SOLENOID
SPWR – SERVICE POWER
STP – SLUDGE TRANSFER PUMP
STRM – STORM

TDS – TREATED & DISINFECTED SEWAGE
TS – TEMPERATURE SWITCH

UPS – UNINTERRUPTIBLE POWER SUPPLY
UV – ULTRA VIOLET DISINFECTION SYSTEM
UVP – UV DISINFECTION PUMP

VFD – VARIABLE FREQUENCY DRIVE

WS – WASTE SLUDGE
WSP – WASTE SLUDGE PUMP

XL – INDICATOR LIGHT

PRELIMINARY

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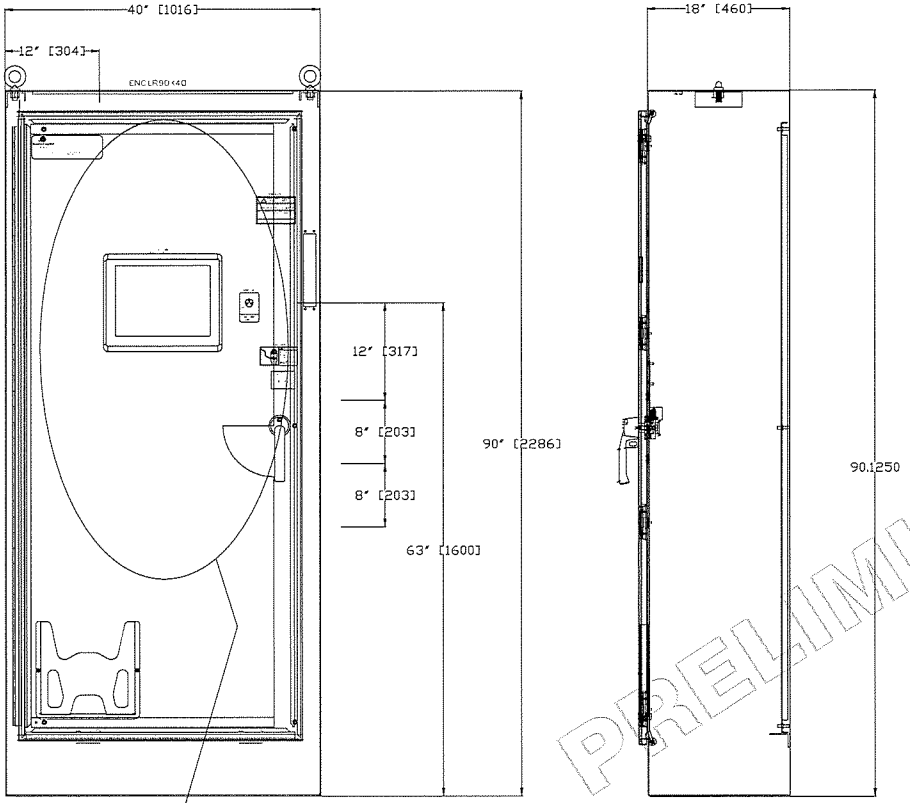
XYLEM

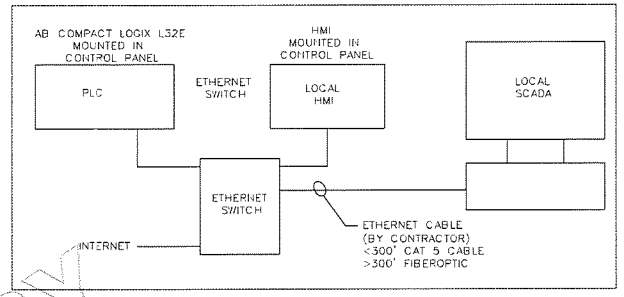
AUMSVILLE, OR
WASTEWATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY	APPVD BY

ELECTRICAL SYMBOLS AND ABBREVIATIONS

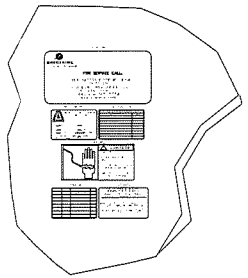
DESIGN BY: IAS 12/06/24 | SIZE: D | SCALE: | JOB: A30323-20 | SHT 1 OF 8
REV: _ | QTY: | DWG: 30323-SA01_

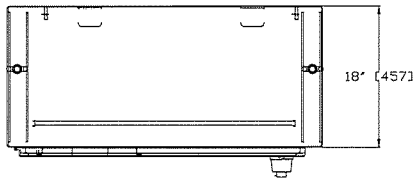




OPTIONAL SCADA SYSTEM BY SANITAIRE

LABELS TO BE
MOUNTED ON LEFT INSIDE
ABOVE HANDLE OF MASTER DOOR





NOTES:
1) ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED.

HOFFMAN ENCLOSURE
A90XM4018FTC

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AUMSVILLE, OR
WASTEWATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY

ENCLOSURE 90" X 40" X 18"

DRAWN BY INS 12/06/24 | SIZE D | SCALE | JOB: A30323-20 | 2 of 8
APPVD BY | REV. _ | QTY. | DWG. 30323-CP01_

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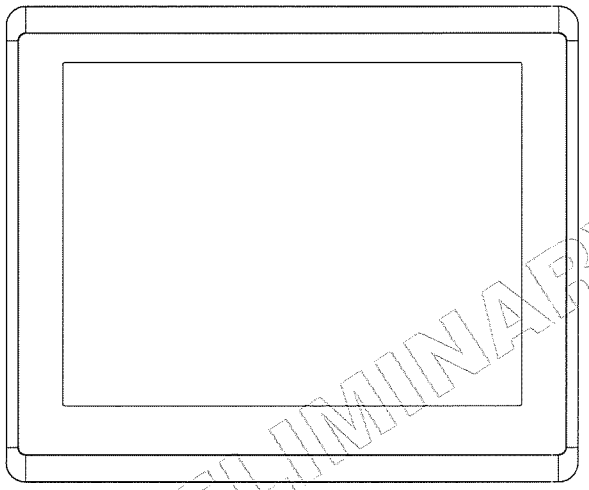
WAUKESHA, WISCONSIN USA
www.xyleminc.com

PLC-HMI



HORN-NP

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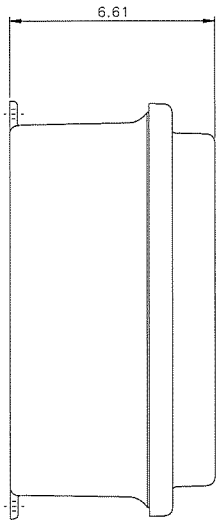
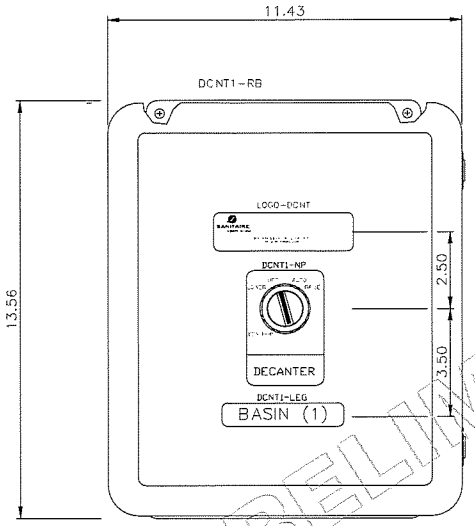
AUMSVILLE, OR
WASTEWATER TREATMENT PLANT

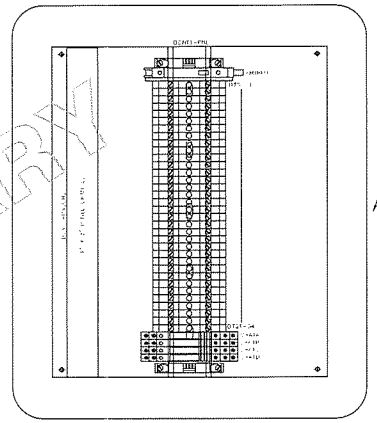
REV	DATE	REVISION DESCRIPTION	BY

HMI AND ALARM HORN NAMEPLATE DETAIL

DESIGN BY: INS 12/06/24	SIZE: D	SCALE:	JOB: A30323-20	3
APPROVED BY:	REV: _	QTY:	DWG: 30323-C-P02_	8







LABEL TO BE LOCATED
ON LATCH SIDE OF ENCLOSURE

PRELIMINARY

BASIN No.1 SHOWN
(2 REQUIRED)

DCNT1-LEG
BASIN 1
DCNT2-LEG
BASIN 2

ENCLOSURE
RJ1210HPL

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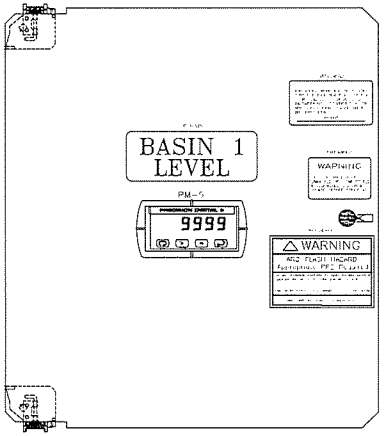
REV	DATE	REVISION DESCRIPTION	BY

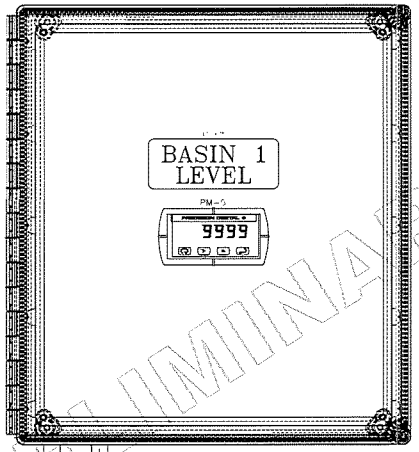
DECANTER LOCAL STATION

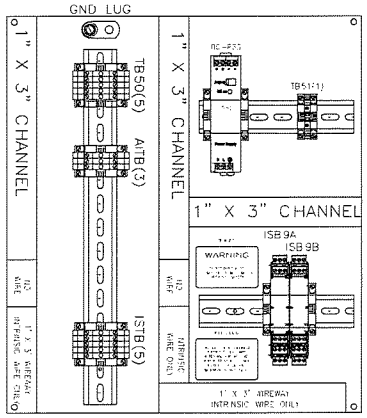
DESIGN BY: IMS	12/06/24	SIZE: D	SCALE	JOB: A30323-20	SHT 4 OF 8
APPVD BY:		REV: _	QTY.	DWG. 30323-CP03_	

PRECISION DIGITAL

PANEL METER (PD765)







PRELIMINARY

BASIN 1 LEVEL
BASIN 2 LEVEL
DIGESTER 1 LEVEL*
DIGESTER 2 LEVEL*

*—FLOAT WILL BE REMOVED FROM DIGESTER BOXES.

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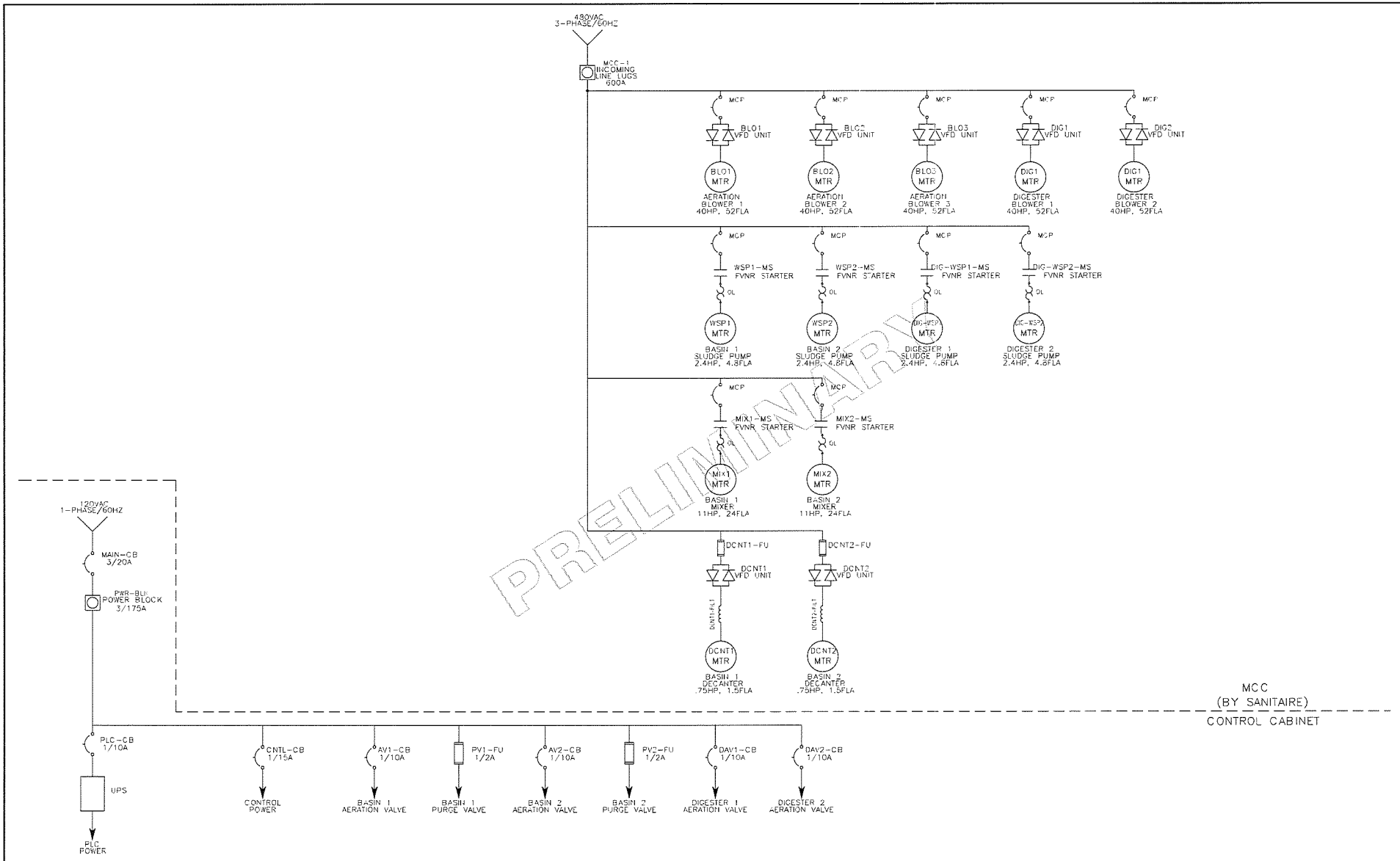
REV	DATE	REVISION DESCRIPTION	BY

SBR LEVEL AND FLOAT INTRINSIC BOX
DIGESTER LEVEL INTRINSIC BOX

DRAWN BY MS 12/05/24 | SIZE D | SCALE | JOB. A30323-20
APPVD BY | REV. _ | QTY. | DWG. 30323-CP04_ | 5 of 8



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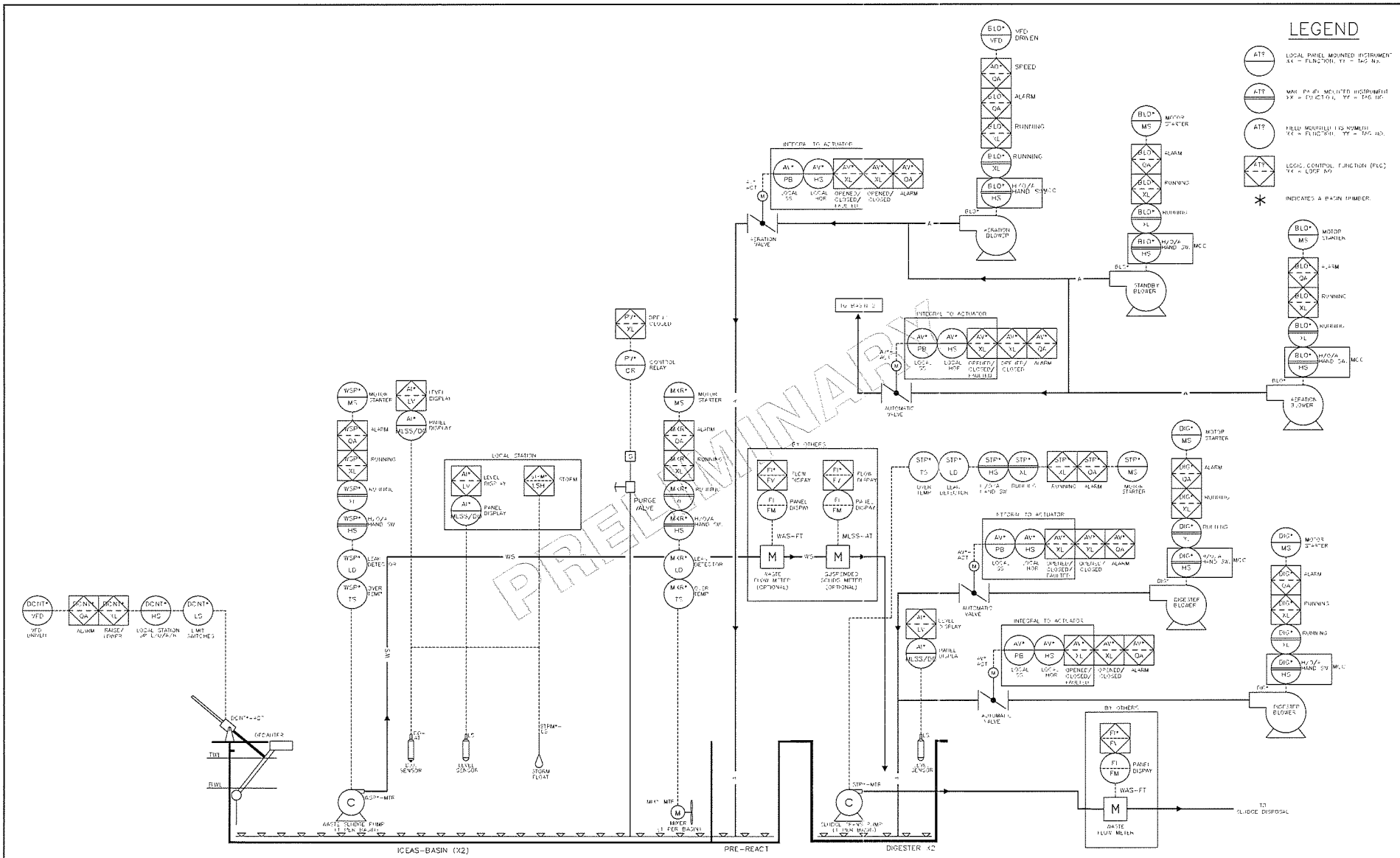
WASTEWATER TREATMENT PLANT

REV	DATE	REVISION DESCRIPTION	BY

SINGLE LINE DIAGRAM

DRWN BY: IKS 12/06/24 | SIZE: D | SCALE | JOB: A30323-20 | DWG: 30323-SL01_ | REV: _ | QTY:



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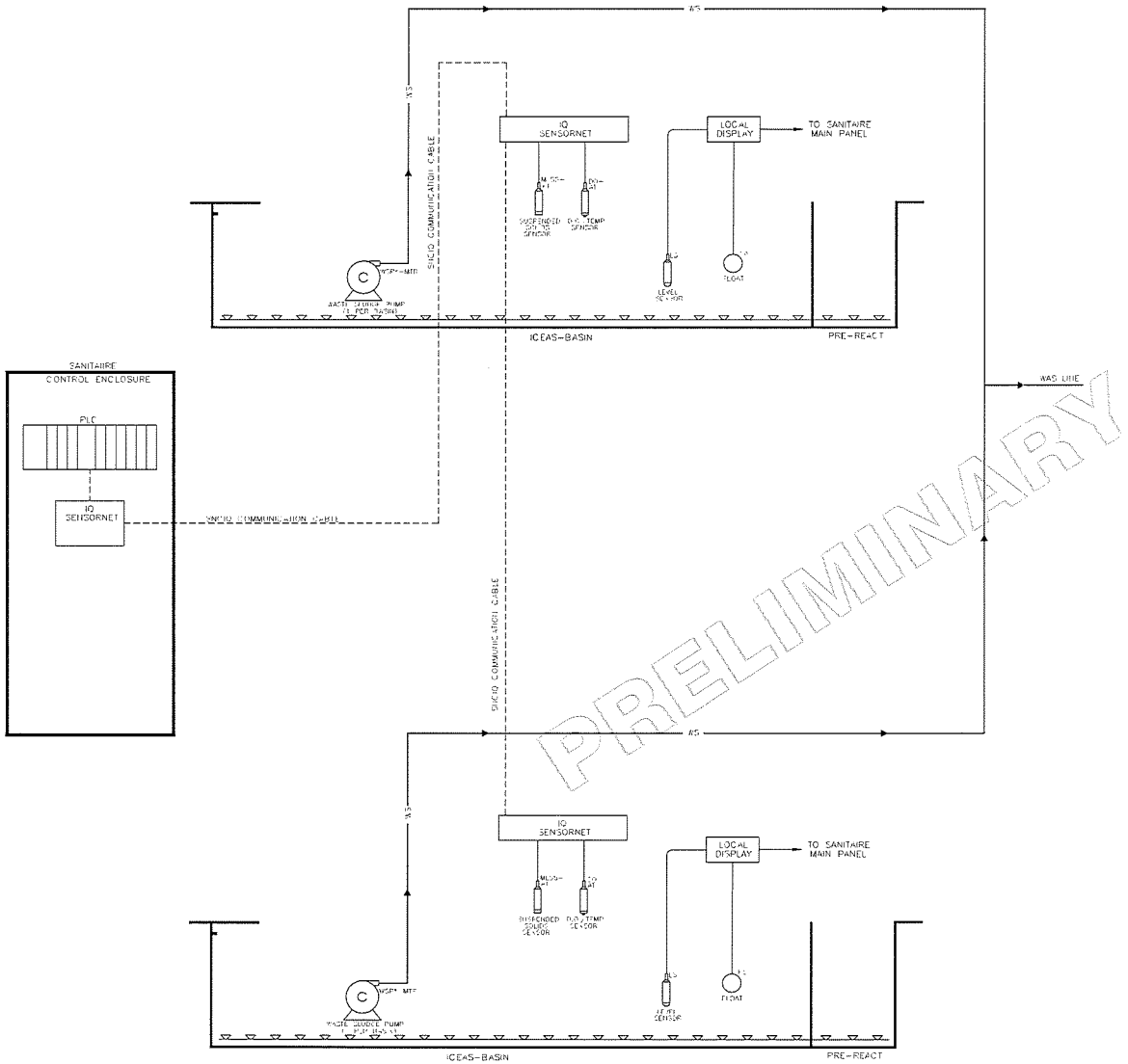
REV	DATE	REVISION DESCRIPTION	BY	APPVD BY

PROCESS PIPING AND INSTRUMENTATION

DRWN BY IKD 12/06/24 | SIZE D | SCALE | JOB. A30323-20 | DWG. 30323-PD01_ | REV. _ | SH. 7 OF 8



TYPICAL FOR ALL BASINS

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REV	DATE	REVISION DESCRIPTION	BY

City of Aumsville, Oregon
Sequencing Batch Reactor Equipment
for
The Aumsville Wastewater Treatment Plant Improvements

Section 15: Instrumentation

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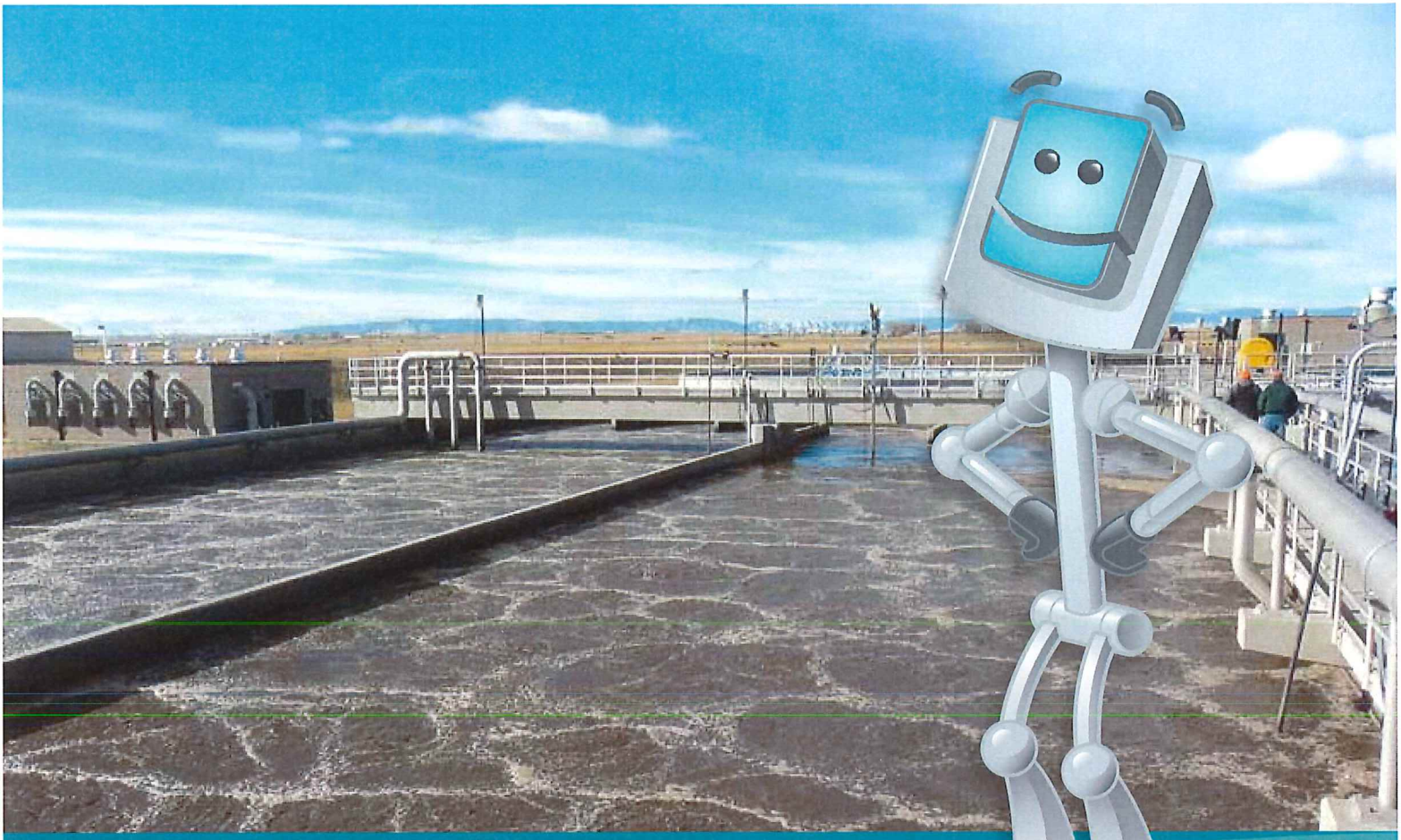

Meet OSCAR™.

THE FIRST NAME IN REAL TIME WASTEWATER PROCESS OPTIMIZATION.

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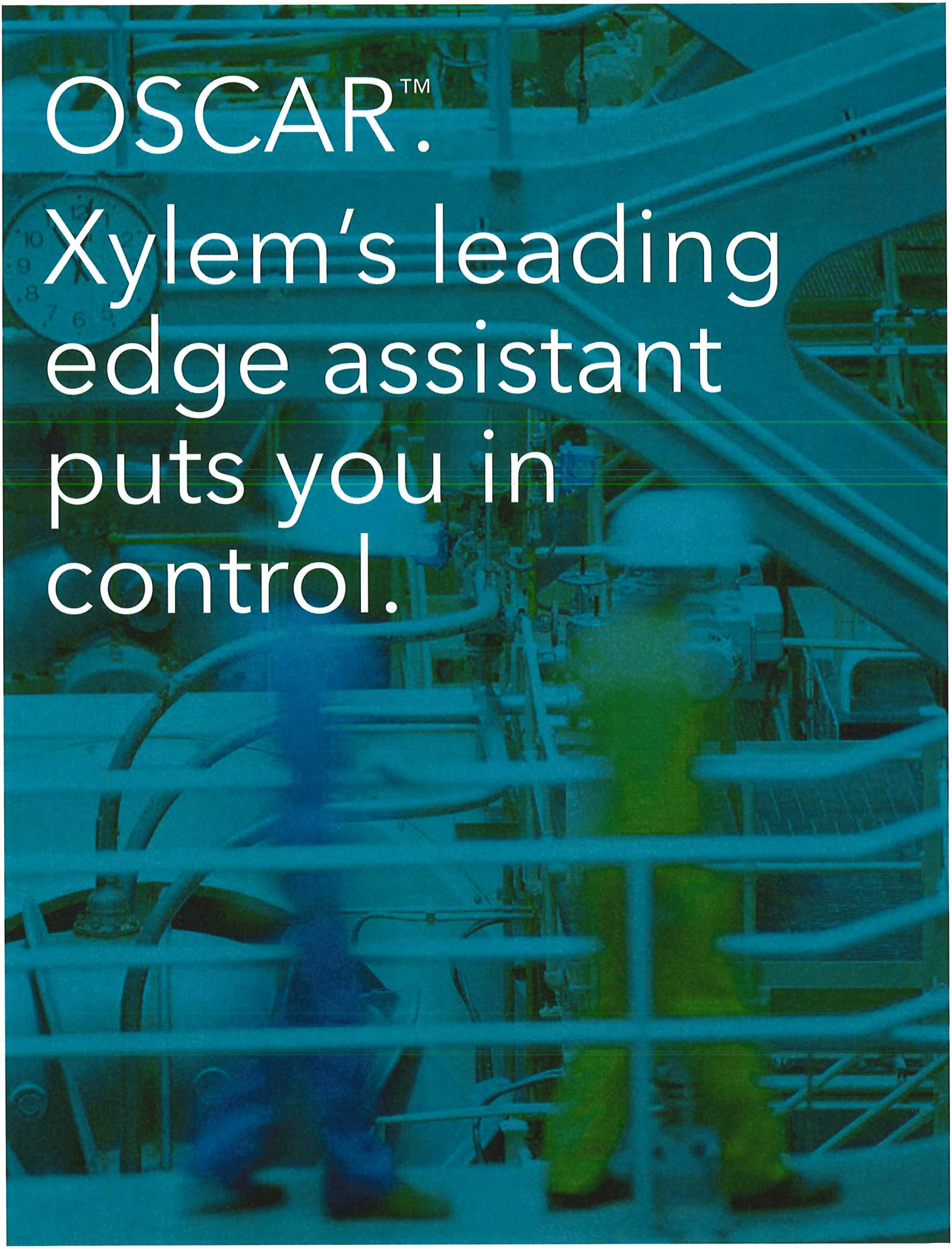

OSCAR™.
Xylem's leading edge assistant puts you in control.

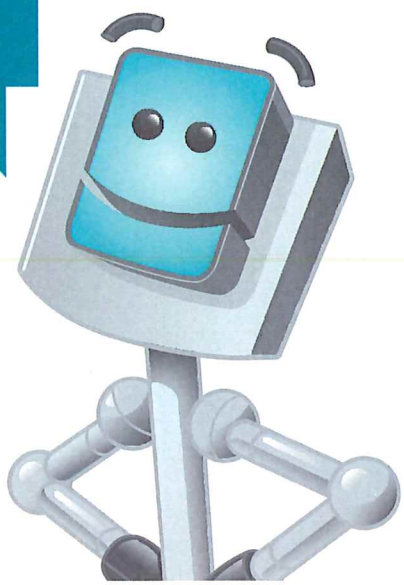
Monitoring and Controls Simplified

Through intuitive Graphic User Interface (GUI), combined with the transparency provided by real time monitoring, operators always know actual treatment process conditions. No more guessing – just ask OSCAR™ process performance optimizer. He equips operators with the tools they need to successfully and efficiently operate the WWTP, and he gives it to them now.

Hi, I'm OSCAR. I'm your new Process Performance Optimizer.

OSCAR™ process performance optimizer gives you real time wastewater process measurement and control to optimize your operations. Combining the monitoring capability of the most advanced probes and control systems for aeration and Solids Retention Time (SRT), OSCAR reduces energy consumption while stabilizing your treatment process and maintaining effluent quality. Developed with Xylem's extensive product, controls, and biological process expertise, OSCAR provides a comprehensive solution for your wastewater needs.

OSCAR can also assist you with your reporting needs. His reporting capabilities give you the tools you need to take your treatment analysis to the next level, spotting trends and allowing further optimization.



What can OSCAR do?

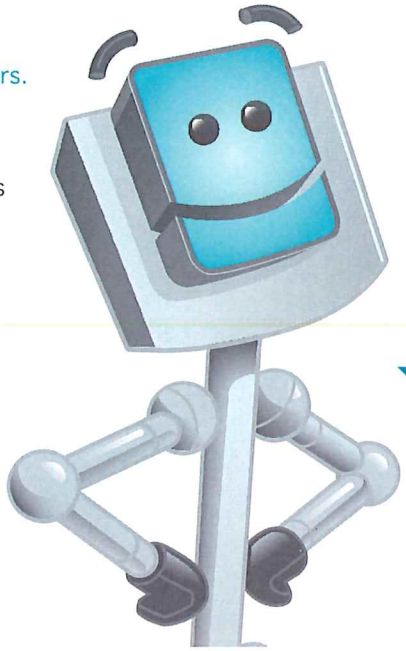
OSCAR's Real Time Information

Control and Optimization Start with Measurement. If you can't measure it, you can't control it, much less optimize it. That's why OSCAR™ process performance optimizer uses the most advanced Xylem brand sensors and probes, by WTW and YSI IQ SensorNet, for reliable monitoring. With OSCAR, all your monitoring and control requirements are integrated under the Xylem umbrella of quality.

Reliable REAL TIME monitoring of influent quality, basin conditions, and effluent quality give you the information you need, when you need it. For example:

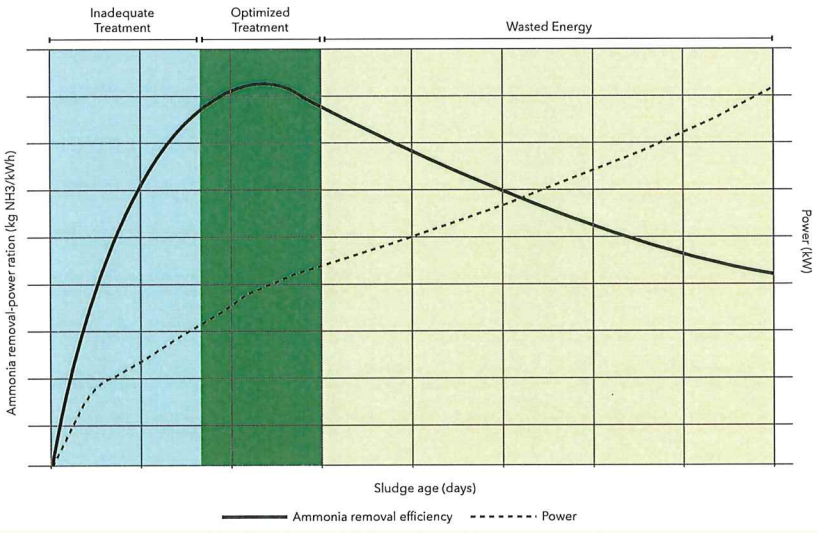
- Influent: pH, Temperature, Conductivity, NH4, TSS, COD, TOC, BOD
- In Basin: DO, Temperature, NH4, NO3, TSS, pH, ORP
- Effluent: NH4, NO3, pH, Conductivity, DO, Turbidity, COD, TOC, BOD.

Modular Design with Plug and Play Sensors. With up to 20 sensors per terminal, OSCAR's plug and play design allows you to change and expand your monitoring as your future requirements change. You are not stuck with yesterday's system. OSCAR provides you the flexibility to simplify the maintenance and control of your process today, and in the future.



If you can't measure it, you can't control it. I can help with my advanced sensors and probes to provide reliable monitoring.

OSCAR Knows Healthy Biomass



Reduced Energy Consumption = Lower Life Cycle Costs

OSCAR Stabilizes Operations by Controlling Solids Retention Time (SRT)

Too long an SRT just wastes power. Too short, and you risk treatment quality.

Monitor

OSCAR monitors the MLSS in the aeration basin and TSS in the waste stream.

Control

Using Sludge Inventory Management System (SIMS) SRT controlling software, OSCAR adjusts the waste pumping rates to maintain the proper SRT for your effluent requirements.

Results

Consistent settling characteristics, energy optimization and reliable, high quality effluent.

OSCAR's Intelligent Control

Control Aeration, Mixing, and Biomass Wasting

Leveraging the aeration expertise plus the biological process control mastery of Sanitaire, OSCAR™ process performance optimizer continuously monitors process parameters in the influent, treatment zones and final effluent. He then stages and fine tunes blowers, pressure, air flow, and solids wasting to deliver the effluent quality required at substantial energy savings. At a WWTP in Sterno Sweden, a complete retrofit combined an energy efficient Sanitaire aeration system with OSCAR's controls and realized energy savings of 65%.

Biological Nitrogen Removal (BNR)

BNR is often controlled using DO levels alone, resulting in excessive energy consumption or inconsistent effluent quality or both. OSCAR uses a smart control algorithm, using both DO and NH4 levels to optimize aeration or anoxic conditions in the appropriate zones. With energy efficient equipment and intelligent control, energy savings for BNR processes of 10% is possible. By using new Ion Selective Electrode technology, which is lower cost and lower maintenance than old wet chemistry analyzers, BNR control is enhanced, putting control within the reach of even small WWTPs.

Precision Control of Aeration

Operating at a higher DO than is necessary to maintain a healthy biomass just wastes energy. OSCAR uses real time monitoring of DO in the basin to adjust aeration rates, minimizing energy consumption. He also ensures effluent quality meets discharge requirements by monitoring effluent parameters (BOD, NH4, DO).

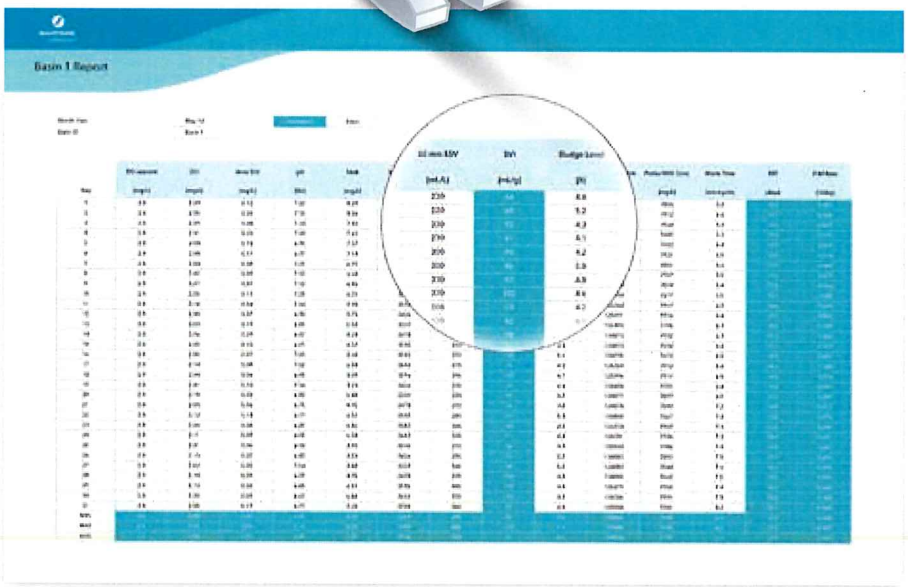
OSCAR's Automated Reports

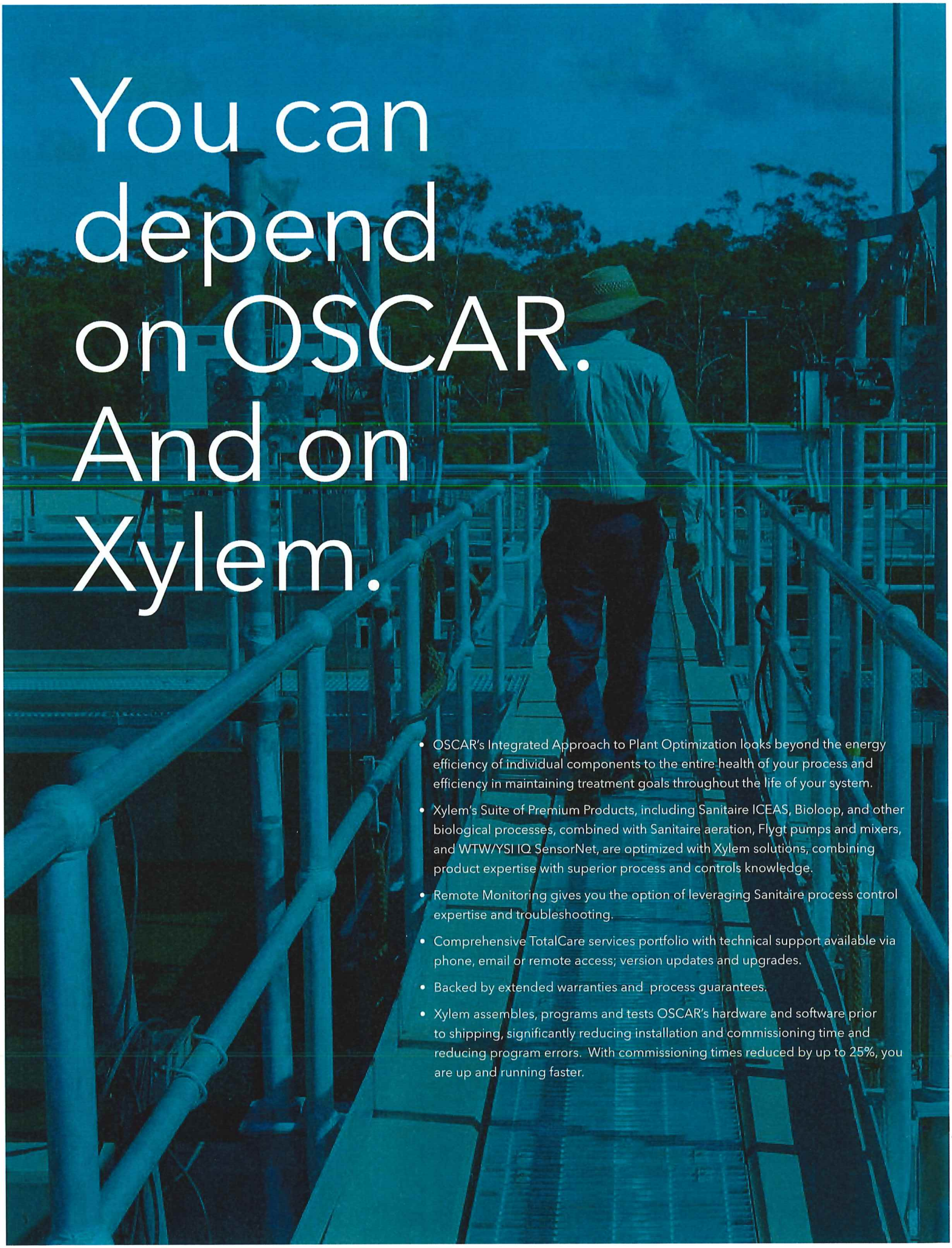
OSCAR assists in analysis. He converts operational data into accurate tables and graphs, freeing operators from data organization and equipping them for data analysis. You can quickly see how your process has been operating and spot trends, allowing for further optimization.

OSCAR quickly extracts data for customized reports to verify regulatory compliance.

OSCAR loves reports but hates errors! OSCAR performs calculations from online process data, automatically generating tables, graphs and reports and minimizing errors.

OSCAR frees Operator Time from administrative duties, so they have more time for other tasks, including process evaluation. Some clients have reported time savings of 3 to 5 hours each week.





You can depend on OSCAR. And on Xylem.

- OSCAR's Integrated Approach to Plant Optimization looks beyond the energy efficiency of individual components to the entire health of your process and efficiency in maintaining treatment goals throughout the life of your system.
- Xylem's Suite of Premium Products, including Sanitaire ICEAS, Bioloop, and other biological processes, combined with Sanitaire aeration, Flygt pumps and mixers, and WTW/YSI IQ SensorNet, are optimized with Xylem solutions, combining product expertise with superior process and controls knowledge.
- Remote Monitoring gives you the option of leveraging Sanitaire process control expertise and troubleshooting.
- Comprehensive TotalCare services portfolio with technical support available via phone, email or remote access; version updates and upgrades.
- Backed by extended warranties and process guarantees.
- Xylem assembles, programs and tests OSCAR's hardware and software prior to shipping, significantly reducing installation and commissioning time and reducing program errors. With commissioning times reduced by up to 25%, you are up and running faster.

Xylem |'zīləm|

1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

We're 12,000 people unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

For more information on how Xylem can help you, go to **www.xyleminc.com**

SANITAIRE®

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Fax +1.414.365.2210
www.sanitaire.com/us

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xylem
Let's Solve Water

Xylem, Inc.
14125 South Bridge Circle
Charlotte, NC 28273
Tel 704.409.9700
Fax 704.295.9080
www.xyleminc.com

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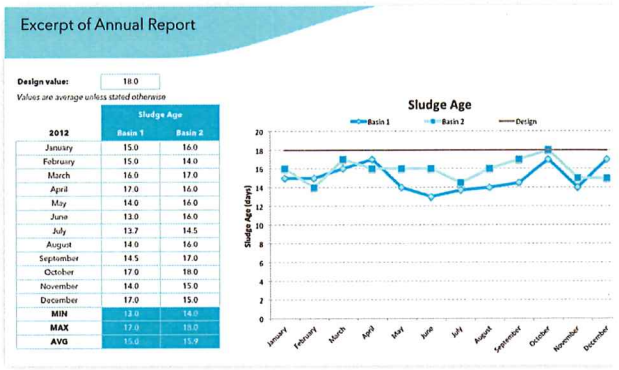
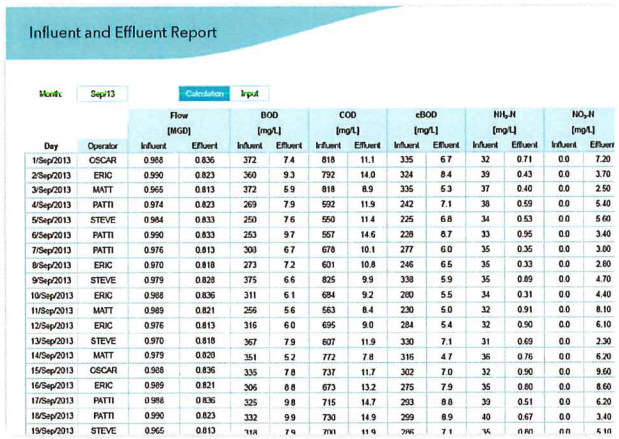
- **Sludge treatment summary** gives an overview of the waste activate sludge (WAS) in all basins, as well as the average WAS flow per month, the WAS solids concentration, the mass wasted, sludge hauled, and the polymer usage. Data is totaled, and minimums, maximums and averages displayed.
- **Setpoint summary** allows operators to share information on summer and winter operational modifications by displaying operational set points in one location. This speeds overall process evaluation and can assist in further optimization.
- **Data** is displayed in tables and/or graphs for easy analysis.



Excerpt of Annual Report

Monthly Reports

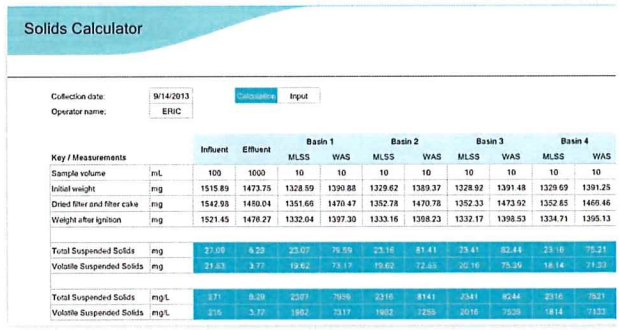
- **Basin report** shows the daily data for the entire month for all the monitored parameters. Maximum, minimums, and averages are all clearly summarized. Combining online data with manual entry, this gives a complete day to day picture of basin operations.
- **Influent and effluent report** details the daily influent and effluent concentrations next to one another for easy comparison, and provides maximums, minimums, averages, and removal rates at a glance.
- **Digester report** monitors the operational parameters of your digester, mass taken in, mass removed, as well as temperature, pH, and DO.
- **Thickener report** shows the daily sludge processed and hauled, and polymer addition. It also gives the daily % solids and % volatile solids in both the feed and the outflow.



Excerpt of Monthly Report

Manual Data Entry Forms

- **BOD/cBOD calculator** employs a user friendly interface for data entries of sample volume and DO concentrations. OSCAR then calcuates the BOD, including cumbersome seed calculations for effluent samples.
- **Solids calculator** requires manual entries of weights and volumes, then calculates the TSS, VSS, and/or % solids.
- **Laboratory form** streamlines entry of inhouse and external laboratory data in a secure and assessible form.
- **Operations digester and thickener form** provides a secure and standardized storage of your specified operations parameters.



Excerpt of Manual Data Entry Form

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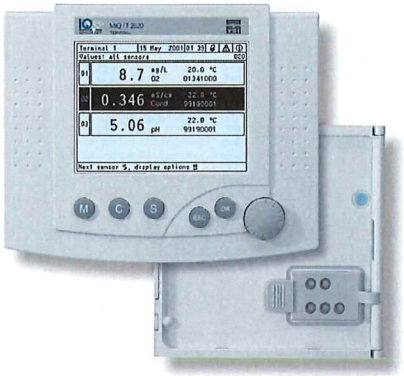
SPECIFICATIONS

DOCUMENT #W100



YSI IQ SensorNet 2020 XT

Continuous Water Quality Monitoring for Process Control

Powerful yet simple, the YSI IQ SensorNet 2020 XT is a modular water quality system for complete process control designed for wastewater. The 2020 XT network can accept additional sensors easily at any time and grow as your facility grows. Benefits include better network visibility and management, early detection of network failures, improved compliance with regulatory targets, and cost savings (energy, pump/blower maintenance, labor).

- 3-year instrument warranty
- User-replaceable cables and sensors. Many sensors provide ultrasonic cleaning.
- Centralized power supply along entire network; 2-wire cable provides power and communications
- Lightning protection along network
- 2020 XT provides tactile buttons; easily use while wearing gloves
- Modular expansion from 1 to 20 sensors; ability to extend network with additional modules
- Up to 48 output channels are possible
- LED status light
- Programmable access permission
- System redundancy if two terminals are used; use in one location or move from point to point

Building a system is easy...choose the IQ SensorNet 2020 XT, determine which modules are needed (control, communications, etc.), determine distances for cabling and select parameters.

Parameters:

Dissolved Oxygen (optical or electrochemical)
pH
ORP/Redox
Conductivity/Salinity
Temperature
Turbidity*
TSS (total suspended solids)*
Ammonium
Nitrate
Potassium
COD (chemical oxygen demand)*
TOC (total organic carbon)*
DOC (dissolved organic carbon share of TOC)*
SAC (spectral absorption coefficient)*
BOD (biochemical oxygen demand)*

* ultrasonic cleaning for sensors

YSI.com/IQSN2020

IQ SensorNet 2020 XT Terminal/Controller Specifications

Certifications	ETL, cETL (conforms with relevant UL and Canadian standards), CE
Electromagnetic Compatibility	EN 61326, Class B; FCC Class A, EMC for indispensable operation
Integrated Lightning Protection	According to EN 61326 enhanced over-voltage protection for *entire system*, implemented in each component
Cable	2-wire with shield for power supply and communications; resistant to polarity reversal; comprehensive EMC shield control; cable topology within network can be in the form of a line, tree, star or multiple star
	Total cable length max. = 1000 m (3280 ft) without signal amplifying; with signal amplifying module MIQ/JBR add an additional 1000 m
Radio	Radio transmission Class 1 with a range of 100 m (328 ft); max 300 m (984 ft)
Module Coupling at Rear	Combined mechanical and electrical connection for rapid coupling to modules; no wiring required
USB Interface	USB-A (host)
Display	Graphic display; resolution 320 x 240 pixels; visible area 114 x 86 mm (4.49 x 3.39 in); backlit
Control Keys/Buttons	5 operation keys: 3 master keys for Measurement (M), Calibration (C), Set/System settings (S)
	2 function keys for confirmation/switching menu OK (OK) and Escape (ESC)
	4 directional button for quick selection of software functions and input of alphanumeric values
Datalogger	MIQ/TC 2020 XT; data memory for up to 525,600 data sets
Electrical	Directly via the IQ SensorNet when coupled to an MIQ module
Temperature Conditions	Operating Temperature: -4 to 131 °F (-20 to 55 °C)
	Storage Temperature: -13 to 149 °F (-25 to 65 °C)
Enclosure	Material: ASA (Acrylonitrile-Styrene-Acryloesterpolymer)
	Rating: IP-66, equivalent to NEMA 4X (not suitable for conduit connection)
	Dimensions: 210 W x 170 H x 40 D mm (8.27 W x 6.69 H x 1.57 D in)
	Weight: 0.7 kg (1.54 lbs)
	Warranty: 3 years

IQ SensorNet 2020 XT Module (MIQ) Specifications

Module Coupling at Front	Combined mechanical and electrical connection for rapid docking and removal of the terminal and docking additional modules
Module Coupling at Rear	Combined mechanical and electrical connection for docking additional modules; a total of 3 modules as a stacked mounted unit
Cable Feeds	4 screw cable glands M 16 x 105
Terminal Connections	Screw terminal strips; terminal area for solid connectors 0.2 to 4.0 mm for flexible connectors 0.2 to 2.5 mm; accessible through cover Used for connecting sensors or as an input/output or for looping through/branching of the IQ SensorNet cable
Additional Functions	Two LEDs (yellow and red) for monitoring the operating voltage; lightning protection; connection resistant to reversed polarity; integrated local identity; integrated switchable terminal resistor (SN terminator)
Enclosure	Material: PC 20% GF (Polycarbonate with 20% fiberglass)
	Rating: IP-66, equivalent to NEMA 4X (not suitable for conduit connection)
	Dimensions: 144 W x 144 H x 52 D mm (5.67 W x 5.67 H x 2.05 D in)
	Weight: 0.5 kg (1.1 lbs)
	Warranty: 3 years

IQ SensorNet 2020 XT Ordering Information (order 2020 XT, modules, cables, sensors separately)

MIQ/TC 2020 XT Item #470 000Y	Central terminal/controller unit only. Required to be installed once at any point, remains in the system and cannot be removed. Operation mode is shown through status LED. Up to 20 sensors can be connected.
MIQ/TC 2020 XT-H3 Item #470 016Y	Multiparameter system consisting of 2020 XT, MIQ/CR3 (3 analog and 3 relays) and MIQ/PS (power supply). Up to 20 sensors can be connected.
MIQ/TC 2020 XT-H3 C6 Item #470 017Y	Multiparameter system consisting of 2020 XT, MIQ/C6 (6 analog outputs) and MIQ/PS (power supply). Up to 20 sensors can be connected.

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Operating manual

IQ SENSOR NET MIQ/TC 2020 XT

Modular multiparameter measuring system, Terminal/Controller MIQ/TC 2020 XT

ba76019e01 12/2012

Note
For the most recent version of the manual, please visit www.ysi.com.

Up-to-dateness of instrument software

The continuous development of the instrument software is part of the consequent improvement process of the instrument software. The current instrument software for the MIQ/TC 2020 XT is available on the Internet. It can be transferred to your instrument with the aid of USB memory device. More detailed information is given on the Internet under www.ysi.com.

Saving the password

If access control is enabled for the IQ SENSOR NET and the administrator password is lost, quick administrator acces to the IQ SENSOR NET is not possible (access control: see section 5.4).

To avoid the loss of the password we recommend to create a back-up of the administrator password. This also applies to the use of the electronic key.

To be on the safe side, you can store the administrator password on an electronic key and/or note it on paper or a PC. Store the passwords in a safe place.

Contact

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Yellow Springs, OH 45387 USA
Tel: +1 937-767-7241
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1 Overview

1.1 How to use this system operating manual

Structure of the IQ SENSOR NET operating manual

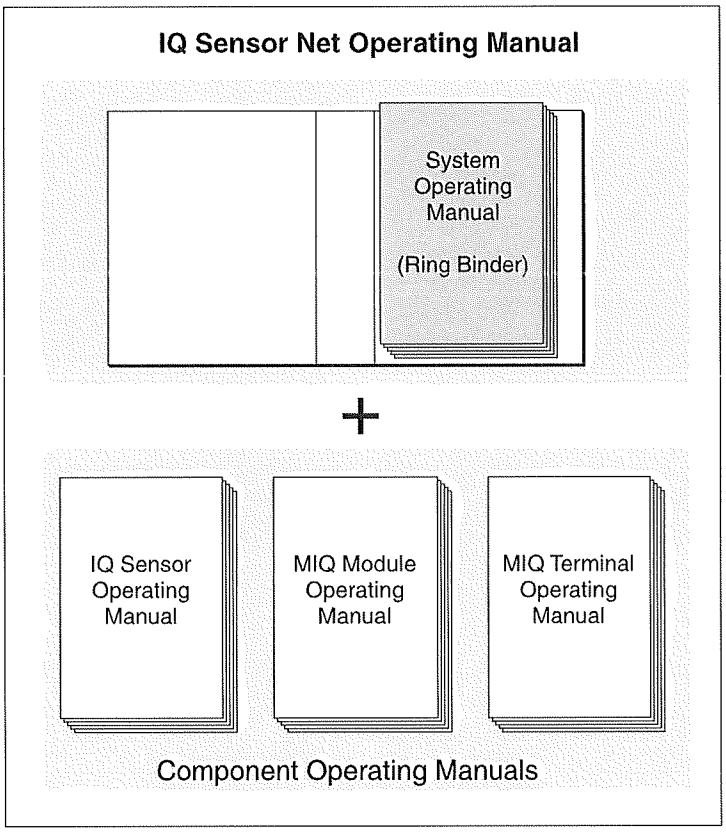


Fig. 1-1 Structure of the IQ SENSOR NET operating manual

The IQ SENSOR NET operating manual has a modular structure like the IQ SENSOR NET system itself. It consists of this system operating manual and the operating manuals of all the components used.

The space in the ring binder behind the system operating manual is intended for filing the component operating manuals. Please file all component operating manuals here so that all information is quickly available in one location.

1.2 The IQ SENSOR NET system 2020 XT USB

1.2.1 Structure of the system

The IQ SENSOR NET is a modular measuring system for online analysis. Modular means that the essential functional units of the measuring system are distributed in components that can be individually compiled for special applications.

The essential functional units of the IQ SENSOR NET system 2020 XT USB include:

- Terminal/controller
- IQ sensors
- Inputs (current inputs)
- Outputs (relay contacts, current outputs, valve outputs)
- Additional terminals (mobile terminals, software terminal)
- Help functions (e.g. power supply unit).

System communication

The functional units are connected with one another via a common line (Fig. 1-2). The line consists of two wires and a shield. It transports digital information between the controller and the other modules. At the same time, the line is used to supply all modules with electrical voltage from a power supply unit. The power supply unit is only required for the power supply and is not used in the system communication.

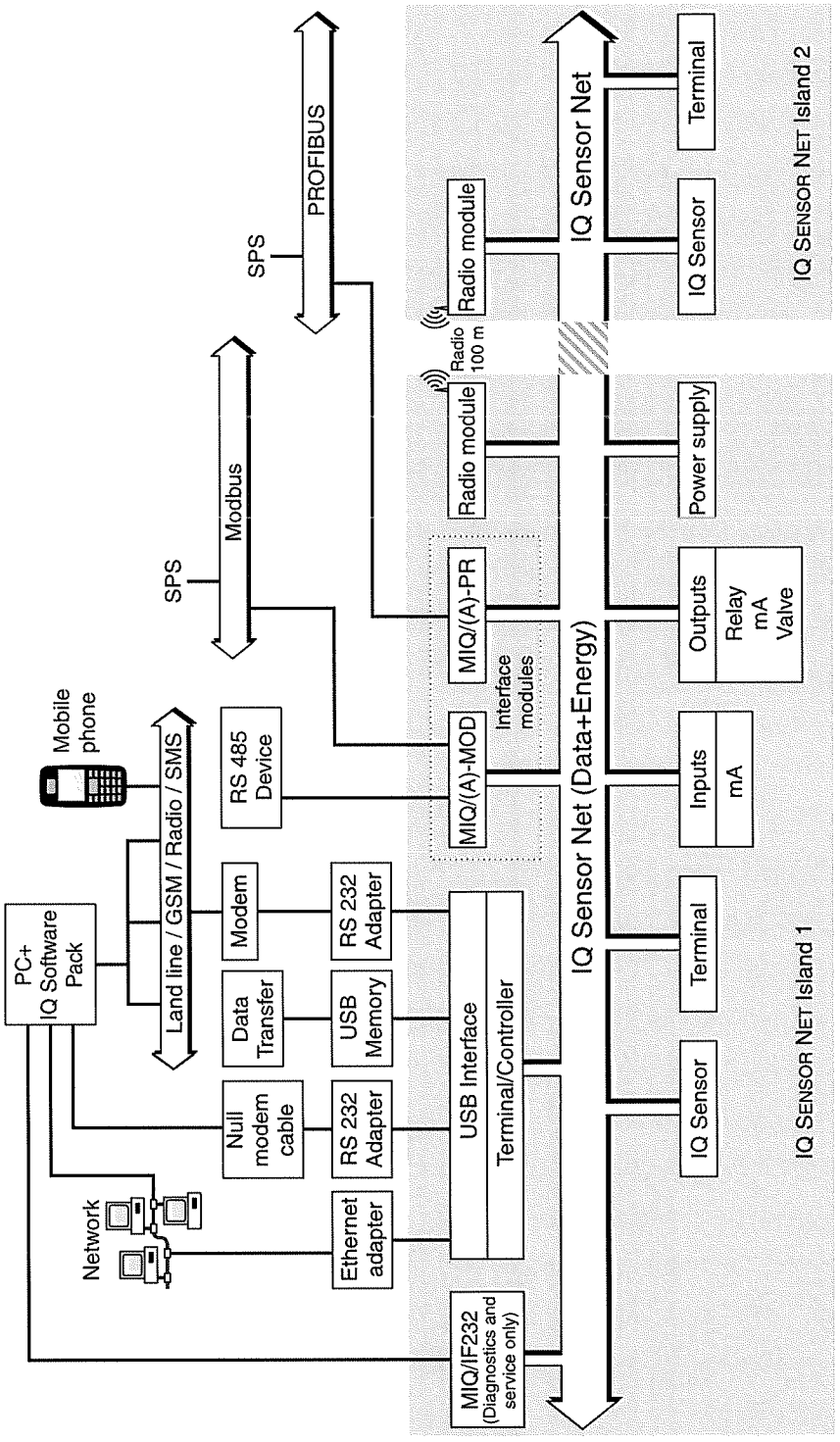


Fig. 1-2 Functional units of the IQ SENSOR NET System 2020 XT USB

1.2.2 Functions in the IQ SENSOR NET

The functions of the IQ SENSOR NET are provided by the system (controller) and the retrofitting components. Details on the functions listed can be found in the relevant system or components operating manuals.

Function	Component
Alarm messages	System
Analog output	Current output module
Data logging	System
Data recording (PC)	IQ software pack
Data transmission (PC)	IQ software pack
Data backup on USB memory device	MIQ/TC 2020 XT
Data communication (Profibus)	MIQ/(A)-PR
Data communication (Modbus)	MIQ/(A)-MOD
Remote data transmission (modem)	MIQ/TC 2020 XT + USB RS232 adapter
Datalogger	IQ software pack
Data server	IQ software pack
Differential sensor	System
Frequency output	Relay output module
Limit monitor	Relay output module
Calibration history	System
List of outputs, list of sensors	System
Log book	System
Log book (messages from components)	IQ sensor Output module
Measured value representation (4 types)	System
Password	System
PID controller	Current output module
Pulse-width output	Relay output module
Sensor cleaning	Relay output module Valve module
Local settings	System
Daily, weekly, monthly load diagram	System
Monitoring functions (sensors, system)	Output module
Access control	System

1.2.3 Possible ways to communicate with the IQ SENSOR NET

Digital communication

The IQ SENSOR NET can communicate with humans and machines via different interfaces.

The following page provides an overview:

- who can communicate with the IQ SENSOR NET
- what interfaces and components are required for this
- which functions are available with which interface

Current and relay interfaces

In addition to the digital communication, output modules provide relay and current outputs. These can be used for control, feedback control and monitoring functions.

Available functions / Who communicates with the IQ Sensor Net via which interface/ component	Direct actions via the terminal user interface	Viewing/transmitting current data: – Measured values – Status info – Alarm messages	Viewing/transmitting logged data: – Measured values – Measured value status	System configuration, – save/ load – view – print	Calibration data, view/ transmit
Human					
Terminal/controller MIQ/TC 2020 XT + USB memory device	X	X	X	X	X
Human + PC					
MIQ/IF232 + IQ software pack	X	X	X	X	X
MIQ/TC 2020 XT + USB RS232 adapter + null modem cable + IQ software pack	X	X	X	X	X
Human + PC + modem					
MIQ/TC 2020 XT + USB RS232 adapter + modem (analog, GSM, or radio) + IQ software pack	X	X	X	X	X
Human + PC/mobile phone + modem					
MIQ/TC 2020 XT + USB RS232 adapter + GSM modem communication via SMS		X			
PROFIBUS DP-V1					
MIQ/(A-)PR		X			
Modbus					
MIQ/(A-)MOD; Modbus RTU operation		X			
MIQ/(A-)MOD; Point-to-point communication via RS485		X			
Network (TCP/IP)					
MIQ/TC 2020 XT + USB Ethernet adapter	X	X	X	X	X
Client + Server + PC ("data logger")					
MIQ/IF232 + IQ software pack (+ network)		X			X

1.2.4 Components of the system 2020 XT USB

Minimum configuration (basic components)

The following basic components are required for a 2020 XT USB system:

- An MIQ/TC 2020 XT, configured as controller
- A power supply module (e.g. MIQ/PS)
- At least one IQ sensor.

IQ sensors, main and secondary measured values

Sensors provide main measured values (e.g. pH, D. O. concentration, turbidity value...) and additionally, depending on the type, secondary measured values (e.g. temperature). In the System 2020 XT USB, digital YSI single sensors and double sensors can be used:

- Single sensors provide a main measured value and normally a secondary measured value (example: TriOxmatic 700 IQ → D. O. + temperature).
- All active 0/4-20 mA inputs of the MIQ/IC2 input module rank among the single sensors. Via a 0/4-20 mA input, any external instruments can be connected to the IQ SENSOR NET via their current output. Each input provides a main measured value.
- Double sensors provide up to two main measured values and normally a secondary measured value (example: VARiON 700 IQ → ammonium + nitrate + temperature).

> Each main measured value occupies a sensor location in the IQ SENSOR NET. A double sensor with two active main measured values thus occupies two sensor locations. The available sensor locations can be occupied by any single or double sensors.

Extension components

The system can be adapted to fulfill different specifications by adding further components, e.g. by:

- Terminals. They are the operation and communication units for the IQ SENSOR NET. Available are:
  - MIQ/TC 2020 XT for operation of the system from various locations, e.g. calibration of IQ sensors on site (compatible terminals, see section 1.4)
  - MIQ/T2020 PC software terminals. The connection to the PC can be established with the MIQ/IF232 interface module and the RS 232 interface of the PC or a remote connection with a modem (set for radio transmission, see chapter 10).
- Output modules with relay, current and valve outputs. Valve outputs enable the time controlled, compressed air operated cleaning of the sensor.

Each current output, relay output and valve output occupies an output channel in the IQ SENSOR NET. The available output channels can be assigned to outputs arbitrarily.

- Power supply modules for power supply
- MIQ/JB and MIQ/JBR branching modules to branch the system and to connect IQ sensors and terminals
- MIQ/Blue PS radio modules for wireless connection within the IQ SENSOR NET.

Maximum configuration

Maximum configuration of the IQ SENSOR NET system 2020 XT USB:

Component or resource	Maximum number
Terminal/controller MIQ/TC 2020 XT	1 (registered as a controller)
Sensor locations, can be occupied by: – Single sensors – Double sensors – 0/4-20 mA inputs	20
Terminal locations, can be occupied by: – Mobile terminals (MIQ/TC 2020 XT) – MIQ/T2020 PC software terminal.	3
Output channels, can be occupied by: – Current outputs – Relay outputs – Valve outputs	48
Power supply modules (e.g. MIQ/PS)	6
MIQ/JB branching modules	25
MIQ/JBR branching modules with integrated signal processing	2
MIQ/Blue PS radio modules	Several transmission paths (see operating manual of the MIQ/Blue PS)
Modbus module	1
PROFIBUS module	1

Connecting MIQ modules

There are two basic mounting variants for connecting the MIQ modules:

- **Stack mounting** - permanent mechanical and electrical connection. The housings of the MIQ modules are permanently mounted on one another to form a stack. No cabling is necessary.
- **Distributed mounting** - electrical connection via cable. Locally separated MIQ modules or module stacks are connected with one another via the SNCIQ or SNCIQ/UG cable.

The following diagram shows an IQ SENSOR NET system with two mounting variants (Fig. 1-3).

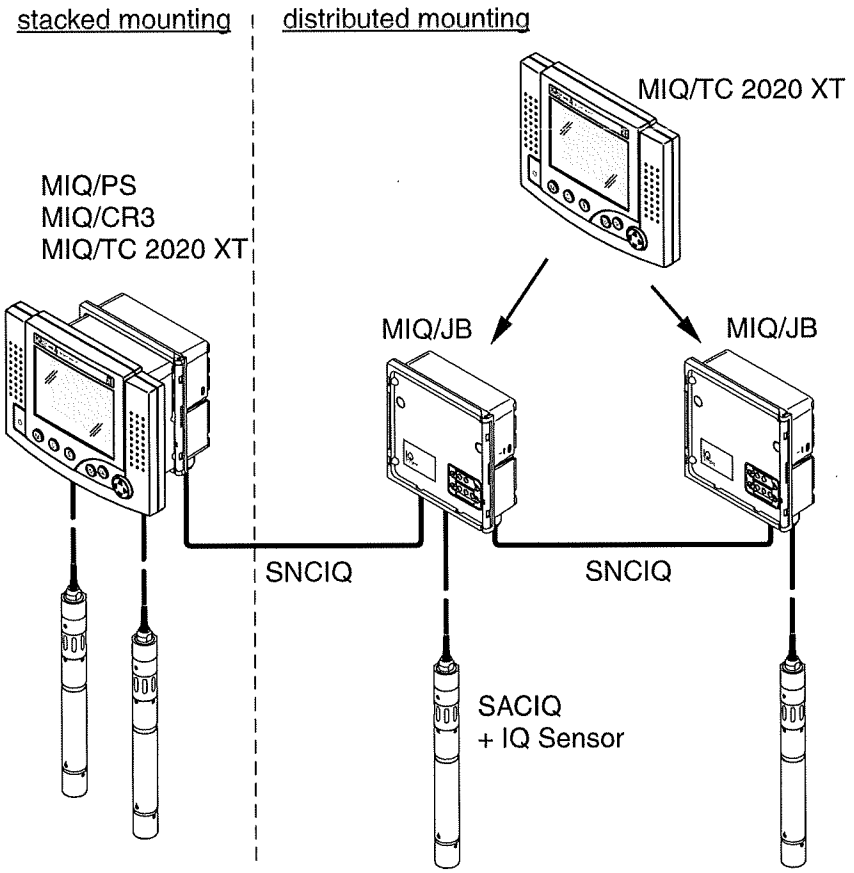


Fig. 1-3 Example of an IQ SENSOR NET system configuration

IQ sensors

Up to 20 IQ sensors of any type can be used in the system 2020 XT USB. They can be connected to any MIQ module that has a free connection for the IQ SENSOR NET. The connection between the IQ sensor and MIQ module is made via the SACIQ sensor connection cable. The IQ sensor connection cable is connected with the plug head connector of the IQ sensor via a screwable socket to form a watertight connection. As a result, the IQ sensor can be quickly removed for maintenance activities and then connected again.

1.2.5 MIQ modules

Some of the IQ SENSOR NET components are so-called MIQ modules with different functions.

All MIQ modules have a standard housing with the following features (Fig. 1-4):

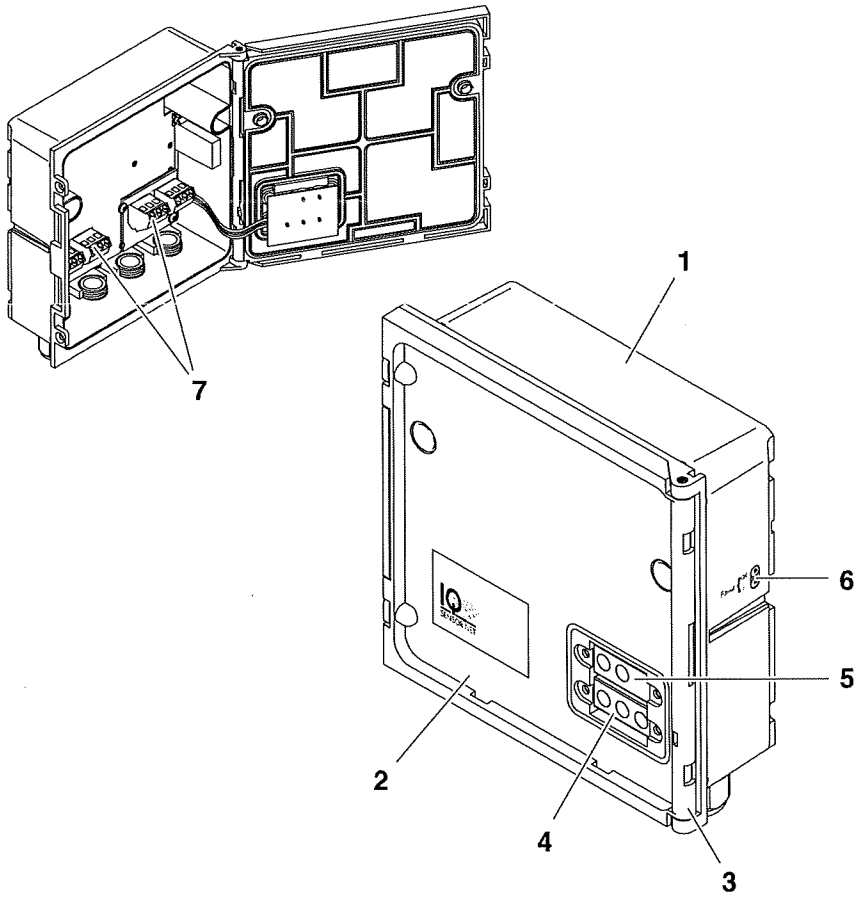


Fig. 1-4 MIQ module

1	Housing
2	Lid
3	Hinge
4	Contacts for voltage and communication
5	Contacts for the local identity function
6	Voltage LEDs
7	Terminal strip (example)

Common characteristics of the MIQ modules

- **Module lid with hinge**
  Due to its wide opening angle, the lid provides a large space for working inside the module (e.g. for connecting lines to the terminal strip).
- **Docking facility**
  MIQ modules can be mechanically docked onto one another. As a result, several MIQ modules can be mounted in the form of a stack to create a single unit (**stack mounting**). At the same time, docking enables the MIQ modules to be electrically connected with one another via the module contacts on the front and back so that no cabling is required. Even when it is part of a stack, each MIQ module can be opened. In addition, a terminal component can be docked onto each free lid front.
- **Terminal strip**
  Further IQ SENSOR NET components can be connected by cable to the terminal strip inside the housing (**distributed mounting**). The terminal strip enables IQ sensors to be connected via the SACIQ sensor connection cable or the IQ SENSOR NET can be further branched and extended here. Certain MIQ modules have a terminal strip with further specific connections (e.g. power connection, relay contacts, current outputs).
- **Local identity function**
  The local identity function is integrated in each MIQ module in the form of a memory chip. This memory chip can store information such as the designation of the measurement location and a specific selection of IQ sensors for the measured value display. This information is output when a terminal is docked and, thus, e.g. enables the rapid finding of local IQ sensors for calibration.
- **Voltage diagnosis via LEDs**
  Two LEDs, yellow and red, on the side of the housing are used to monitor the operational voltage of each MIQ module.

1.3 MIQ/TC 2020 XT terminal/controller

The MIQ/TC 2020 XT can be configured in the IQ SENSOR NET as a controller (see section 1.3.1) or as a terminal (see section 1.3.2).

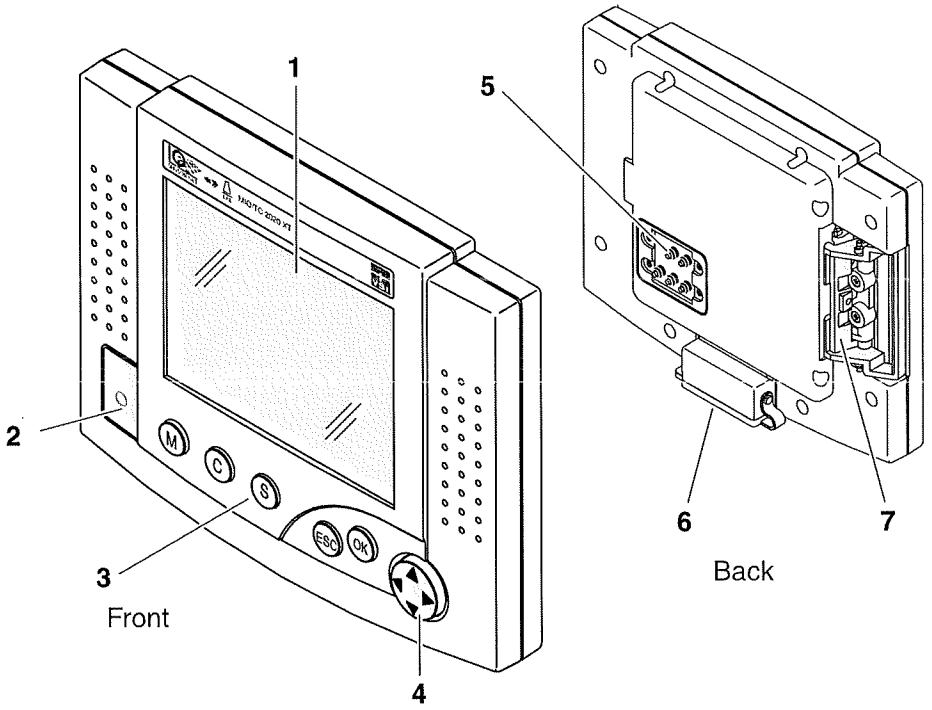


Fig. 1-5 MIQ/TC 2020 XT terminal/controller

1	Graphical display
2	Status LED
3	Keys
4	Arrow keys
5	Module contacts
6	USB-A interface with cover plate
7	Docking mechanism

Keys The keys have the following functions:

Key	Designation	Functions
(M)	<M>	– Switches the photometer on and off
(C)	<C>	– Starts the calibration procedure for the selected sensor
(S)	<S>	– Opens the menu, *System settings*
(OK)	<OK>	– Opens the menu, *Display/Options*
(ESC)	<ESC>	– Quits the current menu without changing any settings
(Arrow keys)	<▲> or <▼>	– Moves the selection in menus, lists and table columns by one position upwards or downwards
	<◀> or <▶>	– Moves the selection in tables by one position to the left or to the right – Erases the character left of the insertion point when entering characters

1.3.1 Operation as terminal/controller

When configured as a controller, the MIQ/TC 2020 XT is a basic component of the 2020 XT USB system and must therefore permanently remain in the system.

The MIQ/TC 2020 XT is connected to the system by docking on the free front cover of an MIQ module.

The **controller function** takes over the following tasks:

- Control and monitoring of all IQ sensors
- Control and monitoring of all current and relay outputs
- Continuous diagnosis of the system, i.e. recording the information and error messages of all modules and entering them in the system log book (e.g.: voltage monitoring)
- Recording measured data in the fixed interval
- Communication with external digital interfaces such as
  - USB memory device
  - Modem
  - PROFIBUS, Modbus, RS485
  - PC

A terminal is required to display and set up the functions of the controller. The following terminal components are suitable:

- MIQ/TC 2020 XT configured as terminal/controller or as terminal (compatible terminals, see section 1.4)
- MIQ/T2020 PC
  (with MIQ/IF232 interface module, PC, modem connection or PROFIBUS environment).

The present component operating manual of the IQ SENSOR NET System 2020 XT USB includes all functions of the MIQ/TC 2020 XT. The connection to Profibus or Modbus is established with the MIQ/(A-)PR and MIQ/(A-)MOD extension modules.

1.3.2 Operation as a terminal

The MIQ/TC 2020 XT configured as a terminal is an extension component for the IQ SENSOR NET System. The MIQ/TC 2020 XT can be used as a mobile control unit and docked on and removed from all free front covers of MIQ modules. The docking is simply done by hand, without using any tools.

The **terminal function** is the graphical user interface of the system. It is used for the following purposes:

- Display of measured values
- Setting of IQ sensors, outputs, terminal characteristics, date, time, etc.
- Execution of maintenance and calibration work
- Display of calibration data
- Display of components lists (IQ sensors and outputs)
- Display of the log book entries

If the MIQ/TC 2020 XT is registered in the system as a terminal, it is mobile and can be removed at any time. If the main controller of the system fails, the MIQ/TC 2020 XT automatically assumes the job of the failed controller (see section 1.3.3).

1.3.3 Operation as backup controller

Automatic backup function

If the MIQ/TC 2020 XT is configured as a terminal, it has a backup controller that assumes the basic functions of the IQ SENSOR NET controller in the case of its failure. Thus the operating safety of the system is considerably increased. For these purposes the MIQ/TC 2020 XT regularly and automatically saves the system configuration during the normal terminal operation.

System configuration

The system configuration incudes the following allocations and settings:

- *Settings of sensors and diff. sensors*
- *Settings of outputs and links*
- *Edit list of sensors*
- *Edit list of outputs*
- *Measured value recording* (datalogger settings)
- List of all components including software versions but without terminal information.
- Application-related sensor calibration (e.g. matrix adjustment)

In the IQ SENSOR NET, the system configuration is stored in the controller (MIQ/TC 2020 XT).

Functions of the MIQ/TC 2020 XT when operating as a backup controller

If the MIQ/TC 2020 XT operates as a backup controller, all basic IQ SENSOR NET functions are carried out. Relay interfaces and current interfaces, PROFIBUS, Modbus and RS485 work without restrictions.

Restrictions of the MIQ/TC 2020 XT when operating as a backup controller

The following functions are not supported:

- Continuation of the data logger operation of the main controller
- Continuation of the modem communication of the main controller if the modem is connected to the interface of the MIQ/TC 2020 XT (configured as controller).
  A redundant data logging function can be set up with the aid of the MIQ/IF232 interface module.

Manual backup function

In addition to the automatic backup of the system configuration you can manually store the system configuration on a USB memory device at any time. In the case of a system failure you can then transfer the stored configuration from the USB memory device to another controller.

1.3.4 USB interface

The USB interface of the MIQ/TC 2020 XT provides the following functions:

- Connection of a USB memory device for data transmission (see section 4.9)
  - Measurement data
  - Calibration data
  - Configuration data
  - Log book
- Connection of a PC for data transmission or for control via the MIQ/T2020 PC software terminal (see operating manual ba64108 "IQ SENSOR NET Softwarepack"). The various connection options (direct connection, modem, network etc.) are described in the operating manual ba75790 "Remote connection to the IQ SENSOR NET 2020 XT USB".
- Connection of an electronic key for simple system access with enabled access control (see section 5.4.2)
- Connection of a USB hub to multiply the USB interface

Note
The USB interface is equipped with a protective cover.
Only remove the protective cover if you want to connect a USB device.
Close the connection immeditaley after disconnecting the USB device.
If the USB connection remains open there is the risk of corrosion.

Operation of the MIQ/TC 2020 XT in the open

Do not leave any USB devices permanently connected to the USB interface. There is the risk of corrosion.

1.3.5 Status LED

The status LED informs you of the state of the system:

Status LED	Meaning
Permanently on	– The IQ SENSOR NET is running fault-free
Permanently off	– No power supply

Flashes	– The IQ SENSOR NET discovered an alarm.
	– The IQ SENSOR NET discovered an error, e.g.:
	  – A communication error in the IQ SENSOR NET
	  – An invalid measure value
	  – The backup controller has assumed controller function
	The LED flashes as long as the error is present (even if the log book message of the error has already been acknowledged). More detailed information on the error is given in the log book.

1.4 Behavior of the IQ SENSOR NET in case of error

1.4.1 Behavior of the IQ SENSOR NET in case of power failure

- The system configuration (*Settings of sensors and diff. sensors* and *Settings of outputs and links*) is stored permanently
- All stored measured data remain permanently available
- Linked current outputs and relay outputs switch to the non-active condition.
  Current output: 0 mA current
  Relay output: Relays open
  For details, refer to the component operating manual of the current or relay output module.
- When the power supply is available again, the system is automatically restarted, starts working again and switches to the measured value display
- During the restart, an entry informing of the power failure is made in the log book.

1.4.2 Behavior of the IQ SENSOR NET if a components fails

- If the operating voltage is too low, the LEDs on the MIQ modules extinguish.
- The blue status LED of the MIQ/TC 2020 XT flashes
- If active components (e.g. sensors or output modules) cannot be contacted, an entry is made in the log book. The error symbol flashes on the display.
- The *Edit list of sensors* or *Edit list of outputs* display shows a question mark "?" for the component.

Component	Behavior
IQ sensor	• The configuration for the IQ sensor (*Settings of sensors and diff. sensors*) remains stored. • Current measured values are not available. • The measured value display shows *ERROR*.
MIQ modules	• If an active module fails, an entry is made in the log book. The error symbol flashes on the display. • The configuration for these modules is retained (e.g. links with output modules).

Component	Behavior
Controller	• No current measured data can be displayed, processed or stored. • If communication with the controller is disturbed, output modules activate the error behavior after 2 minutes (see component operating manual of the output module).
Terminal	• The measured value display is not updated. • The display does not react to entries. • The system continues working. • Stored measured data and the system configuration remain stored in the MIQ/ TC 2020 XT.
Power supply module	like power failure (see section 1.4.1)

1.4.3 Availability of the system

As a basic principle, the IQ SENSOR NET offers a very high availability. This is achieved by

- The two-wire connection technique that is not interference-prone
- The digital signal transmission resulting from this
- Tools for error diagnosis
  - LEDs on the MIQ modules to check the available voltage
  - Log book messages with instructions to eliminate problems
- The possibility to simply assign substitute components for components to be exchanged.
  Replacing components is simple and can be performed very quickly (see section 7.4). The system configuration (*Settings of sensors and diff. sensors* and *Settings of outputs and links*) and the measured data are stored in the controller and remain stored when other components are used.

Preventive actions to optimize the availability of the system

If the requirements of the availability are especially high, you can further improve the availability of the system as follows:

- Install identical components in the system.
  If the requirements of the availability are high, components can be installed doubly in the system (exception: controller component).
- Back up the controller function with the aid of a second MIQ/TC 2020 XT configured as a terminal.
  The MIQ/TC 2020 XT has a redundant controller function. It maintains all essential functions of the system in the case of a controller malfunction and saves all settings. The controller operation starts automatically.
- Keep substitute components ready.
  The system automatically recognizes substitute components of active components (IQ sensors and the output modules). They are easily integrated in the system by assigning them as substitute components.
- Save the system configuration.
  The system configuration (*Settings of sensors and diff. sensors* and *Settings of outputs and links*) can be saved on a PC. Transmission takes place via the USB interface (alternative options: see section 1.2.3). The stored system configuration can be loaded from the PC on a substitute controller if necessary.

2 Safety instructions

This operating manual contains essential instructions that must be followed during the commissioning, operation and maintenance of the IQ SENSOR NET system. Thus, it is essential for the operator to read this component operating manual before carrying out any work with the system.

Some components such as IQ sensors and special MIQ modules are delivered with their own component operating manual. It is also important to read the SAFETY chapter in this manual. Keep the system and all component operating manuals in the vicinity of the IQ SENSOR NET system if possible.

General safety instructions

Safety instructions in this operating manual are indicated by the warning symbol (triangle) in the left column. The signal word (e.g. "Caution") indicates the danger level:

Warning
indicates instructions that must be followed precisely in order to prevent serious dangers to personnel.

Caution
indicates instructions that must be followed precisely in order to avoid slight injuries to personnel or damage to the instrument or the environment.

Other labels

Note
indicates notes that draw your attention to special features.

Note
indicates cross-references to other documents, e.g. component operating manuals.

2.1 User qualification

Target group

The IQ SENSOR NET system was developed for online analysis. Some maintenance activities, e.g. changing the membrane caps in D.O. sensors, require the safe handling of chemicals. Thus, we assume that the maintenance personnel is familiar with the necessary precautions to take when dealing with chemicals as a result of their professional training and experience.

Special user qualifications

The following installation activities may only be performed by a qualified electrician:

- Connection of the MIQ/PS power supply module to the power line (see MIQ/PS module manual).
- Connection of external, line voltage-carrying circuits to relay contacts (see module manual of the relay output module).

2.2 Authorized use

The authorized use of the IQ SENSOR NET system consists only of its use in online analysis.
Please observe the technical specifications according to chapter 8 TECHNICAL DATA. Only operation and running according to the instructions in this component operating manual is authorized.

Any other use is considered to be **unauthorized**. Unauthorized use invalidates any claims with regard to the guarantee.

2.3 General safety instructions

All components of the System IQ SENSOR NET are constructed and inspected in accordance with the relevant guidelines and norms for electronic instruments (see chapter 8 TECHNICAL DATA).
They left the factory in a safe and secure technical condition.

Function and operational safety

The failure-free function and operational safety of the IQ SENSOR NET components are only guaranteed if the generally applicable safety measures and the special safety instructions in this operating manual are followed during their use.

The failure-free function and operational safety of the IQ SENSOR NET components are only guaranteed under the environmental conditions that are specified in chapter 8 TECHNICAL DATA.

If IQ SENSOR NET components are transported from a cold environment into a warm environment, this can cause a functional malfunction through the formation of condensation. In this case, wait for the components to adjust to room temperature before recommissioning.

Safe operation

If safe operation is no longer possible, the IQ SENSOR NET must be taken out of operation and secured against inadvertent operation. Safe operation is no longer possible if components:

- have been damaged in transport
- have been stored under adverse conditions for a lengthy period of time
- are visibly damaged
- no longer operate as described in this manual.

If you are in any doubt, contact the supplier of your IQ SENSOR NET.

Obligations of the operator

The operator of the IQ SENSOR NET system must ensure that the regulations and guidelines listed below are followed when dealing with dangerous substances:

- EEC guidelines relating to safety at work
- National laws relating to safety at work
- Safety regulations
- Safety datasheets of the chemicals manufacturers.

Warning

A circuit (except for the line power supply), that is connected to an IQ SENSOR NET component, must not feed any voltages or currents that are not allowed. It has to be made sure that the circuit at any time meets all requirements of a *Limited circuit* or *Limited Power* as well as of *SELV* (Safety Extra Low Voltage). These include the following limiting value specifications:

- **AC voltage: max. 30 V effective / 42.4 V peak**
- **DC voltage: max. 60 V**
- **Current limit: max. 8 A**
- **Power output limitation: max. 150 VA**

3 Installation

3.1 Scopes of delivery

3.1.1 MIQ modules

The following parts are contained in the scope of delivery of an MIQ module:

- MIQ module
- Accessory kit with:
  - Contact carrier with screws
  - ISO cap nuts with screws and ring washers
  - Cable glands with sealing gaskets
- Operating manual.

3.1.2 Terminal/Controller

The following parts are contained in the scope of delivery of the MIQ/TC 2020 XT terminal/controller:

- MIQ/TC 2020 XT
- Screw to fix the terminal on the MIQ module
- Operating manual.

3.2 Requirements of the measurement location

The respective measurement location of all IQ SENSOR NET components must meet the environmental conditions specified in section 8.1 GENERAL SYSTEM DATA.

3.3 System planning

Overview of the planning steps

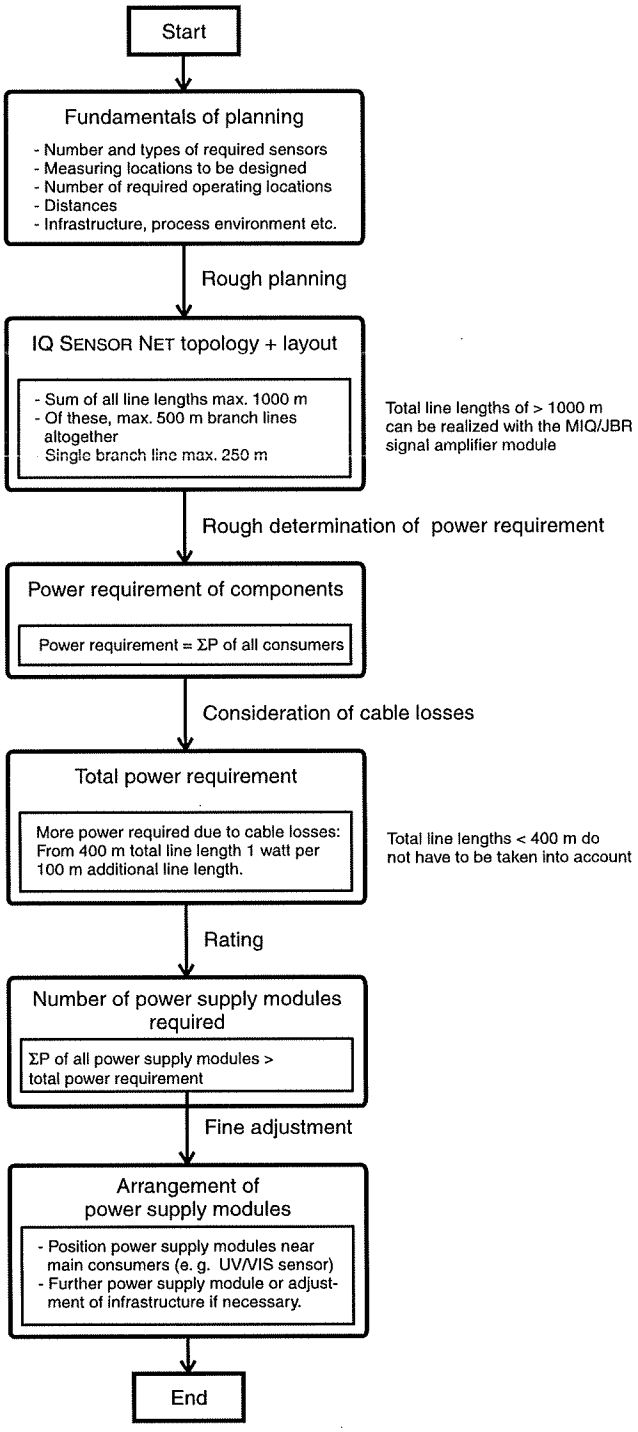


Fig. 3-1 System planning

3.4 Basic requirements for optimum installation

3.4.1 General information

The IQ SENSOR NET supplies all components with low voltage as well as digital communication via a shielded 2-wire line.

Due to this characteristic, the following factors must be taken into account in the planning of an IQ SENSOR NET system:

- Power consumption of all components (power rating). Primarily, this determines the number of power supply modules required (section 3.4.2).
- Distance of the components from one another. Large distances may require a further MIQ/PS power supply module and/or an MIQ/JBR signal amplifier module (section 3.4.3).
- Placement of the MIQ/PS power supply modules in the IQ SENSOR NET (effect on the power supply - section 3.4.3).

Caution
Only IQ SENSOR NET products may be used in the IQ SENSOR NET.

3.4.2 Drawing up the power rating

Power rating - why?

All components in the system require a specific level of electrical power for operation. Thus, it is necessary to draw up a power rating after selecting all the components. At the same time, this can determine whether the entire power requirement of all components (consumers) is covered by the existing MIQ power supply modules. If this is not the case, the power available in the system must be increased by further MIQ power supply modules.

Note
The power rating provides an initial guide value. In specific limiting cases, the power supply may be insufficient despite the positive power rating. Long cable lines, for example, result in additional power losses that may have to be compensated by further MIQ power supply modules. This can be checked for the planned installation by following section 3.4.3.

The total power requirement P of all consumers can be determined from the following table:

Power requirement of IQ SENSOR NET components

Component	Power requirement [W]
IQ sensors	
SensoLyt® 700 IQ (SW)	0.2
TriOxmatic® 700 IQ (SW)	0.2
TriOxmatic® 701 IQ	0.2
TriOxmatic® 702 IQ	0.2
FDO® 70x IQ (SW)	0.7
TetraCon® 700 IQ (SW)	0.2
VisoTurb® 700 IQ	1.5
ViSolid® 700 IQ	1.5
AmmoLyt® *Plus* 700 IQ	0.2
NitraLyt® *Plus* 700 IQ	0.2
VARiON® *Plus* 700 IQ	0.2
NitraVis® 70x IQ (TS)	8.0
CarboVis® 70x IQ (TS)	8.0
NiCaVis® 70x IQ	8.0
MIQ modules	
MIQ/JB	0
MIQ/JBR	0
MIQ/CR3	3.0
MIQ/C6	3.0
MIQ/R6	1.5
MIQ/IC2	0.2 + 2.2 W per connected WG 20 A2 power supply/isolator
MIQ/CHV	2.0
MIQ/CHV PLUS	1.0
MIQ/Blue PS	0.6
MIQ/A	1.5
MIQ/(A)-PR	3.0
MIQ/(A)-MOD	3.0
Terminal, Controller	
MIQ/TC 2020 XT	3.0
MIQ/IF232 (+ MIQ/T2020 PC)	0.2

Determining the number of MIQ power supply modules

From the value determined for the power requirement, determine the number of the MIQ power supply modules as follows:

Total power requirement P	Number of MIQ power supply modules
P ≤ 18 W	1
18 W < P ≤ 36 W	2
36 W < P ≤ 54 W	3
54 W < P ≤ 72 W	4
72 W < P ≤ 90 W	5
90 W < P ≤ 108 W	6

Sample configuration	Power requirement [W] (component)	Total power requirement P [W] (sum of the components)	Number of power supply modules required
1 MIQ/TC 2020 XT (terminal/controller)	3.0	3.0	1
+ 1 MIQ/TC 2020 XT (terminal)	+ 3.0	6.0	1
+ 1 NiCaVis® 705 IQ	+ 8.0	14,0	1
+ 1 VisoTurb® 700 IQ	+ 1.5	15,5	1
+ 1 SensoLyt® 700 IQ	+ 0.2	15,7	1
+ 1 MIQ/CR3	+ 3.0	18.7	2
+ 1 MIQ/CR3	+ 3.0	21.7	2
+ 1 MIQ/TC 2020 XT (terminal)	+ 3.0	24,7	2

Note
The determined number of power supply modules required in the IQ SENSOR NET can increase if the cables are very long (see section 3.4.3).

Power supply with the aid of the MIQ/Blue PS radio module

The MIQ/Blue PS radio module can provide power for components with a total of up to 7 W power consumption on an IQ SENSOR NET island. The relevant details are given in the operating manual of the MIQ/Blue PS.

3.4.3 Effect of the cable length

The length of the cables in the IQ SENSOR NET affects

- the operating voltage available for a component
- the quality of data transmission.

Note
All information applies to SNCIQ cable material only. As regards the copper wire diameter and dielectric, this cable is especially designed for the combined energy and data transmission via great distances and ensures the lightning protection characteristics stated in chapter 8 TECHNICAL DATA.

Voltage drop due to cable lengths

Very long cables in the IQ SENSOR NET cause voltage drops with growing distance from the power supply module. If the voltage is under the limit values, further IQ power supply modules must be used to compensate.

Guideline

If the power supply modules are positioned in the vicinity of the main consumers and the total cable length is no more than 400 m, no additional cable losses have normally to be taken into account. Main consumers are components with a power consumption of 5 W or more.

Note
When determining the number of power supply modules required, the most unfavorable design has to be taken into account for mobile components (Terminals). I. e., take into account

- the maximum number of mobile components and
- their greatest possible installation distance from the power supply module.

Determining the length of the cable section

A diagram is used to determine whether an additional MIQ power supply module is necessary for the planned installation. To do so, the length of the cable section must be determined.

A cable section is the longest continuous length of cable from an MIQ power supply module to a consumer. Sensor connection cables up to 15 m are not taken into account in this.

Example The following figure shows the length of the cable section L made up of the partial lengths L1, L2 and L3 as the cable section L4 is shorter than L3:

L = L1 + L2 + L3

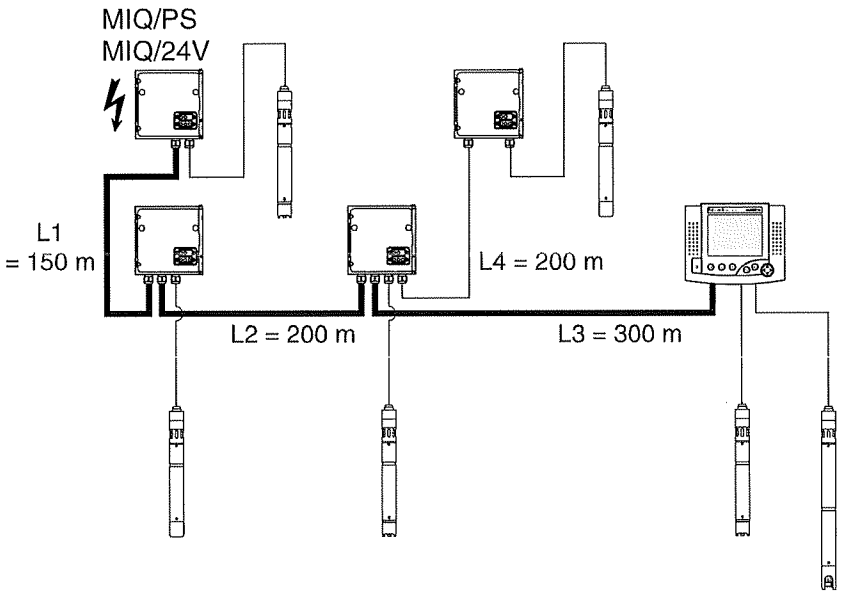


Fig. 3-2 Example of determining the cable section

Checking the power supply

1	Determine the length of the cable section for the planned installation.
2	Determine the sum of the power consumption of all consumers along the cable section (including IQ sensors).
3	Enter both determined values as a point in the following diagram.

Note
To make it easier it is assumed that all consumers are located at the end of the cable section.

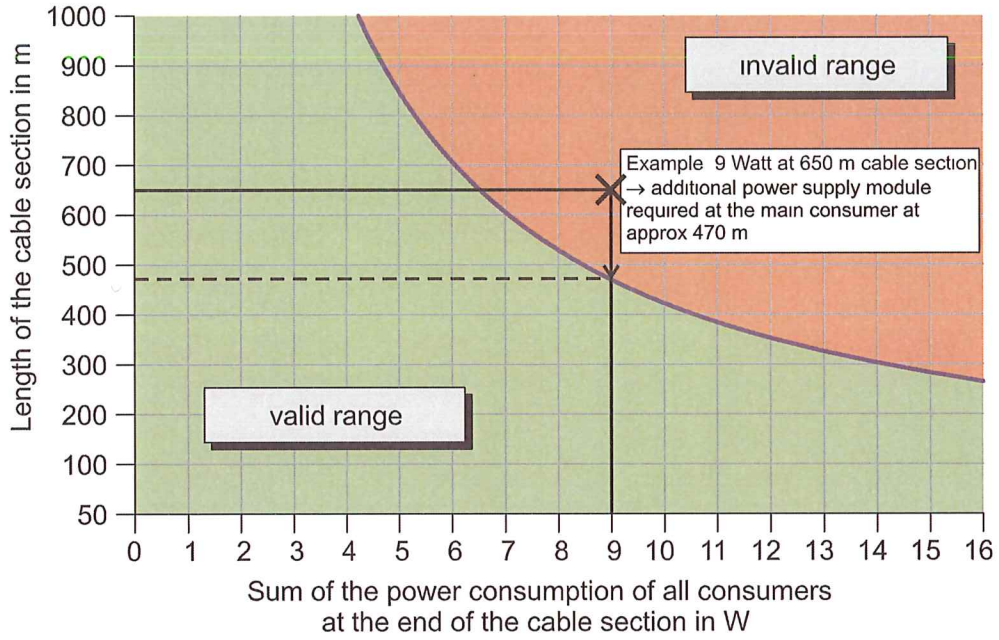


Fig. 3-3 Diagram to check the power supply

4	Evaluation: If the point is in the lower, valid range, no additional power supply module is required. If the point is in the upper, invalid range, an additional power supply module is required. Install this power supply module in the vicinity of the main consumers of this section, or, if not possible, - starting from the primary MIQ power supply module - approx. at that point of the section where the maximum cable length is exceeded (see following example).

Example

Problem:

Consumers with a total power requirement of 9 W are positioned on a cable section of 650 m. Is the power supply with one power supply module sufficient? At which point must a further power supply module be installed if necessary?

Proceeding:

- Enter both values as a point in the diagram (point "x" in Fig. 3-3).
- Result: the point is in the invalid range. I. e. the power supply is not sufficient.
- Draw down a vertical line from the point until the line crosses the limit between the upper and lower range. The intersecting point specifies the maximum cable length for the existing power requirement (at approx. 470 m). This is the place where the additional power supply module is required.
- If any main consumers are near the place, the power supply module should be installed in their vicinity (ideally, directly on them).

Note
After commissioning, you can check the voltage directly on the MIQ modules or on the terminal connections of the IQ sensors (see section 7.2.2). The limits of the voltage levels are given in section 7.2.2 MEASURING THE VOLTAGE of this operating manual.

Quality of data transmission

If the sum of all line lengths (including the SACIQ sensor connection cable) exceeds 1000 m, an MIQ/JBR signal amplifier module must be installed in the system. More details of this are given in the MIQ/JBR component operating manual.

3.4.4 Optimum installation of MIQ power supply modules

Basic rules

- Install the MIQ power supply modules as near as possible to the IQ SENSOR NET components with the highest power consumption. This also applies in the case of several MIQ power supply modules in the system.
- If possible, assemble the IQ SENSOR NET in a star configuration from the MIQ power supply modules.

3.4.5 Installation guidelines for lightning protection

When using the IQ SENSOR NET measuring technique, particularly in outdoor areas, adequate protection against (electrical) surges must be provided. A surge is a summation phenomenon of surge voltage and surge current. It is generated through the indirect effect of a lightning event or switching operation in the mains, in the grounding system and in information technology lines.

To be adequately protected against the damaging effects of surges, an integrated concept of the following protective measures is required:

- technical protective measures inside the instrument, and
- exterior protective measures of the installation environment.

With YSI online measuring technique, the technical protective measures inside the instrument are already integrated as the so-called lightning protection (see chapter 8 TECHNICAL DATA).

The exterior protective measures of the installation environment can be carried out observing the following guidelines:

1 All lines of IQ SENSOR NET systems must be
a) installed inside (or else close to) the grounded metallic mounting constructions, e.g. handrails, pipes and posts if possible
b) or, particularly in the case of longer lines, laid in the ground.

Background: the small distance from the grounded metal construction or the installation in the ground prevents the development of induction loops between the cable and the ground hazardous in the case of lightning strikes.

2 The SNCIQ or SNCIQ-UG cable material must be used exclusively. This cable material, particularly the high line cross section of the cable shielding (1.5 mm²), is an important prerequisite for the hazard-free discharging of the surge without inadmissibly high overvoltages developing along the line at the same time that could have a damaging effect on the individual IQ SENSOR NET components. We strongly recommend not to use any other cables, which normally have a considerably lower shielding wire cross-section.

3 All metallic mounting constructions, handrails, pipes, posts etc. on which MIQ modules are installed must be connected to the local potential equalization system and the grounding system or must be individually sufficiently grounded locally according to the codes of practice.
For the individual grounding of the measuring point the mounting construction must be solidly connected by means of a large-area auxiliary electrode with the measuring medium.
Metallic control shafts/pipes and other large-area metallic bodies that reach into the measuring medium are, for example, ideal for use in the grounding of the mounting construction.
This creates a set path for the main surge. As a result it is possible to avoid the surge being discharged via the IQ IQ SENSOR NET cable and via the valuable sensors in the measuring medium.

4 The contacts of the MIQ modules always have to be protected with the respective contact covers when they are not used by terminal components. The contact covers improve the insulation against electric fields of a thunderstorm by enlarging air gaps and creepage distances.

5 We recommend to install a metal or nonmetal sun shield at each open air location of MIQ modules. Sun shields protect the electric field lines in the area of the MIQ module through an advantageous development of the electrical field lines in the area of the MIQ module and promote the dissipation of the surge via the mounting construction.

6 The line voltage that supports the measuring system must correspond to overvoltage category II. Normally this is ensured by the public operators of the supply network systems. In company-owned networks, e.g. in all power supply systems owned by wastewater treatment plants, this must be kept separate by a potential equalization and asurge protection system for the plant.

7 The IQ SENSOR NET safety and lightning protection concept is partly based on the high-quality protective insulation of the line power supply units and the total system. It does not have or require any protective ground (PG) conductor or earth terminal. Avoid any direct connection of the IQ SENSOR NET connections or the metallic sensor enclosures with the local grounding or potential equalization system and with metallic construction elements (see point 9).

8 Additional external lightning protection measures directly on the IQ SENSOR NET system or its components, e.g. the use of overvoltage surge arresters, are not necessary for protection against the indirect effects of lightning and could possibly result in malfunctions.

9 For the realisation of the internal lightning protection of the system (e.g. wastewater treatment plant control stands) and for the protection of IQ SENSOR NET external resources, cable entry points into buildings or distributions coming from the IQ SENSOR NET must be carried out as follows:

- The shield of SNCIQ or SNCIQ-UG cables can be connected to the local potential equalization with a gas overvoltage surge arrester. Use shielding terminals for the contacting of the shield (e.g. those of the PROFIBUS-System). The shield of the cable must not be opened under any circumstances.
- 0/4-20 mA interfaces must be realized with shielded cables. The cable shield must be connected directly to the potential equalization(s) provided. If plant potential equalization systems are provided on both sides, the shield must also be connected on both sides. The inner conductors must have no contact with the potential equalization.
- PROFIBUS cables and Modbus cables have to be installed according to the prescriptions of the respective bus system.
- Relay lines should be connected to the local potential equalization in order to provide general and consistent protection via gas overvoltage surge arresters.

3.5 Connecting system components

3.5.1 General information

The IQ SENSOR NET system components are connected to form a functioning unit in the following ways:

- **Stacked mounting of MIQ modules**
  Up to three MIQ modules can be installed and mechanically connected with one another to form a stack at a single location. The contacts on the front and rear automatically create the electrical connection between the MIQ modules in the stack (section 3.5.2).
- **Distributed mounting of MIQ modules**
  Individual MIQ modules or an assembled module stack are installed at various locations (for example, a central control unit and an MIQ branching module for connecting IQ sensors at the edge of the basin). The spatial distance is bridged with the aid of the SNCIQ or SNCIQ/UG cable (section 3.5.3).
- **Connection of IQ sensors:**
  IQ sensors are connected to an MIQ module with the aid of the SACIQ cable. This cable is available in different lengths. The MIQ module must have a free SENSORNET connection on the terminal strip. On the sensor side, the connection is made via a plug that is standard for all IQ sensors (section 3.5.4).
- **Docking of a terminal unit:**
  A terminal unit is attached to the lid of a free MIQ module with the aid of a quick-release locking mechanism (section 3.5.5).

Caution

Distributed mounting is only allowed in a star configuration. The system must nowhere be closed to form a ring. Only use the assembly material provided for the installation.

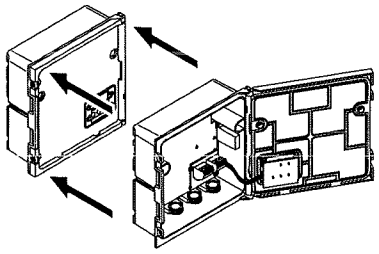
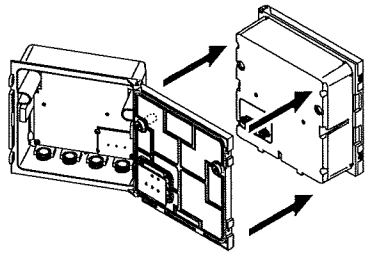
3.5.2 Stacked mounting of MIQ modules:

Caution

For optimum stability, a maximum of three MIQ modules can be mounted in any one stack. Only one MIQ power supply module may be mounted per module stack.

Mounting direction

MIQ modules can be stacked on top of one another from both sides. All the required installation materials are contained in the scope of delivery of the MIQ modules.

Variant 1 - stack expansion forwards. The back of an MIQ module is attached to the lid of another MIQ module (page 3-15).	
Variant 2: - stack expansion backwards. The lid of an MIQ module is attached to the back of another MIQ module (page 3-18).	

Which variant is suitable for a specific case depends on whether and how an MIQ module is already permanently installed at a location (e.g. on a wall or in a panel), among other factors.

Note

In the case of panel mounting, the front MIQ module can only be installed individually in the switch cabinet aperture. Only then can further MIQ modules be added to its back (variant 2). If necessary, dismantle the front MIQ module from an already mounted stack before mounting.

Materials required

- 2 x ISO blind nuts M4
- 2 x cheese-head screws M4x16 with plastic washer
- 1 x contact base with two plastic tapping screws.

Tools

- Phillips screw driver.

Both installation variants are described below. To dismantle a module stack, proceed in the reverse order to mounting the stack.

Variant 1: Stack expansion forwards

Preparing the stack mounting

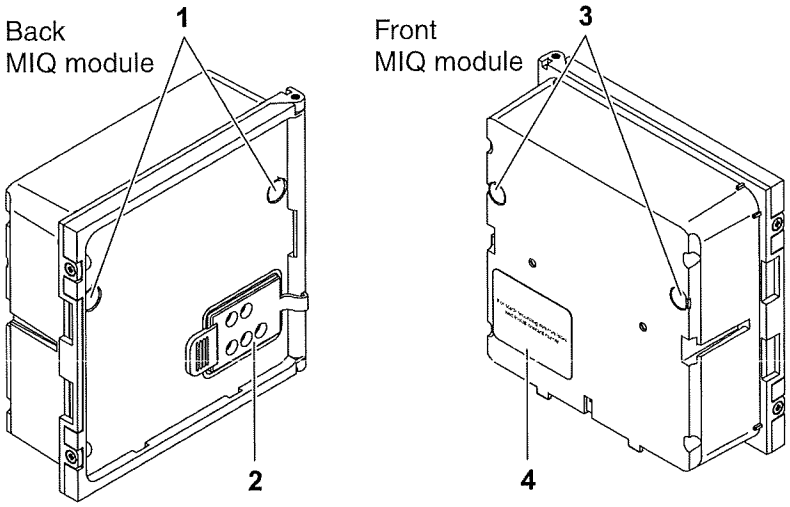


Fig. 3-4 Preparing MIQ modules for stack mounting (variant 1)

1	Remove the covers from the drilled mounting holes (pos. 1 and 3 in Fig. 3-4).
2	Remove the contact cover (pos. 2).
3	Pull off the adhesive label (pos. 4).

Mounting the contact base

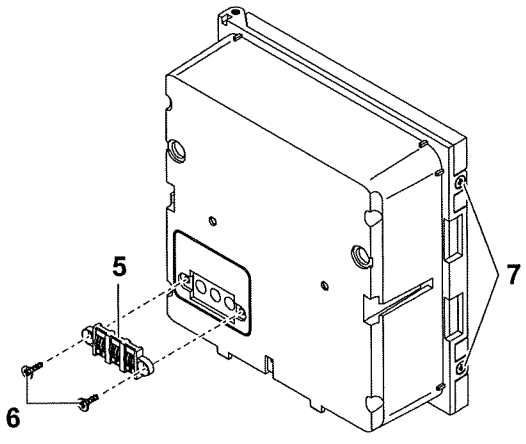


Fig. 3-5 Mounting the contact base (variant 1)

Caution

Only use the plastic tapping screws supplied for attaching the contact base. They ensure the correct fit.

4	Attach the contact base (pos. 5 in Fig. 3-5) on the front MIQ module with the two plastic tapping screws (pos. 6).
5	On the front MIQ module, remove the two countersunk screws (pos. 7 in Fig. 3-5) and swing open the module lid.

Premounting the ISO blind nuts

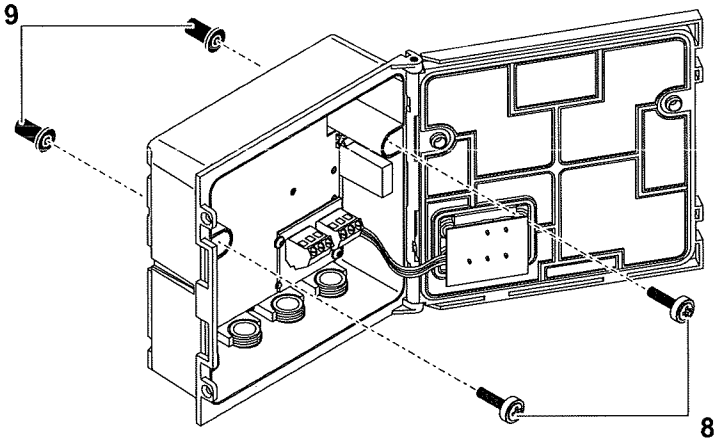


Fig. 3-6 Premounting the ISO blind nuts (variant 1)

6	Insert the cheese-head screws (pos. 8 in Fig. 3-6) with the plastic washers in the drilled mounting holes in the enclosure and loosely screw in the ISO blind nuts (pos. 9).

Stacking the MIQ modules

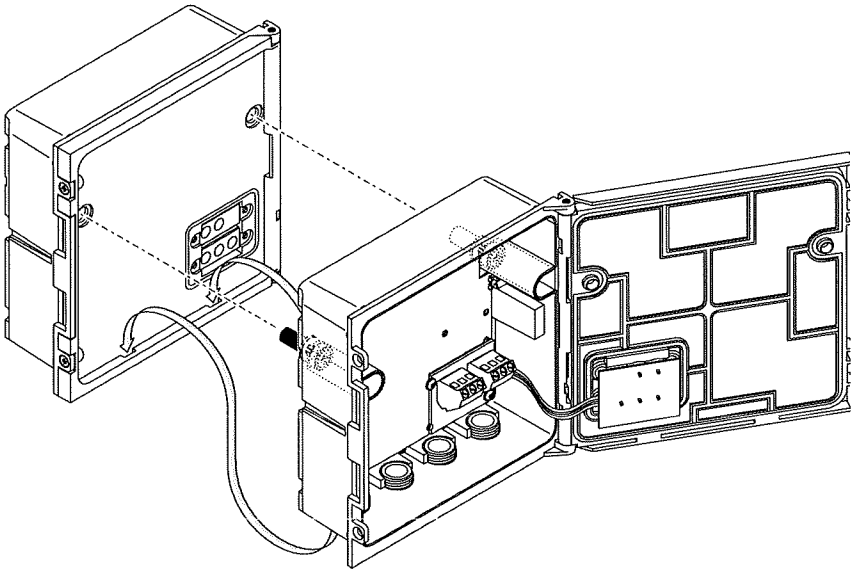


Fig. 3-7 Stacking the *MIQ modules (variant 1)*

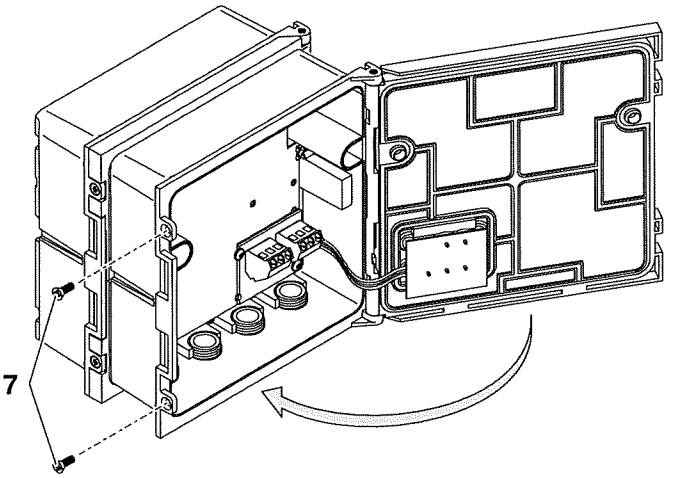


Fig. 3-8 *Closing the enclosure (variant 1)*

7	Attach the prepared MIQ module to the lid of the back MIQ module. At the same time, ensure that the two clips on the front MIQ module click into place in the lid of the back MIQ module. Subsequently, tighten the two screws (pos. 8 in Fig. 3-6).
8	Check the position of the SN terminator switch and correct it if necessary (see section 3.9.1).
9	Close the lid of the front MIQ module and fix it with the two countersunk screws (pos. 7 in Fig. 3-8).

Variant 2: stack expansion backwards

Preparing the stack mounting

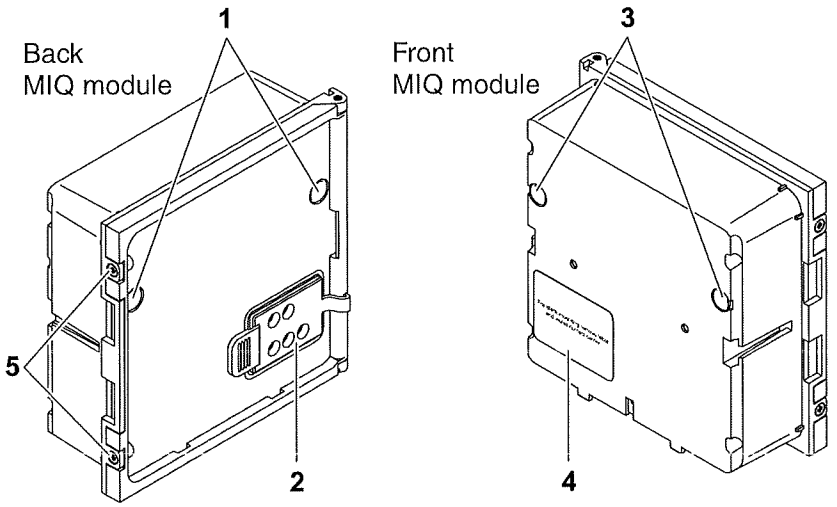


Fig. 3-9 Preparing the MIQ modules for stack mounting (variant 2)

1	Remove the covers from the drilled mounting holes (pos. 1 and 3 in Fig. 3-9).
2	Remove the contact cover (pos. 2).
3	Pull off the adhesive label (pos. 4).
4	On the back MIQ module, remove the two countersunk screws (pos. 5) and swing open the module lid.

Mounting the contact base

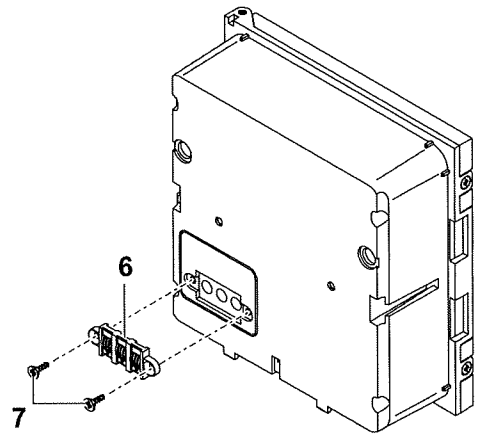


Fig. 3-10 Mounting the contact base (variant 2)

Caution

Only use the plastic tapping screws supplied for attaching the contact base. They ensure the correct fit.

5 Attach the contact base (pos. 6 in Fig. 3-10) on the front MIQ module with the two plastic tapping screws (pos. 7).

Premounting the ISO blind nuts

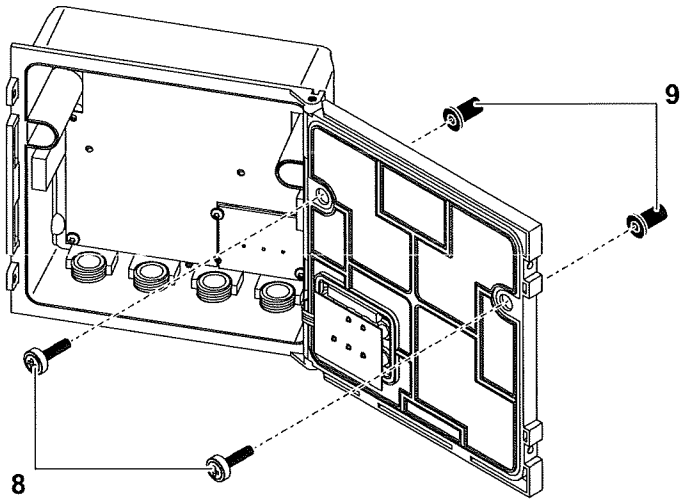


Fig. 3-11 Premounting the ISO blind nuts (variant 2)

6 Insert the cheese-head screws (pos. 8 in Fig. 3-11) with the plastic washers in the drilled mounting holes in the module lid and loosely screw in the ISO blind nuts (pos. 9).

Stacking the MIQ modules

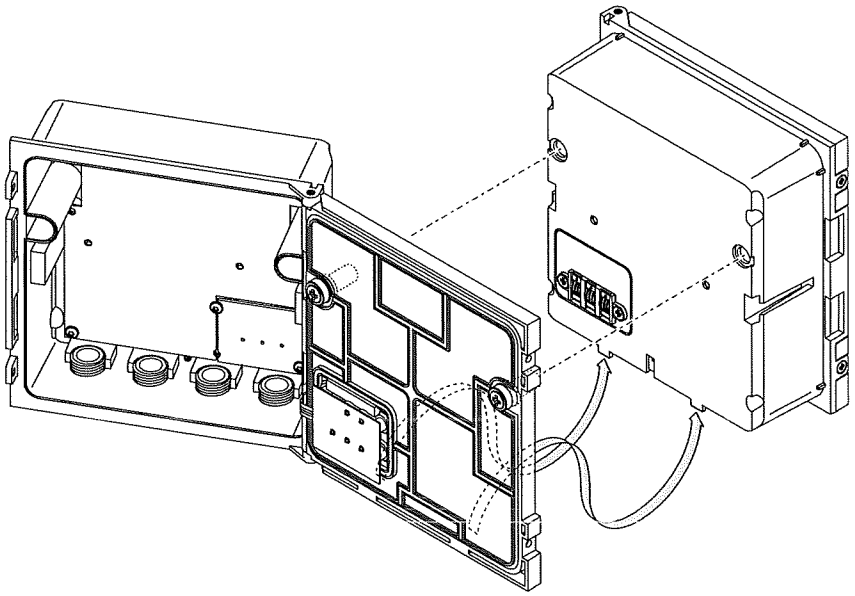


Fig. 3-12 Stacking the *MIQ modules (variant 2)*

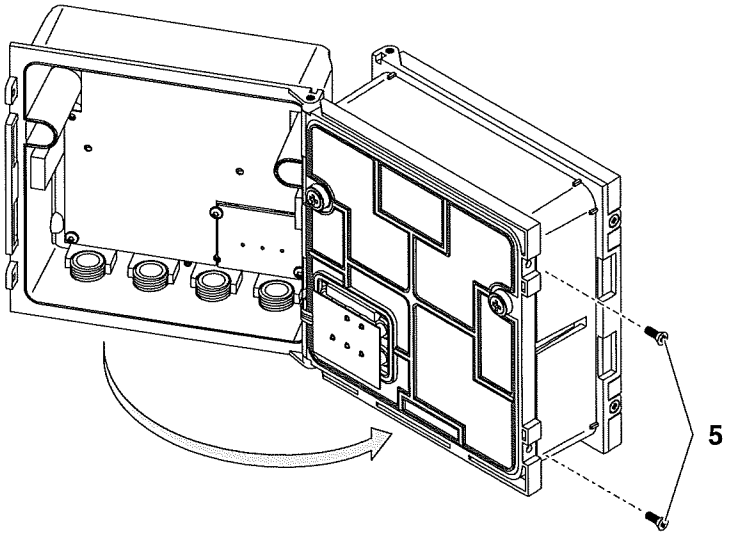


Fig. 3-13 Closing the enclosure (variant 2)

7	Attach the prepared MIQ module to the back of the front MIQ module. At the same time, ensure that the two clips on the front MIQ module click into place in the lid of the back MIQ module. Subsequently, tighten the two screws (pos. 8 in Fig. 3-11).
8	Check the position of the SN terminator switch and correct it if necessary (see section 3.9.1).

9 | Close the back MIQ module and fix it with the two countersunk screws (pos. 5 in Fig. 3-13).

3.5.3 Distributed mounting of MIQ modules

General information

The following IQ SENSOR NET cables can be used for distributed mounting:

- SNCIQ cable
- SNCIQ/UG earth cable - suitable for underground laying according to VDE 01816, Part 2 and DIN/VDE 0891, Part 6.

The cables are delivered as piece goods (please specify length when ordering!).

Each MIQ module has a row of terminal strips in the housing. The two 3-fold terminal strips on the right are always reserved for the connection of further IQ SENSOR NET components (designation "SENSORNET 1" and "SENSORNET 2").

Some MIQ modules have additional "SENSORNET" connections ("SENSORNET 3" and "SENSORNET 4") on the left of the terminal strip.

Caution

The IQ SENSOR NET cable may only be connected to the SENSORNET connections. No wire of the cable may be connected with an external electrical potential. Otherwise, malfunctions could occur.

Note

IQ SENSOR NET cables must always be installed separately at a minimum distance of 20 cm from other lines that carry a voltage greater than 60 V.

Materials required

- 1 x SNCIQ or SNCIQ/UG connection cable (see chapter 10 ACCESSORIES AND OPTIONS)
- Wire end sleeves for 0.75 mm^2 wire cross-section with matching crimping tool
- 1 x cable gland with seal (scope of delivery of MIQ module).

Tools

- Cable stripping knife
- Wire stripper
- Phillips screw driver
- Small screw driver.

Preparing the cable ends

1	Cut off the cable to the required length.
2	Remove approx. 45 mm of cable insulation (in the case of the SNCIQ/UG earth cable, remove both the inner and outer insulation).
3	Only for the SNCIQ/UG earth cable: strip the outer insulation for further 35 mm.
4	Shorten the exposed shielding braid up to the cable sheath.
5	Shorten the two fillers (plastic inlays) up to the cable sheath.
6	Bare the red and green wires and fit them with wire end sleeves.
7	Fit the filler stranded wire with a wire end sleeve.

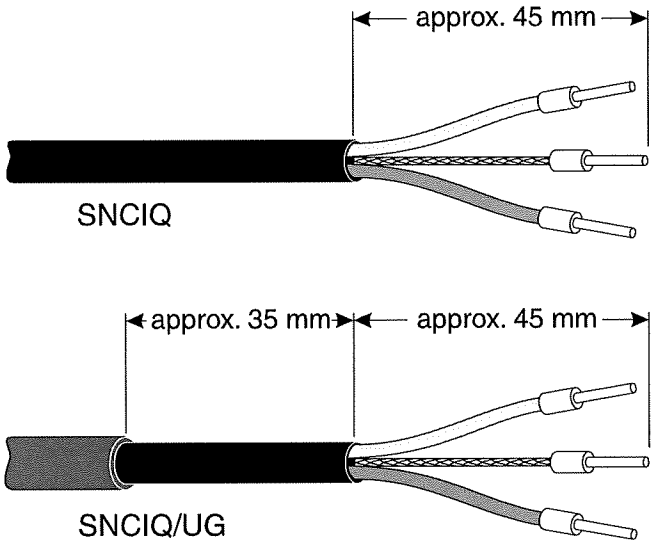


Fig. 3-14 Prepared cable end

Connecting the cables

The SNCIQ and SNCIQ/UG cables are connected to the terminal strip in the same way as the SACIQ sensor connection cable (see section 3.5.4):

1	Open the MIQ module.
2	Select any SENSORNET connection. At the same time, look out for the SENSORNET designation.

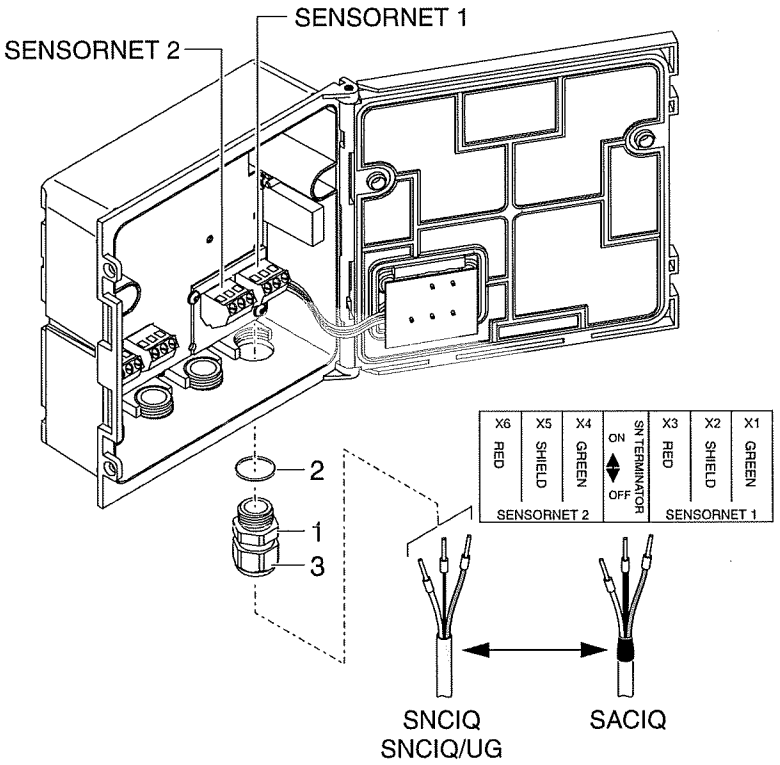


Fig. 3-15 Connecting cables to the MIQ module

3	Screw the cable gland (pos. 1 in Fig. 3-15) with the sealing ring (pos. 2) into the module housing.
4	Loosen the coupling ring (pos. 3 in Fig. 3-15).
5	Feed the cable through the cable gland into the module housing.
6	Connect the cable ends to the terminal strip. At the same time, look out for the designations of the terminals (red / shield / green).
7	Tighten the coupling ring (pos. 3 in Fig. 3-15).
8	Check the position of the SN terminator switch and correct it if necessary (see section 3.9.1).
9	Close the MIQ module.

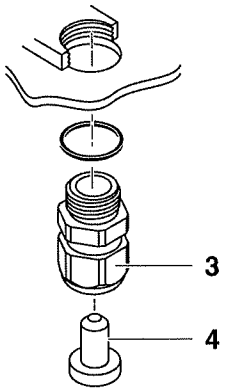


Fig. 3-16 Closing the cable opening

10 Screw the remaining cable glands with the sealing rings into the remaining free openings and close them with the enclosed blind plugs (pos. 4 in Fig. 3-16) and tighten the coupling ring (pos. 3) if they are not used.

3.5.4 Connecting IQ sensors

Materials required

- 1 x SACIQ connection cable (see chapter 10 ACCESSORIES AND OPTIONS)
- 1 x cable gland with seal

The module end of the connection cable already has the sheath removed in the factory and all the wires are fitted with wire end sleeves.

Tools

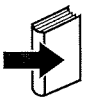
- Phillips screw driver
- Small screw driver.

Differentiating IQ sensors of the same type in the system

For the simpler correlation of measured value and measurement location, the system provides the option of giving each IQ sensor a user-defined name (see section 5.5.1). This name appears in the measured value display.

When the IQ sensor is delivered, the name is identical with the serial number. Therefore, after the initial commissioning, IQ sensors of the same type can only be differentiated by the serial number that appears on the measured value display. In order to prevent confusing the IQ sensors when assigning the name, you can proceed according to one of the two methods:

- Note the serial number of the IQ sensor at the respective measurement location before installation. Then, install all IQ sensors. After the commissioning, open the list of sensors on the controller. Then assign a suitable sensor name using the sensor type and the noted serial number.
- Disconnect the IQ sensors of the same type from the connection cables before commissioning the system. Then, put the system into operation. After the commissioning, connect the IQ sensors individually to the SACIQ connection cable. To do so, proceed step-by-step sensor for sensor. After each newly connected IQ sensor, select the *Edit list of sensors* menu on the terminal and assign a suitable sensor name to the sensor.



Note
The list of sensors and the assignment of sensor names is described in section 5.5.1 on page 5-12.

Connecting the SACIQ cable to the MIQ module

The connection of the SACIQ cable to the terminal strip of an MIQ module is described in section 3.5.3 (see CONNECTING THE CABLES, Seite 22).

Caution
The SACIQ sensor connection cable may only be connected to the SENSORNET connections. No wire of the cable may be connected with an external electrical potential. Otherwise, malfunctions could occur.

Note
IQ SENSOR NET cables must always be installed separately at a minimum distance of 20 cm from other lines that carry a voltage greater than 60 V.

Connecting the sensor to the connection cable

1	Remove the protective caps from the plug connections of the IQ sensor and SACIQ sensor connection cable and keep them safe.
2	Plug the socket of the SACIQ sensor connection cable onto the plug head connector of the IQ sensor. At the same time, rotate the socket so that the pin in the plug head connector (1) clicks into one of the two holes in the socket.
3	Then, screw the coupling ring (2) of the IQ sensor connection cable on the IQ sensor up to the stop.

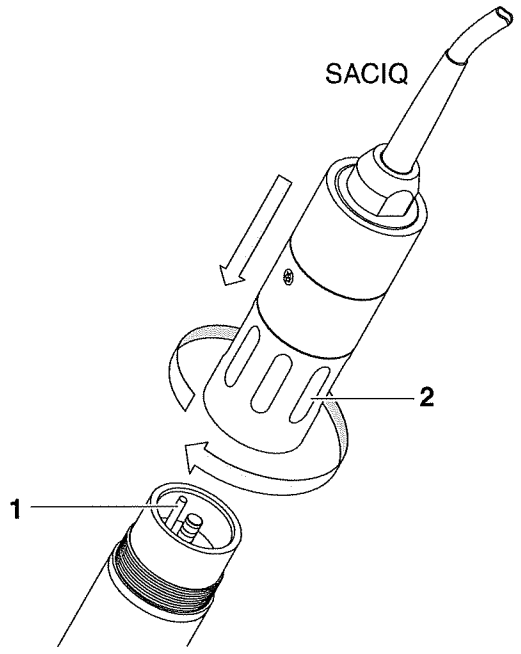


Fig. 3-17 Connecting the SACIQ cable with the IQ sensor

Note
For further instructions on the mounting of IQ sensors at the application location, please see the respective manuals (immersion depths, etc.).

3.5.5 Installing terminal components

The terminal component is the operating and control unit of the IQ SENSOR NET. It serves as an input and output device and is necessary to operate the IQ SENSOR NET.

You can install the following terminal components:

- Terminal MIQ/TC 2020 XT
  (compatible terminals, see section 1.4)
- MIQ/IF232 interface component with software terminal (see MIQ/IF232 component operating manual)

The terminal component is installed on the lid of any free MIQ module.

The MIQ/TC 2020 XT configured as a terminal is docked on the lid of any free MIQ module.

If the MIQ/TC 2020 XT is configured as a controller, the MIQ/TC 2020 XT, as opposed to a mobile terminal (e.g. MIQ/TC 2020 XT configured as terminal) must not be removed during operation. To protect against any inadvertent removal, the MIQ/TC 2020 XT can be secured with a locking screw.

Materials required

- none -

Tools

- Phillips screw driver.

Docking the terminal component

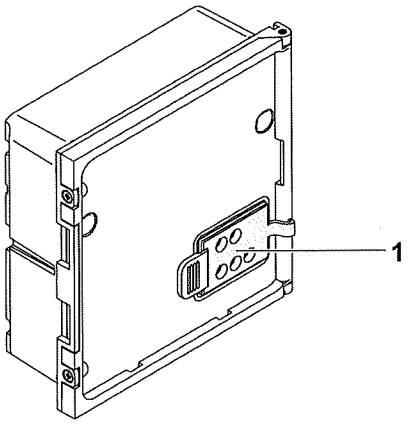


Fig. 3-18 Preparing the MIQ module for docking

1 Pull the cover off the contacts (pos. 1 in Fig. 3-18) on the lid of the MIQ module.

Note
For the temporary docking of a mobile terminal, do not remove the

whole contact cover. Leave it hanging on the side of the MIQ module. After removing the terminal, replace the cover again to protect the contacts.

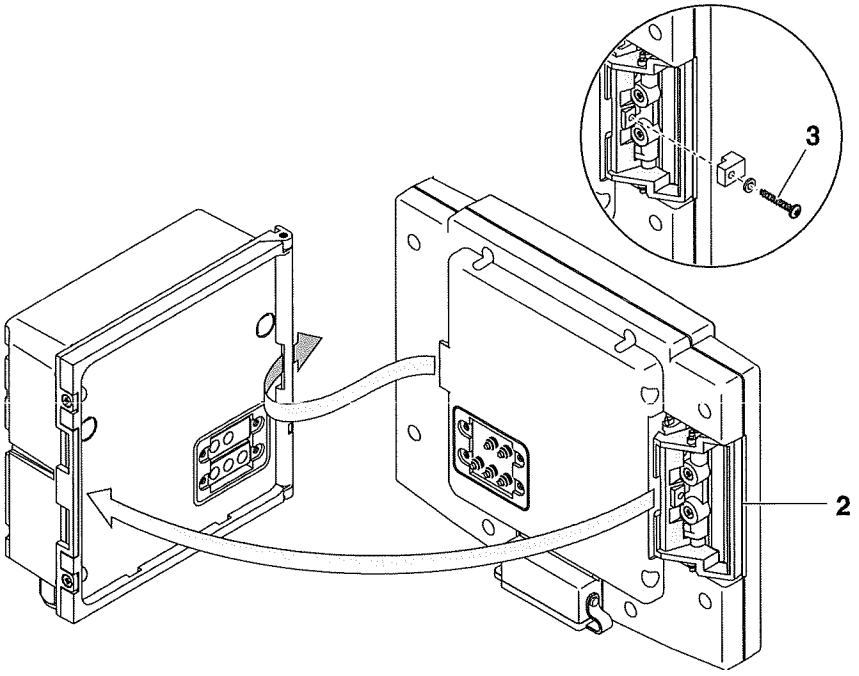


Fig. 3-19 Docking the terminal component

2	Attach the terminal component to the module lid. To do so, insert the flap on the back of the terminal into the slot on the door hinge of the MIQ module. Then, pull back the interlocking lever (pos. 2 in Fig. 3-19), place the terminal completely on the MIQ module and release the interlocking lever.
3	To protect any inadvertent removal of the terminal component, the interlocking lever can be fixed in place with the screw (pos. 3 in Fig. 3-19).

Configuring the MIQ/ TC 2020 XT as a mobile terminal

During the commissioning of the MIQ/TC 2020 XT at the IQ SENSOR NET a query appears asking whether the MIQ/TC 2020 XT should work as a terminal or controller. Select *Terminal:* (see section 3.11).

3.6 Installation of the MIQ modules at the installation location

3.6.1 General information

The IQ SENSOR NET system has a comprehensive program of mounting accessories, which can be used to adapt the installation to the most varied requirements.

Caution

MIQ modules installed outside must always be protected by a sun shield against the effects of the weather (snow, ice and direct solar radiation). Otherwise, malfunctions can result. Always mount MIQ modules vertically. Do not under any circumstances install MIQ modules without rain protection with the lid facing upwards (danger of retained humidity and penetration of moisture).

Installation options

The most important types of installation for MIQ modules and module stacks are described in the following chapters:

- **Mounting on a mounting stand with the SSH/IQ sun shield:**
  The SSH/IQ sun shield provides enough space for one unit of up to three stacked MIQ modules and a docked terminal (section 3.6.2).
- **Mounting on the SD/K 170 sun shield**
  The SD/K 170 sun shield provides enough space for a single MIQ module with a docked terminal. The sun shield can be mounted on round or square section pipes (e.g. rails) with the aid of the MR/SD 170 mounting kit (section 3.6.3).
- **Wall mounting:**
  The back MIQ module of a module stack or a single MIQ module is permanently screwed to a wall. For wall mounting, use the WMS/IQ mounting set (see chapter 10 ACCESSORIES AND OPTIONS).
- **Panel mounting:**
  The front MIQ module of a module stack or a single MIQ module is installed in the aperture of a panel. The aperture dimensions are 138 x 138 mm + 1 mm (maximum thickness 15 mm) according to DIN 43700 or IEC 473 (section 3.6.4).
- **Top hat rail mounting:**
  The back MIQ module of a module stack or a single MIQ module is mounted on a 35 mm top hat rail with the aid of a bracket in accordance with EN 50022, e.g. in a control cabinet. The connection can be released again with one simple movement (section 3.6.5).

Caution
No contact base may be mounted on the back of the module (danger of short-circuit!) if the module is mounted on a wall, a sun shield, or a top hat rail.

3.6.2 Mounting on a mounting stand with the SSH/IQ sun shield

Materials required

- SSH/IQ sun shield (see chapter 10 ACCESSORIES AND OPTIONS).

Tools

- 4 mm set screw wrench
- Phillips screw driver.

Mounting the sun shield on a mounting stand

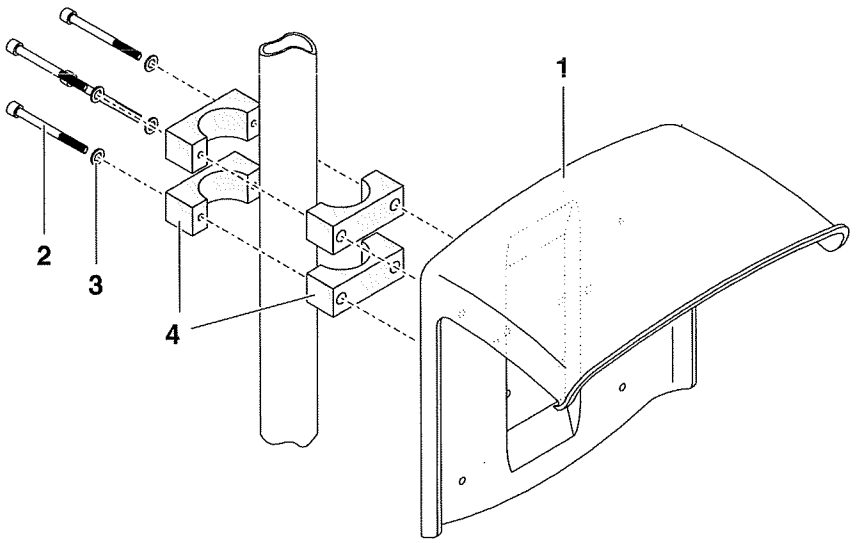


Fig. 3-20 Mounting the SSH/IQ sun shield on a mounting stand

1 Screw the sun shield (pos. 1 in Fig. 3-20) with the four hexsocket head screws (pos. 2), the washers (pos. 3) and the clamps (pos. 4) at the required height on the mounting stand from the back.

Premounting the ISO blind nuts

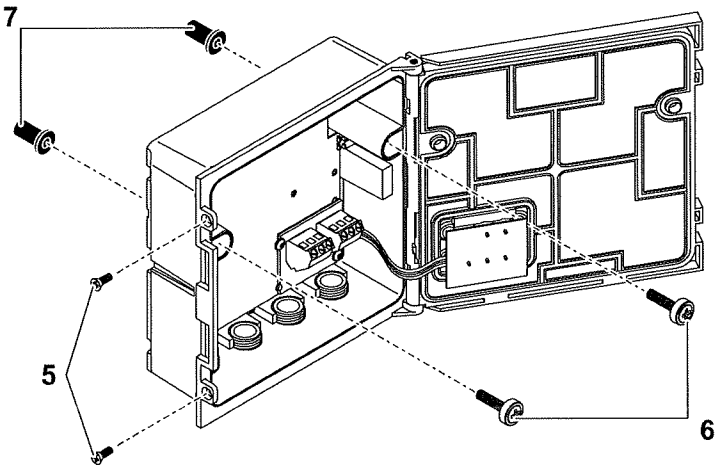


Fig. 3-21 Mounting the sun shield: Premounting the ISO blind nuts

2	Remove the two countersunk screws (pos. 5 in Fig. 3-21) and swing open the module lid.
3	Insert the cheese-head screws (pos. 6 in Fig. 3-21) with the plastic washers in the drilled mounting holes and loosely screw in the ISO blind nuts (pos. 7).

Mounting the MIQ module under the sun shield

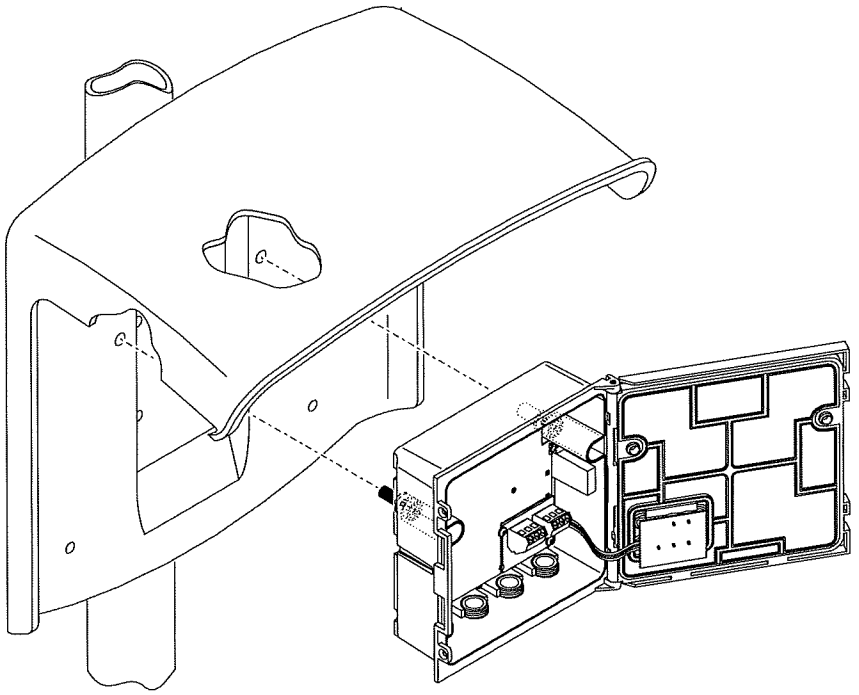
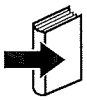


Fig. 3-22 Mounting the MIQ module on the SSH/IQ sun shield

4	Position the MIQ module on the sun shield and fix it into place with the two screws (pos. 6 in Fig. 3-21).
5	Close the module lid and fix it with the two countersunk screws (pos. 5 in Fig. 3-21).

3.6.3 Mounting under the SD/K 170 sun shield

If a single MIQ module is to be installed outside, it must be provided with a sun shield that protects it against the effects of weather. The SD/K 170 sun shield can be mounted directly on a wall, on a mounting stand or on a railing. The MR/SD 170 mounting kit is also required for mounting on a mounting stand or railing.



Note
How to mount the sun shield at the installation location is described in the instructions for the sun shield or mounting kit.

Materials required

- SD/K 170 sun shield (see chapter 10 ACCESSORIES AND OPTIONS)
- The MR/SD 170 mounting kit is also required for mounting the sun shield on a mounting stand or railing (see chapter 10 ACCESSORIES AND OPTIONS).

Tools

- Phillips screw driver.

Mounting the MIQ module under the sun shield

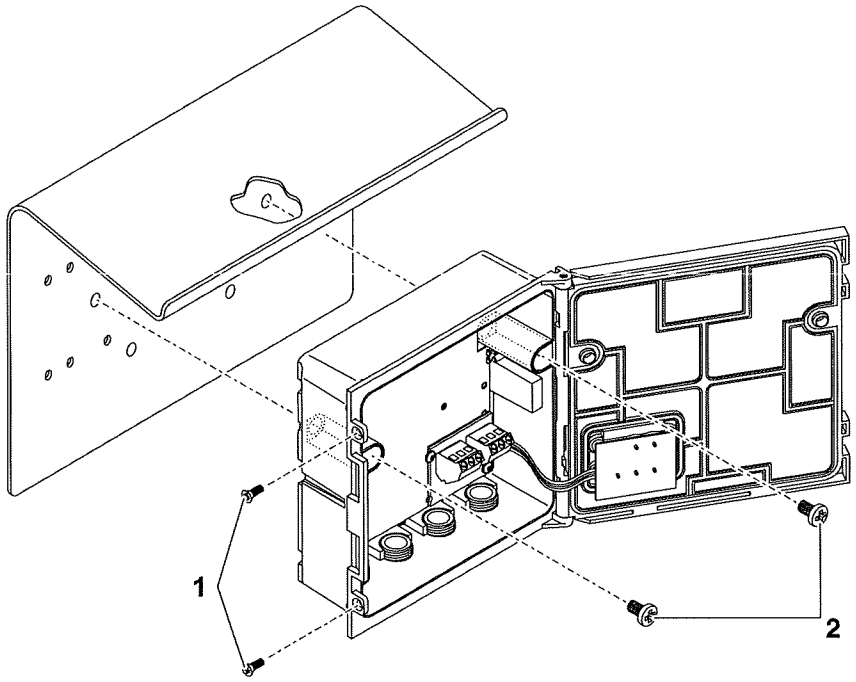


Fig. 3-23 Mounting the MIQ module on the SD/K 170 sun shield

1	Remove the two countersunk screws (pos. 1 in Fig. 3-23) and swing open the module lid.
2	Position the MIQ module on the sun shield and fix it into place with the two screws (pos. 2 in Fig. 3-23).
3	Close the module lid and fix it with the two countersunk screws (pos. 1 in Fig. 3-23).

3.6.4 Panel mounting

Note
The space required on the panel for a module stack is given in the dimension drawings in section 8.3.

Note
The front MIQ module of the preassembled module stack must be removed in order to install the stack. After the installation of the front MIQ module, the remaining part of the stack can be added to the installed MIQ module (see section 3.5.2 STACKED MOUNTING OF MIQ MODULES: - Variant 2).

Materials required

- PMS/IQ kit for panel mounting (see chapter 10 ACCESSORIES AND OPTIONS).

Tools

- 3 mm set screw wrench (contained in the panel installation kit).

Mounting the MIQ module on a panel

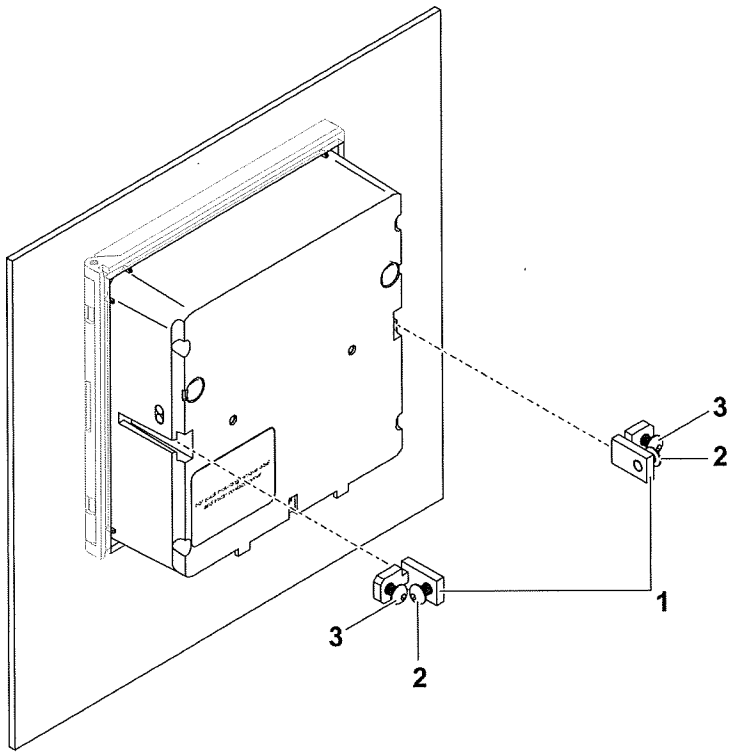


Fig. 3-24 Mounting the MIQ module on a panel

1	Insert the MIQ module in the panel aperture from the front.
2	Slightly unscrew the screws (pos. 2 and 3) of the two angle brackets (pos. 1 in Fig. 3-24), but do not remove them.

3	Push in the two angle brackets - as shown in Fig. 3-24 - into the lateral guides of the MIQ module up to the stop.
4	Tighten the screws (pos. 2).
5	Screw in the screws (pos. 3) until the screws rest snugly against the panel.

3.6.5 Top hat rail mounting

Materials required

- THS/IQ kit for top hat rail mounting (see chapter 10 ACCESSORIES AND OPTIONS).

Tools

- Phillips screw driver.

Mounting the MIQ module on a top hat rail

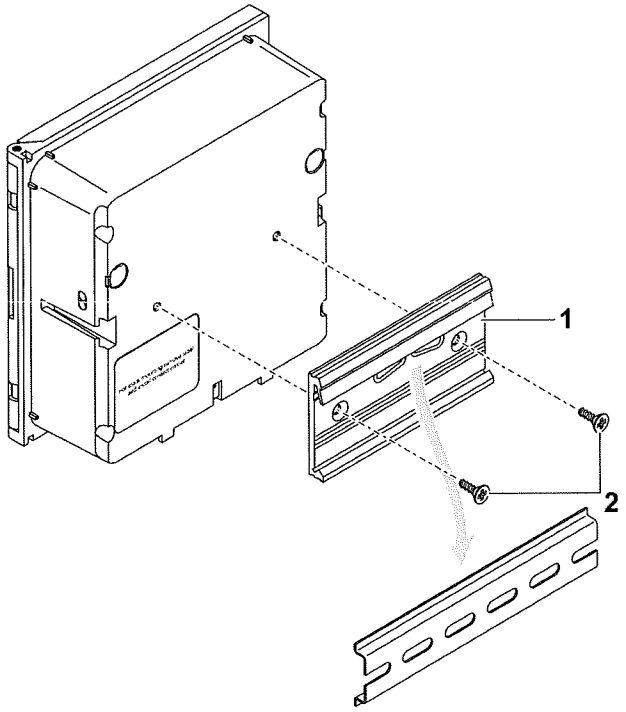


Fig. 3-25 Mounting the MIQ module on a top hat rail

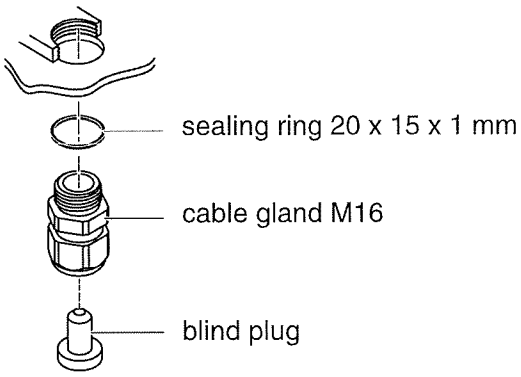
1	Screw the clamping assembly (pos. 1 in Fig. 3-25) onto the back of the MIQ module with the two plastic tapping screws (pos. 2).
2	Attach the MIQ module onto the top hat rail from above using the clamping assembly and press against the rail until the clamping assembly clicks into place. The MIQ module can be moved sideways afterwards.
3	To unhook the MIQ module, press it downwards and pull it forwards at the bottom.

3.7 Electrical connections: General instructions

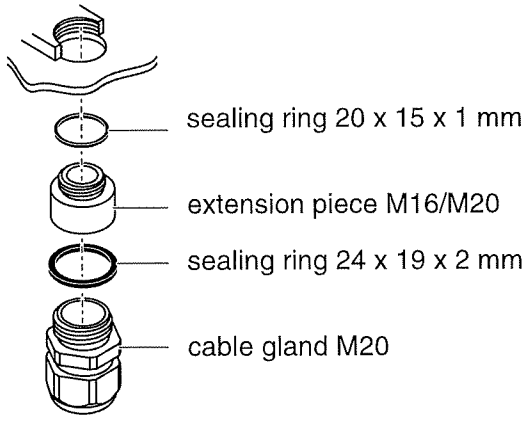
Cable glands

All electric cables are fed from below via prepared openings in the enclosure of the MIQ modules. Cable glands with different clamping ranges are included with most MOQ modules to provide sealing between the cable and enclosure as well as for strain relief. Select the matching cable gland for the respective cable diameter:

- **Small**, clamping range 4.5 to 10 mm. This cable gland is suitable for all IQ SENSOR NET cables (including earth cable after stripping the outer insulation, see section 3.5.3) and IQ SENSOR NET sensor connection cable.



- **Large**, clamping range 7 to 13 mm. This cable gland is required for cable sheaths with an outside diameter of more than 10 mm and is screwed into the enclosure via an extension piece.



Note

If necessary, you can order furhter large cable glands (see chapter 10 ACCESSORIES AND OPTIONS).

General installation instructions

Observe the following points when attaching connecting wires to the terminal strip:

- Shorten all the wires to be used to the length required for the installation
- Always fit all the ends of the wires with wire end sleeves before connecting them to the terminal strip
- Any wires that are not used and project into the housing must be cut off as closely as possible to the cable gland.
- Screw a small cable gland with sealing ring into each remaining free opening and close it with a blind plug.

Warning

No free wires must be allowed to project into the enclosure. Otherwise, there is a danger that areas safe to contact could come into contact with dangerous voltages. This could result in life threatening electric shock when working with the IQ SENSOR NET. Always cut off any wires that are not in use as closely as possible to the cable gland.

3.8 Connecting the voltage supply

Note
How to connect the voltage supply is comprehensively described in the operating manual of the MIQ power supply module.

3.9 Commissioning

3.9.1 Topology and terminator switch

For failure-free operation, the terminator switches (terminating resistors) must always be set to ON on two MIQ modules. On which modules this has to be done can be taken from the topology of the IQ SENSOR NET system:

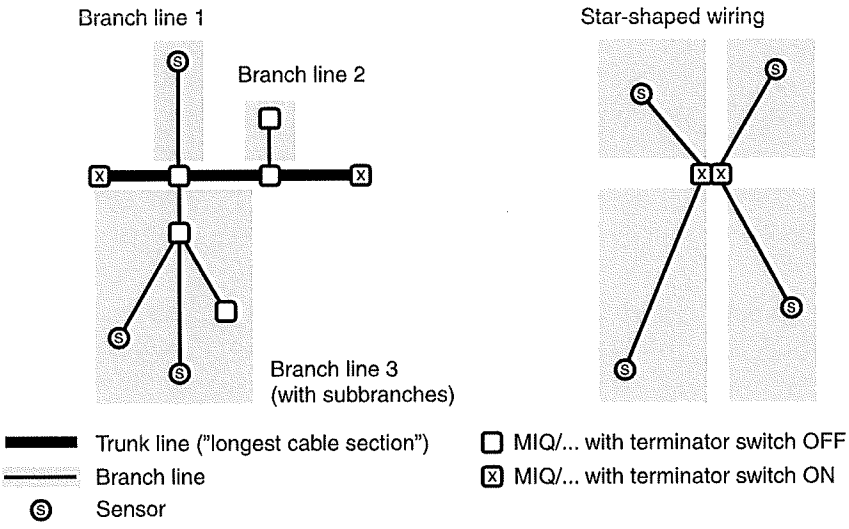


Fig. 3-26 Correct setting of the terminator switches

Main line — Longest cable section with terminator switches at its ends.
The terminator switches on both ends must be set to ON.
If all MIQ modules are at one location, i. e. in a module stack, the length of the main line is zero (star-shaped wiring).

Branch line — All lines that branch from the main line.
Branch lines can be branched further.

Note
In the MIQ/TC 2020 XTmultiparameter measuring transmitter, the SN terminator switches of the two MIQ modules are set to ON in the delivery state. This is the correct setting provided that the system is not further branched. In the case of additional branching, the SN terminator switches must be newly set.

Example of determining the main line

The following figure shows the length of the main line L made up of the partial lengths L1, L2 and L3 as the cable section L4 is shorter than L3:

Length of the main line = L1 + L2 + L3

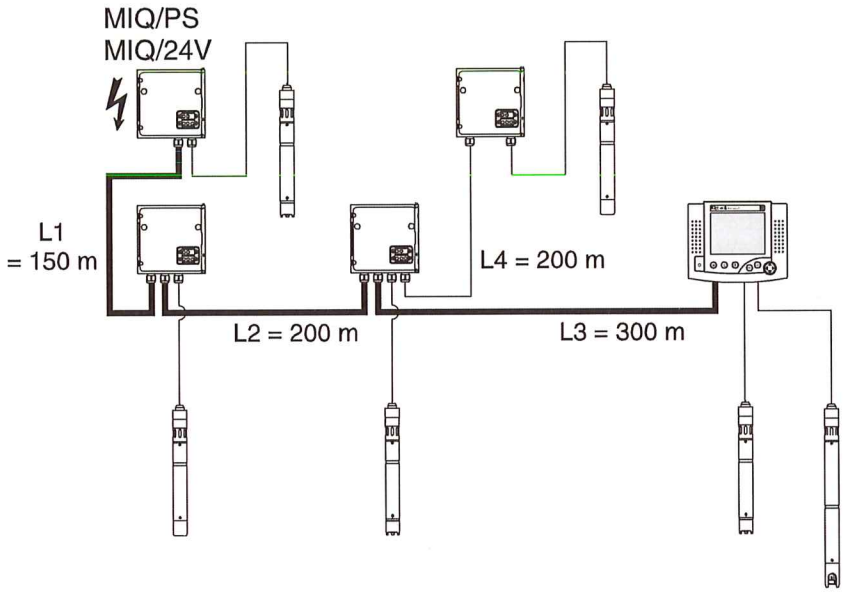


Fig. 3-27 Example of determining the length of the main line

Terminator switch

Terminator switches are located in each MIQ module between the two SENSORNET connections on the right of the terminal strip (designation "SN TERMINATOR"):

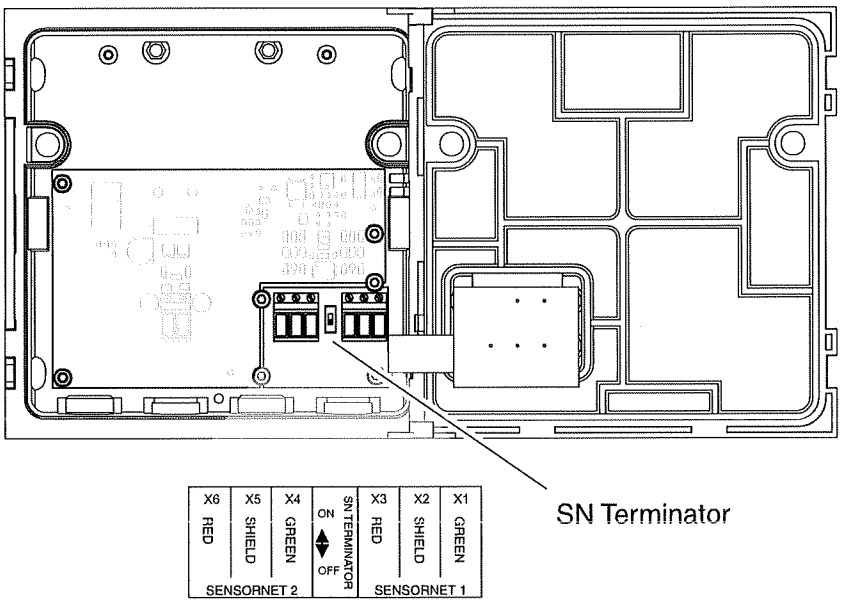


Fig. 3-28 Terminator switch

3.9.2 Start checklist and system start

Before starting the system, carry out the system check using the following checklist. Always carry out the check

- before the initial commissioning
- before any further commissioning if the system has been previously extended or modified.

Start checklist

1 Is the sum of the power consumption of the components smaller than the sum of the power delivery of all power supply modules (see section 3.3)?

2 Are all IQ SENSOR NET components correctly connected with one another (see section 3.5)?

3 Are all SN terminator switches correctly set (see section 3.9.1)?

4 Is the MIQ power supply module correctly connected to the voltage supply?

5 Do the line voltage and line frequency agree with the data on the name plate of the MIQ power supply module?

6 Are all IQ sensors ready for measuring, e.g. a D.O. sensor filled with electrolyte solution?

Starting the system

Switch on the voltage supply of the MIQ power supply module(s).

Configuration of the MIQ/TC 2020 XT

During the commissioning of the MIQ/TC 2020 XT at the IQ SENSOR NET a query appears asking whether the MIQ/TC 2020 XT should work as a controller or just as a terminal. Select the required function for each MIQ/TC 2020 XT.

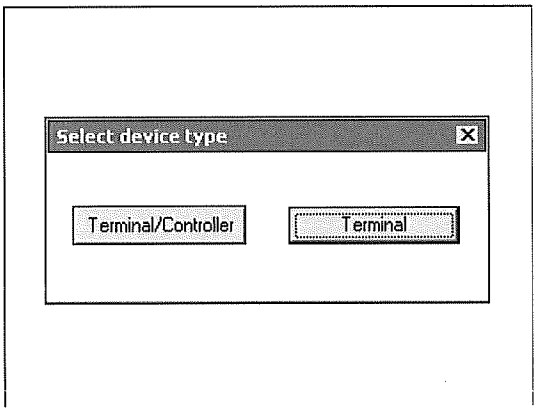


Fig. 3-29 Selecting the instrument type

The MIQ/TC 2020 XT will then try to register with the selected functionality on the IQ SENSOR NET. Note that only one controller can be active in an IQ SENSOR NET.

Details on the configuration of the MIQ/TC 2020 XT, see section 3.11.

Initial start phase

In the initial start phase, all IQ SENSOR NET components are automatically registered on the MIQ/TC 2020 XT controller module and the terminal is initialized. Then, the system performs a self test. This process may last a few seconds. During this period, the following display appears:

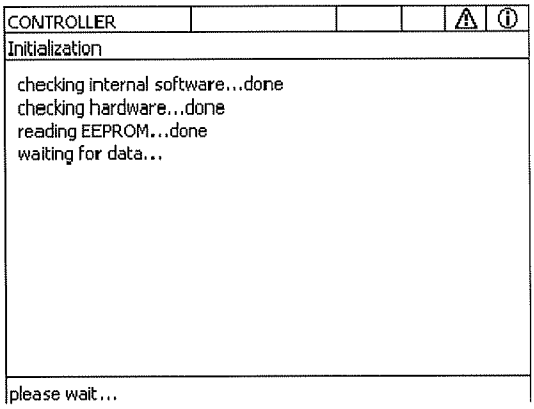


Fig. 3-30 Display during the initialization process

Second start phase

As soon as the terminal is successfully initialized, the measured value display appears (fourfold display). In the case of IQ sensors that are not yet providing measured values, "Init" appears temporarily:

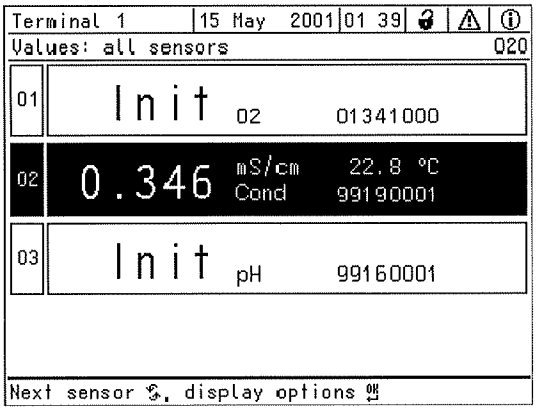


Fig. 3-31 Display after initialization of the terminal

Note
Assign a name to each IQ sensor after putting it into operation for the first time so you can identify it more easily. How to assign a sensor name is described in section 5.5.1 on page 5-12.

Note
If the system start failed, see chapter 7 WHAT TO DO IF ....

3.9.3 Checking the voltage supply

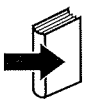
This test should always be performed:

- after the initial commissioning
- after any system extension or modification.

This test checks the power supply and the communication of the components after the system has been started.

Test procedure

1	Check the status of the LEDs on the MIQ power supply modules (Fig. 3-32):	
	– Yellow lights up	Operational voltage OK. The operational voltage supplied is constant and is max. 24 V.
	– Red lights up	Operational voltage with power limitation. The operational voltage supplied is adjusted to the load conditions.
	– no LED lights up:	Operational voltage too low. The operational voltage supplied is too low or the MIQ power supply module is defective.
2	Dock any existing mobile terminals on the system as far away as possible from a MIQ power supply module (i.e. test of the power supply in the most unfavorable possible conditions)	
3	Check the status of the LEDs on all MIQ modules (except for the MIQ power supply modules, see step 1) (Fig. 3-32):	
	– Yellow lights up	Operational voltage OK
	– Red lights up	Operational voltage in warning range. The component is fully functional. However, any further slight drop in voltage can lead to failure
	– no LED lights up:	Operational voltage in error range



Note
The relationship between the supply voltage, the LED status and the log book entries is described in the section 8.1 GENERAL SYSTEM DATA.

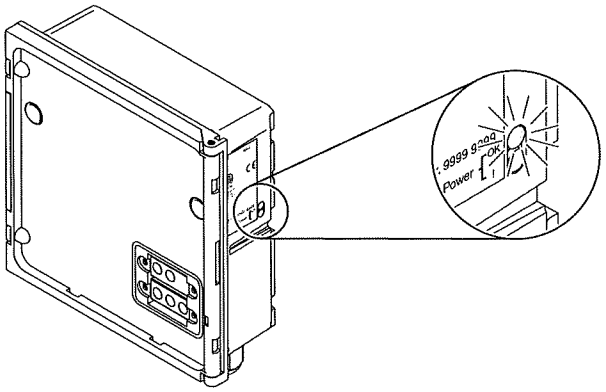


Fig. 3-32 Voltage LED on the MIQ module

Note
You can measure the voltage that is actually available at the MIQ modules or IQ sensors (see section 7.2.2).

4	Wait until the system start is completed and the measured value display appears.
5	If necessary, select another display language (see section 5.1 SELECTING THE LANGUAGE).
6	Check that all the IQ sensors are listed in the measured value display.
7	Check that all the MIQ output modules are listed in the *Edit list of outputs* menu (see section 5.8 EDITING THE LIST OF OUTPUTS).
8	If a component is not listed, carry out troubleshooting according to chapter 7 WHAT TO DO IF ....
9	Open the log book and acknowledge the messages. In the case of error messages, follow the instructions for clearing the error. For more details on the log book, see section 4.5.

3.10 System extension and modification

3.10.1 General information

The modular structure of the IQ SENSOR NET system makes it easy to carry out subsequent extensions and modifications. The system automatically identifies new active modules and includes them in the list of modules. Added IQ sensors immediately deliver measured values without the necessity for special settings.

Warning

When the system is switched on, if the MIQ/PS power supply module is opened, there is a danger to life due to possible hazard of electric shock from line voltage. There is also a danger to life inside the relay output modules (e.g. MIQ/ CR3) if voltages are applied to the relay contacts that may present a hazard of electric shock. Before opening the MIQ modules, switch off the system and all external voltages that present a hazard of electric shock and secure the system against being inadvertently switched on again.

Installation instructions

Note the following points in any system extension or modification:

- Before any extension or modification, check that the planned number of MIQ power supply modules is sufficient for the planned installation (see section 3.3 SYSTEM PLANNING)
- Before beginning the installation tasks, always switch off the system. Also, switch off all external voltages
- Clean the MIQ module stack to remove the worst of any dirt before taking it apart or opening it (see section 6.2 CLEANING)
- Before mounting the stack, check the contacts on the front and back of any MIQ modules that were already in use somewhere else. Clean any dirty contacts
- After any change to the system, check the setting of the SN terminator switches and adjust it if necessary (see section 3.9.1 TOPOLOGY AND TERMINATOR SWITCH).

Installing new components

Install new components as described in section 3.5 CONNECTING SYSTEM COMPONENTS. Then put the system into operation again (section 3.9 COMMISSIONING). Active modules are automatically recognized by the controller and included in the corresponding module lists.

Note
If a new component is not included, the maximum number of datasets (active and inactive datasets) may be exceeded.

The maximum number of datasets for IQ sensors is 20. For MIQ output modules, the maximum number of datasets (active and inactive datasets) is 8.

When this number of datasets is already stored, no further component can be installed.

If necessary, an inactive dataset has to be erased to make an extension possible (how to erase inactive datasets is described in section 5.5.3 or section 5.8.2).

Note
New modules are first registered on the system when the measured value display is opened.

Replacing components

The replacement of components is described in detail in section 7.4 REPLACING SYSTEM COMPONENTS.

3.11 Configuration of the MIQ/TC 2020 XT as a terminal/ controller or terminal

During the initial commissioning of the MIQ/TC 2020 XT a query appears asking whether the MIQ/TC 2020 XT should work as a terminal/controller or just as a terminal. Select the required function for each MIQ/TC 2020 XT.

The MIQ/TC 2020 XT will then try to register with the selected functionality on the IQ SENSOR NET. Note that only one controller can be active in an IQ SENSOR NET.

When the MIQ/TC 2020 XT is once configured, the MIQ/TC 2020 XT saves this configuration. Thus, no further query appears during the docking on and off of terminals.

4 Operation

4.1 MIQ/TC 2020 XT terminal/controllers

During the initial commissioning of the MIQ/TC 2020 XT, a query appears asking you in which function you want to use the MIQ/TC 2020 XT in the system.

Two configurations can be selected:

- Configuration as terminal and controller
- Configuration as a mobile terminal

The MIQ/TC 2020 XT (configured as terminal/controller) is the operating and control unit of the IQ SENSOR NET.

You can install further terminal components:

- MIQ/TC 2020 XT (configured as terminal)
  (more compatible terminals, see section 1.4)
- MIQ/IF232 interface component with software terminal (see MIQ/IF232 component operating manual)

The terminal can be used to:

- Display measurement results
- Start calibration
- Perform system and terminal settings
- Display messages.

Note
To guarantee data safety within the IQ SENSOR NET, access to the following functions is only possible from one terminal at the same time:

- Opening the *Settings* menu
- Start calibration
- Assigning IQ sensors or MIQ output modules as substitutes.

If one of these functions is already active at another terminal, a note appears on the display.

Note
General key symbols are used in this operating manual for all operating steps. Details and differences when using the software terminal can be found in the MIQ/IF232 component operating manual.

4.1.1 Overview of the operating elements

This section gives basic information on the operation of the IQ SENSOR NET system via the MIQ/TC 2020 XT.

The operating elements on the terminal are described here using the MIQ/TC 2020 XT terminal as an example.
Details and differences when using the software terminal can be found in the MIQ/IF232 component operating manual.

The terminal is equipped with a large display for the clear presentation of current measured values, the graph of measured values, status displays and message texts.

The IQ SENSOR NET system is operated with the five keys, **<M>**, **<C>**, **<S>**, **<ESC>**, **<OK>** and the arrow keys **<▲▼◀▶>**.

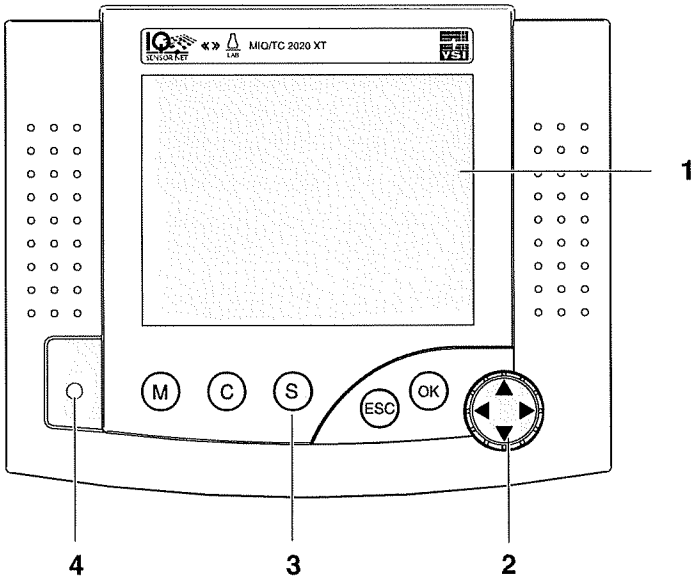


Fig. 4-1 View of the terminal/controller MIQ/TC 2020 XT

1	Display (see section 4.1.2 DISPLAY)
2	Arrow keys (see section 4.1.4 ARROW KEYS)
3	5 keys, **<M>**, **<C>**, **<S>**, **<ESC>**, **<OK>** (see section 4.1.3 KEYS)
4	Status LED

4.1.2 Display

The display contains the following information:

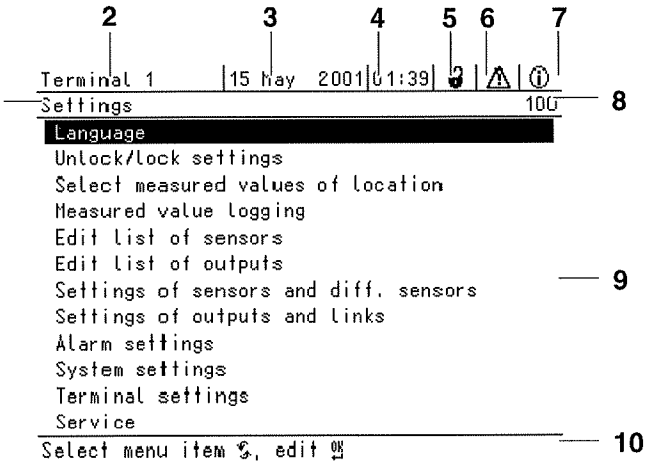


Fig. 4-2 View of the display

1	Name of the display
2	Name of the terminal and controller function alternately (CONTROLLER or BACKUP CONTROLLER)
3	Date
4	Time
5	User authorization:
	Simple access control Lock open: Settings are unlocked – System settings can be changed Lock closed: Settings are locked – All system settings can only be read
	Extended access control: Crown: Administrator authorization Configuration and continuous operation of the system Tool: Maintenance authorization Continuous operation of the system and maintenance activities Eye: View authorization Only read permission, no operation of the system

6	Error symbol ⚠: If the error symbol flashes, a new or unacknowledged error message is present in the log book that requires immediate action (see section 4.5.3).
7	Info symbol ⓘ: If the info symbol flashes, new or unacknowledged information is present in the log book (see section 4.5.3).
8	Number of the display
9	Display range for measured values, menus, lists, etc.
10	Help line with operating instructions

Measured value display

The measured value display contains the following information for each IQ sensor/differential sensor:

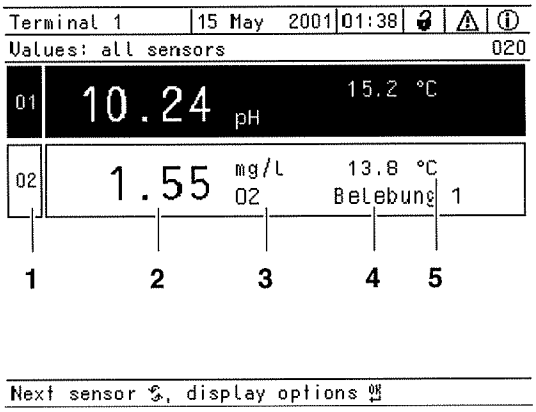


Fig. 4-3 Display - measured value display

1	Consecutive numbering of the measured values
2	Main measured value
3	Unit and parameter of the main measured value
4	Name of the sensor (to enter name: see section 5.5.1
5	Adjoining measured value with unit

Special displays

Init	Sensor is being initialized ● during commissioning or ● if a new IQ sensor is recognized that is not yet giving measured values
----	Invalid measured value
Cal	Sensor is being calibrated
Clean	Cleaning system active, sensor is offline
Error	Sensor is inactive or defective
OFL	Measuring range undercut or exceeded (overflow)
Display flashes	Sensor in maintenance condition

4.1.3 Keys

Key	Function
<M>	Display measured values
<C>	Start calibration of the IQ sensor selected in the measured value display
<S>	Open the *Settings* menu
<ESC>	Change to the higher menu levels or abort entries without storing them
<OK>	Confirm selection

4.1.4 Arrow keys

Arrow keys	Function
<▲▼◀▶>	Highlight and select: ● Menu items ● Entries ● Columns or fields ● Letters or numerals

Note
The selection highlighted with the arrow keys is displayed as white text on a black background (reverse video).

4.2 General operating principles

The operation of the IQ SENSOR NET is standardized and user-friendly.

- The arrow keys, <▲▼◀▶> are use to make a selection
  - Highlight individual elements in menus, lists and tables, e.g. menu entries, list elements, columns or fields
  - Select a setting in selection fields
  - Select a character in text entry fields

- The **<OK>** key confirms a selection.
- Break off an action and change to the next higher level with the **<ESC>** key.
- Start a calibration procedure with the **<C>** key.
- Switch to the settings with the **<S>** key.
- Change to the measured value display and break off current actions with the **<M>** key.

Note
Short operating instructions are given in the help line on the display.

Examples of the operating principles are given below:

- Navigation in menus, lists and tables (see chapter 4.2.1)
- Entering text and numerical values (see chapter 4.2.2)

Note
General key symbols are used for all operating steps in this operating manual. Details and differences when using the software terminal can be found in the MIQ/IF232 component operating manual.

Note
If two or more terminals are used in a IQ SENSOR NET access to the functions **<C>** and **<S>** is blocked if the functions are already being used at another terminal.

4.2.1 Navigating in menus, lists and tables

1	Using **<S>**, open the *Settings* menu. Menus appear in the form of a list on the display, e.g. the *Settings* menu shown here.

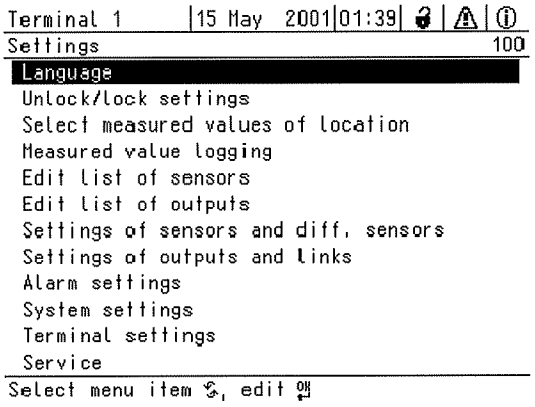


Fig. 4-4 100 - Settings

2	Use **<▲▼◀▶>** to select a menu item (e.g. *System settings*). Use the arrow keys **<▲▼◀▶>** to move the highlighting (reverse video display, black background) in the list of menu items.
3	Use **<OK>** to confirm the menu item (e.g. *System settings*). The display (e.g. *System settings*) opens up. Pressing the **<OK>** key confirms the selection and goes to a new display representation.
4	Return to a higher level with **<ESC>**. or: Switch to the measured value display with **<M>**.

4.2.2 Entering texts or numerals

You can assign names to IQ sensors, MIQ output modules, terminals and locations. Example: Entering a sensor name:

1	Using **<S>**, open the *Settings* menu.
2	Use **<▲▼◀▶>** to select the menu item, *Edit list of sensors*.
3	Use **<OK>** to confirm the menu item, *Edit list of sensors*. The *Edit list of sensors* display opens. A column is highlighted.
4	Use **<▲▼◀▶>** to select the *Sensor name* column.
5	Use **<OK>** to confirm the *Sensor name* column. A sensor name is highlighted.
6	Select a sensor name with **<▲▼◀▶>**.

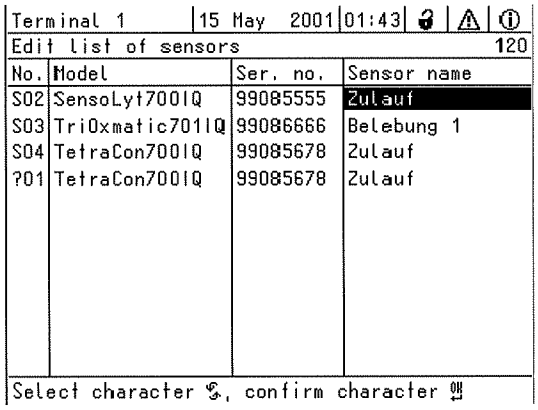


Fig. 4-5 Edit list of sensors

7	Confirm the selection with **<OK>**. The name of the selected sensor is edited.

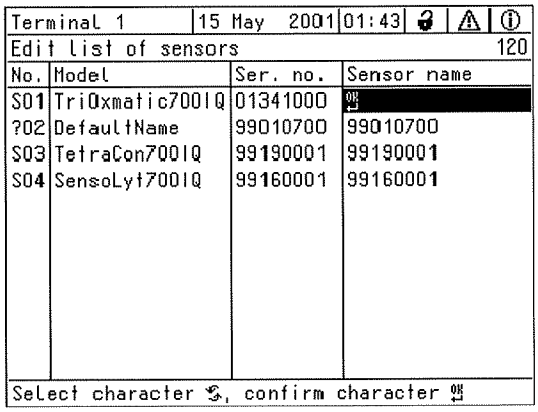


Fig. 4-6 Edit list of sensors

Note

The following letters, numerals and special characters can be entered:
`AaBb..Zz0..9µ%&/()+-=><!?_ °`.

8	Select a letter or numeral with <▲▼◀▶>.
9	Confirm the letter with **<OK>**. The character OK appears behind the last letter.

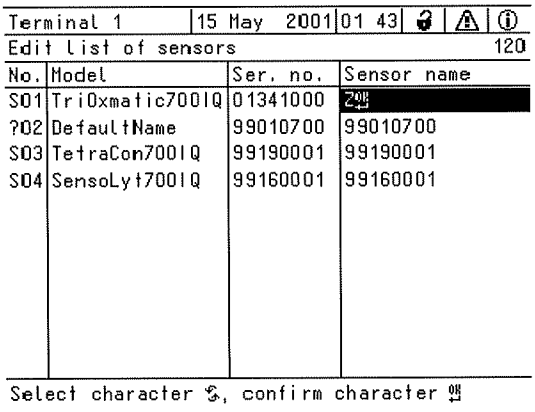


Fig. 4-7 Edit list of sensors

10	• Add a new character Select the character to be added with <▲▼◀▶> and confirm with **<OK>**. or • Delete the last character Use <▲▼◀▶> to select the character ← and confirm with **<OK>**. or • Adopt the name Use <▲▼◀▶> to select the character OK and confirm with **<OK>**.
11	Repeat steps 8 to 10 until the whole name has been entered.

Note
Break off entering the name with **<ESC>**. The old name is retained.

4.3 Access to the IQ SENSOR NET with enabled access control

Note
Access control is switched off in the delivery condition.
No log-in to the IQ SENSOR NET is required.

As soon as any access control is enabled, access to the IQ SENSOR NET is protected completely or partly. Access is only possible after a password has been entered.

Access to the system (entry of a password) is different for the various types of access control.

- Simple access control:
  the lock symbol (open, closed) is visible
  (see section 4.3.1)
- Extended access control:
  one of the following symbols is visible: Crown, tool, eye
  (see section 4.3.2)
- Extended access control with instrument block:
  only the IQ SENSOR NET logo is visible (see section 4.3.3)

4.3.1 Simple access control

If simple access control is enabled and the system settings are locked, a lock symbol appears on the display. If a closed lock is displayed, the IQ SENSOR NET informs you that settings cannot be changed in the protected mode before you can adopt a changed system setting.

Releasing the system settings

You can unlock the system settings as follows:

- Enter the password for simple access control with the arrow keys in the menu, *Settings / Unlock/lock settings / Unlock settings*.
  The system settings are unlocked.
- Connect the electronic key to the USB interface
  (if the administrator has unlocked this function)

Locking the system settings

You can lock the system settings as follows:

- Enter the password for simple access control with the arrow keys in the menu, *Settings / Unlock/lock settings / Lock settings*.
  The system settings are locked.
- Remove the electronic key from the USB interface
- If no key is pressed for 10 minutes the system settings are automatically locked.

4.3.2 Extended access control

If extended access control (without instrument block) is enabled, a symbol for the currently enabled access authorization is displayed.

Crown: Administrator logged in, all functions allowed

Tool: User with authorization for maintenance activities logged in (e.g. calibration)

Eye: Viewer without any authorization

The relevant symbol is displayed, depending on the currently enabled user authorization. Functions that are not allowed are hidden in the menu.

User or administrator access

If authorization is required for a task, log-in with the password is required. This can be done as follows:

- Open the menu, *Display/Options / Change user rights.*
  A password query appears.
  Enter the password with the arrow keys and confirm with OK.
  The respective user rights are unlocked.
- Connect the electronic key to the USB interface
  (if the administrator has unlocked this function)
  The respective user rights are unlocked.

Protecting the system

The following options to protect the system are available:

- Select the menu, *Display/Options / Viewing only.*
  The system is protected.
- Remove the electronic key from the USB interface
- If no key is pressed for 10 minutes, the user or administrator is automatically logged off and the system protection is automatically activated.

4.3.3 Extended access control with instrument block

If the extended access control with instrument block is enabled, the display of the terminal where the instrument block was enabled only indicates the IQ SENSOR NET logo.

As soon as a password was entered the symbol for the currenctly active access authorization is displayed.

Crown: Administrator logged in, all functions allowed

Tool: User with authorization for maintenance activities logged in (e.g. calibration)

Eye: Viewer without any authorization

The relevant symbol is displayed, depending on the currently enabled user authorization. Functions that are not allowed are hidden in the menu.

Access as viewer, user or administrator

User authorization is required for all tasks, even for the viewing of measured values. Log-in with a password is required. This can be done as follows:

- Press any key.
  A password query appears.
  Enter the password with the arrow keys and confirm with OK.
  The respective user rights are unlocked.
- Connect the electronic key to the USB interface
  (if the administrator has unlocked this function)
  The respective user rights are unlocked.

Log-off Protecting the system and terminal

You can protect the system and lock the terminal as follows:

- Select the menu, *Display/Options / Lock Device.*
  The system is protected. The instrument is locked.
- Remove the electronic key from the USB interface
- If no key is pressed for 10 minutes, the user or administrator is automatically logged off and the system protection is automatically activated.

4.4 Display of current measured values

Several options can be selected for displaying the measured values:

- *Measured values (1 sensor)*
  The measured value is shown numerically and as a bar graph on the *Measured values (1 sensor)* display (see section 4.4.1)
- *Measured values (4 sensors)*
  The *Measured values (4 sensors)* display provides an overview of a maximum of four IQ sensors or differential sensors (see section 4.4.2)
- *Measured values (8 sensors)*
  The *Measured values (8 sensors)* display provides an overview of a maximum of eight IQ sensors or differential sensors (see section 4.4.3)
- *Display local values or all values*
  Here you can switch between the display of the IQ sensors selected for the measurement location and the display of all the IQ sensors (see section 4.4.4).

Switch between the different display types as follows:

1	Call up the measured value display with **<M>**.
2	Using **<OK>**, open the *Display/Options* menu.

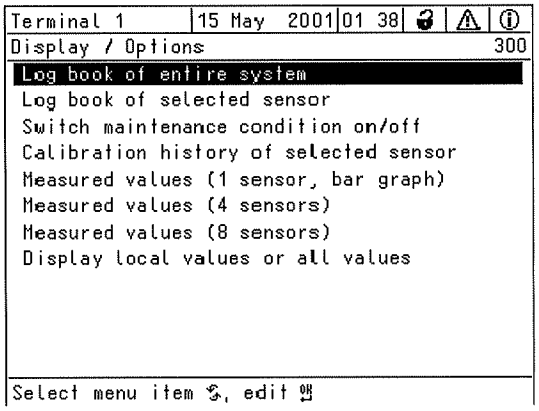


Fig. 4-8 Display/Options

3	Select and confirm a display option with **<▲▼◀▶>** and **<OK>**. The selected display is activated.

4.4.1 Displaying a single measured value

The measured value is shown numerically and as a bar graph on the *Measured values (1 sensor)* display.

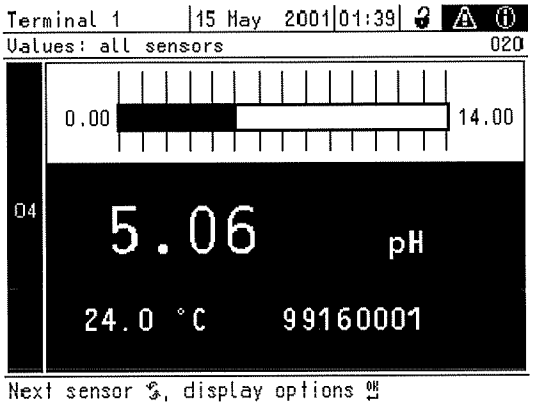


Fig. 4-9 Values: all sensors -> Measured values (1 sensor)

4.4.2 Displaying four measured values

Up to four measured values of IQ sensors or differential sensors are shown on the display at the same time.

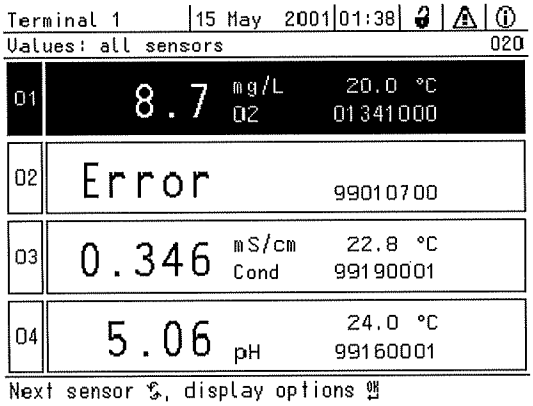


Fig. 4-10 Values: all sensors -> Measured values (4 sensors)

4.4.3 Displaying eight measured values

Up to eight measured values of IQ sensors or differential sensors are shown on the display at the same time.

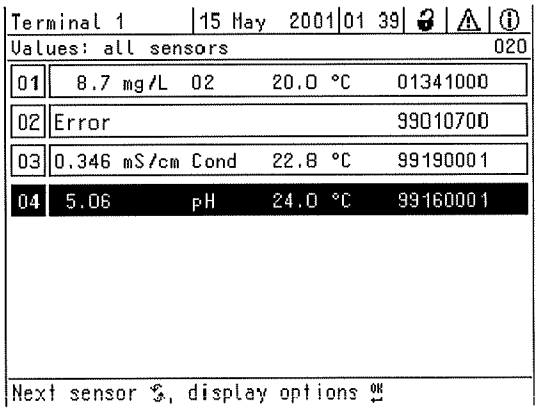


Fig. 4-11 Values: all sensors -> Measured values (8 sensors)

4.4.4 Displaying recorded measured values

If the measured value recording has been activated for an IQ sensor (see section 5.12), the temporal course of the recorded measured values can be displayed numerically and graphically.

The following display options are possible:

- *Monthly load of selected sensor* (graphic display)
- *Weekly load of selected sensor* (graphic display)
- *Daily load of selected sensor* (graphic display)
- *Measured value list of selected sensor* (numerical display)

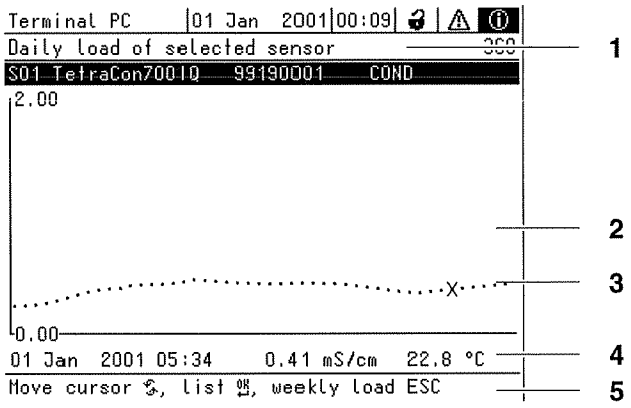


Fig. 4-12 Daily load of selected sensor (example)

1	Display
2	Range of the graphical display ● The time range (x axis) corresponds to the selected display option (1 day, 1 week, 1 month). ● The value range of the y-axis is automatically adjusted to min and max values
3	Position of the cursor (X)
4	Data about the position of the cursor (X) (Date, time, main measured value and adjoining measured value)
5	Navigation instructions

Displaying recorded measured values

1	Switch to the measured value display with **<M>**.
2	Select an IQ sensor with **<▲▼◀▶>**.
3	Using **<OK>**, open the *Display/Options* menu.
4	Select one of the display options with **<▲▼◀▶>**. ● *Monthly load of selected sensor* ● *Weekly load of selected sensor* ● *Daily load of selected sensor* ● *Measured value list of selected sensor* Select and confirm with **<OK>**. The selected option is displayed.

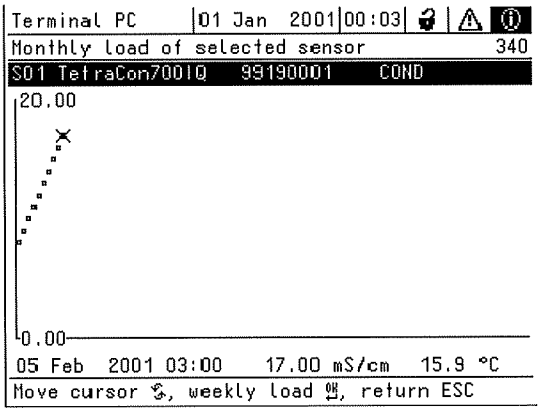


Fig. 4-13 Monthly load of selected sensor (example)

5	Move the cursor (X) along the measured value curve with **<▲▼◀▶>**. The cursor (X) marks the selected measured value.
6	Switch to the next display option with a shorter display period with **<OK>**. or Switch to the next display option with a longer display period with **<ESC>**.

4.4.5 Display of the measured values of a measurement location or of all IQ sensors in the system

As soon as a terminal is docked onto a measurement location, the local measured value display becomes active. The IQ sensors selected for the measurement location appear on the measured value display (see section 5.9).

Switch between the measured values for the measurement location and all IQ sensors as follows:

1	Switch to the measured value display with **<M>**.
2	Using **<OK>**, open the *Display/Options* menu.
3	Using **<▲▼◀▶>**, select the menu item, *Display local values or all values* and confirm with **<OK>**. The measured value display switches between the display of the sensors at the measurement location and all sensors.

4.5 Messages and log book

The IQ SENSOR NET continuously monitors the status of the entire system. If the IQ SENSOR NET identifies system changes, a message appears. New messages can be recognized by the flashing information symbol or error symbol on the display.

All messages are recorded in the log book.

In addition, a flashing status LED at the MIQ/TC 2020 XT reminds you that there is an error or alarm (see section 1.3.5).

4.5.1 Message types

The system differentiates two types of messages:

- **Errors** ⚠
  Indicates a critical status in the system or an individual system component that requires immediate action.
  In the case of new error messages, the error symbol flashes on the display.
- **Information** ⓘ
  Information that does not require immediate action.
  In the case of new information, the info symbol flashes on the display.

Note
In the case of errors, immediately open the detailed message text in the log book and perform the recommended actions. If the actions have been performed, mark the message as read (see section 4.5.3).

4.5.2 Log book

The log book is a list with all the messages from all modules. The log book contains up to 1000 entries. If there are more than 1000 messages, the oldest entries are deleted.

New messages can be recognized by the flashing information symbol or error symbol. The log book always contains the latest message in the first position. They do not yet have a checkmark in the status field.

The flashing of the info or error symbol only stops after all detailed message texts in the log book have been opened and marked with a checkmark (✔) (see section 4.5.3).

Structure of the log book

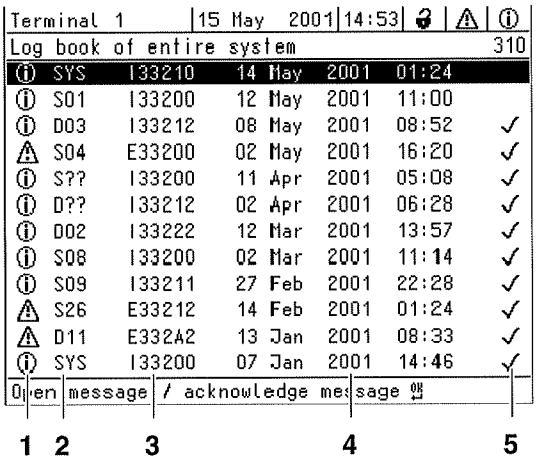


Fig. 4-14 Log book of entire system

1	Message category (error or info symbol)
2	Module that triggered the message. *SYS* system (controller) *S01* IQ sensor (number 01) *S??* IQ sensor (inactive, dataset deleted) *D01* MIQ output module (number 01) *D??* MIQ output module (inactive, dataset deleted)
3	Message code
4	Date and time of the message
5	Status field of the message ✔ message is acknowledged No checkmark message is not acknowledged

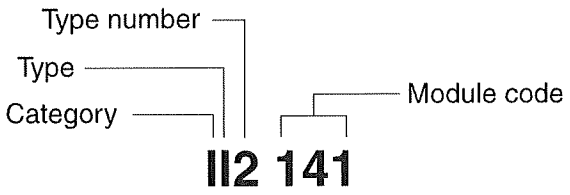
The system provides the following log books:

- *Log book of entire system*:
  List of all messages from all modules
- *Log book of selected sensor*:
  List of all messages from a single IQ sensor.

There is a detailed message text for each message of a module that is ready for operation. The detailed message text on each message is given in the log book (see section 4.5.3) and in the operating manual of the registering module.

Structure of the message code

The message code consists of 6 characters and can contain numerals and letters, e.g.: II2141.



Pos.	Information	Explanation
1 - 3	Short message form	The short form of the message contains the following information of the message: Category, type and type number
	1: possible categories	• Info message (I) • Error message (E)
	2: possible types	• Calibration data (C) • Installation and commissioning (I) • Instructions for service and repair (S) • Application instructions (A)
	3: Type number	Each type contains subtypes (0..9A..Z)
4 - 6	Module code	The three-digit module code designates the module that generated the message. The module code can be found in the chapter LISTS of the respective component operating manual.

Example: Message code II2141

Component "141" (MIQ/TC 2020 XT) sends a message with the short form message "II2".
This is an info message (I) of the type Installation (I) with the type number (2). The detailed message text of the short form message (II2) can be found in the log book and in the operating manual of the component that sent it.

Note
The detailed message text in the log book contains a precise description of the message code and, if required, any further actions.

The detailed message texts can also be found in the component operating manuals of the individual components.

Note
The log book shows the current status at the point of time that it was opened. If new messages arrive while a log book is open, these do not appear in the log book. As usual, you are informed of new messages by flashing info or error symbols. The current log book with the new messages can be viewed by closing and reopening the log book.

4.5.3 Viewing detailed message texts

1	Switch to the measured value display with **<M>**.
2	Using **<OK>**, open the *Display/Options* menu.
3	Using **<OK>**, select and open the *Log book of entire system*. A list of log book entries appears.
4	Select and confirm a new log book entry (no checkmark) with **<▲▼◀▶>** and **<OK>**. The message text with further information on the selected log book entry appears.

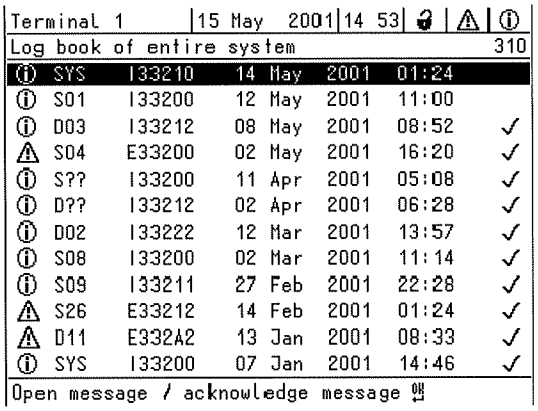


Fig. 4-15 Log book of entire system

5	Acknowledge the message with **<OK>**. A checkmark appears in the log book entry.
6	Leave the message text with **<ESC>**.

Note
Acknowledgment of a new message text in the log book marks the message as read. When all errors or information messages are acknowledged, the symbols no longer flash.

With the *Acknowledge all messages* function you can acknowledge all messages at the same time (see section 4.5.4).

Note
Message texts are stored in the components that caused them. Therefore, further information on a log book entry for an IQ sensor such as, e.g. calibration messages, instructions and help texts are only accessible in the case of connected components that are ready for operation.

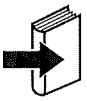
If a message text is not available because, e.g. a component is not connected with the system, you can look up the detailed text of the message as follows:

- Messages of the system are given in this operating manual (see section 11.2).
- Messages of a module are given in the respective component operating manual of the component.

4.5.4 *Acknowledge all messages*

1	Switch to the measured value display with **<M>**.
2	Using **<S>**, open the *Settings* menu.
3	Using **<▲▼◀▶>**, select the menu item, *Service* and confirm with **<OK>**.
4	Using **<▲▼◀▶>**, select the menu item, *Acknowledge all messages* and confirm with **<OK>**. A security prompt opens.
5	Using **<▲▼◀▶>**, select the menu item, *Acknowledge* and confirm with **<OK>**. All messages are acknowledged. Error symbol and info symbol do no longer flash.

4.6 Calibration data



Note
Details on calibration are given in the operating manual for the IQ sensor.

Each calibration of IQ sensors that are able to be calibrated causes an entry to be made in the log book. Log book entries contain the following information:

- Calibration date
- Calibration successful or not successful.

The detailed calibration data of the last calibrations are integrated in the *Calibration history of selected sensor* overview.

Note
All calibration data are stored in the IQ sensor. In order to view the calibration data of an IQ sensor, the IQ sensor must be connected to the IQ SENSOR NET and must be ready for operation.

4.6.1 Calibration entries in the log book

The date and time of a calibration are entered in the log book. The respective message text contains an indication as to whether a calibration was successful or not. The values determined with calibration can be viewed in the calibration history (see section 4.6.2).

1	Call up the measured value display with **<M>**.
2	Using **<▲▼◀▶>**, highlight a sensor and confirm with **<OK>**. The *Display/Options* menu opens.
3	Using **<▲▼◀▶>**, select the menu item, *Log book of selected sensor* and confirm with **<OK>**. Calibration entries in the log book are held in message code (ICxxxx and ECxxxx).
4	Using **<▲▼◀▶>** und **<OK>**, select and open a calibration entry (ECxxxx or ICxxxx).
5	Press **<M>** to leave the *Calibration history of selected sensor.*

4.6.2 Calibration history

The calibration history contains the detailed calibration data of the last calibrations.

1	Call up the measured value display with **<M>**.
2	Using **<▲▼◀▶>**, highlight a sensor and confirm with **<OK>**. The *Display/Options* menu opens.
3	Using **<▲▼◀▶>**, select the menu item, *Calibration history of selected sensor* and confirm with **<OK>**. The calibration history with the results of the last calibrations opens.
4	Press **<M>** to leave the *Calibration history of selected sensor* overview.

4.7 Status info of sensors and outputs

The display of the instrument status provides a simple overview of the current modes of sensors (sensor info) and outputs in the IQ SENSOR NET.

The status display can be reached in the *Settings/Service/List of all components* menu (see section 4.7).

1. Call up the *List of all components* (see section 4.7).
2. Select the required component with <▲▼◀▶> and confirm with **<OK>**.
   - Output module: The *Status of output channels* window opens up (for details, refer to the operating manual of the output module).
   - Sensor: The sensor info opens up (for details, refer to the operating manual of the selected sensor).

CONTROLLER		26 May 2008	10:31			ⓘ
Status of output channels						394
No.	Name	Chan.	Status			
D01		R1	open			
D01		R2	open			
D01		R3	open			
D01		C1	0.00 mA			
D01		C2	0.00 mA			
D01		C3	0.00 mA			
Return ESC						

Fig. 4-16 List of all components with sensor info

3. Use **<M>** or **<ESC>** to quit the window, *Status of output channels*.

4.8 General course when calibrating, cleaning, servicing or repairing an IQ sensor

When an IQ sensor is calibrated, cleaned, serviced or repaired, the maintenance condition for the relevant IQ sensor should always be switched on.

In the maintenance condition

- the system does not react to the current measured value or the condition of the selected IQ sensor
- linked outputs are frozen
- IQ sensor errors do not prompt changes in the conditions of linked outputs.

The maintenance condition for IQ sensors is automatically activated

- during calibration. After calibration the IQ sensor remains in the maintenance condition until the maintenance condition is switched off manually (see section 4.8.3)
- during a compressed-air cleaning cycle.

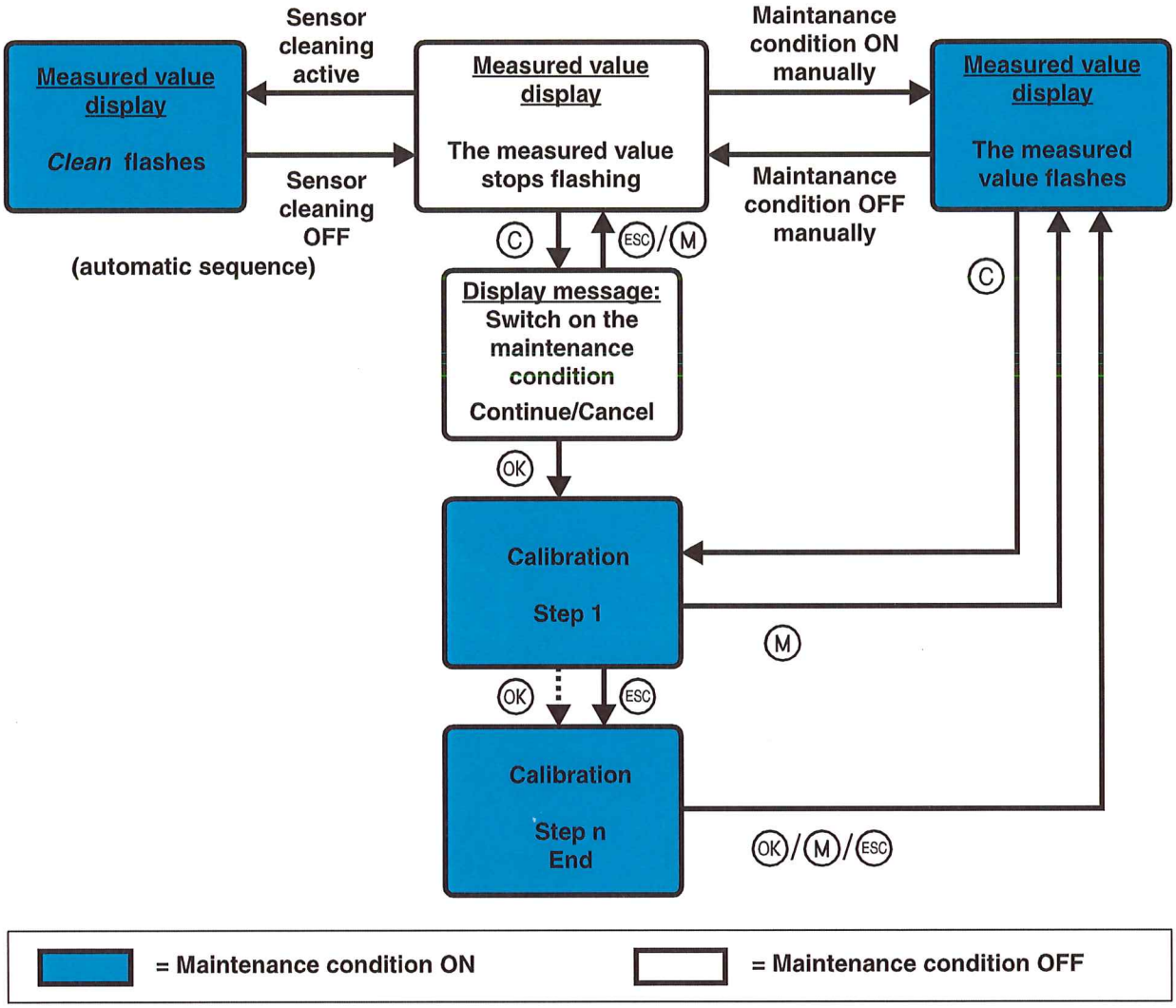
Therefore, keep to the following course when you calibrate, clean, service or repair an IQ sensor.

Course

1	Switch on the maintenance condition for the IQ sensor (see section 4.8.2). The display of the sensor in the measured value display flashes.
2	Pull the sensor out of the sample.
3	Perform the calibration in the laboratory, cleaning, maintenance or repair (removing and replacing) of the sensor (about these topics, see the component operating manual of the corresponding sensor).
4	Submerse the sensor in the sample again.
5	Wait until the measured value does no longer change.
6	Switch off the maintenance condition for the sensor (see section 4.8.3). The display of the sensor in the measured value display does no longer flash.

4.8.1 Maintenance condition of IQ sensors

The following diagram gives you an overview of when an IQ sensor is in the maintenance condition.



4.8.2 Switching on the maintenance condition

Switch on the maintenance condition manually when you want to clean, service or repair (remove and replace) an IQ sensor.

1	Call up the measured value display with **<M>**.
2	Select the sensor you want to switch on the maintenance condition for with **<▲▼◀▶>**. The display of the sensor in the measured value display does not flash.
3	Using **<OK>**, open the *Display/Options* menu.
4	Using **<▲▼◀▶>**, select the menu item, *Switch maintenance condition on/off* and confirm with **<OK>**. A window that informs you about the maintenance condition opens up.
5	Confirm with **<OK>** *Continue*. The selected sensor is in the maintenance condition. Linked outputs are frozen.
6	Call up the measured value display with **<M>**. The display of the sensor in the measured value display flashes.

Subsequently, perform the cleaning, maintenance or repair work (removal and replacement).

When you have finished calibrating, cleaning, servicing or repairing the sensor, switch off the maintenance condition manually (see section 4.8.3).

4.8.3 Switching off the maintenance condition

1	Call up the measured value display with **<M>**.
2	Select the sensor you want to switch off the maintenance condition for with **<▲▼◀▶>**. The display of the sensor in the measured value display flashes.
3	Using **<OK>**, open the *Display/Options* menu.
4	Using **<▲▼◀▶>**, select the menu item, *Switch maintenance condition on/off* and confirm with **<OK>**. A window that informs you about the maintenance condition opens up.
5	Confirm *Continue* with **<OK>** . The maintenance condition of the selected sensor is switched off. Linked outputs are released.
6	Call up the measured value display with **<M>**. The display of the sensor in the measured value display does not flash.

Note
If a power failure occurs, the outputs automatically are in the non-operative condition (relays: open, current output: 0 A; see component operating manual of the output module). After the end of the power failure the outputs work as defined by the user again.

If a power failure occurs while an IQ sensor that is linked with an output is in the maintenance condition, the current and relay outputs work as defined by the user only after the maintenance condition has been switched off (see section 4.8.3).

4.9 Data exchange via the USB interface

With the USB interface the MIQ/TC 2020 XT provides a very simple way to

- Save data of the IQ SENSOR NET on a USB memory device (see section 4.9.1)
- Transmit data to a PC with the aid of a USB memory device
- Transmit configuration data to the controller

4.9.1 Saving IQ SENSOR NET data on a USB memory device

You can save the following data types:

- Configuration data (see section 4.9.3)
- Measurement data (see section 4.9.2)
- Log book
- Calibration history

From the USB memory device, the configuration data can be copied back to the IQ SENSOR NET. Thus you can very easily create systems that are configured identically.

Saving data

Saving measurement data via the USB interface is only recommended if the MIQ/TC 2020 XT is configured as terminal/controller.

Note
If it is configured as a terminal, the data is first sent form the controller to the termina via the IQ SENSOR NET. This can take several hours with great amounts of data.

1	Switch to the measured value display with **<M>**.
2	Using **<S>**, open the *100 - Settings* menu.
3	Using **<▲▼◀▶>** and **<OK>**, open the menu, *Data transfer to USB memory*.

4	Select the data to be saved with <▲▼◀▶>. ● *Save configuration* ● *Measured data storage* ● *Log book* ● *Calibration history* and confirm with **<OK>**. Only for backing up the measurement data memory:

4-1	A list of sensors is displayed for which stored measured values are available.
4-2	Using <▲▼◀▶>, select the *Selec.* column. Confirm with **<OK>**. Using <▲▼◀▶>, select the sensors. Place a checkmark with **<OK>**. The measurement data of the sensor is included in the backup. Include further sensors in the list of measurement data to be saved as necessary.
4-3	Terminate the selection of sensors with **<ESC>**.
4-4	Using <▲▼◀▶>, select the menu item, *Transfer data for selected sensors* and confirm with **<OK>**. A dialog box pops up for the selection of the decimal separator for the exported *.csv file.
4-5	Using <▲▼◀▶>, select the decimal separator (comma or dot) for the measurement data. Confirm with **<OK>**. A query pops up concerning the restart of the measured value recording.
4-5	Using <▲▼◀▶>, select *Yes* or *No*. Confirm with **<OK>**. If the restart of the measured value recording is selected, the measurement data stored in the IQ SENSOR NET is erased after storing. The measured value recording is restarted.

5	The data is prepared for transmission.

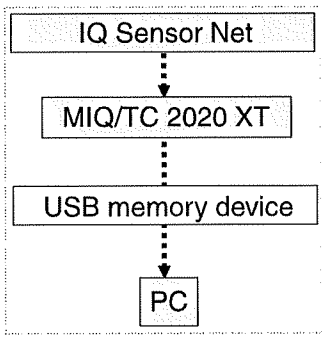
Note
You can cancel the data saving process by selecting and confirming *Cancel* with <▲▼◀▶> and **<OK>**. The data will then not be stored on the USB memory device.

6 Press <▲▼◀▶> to highlight the selection of *Save* and confirm with **<OK>**.
The selected data will be stored on the USB memory device.

4.9.2 Transmitting recorded measurement data to a PC

In the IQ SENSOR NET, you can log measured values of IQ sensors or differential sensors (see system operating manual, *Measured value logging*). The recorded measured values can be transferred to a PC via the USB interface or with the aid of the component MIQ/IF232 (see section 4.4.5).

The following methods are available for this:



- **Data transfer via the USB interface (MIQ/TC 2020 XT --> USB memory device --> PC)**

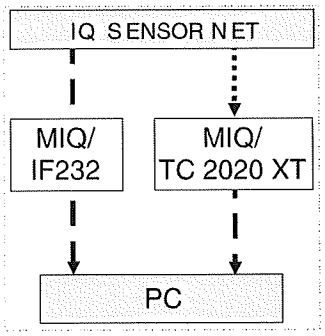
  This method is recommended if the MIQ/TC 2020 XT is configured as terminal/controller.
  Note: If it is configured as a terminal, the data is first sent from the controller to the terminal. This can take several hours with great amounts of data.

  Data transmission consists of two steps:

  – Transmission of the recorded sensor data to a USB memory device.

  and

  – Transmission of the intermediately stored measurement data from the USB memory device to the PC.

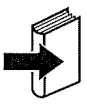


- **Data transfer via the MIQ/IF232 component (IQ SENSOR NET --> MIQ/IF232 --> PC) or via the USB interface on the MIQ/TC 2020 XT (MIQ/TC 2020 XT --> USB-RS232 adapter + null modem cable --> PC)**

  The data transfer via the MIQ/IF232 component or via the USB interface is the method to use when a PC can be the operated in the vicinity of the IQ SENSOR NET. The data transfer can be carried out in two ways:

  – Transmitting recorded measuring data to the PC with the aid of the software terminal

  – Transmission of the recorded measured data onto the PC with the aid of the MIQ/IF232 component and the *Data transfer* transmission software



Note
The data are sent first from the controller to the terminal. This can take several hours with large amounts of data.
Details about the data transfer via the MIQ/IF232 component are given in the component operating manual MIQ/IF232.

4.9.3 Manual backup of the system configuration

In regular terminal operation in addition to the automatic backup there is the option of saving the system configuration of the main controller onto a USB memory at any time.

To do so, proceed as follows:

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>**, select the menu item, *Service* and confirm with **<OK>**.
3	Press **<▲▼◀▶>** to select the menu item *Save configuration* and press **<OK>**. The process is started.
4	Wait for the saving process to be completed.
5	Confirm the concluding message with **<OK>**.

Backup copy before changes to the system configuration

If you want to carry out changes to the system configuration that may have to be canceled again (e.g. if you want to briefly try out certain functions), you can carry out a manual backup beforehand. The timer for the automatic backup is reset, i.e. the backup copy is available for a period of 60 min. It will then be overwritten with the current status.

4.9.4 Restoring the system configuration

The system configuration backed up by the MIQ/TC 2020 XT can be restored onto the main controller. Hence, after replacement of a defective controller, the original system configuration can be quickly restored. Prerequisite for this is that the two controllers are the same type and the software version of the backup controller is the same or higher than that of the original controller.

The restoration of a configuration onto the main controller is carried out manually from the USB memory device. A backup of the configuration onto USB memory device can be carried out in one of the following ways:

- Regular manual backup to USB memory device
- Regular automatic backup to MIQ/TC 2020 XT (configured as terminal)

If no current manual backup is present, the automatic backup of the MIQ/TC 2020 XT can be used.
To transfer the configuration automatically backed up on the MIQ/TC 2020 XT to a USB memory, operate the MIQ/TC 2020 XT as a controller or backup controller. In this status the configuration data of the backup controller can be backed up onto a USB memory as a manual backup.

Manually restore after MIQ/TC 2020 XT controller operation

To transfer configuration data onto the controller, proceed as follows:

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>**, select the menu item, *Data transfer to USB memory* and confirm with **<OK>**.
3	Using **<▲▼◀▶>**, select the menu item, *Retransfer configuration* and confirm with **<OK>**. The process is started.
4	Wait for the restore process to be completed.
5	Confirm the concluding message with **<OK>**.

4.10 Software update for IQ SENSOR NET components

With a Software update you can regularly update your IQ SENSOR NET System 2020 XT USB and all active components.

From software version 3.09 for the MIQ/TC 2020 XT, new instrument languages (e.g. Asian languages) are available for the IQ SENSOR NET components. The software update is subdivided into language packets.

The transfer of the new software version to the MIQ/TC 2020 XT is carried out via a USB memory device.

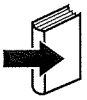
The update packet with the current instrument software for active IQ SENSOR NET components is available on the Internet under www.ysi.com.

Note
A Software update leaves measurement settings, measurement data and calibration data unchanged. The instrument languages included in the language packet are installed automatically. Languages that were installed before are erased except for German and English.

Prerequisites for the Software update

- USB memory device with directory and files for the Software update
- MIQ/TC 2020 XT ready for operation
  (the MIQ/TC 2020 XT must be configured as a controller for a software update of all components)
- If the extended access control is activated, the Software update can only be carried out with administrator authorization.

For the Software update of IQ SENSOR NET components, the software version 3.09 or higher is required for the terminal/controller MIQ/TC 2020 XT.



Note
More details about the Software update are given in the documentation of the software update.

4.10.1 Information on software versions

The system informs you of the current software versions of the individual IQ SENSOR NET components.

1	Call up the measured value display with **<M>**.
2	Using **<S>**, open the *Settings* menu.
3	Using **<▲▼◀▶>**, select the menu item, *Service* and confirm with **<OK>**. The *Service* dialog window opens.
4	Using **<▲▼◀▶>**, select the menu item, *List of all components* and confirm with **<OK>**. The *List of all components* dialog window opens.

Terminal PC	01 Jan 2001	01:04			ⓘ
List of all components					393
No.	Model		Ser. no.	Softw. vers.	
SYS	Controller		01450001	2.00	
SYS	Terminal		01450002	2.01	
S01	TetraCon700IQ		01450003	2.02	
D02	MIQCR3		01450004	2.03	
?03	TriOxmatic701IQ		01450005	2.04	
	TetraCon700IQ		99180006	1.05	
Return ESC, scroll					

Fig. 4-17 List of all components

5	Use **<M>** or **<ESC>** to quit the window, *List of all components*.

Note
If the software version of a component is not up-to-date, you can carry out a software update via the USB interface (see section 4.11).

4.11 MIQ/TC 2020 XT in its function as terminal and backup controller

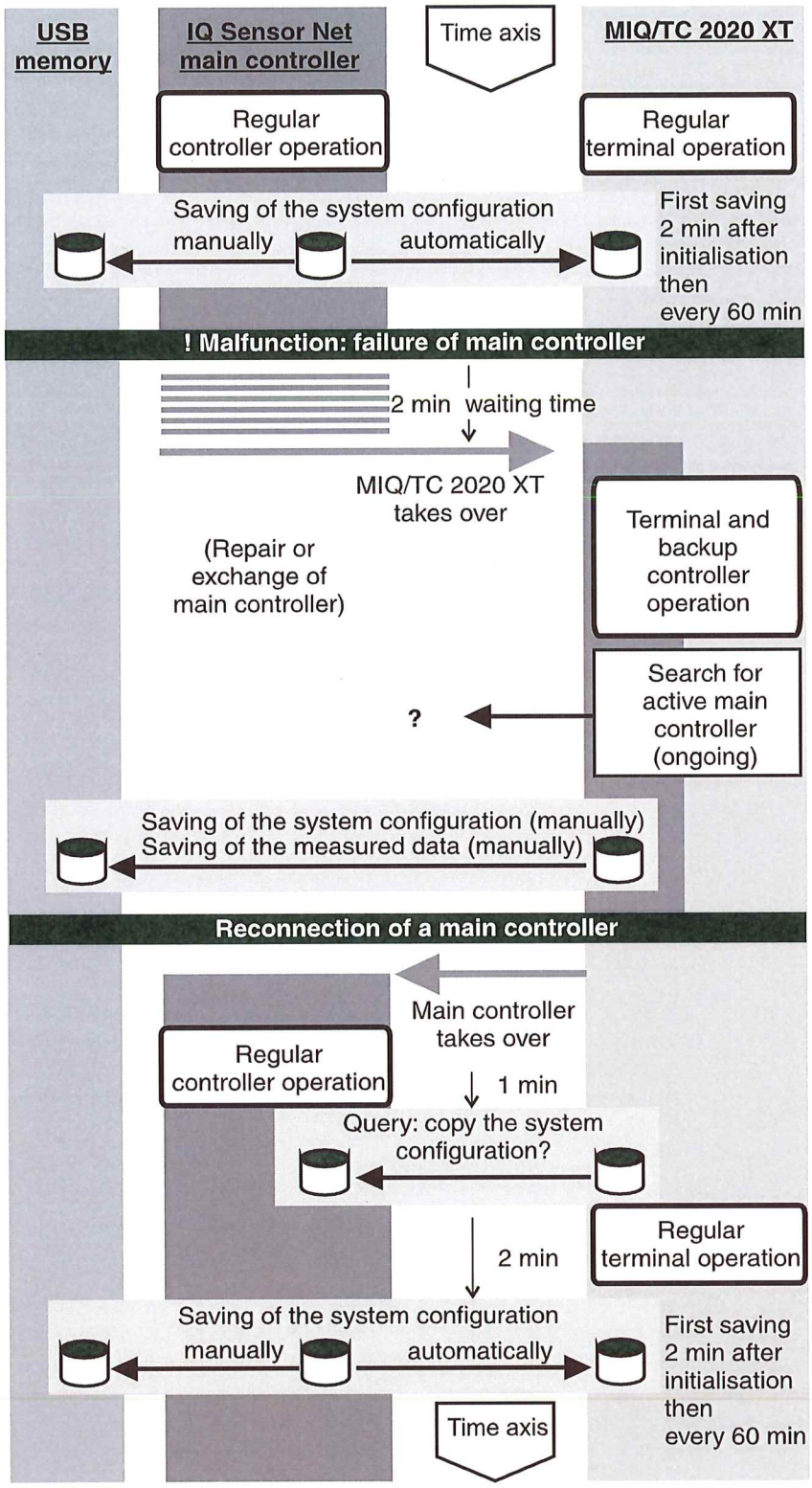
If the MIQ/TC 2020 XT was configured as a terminal, the integrated controller works as a backup controller. The backup controller saves the system data at regular intervals and is immediately available in the system as a backup controller if the main controller fails. If several MIQ/TC 2020 XT are configured in the IQ SENSOR NET as terminals, one MIQ/TC 2020 XT takes over the function of the backup controller. The function is shown on the display.

The diagram on the following page illustrates how the MIQ/TC 2020 XT works when it is configured as a terminal:

Sequence of MIQ/TC 2020 XT controller operation (simplified)

Controller operation

Terminal operation



The sequence in detail:

Normal operation

- In normal operation the main controller carries out regular controller operation.
- The MIQ/TC 2020 XT (configured as a terminal) works as a regular terminal.
- The MIQ/TC 2020 XT (configured as a terminal) backs up the system configuration:
  - Automatic backups are carried out 2 minutes after initialization and regularly every further 60 min.
  - In addition to the automatic backup the backup can also be started manually at any time (see section 4.9.3). The timer for the automatic backup is reset for this.
  - The automatic backup is always only carried out in the measuring state (normal measured value display). If the MIQ/TC 2020 XT is in another operating state, the next backup is carried out as soon as a switch is made again to the measuring state.
  - If a backup fails, e.g. because another terminal is in the setting or calibration mode, a new backup is attempted after 30 s. After three failed attempts the next automatic backup takes place after 60 min.
  - During the backup a message appears on the display. If desired, the running backup can be canceled with the **<ESC>** or **<M>**key.
- The MIQ/TC 2020 XT receives ongoing information on the status of the main controller.

Event: Failure of the main controller (MIQ/TC 2020 XT controller operation)

- If the MIQ/TC 2020 XT (configured as a terminal) receives no more valid telegrams from the main controller **for a period of 2 min**, it takes over the controller operation as a backup controller. The MIQ/TC 2020 XT is reinitialized.
- On takeover of the controller operation a logbook message is generated.
- In the MIQ/TC 2020 XT backup controller operation
  - the status LED flashes
  - BACKUP CONTROLLER appears on the display alternately with the terminal name
  - the MIQ/TC 2020 XT (configured as a terminal) keeps its own logbook. The logbook is empty when the controller operation is adopted. The topmost message contains the reference to controller operation. It can neither be acknowledged nor deleted. The logbook is deleted when the controller operation is terminated.

Event: Main controller goes back into operation

- As soon as the MIQ/TC 2020 XT (configured as terminal) again receives a valid telegram from a main controller in the IQ SENSOR NET, it is reinitialized as a regular terminal. The main controller works again as a regular controller. It uses its own settings for this (or the factory settings in the case of a brand new controller).
- The MIQ/TC 2020 XT (configured as terminal) detects whether the system configuration in the main controller differs from the backed-up system configuration and, if necessary, offers to restore the backed-up system configuration on the main controller.
  If the system configuration is not restored onto the main controller, the first regular backup from the main controller to the MIQ/TC 2020 XT is immediately carried out.

5 Settings/setup

5.1 Selecting the language

A list shows all the available system languages.

1	Using <**S**>, open the *Settings* menu.
2	Using <▲▼◀▶>, select the menu item, *Language* and confirm with <**OK**>. The *Language* display opens.

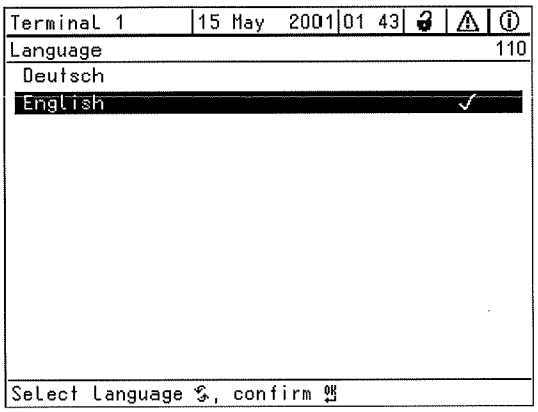


Fig. 5-1 Language

3	Select a language from the list with <▲▼◀▶> and confirm with <**OK**>. The active language is marked with a tick.
4	Switch to the higher menu level with <**ESC**>. or: Switch to the measured value display with <**M**>.

Note
If the selected system language is not available in a component, all indications of this component (e.g. sensor, controller, terminal, output module) appear in the standard language, English. To activate the selected system language for this component, a software update of the component is required. Contact YSI.

5.2 Configuration of the MIQ/TC 2020 XT

During the commissioning of the MIQ/TC 2020 XT on the IQ SENSOR NET System MIQ/TC 2020 XT, you determine the configuration of the MIQ/TC 2020 XT as a terminal/controller or terminal (see section 3.11).

If, after the initial commissioning, you want to change the configuration, proceed as follows:

1	Reset the MIQ/TC 2020 XT to the default condition ("*System settings/Service/Factory reset*"). After the reset the instrument asks for the operating mode once again (terminal/controller or terminal).
2	Select the required function. The MIQ/TC 2020 XT will then try to register with the selected functionality on the IQ SENSOR NET.

Note
If another controller already is already running in the IQ SENSOR NET, the MIQ/TC 2020 XT cannot start working as a controller.

Remove the old controller from the IQ SENSOR NET and dock the MIQ/TC 2020 XT once again.

or

Cancel the log-in with ESC.

or

Undock the MIQ/TC 2020 XT from the IQ SENSOR NET, then redock it. Select the operating mode, "Terminal" for the MIQ/TC 2020 XT.

5.3 Terminal settings

The available terminal settings depend on the terminal installed. The following terminals can be used:

- MIQ/TC 2020 XT
- Any further compatible terminals (see section 1.4) (see respective component operating manual)
- MIQ/IF232 interface component with software terminal (see MIQ/IF232 component operating manual)

The terminal settings at the MIQ/TC 2020 XT include:

- *Terminal name*, user-defined
- *Illumination brightness*
- *Illumination brightness (standby)*
- *Display contrast*
- *Network settings* (if the MIQ/TC 2020 XT is configured as a controller only)

1	Using <**S**>, open the *Settings* menu.
2	Using <▲▼◀▶> and <**OK**>, select and confirm the menu item, *Terminal settings* -> . The *Terminal settings* display opens.

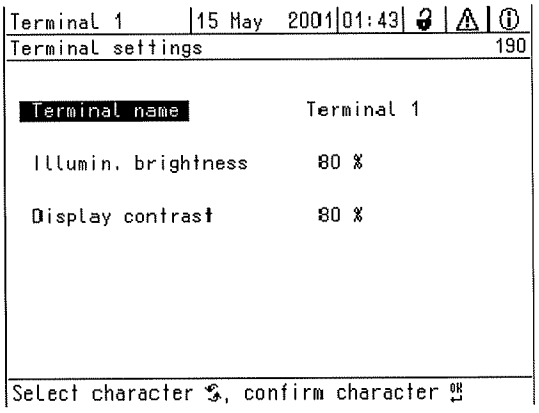


Fig. 5-2 Terminal settings

Terminal name

The name of the terminal appears in the top left corner of the display. 15 characters are available for the name.

3	Using <▲▼◀▶> and **<OK>**, select and confirm the menu item, *Terminal name* -> .
4	Enter the terminal name with <▲▼◀▶> and **<OK>** and confirm with **<OK>** (see also section 4.2.2).

Illumination brightness

When operating the terminal the brightness of the display can be continuously adjusted between 0 ... 100 %.

5	Using <▲▼◀▶> and **<OK>**, select and confirm the menu item, *Illumination brightness* -> .
6	Press <▲▼◀▶> and **<OK>** to select and confirm a brightness level.

Illumination brightness (standby)

When operating the terminal without making any entries on the keys the brightness of the display can be continuously adjusted between 0 ... 50 %.

7	Using <▲▼◀▶> and **<OK>**, select and confirm the menu item, standby *Illumination brightness (standby).*
8	Press <▲▼◀▶> and **<OK>** to select and confirm a brightness level.

Display contrast

The display contrast can be continuously adjusted.

9	Using <▲▼◀▶> and **<OK>**, select and confirm the menu item, *Display contrast* -> .
10	Press <▲▼◀▶> and **<OK>** to select and confirm a contrast level.

Network settings (TCP/IP settings)

These settings are used to connect the MIQ/TC 2020 XT to a TCP/IP network.

5.4 Access control

Use the function *Access control* to define the safety settings for theIQ SENSOR NET.

The MIQ/TC 2020 XT, configured as a terminal/controller, provides 4 steps of system security:

Safety instructions		Password-protected functions
1	No access control	None
2	Simple access control	System settings
3	Extended access control	• System settings • Maintenance functions
4	Extended access control with instrument block	• System settings • Maintenance functions • Measured value display

Note
Information on access to the system is given in section 4.3.

Delivery condition

Access control is switched off in the delivery condition.
Every user can carry out all functions.

Saving the password

If access control is enabled for the IQ SENSOR NET and the administrator password is lost, quick administrator access to the IQ SENSOR NET is not possible.

To avoid the loss of the password we recommend to create a back-up of the administrator password. This also applies to the use of the electronic key.

To be on the safe side, you can store the administrator password on an electronic key and/or note it on paper or a PC. Store the passwords in a safe place.

5.4.1 Simple access control (*Unlock/lock settings*)

Use the simple access control

- where the requirements on the security of the system are low or
- if old and new terminals or controllers are to be used together in the IQ SENSOR NET.

Password protection can be switched on or off with the *Unlock/lock settings* function. The current setting is displayed in the safety field. The lock symbol is open or closed. Before any change of the release setting, a password query appears. The password must also be entered per SMS for remote access (with operational GSM modem).

Authorization levels

The current authorization level is shown on the display with the following symbols.

Simple access control	Symbol	Authorization
Settings are unlocked (Access control switched off)	🔓	All functions in the system are accessible for all users
Settings are locked	🔒	Access to the system settings is only possible with a password Unprotected functions ● Calibration ● Data backup ● View measured values

Note
If the closed lock symbol 🔒 is visible on the display, changes to the system settings are only possible after entering a password.

Switching on the simple access control

1	Using <**S**>, open the *Settings* menu.
2	Using <**▲▼◀▶**> and <**OK**>, select and confirm the menu item, *System settings -> Access controlUnlock/lock settings*. The *Unlock/lock settings* dialog window opens.

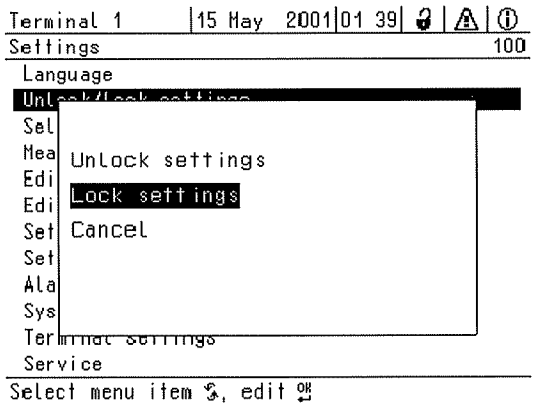


Fig. 5-3 100 - Settings -> Unlock/lock settings

3	Press <▲▼◀▶> and **<OK>** to select a function and **<OK>** to confirm. The dialog window for entering the password opens.
4	Press <▲▼◀▶> and **<OK>** to enter the valid password and press **<OK>** to confirm. The setting is changed.

Note
Forgotten the password? You can display the valid password on the screen (see section 12.1).

Switching off the simple access control (open system)

Password protection is switched off as follows:

1	Using **<S>**, open the *Settings* menu.
2	Press <▲▼◀▶> to select the menu item, *System settings* -> *Access control* and confirm with **<OK>**.
3	If extended access control is activated: Deactivate extended access control.
4	Press <▲▼◀▶> to select the menu item, *Release/lock settings* and confirm with **<OK>**.
5	Press <▲▼◀▶> to select the menu item, *Release/lock settings* and confirm with **<OK>**. All system functions can be accessed without a password.

5.4.2 Extended access control

The extended access control provides three preconfigured user types in the system. Each user type can be protected with its own password.

Authorization

The current user type is shown on the display with the following symbols.

Validity	User type	Symbol	Authorization
System wide	*Administration*		• Access only with password • Change system settings • Assign user rights • Calibration • Data backup • Reset configuration • View measured values
	Maintenance		• Access only with password • Calibration • Data backup • View measured values
	Viewer		• Without instrument block: Access without password • With instrument block: Access only with password • Data backup • View measured values
For the terminal on which the function was activated	Instrument block		• Instrument block switched off: Authorization as for *Viewer*. • Instrument block active: The MIQ/TC 2020 XT is blocked. Only the IQ SENSOR NET logo is displayed. Access only with password.

Switching on the extended access control

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *Access control* -> . The *Simple access control* dialog window opens.

3	Using <▲▼◀▶>, select the function, *Activate extended access control* and confirm with **<OK>**. Authorization and instrument block can be selected.

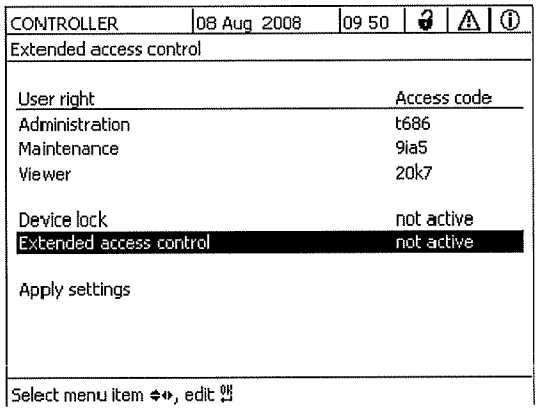


Fig. 5-4 100 - Settings -> Access control -> Extended access control

The instrument automatically generates a password for each authorization level. This password can be accepted or changed.

4	Press <▲▼◀▶> to select an authorization level and confirm with **<OK>**. If necessary, change the password in the selection dialog and/ or save the password on a connected USB memory device.
5	Note passwords. For reasons of safety at least the administrator password should be saved in such a way that it can be accessed in an emergency.
6	Press <▲▼◀▶> to select the *Apply settings* function and confirm with **<OK>**. A security prompt opens.
7	Press <▲▼◀▶> to select *OK* and confirm with **<OK>**. The settings are adopted. The *Extended access control* window is still open. The current passwords are visible.

Note
Forgotten the password? You can release the IQ SENSOR NET again (see section 12.1).

5.4.3 Instrument block

Use the *Device lock* function to protect the terminal on which this function is activated, not only against unauthorized operation, but also against unauthorized reading of the current measured values. By activating the instrument block the password for viewing the measured values is activated.

After a selected interval without user entries, the system is automatically blocked. The display shows only the IQ SENSOR NET logo.

1	Call up extended access control (see section 5.4.2).
2	Press <▲▼◀▶> to select the *Device lock* function and confirm with <**OK**>. A checkmark appears next to the function.
3	Press <▲▼◀▶> to select the *Apply settings* function and confirm with <**OK**>. A security prompt opens.
4	Press <▲▼◀▶> to select *OK* and confirm with <**OK**>. The settings are adopted. The *Access control* dialog box is still open. The current passwords are visible.

5.4.4 Electronic key

The administrator can simplify access to the IQ SENSOR NET by saving the password on a USB memory device. The USB memory device thereby becomes an electronic key.

When the electronic key is inserted in the MIQ/TC 2020 XT the authorization level saved there is automatically read out with the associated password. The user of the electronic key is logged onto the system with his authorization level without any further password query.

When the electronic key is removed, the IQ SENSOR NET automatically switches back to the lowest authorization level again.

Passwords for different IQ SENSOR NET systems can be saved on every electronic key.
For each IQ SENSOR NET system only one password can be saved on each electronic key.

Saving a password on an electronic key

Simple access control

1	Connect the USB memory device to the USB-A interface.
2	Using <**S**>, open the *Settings* menu.
3	Using <▲▼◀▶> and <**OK**>, select and confirm the menu item, *Access control* -> . The *Access control* dialog window opens.
4	Press <▲▼◀▶> and <**OK**> to select and confirm the menu item, *Change access control.*
5	Press <▲▼◀▶> and <**OK**> to select and confirm the menu item, *Save access code on USB memory.* The password for the system settings is saved on the USB memory device.

Extended access control:

1	Connect the USB memory device to the USB-A interface.
2	Using <**S**>, open the *Settings* menu.
3	Using <▲▼◀▶> and <**OK**>, select and confirm the menu item, *Access control* -> . The *Access control* dialog window opens.
4	Press <▲▼◀▶> to select an authorization level and confirm with <**OK**>.
5	Using <▲▼◀▶>, select the menu item, *Save access code on USB memory* and confirm with <**OK**>. The password for the system settings is saved on the USB memory device.

5.5 Editing the list of sensors

The *Edit list of sensors* display provides an overview of all IQ sensors, differential sensors and inactive datasets (see section 7.4.2).

In the *Edit list of sensors* display, you can:

- assign sensor names (see section 5.5.1)
- delete inactive datasets (see section 5.5.1)
- change the order of the display of measured values on the measured value display (see section 5.5.2).

5.5.1 Entering / editing a name for an IQ sensor

For the easier identification of the IQ sensors and differential sensors, you can assign an individual name to each IQ sensor.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Edit list of sensors.* The *Edit list of sensors* display opens.
3	Using **<▲▼◀▶>**, highlight the *Sensor name* column. Confirm with **<OK>**.
4	Using, **<▲▼◀▶>** highlight the name of a sensor and confirm with **<OK>**.

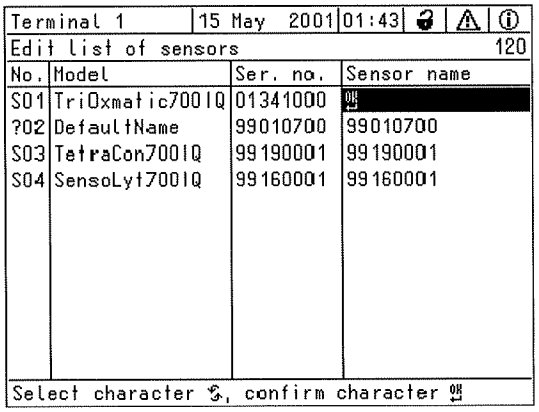


Fig. 5-5 Edit list of sensors

5	Enter the name with **<▲▼◀▶>** and **<OK>** and confirm with **<OK>** (see section 5.5.1).

5.5.2 Changing the display position

The numbering of the sensors is generated by the system. The order of the sensors in the measured value display and in the *Edit list of sensors* overview can be individually determined.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Edit list of sensors*. The *Edit list of sensors* display opens.
3	Using **<▲▼◀▶>**, highlight the *Model* column. Confirm with **<OK>**.
4	Press **<▲▼◀▶>** to highlight a *Model* and confirm with **<OK>**. A dialog window opens.

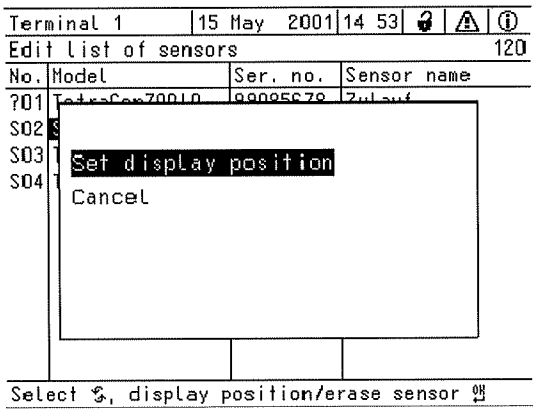


Fig. 5-6 Edit list of sensors -> Set display position

5	Using **<▲▼◀▶>**, select the menu item, *Set display position* and confirm with **<OK>**. A dialog window opens.
6	Press **<▲▼◀▶>** to select the required number for the display position and confirm with **<OK>**. The sensor is displayed at the new position in the list of sensors. The other sensors are moved accordingly.

5.5.3 Erasing inactive sensor datasets

An inactive dataset for an IQ sensor arises if the controller receives no signals from a registered IQ sensor. The *Error* display appears on the measured value display instead of a measured value. Inactive datasets can be recognized by a question mark, e.g. "?01" in the *Edit list of sensors* overview.

An inactive dataset can be reactivated by assigning it, e.g. to an IQ sensor of the same type (see section 7.4.2). All settings are retained. If you no longer require these data, you can erase them. All the data and settings belonging to this IQ sensor, as well as differential sensors and the link with an output, are erased by this action.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Edit list of sensors.* The *Edit list of sensors* display opens.
3	Using **<▲▼◀▶>**, highlight the *Model* column. Confirm with **<OK>**.
4	Press **<▲▼◀▶>** to highlight a *Model* and confirm with **<OK>**.

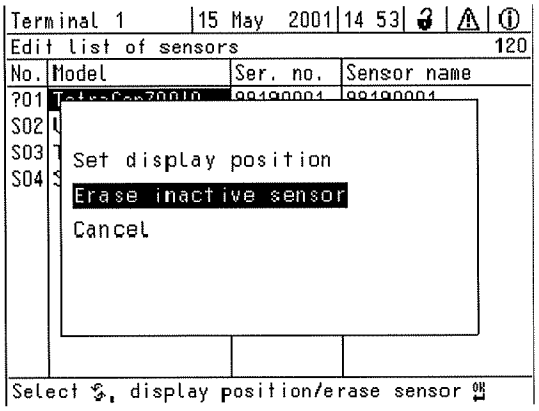


Fig. 5-7 Edit list of sensors -> Erase inactive sensor

5	Press **<▲▼◀▶>** to select *Erase inactive sensor* and confirm with **<OK>**. The dialog window for the security prompt appears.
6	Press **<▲▼◀▶>** to select *Erase inactive sensor* and confirm with **<OK>**. The inactive sensor is erased.

5.6 Setting up IQ sensors/differential sensors

5.6.1 Creating a differential sensor

A differential sensor is a virtual sensor. It shows the differential value of two IQ sensors that measure the same parameter and have the same settings. This is used to display the difference, e.g. before and after a water treatment.

Differential IQ sensors can be recognized in the *Edit list of sensors* overview in the *Ser. no.* field by the specification of the two sensors involved. A link with another IQ sensor in the *Settings of sensors and diff. sensors* menu can be recognized in the *&* field by the sensor number of the linked sensor.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Settings of sensors and diff. sensors.* The *Settings of sensors and diff. sensors* display opens.
3	Using **<▲▼◀▶>**, select a sensor and confirm with **<OK>**. The display for the selection of the second sensor opens.

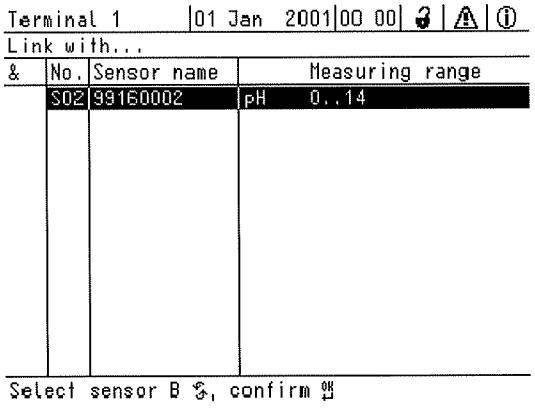


Fig. 5-8 Settings of sensors and diff. sensors -> Link with...

4	Using **<▲▼◀▶>**, select a sensor and confirm with **<OK>**. The sensors are linked. The link in both sensors is entered in the *Edit list of sensors* overview. The linked sensor is created as a new sensor and also appears in the measured value display.

5.6.2 Erasing a differential sensor

If a differential sensor is no longer required, it can be erased from the list of sensors.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Settings of sensors and diff. sensors*. The *Settings of sensors and diff. sensors* display opens.
3	Press **<▲▼◀▶>** to highlight the *&* column and confirm with **<OK>**.
4	Press **<▲▼◀▶>** to highlight a differential sensor and confirm with **<OK>**.

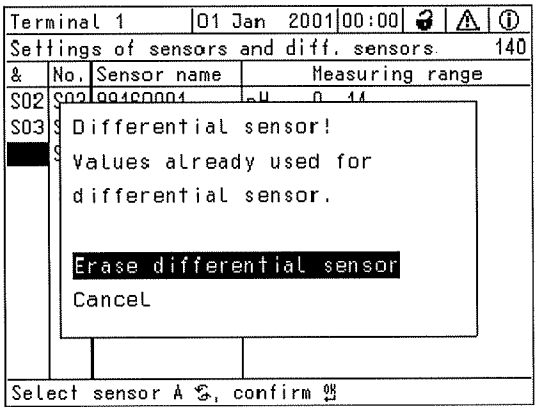


Fig. 5-9 Settings of sensors and diff. sensors -> Erase differential sensor

5	Press **<▲▼◀▶>** to select *Erase differential sensor* and confirm with **<OK>**. The differential sensor is erased.

5.6.3 Adjusting the settings for sensors/differential sensors

Sensor settings include the measured parameter, measuring range and, if necessary, compensations.

Note
General steps for the selection of sensor settings are given below. Details on sensor settings are given in the operating manual for the IQ sensor.

1	Using <**S**>, open the *Settings* menu.
2	Using <▲▼◀▶> and <**OK**>, select and confirm the menu item, *System settings -> Settings of sensors and diff. sensors*. The *Settings of sensors and diff. sensors* display opens.
3	Using <▲▼◀▶>, highlight the *Measuring range* column. Confirm with <**OK**>. An information window opens up.

Note
If the measuring mode or measured parameter are changed, a link of the sensor with a relay is erased!

4	Confirm the information with <**OK**>. The *Link with...* display opens.

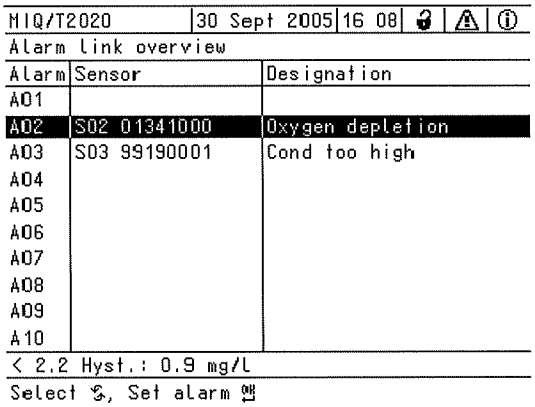


Fig. 5-10 Settings of sensors and diff. sensors

5	Using <▲▼◀▶>, select a sensor and confirm with <**OK**>. The current settings are displayed.

5.7 *Sensor-sensor link* (automatic inclusion of an influence quantity)

The *Sensor-sensor link* function automatically provides a sensor with the measured value of another sensor in the IQ SENSOR NET system.

Example Measurement of the D.O. concentration

D.O. sensors measure the D.O. partial pressure and use the solubility function of oxygen in the test sample to calculate the D.O. concentration (mg/L).
The solubility of oxygen in water is influenced by the salt content (the salinity) of the solution and other factors such as the temperature or air pressure.

Static salinity correction

To take into account the influence of the salinity on the D.O. concentration, many D.O. measuring systems provide a function where you can manually enter the salinity value. The sensor includes the salinity and provides a corrected measured value.

This type of static salinity correction is especially suitable for test samples with almost unchanging salinity.
To obtain optimum measurement results even with changing salinity values, the actual salinity has to be determined and entered for each measurement of the D.O. concentration.

Dynamic salinity correction

A dynamic salinity correction is provided by the *Sensor-sensor link* function.
This function supplies the D.O. sensor continuously with the current salinity value and is thus especially suitable for the continuous measurement of the D.O. concentration with changing salinity values.

5.7.1 Establishing a sensor-sensor link

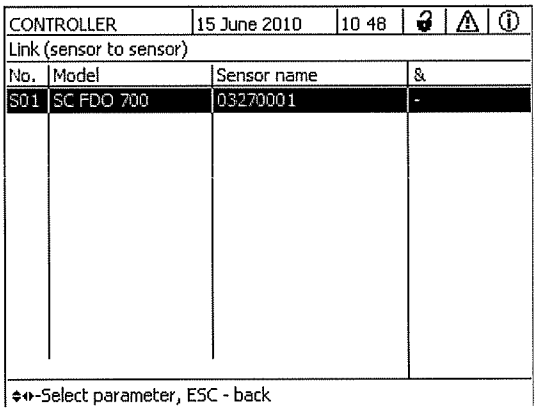
Requirements for a sensor-sensor link

The following requirements have to be met for a sensor-sensor link:

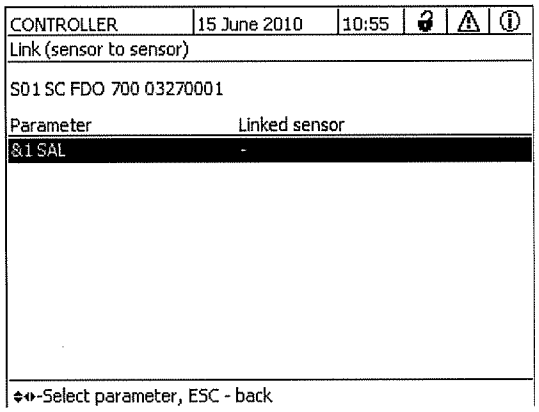
- Hardware
  - A sensor for which an influence quantity can be corrected (e.g. FDO® 700 IQ, TriOxmatic® 700 IQ) is in the IQ SENSOR NET system.
  - A sensor that measures the influence quantity (e.g. TetraCon® 700 IQ) is in the IQ SENSOR NET system.
- Software
  - The software of the sensor with correction function (e.g. FDO® 700 IQ) supports the function, *Sensor-sensor link.*
  - The software of the sensor measuring the influence quantity (e.g. TetraCon® 700 IQ) supports the function, *Sensor-sensor link.*
- Sensor settings
  - The correction function is enabled in the setting menu for the sensor with correction function (e.g. FDO® 700 IQ).
  - The automatic (dynamic) correction is enabled in the setting menu for the sensor with correction function (e.g. FDO® 700 IQ).
  - A sensor measures the influence quantity and displays it with the unit which is used for manual input in the menu of the sensor with correction function
    (e.g. TetraCon® 700 IQ measures the salinity in mg/L).
  - The manually entered value for the static correction is set to the mean value of the influence quantity (e.g. salinity value) of the test sample.
    If no measured value for the influence quantity is available, the correction is made with the value that was manually entered (static correction).

Establishing a link

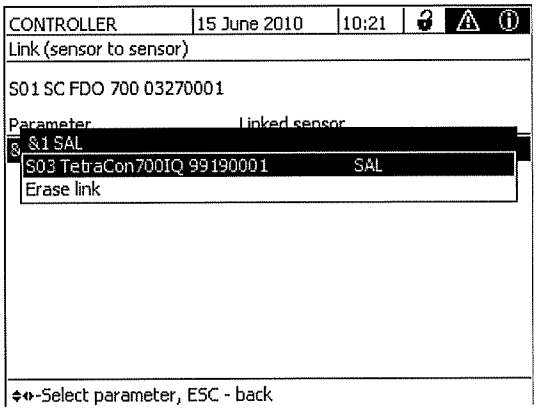
1	Using **<S>**, open the *Settings* menu.
2	Using **<▲><▼>** and **<OK>**, select and confirm the menu item, *System settings -> Sensor-sensor link.* The *Sensor-sensor link* overview opens. The displayed list includes all sensors with which the correction of an influence quantity is possible (e.g. FDO® 700 IQ).



3	Using **<▲><▼>**, highlight a sensor and confirm with **<OK>**. The influence quantity to be linked and the current state of the link are displayed.



4	Using **<▲><▼>**, highlight a parameter to be linked, and confirm with **<OK>**. The displayed list includes all sensors that measure an influence quantity with the correct unit (e.g. TetraCon® 700 IQ, which measures the salinity in mg/L).



5	Using <▲><▼>, highlight a sensor that can be linked, and confirm with <**OK**>. The sensors are linked. The influence quantity to be linked and the linked sensor are displayed.
6	Leave the system settings with <**M**>. In the measured value display, the corrected measured value is marked by an asterisk (*).

Behavior if there is no measured value for the influence quantity

Cause	Behavior
– Sensor failure	– The manually entered value for the influence quantity is automatically used for correction. An exclamation mark (!) indicates the interrupted link. – The sensor-sensor link is reactivated as soon as the measured value for the influence quantity is available again.
– Maintenance condition active	– The value last measured for the influence quantity is automatically used for correction. – The current measured value is used for correction as soon as the measured value for the influence quantity is available again.

5.7.2 Erasing a *Sensor-sensor link*

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲><▼>** and **<OK>**, select and confirm the menu item, *System settings -> Sensor-sensor link*. The *Sensor-sensor link* overview opens. The displayed list includes all sensors with which the correction of an influence quantity is possible (e.g. FDO® 700 IQ).
3	Using **<▲><▼>**, highlight a sensor and confirm with **<OK>**. The displayed list includes all linked sensors.
4	Using **<▲><▼>**, highlight a sensor and confirm with **<OK>**. The displayed list includes all sensors that measure an influence quantity with the correct unit (e.g. TetraCon® 700 IQ, which measures the salinity in mg/L), and the menu item, *Erase link*.
5	Using **<▲><▼>**, highlight the menu item, *Erase link*, and confirm with **<OK>**. The sensor-sensor link is deleted.
6	Leave the system settings with **<M>**. In the measured value display, the measured value is corrected by the manually entered value.

Note
The *Sensor-sensor link* function is automatically deactivated if the measured parameter of the linked sensor is changed (e.g. by switching the display of the TetraCon® 700 IQ conductivity sensor from salinity to conductivity).

5.8 Editing the list of outputs

The *Edit list of outputs* display provides an overview of all outputs, links and inactive datasets (see section 7.4.3).

In the *Edit list of outputs* display, you can:

- assign output names (see section 5.5.1) and
- erase inactive datasets (see section 5.5.2).

5.8.1 Entering / editing the name of an output

For the easier identification of the outputs, you can assign an individual name to each output in the *Edit list of outputs* display.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *Edit list of outputs* -> . The *Edit list of outputs* overview opens.
3	Press **<▲▼◀▶>** to highlight a name in the *Name* column and confirm with **<OK>**.

Terminal 1 | 15 May 2001 | 14:53

Edit list of outputs 130

No.	Model/Channel	Ser. no.	Name
D01	ADCR/C1	12345678	
D01	ADCR/C2	12345678	O2-Belebung
D01	ADCR/C3	12345678	O2-Belebung
D01	ADCR/R1	12345678	GW Lüfter I
D01	ADCR/R2	12345678	GW Lüft II
D01	ADCR/R3	12345678	GW Lüft III
?02	ADCR/R1	22222222	GW1 Trübung
?02	ADCR/R2	22222222	GW2 Trübung
D03	ADCR/C1	66666666	Schlammpgl
D03	ADCR/C2	66666666	Trüb Abl
D03	ADCR/R1	66666666	Trüb Zul

Select character ⇳, confirm character ⇵

Fig. 5-11 Edit list of outputs -> enter a name

4	Enter the name with **<▲▼◀▶>** and **<OK>** and confirm with **<OK>** (see also section 4.2.2).

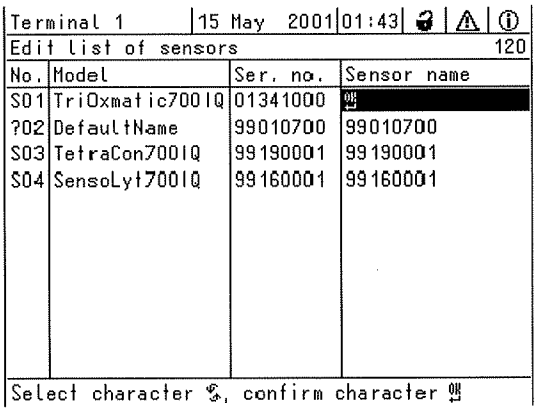


Fig. 5-12 Edit list of sensors

5.8.2 Erasing an inactive dataset for an MIQ output module

An inactive dataset for an MIQ output module arises if the system receives no signals from a registered MIQ output module. Inactive datasets can be recognized by a question mark, e.g. "?01" in the *Edit list of outputs* overview.

An inactive dataset can be reactivated by assigning it, e.g. to an MIQ output module of the same type (see section 7.4.3). All settings are retained. If you no longer require the stored data, you can erase them.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Edit list of outputs.* The *Edit list of outputs* display opens.
3	Using **<▲▼◀▶>**and **<OK>**, highlight the *Model/Channel* column. Confirm with . This column can only be highlighted if an inactive dataset (?xx) is present.
4	Press **<▲▼◀▶>** to highlight a *Model/Channel* and confirm with **<OK>**.

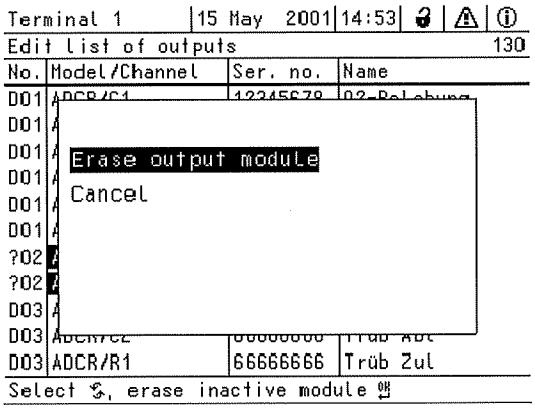


Fig. 5-13 Edit list of outputs -> Erase output module

5	Press <▲▼◀▶> to select *Erase output module* and confirm with <**OK**>. The dialog window for the security prompt appears.
6	Press <▲▼◀▶> to select *Erase output module* and confirm with <**OK**>. The output is erased.

5.8.3 Output links/settings

Note
The procedure and possible settings for linking outputs with sensors are given in the operating manual of the respective output module.

5.9 Settings for a measurement location

Primarily, the settings for a measurement location simplify the calibration of IQ sensors if several IQ sensors of the same type are operated on the system. The option of hiding IQ sensors on the measured value display that are not operated at the measurement location helps to find IQ sensors at the measurement location quickly.

Measurement location-related settings become effective as soon as a terminal is docked on an MIQ module. Measurement location-related settings include:

- the location name (module name)
- the selection of the sensors for the measured value display.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Select measured values of location.* The *Location display* display opens.

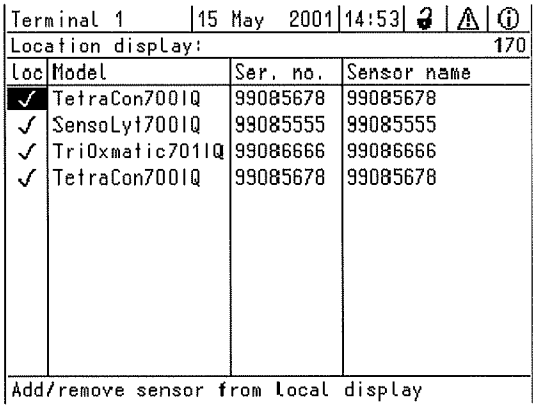


Fig. 5-14 Location display

Entering the name of a measuring location

The name of the measurement location is displayed in the line with the name of the display. 15 characters are available for the name of the measurement location.

3	Press <▲▼◀▶> to select the name of the display, *Select measured values of location* and confirm with **<OK>**.
4	Press <▲▼◀▶> and **<OK>** to enter the location name and finally confirm with **<OK>** (see also section 4.2.2).

Selecting sensors for the measured value display on the measurement location

The measured value display provides the option of displaying either all sensors or a selection of sensors (see section 4.4.4).

As soon as a terminal is docked on any MIQ module, the selected sensors at the measurement location are displayed. All sensors for the display at the measurement location are activated in the delivery state.

The sensors are selected in the *Select measured values of location* menu. This selection is stored in the MIQ module on which the terminal is docked.

5	Select and confirm sensors for the local measured value display with <▲▼◀▶> and **<OK>**. This sets or removes a tick (✔) for the individual sensors. Sensors selected for the display are marked with a tick (✔).

5.10 Alarm settings

5.10.1 General information

Under this menu item you can specify reactions on certain alarm events.

An alarm event is when a certain measured value (limiting value) of a sensor is exceeded or undercut. You can configure up to 20 alarm events.

Alarm events can be relayed as follows:

- as a message on the display
- as a relay action (with corresponding output module)
- as SMS (with ready-to-operate GSM modem)

Note
An alarm message via display or relay cannot be acknowledged or switched off. An alarm only disappears if the cause for the alarm was eliminated or the *Alarm settings* were changed or erased. An SMS alarm message is only sent once when an alarm event occurs.

5.10.2 Setting up / editing alarms

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *Alarm settings* -> . The *Alarm link overview* dialog window opens. Alarms that have already been set up have entries in the *Sensor* column.

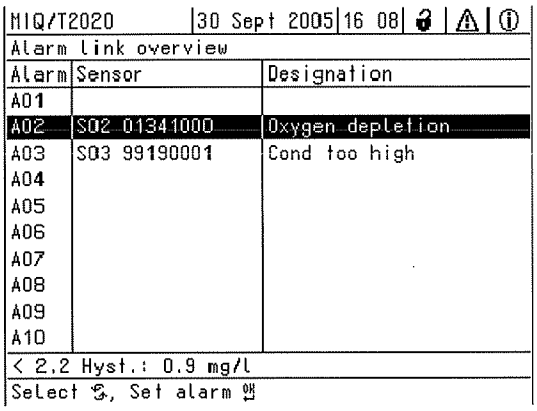


Fig. 5-15 Alarm settings -> Alarm link overview

Note
In the *Sensor* column, the sensor number (corresponding to the list of sensors) and series number is named.

3	Select an alarm *A01* to *A20* to be edited with **<▲▼◀▶>**. To set up a new alarm without entry select in the *Sensor* column. Then confirm with **<OK>**. When a new alarm is set up a list with all sensors appears first. Alarm links that are already available can be erased or edited (for editing continue with step 5).

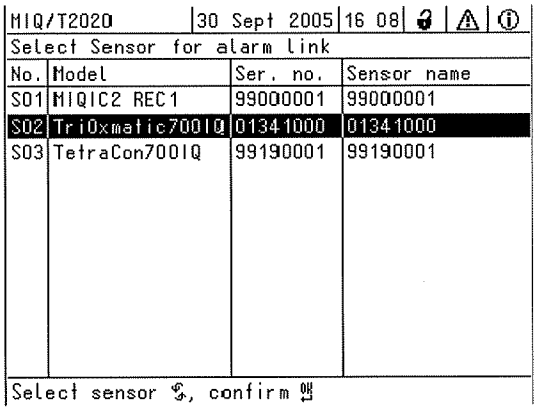


Fig. 5-16 Select Sensor for alarm link

4 To set up a new alarm, select a sensor from the list with <▲▼◀▶> and confirm with **<OK>**. The *Set alarm link* display opens.

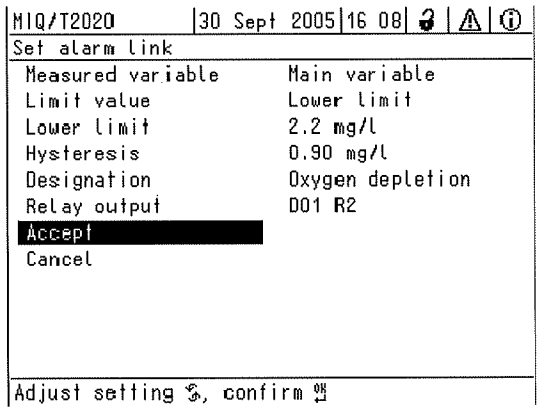


Fig. 5-17 Set alarm link

5 Edit the setting table. The required operating steps are described in detail in section 4.2 GENERAL OPERATING PRINCIPLES.

Alarm links setting table

Menu item	Selection/Values	Explanations
Measured variable	• *Main variable* • *Adjoining variable*	*Main variable* designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). *Adjoining variable* designates an additional measured parameter (e.g. temperature).
Limit value	• *Lower limit* • *Upper limit*	Type of the alarm event. *Lower limit*: An alarm is triggered if the defined limit value is undercut. *Upper limit*: An alarm is triggered if the defined limit value is exceeded.
Lower limit / *Upper limit*	*within the measuring range (sensor-dependent)*	Limit value for the alarm event
Hysteresis	*0 - 10 % of the measuring range*	Hysteresis for the limit value
Designation	(max. 20 characters)	User-defined designation for easier identification in the alarm message (display and SMS).
Relay output	Dxx / .../Ry ... ... *No relay output*	Opens a list with all relay outputs where the *Alarm contact* is set. Dxx: number of the output module .../Ry: relay output channel Here you can select a relay output. When the alarm event occurs, it carries out the specified action (Open or Close). Details see section 5.10.3 ALARM OUTPUT TO DISPLAY.
Accept		The settings are taken over in the setting table by pressing **<OK>**. The display switches to the next higher level.
Cancel		The display switches to the next higher level without storing the new settings.

5.10.3 Alarm output to display

When an alarm event occurs, a window with a text message appears.

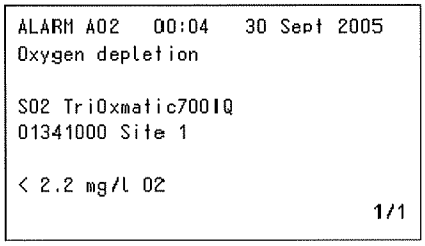


Fig. 5-18 Example of an alarm message on the display

The alarm message contains the following information:

- Line 1: Alarm no. Axx and time and date of the alarm event
- Line 2: User-defined designation
- Line 3: Sensor number and model name of the sensor that triggered the alarm event
- Line 4: Series number and name of the sensor that triggered the alarm event
- Line 5: Description of the event with specification of the limiting value:
  "<" = undercut
  ">" = exceeded

Operating instructions

If there are several alarm messages indicated on the display, you can scroll through the messages with <▲▼◀▶>. This can be recognized from the page number in the right lower corner. The latest message is always on the first position.

Pressing **<M>** hides the alarm messages and switches to the measured value display. After one minute the alarm messages appear again if what caused them is still present.

5.10.4 Alarm output as relay action

The relay outputs of the IQ SENSOR NET can be configured so a relay action is triggered when an alarm event occurs (Open or Close). For this the *Alarm contact* function must be set for the relay output in the *Settings of outputs and links*.

The *Alarm contact* function is only available for relays that are not linked with a sensor. If necessary, an existing link must be erased. For details please refer to the operating manual of the output module.

5.10.5 Alarm message as an SMS

All alarm messages can be sent as SMS via a GSM modem. The same information that is output on the display is transmitted when doing so. Details of how to connect the IQ SENSOR NET to a GSM modem are given in the operating manual "Remote connection to the IQ SENSOR NET 2020 XT USB".

Caution

For critical alarm events take into account that - due to radio transmission - SMS messages may possibly be received delayed.

5.11 System settings

System settings include:

- *Language* (see section 5.1)
- *Date/Time* (see section 5.11.1)
- *Loc. altitude:* (see section 5.11.2)

5.11.1 Setting the date and time

The real time clock is used for the display of date and time in the measured value display and in log book entries.

1	Using <**S**>, open the *Settings* menu.
2	Using <▲▼◀▶> and <**OK**>, select and confirm the menu item, *System settings* -> *Date/Time*. The *Date/Time* display opens.
3	Press <▲▼◀▶> to select *Set date* or *Set time*.
4	Confirm the selection with <**OK**>. A field is highlighted, e.g. *Year*.

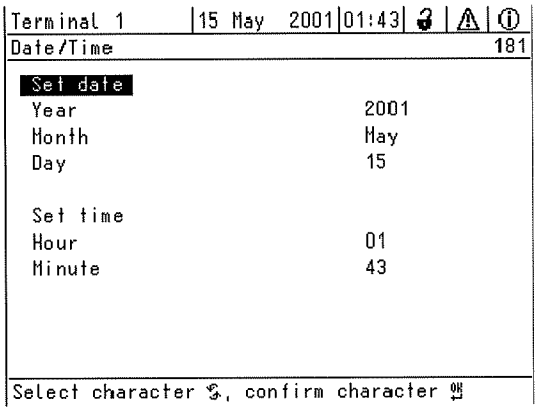


Fig. 5-19 Date/Time

5	Press <▲▼◀▶> and <**OK**> to select and confirm a number. The next field is highlighted, e.g. *Month*.
6	Complete the entries on the display *Date/Time*.

Note
The clock in the MIQ/TC 2020 XT bridges periods of power failure of up to 24 hours. After a longer power failure, the clock starts precisely at the time of the failure. A message and an entry in the log book provide information on the power failure and the necessity for resetting the clock.

5.11.2 Site altitude / setting the medium air pressure

Note
When using a module for automatic air pressure compensation (MIQ/A-(PR/MOD)), the *Location altitude/Air pressure* menu item with associated values is displayed, but cannot be adjusted.

Air pressure values in a range of 500 to 1100 mbar can be set.

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Location altitude/Air pressure.* The *Location altitude/Air pressure* display opens.

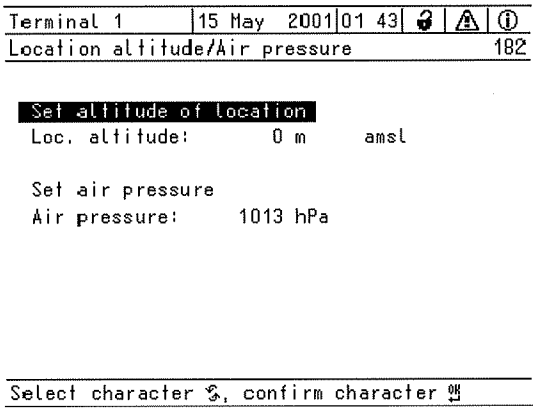


Fig. 5-20 Location altitude/Air pressure

3	Press **<▲▼◀▶>** and **<OK>** to select and confirm *Set altitude of location* or *Set air pressure.*
4	Press **<▲▼◀▶>** and **<OK>** to adjust and confirm the values for *Loc. altitude:* or *Air pressure:*.

5.12 *Measured value logging*

With the *Measured value logging* setting you can record and store measured values of IQ sensors or differential sensors.

You can display the stored measured values

- as a list or
- display the temporal course of the stored measured values graphically (see section 4.4.4).
- display the stored measured values to a PC.

The system allocates memory blocks to an IQ sensor for the *Measured value logging*. With a recording interval of 1 measurement dataset per minute, a recording duration of 1 day per memory block is possible. 360 memory blocks are available and can be distributed to the sensors.

The recording duration directly depends on the recording interval. If a recording duration of 0 d is set for a sensor, there is no memory block allocated to the IQ sensor. The *Dur.* setting also contains the number of the allocated memory blocks (see table).

Recording interval	Possible recording duration with the given recording interval					
1 min	0 d	1 d	2 d	3 d	...	360 d
5 min	0 d	5 d	10 d	15 d	...	1800 d
10 min	0 d	10 d	20 d	30 d	...	3600 d
15 min	0 d	15 d	30 d	45 d	...	5400 d
30 min	0 d	30 d	60 d	90 d	...	10800 d
60 min	0 d	60 d	120 d	180 d	...	21600 d
Number of allocated memory blocks	**0**	**1**	**2**	**3**	**...**	360

Minimum recording duration

Approx 1 year with a recording interval of 1 min and one allocated memory block.

Maximum recording duration

Approx. 59 years with a recording interval of 60 min and 360 allocated memory blocks for a sensor.

If several sensors are recorded at the same time, the number of memory blocks available for one sensor decreases and, therefore, the longest possible recording duration decreases as well.

5.12.1 Setting the recording interval (*dt*) and recording duration (*Dur.*)

1	Using <**S**>, open the *Settings* menu.
2	Using <▲▼◀▶> and <**OK**>, select and confirm the menu item, *Measured value logging* -> . The *Measured value logging* display opens. It contains a list of all sensors and inactive sensors.

Terminal PC	01 Jan 2001	00:50			
Measured value Logging					160
No.	Model	Sensor name	dt	Dur.	
?01	TetraCon700IQ	Zulauf	1 min	1 d	
S02	SensoLyt700IQ	Zulauf	5 min	5 d	
S03	TriOxmatic701IQ	Belebung 1	10 min	30 d	
S04	TetraCon700IQ	Zulauf	15 min	15 d	
S05	SensoLyt700IQ	Ablauf	30 min	30 d	
S06	TetraCon700IQ	Ablauf	60 min	120 d	
S07	TriOxmat701IQ	Belebung 2	1 min	0 d	
S08	VisoTurb700IQ	Filterung	1 min	0 d	
S09	VisoTurb700IQ	Zulauf	1 min	0 d	
Save and quit		Quit			
Free storage: 100 %					
select , edit log interval					

Fig. 5-21 Measured value logging

3	Press <▲▼◀▶> and <**OK**> to select and confirm the *dt* column.
4	Press <▲▼◀▶> and <**OK**> to select and confirm a sensor.
5	Determine the recording interval with <▲▼◀▶> and <**OK**>. When the recording interval is changed, the recording duration changes at the same time (*Dur.*), because the recording duration results from the recording interval due to a fixed number of memory blocks.
6	Switch to the selection of columns with <**ESC**>.
7	Press <▲▼◀▶> and <**OK**> to select and confirm the *Dur.* column.
8	Press <▲▼◀▶> and <**OK**> to select and confirm a sensor.
9	Select the recording duration with <▲▼◀▶> and <**OK**>. The recording duration is always increased or decreased in the same steps.

Note
The percentage of the memory blocks not yet allocated is shown on the display. If all memory blocks have already been allocated (*Free storage:*: 0%), the number of memory blocks allocated to another IQ sensor may have to be reduced.

When the number of memory blocks for a sensor is reduced, the memory block with the oldest data is erased. All other data is retained.

Note
For inactive IQ sensors, the *Dur.* setting can only be reduced.

10	Switch to the selection of columns with **<ESC>**.
11	Press **<▲▼◀▶>** and **<OK>** to select and confirm the *Save and quit* column. The changes are stored. The *Settings* display opens.

Note
If the changes made for recording duration or recording interval should not be stored, press **<▲▼◀▶>** and **<OK>** to select and confirm the *Quit* field.

6 Maintenance and cleaning

6.1 Maintenance

Maintenance activities

Component	Maintenance
IQ sensors	Depending on the type of sensor (see the component operating manual of the sensor)
Other components	No maintenance required

6.2 Cleaning

MIQ modules and control units

Clean components mounted in the open of gross contamination as necessary. We recommend to clean the worst of the dirt on the MIQ module and the area around it each time before opening in order to prevent gross contamination from entering the open enclosure.

To clean the module, wipe the housing surfaces with a damp, lint-free cloth. If compressed air is available on site, blow off the worst of the dirt beforehand. Keep the housing closed while doing so.

Caution
Do not use high-pressure water blasters for cleaning (danger of water penetration!).
Do not use aggressive cleaning agents such as alcohol, organic solvents or chemical detergents.
These types of cleaning agent can attack the surface of the housing.

IQ sensors

The cleaning of the IQ sensors depends greatly on the respective application. Instructions for this are given in the respective component operating manual.

A valve module for the compressed air-operated cleaning of sensors is available as an accessory.

7 What to do if ...

7.1 Information on errors

Log book

The IQ SENSOR NET system performs a comprehensive cyclical self test during operation. While doing so, the system identifies all states that deviate from normal operation and enters corresponding messages in the log book (information or error message).

With the aid of the log book, you can call up instructions on how to clear the error directly on the terminal. The log book is described in detail in section 4.5 MESSAGES AND LOG BOOK.

Note
Information on possible errors in IQ sensors and MIQ output modules is given in the chapter WHAT TO DO IF ... of the respective component operating manual.

Status LED of the MIQ/ TC 2020 XT

In addition to the logbook entries current errors and alarms or system faults are indicated by the flashing of the status LED on the MIQ/ TC 2020 XT (see section 1.3.5).

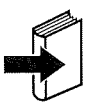
As soon as the fault is no longer present, the status LED lights again permanently.

7.2 Diagnosing faults in the voltage supply

7.2.1 Options for checking the voltage

The following options are available for checking the correct voltage supply of the individual components:

- **Checking the log book entries**
  Log book entries can only be generated by components with a processor (e.g. IQ sensors and MIQ output modules). The log book entries contain information on how to clear errors. For more details on the log book, see section 4.5.
- **Checking the LED status on the MIQ module housing**
  This check is described within the framework of the commissioning in section 3.9.3 CHECKING THE VOLTAGE SUPPLY.
- **Measuring the voltage on the MIQ modules**
  (see section 7.2.2 MEASURING THE VOLTAGE).



Note
The relationship between the supply voltage, the LED status and the log book entries is described in the section 8.1 GENERAL SYSTEM DATA.

7.2.2 Measuring the voltage

If an MIQ module shows an error condition (both LEDs off), this can be due to the following causes:

- The voltage supply has been interrupted
- The available voltage is not sufficient; the voltage is below the warning range.

These two cases can be differentiated with a voltmeter.

Measuring points of MIQ modules

The supply voltage is tapped at the following points (Fig. 7-1 on page 7-3):

- Outside on the free contacts on the front of the SENSORNET module
- Inside on the SENSORNET connections of the terminal strip (see section 7.2.2 MEASURING THE VOLTAGE).

Measuring points for IQ sensors

The supply voltage is measured on the MIQ module to which the IQ sensor is connected via the SACIQ sensor connection cable.

Systematic voltage measurement

Dock all mobile components (terminals) onto the modules with the greatest distance to the next power supply module. Begin measuring the voltage at the MIQ modules that are directly connected with an MIQ power supply module. Continue to measure the voltage systematically to the end of each cable section, i. e. along the voltage drop. Thus, in combination with the log book entries, you can narrow down the error location.

Warning

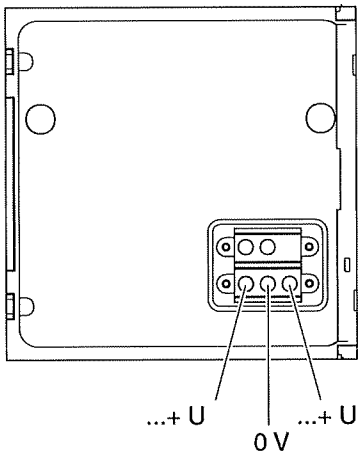
If the MIQ/PS power supply module is opened during operation, there is a danger to life due to possible hazard of electric shock. There is also a danger to life from voltages that may present a hazard of electric shock on the relay contacts of open MIQ output modules (e.g. MIQ/CR3). Note the following points in the case of voltage measurement during operation:

- **The voltage measurement may not be performed on the open MIQ/PS power supply module. The MIQ/PS may only be opened when the line voltage is switched off.**
- **The voltage measurement at an open MIQ output module with relays may only be performed if all external voltages have been previously switched off.**
- **Secure all voltages that have been switched off against being switched on again for the duration of the work.**

Note
Safe voltage measurement is possible on the module contacts on the outside of MIQ/PS and relay output modules (see Fig. 7-1).

Tapping points for measuring the voltage

Front:



SENSORNET connections on the terminal strip (example):

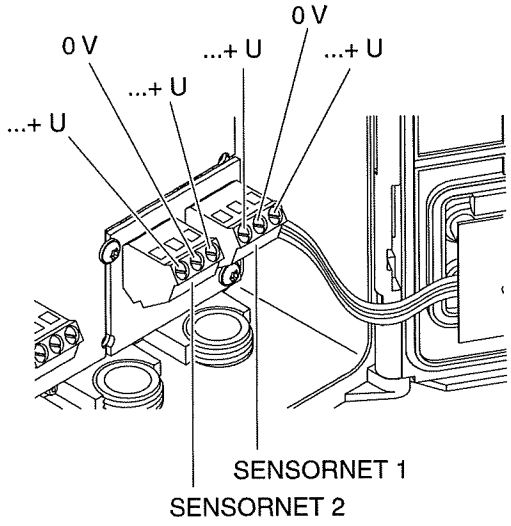


Fig. 7-1 Tapping points for measuring the voltage

Note
The supply voltage (...+ U) must be measurable at both SENSORNET wires, i. e. left and right of the shielding. Otherwise, the functioning of the component is not ensured. Admissible values for the internal voltage supply (+U) are given in section 8.1.

7.2.3 Tips for clearing errors in the voltage supply

Note
Admissible values for the internal voltage supply (+U) are given in section 8.1.

Supply voltage not present or in the warning or error range

Cause	Remedy
– Number of power MIQ power supply modules is not sufficient	– Check power rating. If necessary, install another MIQ power supply module (for details of how to do this, see section 3.4.2 DRAWING UP THE POWER RATING).
– Cable section is too long	– Check length of the cable section. If necessary, install another MIQ power supply module (for details of how to do this, see section 3.4.3 EFFECT OF THE CABLE LENGTH).
– Electrical connection between MIQ power supply module and component is defective (distributed mounting)	– Check cable connection step-by-step starting with the MIQ power supply module, and replace defective cable sections. – Check contacts on the MIQ modules (stack mounting). Clean any dirty contacts. Carefully bend back contact springs that have been pressed flat or bent (pay attention to sufficient spring tension). – Tighten all screws on the terminals.

Malfunctions despite adequate supply voltage on both +U V wires

Cause	Remedy
– Signal transmission faulty	– For terminal components, check/correct their seating on the MIQ module. – Check the log book for error messages (for details on the log book, see section 4.5). – Check/correct the position of the SN terminator switches (for the correct settings, see section 3.9.1). – Check the total line length within the IQ SENSOR NET. For a total line length of more than 1000 m, an MIQ/JBR signal amplifier module is required.
– Component is defective	– Check the log book for error messages (for details on the log book, see section 4.5). – If no log book entry exists, send the component back.

Component is not registered on the system despite sufficient supply voltage on both +U V wires (with no error message)

Cause	Remedy
IQ sensors	
– IQ sensor connection cable is not correctly connected or defective	– Check IQ sensor cable connection on the terminal strip. – Check IQ sensor cable and, if necessary, replace it. Another IQ sensor can be used for the test.
– IQ sensor is defective	– Test IQ sensor at another measurement location. – If IQ sensor still does not function, contact YSI.
Other components	
– Component is defective	– If possible, test component at another measurement location. – If component still does not function, contact YSI.

7.3 Other errors

Status LED of the MIQ/TC 2020 XT flashes

Cause	Remedy
– A fault is present	Fault remedy according to the logbook: – More detailed information on the current fault and its remedy is given in the logbook (see section 4.5.2)

The system does no longer react on entries

Cause	Remedy
– System error	Reset the system: – Remove the Terminal/ Controller and dock it again after 10 s or: – Switch off the power supply and switch it on again after 10 s

"Error" in the measured value display

Cause	Remedy
– Communication with the IQ Sensor interrupted	– Check the cable connection
– Error in the IQ sensor	– Disconnect the IQ sensor and reconnect it after 10 s

Local settings cannot be displayed

Cause	Remedy
– The contacts of two MIQ modules are not correctly connected to each other	– Clean the contacts

"no sensor" in the measured value display though an IQ sensor is connected

Cause	Remedy
– Local display has been set up and the IQ sensor is not included in the local display	– Add the sensor to the local display (see section 5.9) – Switch to the *All sensors* display with *Display local values or all values* (see section 4.4.5)

The selected system language was not activated for all components

Cause	Remedy
– A system language was selected that is not available in one component (sensor, controller, terminal, output module). The standard language, English, was activated instead of the selected system language.	– Contact YSI, a software update is required for the respective components

7.4 Replacing system components

Note
It is always possible to replace components and assign a substitute if the software state of the substitute component is as high or higher as the software version of the original component.

7.4.1 Replacing passive components

Passive components include all components that the controller cannot recognize.
These include:

- MIQ power supply modules
- MIQ branching module
- Cables (SNCIQ, SACIQ).

Warning
If the MIQ/PS power supply module is opened during operation, there is a danger to life due to possible hazard of electric shock. The MIQ/PS may only be opened when the line voltage is switched off. Secure the line voltage against being switched on again.

Only ever replace components when the IQ SENSOR NET system is switched off. Defective components are removed in the reverse order to the installation (see chapter 3 INSTALLATION).

7.4.2 Adding and replacing IQ sensors

Inactive datasets of IQ sensors

If an IQ sensor is removed from the system, its settings remain stored in the IQ SENSOR NET controller. A "?" appears in the left column of the *Edit list of sensors* menu. This indicates an "inactive dataset". A dataset contains the following information:

- Serial number of the IQ sensor (and, with it, the type of sensor)
- Display position
- All sensor settings including differential sensor
- All characteristics of the link with an output.

If no suitable inactive dataset is available, a newly connected IQ sensor is automatically recognized as a new module and added to the list of sensors (see section 3.10 SYSTEM EXTENSION AND MODIFICATION).

Note
The maximum number of data sets (active and inactive datasets) for IQ sensors is limited to 20 in the IQ SENSOR NET system 2020 XT USB.

When this number is reached, no further IQ sensor can be installed. If necessary, an inactive dataset has to be erased to make an extension possible.

Note
The current calibration data of the IQ sensor is always stored in the sensor. If an IQ sensor is connected that is ready for operation and calibrated, it can be used immediately without the need for recalibration.

Note
To erase inactive datasets, see section 5.5.3.

If an IQ sensor is connected to the system when an inactive dataset is present, the following cases are possible:

Case 1:

The serial number of the IQ sensor is identical with the serial number of an inactive dataset.	The connected IQ sensor is automatically assigned to the inactive dataset and starts to operate again. Example: Maintenance or repair. This mechanism ensures that all IQ sensors retain their settings and links if an IQ sensor was removed for maintenance, or if the system was temporarily switched off.

Case 2:

The type of sensor is identical with the type of sensor in an inactive dataset (or several inactive datasets), but the serial numbers differ.	Operator intervention is required here. The connected IQ sensor can: – be assigned to the inactive dataset (or one of the inactive datasets). Example: Replacing an IQ sensor. Make sure that the substitute sensor has at least the software status of the active IQ sensor. – be included as a new module in the list of the sensors. The operating sequence to do this is described below.

Operating sequence in case 2

1	Connect a new IQ sensor.
2	Change to the measured value display with **<M>**. The module database is updated. The following display appears (example):

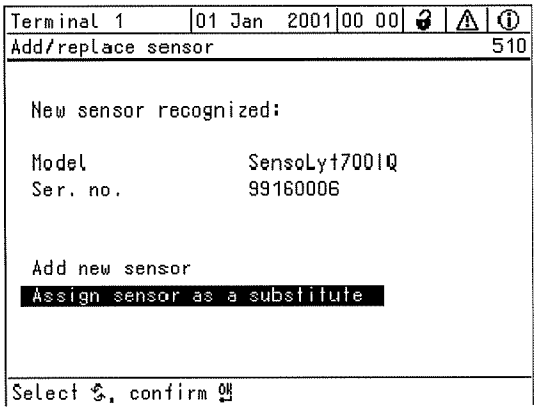


Fig. 7-2 Add/replace sensor

3 Select the required option with <▲▼◀▶> and confirm with **<OK>**.

- If *Add new sensor* was selected, the system changes directly to the measured value display. As soon as the IQ sensor is ready for operation, it delivers a measured value.
- If *Assign sensor as a substitute* was selected, a list of matching inactive datasets appears:

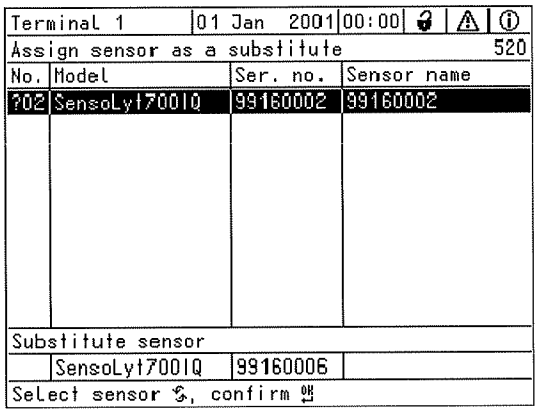


Fig. 7-3 Assign sensor as a substitute

4 Select the required inactive dataset with <▲▼◀▶> and confirm with **<OK>**. The system changes to the measured value display. The IQ sensor takes over all settings of the inactive dataset. As soon as the IQ sensor is ready for operation, it delivers a measured value.

7.4.3 Adding and replacing MIQ output modules

Warning
There is also a danger to life from voltages that may present a hazard of electric shock on the relay contacts of open MIQ output modules (e.g. MIQ/CR3). MIQ output modules with relays may only be opened if all external voltages have previously been switched off. Secure all external voltages against being switched on again for the duration of the work.

Note
When replacing MIQ modules make sure that the substitute module has at least the software status of the active module.

Only replace MIQ output modules (all MIQ modules with relay contacts and/or electrical signal outputs) when the IQ SENSOR NET system is switched off. Defective MIQ output modules are removed in the reverse order to the installation. The installation is described in the INSTALLATION chapter of the respective component operating manual.

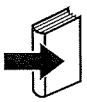
Inactive datasets in MIQ output modules

If an MIQ output module is removed from the system, its settings remain stored in the IQ SENSOR NET controller. A "?" appears in the left column (= inactive dataset) of the *Edit list of outputs* menu. The dataset contains the following information:

- All settings of the relays
- All settings of the current outputs.

If no inactive dataset is available, a newly connected MIQ output module is automatically recognized as a new module and added to the list of outputs (see section 3.10 SYSTEM EXTENSION AND MODIFICATION).

Note
The maximum number of data sets (active and inactive datasets) for MIQ output modules is limited to 8 in the IQ SENSOR NET system 2020 XT USB. When this number is reached, no further MIQ output module can be installed. If necessary, an inactive dataset has to be erased to make an extension possible.



Note
To erase inactive datasets, see section 5.8.2.

If an MIQ output module is connected to the system when an inactive dataset is present, the following cases are possible:

Case 1:

The serial number of the MIQ output module is identical with the serial number in an inactive dataset.	The connected MIQ output module is automatically assigned to the inactive dataset and starts to operate again. Example: In the case of repair.

Case 2:

The type of the MIQ output module is identical with the type in an inactive dataset (or several inactive datasets), but the serial numbers differ.	Operator intervention is required here. The connected MIQ output module can: – be assigned to the inactive dataset (or one of the inactive datasets). Example: Replacing an MIQ output module. – be included as a new module in the list of outputs. The operating sequence to do this is described below.

Operating sequence in case 2

1	Remove the (defective) MIQ output module. The output module is removed in the reverse order to the installation. The installation is described in the INSTALLATION chapter of the respective component operating manual.
2	Install the new MIQ output module (INSTALLATION chapter of the respective component operating manual).
3	Change to the measured value display with **<M>**. The module database is updated. The following display appears (example):

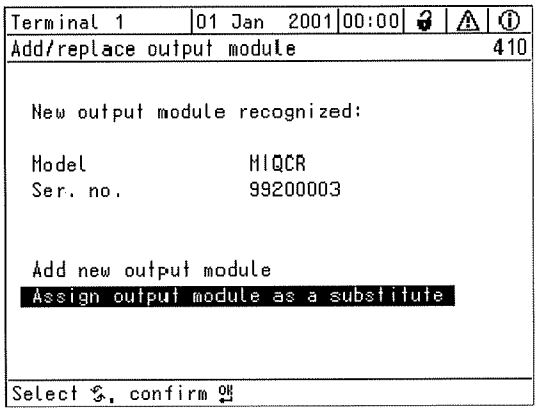


Fig. 7-4 Add/replace output module

4 Select the required option with <▲▼◀▶> and confirm with **<OK>**.

- If *Add new output module* was selected, the system changes directly to the measured value display.
- If *Assign output module as a substitute* was selected, a list of the matching inactive datasets appears:

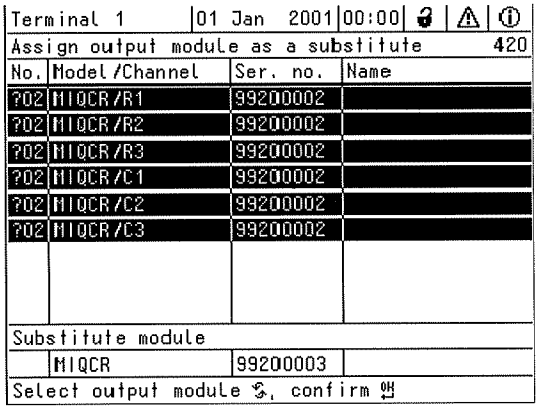


Fig. 7-5 Assign output module as a substitute

5 Select the required inactive dataset with <▲▼◀▶> and confirm with **<OK>**. The system changes to the measured value display. The MIQ output module takes over all settings of the inactive dataset.

8 Technical data

8.1 General system data

Test marks

cETLus, CE

Ambient conditions

Temperature

Operation	- 20 °C ... + 55 °C (- 4 ... 131 °F)
Storage	- 25 °C ... + 65 °C (- 13 ... 149 °F)

Relative humidity

Yearly average	≤ 90 %
Dew formation	Possible

Site altitude	Max. 2000 m above sea level

Electrical data

Nominal voltage of the power supply	See operating manual of the MIQ power supply modules used
Protective class	II
Overvoltage category	II
Maximum power consumption	Depending on the number of MIQ power supply modules
Number of MIQ power supply modules in an IQ SENSOR NET system	Up to 6, depending on the total power requirement of the system (see section 3.3 SYSTEM PLANNING)
Voltage monitoring	– Optically via 2 LEDs on each MIQ module – Additional monitoring of all components by the controller software

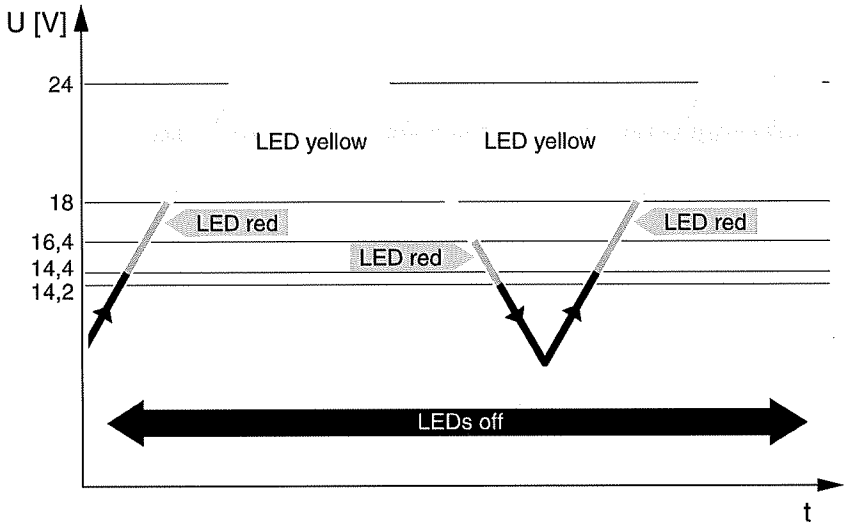
Warning

A circuit (except for the power supply connections), that is connected to an IQ SENSOR NET component, must not feed any voltages or currents that are not allowed. It has to be made sure that the circuit at any time meets all requirements of a *Limited circuit* or *Limited Power* as well as of *SELV* (Safety Extra Low Voltage). These include the following limiting value specifications:

- **AC voltage: max. 30 V effective / 42.4 V peak**
- **DC voltage: max. 60 V**
- **Current limit: max. 8 A**
- **Power output limitation: max. 150 VA**

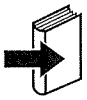
Internal voltage supply

Relationship between the supply voltage U, the LED status on the MIQ module and the log book entries (Fig. 8-1):



LED state	Log book
LED yellow	No entry (= OK)
LED red	1st error message
Both LEDs off	2nd error message (or switch-off)

Fig. 8-1 Relationship of supply voltage - LED states - log book



Note
Instructions of how to measure the actual supply voltage on individual IQ SENSOR NET components are given in this operating manual in section 7.2 DIAGNOSING FAULTS IN THE VOLTAGE SUPPLY.

Instrument safety

Applicable norms	– EN 61010-1 – UL 3111-1 – CAN/CSA C22.2 No. 1010.1

EMC product and system characteristics

EN 61326	EMC requirements for electrical resources for control technology and laboratory use – Resources for industrial areas, intended for indispensable operation – Interference emission limits for resources of class B
System lightning protection	Significantly extended qualitative and quantitative protective characteristics as opposed to EN 61326
FCC, class A	

Note
Any combination of IQ SENSOR NET products in a user-specific system fulfills these listed EMC characteristics.

8.2 General data of MIQ modules

Note
Technical data on special MIQ modules are given in the respective operating manuals.

Dimensions

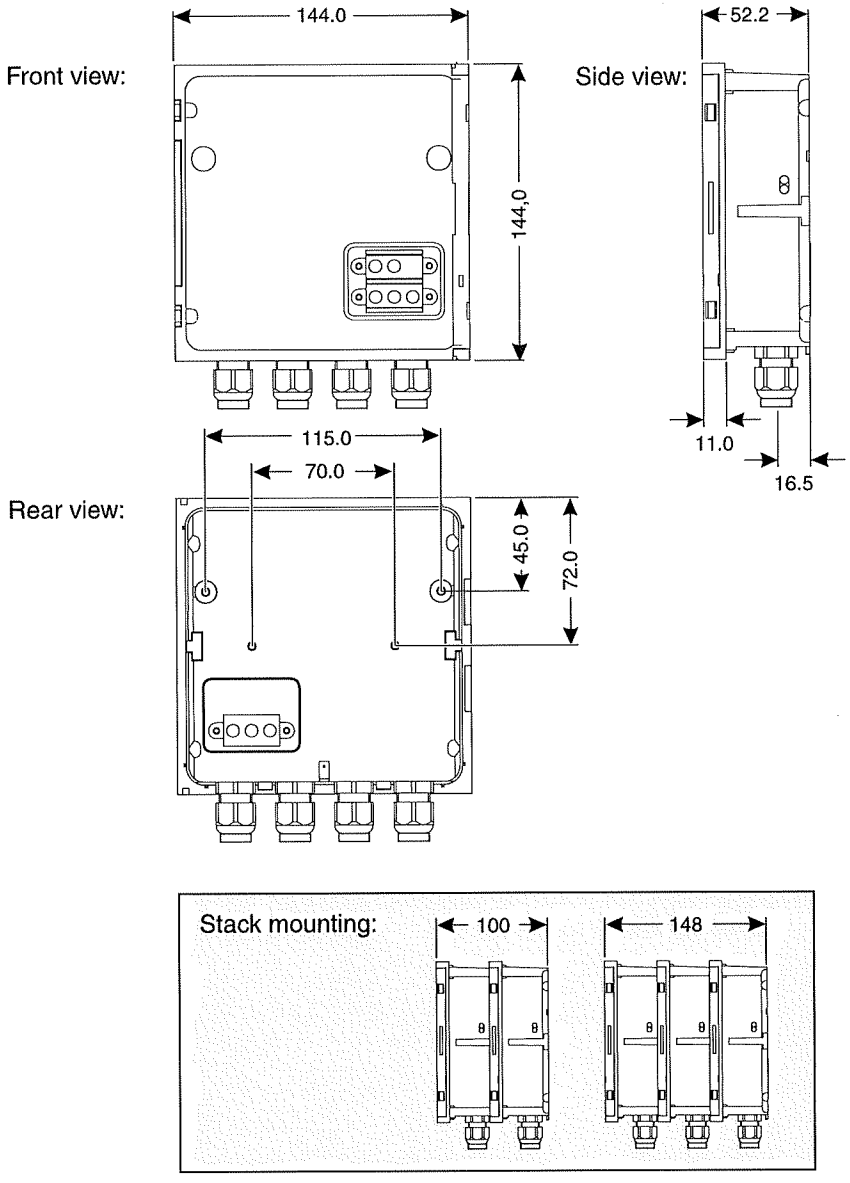


Fig. 8-2 Dimension drawing of MIQ module (dimensions in mm)

Mechanical construction	Maximum number of MIQ modules in a module stack	3 plus terminal component
	Enclosure material	Polycarbonate with 20 % glass fiber
	Weight	Approx. 0.5 kg
	Type of protection	– IP 66 – In accordance with NEMA 4X MIQ modules are not suitable for conduit connection – NEMA 3S
Electrical data	Nominal voltage	Max. 24 VDC via the IQ SENSOR NET (for details, see section 8.1 GENERAL SYSTEM DATA)
	Power consumption	Module-dependent (see section 3.4.2 DRAWING UP THE POWER RATING)
Terminal connections	IQ SENSOR NET connections	At least two in each MIQ module. Additional connectable SENSORNET terminator (terminating resistor)
	Further connections	Module-dependent
	Terminal type	Screw-type terminal strip, accessible by opening the lid
	Terminal ranges	Solid wires: 0.2 ... 4.0 mm^2 AWG 24 ... 12 Flexible wires: 0.2 ... 2.5 mm^2
Cable glands	Suitable for cable sheath diameter	4.5 - 10 mm or 9.0 - 13 mm

8.3 MIQ/TC 2020 XT terminal/controller

Dimensions

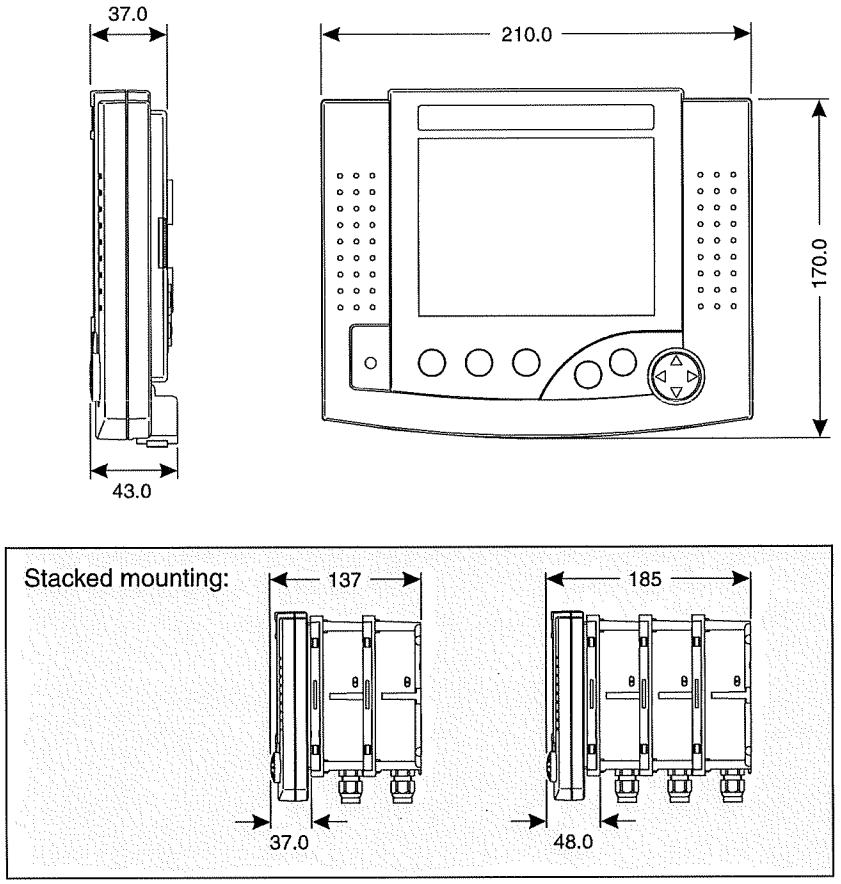


Fig. 8-3 Dimension drawing of the MIQ/TC 2020 XT (dimensions in mm)

Mechanical construction

Enclosure material	ASA (Acrylonitrile Styrene Acrylesterpolymer)
Weight	Approx. 0.9 kg
Type of protection	– IP 66 – corresponds to NEMA 4X The MIQ/TC 2020 XT is not suitable for conduit connection – NEMA 3S

Electrical data	Supply voltage	Max. 24 VDC via the IQ SENSOR NET (for details, see section 8.1 GENERAL SYSTEM DATA)
	Power consumption	3.0 W
Interfaces	Type	USB-A (*USB Host*)
Air pressure	Measuring range (if an MIQ/A module for air pressure compensation is installed in the system)	500 mbar ... 1100 mbar
	Setting range (if no MIQ/A module for air pressure compensation is installed in the system)	500 mbar ... 1100 mbar

8.4 Space required by mounted components

Wall mounting and top hat rail mounting

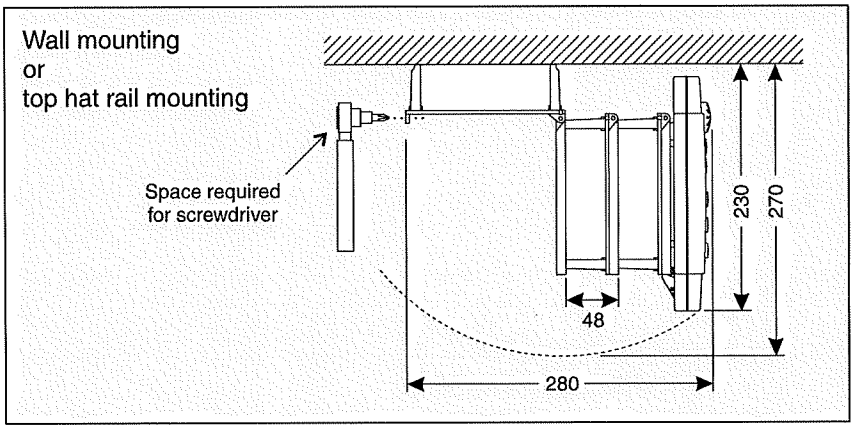


Fig. 8-4 Space required for wall and top hat rail mounting: (dimensions in mm)

Panel mounting

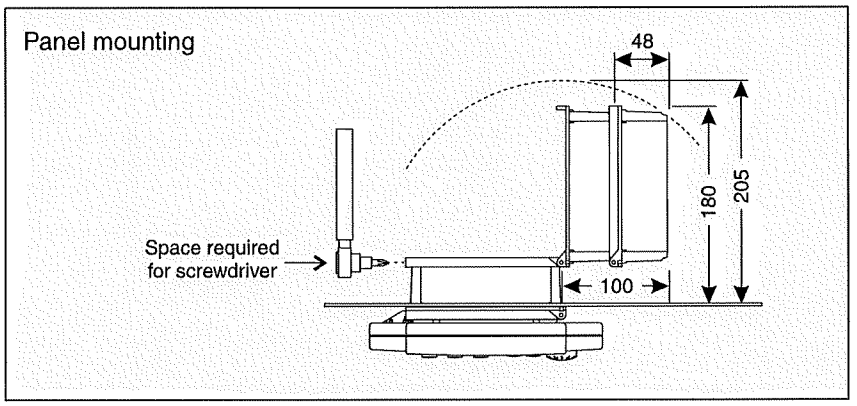


Fig. 8-5 Space required for panel mounting (dimensions in mm)

FCC Class A Equipment Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

9 Contact Information

9.1 Ordering & Technical Support

Telephone: (800) 897-4151
(937) 767-7241
Monday through Friday, 8:00 AM to 5:00 PM ET

Fax: (937) 767-1058

Email: environmental@ysi.com

Mail: YSI Incorporated
1725 Brannum Lane
Yellow Springs, OH 45387
USA

Internet: www.ysi.com

When placing an order please have the following information available:

YSI account number (if available)	Name and Phone Number
Model number or brief description	Billing and shipping address
Quantity	Purchase Order or Credit Card

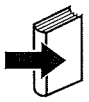
9.2 Service Information

YSI has authorized service centers throughout the United States and Internationally. For the nearest service center information, please visit www.ysi.com and click 'Support' or contact YSI Technical Support directly at 800-897-4151.

When returning a product for service, include the Product Return form with cleaning certification. The form must be completely filled out for an YSI Service Center to accept the instrument for service. The Product Return form may be downloaded at www.ysi.com and clicking on the 'Support' tab.

10 Accessories and options

Description	Model	Order no.
IQ SENSOR NET cable - please specify required length in m when ordering	SNCIQ SNCIQ/UG	480 046Y 480 047Y
IQ sensor connection cable		
– 1.5 m	SACIQ-1.5	480 040Y
– 7.0 m	SACIQ-7.0	480 042Y
– 15.0 m	SACIQ-15.0	480 044Y
– Special length up to max. 100 m	SACIQ-SO	480 041VY
– 20 m (seawater version)	SACIQ-20.0 SW	480 045Y
– 25 m (seawater version)	SACIQ-25.0 SW	480 066Y
– 50 m (seawater version)	SACIQ-50.0 SW	480 060Y
– 75 m (seawater version)	SACIQ-75.0 SW	480 067Y
– 100 m (seawater version)	SACIQ-SO SW	480 062Y
– Special length (seawater version)	SACIQ-SO SW	480 064VY
Set with four cable glands for cable sheath diameter of 7 to 13 mm	EW/1	480 051Y
Sun shield for a unit of up to three stacked MIQ modules plus docked terminal	SSH/IQ	109 295Y
Sun shield for a single MIQ module plus docked terminal	SD/K 170	109 284Y
Mounting kit for fixing the SD/K 170 sun shield on horizontal or vertical pipes	MR/SD 170	109 286Y
Kit for wall mounting of a MIQ module	WMS/IQ	480 052Y
Set for panel mounting of MIQ modules; switch panel aperture 138 x 138 mm according to DIN 43700 or IEC 473 (max. thickness 15 mm)	PMS/IQ	480 048Y
Kit for mounting of MIQ modules on a 35 mm top hat rail in accordance with EN 50022	THS/IQ	480 050Y
Set for remote transmission	MIQ/TM/SET	902 887Y



Note
Other accessories for the IQ SENSOR NET are given in the YSI catalog or on the Internet.

11 Indexes

On the following pages, you will find the following indexes:

- Index of all displays (see section 11.1)
- Explanation of the message codes (see section 11.2)

11.1 Index of all displays

This index contains a selection of displays showing important indications or settings.

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11.2 Explanation of the message codes

The log book contains a list with all the messages from all modules. Each message consists of message code, date and time. You can obtain more detailed information by opening the full message text (see section 4.5).

The full message text comes from the component that has triggered the message. Therefore, these texts are only available from components which are connected to the system and ready for operation.

If a message text is not available, because the component is not connected to the system, you can look up the texts of the messages in the operating manual of the respective component.

The following lists contain the message codes and the related message texts that are shown on the display. Error messages and info messages are listed separately.

General explanations on the subjects of messages, message codes and log book are given in section 4.5 of this system operating manual.

11.2.1 Error messages

Message code	Message text
EAB141	*Error at automatic air pressure measurement* *An air pressure value of 1013 mbar is used for air pressure compensation* ** Component has been removed from the system, insert component again* ** Component defective, contact service*
EI4141	*Max. components of this component type exceeded* *Danger of system overload* ** Check and adapt the components for this type*
EI5141	*Component cannot be reached or not present* ** Component has been removed from the system, insert component again* ** Connex. to component cut.,* *Check sys. installation acc. to op. manual*
EI6141	*Incompatible terminal software* ** Contact service*
EI7141	*Incompatible controller software* ** Contact service*

Message code	Message text
EI8141	*Connection to the component instable* ** Check installation and cable lengths,* *Follow installation instructions* ** Set SN terminator switch acc. to operating manual* ** Check environmental effects* ** Component defective, contact service*
EI9141	*Power failure occurred* ** Check date and time and, if necessary, adjust them*

11.2.2 Info messages

Message code	Message text
IA2141	*Automatic air pressure measurement component identified* *The measured values of the air pressure compensation component are used*
II1141	*Language not available,* *Default language German* ** Contact service*
II2141	*New IQ Sensor Net component identified*
II3141	*New IQ Sensor Net component recorded* ** See component lists*
II4141	*IQ Sensor Net component recorded as replacement component* ** See component lists*
II5141	*Link sensor - output has been erased* ** if necessary, link sensor again*
II9141	*Date and time have been set*

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12 Appendix

12.1 Forgotten the password? (store separately if required)

Extended access control

The administrator can view and change all stored passwords (see section 5.4).

If the IQ SENSOR NET is locked and the administrator password lost, you can unlock the system with a master password. The master password is available from your instrument manufacturer.

The master password is valid for 7 days.

If you have unlocked the IQ SENSOR NET with the master password, we recommend to note down the normal administrator password and keep it in a safe place.

Simple access control

Proceed as follows to show the currently valid password on the display:

1	Using **<S>**, open the *Settings* menu.
2	Using **<▲▼◀▶>** and **<OK>**, select and confirm the menu item, *System settings -> Change password*. The *Change password* dialog window opens.

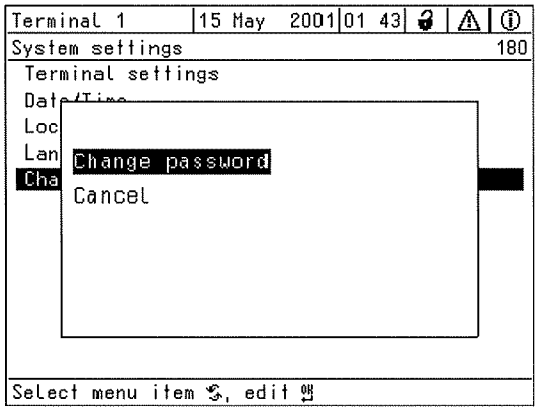


Fig. 12-1 System settings -> Change password

3	Press **<C>** and then **<S>**. The current password is displayed.

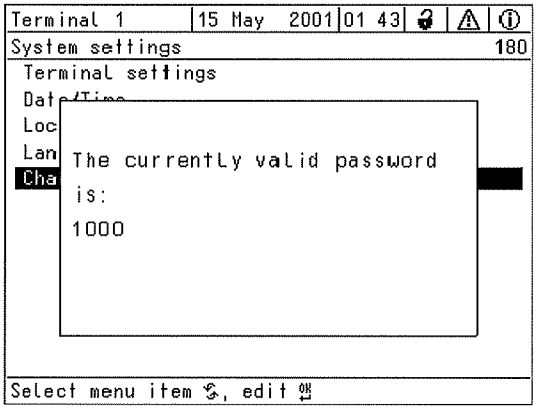


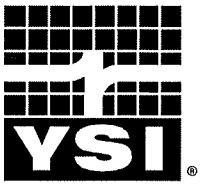
Fig. 12-2 System settings -> Display password

4 | Quit the display of the password with **<OK>**.

12.2 Default password

Simple access control

The password of the MIQ/TC 2020 XT is set to 1000 in the delivery state.



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Section 16: Operation Description

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BIOLOGICAL TREATMENT AND THE ICEAS PROCESS

INTRODUCTION

This Biological Treatment and ABJ Process section begins with a general discussion regarding the philosophy and principles of biological treatment. The following discussions include a summary of both the conventional activated sludge process and conventional SBR technology. The final discussion focuses specifically on the ABJ ICEAS process; it's features, benefits and differences from conventional processes.

PRINCIPLES OF BIOLOGICAL TREATMENT

Biological treatment is achieved by creating an environment suitable for the survival and reproduction of various bacterial cultures and exposing them to organic substances present in the wastewater. This is a natural process that also occurs in any natural body of water.

The activated sludge process that is used for treatment of wastewater originating from domestic and industrial sources is a biological system. It is designed to optimize the efficiency or the degree of treatment that occurs in a natural body of water. In order to understand the activated sludge process, it is of paramount importance to be familiar with the principles of biological treatment.

MEASUREMENT OF ORGANIC MATTER

The organic strength of the wastewater is measured experimentally using various test procedures such as Biochemical Oxygen Demand (BOD_5), Ultimate Biochemical Oxygen Demand (BOD_U), Chemical Oxygen Demand (COD) and Total Organic Carbon (TOC). Of these, BOD_5 is the most commonly used parameter.

BIOCHEMICAL OXYGEN DEMAND (BOD_5)

Biochemical Oxygen Demand (BOD_5) is a measurement of the amount of oxygen demand exerted by microorganisms to oxidize the organics present in wastewater during a 5-day test period. The task of biological treatment is to reduce the oxygen demand exerted by the microorganisms to a level that will have no significant impact on the receiving stream. The BOD removal process is illustrated by the following equation:

$$BOD_5 + O_2 \xrightarrow[\text{Nutrients}]{\text{Bacteria}} \text{New Cells} + CO_2 + H_2O + \text{Nutrients} + \text{Energy} \qquad (1)$$

NUTRIENTS

Nitrogen and phosphorus serve as essential nutrients in the growth of living organisms including human beings, plants and microorganisms. High concentrations of these nutrients discharged into receiving water bodies can result in eutrophication. Controlled discharge of these nutrients necessitates their removal during treatment of the wastewater. The forms, in which these nutrients exist in the wastewater and how they are removed during wastewater treatment, are described below.

NITROGEN

The sources of nitrogen in domestic wastewater are urea, feces and other organic material. Inorganic nitrogen is a combination of ammonia nitrogen, nitrite nitrogen and nitrate nitrogen. Total Kjeldahl Nitrogen (TKN) is a combination of ammonia nitrogen and organic nitrogen.

BIOLOGICAL NITROGEN REMOVAL

This process can be divided into two steps:

1. Nitrification - ammonia nitrogen is converted to nitrate by bacteria in the presence of oxygen
2. Denitrification - nitrate is converted to nitrogen gas in the absence of oxygen. Since biological denitrification is performed only on the nitrate ion, nitrification is essential for complete nitrogen removal.

NITRIFICATION

In biological nitrification, two sequential reactions occur:

1. Conversion of ammonia to nitrite by *Nitrosomonas* organisms

$$\text{Ammonia Nitrogen} + 1.5\ O_2 \quad \text{------>} \quad \text{Nitrite} + H_2O + \text{Loss of Alkalinity} \qquad (2)$$

2. Conversion of nitrite to nitrate by *Nitrobacter* organisms

$$\text{Nitrite Nitrogen} + 0.5\ O_2 \quad \text{------>} \quad \text{Nitrate Nitrogen} \qquad (3)$$

The overall nitrification reaction can be expressed as:

$$\text{Ammonia Nitrogen} + 2\ O_2 \quad \text{------>} \quad \text{Nitrate Nitrogen} + H_2O + \text{Loss of Alkalinity} \qquad (4)$$

DENITRIFICATION

In the biological denitrification process, nitrates are converted to nitrogen gas. The gas is ultimately released to the atmosphere. In contrast to nitrification, biological denitrification occurs in the absence of oxygen and uses organic compounds present in wastewater as a source of carbon. Energy is obtained by oxidizing the organic substrates. During denitrification, nitrate acts as an electron acceptor in the absence of free oxygen. The overall denitrification reaction is expressed in Equation 5.

$$\text{Nitrate Nitrogen} + \text{Organic Carbon} \quad \text{------>} \quad \text{Nitrogen Gas} + \text{Gain of Alkalinity} \qquad (5)$$

BIOLOGICAL PHOSPHORUS REMOVAL

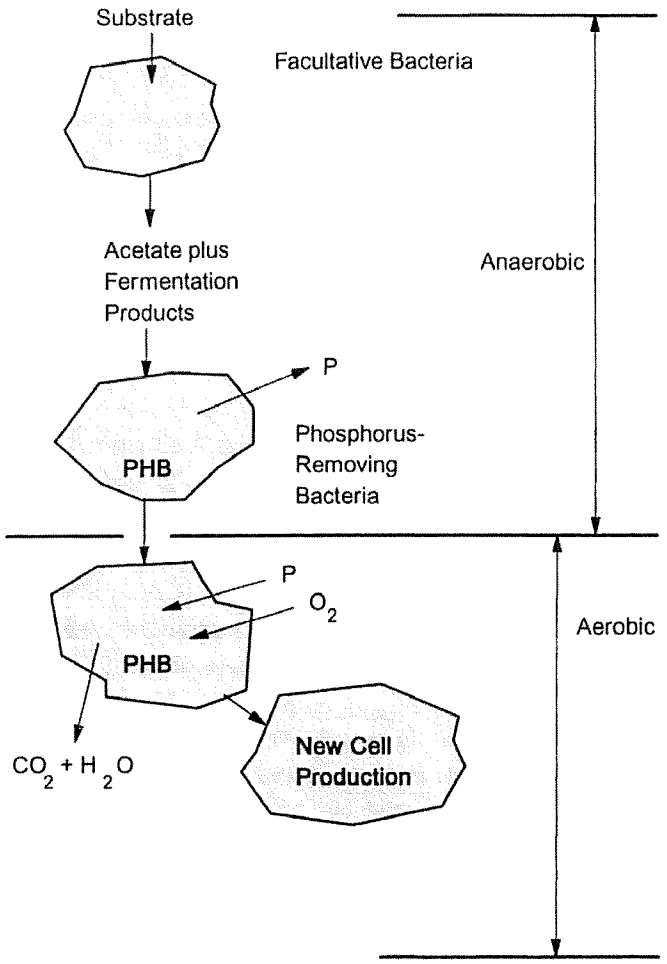
Phosphorus exists in the forms of orthophosphate, polyphosphate and organic phosphates in wastewater. The major sources of phosphorus in domestic wastewater are human excrement, synthetic laundry detergents and water treatment chemicals.

In biological treatment, the phosphorus in wastewater is removed through incorporation into the cell tissue of microorganisms during BOD removal. This two step process is described in Figure 1:

1. Certain microorganisms, when subjected to anaerobic (absence of oxygen and nitrates) conditions, assimilate and store fermentation products produced by other facultative bacteria. These microorganisms derive energy for this assimilation from stored polyphosphates, which are hydrolyzed to liberate energy. The free phosphorus that results from the hydrolysis reaction is released to the mixed liquor.

2. These same microorganisms, when subsequently exposed to aerobic conditions, consume both phosphorus (which is used for cell synthesis and stored as polyphosphates) and oxygen to metabolize the previously stored substrate for energy production and cell synthesis. The organisms take up the phosphorus in excess to remedy their phosphorus-starved condition. That is, they take in more phosphorus than they previously released. The phosphorus is removed from the system during the normal sludge wasting procedure.

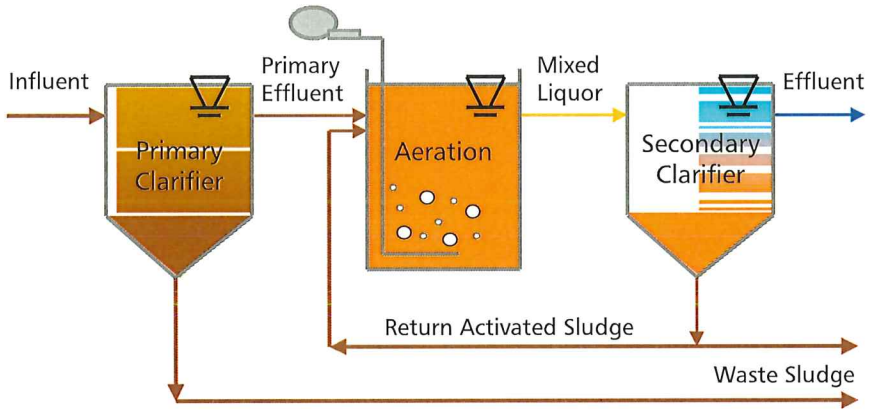
Figure 1



CONVENTIONAL ACTIVATED SLUDGE PROCESS

A typical conventional activated sludge process as shown in Figure 2, consists of separate tanks to accomplish unit processes of primary clarification, BOD removal and secondary clarification with recycle pumping and piping.

Figure 2 **Typical Conventional Activated Sludge Process**



PRIMARY CLARIFIER

The wastewater from the plant headworks is received in the primary clarifier. The primary clarifier is typically equipped with a sludge collection mechanism and an effluent overflow weir. In this unit process, solids (or sludge) with a higher density settles to the bottom of the clarifier and partially treated primary effluent is discharged over the weirs to the aeration basin. The sludge settled in the primary clarifier is sent to the sludge handling facilities.

AERATION BASIN

The aeration basin is typically equipped with diffusers installed on the floor of the basin. The blowers located in a building near the basins are used to supply the air to the basins via the diffusers. The effluent received from the primary clarifier is continuously mixed and aerated in this basin with return sludge resulting in the oxidation of the BOD. The combination of treated water and sludge from the aeration basin ("mixed liquor") is discharged to the secondary clarifier.

SECONDARY CLARIFIER

The mixed liquor discharge from the aeration basin enters the secondary clarifier through the feed well. Similar to the primary clarification, the liquid solids separation occur in the clarifier where sludge is settled to the bottom and the treated effluent is discharged over the weirs to the downstream facilities. A major portion of the sludge that settled in the secondary clarifier is recycled back as return "activated sludge" to the aeration basin and the remainder is wasted to the sludge handling facilities.

Additional tanks are added to the unit processes discussed above to create the aerobic, anoxic and anaerobic environments required for biological nitrogen and phosphorous removal.

The principle of the conventional activated sludge process discussed above is being used for wastewater treatment in various forms and operational methodologies. One of these variations is the Sequencing Batch Reactor (SBR) process.

CONVENTIONAL SBR

The Sequential Batch Reactor (SBR) process is a variant of the Activated Sludge process. It uses the fill and draw principal in which unit processes occur sequentially on a cyclical basis. The SBR process eliminates the need for primary and secondary clarifiers.

A typical SBR cycle consists of the following phases as illustrated in Figure 3:

Fill: Raw wastewater that has been screened and degritted flows into the basin and mixes with the mixed liquor settled during the previous phase. After the fill phase, the influent valve is closed and the influent is routed to the other basin.

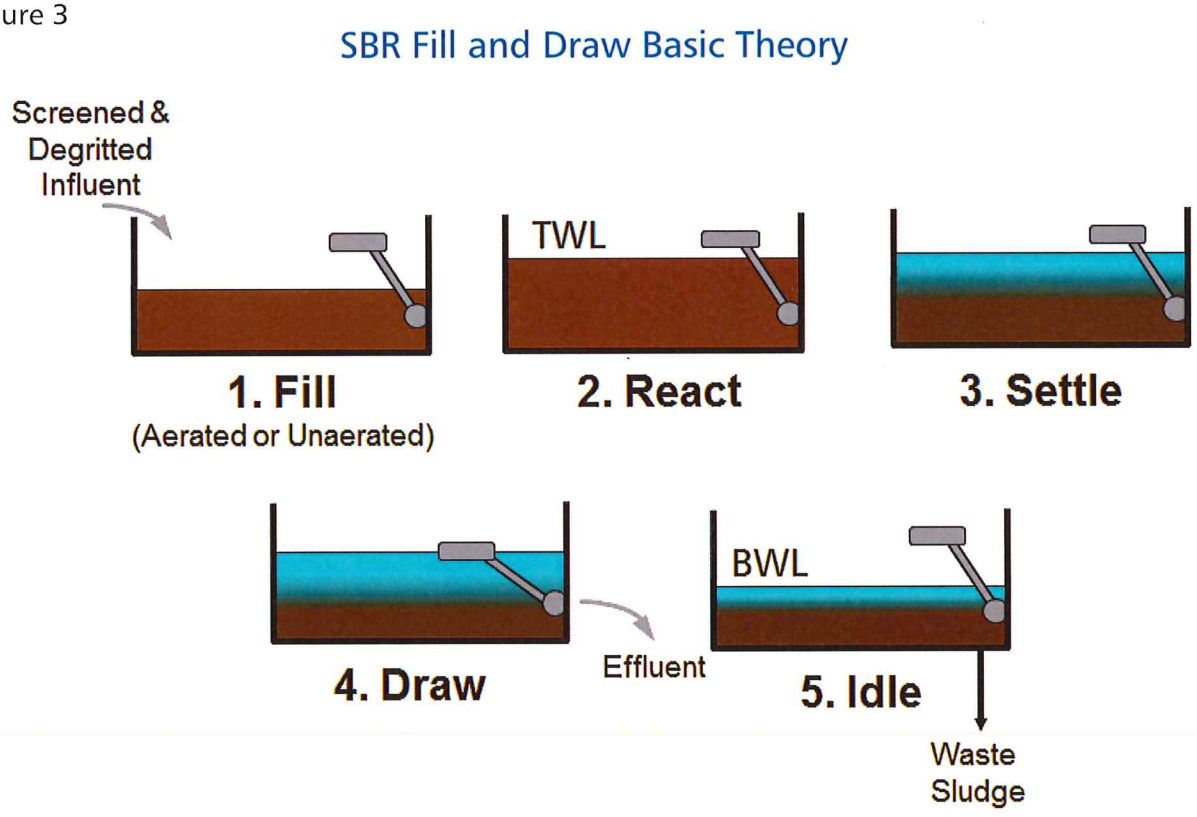
React: The basin is aerated and biological oxidation takes place similar to the aeration basin in the conventional activated sludge process.

Settle: Aeration is stopped and the solids settle to the bottom of the basin leaving the clear water on the top.

Draw: The clear water is discharged using a decant mechanism.

Idle: Sludge is wasted from the bottom of the basin using pumps.

Figure 3



At the end of the idle phase, the cycle begins again with the fill phase. The SBR carries out the functions of primary clarification, aeration and secondary clarification in one basin.

In the conventional activated sludge process, various unit processes such as primary clarification, aeration and secondary clarification are carried out in separate basins. These "trains" of unit processes generally occupy a significant land area as compared to an SBR. In the conventional activated sludge process, a limited amount of flexibility can be exercised by adjusting the rate of return activated sludge (RAS) and waste activated sludge (WAS) or through varying the rate of air introduced in the aeration basin.

In an SBR, the same unit processes that are carried out in the conventional activated sludge process occur sequentially in one basin. As a result, the "footprint" of a SBR is typically much smaller than that of a conventional activated sludge plant. The SBR process is automated through the use of a control system ranging in sophistication from simple timers to PLC or PC based systems. The control system automatically coordinates equipment operation through various phases of the SBR cycle. This feature offers a high degree of flexibility allowing adaptation of the process cycle to meet the changing influent conditions through simple changes in control setpoints.

This difference in system configuration gives the SBR system several advantages over the conventional activated sludge process including:

LOWER CAPITAL COST

- No primary or secondary clarifiers and accompanying pumping systems are needed
- Requires smaller footprint
- Simpler and faster installation
- Lower construction costs

ENHANCED BIOLOGICAL PERFORMANCE

- Low sludge volume
- Enhanced nutrient removal
- Quick response to changing influent conditions
- No washout of activated sludge during peak storm flows

LOWER OPERATING COST

- Reduced power
- Reduced maintenance
- Nutrient removal without costly chemicals

DESIGN FLEXIBILITY

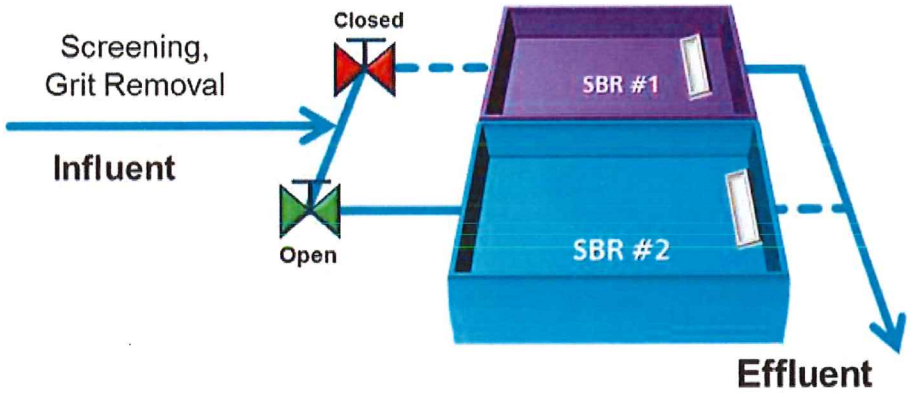
- Easily expandable
- Hydraulic peaks easily accommodated
- Handles shock loads without degradation of final effluent quality
- Control system provides high flexibility

While the conventional SBR system has many advantages, it does have some shortcomings. These include:

- It must be designed with a minimum of either two reactors, (see Figure 4) or an equalization/storage tank in conjunction with a single reactor. These configurations are required to allow continuous acceptance and treatment of the influent. During the react, settle and decant phases of the cycle, flow is diverted to the other basin or to the storage tank.

Figure 4

Conventional SBR Batch Mode



- When conventional SBR systems are considered for smaller treatment plant applications, two basin designs are typically evaluated. However, due to the batch nature of the process, one basin can not be readily taken out of service for maintenance purposes. In addition, a single tank operational mode cannot be easily utilized for low flow situations.

- For most municipal treatment facilities and some industrial applications, flow and loadings to a plant vary according to a diurnal cycle. With a conventional SBR system, this results in unequal mass and hydraulic loadings to each reactor in a multi-reactor facility. The loadings to a specific reactor are dependent on when it is receiving flow during the diurnal flow variation. The variation in loadings causes differences in the biomass and oxygen demand of the individual reactors. This complicates the operational control of the treatment plant resulting in the need for additional testing, a more intensive instrumentation/control system and greater operator attention to the system.

- The batch treatment approach of conventional SBRs typically incorporates a water level based control system. That is, the duration of the daily process cycles are subject to change based on the specific inflow to a reactor. Since diurnal flow variations occur, the cycling results in different actual aeration times for the biological reactions. This can lead to difficulty in controlling the process and cycling/switchover of the blowers.

- For Biological Nutrient Removal systems, a continuous carbon source is beneficial in maintaining consistent performance. Organic compounds in the raw influent to such secondary treatment systems are typically used as the source of the carbon. Conventional SBR systems however periodically interrupt this food source especially during the react phase. This lowers the removal of nitrogen and phosphorus and may necessitate expensive chemical additions to enhance biological nutrient removal.

ICEAS® PROCESS

The ABJ ICEAS process is a modification and enhancement of the superior technology of the conventional SBR. ICEAS, an acronym for Intermittent Cycle Extended Aeration System, allows continuous inflow of wastewater to the basin. Influent flow to the ICEAS basin is not interrupted during the settle and decant phases or at any time during the operating cycle.

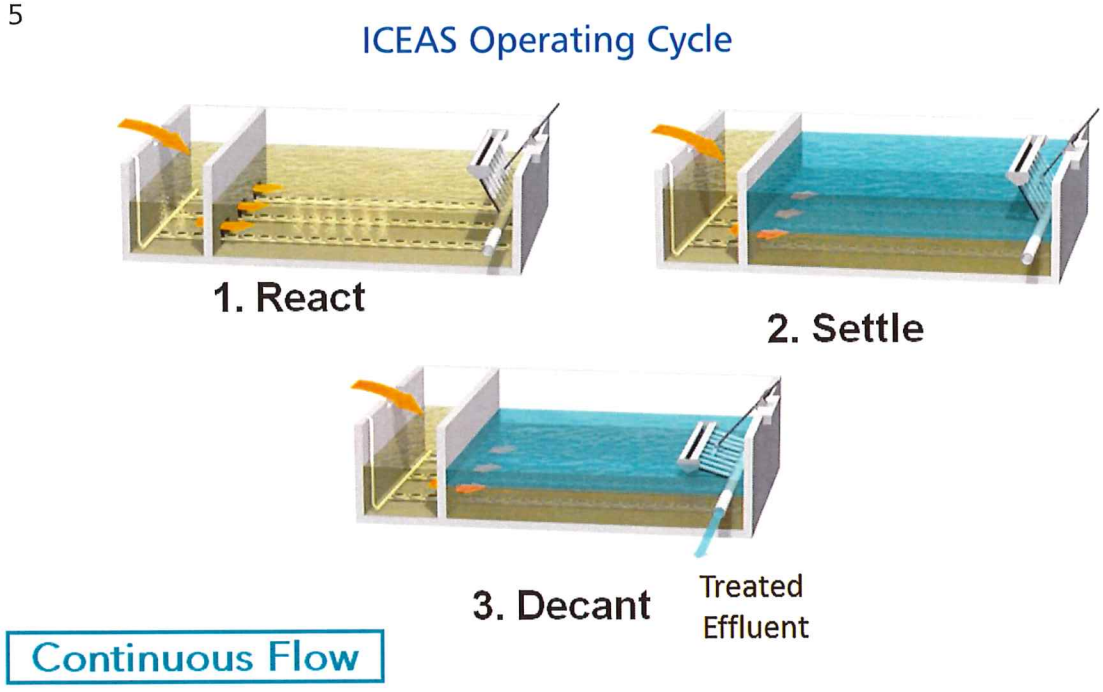
A typical ICEAS process consists of the following time-based phases as illustrated in Figure 5:

Aerate: Raw wastewater from screening and grit removal flows into the basin and mixes with the mixed liquor. The basin is aerated while filling and biological oxidation takes place simultaneously.

Settle: Aeration is stopped and the solids settle to the bottom of the basin leaving clear water on top. The basin continuously receives the influent.

Decant: The clear water is discharged from the top of the basin, while the basin continuously receives the influent. Typically, sludge is wasted during this phase of the cycle.

Figure 5



Influent is received continuously during all phases of the cycle, including settle and decant. This allows the ICEAS process to be controlled on a time, rather than flow basis and ensures equal loading and flow to all basins. Use of a time-based control system in the ABJ ICEAS process facilitates simple changes to the process control program. The duration of each cycle and segment of each operating cycle are the same among all basins in a time-based system. Therefore, changes to the process are made simply by changing the duration of individual segments. In a flow-based conventional SBR, cycle times and individual segments of each cycle may be different among basins due to diurnal flow variations. Thus, it is not possible to simply affect a change to the entire system. In essence, separate control must be maintained over each basin in the SBR system.

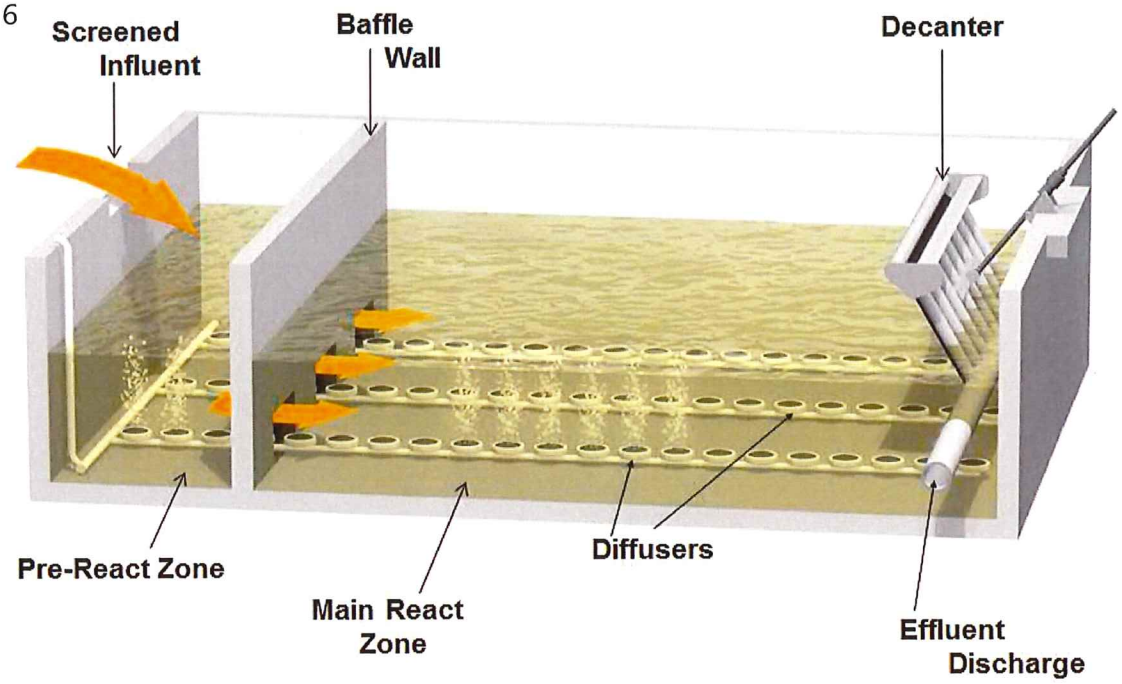
Single basin operation is also possible in the ICEAS process. The process does not require automatic influent control valves or an additional basin to hold diverted flow. This eliminates the need for designated fill and idle phases resulting in smaller basins.

The ICEAS process can be designed to accommodate peak flows up to 6 times the average flow to the plant. This flexibility is facilitated by the ability of the ICEAS to accommodate influent during all phases of the cycle. Peak flows are spread evenly among all operating basins. Typically, a separate cycle with a shorter duration is used to accomplish this flexibility.

ICEAS BASIN

The ICEAS basin is divided into two zones, the pre-react zone and the main react zone as shown in Figure 6. A non-hydrostatic baffle wall with openings at the bottom is constructed to divide the ICEAS basin into the two zones. The influent flows continuously into the pre-react zone and is directed down through engineered orifice openings at the bottom of the baffle wall into the main react zone. The pre-react wall baffles the incoming flow and prevents short-circuiting. The volume of the pre-react zone is typically 10 to 15 percent of the total basin volume.

Figure 6



BIOLOGICAL SELECTOR

The pre-react zone also provides pre-treatment of the wastewater before it enters the main react zone. Since influent flows continuously into the pre-react zone, a high concentration of soluble BOD is available to the microorganisms in a relatively small basin volume. This situation creates a high "Food to Microorganisms" (F:M) ratio. The high F:M ratio encourages the maximum bio-sorption of food by the microorganisms. The pre-react zone therefore acts as a biological selector encouraging the proliferation of the most desirable organisms. The presence of the biological selector at the front end of the ICEAS basin minimizes the growth of filamentous bacteria that cause sludge bulking and poor settling.

ICEAS BASIN SIZING

BASINS

Typically, concrete basins are used. However, in some cases, steel is used depending on the cost evaluation of the plant construction. The number of basins used in the ICEAS process is a function of flow and loading to the plant and the guidelines established by individual Government Agencies. Sanitaire has experience in designing systems built using a single basin to a multitude of parallel basins. The continuous flow feature of the ICEAS process facilitates single basin system design and operation without the need for influent flow equalization or a second basin.

BASIN HYDRAULICS

Time based cycles are used in sizing the ICEAS process. A normal cycle is designed to handle the Average Dry Weather Flow (ADWF) and Peak Dry Weather Flow (PDWF) to the plant. A storm cycle is used to handle the storm flows. The storm cycle operates with a shorter duration compared to the normal cycle so that higher flows can be processed by the system. Typically, the ICEAS process can be designed to handle 3 to 6 times the average flow conditions. The maximum volume required for the average, peak and storm flows are determined based on the cycle times. This volume is the total flow received by the basin from the start of the cycle until the beginning of the decant phase and is defined as basin "Drawdown". The basin drawdown extends from the designated Top Water Level (TWL) to the Bottom Water Level (BWL). The ability to accommodate a Peak Wet Weather Flow (PWWF) of 6 times the ADWF is due to many ICEAS concepts. The ability to have a special "storm" cycle with decanter speed control is very important. ***This cannot be achieved with conventional SBRs using fixed or floating decanters***. SBR's with floating decanters are usually limited to a PWWF of 3 times the ADWF.

PROCESS KINETICS

The influent BOD and ammonia loadings determine the mass of biomass required in the basin. Typically, F:M ratios are used in determining the mass of the biomass for a given BOD loading in conjunction with minimum sludge age requirements for the nitrification process. The typical Food:Microorganism (F:M) ratios used in design of the ICEAS process are in the range of 0.05 to 0.12 lb. BOD/lb. MLSS/day. The Sludge Volume Index (SVI) is used to determine the volume occupied by the calculated mass of biomass in the basin. The Typical SVI value used in the design of the ICEAS process is in the range of 150 to 200 ml/g. In each cycle, a measured amount of sludge is wasted. This allows the ICEAS process to operate in a steady state condition maintaining a desired Mixed Liquor Suspended Solids (MLSS) concentration and Mean Cell Residence Time (MCRT) or Sludge Age (SA).

BUFFER ZONE

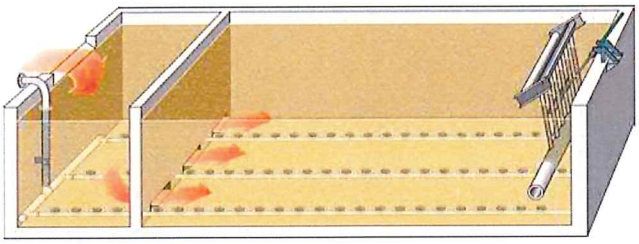
The design volume of the basin is based on a combination of the volume required for the hydraulics based on the peak wet weather flow conditions and the volume occupied by the sludge. A "Buffer Zone" is included in the design as a safety factor to ensure the ICEAS process's ability to withstand the unusual flows and loadings that are typical in wastewater treatment plants. This zone is typically a minimum of three feet deep, extending from the top of sludge blanket to the BWL after decanting.

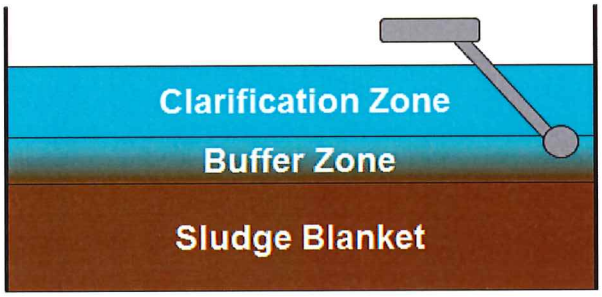
BASIN DIMENSIONS

The basin depth is a combination of the sludge blanket, the buffer zone and the drawdown as shown in Figure 7. The basin area is calculated using a designated TWL. Typically, the length and

width of the basin is calculated such that, a L:W ratio of 3:1 is maintained. This ratio creates a plug flow pattern in the ICEAS basin.

Figure 7





ICEAS PROCESS DESIGN & OPERATION

The ICEAS process offers the following design options to maximize the flexibility of the plant operation and to meet its discharge permit requirements.

ICEAS-NIT Process

Designed for the Removal of:

- BOD
- TSS
- Ammonia and Total Nitrogen (Partial Denitrification)

Typically Used for:

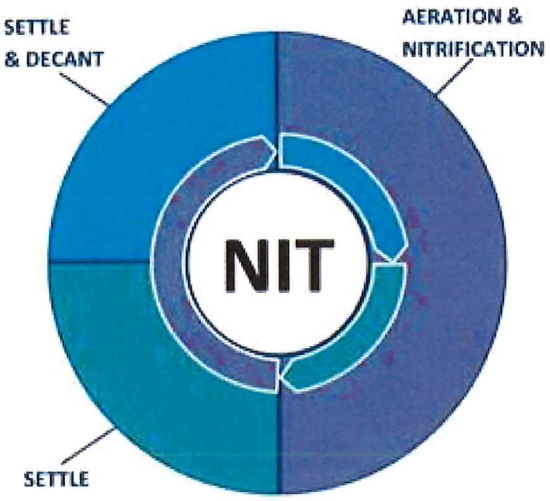
- Municipal Wastewater
- Industrial Wastewater

Nitrification and BOD removal is accomplished in the ICEAS process during the aeration phase of the cycle as shown in Figure 8. The ICEAS basin is designed with F:M ratios and sludge ages suitable to maintain sufficient MLSS in the basin and to achieve the required degree of nitrification based on the temperature range and pH of the influent wastewater. The blowers and aeration system are designed to ensure a sufficient supply of oxygen as required for the process.

A typical operating cycle for a two-(2) basin ICEAS-NIT process is shown in Figure 9. The first half of the cycle is continuously aerated to achieve BOD removal and nitrification. After the aeration phase, the system enters a settling phase where liquid/solids separation occurs. The system then enters the decant phase, where treated effluent is decanted from the basin. The duration of the aeration phase in the four-hour cycle allows one blower to provide air to two basins using motorized air control valves. When Basin #1 is in the aeration phase, Basin #2 is in the settle or decant phase. When Basin #2 is in the aeration phase, Basin #1 is in the settle or decant phase.

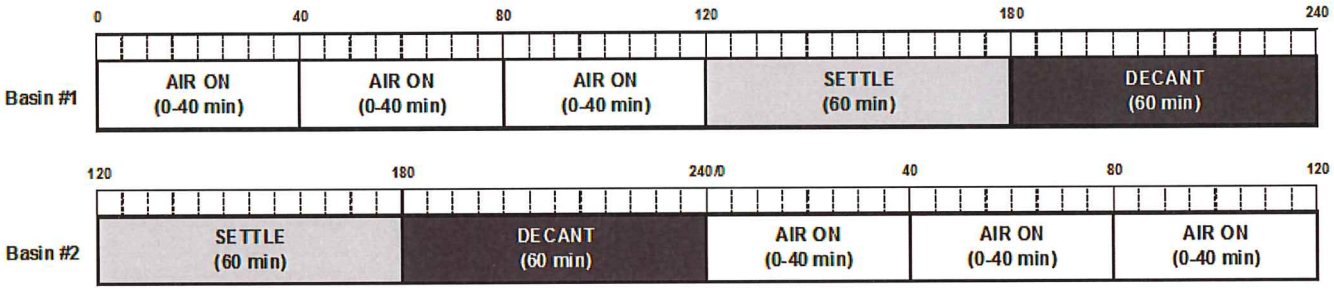
The 3-hour storm cycle for the same application is shown in Figure 10. It is of interest to note that the overall aeration, settle and decant times per day remain the same as the normal cycle. It is only the duration per cycle that is changed to accommodate higher flows to the plant. ***SBR systems using fixed or floating type decanters cannot offer this flexibility without affecting the overall duration of the aeration and settle phases on a daily basis***.

Figure 8



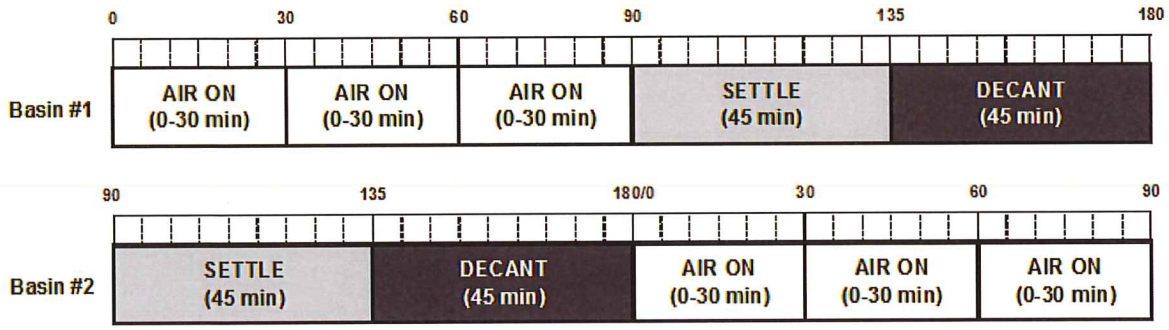
Normal Cycle Operational Sequence of ICEAS-NIT Process

Figure 9



Storm Cycle Operational Sequence of the ICEAS-NIT Process

Figure 10



Cycle bar charts depicting the normal and storm cycles for the ICEAS-NIT process using four basins are shown in Figures 11 and 12. The control system provides the flexibility of changing blower run time proportional to the influent flow and loading to the plant. Additional controls such as dissolved oxygen probes in the ICEAS basin with blower output control can be provided.

Figure 11

Normal Cycle Operational Sequence of ICEAS-NIT Process

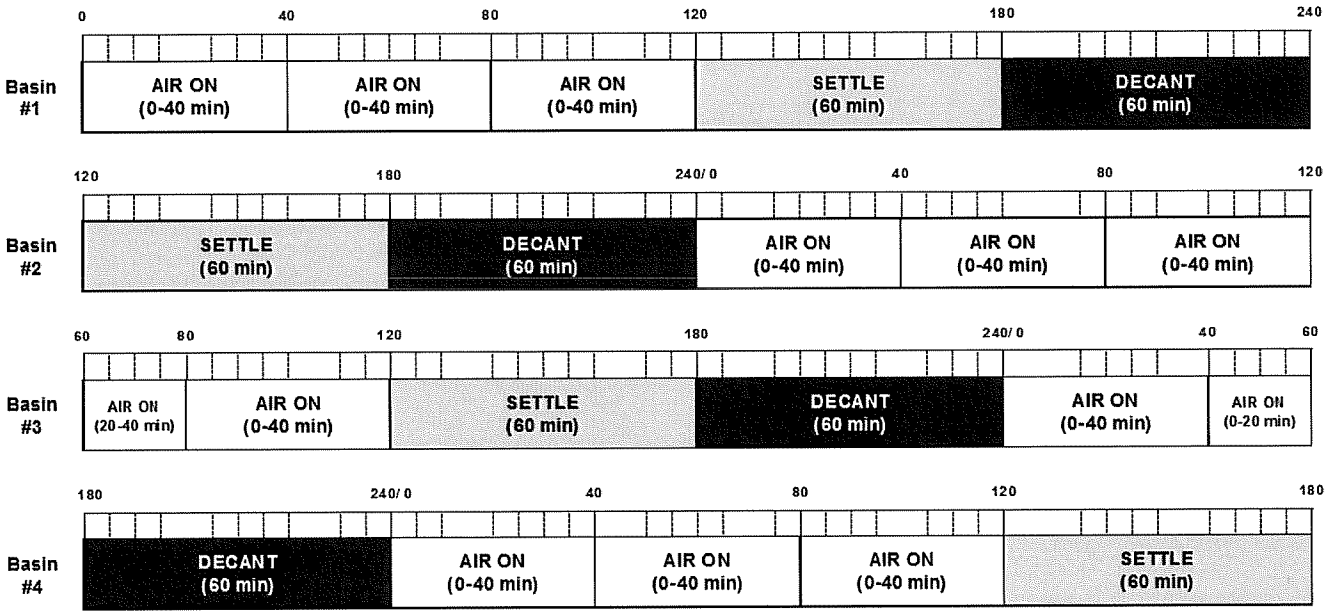
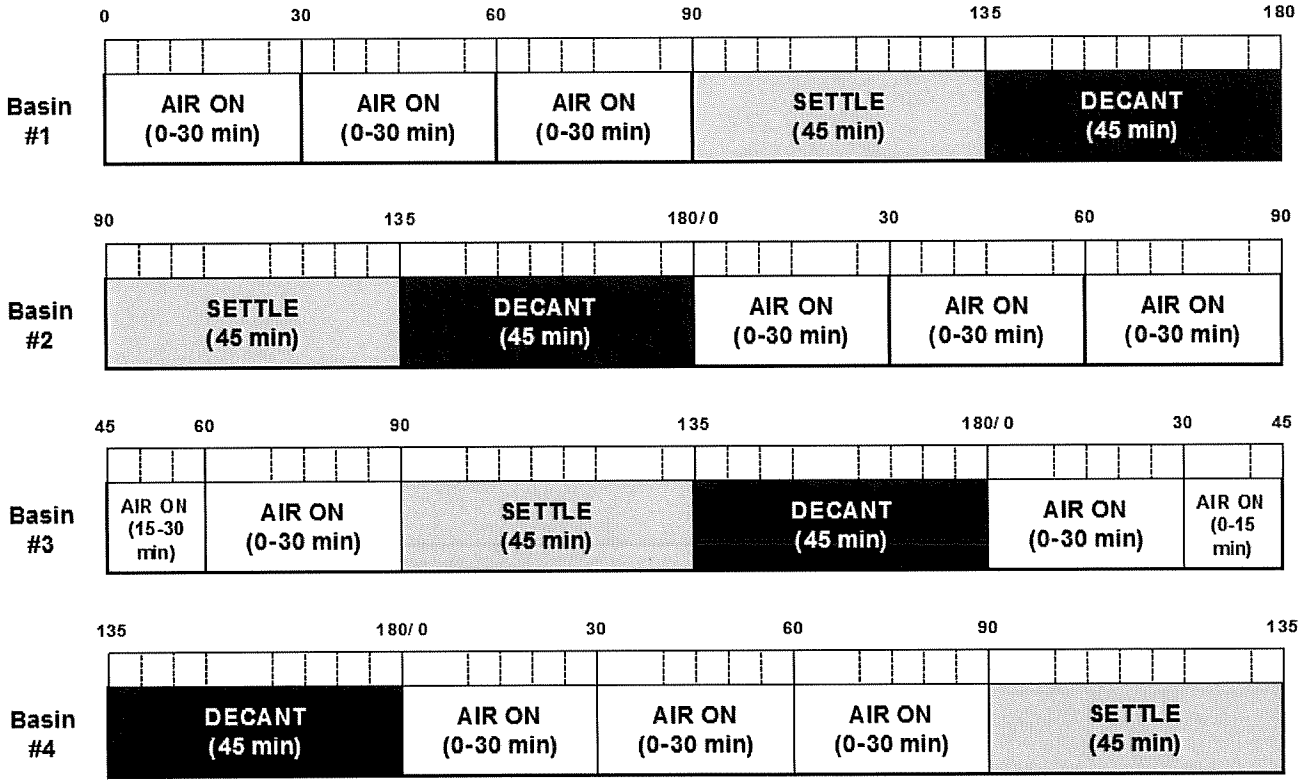


Figure 12

Storm Cycle Operational Sequence of the ICEAS-NIT Process



ICEAS-NDN PROCESS: BIOLOGICAL NUTRIENT REMOVAL (BNR)

Designed for the Removal of:

- BOD
- TSS
- Ammonia
- Total Nitrogen
- Total Phosphorous

Typically Used for:

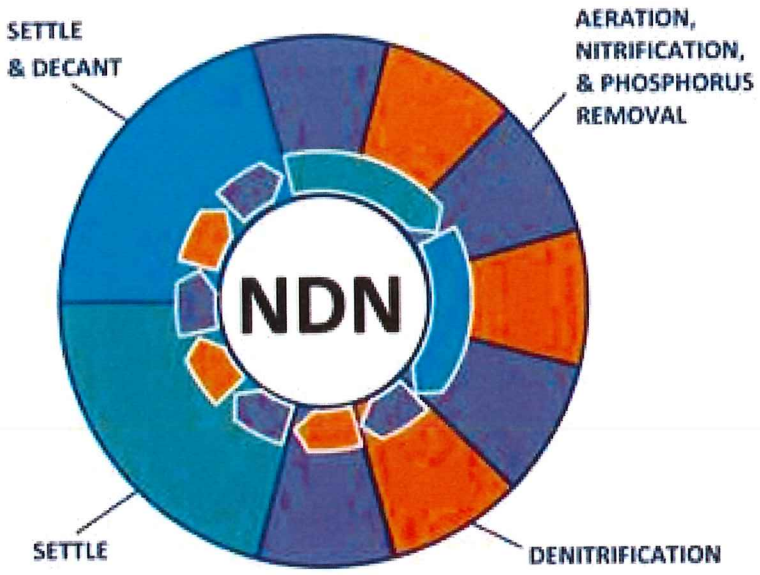
- Municipal Wastewater
- Industrial Wastewater

Biological nutrient removal is accomplished in the ICEAS-NDN process by incorporating alternating phases of oxic-anoxic/anaerobic (air on-air off) conditions in the cycle as shown in Figure 13. The ICEAS basin is sized to ensure complete nitrification, denitrification and to maximize the total biological phosphorus removal.

Typical normal and storm cycles using 2 basins for the ICEAS-NDN process are shown in Figure 14 and 15. The aerobic phases promote BOD removal, nitrification and phosphorus uptake. The anoxic/anaerobic (air off) phases promote denitrification and phosphorus release. Nitrification rates and sludge age requirements for the nitrification process are calculated based on the temperature range and pH of the influent wastewater.

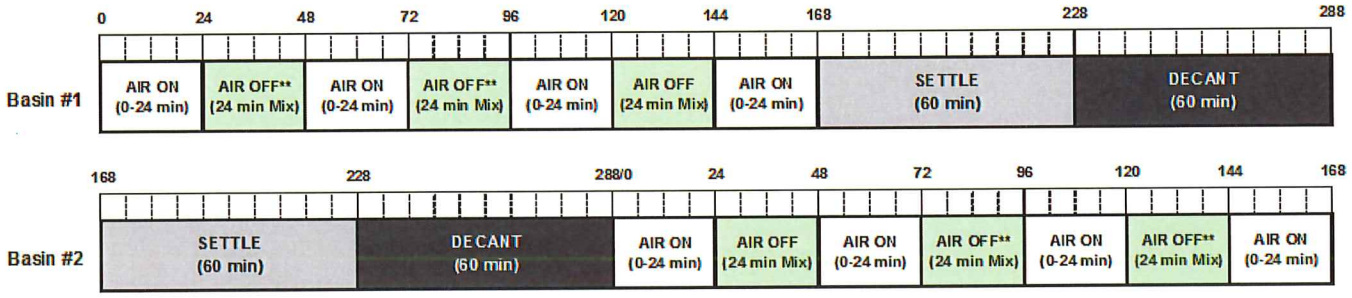
The degree of denitrification and phosphorus removal achieved by the ICEAS-NDN process is dependant on the influent BOD/TN and BOD/TP ratios. The typical blower control for the ICEAS-NDN process involves a D.O. control system with blower output control.

Figure 13



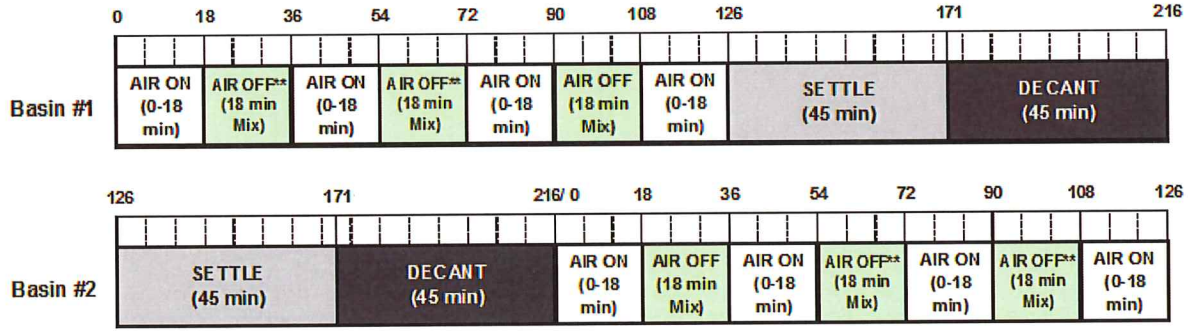
Normal Cycle Operational Sequence of ICEAS-NDN Process

Figure 14



Storm Cycle Operational Sequence of the ICEAS-NDN Process

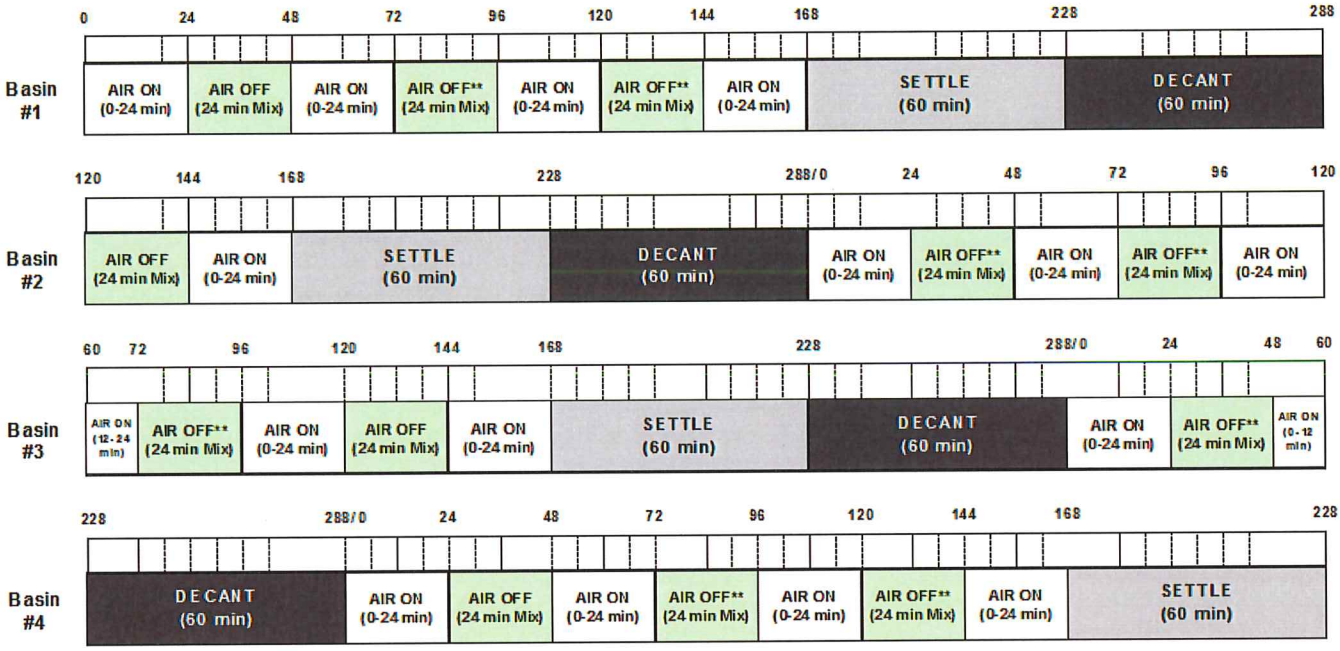
Figure 15



The cycle charts for the ICEAS-NDN process operating in normal and storm cycles using four basins are shown in Figures 16 and 17.

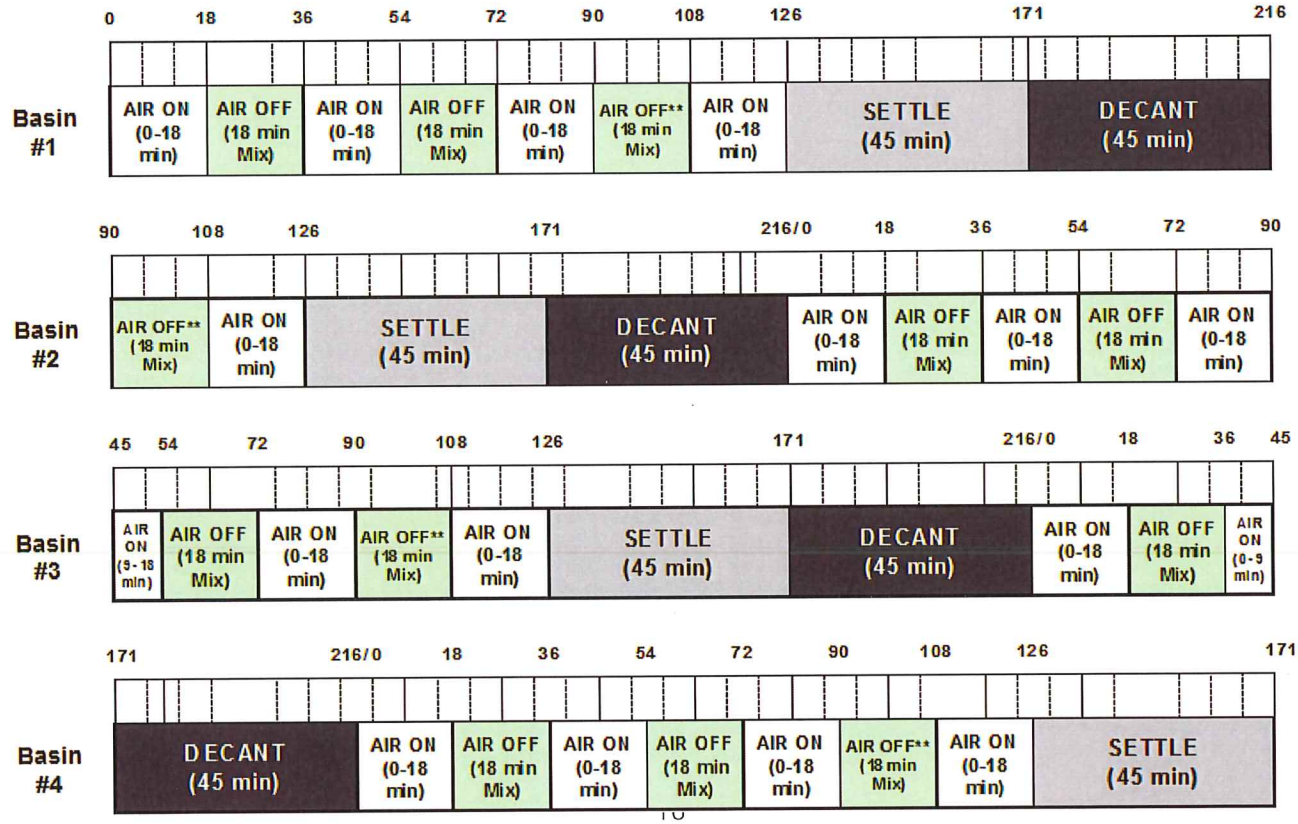
Figure 16

Normal Cycle Operational Sequence for the ICEAS-NDN Process



Storm Cycle Operational Sequence of the ICEAS-NDN Process

Figure 17



EXPANSION POTENTIAL

The ICEAS process design allows simplified expansion because each basin forms a modular treatment unit. The ICEAS process is ideal for a growing community requiring wastewater treatment. The installation shown in Figure 18 is a facility designed for an ultimate flow of 2.0 MGD. During Phase-I, the plant was built with a design capacity of 0.25 MGD using two basins. It was expanded to 0.5 MGD in Phase-II by adding one additional basin with a capacity of 0.25 MGD. In serving the growth of the community, the plant was expanded again in Phase-III through the addition of one basin with 0.5 MGD capacity bringing the overall capacity to 1.0 MGD. This plant will continue to expand in the future.

It is of interest to note that all the basins have been built with common wall construction. This is achieved by maintaining the same length for all tanks and increasing the width appropriately. The blower equipment is also sized proportionately to the capacity of each basin such that the same blowers are used before and after expansion.

Figure 18

Phased Expansion of the ICEAS-NDN Process for a Growing Community

GENERAL ADVANTAGES OF THE ABJ ICEAS PROCESS COMPARED TO BATCH SYSTEMS

- Proven process which enhances the standard SBR system through strategic cost, operating and biological advantages
- Continuous inflow provides equal loading and flow to all basins, simplifying operation and process control. It enables single basin operation for maintenance and low flow conditions.
- Incorporates a time, not flow-based control system that enables a constant relationship between aeration, settling and decanting. Provides the same aeration time per day regardless of the cycle time.

BIOLOGICAL AND PROCESS ADVANTAGES

Biological Effluent Quality

- Proven effluent quality below 10 mg/l BOD_5 and TSS
- Proven nutrient removal quality below 1 mg/l Ammonia-N, 1 mg/l total phosphorus and 5 mg/l total nitrogen
- Low volume of highly stabilized sludge – dewaters easily
- Pre-react Zone
  - Enhances bacterial growth with good settling characteristics while minimizing the formation of filamentous organisms
  - Allows continuous operation without short-circuiting
  - Enhances nutrient removal
  - Confines floating material for manual removal
- No chemicals/filters required
- Suitable for municipal/industrial wastewater treatment

Hydraulic and Organic Loading

- Can be designed to accommodate hydraulic peaks up to 6 times average design flow without sludge washout
- No separate influent equalization basin needed, redundant tankage eliminated
- Automatic activation of storm cycle during storm flows
- Equal loading to all basins at all times
- Easily expandable for future needs (modular system)

EQUIPMENT DESIGN ADVANTAGES

Decanter Design

- Easy to install
- Easy accessibility from basin walkway
- In "Park Position," acts as safety overflow weir
- Stainless steel design – robust/corrosion resistant
- Prolonged life
- No flexible, costly, high maintenance knee joints, as needed for floating decanters
- No submerged valves or orifices, which are prone to plugging

Electrical Design

- In-house electrical engineers to coordinate control requirements with biological functions to maximize flexibility with ease of maintenance
- Control system designed to suit overall plant control needs
- Modem to facilitate fault-finding
- SCADA system for remote access

COST ADVANTAGES

- Reduced capital cost when designed as an ICEAS continuous flow process
- Up to 30% less basin volume to achieve same operating performance as an SBR
  - Less Concrete
  - Less Excavation
  - Smaller Land Area
- If others size basins as an SBR, then operating the process as an ICEAS will allow up to 30% greater flow

Reduced Operating Cost

- No supplemental mixing required for aeration system
- Proven D.O. control system for optimizing energy usage
- Ultra high efficient SANITAIRE® Fine Bubble Aeration minimizes energy used for aeration

Reduced Installation Cost

- No influent or effluent control valves
- No retrievable equipment required
- Decanter easy to install

Reduced Maintenance Cost

- No influent or effluent control valves
- Continuous flow enables shut down of one basin to facilitate maintenance of equipment when required
- Retrievable aeration facilities not required
- Decanter easy to service from walkway

INDUSTRIAL WASTEWATER TREATMENT

Inherent flexibility gained through automated control systems and adaptability to high flow and loading fluctuations make SBR systems well suited for the treatment of wastewater originating from industrial facilities. ABJ SBR and the ICEAS process technology are applicable for both pre-treatment and complete secondary treatment.

ABJ SBR and ICEAS technology have been applied in the treatment of several types of industrial effluent including:

Pulp and Paper
Meat Packaging
Pharmaceutical
Food Processing
Dairy Industry
Textile
Bottling Plants
Chemical & Agricultural Products
FGD

SANITAIRE® Fine and Coarse Bubble Aeration systems are tailored specifically for each application to sustain the performance and longevity of the diffusers. Special supports and piping fixtures are used to provide redundancy, thus eliminating the need to take tanks out of service for maintenance.

The decanter mechanisms are constructed completely of 304L or 316L stainless steel to provide maintenance free operation in corrosive environments.

The ergonomic and robust system design facilitates a simple process with minimal mechanical and electrical components. In addition, the state of the art control system design with SCADA runs the process with minimal input from the plant operators.

Typical plant profiles are included for your review.

Installation, Operation,
and Maintenance Manual

Sanitaire, Silver Series

SANITAIRE

a xylem brand

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Introduction and Safety

Introduction

Purpose of this manual

The purpose of this manual is to provide necessary information for:

- Installation
- Operation
- Maintenance

CAUTION:

Read this manual carefully before installing and using the product. Improper use of the product can cause personal injury and damage to property, and may void the warranty.

NOTICE:

Save this manual for future reference, and keep it readily available at the location of the unit.

Other manuals

See also the safety requirements and information in the original manufacturer's manuals for any other equipment furnished separately for use in this system.

Safety

DANGER:

- Operating, installing, or maintaining the unit in any way that is not covered in this manual could cause death, serious personal injury, or damage to the equipment. This includes any modification to the equipment or use of parts not provided by Xylem. If there is a question regarding the intended use of the equipment, please contact a Xylem representative before proceeding.
- Do not change the service application without the approval of an authorized Xylem representative.

CAUTION:

- The operator must be aware of safety precautions to prevent physical injury.
- Read this manual carefully before installing and using the product. Improper use of the product can cause personal injury and damage to property, and may void the warranty.

You must observe the instructions contained in this manual. Failure to do so could result in physical injury, damage, or delays.

CAUTION:

Always adhere to site-specific safety protocol.

The safety information presented here is organized into the following areas:

- An explanation of safety symbols and hazard levels, see *Safety terminology and symbols* (page 4)
- Safety precautions to prevent physical injury to personnel, see *User safety* (page 4)
- Precautions for protecting the environment, see *Environmental safety* (page 6)

Safety terminology and symbols

About safety messages

It is extremely important that you read, understand, and follow the safety messages and regulations carefully before handling the product. They are published to help prevent these hazards:

- Personal accidents and health problems
- Damage to the product
- Product malfunction

Hazard levels

Hazard level	Indication
DANGER:	A hazardous situation which, if not avoided, will result in death or serious injury
WARNING:	A hazardous situation which, if not avoided, could result in death or serious injury
CAUTION:	A hazardous situation which, if not avoided, could result in minor or moderate injury
NOTICE:	• A potential situation which, if not avoided, could result in undesirable conditions • A practice not related to personal injury

Hazard categories

Hazard categories can either fall under hazard levels or let specific symbols replace the ordinary hazard level symbols.

Electrical hazards are indicated by the following specific symbol:

Electrical Hazard:

These are examples of other categories that can occur. They fall under the ordinary hazard levels and may use complementing symbols:

- Crush hazard
- Cutting hazard
- Arc flash hazard

User safety

General safety rules

These safety rules apply:

- Machinery in the work area must be de-energized (lockout/tagout) before starting work.
- Pay attention to the risks presented by gases and vapors in the work area.
- Always bear in mind the risk of drowning, electrical dangers, and burn injuries.

Safety equipment

Use personal protective equipment in accordance with applicable laws, regulations, and guidelines. Follow the Health and Safety Plan of the site.

NOTICE:

Never operate a unit unless safety devices are installed. Also see specific information about safety devices in other chapters of this manual.

Electrical connections

Electrical connections must be made by certified electricians in compliance with all applicable codes and regulations. For more information about requirements, see sections dealing specifically with electrical connections.

Confined spaces

DANGER: Inhalation Hazard

The chamber or tank where the equipment is installed should be treated as a confined space. Always follow the applicable safety laws, regulations and guidelines for confined spaces.

Never work alone in a confined space. Before entering the space, check that the following requirements are complied with:

- The atmosphere contains sufficient oxygen
- The atmosphere contains no explosive or toxic gases
- All energy sources are locked out and tagged out
- Adequate ventilation is in place
- There is a clear path of retreat
- Monitoring is in place for hazards which can develop after entering the confined space
- The applicable safety laws, regulations, and guidelines for enclosed spaces are understood and followed.

Drowning

Spaces that are not fully drained or dry can pose a risk of drowning. It takes relatively little standing water or other liquid to create a drowning hazard. For example, insufficient oxygen or the presence of a toxic material can make a worker unconscious, which makes them vulnerable to drowning if they fall face down into a small pool of water. Never work alone where there is a risk of drowning.

WARNING:

Bear in mind the risk of drowning.

Biological hazards

The product is designed for use in liquids that can be hazardous to your health. Observe these rules when you work with the product:

- Make sure that all personnel who may come into contact with biological hazards are vaccinated against diseases to which they may be exposed.
- Observe strict personal cleanliness.

WARNING: Biological Hazard

Infection risk. Rinse the unit thoroughly with clean water before working on it.

Organic dust

WARNING: Biological Hazard

Infection risk. Rinse the unit thoroughly with clean water before working on it.

When performing maintenance on the product inside or close to the tank or pit where the product is used, workers may be exposed to organic dust contaminated with microorganisms.

Employers and workers can minimize the risks of exposure to organic dust by taking the following precautions:

- Be aware of the adverse health effects of breathing organic dust.
- Use engineering controls such as local exhaust ventilation, and wet methods of dust suppression to minimize exposure to organic dust.
- Use appropriate respirators when exposure to organic dust cannot be avoided.
- Follow all health and safety rules and local codes and ordinances.

Working with solvents

WARNING: Explosion/Fire Hazard

Before starting any permit-required hot work such as welding, gas cutting, grinding, or using electrical handtools, do the following: 1. Check the explosion risk. 2. Provide sufficient ventilation.

CAUTION: Chemical Hazard

Contact the supplier for information for proper handling and use.

Be aware of changing conditions when using solvents. Follow all health and safety rules and local codes and ordinances.

Wash the skin and eyes

Follow these procedures for chemicals or hazardous fluids that have come into contact with your eyes or your skin:

Condition	Action
Chemicals or hazardous fluids in eyes	1. Hold your eyelids apart forcibly with your fingers. 2. Rinse the eyes with eyewash or running water for at least 15 minutes. 3. Seek medical attention.
Chemicals or hazardous fluids on skin	1. Remove contaminated clothing. 2. Wash the skin with soap and water for at least 1 minute. 3. Seek medical attention, if necessary.

Environmental safety

The work area

Always keep the station clean to avoid discharge or release of environmentally hazardous substances, and to aid in detecting inadvertent discharges.

Waste and emissions regulations

Observe these safety regulations regarding waste disposal and release of substances:

- Appropriately dispose of all waste.
- Handle and dispose of used or process liquids in compliance with applicable environmental regulations.
- Clean up all spills in accordance with safety and environmental procedures.
- Report all environmental discharges to the appropriate authorities.

CAUTION: Radiation Hazard

Do NOT send the product to Xylem if it has been exposed to nuclear radiation, unless Xylem has been informed and appropriate actions have been agreed upon.

Recycling guidelines

Always follow local laws and regulations regarding recycling.

Product warranty

Coverage

Xylem undertakes to remedy faults in all equipment supplied under these conditions:

- The faults are due to defects in design, materials, or workmanship.
- The faults are reported to a Xylem representative within the warranty period.
- The product is used only under the conditions described in this manual.
- All service and repair work is done according to the instructions in this manual.
- Genuine parts from the original equipment manufacturers are used.

Replacement does not include labor for removal or re-installation of the unit or parts deemed defective.

Limitations

The warranty does not cover faults caused by these situations:

- Deficient maintenance
- Improper installation
- Incorrect storage and handling
- Modifications or changes to the product and installation made without consulting Xylem
- Incorrectly executed repair work
- Normal wear and tear

Xylem assumes no liability for these situations:

- Bodily injuries
- Material damages
- Economic losses

Warranty claim

Xylem products are high-quality products with expected reliable operation and long life. However, should the need arise for a warranty claim, then contact your Xylem representative.

Transportation and Storage

Inspect the delivery

Inspect the package

1. Inspect the package for damaged or missing items upon delivery.
2. Note any damaged or missing items on the receipt and freight bill.
3. File a claim with the shipping company if anything is out of order.

   If the product has been picked up at a distributor, make a claim directly to the distributor.

Inspect the product

1. Inspect the product to determine if any parts have been damaged or are missing.
2. If applicable, unfasten the product by removing any screws, bolts, or straps.

   For your personal safety, be careful when you handle nails and straps.
3. Contact your sales representative if anything is out of order.

Transportation guidelines

Precautions

DANGER: Crush Hazard

Moving parts can entangle or crush. Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

Lifting

Lifting equipment is always required when handling the shipment. The equipment components can be lifted with either a crane or a forklift.

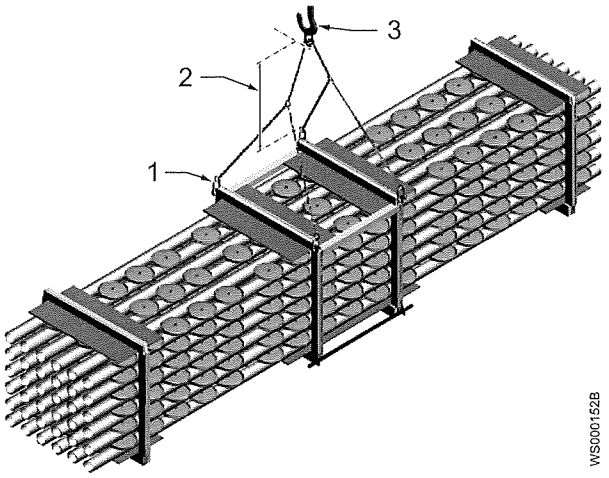
WARNING: Crush Hazard

1) Always lift the unit by its designated lifting points. 2) Use suitable lifting equipment and ensure that the product is properly harnessed. 3) Wear personal protective equipment. 4) Stay clear of cables and suspended loads.

Lifting with crane

Cranes used to lift the equipment components must fulfill the following requirements:

- The lifting equipment must be able to hoist the equipment components straight up and down, preferably without the need for resetting the lifting hook.
- The lifting strap must be fastened to the lifting points on top of the package.

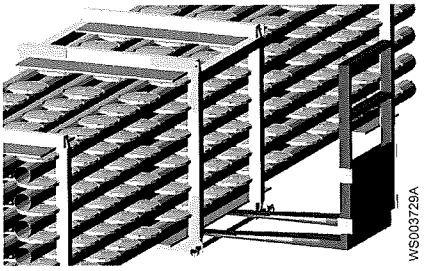


1. Lifting point
2. Minimum 2 m (6 ft 7 in.)
3. Lifting device

Figure 1: Lifting points

1. Check that the site where the equipment components will be placed has a clean and level surface.
2. Fasten a suitable lifting strap or sling to the lifting points on top of the pallet, if used.
3. If the equipment components are secured to the flatbed or other surface, then cut the transportation straps.
4. Lift using proper lifting equipment.
5. Place the equipment components on a clean, rigid, horizontal surface so that they cannot fall over.

Lifting with pallet and forklift



1. Align the forklift prongs with the forklift hole(s), and insert the prongs.
2. If the pallet is secured to the flatbed or other surface, then cut the transportation straps.
3. Lift the pallet and move it to its new position.
4. Place the pallet on a clean, rigid, horizontal surface so that it cannot fall over.

Storage guidelines

Dry storage location

The storage site must be available before equipment arrival. The equipment must be stored in a level and dry location free from heat and dirt. It is recommended that the equipment is stored indoors or in a covered area.

NOTICE:

Do not cover the pipe components with plastic. Excessive heat build-up can damage plastic pipes and void the warranty.

NOTICE:

- Do not stack shipping units.
- Do not place heavy weights on the packed product.
- Protect the product against humidity, heat sources, and mechanical damage.
- Risk of wear. Make sure the equipment is clean before it is placed into service.

Specific storage requirements

Component	Storage
Diffusers	• Original packaging until final installation
PVC piping	• Uncovered • Maximum stack of two bundles
PVC piping with diffusers installed (pre-mounted)	• Uncovered • A sheet of wood placed on top of the piping bundles To keep membrane diffusers shielded from the elements
Wooden crates	• Uncovered • Maximum stack of two crates
Cardboard boxes	• Uncovered • Unstacked • Dry location The cardboard box pallets can loose structure integrity and topple if they get wet

For more information on long-term storage of installed equipment, see *Tank storage* (page 33).

System Description

Diffusers included

Type	Model
Fine bubble	Silver Series II LP, 7 and 9 in.
	Silver Series II, 7 and 9 in.

Diffuser design

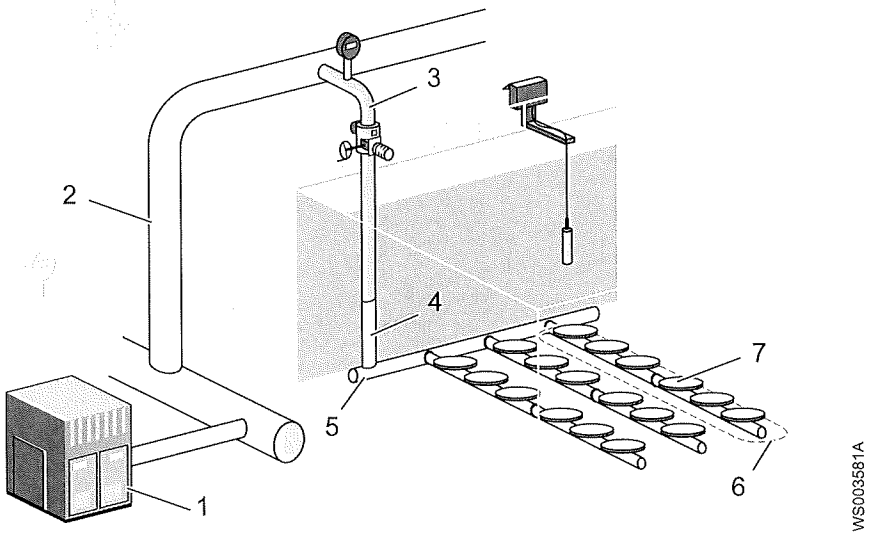
Fine bubble disc diffusers are designed for an efficient and reliable aeration and mixing process of industrial and municipal wastewater. The fine bubble diffuser is completely compatible with other Sanitaire aeration equipment.

Intended use

The product is only for use with municipal and industrial wastewater. If there is a question regarding the intended use of the equipment, then contact a sales representative.

Definition of system components

The main components in an aeration system are shown in the figure below.



Position number	Description	Definition
1	Blower	The device that distributes the air to the air main.
2	Air main	The pipe that connects the blower to the upper dropleg.
3	Upper dropleg	The pipe that connects the air main to the lower dropleg.
4	Lower dropleg	The pipe that connects the upper dropleg to the manifold.
5	Manifold	The pipe that connects the lower dropleg to the air distributor. There are no holders mounted on this pipe.
6	Air distributor	A set of pipes, couplings, and holders with diffusers from the manifold to the end cap.
7	Holder with diffuser	The diffuser is attached to the holder. It forms part of the air distributor, and distributes the air to the liquid.

Installation

Precautions

WARNING:

Always follow safety guidelines when working on the product. See *Introduction and Safety* (page 3).

Requirements

The following requirements apply:

- Never work alone.
- Make sure to have a clear path of retreat.
- Make sure that the work area is properly ventilated.
- Provide a suitable barrier around the work area, for example a guard rail.
- Check the explosion risk before you weld or use electrical hand tools.
- Ensure that welding or construction work does not damage the aeration system equipment.
- Use the installation drawings, containing the required part number designation, in order to ensure proper installation.
- Remove all debris from the air main before installation.

The figures in the instructions can differ from the delivered products.

Leveling guidelines

To ensure an installation where maximum system efficiency is obtained, and where leaks, adjustments, and damage to products are minimized, follow these guidelines:

- Always use the highest point of the tank floor as a reference when leveling. The height of the grid should be as low as possible at this point.
- Use a level system which ensures installation within the given tolerance (6 mm [¼ in.] horizontally).
- Allow for movement of the pipes when securing the clamps.
- Align pipes correctly before couplings are assembled.

Support types

There are three types of supports:

- Single anchor support that is used for 110 mm (4 in) diameter manifolds or air distributors.
- Support with strut that is used for 160 mm (6 in) diameter or greater manifolds where the manifold centerline elevation is less than 559 mm (22 in) from the floor.
- Support with strut that is used for 160 mm (6 in) diameter or greater where the manifold centerline elevation is above 559 mm (22 in) from the floor.

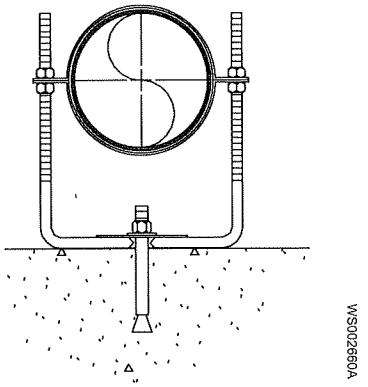


Figure 2: Single anchor support

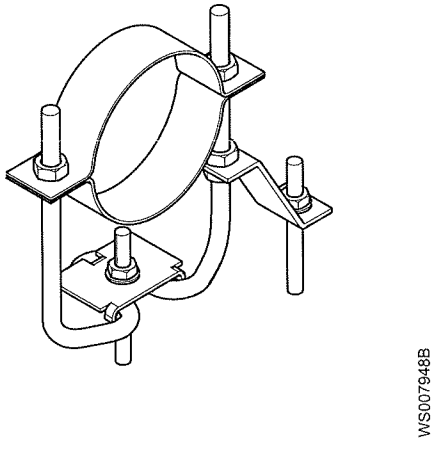


Figure 3: Support with strut, low

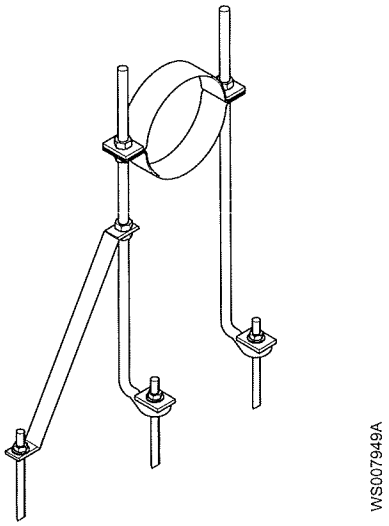


Figure 4: Support with strut, high

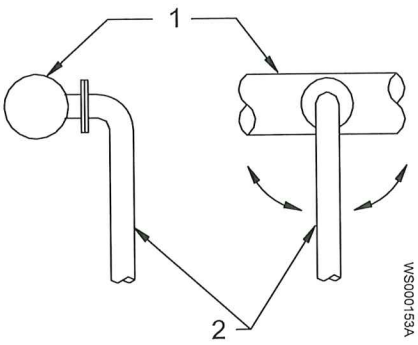
Dropleg and manifold installation

Prerequisites

- Always use the highest point of the tank floor as a reference when leveling.
- Ensure that the air filtration equipment is installed and operating.
- Ensure that all dirt and debris are removed from the air main.

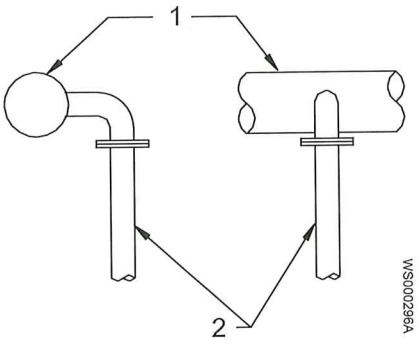
  If air blowers are used, then follow the instructions from the manufacturer. Blowers can require a minimum back pressure when operating.

Upper dropleg connection requirement



1. Air main
2. Upper dropleg

Figure 5: Vertical flange connection



1. Air main
2. Upper dropleg

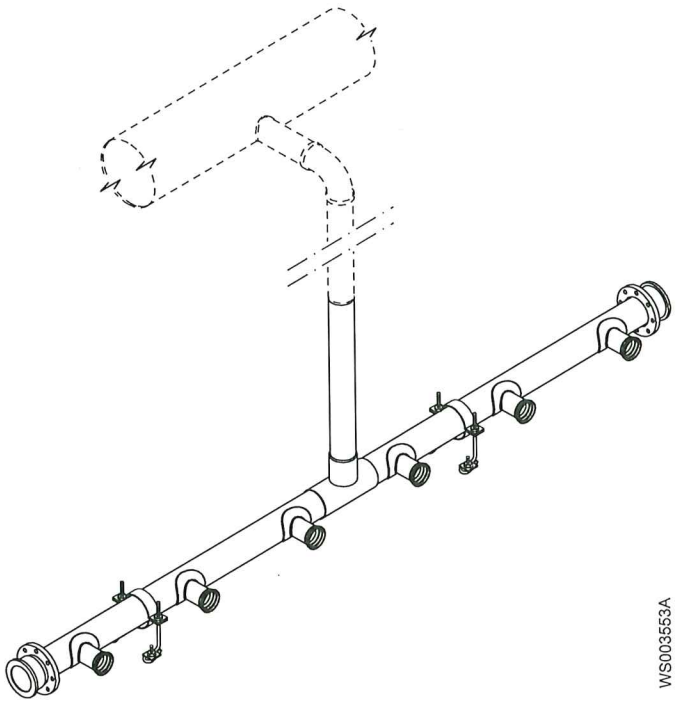
Figure 6: Horizontal flange connection

Ensure that the upper dropleg is attached to the air main, and vertical to its centerline. Refer to the installation drawings. In order to allow easy installation of the lower dropleg, the dropleg must be attached loosely.

- If the dropleg is connected with a vertical flange, then ensure that it can be swung to the side.
- If the dropleg is connected with a horizontal flange, then ensure that it can be easily removed.

Ensure that the end plugs of the upper droplegs are removed.

Installation procedure overview

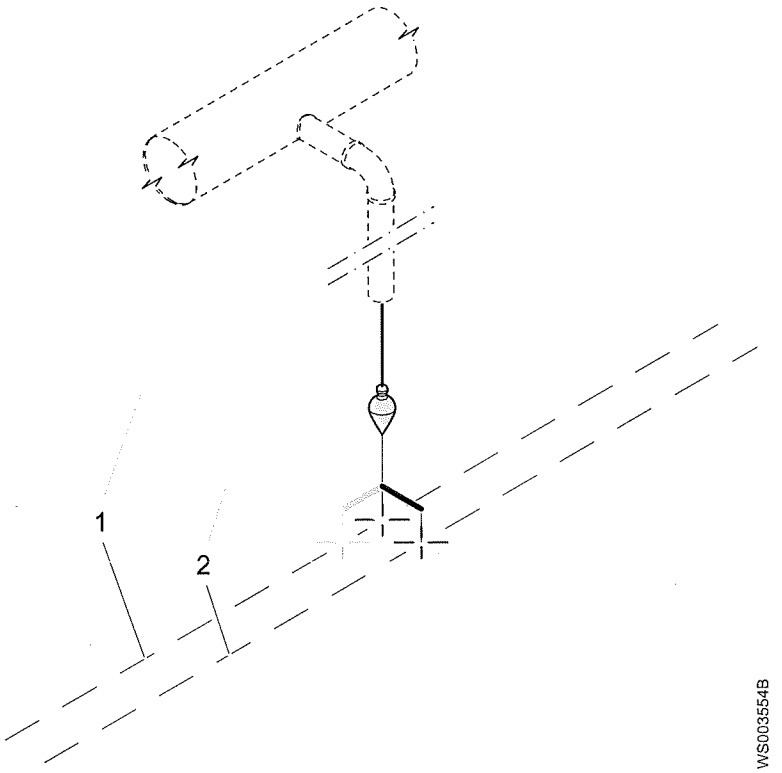


The manifold installation includes the following steps:

- *Lay out the manifold centerline* (page 15)
- *Lay out the manifold support locations* (page 16)
- *Install the manifold anchors and supports* (page 16)
- *Assemble the manifold pipe sections* (page 18)
- *Install the lower dropleg* (page 20)

Lay out the manifold centerline

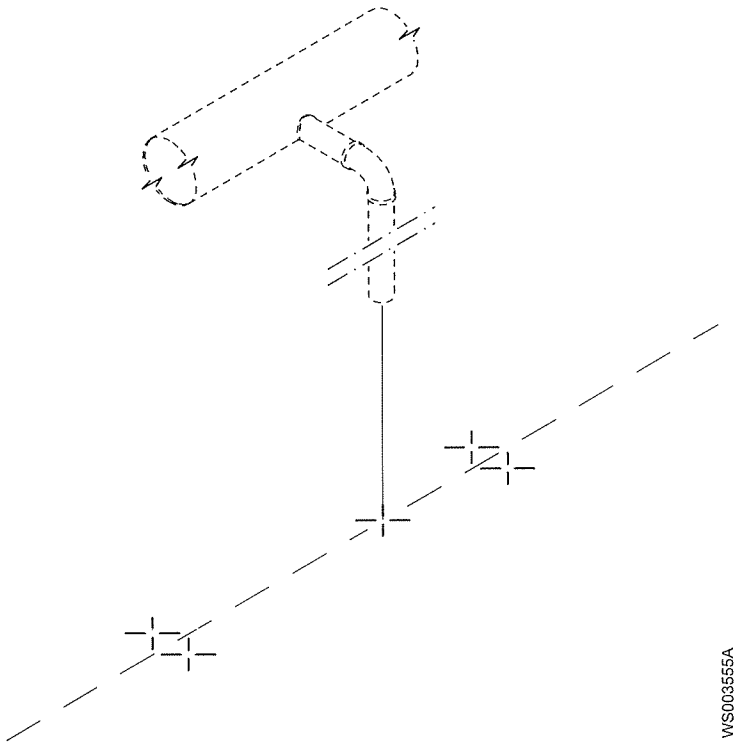
The dropleg connection to the manifold is located directly under the dropleg. In some installations, the dropleg connection is offset.



1. In-line manifold
2. Offset manifold

1. Locate the centerline of the manifold.
   Use the installed upper dropleg and the installation drawings.
2. Mark clearly the position on the floor.

Lay out the manifold support locations



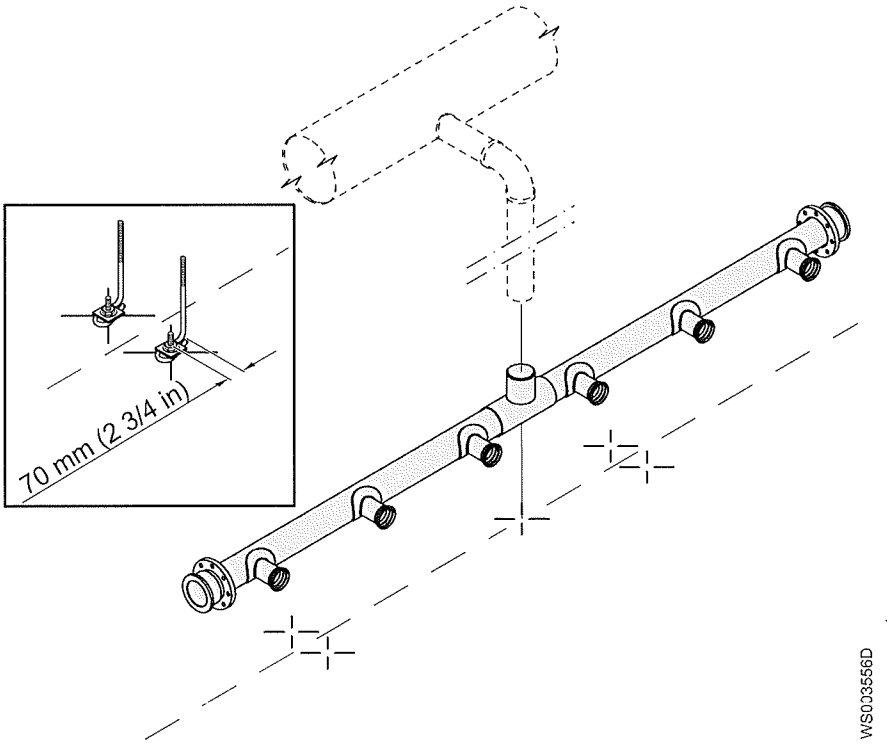
1. Locate and layout all manifold support locations.
   Use the installation drawings and shippings lists.
2. Mark clearly the positions on the floor.

Install the manifold anchors and supports

The manifold sections must be placed according to the manifold and anchor layout before the anchors are installed.

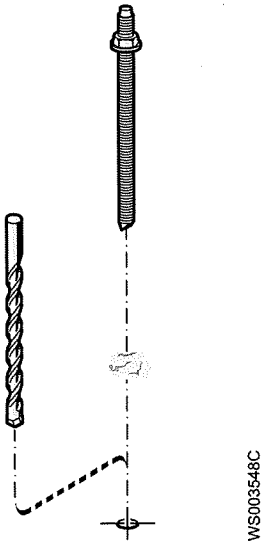
Always use the highest point of the tank floor as a reference when leveling.

1. Lower the manifold sections into the tank.
2. Place the sections according to the layout and double check for possible interference.
   Use the reference numbers from the installation drawings to identify the pipe sections.
3. Check, and if necessary, correct the positions of the support anchors.
   Consider the offset from the anchor position to the center line of the support, and install all supports in the same direction.
   Ensure that the maximum support spacing does not exceed 2400 mm or 8 ft.



4. Install the manifold support anchors according to the instructions from the manufacturer.

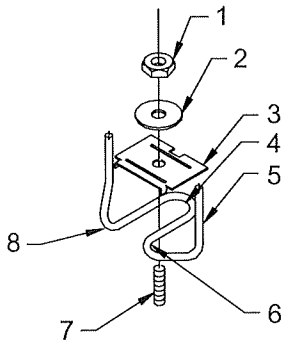
   The threaded projection from the floor level must correspond to the installation drawing anchor table.

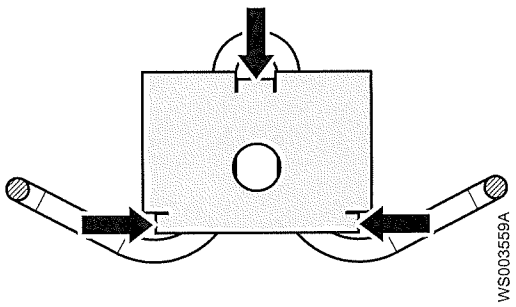


   The tightening torque values are listed in the installation instructions from the anchor bolt manufacturer.

5. On a single anchor support, install the locating plate with the two bent prongs in front, inside the support rod, and the single prong to the back, inside the u-bend.

   Install all supports in the same direction.

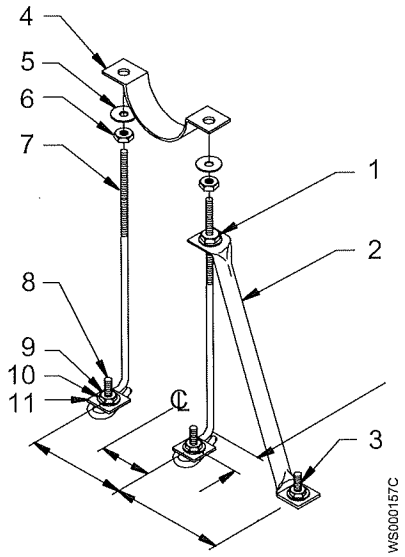




1. Hexagon nut
2. Flat washer
3. Locating plate
4. Back of support
5. Support rod
6. Inside of support rod
7. Anchor bolt
8. Front of support rod

6. Install the struts, if applicable.
7. Install the hexagon nuts and place the lower pipe support clamp on them.

   Project-specific anchor dimensions are found in the erection drawing.



1. Hexagon nut
2. Strut
3. Anchor bolt
4. Clamp
5. Washer
6. Hexagon nut
7. Rod
8. Anchor bolt
9. Hexagon nut
10. Washer, round
11. Washer, square

8. Use the installation drawings and a level system to find the correct clamp flange elevation.

   The correct elevation is equal to the manifold center line, and the tolerance is ± 6 mm (¼ in.).

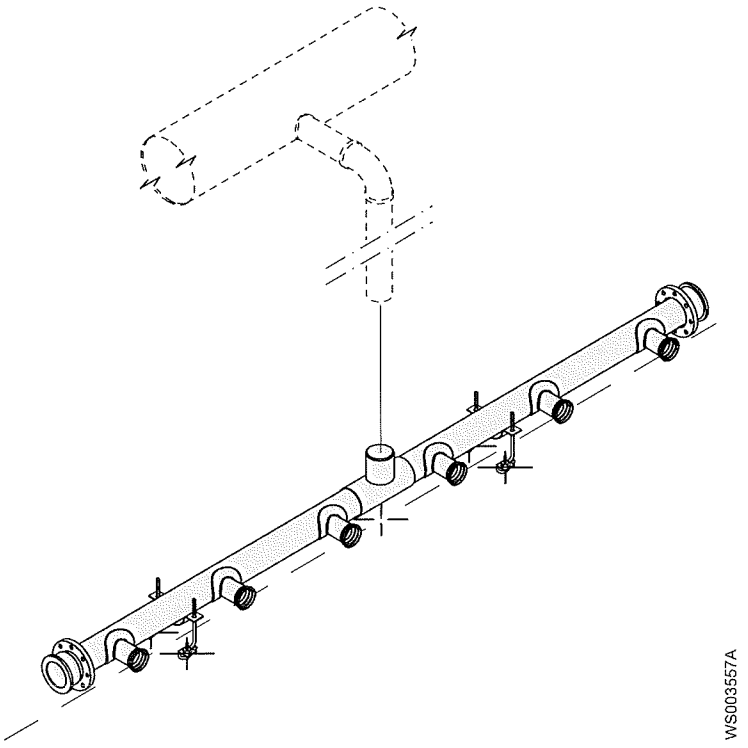
Assemble the manifold pipe sections

CAUTION: Chemical Hazard

Contact the supplier for information for proper handling and use.

1. Examine the manifold sections.

   If the sections are dirty and contain debris from storage, then flush with water before installation.
2. Remove all protective dust covers from the pipe ends and connections.
3. Place the manifold sections in the lower part of the support clamp.



4. Connect the manifolds:
   a) Connect flanges with bolts loosely.
   b) Connect joints with glue.
   c) Connect spline couplings without tightening.
5. Install the upper part of the support clamp with washers and nuts.
   Tighten loosely.
6. Level the manifold sections which attach to the droplegs.
   - For in-line manifolds, ensure that the air distributor connections are horizontal.
   - For raised manifolds, ensure that the air distributor connections are vertical.

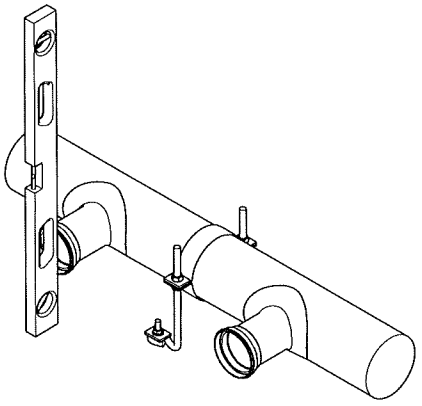


Figure 7: In-line manifold

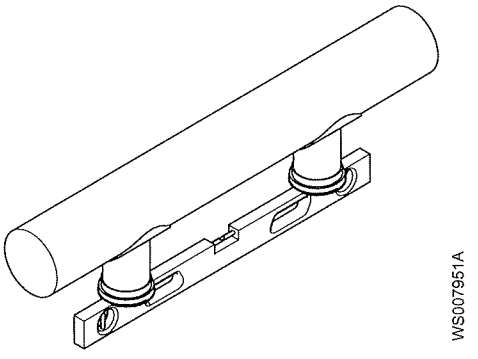


Figure 8: Raised manifold

7. Secure the clamps on the sections which attach to the droplegs by tightening the hexagon nuts.
   Ensure that the manifold is horizontal.
8. Install all manifold sections according to the installation drawings.

Do not secure the clamps on these sections at this point.

9. Install the lower dropleg according to *Install the lower dropleg* (page 20).
10. Complete the manifold installation:
    a) Level the remaining manifold sections and ensure that the air distributor connections are level.
    b) Tighten the flange connections between the manifold sections.
    c) Secure the pipes by tightening the hexagon nuts on the upper part of the clamps.

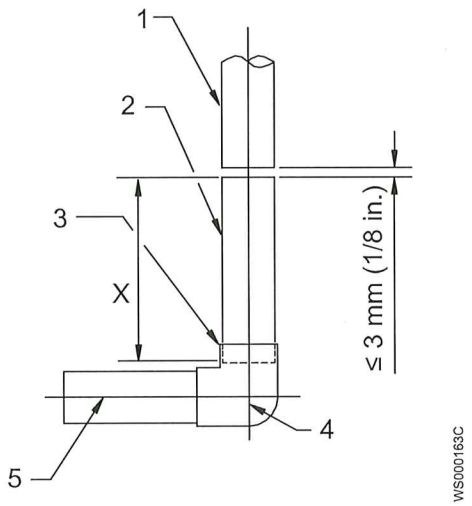
Install the lower dropleg

CAUTION: Chemical Hazard

Contact the supplier for information for proper handling and use.

An in-line manifold (see figure below) does not require a feed pipe. See the installation drawings.

1. Install the feed pipe and support, if applicable. This is only applicable to an offset manifold.
    a) Glue the feed pipe and fittings.
    b) Install the feed pipe and the supports, if applicable.



1. Upper dropleg
2. Lower dropleg, cut to length X
3. Socket fitting
4. Upper dropleg centerline
5. Feed pipe centerline

Figure 9: Parts between dropleg and manifold, offset manifold

2. Measure the distance X from the end of the installed upper dropleg to the insertion depth of the socket fitting.

   If a flange connection is used, then consider the flange, the socket depth, and the gasket thickness.
3. Remove the upper dropleg out of the work area.
4. Cut or trim the lower dropleg to the measured distance.
5. Glue the lower dropleg into the socket fitting.
6. Reinstall the upper dropleg.

   Ensure that the gap between the upper and lower dropleg is maximum 3 mm (1/8 in.).

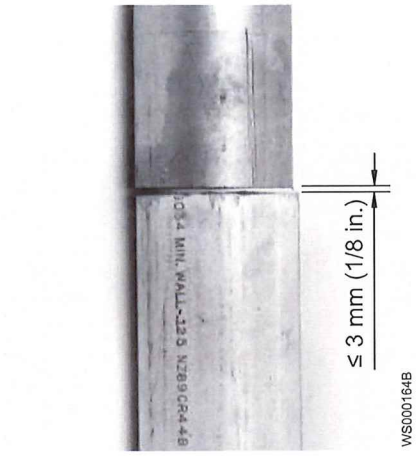


Figure 10: Upper and lower dropleg

7. Install the clamp coupling or tighten the flange connection.
   Tighten the clamp coupling bolts to a torque of 70–75 Nm (50–55 ft-lbs).

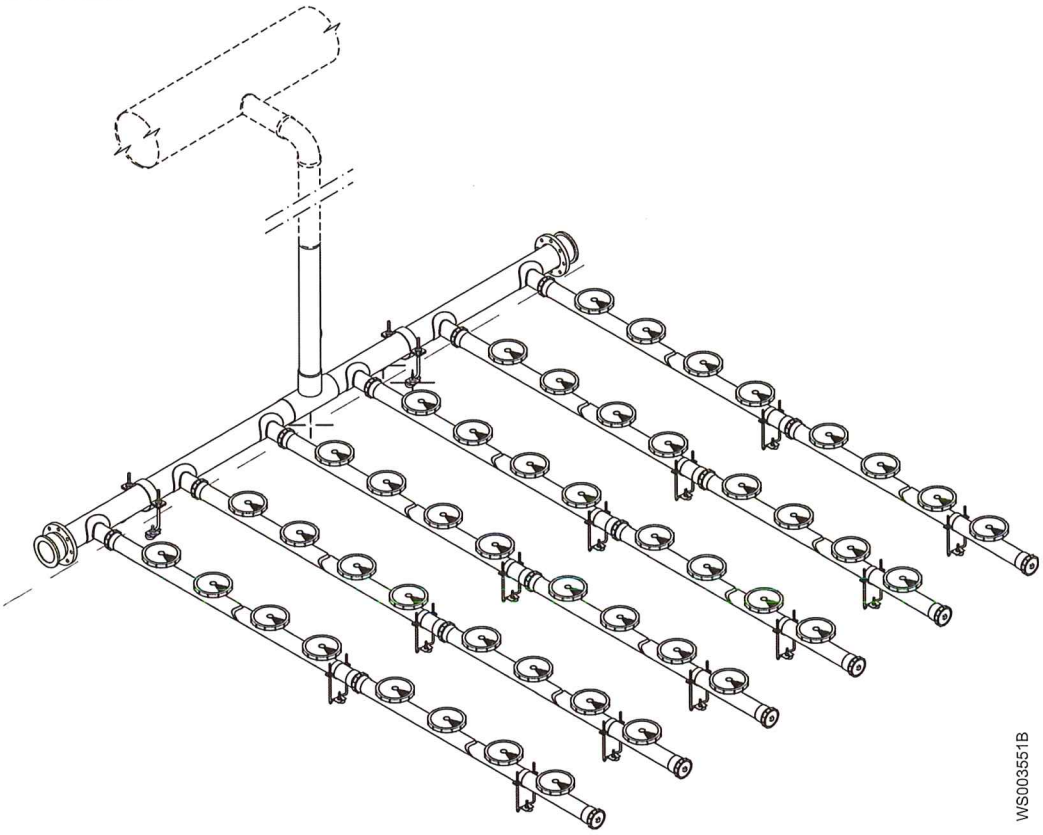
Figure 11: Example of clamp coupling

Figure 12: Example of flange connection

8. Tighten the upper dropleg to the air main.
9. Complete the manifold installation according to the last step in *Assemble the manifold pipe sections* (page 18).

Air distributor installation

Installation procedure overview



The installation includes the following steps:

- *Lay out the air distributor support locations* (page 22)
- *Install the air distributor anchors and supports* (page 23)
- *Assemble an air distributor section* (page 24)
  - *Place the sections* (page 25)
  - *Assemble with spline couplings* (page 25)
  - *Assemble with expansion couplings* (page 26)
  - *Level and tighten the air distributors* (page 28)

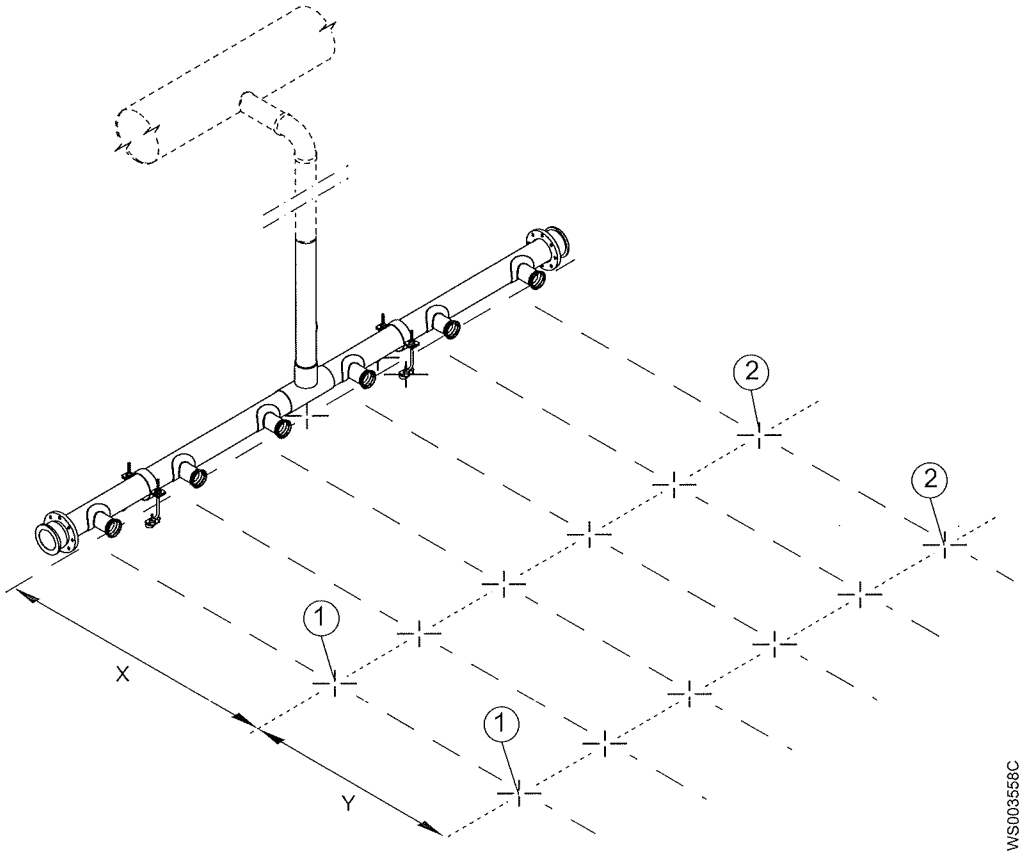
For drainline installation, see *Drainline installation* (page 29).

Lay out the air distributor support locations

1. Lay out the centerline for each air distributor.

   Use the installation drawings and the manifold air distributor connections. Start measuring from the center line of the manifold.
2. Mark the air distributor support locations for the first air distributor from one side. See (1) in the figure below.

   The distance between the manifold center line and first support location is marked X in the figure below. The distance to the second support location is marked Y.



3. Ensure that there is no interference between the holders, couplings, and supports.
4. Make the required adjustments.

   If spacing is extended beyond the installation drawing specification, then consult your Xylem representative.
5. Mark the support locations for the air distributor located at the opposite end of the manifold. See (2) in the figure above.
6. Use a chalk line to mark all support locations between the outside layout lines.

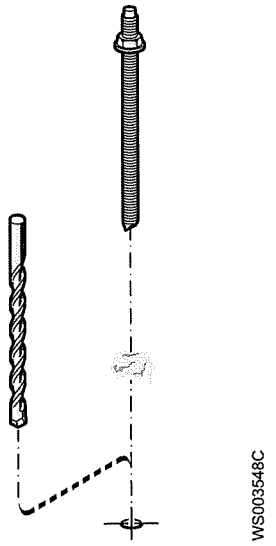
Install the air distributor anchors and supports

Sloped floors can require the use of several different support types or support rod diameters. Refer to the installation drawings for identification of the correct support at each location.

1. Install the anchor bolts according to the instructions from the anchor manufacturer.

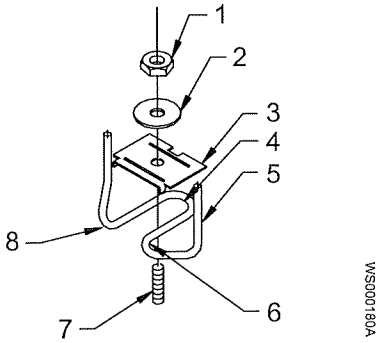
   The threaded projection from the floor level must correspond to the installation drawing anchor table.

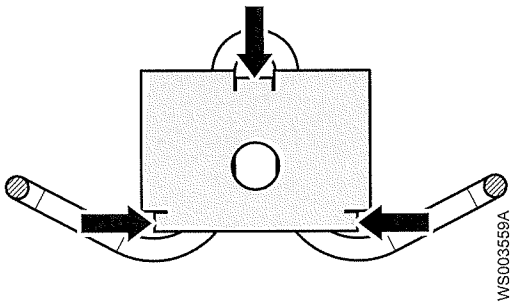
   The tightening torque values are listed in the installation instructions from the anchor bolt manufacturer.



2. Install the locating plate with the two bent prongs in front, inside the support rod, and the single prong to the back, inside the u-bend.

   Install all supports in the same direction.





1. Hexagon nut
2. Flat washer
3. Locating plate
4. Back of support
5. Support rod
6. Inside of support rod
7. Anchor bolt
8. Front of support

3. Tighten the hexagon nut to the recommended torque value as listed by the anchor bolt manufacturer.
4. Using a level system, find the correct elevation to put the hexagon nut on all air distributor supports.

   The correct elevation is the air distributor center line, which is shown on the installation drawings. The difference in height cannot exceed a tolerance of ± 6 mm (¼ in.) from one side to the other throughout the whole grid.
5. Install the lower clamp sections on all air distributor supports.

Assemble an air distributor section

This instruction describes the assembly of a complete air distributor section from the manifold to the end cap.

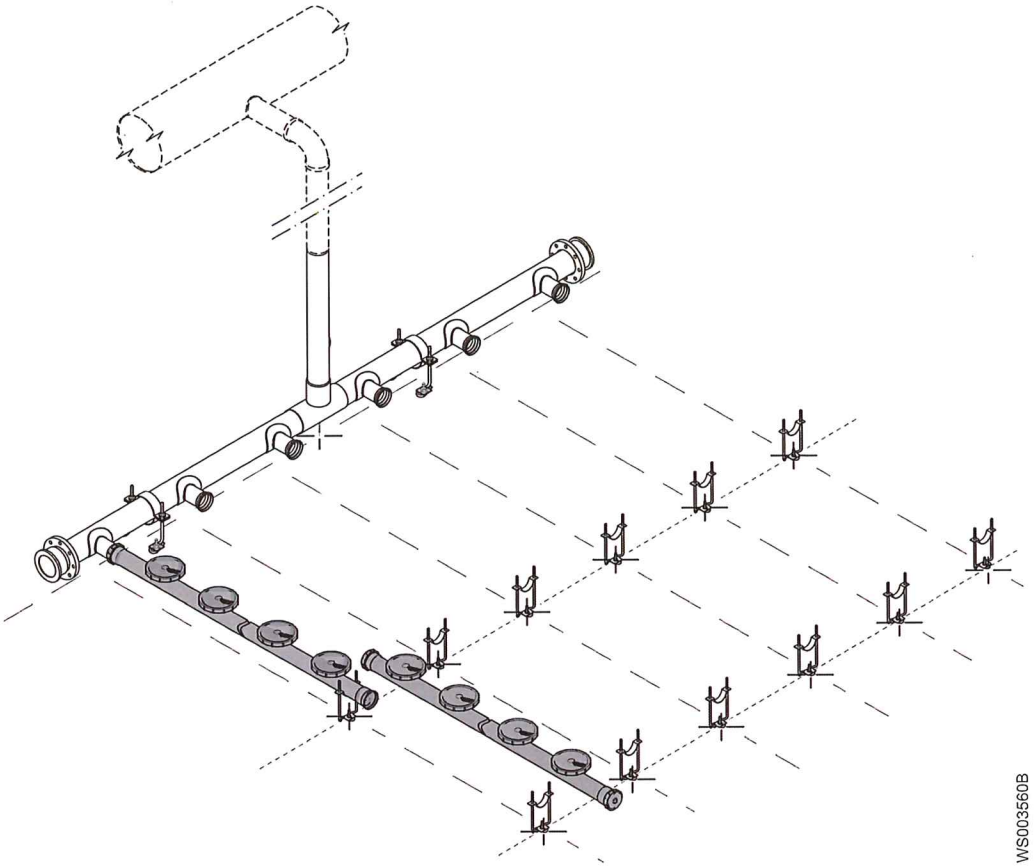
Use the following:

- Air distributor sections, see the installation drawings and the corresponding markings on the sections
- Spline couplings
- Expansion couplings, if applicable
- Drainline sections, if applicable

Piece markings can be printed or hand written on pipe.

Figure 13: Markings on installation drawings and sections

Place the sections



1. Starting from the manifold, check, and flush out any dirt from the first section and place it in the supports.
2. Assemble the first section according to the instructions in *Assemble with spline couplings* (page 25).
3. Check and flush out any dirt from the subsequent section and assemble according to the instructions in *Assemble with spline couplings* (page 25) or*Assemble with expansion couplings* (page 26). Repeat this step until all the sections have been assembled.

   Do not place the flanges closer than 153 mm (6 in) to an anchor support.

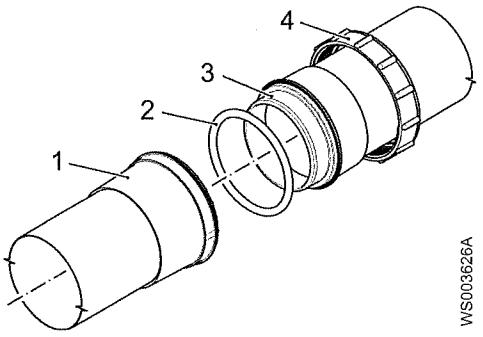
   Tighten loosely.

Assemble with spline couplings

Before starting the assembly, ensure that the air distributor sections are as level as possible.

The spline coupling is a coupling that is used to prevent an air distributor section from rotating.

To adjust the spline coupling after the initial installation, it must be loosened and backed off until the splines are disengaged.



1. Spline socket
2. O-ring
3. Spline spigot
4. Retainer ring

Figure 14: Spline coupling

1. Lubricate the O-ring for ease of installation.
   Use a common dish soap solution. Do not use oil or grease.
2. Fit the O-ring into the spline socket.
3. Push the spline spigot into the spline socket.
   Ensure that the splines are fully engaged.
4. Thread the retainer ring onto the spline socket.
5. Tighten the retainer ring to a hand-tight position.
   Do not use a strap wrench, pipe wrench, spanner wrench or other tool to tighten the retainer ring. The spanner wrench sent together with spares is used for disassembly only.

Assemble with expansion couplings

Expansion couplings are used in some installations and always together with fixed supports.

1. Spline socket
2. O-ring
3. Retainer ring
4. Spline spigot
5. Retainer ring
6. O-ring

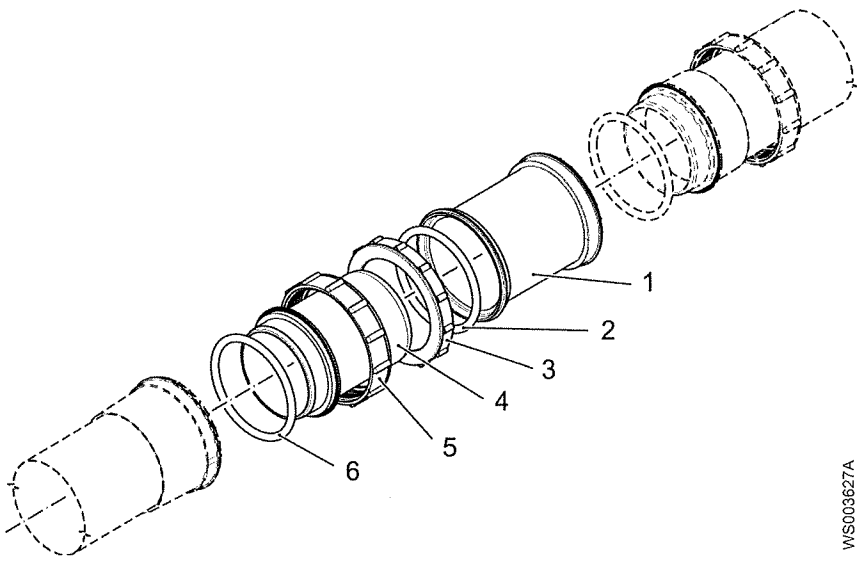
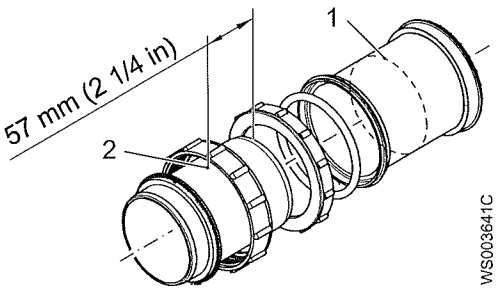


Figure 15: Expansion coupling

1. Assemble the coupling:



1. Spline spigot end placement in an assembled coupling
2. O-ring placement

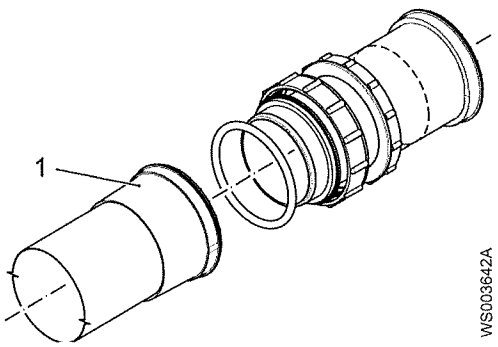
a) Fit both retainer rings on the spline spigot.
b) Lubricate the O-ring for ease of installation.
   Use the supplied silicone grease.

NOTICE:

Risk for damaged O-ring. Always use the supplied grease for the expansion coupling O-ring.

c) Fit the O-ring on the spline spigot.
   Place the O-ring at half the length of the spline spigot, which is 60 mm (2 3/8 in.) from the end.
d) Push the spline socket onto the spline spigot.
   See the exploded view for spline spigot end placement in the spline socket.
e) Thread the retainer ring onto the spline socket, until the O-ring seats.
f) Tighten the retainer ring to a hand-tight position.

2. Install the assembled coupling:

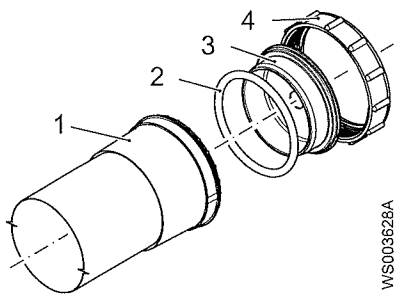


1. Spline socket

a) Lubricate the O-ring for ease of installation.
   Use a common dish soap solution. Do not use oil or grease.
b) Fit the O-ring into the spline socket.
c) Push the assembled coupling into the spline socket.
d) Thread the retainer ring onto the spline socket.
e) Tighten the retainer ring to a hand-tight position.

Install the end cap

The end cap is in some cases factory assembled with the air distributor.

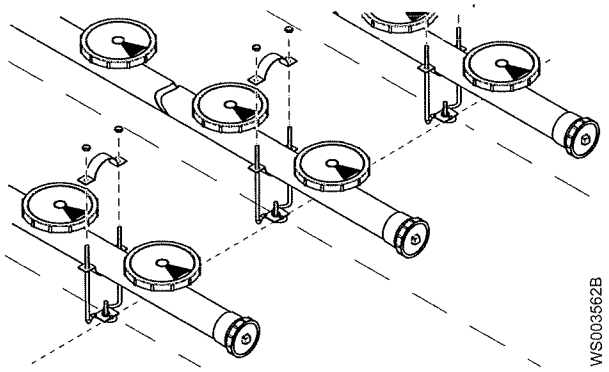


1. Spline socket
2. O-ring
3. End cap
4. Retainer ring

1. Lubricate the O-ring for ease of installation.
   Use a common dish soap solution. Do not use oil or grease.
2. Fit the O-ring into the spline socket.
3. Push the end cap into the spline socket.
4. Thread the retainer ring onto the spline socket.
5. Tighten the retainer ring to a hand-tight position.

Level and tighten the air distributors

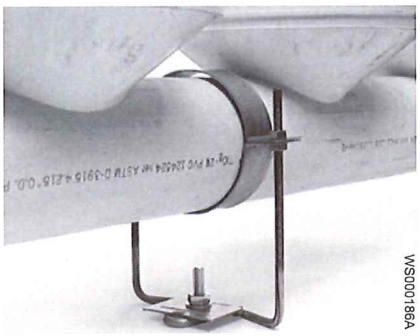
1. Install the top half clamp on each support, and loosely install the top hexagon nuts.



2. Rotate the distributor section until the diffuser is level.
   Use a level system. Make sure to disengage the splines before rotating.
3. Hold the pipe section level and do one or both of the following:
   a) Retighten all corrected spline couplings.
   b) If expansions couplings are used, then tighten all fixed support clamps on those sections.
4. Recheck for level both perpendicular and parallel to the distributor section.
5. Continue this procedure for all distributor sections.
6. Tighten all nuts on the supports.

NOTICE:

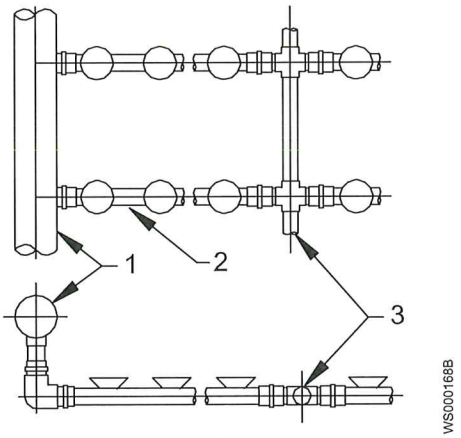
The clamps must be loose around the pipe to allow for movement. Do not wrap anything around the pipe to tighten the clamps against the pipe.



Drainline installation

Separate drainlines are primarily used on fine bubble systems with raised manifolds. On systems with in-line manifolds, the manifold normally serves as drainline.

Ensure that the installation of the drainline is made according to the installation drawings.



1. Raised manifold
2. Air distributor
3. Drainline

Figure 16: Raised manifold with drainline

Purge system installation

There are two types of purge systems:

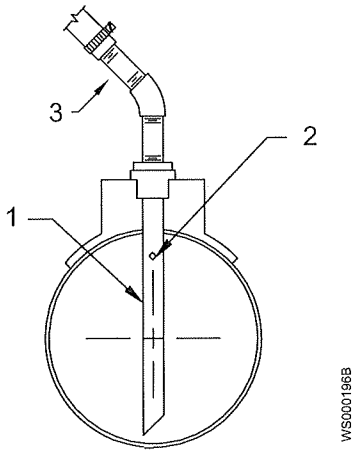
- The manual purge system, with sump and evacuation pipe

  This system uses a sump with an eductor line that extends from the grid to above the water surface and ends with a manual ball valve.
- The continuous purge system, with a diffuser unit that is attached to the bottom of the manifold or the drainline

  The entrapped moisture is continuously purged from the system.

Install a manual purge system

The manual purge system consists of a sump and an evacuation pipe.



1. Suction tube
2. Air orifice hole
3. Evacuation pipe

The sump for systems using in-line manifolds is built into the manifold pipe.

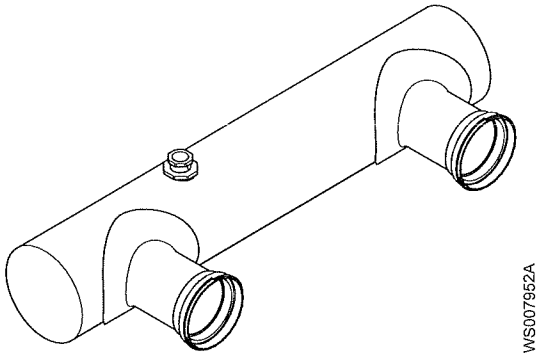


Figure 17: Sump in in-line manifold

The sump for systems using the raised manifold is installed between air distributor or drainline sections.

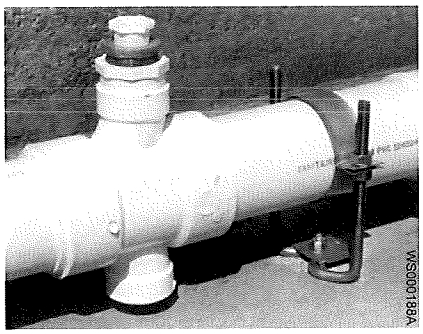


Figure 18: Sump between air distributor sections

1. Identify the parts of the purge system.
2. Install the purge system according to the installation drawings.

Install a continuous purge system

The continuous purge system consists of a tube diffuser unit or a flex-cap diffuser unit that is attached to the bottom of the manifold, air distributor, or drainline.

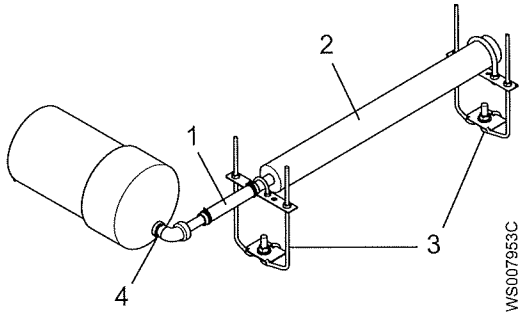


Figure 19: Tube diffuser

1. Hose
2. Tube diffuser
3. Support
4. Cap with drainline tap

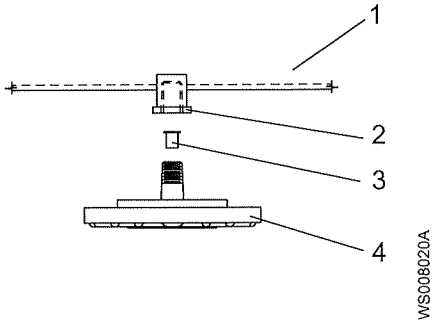


Figure 20: Flex-cap diffuser

1. Manifold
2. Reducer bushing
3. Orifice
4. Flex-cap

The installation is made according to the installation drawings.

1. Mount the diffuser.

Condition	Action
Tube diffuser	1. Assemble the continuous purge. 2. Install the supports on the tank floor according to the installation drawings and the instructions from the anchor bolt manufacturer. Ensure that the tube diffuser is placed horizontally, aligned with the orifice and at an elevation lower than the section to which it is attached. 3. Cut the hose to the correct length 4. Attach the hose to the cap with drainline tap.
Flex-cap diffuser	Thread the flex-cap diffuser into the solvent welded bushing of the manifold. Hand-tight only.

2. Make sure that the manifold, air distributor, or drainline is tapped at a low point.

Diffuser installation

Prerequisites

The diffusers should be installed just before the scheduled start-up of the aeration system.

If the diffusers are pre-mounted, then ensure that all retainer rings are in a hand-tight position. If not, tighten according to the applicable steps in *Install the diffusers* (page 31).

If the diffusers are not delivered pre-mounted, they must be assembled. Before the assembly, ensure that:

- The holders are clean.
- The orifices are not obstructed.
- Blank holders are plugged according to the instructions in *Plug blank holders* (page 32). See the installation drawings for the location of blank holders.

The orifices must be drilled with the correct tool if they are obstructed. Contact your local sales representative.

Install the diffusers

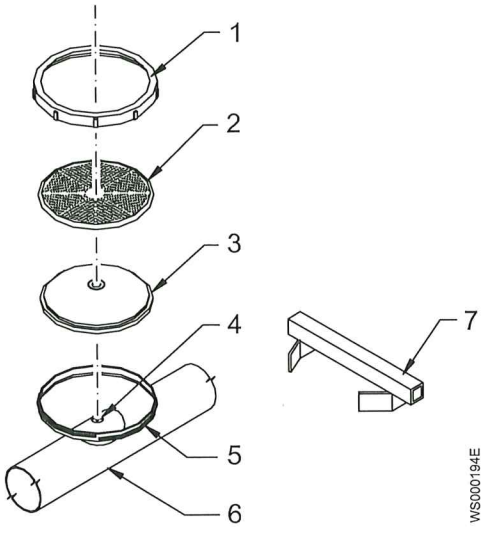


Figure 21: Assembly

1. Retainer ring
2. Diffuser
3. Base plate
4. Orifice
5. Holder
6. Air distributor pipe
7. Spanner wrench

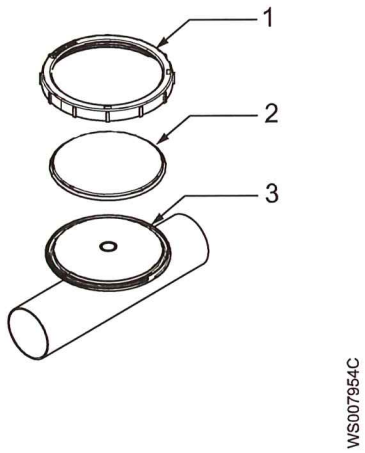
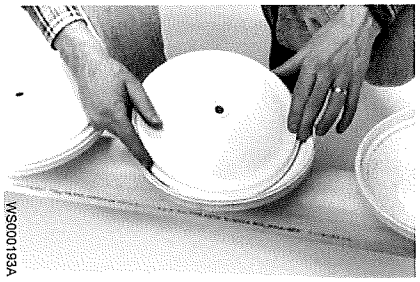


Figure 22: Assembly

1. Retainer ring
2. Diffuser
3. Premounted holder and base plate

1. Set the base plate, if applicable, in the holder with the flat side up.

In some equipment the holder and base plate are incorporated as one piece.



2. Mount the diffuser.

   The diffuser O-ring edge must fit down into the void at the edge of the holder to ensure good sealing.

1. Retainer ring
2. Diffuser
3. Base plate
4. Holder

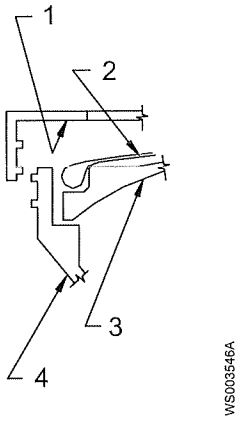


Figure 23: Diffuser placement

3. Lubricate the retainer ring with the silicone grease provided.

   Use a small amount, approximately the size of a finger tip. Do not use excessive silicone grease and only lubricate the underside of the retainer ring, in three or four places. Avoid getting lubricant on the threads.

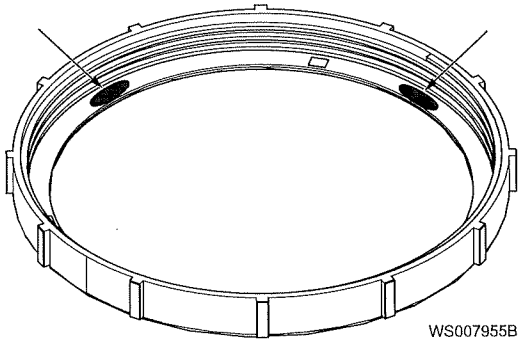


Figure 24: Lubrication of retainer ring

4. Turn the retainer ring to a hand-tight position.
5. Turn the retainer ring an additional 45–90°, using the spanner wrench.

   Do not over tighten.

Plug blank holders

A holder that is not put into operation must be plugged. This is known as a blank holder. If the aeration process requirements change, then the holder can be put into operation later.

1. Locate blank holder positions. See the installation drawings.
2. To ensure proper embedment, add the provided silicone grease in the plugging tool before inserting the plug.
3. Plug the orifice.

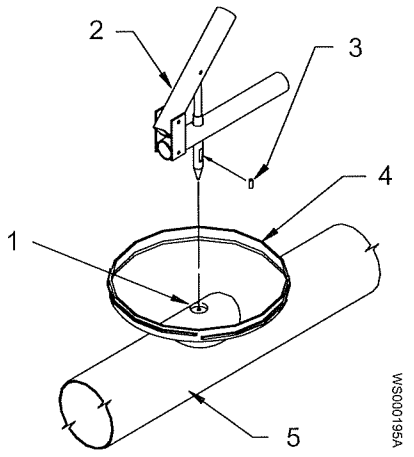


Figure 25: Example of plugging tool

1. Orifice
2. Tool
3. Plug
4. Holder
5. Air distributor

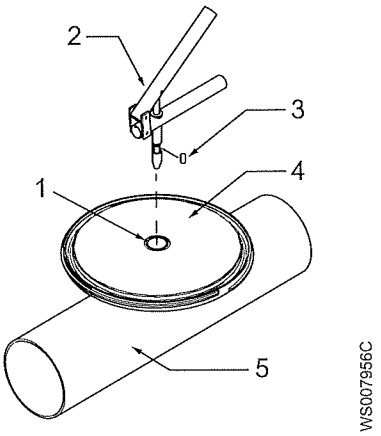


Figure 26: Example of plugging tool

1. Orifice
2. Tool
3. Plug
4. Premounted holder and base plate
5. Air distributor

Tank storage

The different options have been developed to protect the pipes and diffusers from environmental damage, and are listed in order of preference.

Xylem assumes no responsibility for damage and cleaning requirements as a result of long-term storage.

- Equipment flooded by overflows, misdirected sewage flows, and excessive airborne dirt build-up requires cleaning before being placed in service.
- Standing water which is allowed to freeze around the pipe can break the pipe or cause diffusers to crack.
- UV light degradation and heat build-up in the tank bottom can cause warping and loss of some structural properties.

NOTICE:

Risk of wear. Make sure the equipment is clean before it is placed into service.

Store in tank when air and water is available

This procedure describes storage of an installed system, before placing it into operation.

1. Add protection around the dropleg and the carrier columns in the tank when there is a risk of ice build-up.

   Use for example Styrofoam blocks.
2. Fill the tank with clean water to a minimum level of 1 m (3.1 ft) above the lower droplog. This action gives the pipe and the diffusers protection from UV light and heat build-up.
3. Run a small amount of air through the system to secure that the pipes remain free from water and to minimize the growth of algae on the diffusers.
4. Take appropriate measures against excessive algae growth.
5. Before bringing the system into operation:

a) Drain and check all hardware.
b) Check the diffusers and clean if fouling is evident.

The operator may have to adjust the air flow rate to a higher level to prevent ice formation during severely cold temperatures.

Store in tank without air, removed diffusers

This procedure describes storage of an installed system in a flooded tank, before placing it into operation.

1. If there is a risk of ice build-up, then start by installing styrofoam blocks around the dropleg and carrier columns installed in the tank.

   If ice builds up around the pipes, these blocks prevent crushing.
2. Remove all diffusers, O-rings, retainer rings, base plates, and so on.
3. Clean as required, and store in a clean, dry environment.
4. Fill the tank with clean water to a minimum level of 1 m (3.1 ft) above the lower dropleg.
5. Take appropriate measures against excessive algae growth.
6. Before bringing the system into operation:
   a) Ensure that there is no ice in the tank.
   b) Drain and check all hardware.
   c) Check all holders.
   d) Spot check pipe internals for algae growth and fouling.
   e) Clean as required before installing the diffusers.

NOTICE:

Falling ice can crush the system. If water freezes, do not drain the water below the ice layer.

Store in tank without air, with diffusers

This procedure applies to storing in a flooded tank with diffusers installed.

1. If there is a risk of ice build up, then start by installing styrofoam blocks around the dropleg and carrier columns installed in the tank.

   If ice builds up around the pipes, these blocks prevent crushing.
2. Fill the tank with clean water to a minumum level of 1 m (3.1 ft) above the lower dropleg.
3. Take appropriate measures against excessive algae growth.
4. Before bringing the system into operation:
   a) Ensure that there is no ice in the tank.
   b) Drain and check all hardware.
   c) Spot check pipe internals for algae growth and fouling.
   d) Remove the diffusers and spot check the underside to determine the extent of fouling, and if cleaning is required before use.
   e) Clean as required before use and then remount the diffusers.

NOTICE:

Falling ice can crush the system. If water freezes, do not drain the water below the ice layer.

Store in tank with neither air nor water

This procedure applies to storing in tanks when flooding is undesirable.

1. Drain tanks dry.
2. Clean out solids and debris.
3. Make sure that floor drains remain open to prevent water from standing in the pipe system and tank.
4. Before bringing the system into operation:
   a) Check gaskets and O-rings for deterioration or leakage.
   b) Replace as required.

- Equipment flooded by overflows, misdirected sewage flows, and excessive airborne dirt build-up requires cleaning before being placed in service.
- Standing water which is allowed to freeze around the pipe can break the pipe or cause diffusers to crack.

NOTICE:

Risk of wear. Make sure the equipment is clean before it is placed into service.

Operation

Precautions

WARNING:

Always follow safety guidelines when working on the product. See *Introduction and Safety* (page 3).

- Never work alone.
- Make sure that you have a clear path of retreat.
- Never operate the system without safety devices installed.
- Make sure that all safety guards are in place and secure.

Preconditions

Perform a final tank inspection:

- Tighten any loose nuts, couplings, or end caps
- Replace any missing or improperly placed hardware.

Before starting the system, ensure that all repair work is completed. Before doing any work, see *Introduction and Safety* (page 3).

Start the system

Complete the start-up procedure before the site visit by authorized service personnel.

CAUTION: Fall Hazard

Slips and falls can cause severe injuries. Watch your step.

WARNING:

- Bear in mind the risk of drowning.

NOTICE:

To avoid damage to the piping, introduce water to the tank at a low flow rate and avoid vertical water flow falling directly on the piping.

1. Start filling the aeration tank with clean water.
2. If a manual purge system is installed, then disconnect the purge hoses from the sumps.
3. When the water level reaches a point just above the top of the air distributor pipes, then turn on the air at a low air flow rate of approximately 0.85 Nm^3/h/diffuser (0.5 SCFM/diffuser) or 1.7 Nm^3/h/diffuser (1.0 SCFM/diffuser) for LP.
4. Check all submerged couplings for air bubbles which indicate leaks.

   Leaking at spline or expansion couplings is normally due to:

   - The O-ring is pinched or out of place.
   - The coupling retainer ring is cross threaded in the spigot.
   - The coupling is not tight.

   Repair as required, see chapter *Maintenance* (page 39).
5. With the air on, check each purge.

Any water in the pipe should be discharging from the purge.

Condition	Action
There is water in the pipe	The water should be discharging from the purge exit
There is no water in the pipe	Air should be discharging
Neither air nor water is discharging	Check, and if necessary, clean or redrill the purge air orifice to 5 mm (0.2 in.)

6. Turn the water supply off when it has reached a level of 25 mm (1 in.) below the top of the diffusers.

   This is half way up the retainer ring.

   a) Visually check the level of the aeration system using the water line.

      The distance from the top of the perimeter of the diffusers to the static water level should be ±6 mm (1/4 in.).

   b) Adjust the air distributor sections as required in order to level the aeration system.

7. Check for small leaks in the holders.
8. Increase the air rate to about 1.7–2.6 Nm^3/h/diffuser (1–1.5 SCFM/diffuser) and turn the water supply back on.
9. Fill the aeration tank to a maximum water level of 50–75 mm (2–3 in.) above the diffusers, and then turn off the water.
10. Check all diffuser units for uniform air distribution or excessive air discharge.

    Air should be discharging uniformly across the diffuser surface. Large coarse bubbles around the perimeter or halo of the diffuser indicate a loose retainer ring or an improperly seated O-ring.

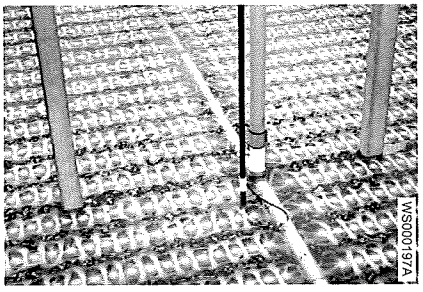


Figure 27: Uniform air discharge

Figure 28: Excessive air discharge

    a) Remove the retainer ring.

       Use the spanner wrench.

    b) Reseat the diffuser.

       Ensure that the diffuser is correctly seated.

    c) Retighten the retainer ring to a hand-tight position.
    d) Turn the retainer ring an additional 45–90°, using the spanner wrench.

       Do not over tighten.

11. If no air is discharging from the diffuser surface, then the air control orifice can be plugged with debris.

    a) Remove the retainer ring, the diffuser, and the base plate, if applicable.
    b) Clean or drill the orifice.

Use an appropriate tool. Contact your local sales representative.

c) Reinstall the retainer ring, the diffuser, and the base plate, if applicable.

12. Reattach the purge hoses to the purge sumps when the system is leak free and is purged of any entrapped water.
13. Leave the tank before filling with more water.
14. Continue filling the tank to a point 1 m (3.1 ft) over the diffusers.

    If the system has a raised manifold, then check for manifold connection leaks. Repair as required.
15. Continue to fill with water and check for leaks at the connection between the upper and lower dropleg. Use soapy water or a spray bottle of cleaning solution and inspect for bubbles. Bubbles will indicate a leaking connection.

    Adjust as required.
16. Allow the system to operate 3-4 hours in this mode before introducing the process media (liquid).

Maintenance

Precautions

WARNING:

Always follow safety guidelines when working on the product. See *Introduction and Safety* (page 3).

Requirements

The following requirements apply:

- Never work alone.
- Make sure to have a clear path of retreat.
- Make sure that the work area is properly ventilated.
- Provide a suitable barrier around the work area, for example a guard rail.
- Check the explosion risk before you weld or use electrical hand tools.
- Make sure that the product and its components have been thoroughly cleaned.

The figures in the instructions can differ from the delivered products.

Preventive maintenance

The operator should keep a regular log of pressure and dissolved oxygen readings.

Diffuser fouling is indicated by a continuous increase in:

- Operating pressure
- Air demand without a change in the aeration tank loading
- Air demand with a decrease of dissolved oxygen levels

This chapter includes instructions for:

- Empty the moisture purging system
- Air bumping
- Power failure and loss of air supply
- Visual inspection

Moisture purging

Moisture enters the pipe system in the following ways:

- Condensate build-up inside the pipe system due to high blower discharge temperatures, or moist or humid air
- Minor leaks in the pipe system

The effects of entrapped moisture are:

- Increased air velocity and headloss
- Poor air distribution

1. Lower the air flow to the grid for maximum purge results.
   The air velocity is reduced and more of the liquid is forced to the sump.
2. Open the ball valve on the eductor line.
   The trapped liquid is purged from the system.

CAUTION:

Contents under pressure. Wear safety goggles.

3. Close the ball valve when the water flow stops and mist appears.

Air bumping

Air bumping is a technique that operators can employ to remove settled debris temporarily on a system in operation, between diffuser cleaning. It means increasing the air flow rate for 5–10 minutes once a week. Use an air rate per diffuser as stated in *Operational limits* (page 52).

Power failure and loss of air supply

The result of a power failure and loss of air supply on membrane diffusers is that solids settle on the diffuser surface. The short-term affect is none.

The long-term effect is that the potential of surface fouling is possible and the diffusers can require a cleaning. This is generally the case for long-term intermittently used membrane diffuser aeration systems (for example Anoxic Zones or Batch Reactors).

Due to the described long-term effect, the operator can be required to shut off adjacent grids or turn on additional blowers to increase the air flow rate and force the membrane off the base plate surface.

Visual inspection

Visual inspection is an ongoing preventative maintenance step and can be done while taking routine samples.

- Visually inspect the aeration tank surface pattern.

  The flow should be, for the most part, a nice quiescent pattern. Some coarse bubbling at the tank inlet may occur due to surfactants in the wastewater and is generally dispersed shortly downstream.
- Look for excessive coarse bubbling throughout the tank.

  Coarse bubbling indicates that the diffusers can be fouled.
- Look for large boiling in an isolated area.

  Large boiling indicates a failure in the submerged pipe system or a broken diffuser.

Recurrent maintenance

Maintenance schedule

The following service schedule is recommended to be observed at least once per year.

1. Drain each tank.
2. Remove excess settled solids that have accumulated.
3. Clean diffusers. See *Diffuser cleaning* (page 40).
4. Inspect support hardware to ensure that all components are intact and tight.
5. Inspect diffuser retainer rings to make sure all rings are in place and tight.
6. Inspect spline and expansion coupling retainer rings to make sure that they are tight.

For hardware inspection, see also the corresponding section in the installation chapter, or in other appropriate documentation.

Diffuser cleaning

Clean the diffusers

1. Drain the aeration tank.

   The air supply must remain on when the tank is drained and the water is above the diffusers. The valve on the dropleg has to be adjusted as the tank is being drained. Excessive air flow to the tank being drained must be prevented, and enough air must be supplied to adjacent operating grid systems supplied from the same source.

NOTICE:

Excessive heat build-up can damage plastic pipes.

2. Clean each diffuser.
   Use a hose with clean water at a nozzle pressure of 410 kPa (60 psig).
3. Scrub each diffuser with a rag or soft bristle brush in order to remove stubborn slime growth, chemical precipitates, or oils.

NOTICE:

Do not use acids or aggressive cleaners on the membranes.

4. Inspect the aeration system visually. Ensure that no hardware was loosened or broken during the cleaning.

Manifold repair

Replace a saddle

This section shows how to replace a damaged air distribution connection, a saddle tee, on the manifold. A cracked saddle tee, or a damaged socket end, is hard to detect until the air is turned on. Always replace the entire saddle tee, even if only the socket is damaged.

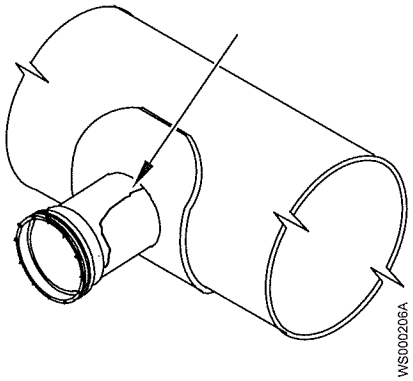


Figure 29: Cracked saddle tee

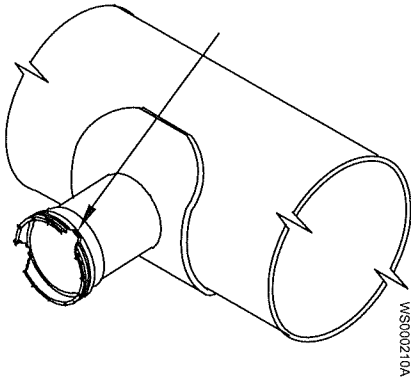
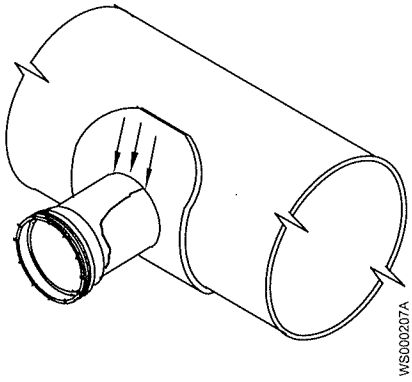
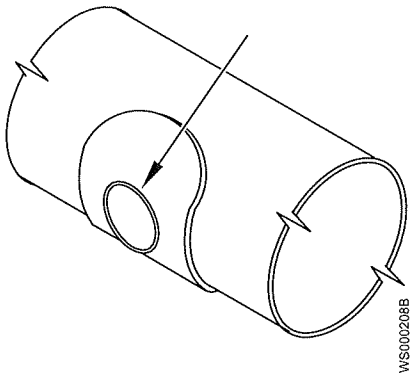


Figure 30: Damaged socket

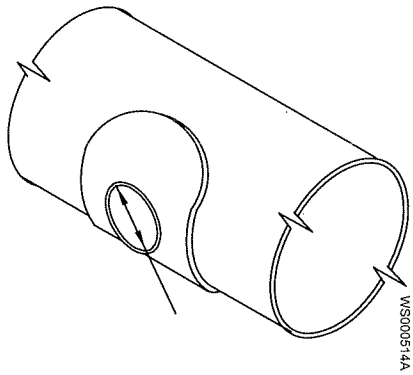
1. Cut the pipe section off flush with the saddle.
   Use a reciprocating type saw (Sawzall).



2. Chamfer the inside edge of the saddle opening to remove any saw cut projections.



3. File the saddle opening using a half round file.
4. File off the saddle projection on each side of the opening.
   The clear opening diameter must be 108 mm (4 1/4 in.) for a proper fit of the new saddle piece.



5. Clean and prime the surfaces.
6. Glue the new saddle assembly directly over the existing saddle.

WARNING:

These chemicals can cause physical injury. Contact the supplier for information and advice for proper handling precautions and procedures.

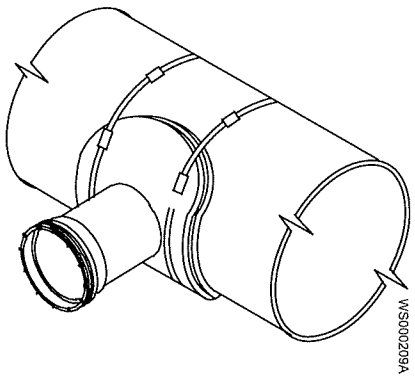


Figure 31: 1-piece saddle tee

7. Secure the saddle assembly to manifold using strap clamps.
8. Allow appropriate time to cure.

Repair a minor leak

This instruction shows how to repair a minor leak around the edge of a saddle tee. Air release at startup indicates a leak.

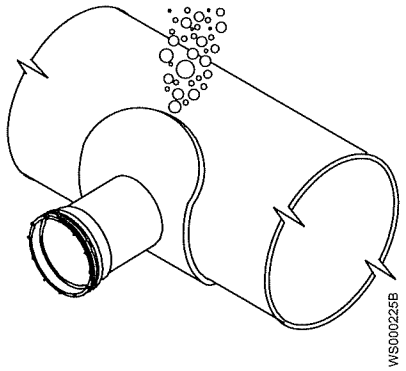


Figure 32: Air release

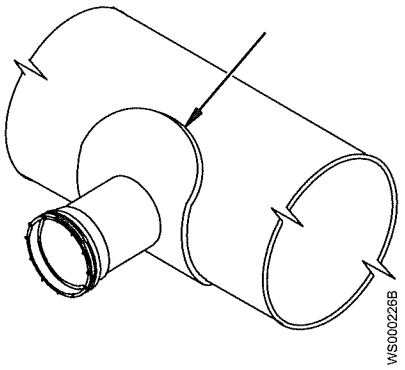


Figure 33: Glue

1. Apply a bead of glue around the edge of the pipe saddle.

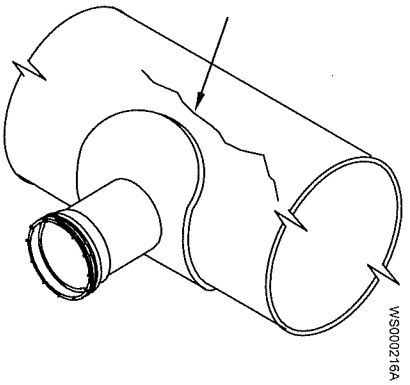
CAUTION: Chemical Hazard

Contact the supplier for information for proper handling and use.

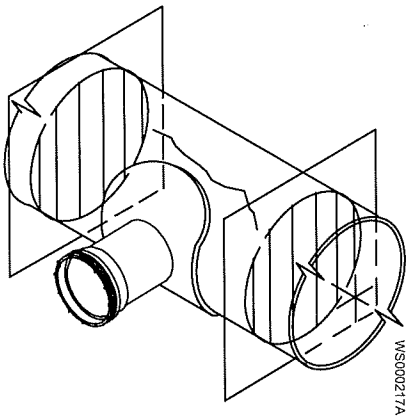
2. Allow adequate time to cure (>24 hours).

Replace a cracked manifold pipe section

This instruction shows how to replace a cracked manifold pipe section. The crack can extend further down the pipe.

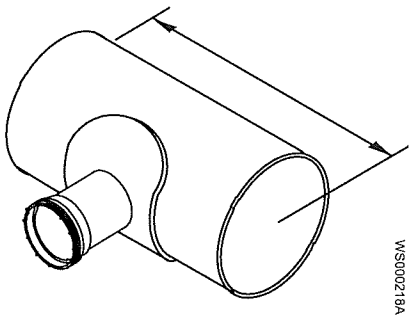


1. Cut the broken pipe section between the saddles.



2. Remove saw cut burrs by filing or sanding the outside edge of the pipe.
3. Cut a length of pipe of the correct diameter and the correct number of tee connections.

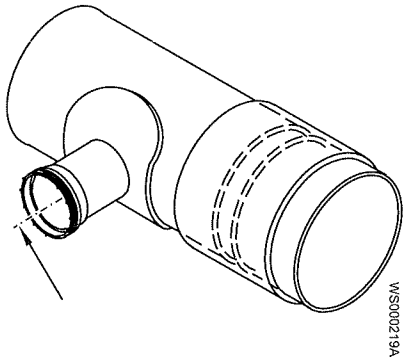
   The ends must be cut perpendicular to the pipe.



4. Remove the burrs from the cut pipe ends.
5. Glue the repair section to the new couplings.
   Ensure that the couplings are the correct size and type.

CAUTION: Chemical Hazard

Contact the supplier for information for proper handling and use.

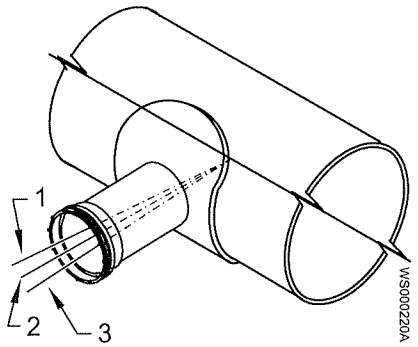


6. Glue the repair section to the original manifold sections.
   Ensure that the manifold air distributor connections are level.

Align an air distributor connection

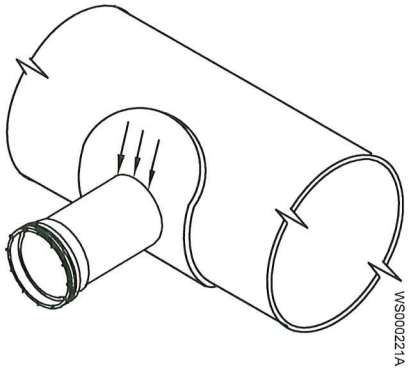
This instruction shows how to align an air distributor connection. Alignment is needed in the following situations:

- The in-line manifold air distributor connection is out of horizontal level, causing the air distributor to be out of level.
- The raised manifold air distributor connection is out of vertical plumb, causing the air distributor to be out of level.



1. Out of level
2. Level
3. Out of level

1. Use a reciprocating type saw (sawzall) and cut the spigot section off flush with the saddle.

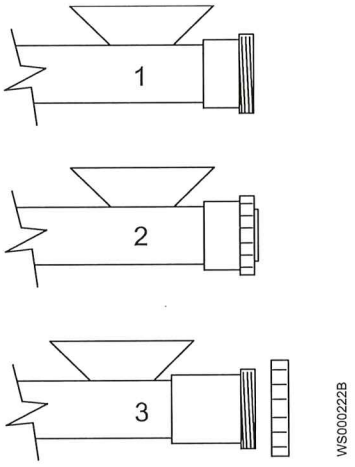


2. Follow the instructions in *Replace a saddle* (page 41).

Air distributor repair

Replace an air distributor end

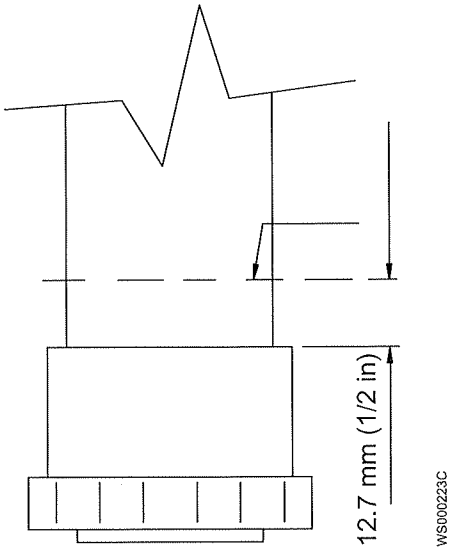
This instruction shows how to repair an air distributor spline coupling, expansion coupling, and socket. Ensure that the required spare parts are available.



1. Spline socket
2. Spline spigot with retainer ring
3. Expansion coupling with retainer ring

1. Remove damaged coupling end by cutting the attached pipe section at a distance of 12.7 mm (1/2 in.) from the end of the fitting.

   Care should be taken to make cut as perpendicular as possible.

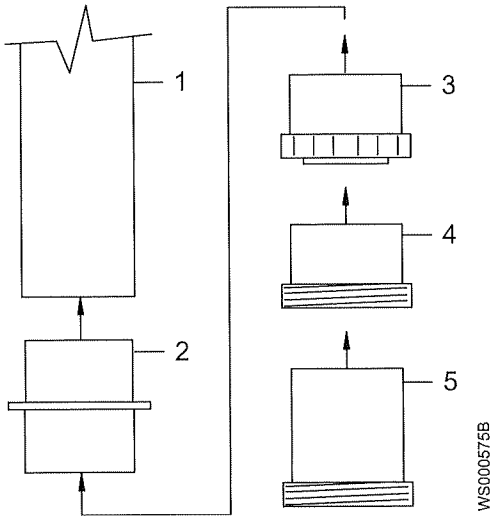


2. Remove the burrs from the cut pipe end.
3. Clean and prime the inside of cut pipe end.

CAUTION: Chemical Hazard

Contact the supplier for information for proper handling and use.

4. Clean and prime the outside of the small end of the adaptor.
5. Glue the pipe adaptor to the pipe end.
6. Clean and prime the opposite outside end of the adaptor.
7. Clean and prime the inside face of the coupling end.
8. Glue the coupling end onto the adaptor.



1. Pipe end
2. Adaptor
3. Spline spigot with retainer ring
4. Spline socket
5. Expansion coupling

Replace a spline coupling retainer ring

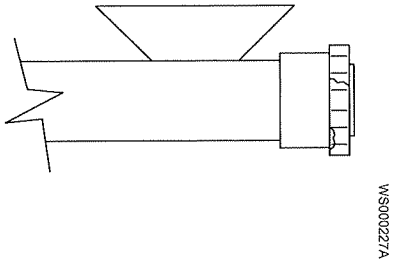


Figure 34: Damaged or broken retainer ring

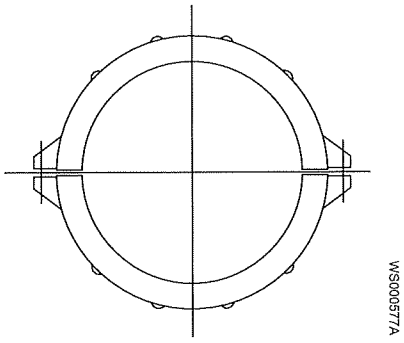


Figure 35: Retainer ring for replacement

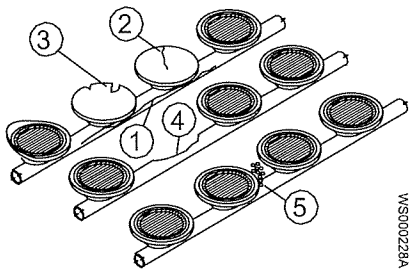
1. Cut off the damaged retainer ring.
   Use a hand held hacksaw or pipe saw and be careful not to damage other parts.
2. Install a replacement retainer ring.

Replace a holder

This instruction shows how to repair a holder due to one or more of the following problems:

CAUTION: Chemical Hazard

Contact the supplier for information for proper handling and use.



1. Cracked pipe
2. Cracked holder
3. Chipped diffuser holder
4. Broken off holder
5. Holder unable to seal

The repair of the listed problems involves cutting out and replacing a pipe section. The number of diffusers that require removal depend on the extent of the damage.

Ensure that repair components are available before starting the repair work. The components are supplied locally.

1. Remove the diffusers from the holders on the damaged pipe section.
2. Cut out the damaged pipe section.
   The minimum distance the pipe should be cut from any adjacent holder is 150–200 mm (6–8 in.), depending on which holder type is installed. Ensure that the coupling does not interfere with the holder after the installation.
   If the cut point falls on a support location, then do one of the following:
   - If the space allows, then move off the support location towards the next diffuser.
   - If the diffusers are tightly spaced, then move down to the space after the next diffuser.

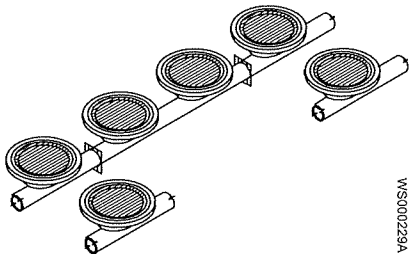


Figure 36: Damaged pipe section cut

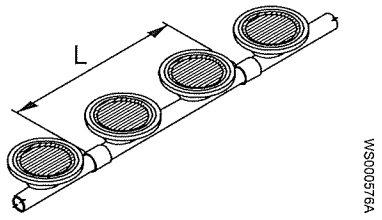


Figure 37: Spare distributor section cut

3. Cut a section to the required length L with the appropriate number of diffusers at the correct diffuser spacing.
4. Remove the burrs, clean and prime all cut ends.
5. Glue the repair pipe section into place.

   Use two repair couplings.
6. Clean, prime and glue according to separate instructions.

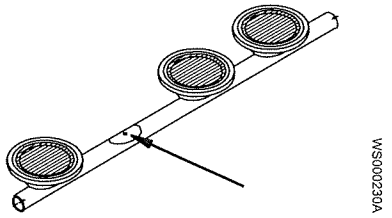
   The retainer ring must be free to rotate. Ensure that no excess glue comes in contact with the retainer ring.

Refit a holder

This instruction shows how to replace a missing holder when there is no pipe damage.

CAUTION: Chemical Hazard

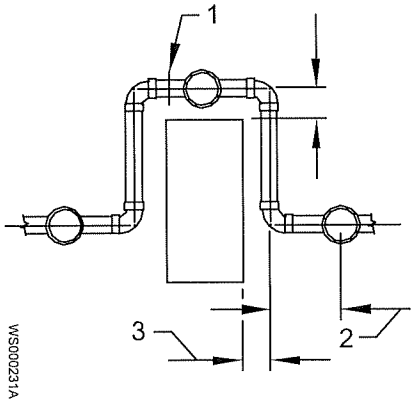
Contact the supplier for information for proper handling and use.



1. Clean the holder area of any old glue residue.
2. Prime the holder area and the bottom of the holder.
3. Attach the holder on the pipe. Ensure that the holder is level.
4. Drill a new hole in the holder and the pipe, if applicable.
5. Allow appropriate time to cure (>24 hours).

Reroute an air distributor section

This instruction shows how to route an air distributor around an obstacle.



1. Support placement
2. Minimum distance 230 mm (9 in.)
3. Minimum distance 150 mm (6 in.)

Use 90° sewer size socket elbows and 110 mm diameter (4.215 in. O.D.) sewer pipe to make necessary modifications.

Ensure that the offset air distributor run is adequately supported.

Troubleshooting

Operational troubleshooting

For instructions, see chapter *Maintenance* (page 39). For instructions on how to handle other equipment such as air blowers, see the instructions from the manufacturer.

Symptom	Cause	Remedy
Poor air distribution Non-uniform air distribution	Diffusers not level	Level system
	Grid flooded	Operate grid purge system
	Insufficient air	Provide more air
	Solids settling	Provide more air to the grid, perform air bumping procedure, or clean the diffusers
	Plugged orifice	Clean orifice
Visible mounding of air in one location	Broken pipe	Repair pipe, see *Manifold repair* (page 41) or *Air distributor repair* (page 45)
Coarse bubbling (large bubbles)	Diffuser fouling, loose coupling, degraded gasket, broken pipe or diffuser	Clean diffusers, see *Diffuser cleaning* (page 40), or inspect and repair accordingly
Low dissolved oxygen (D O) concentration	Too little air	Increase air flow
Increased operating pressure	Diffuser fouling	Clean diffusers, see *Diffuser cleaning* (page 40)
	Line blockage or valve closed	Check air lines and valves
Increased air requirement without load change	Diffuser fouling	Clean diffusers, see *Diffuser cleaning* (page 40)
	Leak in air system	Inspect and repair accordingly

Diffuser fouling

Fine bubble diffusers can foul or become clogged during operation. The rate of fouling, type of foulant, and strength of foulant depend primarily on the constituents in the wastewater.

The results of diffuser fouling include:

- Loss of oxygen transfer efficiency due to bubble coalescence and coarse bubbling
- Increased pressure requirements
- Increased air demand
- Increased operating costs

Several ways to determine if the diffusers are fouled are discussed in *Preventive maintenance* (page 39).

The corrective action for fouled diffusers is to clean them. See *Diffuser cleaning* (page 40).

Diffuser fouling causes

Diffuser fouling is divided into two categories:

- Water side fouling (most common)
- Air side fouling (less common)

Causes of water side fouling include:

- Fibrous material that adheres to the edges of the diffuser units
- Oil or grease in the wastewater

- Precipitated deposits of iron and carbonates
- Biological growths of slime

Causes of air side fouling include:

- Dust and dirt from unfiltered or inadequately filtered air
- Rust and scale from air main corrosion
- Oxidation and subsequent flaking of bituminous air main coatings
- Construction debris
- Mixed liquor solids that enter through system leaks or cracks.

Technical Reference

Operational limits

Use ADA for proper dimensioning and related performance.

Silver Series II

Table 1: Air flow per diffuser

Size (in)	Minimum	Maximum
7	0.60 Nm^3/h (0.35 SCFM)	• Long term 5.10 Nm^3/h (3.00 SCFM) • Short term 8.20 Nm^3/h (4.80 SCFM)
9	0.85 Nm^3/h (0.50 SCFM)	• Long term 6.80 Nm^3/h (4.00 SCFM) • Short term 11.90 Nm^3/h (7.00 SCFM)

Silver Series II LP

Table 2: Air flow per diffuser

Size (in)	Minimum	Maximum
7	1.20 Nm^3/h (0.70 SCFM)	• Long term 14.50 Nm^3/h (8.50 SCFM) • Short term 29.80 Nm^3/h (17.50 SCFM)
9	1.70 Nm^3/h (1.00 SCFM)	• Long term 20.40 Nm^3/h (12.00 SCFM) • Short term 42.50 Nm^3/h (25.00 SCFM)