

SECTION 00 40 00 - BID FORM

(To be submitted with Bid)

**MAHLER WATER RECLAMATION FACILITY
OWNER-PROVIDED DEWATERING EQUIPMENT PROCUREMENT
CITY OF SWEET HOME, OREGON**

THIS BID IS SUBMITTED TO: City of Sweet Home
Attn: Greg Springman, Public Works Director
3225 Main Street
Sweet Home, OR 97386

- 1.01** The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.
- 2.01** Bidder accepts all of the terms and conditions of the Advertisement for Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. The Bid will remain subject to acceptance for 30 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of OWNER.
- 2.02** Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 13.05 of the General Conditions on or before the **dates or within the number of calendar days indicated in the Agreement.**
- 2.03** Bidder agrees to complete the Work required to complete the Milestones in accordance with Article 2 of the Agreement by the dates provided in Article 2.02.
- 2.04** Bidder accepts the provisions of the Agreement as to liquidated damages as stipulated in Article 2.04 of the Agreement and in the General Conditions.
- 3.01** Refer to the Instructions to Bidders for forms and documents that must be executed in full and submitted with the bid.
- 3.02** The terms used in this Bid with initial capital letters have the meanings indicated in the Instructions to Bidders, and the General Conditions.
- 3.03** In submitting this Bid, Bidder represents, as set forth in the Agreement, that:
- A. Bidder has examined and carefully studied the Bidding Documents, the other related data and documents identified in the Bidding Documents, and the following Addenda, receipt of all which is hereby acknowledged.

Addendum No.

1

Addendum Date

December 20, 2022

- B. Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and performance of the Work.
 - C. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.
 - D. Bidder is aware of the general nature of work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents.
 - E. Bidder has correlated the information known to Bidder, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.
 - F. Bidder has given OWNER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by OWNER is acceptable to Bidder.
 - G. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.
- 4.01** Bidder further represents that 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 agreement or rules of any group, association, organization or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any individual or entity to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.
- 5.01** Bidder will complete the Work in accordance with the Contract Documents for the price described in the following bid schedule within the time of completion specified in the Agreement.

BID SCHEDULE

Bidder shall submit a Bid as set forth in the Bid form. Submission of Bids on this schedule signifies Bidder's willingness to enter into a Contract for the price offered. Bidders offering a Bid on this schedule must be capable of completing the Work within the time period stated in the Agreement. OWNER may elect to any delete bid item from the work.

1.01 LUMP SUM WORK

- A. Bidder proposes and agrees to accept as full payment the following bid amount for the Mahler WRF Owner-Provided Dewatering Equipment Procurement proposed within the Bidding Documents, and certifies that this amount is based upon the undersigned's own estimate of quantities and costs and includes sales, consumer, use, and other taxes, except as provided below, overhead and profit.
- B. Lump Sum Bid Price: \$ 598,815⁰⁰

Bidder Identification and Signatures


Name of Firm: FKC Co., Ltd.

Federal Tax ID No: 91-1415986

State of Incorporation and Oregon CCB License No: Washington State, CCB License N/A

Bidder ☐ IS / ☒ IS NOT a "Resident Bidder" as defined by ORS 279.029.

Signature and Printed Name(s): *(If Bidder is a partnership or joint venture, all parties must sign below)*


Trent Bohman

Title Vice President

Date 5 JAN 2023

END OF SECTION

**CONSENT TO ACTION OF BOARD OF DIRECTORS
IN LIEU OF ANNUAL MEETING
OF
FKC CO., LTD.**

The undersigned, being the sole director of this corporation, acting pursuant to RCW 23B.08.210 without the necessity of a formal meeting, hereby adopts the following resolutions and hereby consents to the taking of the actions herein set forth:

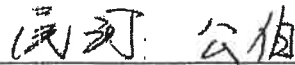
RESOLVED, that the following persons are hereby elected officers of the corporation, in the following capacities, to serve until the next annual meeting of the Board of Directors, and until their successors are elected and qualified:

| | |
|--------------------|--------------|
| President | Roger Olson |
| Sr. Vice-President | James Capell |
| Vice-President | Trent Bohman |
| Secretary | Lisa Webb |

AND, RESOLVED that FKC Co., Ltd. is accumulating earnings to have adequate reserves to fund future growth in sales and construction projects. In addition, due to the standard contractual agreements regarding payment for major equipment provided by FKC Co., Ltd, it is critical to maintain a substantial amount of cash in the business checking account, in order to purchase raw materials and component parts for projects that do not require payment from the buyer to the seller (FKC), until the goods are delivered and started up.


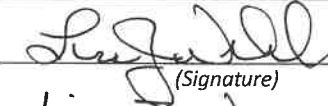
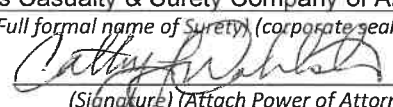
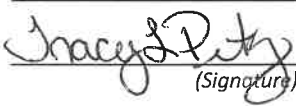
FURTHER RESOLVED, that all of the acts of the officers of the corporation, from the date of the last annual meeting of the Board of Directors through the date hereof, which are, lawful, and which have been disclosed to the director, are hereby approved, ratified and confirmed.

Dated effective March 21, 2022



Tomo Ogawa

ARTICLE 1— BID BOND (PENAL SUM FORM)

| | |
|---|--|
| Bidder Name: FKC Co., LTD Address (principal place of business): 2708 W 18th St. Port Angeles, WA 98363 | Surety Name: Travelers Casualty & Surety Company of America Address (principal place of business): 1501 Fourth Ave. Ste. 1000 Seattle, WA 98101 |
| Owner Name: City of Sweet Home, Oregon Address (principal place of business): 3225 Main Street Sweet Home, OR 97386 | Bid Project (name and location): Mahler WRF Owner-Provided Dewatering Equipment Procurement 1357 Pleasant Valley Road Sweet Home, OR 97386 Bid Due Date: January 10, 2023 |
| Bond Penal Sum: Five Percent of Total Bid (5%) Date of Bond: January 5, 2023 | |
| Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative. | |
| Bidder FKC Co., LTD By:  (Signature) Name: <u>Trent Bohman</u> (Printed or typed) Title: <u>Vice President</u> Attest:  (Signature) Name: <u>LISA J. WEBB</u> (Printed or typed) Title: Witness | Surety Travelers Casualty & Surety Company of America By:  (Signature) (Attach Power of Attorney) Name: <u>Cathy L. Wahlsten</u> (Printed or typed) Title: <u>Attorney-in-fact</u> Attest:  (Signature) Name: <u>Tracy L. Pitz</u> (Printed or typed) Title: Witness |
| Notes: (1) Note: Addresses are to be used for giving any required notice. (2) 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 will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs 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 will 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 does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will 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 will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must 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 Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will 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 will 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 governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.



Travelers Casualty and Surety Company of America
Travelers Casualty and Surety Company
St. Paul Fire and Marine Insurance Company

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company are corporations duly organized under the laws of the State of Connecticut (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint **Cathy L. Wahlsten** of **Port Angeles**

Washington, their true and lawful Attorney-in-Fact to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed, and their corporate seals to be hereto affixed, this **3rd** day of **February**, 2017.



State of Connecticut

City of Hartford ss.

By: 

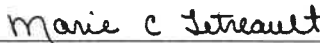
Robert L. Raney, Senior Vice President

On this the **3rd** day of **February**, 2017, before me personally appeared **Robert L. Raney**, who acknowledged himself to be the Senior Vice President of Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company, and that he, as such, being authorized so to do, executed 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 hereunto set my hand and official seal.

My Commission expires the **30th** day of **June**, 2021




Marie C. Tetreault, Notary Public

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

FURTHER RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

FURTHER RESOLVED, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary; or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

FURTHER RESOLVED, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any Power of Attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such Power of Attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or understanding to which it is attached.

I, **Kevin E. Hughes**, the undersigned, Assistant Secretary of Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company, do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which remains in full force and effect.

Dated this **5th** day of **January**, 2023




Kevin E. Hughes, Assistant Secretary

To verify the authenticity of this Power of Attorney, please call us at 1-800-421-3880.
Please refer to the above-named Attorney-in-Fact and the details of the bond to which the power is attached.

SECTION 00 45 19 – NON-COLLUSION AFFIDAVIT

(To be submitted with Bid)

MAHLER WATER RECLAMATION FACILITY INTERIM IMPROVEMENTS
OWNER-PROVIDED DEWATERING EQUIPMENT PROCUREMENT
CITY OF SWEET HOME, OREGON

STATE OF OREGON
COUNTY OF LINN

I state that I am Vice President (title) of FKC Co., Ltd. (name of firm) and that I am authorized to make this affidavit on behalf of my firm and its owners, directors, and officers. I am the person responsible in my firm for the price(s) and the amount of this bid.

I state that:

- (1) The price(s) and amount of this bid have been arrived at independently and without consultation, communication, or agreement with any other contractor, bidder, or potential bidder, except as disclosed on the attached appendix.
- (2) Neither the price(s) nor the amount of this bid, and neither the approximate price(s) nor approximate amount of this bid, have been disclosed to any other firm or person who is a bidder or potential bidder, and they will not be disclosed before bid opening.
- (3) No attempt has been made or will be made to induce any firm or person to refrain from bidding on this contract, to submit a bid higher than this bid, or to submit any intentionally high or noncompetitive bid or other form of complementary bid.
- (4) The bid of my firm is made in good faith and not pursuant to any agreement or discussion with, or inducement from, any firm or person to submit a complementary or other noncompetitive bid.
- (5) FKC Co., Ltd. (name of firm), its affiliates, subsidiaries, officers, directors and employees are not currently under investigation by any governmental agency for violating any non-collusion statutes and have not in the last four years been convicted of or found liable for any act prohibited by state or federal law in any jurisdiction, involving conspiracy or collusion with respect to bidding on any public contract, except as described in the attached appendix.

I state that FKC Co., Ltd. (name of firm) understands and acknowledges that the above representations are material and important and will be relied on by the City of Sweet Home in awarding the contract(s) for which this bid is submitted. I understand, and my firm understands that any misstatement in this affidavit is and shall be treated as fraudulent concealment from the City of Sweet Home of the true facts relating to the submission of bids for this contract.

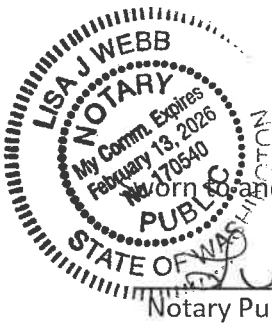
[Signature]

Authorized Signature

FKC Co., Ltd. / Vice President

Name of Company / Position

I am born and subscribed before me this 5 day of January, 2023.



[Signature]
Notary Public for the State of Washington

2-13-26

My Commission Expires

SECTION 00 43 33- PROPOSED PRODUCTS LIST*(To be submitted with Bid)***MAHLER WATER RECLAMATION FACILITY INTERIM IMPROVEMENTS
OWNER-PROVIDED DEWATERING EQUIPMENT PROCUREMENT
CITY OF SWEET HOME, OREGON**

The Bidder states that the manufacturer of each listed item of equipment or material proposed by the Contractor for use on this Project will be as listed below:

| Material Item | Description | Equipment or Material Manufacturer (Do not show Dealer or Supplier) |
|---------------|--|--|
| 1 | Screw Press Dewatering Equipment (46 76 27) | FKC Co., Ltd. |
| 2 | Shaftless Screw Conveyors (41 12 13) | FKC Co., Ltd. |
| 3 | Polymer Blending Unit (46 33 33) | Velodyne |


The Bidder must include in the space provided, the name of the equipment or material manufacturer he has used in determining his Base Bid which will be used by the Successful Bidder in constructing the project. If the Bidder does not fill in any of the spaces, it will be considered that the Bidder has selected the first-named manufacturer as his selection for those spaces not filled in.

After the opening of Bids, no changes or substitutions from those listed manufacturers will be allowed without the express written approval of the Engineer. If such change is permitted by the Engineer, it will be evaluated in accordance with provisions of the Contract Documents pertaining to Specified Items/Proposed Equivalents.

Circumstances which will justify changes to the above listing are limited to the following:

1. Manufacturer is unable to meet specifications.
2. Manufacturer fails to honor original quotation upon which the Contractor's bid was based.
3. Manufacturer goes out of business or ceases to make the specified product.

It is the responsibility of the Contractor to furnish materials and equipment meeting the requirements of the Specifications, and acceptance of the bid does not constitute nor imply favorable review or approval of items proposed. The Owner reserves the right to deny approval or acceptance of any equipment or materials which do not comply with Specifications even though listed herein.


(Signature)
Trent Bohman
(Type or Print Name)
Vice President
(Title)
FKC Co., Ltd.
(Company)

END OF SECTION

FKC CO., LTD.

2708 West 18th Street
Port Angeles, WA 98363



(360) 452-9472
FAX (360) 452-6880

January 5, 2023

RE: Authority for FKC Co., Ltd. to Supply Equipment for Projects in Oregon

I hereby certify that FKC Co., Ltd. based in Port Angeles WA has legal authority to design, fabricate, and supply equipment for municipal projects in the State of Oregon.

See attached Washington State business license for FKC Co., Ltd.

FKC's Federal Tax ID number is: 91-1415986

Best regards,

Roger Olson
President
FKC Co., Ltd.
2708 W. 18th St.
Port Angeles, WA 98363
Office: (360) 452-9472 x 102
rjolson@fkcscrewpress.com



STATE OF
WASHINGTON

BUSINESS LICENSE

Issue Date: Aug 27, 2021

Profit Corporation

Unified Business ID #: 601083995

Business ID #: 001

Location: 0001

FKC CO., LTD.
2708 W. 18TH ST.
PORT ANGELES WA 98363

UNEMPLOYMENT INSURANCE - ACTIVE
TAX REGISTRATION - ACTIVE

INDUSTRIAL INSURANCE - ACTIVE

LICENSING RESTRICTIONS:

Not licensed to hire minors without a Minor Work Permit.

This document lists the registrations, endorsements, and licenses authorized for the business named above. By accepting this document, the licensee certifies the information on the application was complete, true, and accurate to the best of his or her knowledge, and that business will be conducted in compliance with all applicable Washington state, county, and city regulations.

Director, Department of Revenue

UBI: 601083995 001 0001

FKC CO., LTD.
2708 W. 18TH ST.
PORT ANGELES WA 98363

UNEMPLOYMENT INSURANCE -
ACTIVE
INDUSTRIAL INSURANCE - ACTIVE
TAX REGISTRATION - ACTIVE

STATE OF WASHINGTON

IMPORTANT!

PLEASE READ THE FOLLOWING INFORMATION CAREFULLY BEFORE POSTING THIS LICENSE

General Information

Post this Business License in a visible location at your place of business.

If you were issued a Business License previously, **destroy the old one and post this one in its place.**

Login to My DOR at dor.wa.gov if you need to make changes to your business name, location, mailing address, telephone number, or business ownership.

Telephone: 360-705-6741

Endorsements

All endorsements should be renewed by the expiration date that appears on the front of this license to avoid any late fees.

If there is no expiration date, the endorsements remain active as long as you continue required reporting. Tax Registration, Unemployment Insurance, and Industrial Insurance endorsements require you to submit periodic reports. Each agency will send you the necessary reporting forms and instructions.

For assistance or to request this document in an alternate format, visit <http://business.wa.gov/BLS> or call (360) 705-6741. Teletype (TTY) users may use the Washington Relay Service by calling 711.

BLS-700-107 (07/27/20)



WASHINGTON
Secretary of State
Corporations & Charities Division

Filed
Secretary of State
State of Washington
Date Filed: 04/22/2022
Effective Date: 04/22/2022
UBI #: 601 083 995

EXPRESS ANNUAL REPORT WITH CHANGES

BUSINESS INFORMATION

Business Name:

FKC CO., LTD.

UBI Number:

601 083 995

Business Type:

WA PROFIT CORPORATION

Business Status:

ACTIVE

Principal Office Street Address:

2708 W. 18TH ST., PORT ANGELES, WA, 98363, UNITED STATES

Principal Office Mailing Address:

2708 W 18TH ST, PORT ANGELES, WA, 98363-1349, UNITED STATES

Expiration Date:

05/31/2023

Jurisdiction:

UNITED STATES, WASHINGTON

Formation/Registration Date:

05/05/1988

Period of Duration:

PERPETUAL

Inactive Date:

Nature of Business:

MANUFACTURER OF INDUSTRIAL DEWATERING EQUIPMENT

REGISTERED AGENT RCW 23.95.410

Registered Agent Name **Street Address**

Mailing Address

ROGER OLSON

2708 W 18TH ST, PORT ANGELES, WA, 98363-0000, UNITED STATES

PRINCIPAL OFFICE

Phone:

3604529472

Email:

LWEBB@FKCSCREWPRESS.COM

Street Address:

2708 W. 18TH ST., PORT ANGELES, WA, 98363, USA

Mailing Address:

2708 W 18TH ST, PORT ANGELES, WA, 98363-1349, USA

GOVERNORS

| Title | Type | Entity Name | First Name | Last Name |
|----------|------------|-------------|------------|-----------|
| GOVERNOR | INDIVIDUAL | | ROGER | OLSON |
| GOVERNOR | INDIVIDUAL | | LISA | WEBB |
| GOVERNOR | INDIVIDUAL | | JAMES | CAPELL |
| GOVERNOR | INDIVIDUAL | | RICHARD | BOHMAN |

NATURE OF BUSINESS

- MANUFACTURER OF INDUSTRIAL DEWATERING EQUIPMENT

EFFECTIVE DATE

Effective Date:

04/22/2022

CONTROLLING INTEREST

1. Does this entity own (hold title) real property in Washington, such as land or buildings, including leasehold improvements?

NO

2. In the **past 12 months**, has there been a transfer of at least 16-2/3 percent of the ownership, stock, or other financial interest in the entity?

NO

a. If "Yes", in the **past 36 months**, has there been a transfer of controlling interest (50 percent or greater) of the ownership, stock, or other financial interest in the entity?

NO

3. If you answered "Yes" to question 2a, has a controlling interest transfer return been filed with the Department of Revenue?

NO

You **must** submit a Controlling Interest Transfer Return form if you answered "yes" to questions 1 and 2a.

Failure to report a Controlling Interest Transfer is subject to penalty provisions of RCW 82.45.220.

For more information on **Controlling Interest**, visit www.dor.wa.gov/REET.

RETURN ADDRESS FOR THIS FILING

Attention:

Email:

Address:

2708 W 18TH ST, PORT ANGELES, WA, 98363, USA

EMAIL OPT-IN

☐ By checking this box, I hereby opt into receiving all notifications from the Secretary of State for this entity via email only. I acknowledge that I will no longer receive paper notifications.

This document is a public record. For more information visit www.sos.wa.gov/corps

Work Order #: 2022042200263308 - 1

Received Date: 04/22/2022

Amount Received: \$60.00

A. Proposed Equipment

1. Screw Press

| Quantity | Description | Unit Price FOB Sweet Home, OR |
|----------|-------------|----------------------------------|
|----------|-------------|----------------------------------|

1 FKC Screw Press
Model BHX 800x4500L

See Bid Form

Material to process: Municipal Waste Activated Sludge (WAS) or
Municipal Anaerobically Digested Sludge (ADS)

Inlet Consistency: WAS 0.5 to 2.0% % Total Solids
ADS 1.0 to 2.5% Total Solids

Inlet Hydraulics:

| Anaerobically Digested Sludge | | |
|-------------------------------|------|----------|
| gpm | %TS | dry #/hr |
| 92 | 1.0% | 458 |
| 83 | 1.1% | 458 |
| 76 | 1.2% | 458 |
| 70 | 1.3% | 458 |
| 65 | 1.4% | 458 |
| 61 | 1.5% | 458 |
| 57 | 1.6% | 458 |
| 54 | 1.7% | 458 |
| 51 | 1.8% | 458 |
| 48 | 1.9% | 458 |
| 46 | 2.0% | 458 |
| 44 | 2.1% | 458 |
| 42 | 2.2% | 458 |
| 40 | 2.3% | 458 |
| 38 | 2.4% | 458 |
| 37 | 2.5% | 458 |

| Waste Activated Sludge | | |
|------------------------|------|----------|
| gpm | %TS | dry #/hr |
| 100 | 0.5% | 250 |
| 100 | 0.6% | 300 |
| 100 | 0.7% | 350 |
| 94 | 0.8% | 375 |
| 83 | 0.9% | 375 |
| 75 | 1.0% | 375 |
| 68 | 1.1% | 375 |
| 62 | 1.2% | 375 |
| 58 | 1.3% | 375 |
| 54 | 1.4% | 375 |
| 50 | 1.5% | 375 |
| 47 | 1.6% | 375 |
| 44 | 1.7% | 375 |
| 42 | 1.8% | 375 |
| 39 | 1.9% | 375 |
| 37 | 2.0% | 375 |

Average Solids Thru put: WAS 375 dry pounds per hour, 4.5 BDST/d
ADS 458 dry pounds per hour, 5.5 BDST/d

Min Outlet Consistency: WAS 15% Total Solids
ADS 18% Total Solids

Max Polymer Consumption: WAS 30 active lbs per dry ton solids
ADS 35 active lbs per dry ton solids

Solids Capture Rate: 95% (minimum) or 750 mg/L TSS maximum

A. Proposed Equipment

1. Screw Press (con't)

| Quantity | Description | Unit Price FOB Sweet Home, OR |
|----------|-------------|----------------------------------|
|----------|-------------|----------------------------------|

(con't – FKC Screw Press Model BHX-800x4500L)

Included

Materials of Construction:

| | |
|--|----------------------|
| Screw Shell | 304 Stainless Steel |
| Screw Flight | 304 Stainless Steel |
| Drums | 304 Stainless Steel |
| Screens | 304 Stainless Steel |
| Discharge Box | 304 Stainless Steel |
| Inlet Stand | 304 Stainless Steel |
| Bearing Housings & Gussets | Painted Carbon Steel |
| Base | 304 Stainless Steel |
| Covers | 304 Stainless Steel |
| Fasteners (B,N,W,Clips) in wetted area | 304 Stainless Steel |
| Shaft Seals | Nitrile Rubber |

Including:

Marine Grade Aluminum Skid
with Access Ladder to FT
with Screw Press support legs
Flocculation Tank (FT)
model 175GL, 304SS body, 1 HP motor
Velodyne Polymer Blending Unit
model VM-5P-1200-D-0-A-1
FKC Standard Control Panel
NEMA 4X, 304SS, w/PLC & HMI

Including Other:

1 set standard tools in toolbox
1 set drum covers
1 motor coupling

Speed Reducer:

Sumitomo Cyclo Reducer

Motor:

2 HP, 460V, 3ph, 145TC Frame

A. Proposed Equipment

2a. Shaftless Screw Conveyors

| Quantity | Description | Unit Price FOB Sweet Home, OR |
|----------|---|----------------------------------|
| 1 | <p>Shaftless Screw Conveyor</p> <p>Approximately 22'-5" long</p> <p>3 HP, 460V, 3ph, 1800 rpm motor</p> <p>To include:</p> <p>Reducers: SEW Eurodrive, Type FAZ, Parallel Shaft Helical Gearmotor</p> <p>Spiral Flighting: Diameter of 9-inch minimum, 0.75-inch x 2-1/2 inch spiral. Spring effect at full load will not elongate more than .08" per foot of length. 8620 steel material. Drive end of flighting to include shop installed torque plate for bolting to drive shaft. Shop/field full penetration welds at all splice connections.</p> <p>Troughs: 10-gauge, 304 stainless steel formed flange u-troughs fabricated in maximum 8' lengths. Trough end plates will be minimum 3/8" thick 304 stainless steel. The screw conveyor trough will be provided with two 2-inch threaded out at each, the discharge end will be capped, and the inlet end will connect to the drain.</p> <p>Trough Liners: 1/2" thick UHMW trough liner in 4' long sections. Liners held in place with 304 stainless steel 1/2" square bar retaining rods.</p> <p>Covers: 10-gauge 304 stainless steel formed conveyor covers in maximum 48" lengths. Covers will be gasketed and bolted to trough flange.</p> <p>Inlet Chutes: Fabricated from 10-gauge, 304 stainless steel with inlet to match the Screw Press or other conveyor outlets and the slope of the conveyor (if applicable).</p> <p>Conveyor Supports: 3"x3"x1/4" 304 stainless steel angle as required. Include anchor bolt calculations by Structural PE. Anchor bolts sized by FKC but supplied by Purchaser.</p> | See Bid Form |

A. Proposed Equipment

2a. Shaftless Screw Conveyors

| Quantity | Description | Unit Price FOB Sweet Home, OR |
|-------------------------------------|-------------|----------------------------------|
| (Shaftless Screw Conveyors – con’t) | | Included |

Safety Stop Switch: NEMA 4x, 120vac safety stop switch with orange vinyl coated aircraft cable with stainless steel eyebolt supports and cable clips

Zero speed Switch: Milltronics MFA-4 and MSP-12 120 vac motion switch with NEMA 4X enclosure and 0-60 second time delay, single pole, double throw with cable and reset, 5amps, 120VAC, with actuator arm of 316SS.

Slide Gate Valves: None.

Spare Parts: None.

Assembly: Conveyor supports, safety stop switches, zero speed switches, gates, discharge chutes, and assembly bolts shipped loose for field installation by contractor.

Note: For inclined conveyor, only the A-frame style support legs closest to the inlet chute of the conveyor are supplied by FKC. All other support structures for the conveyor, including hangers for the discharge end gearmotor, are supplied by others.

A. Proposed Equipment

2b. Shaftless Screw Conveyors

| Quantity | Description | Unit Price FOB Sweet Home, OR |
|----------|--|----------------------------------|
| 1 | <p>Shaftless Screw Conveyor</p> <p>Approximately 9'-4" long</p> <p>3 HP, 460V, 3ph, 1800 rpm motor</p> <p>To include:</p> <p>Reducers: SEW Eurodrive, Type FAZ, Parallel Shaft Helical Gearmotor</p> <p>Spiral Flighting: Diameter of 9-inch minimum, 0.75-inch x 2-1/2 inch spiral. Spring effect at full load will not elongate more than .08" per foot of length. 8620 steel material. Drive end of flighting to include shop installed torque plate for bolting to drive shaft. Shop/field full penetration welds at all splice connections.</p> <p>Troughs: 10-gauge, 304 stainless steel formed flange u-troughs fabricated in maximum 8' lengths. Trough end plates will be minimum 3/8" thick 304 stainless steel. The screw conveyor trough will be provided with two 2-inch threaded out at each, the discharge end will be capped, and the inlet end will connect to the drain.</p> <p>Trough Liners: 1/2" thick UHMW trough liner in 4' long sections. Liners held in place with 304 stainless steel 1/2" square bar retaining rods.</p> <p>Covers: 10-gauge 304 stainless steel formed conveyor covers in maximum 48" lengths. Covers will be gasketed and bolted to trough flange.</p> <p>Inlet Chutes: Fabricated from 10-gauge, 304 stainless steel with inlet to match the Screw Press or other conveyor outlets and the slope of the conveyor (if applicable).</p> <p>Conveyor Supports: 3"x3"x1/4" 304 stainless steel angle as required. Include anchor bolt calculations by Structural PE. Anchor bolts sized by FKC but supplied by Purchaser.</p> | See Bid Form |

A. Proposed Equipment

2b. Shaftless Screw Conveyors

| Quantity | Description | Unit Price FOB Sweet Home, OR |
|-------------------------------------|-------------|----------------------------------|
| (Shaftless Screw Conveyors – con't) | | Included |

Safety Stop Switch: NEMA 4x, 120vac safety stop switch with orange vinyl coated aircraft cable with stainless steel eyebolt supports and cable clips

Zero speed Switch: Milltronics MFA-4 and MSP-12 120 vac motion switch with NEMA 4X enclosure and 0-60 second time delay, single pole, double throw with cable and reset, 5amps, 120VAC, with actuator arm of 316SS.

Slide Gate Valves: None.

Spare Parts: None.

Assembly: Conveyor supports, safety stop switches, zero speed switches, gates, discharge chutes, and assembly bolts shipped loose for field installation by contractor.

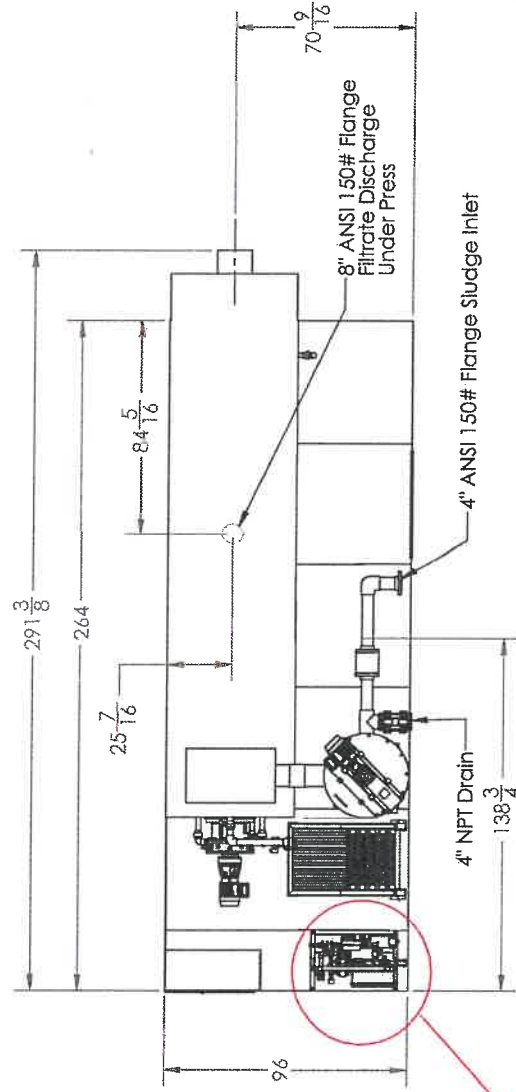
Note: For horizontal conveyor, all support structures for the conveyor, including legs, frames, and hangers are supplied by others. FKC scope and supply does not include any supports, legs, frames or hangers for the horizontal conveyor.

B. Notes, Clarifications and Exceptions

1. FKC understands that the delivery time is the important factor in bid and FKC scope of supply. Exceptions to the specifications have been provided with this important factor in mind. FKC has attempted to provide the desired materials and labor specified, but certain exceptions and clarifications have been made to meet your required delivery time.
2. It is expected that the FKC notes, clarifications, and exceptions will be added to the Procurement Task Order Documents list in the signed Agreement and be in full force for the project.
3. The screw press dewatering equipment, shaftless screw conveyors, polymer blending unit, panel mounted equipment specifications and P&IDs have been check marked by FKC. A checkmark signifies FKC compliance with the specification. A hashtag with a number (Example: #1) shows an FKC clarification or exception with description provided. FKC scope and pricing includes these notes on the check marked specifications provided.
4. In addition to the markups of the specifications, FKC offers the following notes, clarifications and exceptions:
 - a. Taxes are not included in the FKC pricing offered. FKC does not collect or pay taxes in the State of Oregon. Any required taxes will be paid by the Owner directly to the applicable government agencies.
 - b. FKC takes an exception to the Commercial General Liability insurance requirement of \$2,000,000 each occurrence. Liberty Mutual, our insurance provider, provides \$1,000,000 each occurrence. FKC also takes exception to the Automobile Liability insurance requirement of \$2,000,000 combined single limit property damage. Liberty Mutual provides \$1,000,000 combined single limit property damage.
 - c. FKC will provide additionally insured forms CG 20 37 04 13 and CG 20 10 04 13.
 - d. Examples of the warranties to be provided by FKC are provided with the bid bond. The 10-year warranty is only an Extended Mechanical Warranty for the screw press. See provided warranty examples for details.
 - e. All anchor bolts for the FKC supplied equipment will be sized by FKC. FKC will provide anchor bolt design calculations by a Structural PE Engineer in the State of Oregon. All anchor bolts will be provided by others.
 - f. No expansion joints (46 05 14-3.01.A) are provided in the FKC scope of supply or pricing.
 - g. No copy or license of AB Rx Software, or any licensed software, is provided in the FKC scope of supply or pricing.
 - h. The screw press legs on the skid are made of the same material as the skid, namely marine grade aluminum.
 - i. For inclined conveyor, only the A-frame style support legs closest to the inlet chute of the conveyor are supplied by FKC. All other support structures for the conveyor, including hangers for the discharge end gearmotor, are supplied by others.
 - j. For horizontal conveyor, all support structures for the conveyor, including legs, frames, and hangers are supplied by others. FKC scope and supply does not include any supports, legs, frames or hangers for the horizontal conveyor.
 - k. The polymer blending unit will come with Velodyne standard motors. The screw press, flocculation tank and conveyor(s) motors, due to delivery time constraints, will not be provided with Thermal Protection or Grounding Units. FKC scope of supply and pricing includes Toshiba 841 XT C-face motors for the screw press, flocculation tank and conveyors. In lieu of the Thermal Protection and Grounding Units, FKC has provided a total of Qty (4) additional Toshiba motors as spares for the screw press, flocculation tank and conveyor motors.

Note:

- Equipment Weight: 15,000
- Operating Weight: 21,000
- All piping to be Sch 80 PVC
- All conduit and fittings to be Liquidtight Flexible Nonmetallic Conduit
- Skid to be prewired and tested.
- 480 VAC
- FKC recommends 1-1/2" grout under all equipment foot pads.



Velodyne Polymer System
that is mounted, wired and piped to the skid
but can be removed and installed against the wall for
permanent installation.

| | | |
|-------------|-----------------------------|-----------------------------------|
| Job No. | Customer | Wt. Lbs. |
| Drawing No. | REFERENCE | Quantity |
| | BHX-800x4500L | 1 |
| | Screw Press Dewatering Skid | Date |
| | Assembly Details | 8/18/22 |
| | | Drawn By |
| | | RTB |
| | | FKC CO. LTD. |
| | | 2700 1 st Ave. S.W. |
| | | Port Angeles, WA 98343 |
| | | (360) 452-9422 Fax (360) 452-6890 |
| | Revision | SHEET 1 OF 3 |

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WRITTEN PERMISSION OF FKC CO. LTD. IS
PROHIBITED.

| No. | Alteration | Date | Sign |
|-----|------------|------|------|
| | | | |
| | | | |
| | | | |
| | | | |

✓ Checkmark signifies FKC compliance with specification. A hashtag with a number (Example: #1) shows an FKC clarification or exception with description provided.

SECTION 46 76 27

SCREW PRESS DEWATERING EQUIPMENT

PART 1 - GENERAL

✓ 1.01 SECTION INCLUDES

✓ A. Requirements for furnishing installing a complete screw press dewatering system and all appurtenances specified, or otherwise required, for a complete and properly operating system. The system will be temporarily used to treat waste activated sludge from a sludge blend tank. The system will then be used to treat digested sludge from anaerobic digester.

✓ B. If required to meet the Project schedule, the screw press dewatering system manufacturer may propose alternative components for consideration during bidding. The alternative components must be equal in quality and function to the components included in this specification. Alternative components must also be industry standard components and components that are typically used by the manufacturer.

✓ C. Equipment Numbers

1. Screw Press: Tag No. DEW-250-02
2. Flocculation Tank: Tag No. MIX-250-01
3. Polymer Blending Unit: Tag No. POL-250-04
4. Control Panel: Tag No. LCS-250-01

✓ D. Scope of supply:

1. One (1) screw press dewatering unit, including supports
2. One (1) flocculation tank including mixer
3. One (1) polymer blending and injection system for liquid polymer, including a polymer blending unit.
4. One (1) control panel
5. Mounting equipment, anchor bolts, concrete anchors, and other anchoring devices
6. Spare parts
7. All other accessories and appurtenances required to provide a complete and fully functional screw press dewatering system for Owner's use, whether or not specifically indicated in this Section.
8. Screw press, flocculation tank, polymer blending unit, control panel, and all other accessories and appurtenances will be integrally mounted as components of a dewatering skid, each component prewired and pre-piped to each other on the dewatering skid from the factory.
9. Two shaftless screw conveyors (one inclined conveyor and one horizontal conveyor) will not be integrally mounted to the skid and are to be provided loose and separate from the skid. See Section 41 12 13 for conveyor specifications.

#66 FKC scope and pricing provides anchor bolt Structural PE Oregon calculations for the skid, but does not include anchor bolts. Anchor bolts to be provided by others.

Dewatering skid will have a junction box near the screw press discharge end for all power and signal wiring requirements of the conveyor.



E. Intent of Drawings

1. Drawings show only general locations of equipment, devices, and supports.
2. The Drawings are based on equipment that is manufactured by the first manufacturer named in Paragraph 2.01 of this Specification Section. This first named manufacturer is also listed in the bid form "Major Equipment of System Schedule Supplied by the Construction Contract". The Contractor shall be responsible for the design and construction of any modifications that are necessary to install dewatering equipment provided by another manufacturer. All modifications to the design are subject to approval by the Engineer.



1.02 REFERENCED SECTIONS



A. The following Sections are referenced in this Section:

1. Section 01 33 00 – Submittals
2. Section 01 61 10 – Seismic Design Requirements
3. Section 01 66 00 – Material and Equipment
4. Section 01 78 23 – Operations and Maintenance Data
5. Section 01 79 00 – Training
6. Section 01 81 00 – Equipment Startup and Testing
7. Section 01 99 00 – Reference Forms
8. Section 05 50 01 – Anchor Bolts and Anchoring Devices
9. Section 09 96 00 – High Performance Coatings
10. Section 11 05 13 – Electric Motors
11. Section 40 78 00 – Panel Mounted Equipment
12. Section 41 12 13 – Shaftless Screw Conveyor
13. Section 46 05 13 – General Requirements for Equipment
14. Section 46 05 14 – Equipment Mounting
15. Section 46 33 33 – Polymer Blending Units



1.03 REFERENCED STANDARDS



A. This section contains references to the following documents. They are part of this section as specified and modified. In case of conflict between the requirements of the section and those of the listed documents, the requirements of this section shall prevail.

1. ASTM A322: Carbon and Alloy Steel Bar Specifications
2. ASTM A507-10: Standard Specification for Drawing Alloy Steel, Sheet and Strip, Hot-Rolled and Cold Rolled
3. ABMA, Standard 9-90: Load Rating and Fatigue Life for Ball Bearings

4. ABMA, Standard 11-90: Load Ratings and Fatigue Life for Roller Bearings
5. AWS, D1.1: Structural Welding Code



1.04 SUBMITTALS



A. General

1. Comply with Section 01 33 00.
2. Include a checked-off copy of this specification with deviations noted, per Section 01 33 00.
3. Include a copy of the contract document mechanical layout drawings, control diagrams and process and instrumentation diagrams, with addenda updates, that apply to the equipment in this section.
 - a. Mark to show specific changes necessary for the equipment proposed in the submittal.
 - b. If no changes are required, mark the drawing or drawings "No Changes Required".
 - c. Failure to comply with this paragraph is sufficient cause to reject the entire submittal.
4. In all submitted product data, call out model, configuration, size etc. of proposed equipment and/or cross out model, configuration, size etc. of non-applicable equipment.
 - a. Failure to comply with this requirement is sufficient cause to reject the entire submittal.



- B. Bill of Materials with quantity, originating manufacturer and part number, and description. List all spare parts separately at the end of the Bill of Materials.



C. Product Data

1. Submit manufacturer's standard catalog data, descriptive literature, motor and drive system data, parts list, equipment weights and lifting points, and detailed specifications describing all system components forming a part of the equipment furnished under this section.
2. Submit coatings information. Refer to Section 09 96 00.



D. Calculations

1. Submit anchor bolt design calculations, stamped and signed by an Oregon registered professional civil or structural engineer. Comply with Sections 01 61 10, and 05 50 01.
2. Calculations documenting the AGMA rating of the drive unit and life of the main bearing for spur and helical gears. For other gearbox types provide manufacturer's catalog engineered rating of the drive unit and calculated life of the main bearing.



E. Shop Drawings

1. Submit drawings showing the general arrangement of the entire assembly, including:
 - a. Dimensional information
 - b. Plan and section views of the equipment layout
 - c. Location and size of piping connections
 - d. Auxiliary equipment locations
2. Submit manufacturer's equipment mounting instructions, requirements and detailed drawings for the installation of the screw press and flocculation reactor.



F. Submit a certificate of Unit Responsibility. See Section 01 99 00.



G. Submit motor data in accordance with Section 11 05 13.



H. Submit equipment mounting information in accordance with Section 46 05 14.



I. Submit a written report on results of factory testing specified in Part 3 below.



J. Submit proposed on-site testing and start-up procedures, including sketches and calculations for specified tests.



K. Manufacturer's Experience and Qualifications

1. Submit a list of at least twenty (20) installations in which the proposed screw press equipment, of similar or larger capacity, including flocculation reactor system, has been installed and is in operation in municipal wastewater treatment applications. Provide installation date, system solids and hydraulic capacities, and owner contact information for each installation.
2. Submit manufacturer's ISO 9001 certification or other QA/QC documentation and forms.



L. Electrical Information

1. Electrical Drawings

- a. Equipment elevations with enclosure details drawn to scale.
- b. Electrical One-line and Elementary diagrams
- c. PLC I/O diagrams
- d. Interconnection diagrams

2. Catalog Data for each component used in the construction of the assembly and control panel:

- a. Instrumentation data summary sheets to include instrumentation type and tag name, description, manufacturer's model number and part number with all proposed options, range, span, engineering units, input and output characteristics.
- b. Description of component as it relates to the model number. For each portion of the model number the associated description shall be shown.
- c. Manufacturer's literature, illustrations, specifications and engineering data including: materials, dimensions, weight, performance, and ordering

#1: Standard FKC/TSI drawings will be provided. PLC I/O Diagrams and Interconnection diagrams are not included, but pertinent info is available within FKC/TSI standard drawings.

information with applicable features and options highlighted, circled, or "arrowed."

1) Manufacturer's data not properly marked will not be accepted for review.

d. Manufacturer's description or equipment features.

e. Physical size and mounting details.



3. Control Panel with Programmable Logic Controller (PLC) and Operator Interface (OI). Submit the following documentation for approval.

a. Complete information, catalog cuts, and Bill of Materials for the control panel hardware, software, and configuration.

b. PLC Ladder diagrams of the control system programming logic.

1) The Supplier shall submit the ladder logic diagrams utilizing AB RX Logix software or copy of ladder logic file compatible with RX Logix.

2) A narrative functional description shall accompany the ladder diagram describing system operation on a line-by-line basis.

c. OI graphic screen printouts for all proposed graphic screens.

d. PLC I/O lists and control descriptions. I/O tags shall be those designated on the Contract Drawings P&IDs.

e. Submit software operations manual including, as a minimum:

1) Program code

2) Tag database

3) Setpoint listings with description

4) Program description

5) Register cross reference listing

6) Configuration and set-up

7) Data tables

8) Special files

f. Electronic copies of proposed PLC ladder logic program listing and OI graphic screens.



M. Complete and submit the following forms from Section 01 99 00:

1. Motor Data Form.

2. Unit Responsibility Form.

3. Extended Warranty Forms.



N. Bench Scale Test Report

1. Manufacturer shall test polymers and make at least two (2) preliminary selections for use during acceptance testing, as specified in 1.05.E.

2. Submit bench test results and polymer selections.
3. Include the following:
 - a. Narrative description of equipment used for bench testing
 - b. Narrative overview of testing procedures
4. Contractor shall collect samples and ship them to the manufacturer.



O. Deferred Submittals:

1. Factory Tests
 - a. Submit certified shop inspection reports indicating that all components of the screw press dewatering equipment have been factory-tested in accordance with the manufacturer's requirements and that the components meet or exceed the requirements of this Section.
 - b. Submit a minimum of 10 days prior to equipment shipment.
2. Submit operating and maintenance (O&M) information as specified in Section 01 78 23 a minimum of 10 days before equipment shipment.
3. Submit additional forms required following startup and training per Part 3. Include forms in final O&M manual.
4. Submit certification of shop trial assembly and photographs of assembly a minimum of 10 days before shipment.
5. Submit shop inspection records and evidence of inspector qualification a minimum of 10 days before shipment.
6. Following installation and startup, submit completed Manufacturer's Installation Certification Form.



1.05 QUALITY ASSURANCE



A. Comply with Section 46 05 13.



B. Manufacturer

1. A minimum of 15 years of experience in the design, application, and supply of screw press dewatering equipment in municipal wastewater treatment plants.
2. A minimum of 20 municipal installations in the United States, Europe and/or Australia in operation for more than one year.



C. Unit Responsibility

1. Assign unit responsibility, as specified in Section 46 05 13, to the screw press dewatering equipment manufacturer for the equipment specified in this Section.
2. Manufacturer shall provide screw press, flocculation reactor tank, polymer system including polymer blending unit, mixers, motors, gear reducers, VFDs, controls, control panels, and lifting attachments as a complete integrated package to ensure proper coordination, compatibility, and operation of the system.



D. Coordination

1. Contractor shall coordinate all details of the equipment with other related parts of the work. Contractor shall verify that all structures, piping, wiring and equipment components are compatible. Contractor shall be responsible for all structural and other alterations required to accommodate equipment differing in dimensions or other characteristics from these specifications and the Drawings.
2. Coordinate the design, fabrication and installation requirements for sludge feed piping and pipeline appurtenances not supplied by the screw press manufacturer.
3. Coordinate PLC I/O data table with Application Programmer performing SCADA and PLC programming on other PLCs for the Project.

#2: FKC offers only the PLC, Ethernet switch and OIT listed in FKC proposal.

4. Contractor to coordinate PLC, Ethernet switch and operator interface panel required in this specification with those specified in Sections 11362, 11374 and 11377 so one manufacturer and model of each type of equipment is supplied on this project



E. Bench Scale Testing:

1. Contractor shall provide sludge samples to screw press dewatering equipment manufacturer.
2. Sludge samples shall be obtained by the Owner from existing belt filter press feed before polymer addition. Contractor shall provide sampling instructions to Owner and coordinate scheduling of sampling.
3. Sludge sampling shall be performed at a time when the sludge conditions are within the ranges specified for Condition 1 in paragraph 2.03.
4. Contractor shall be responsible for shipping sludge samples to screw press dewatering equipment manufacturer.
5. Upon receipt of sludge samples, manufacturer shall test polymers and make at least two (2) preliminary selections for use during acceptance testing.
6. Submit bench test results and polymer selections.



1.06 WARRANTY



A. Provide a written extended warranty from the manufacturer for the equipment specified in this Section.

#3: See Extended Warranty Form for details.

1. Extended Warranty Period: Ten (10) years from successful completion of the demonstration period for the dewatering system.
2. Coverage: Cover defects or failures of materials or workmanship which occur as the result of normal operation and service.

3. Complete the Extended Warranty Form in Section 01 99 00.



B. Screw Press Dewatering Equipment Performance

1. Guarantee screw press dewatering equipment performance as specified in paragraph 2.03 when flow and water quality parameters conform to those specified in paragraph 2.03.

#4: Included in FKC scope of supply are two performance trips; one for WAS sludge and one for Anaerobic Sludge to demonstrate performance. FKC will submit a performance report for each trip. No other performance compliance or performance period length guarantee is offered due to other operating conditions beyond FKC's control.

2. Length: 2 years from successful completion of the demonstration period for the dewatering system.

☒ **PART 2 - PRODUCTS**

☒ **2.01 MANUFACTURERS**

- ☒ A. FKC Co., Ltd. (Port Angeles, WA)
- ☒ B. Or equal, as specified in Section 01 33 00

☒ **2.02 OVERALL SYSTEM REQUIREMENTS**

- ☒ A. Design to receive, flocculate, condition, and dewater the feed sludge specified herein, and neatly discharge the dewatered sludge cake into the existing discharge chute.
- ☒ B. Design to accommodate municipal secondary wastewater solids without jamming, clogging, or overflow.
- ☒ C. Design to operate continuously 24 hours per day, 7 days per week or intermittently.
- ☒ D. Design to operate in both manual and fully automatic modes.
- ☒ E. Design to operate at variable rates to accommodate varying combinations of sludge concentration, sludge feed rate, and polymer addition, in order to optimize cake solids concentration, capture rate and polymer use. Tracking sludge concentration changes is not required.
- ☒ F. Screw press shall be capable of retaining a plug of feed and/or dewatered sludge inside the dewatering screen basket for up to 72 hours without adversely impacting screw press components or startup procedures for the subsequent dewatering run.
- ☒ G. Structural Design
 - 1. Design and manufacture all components to handle the forces that may be exerted during fabrication, shipping, erection, and proper operation according to the O&M manual.
 - 2. Design so that jamming at any point will cause the drive motor to stall without resulting in component damage or structural failure.
 - a. Provide motor load setpoints in PLC and VFD.
- ☒ H. Provide drains with the ability to drain all liquid and feed sludge from the dewatering and flocculating equipment and piping.
- ☒ I. Corrosion Control
 - 1. Equipment design shall not result in crevices, unsealed overlapping plates and similar inaccessible areas where corrosion can take place without allowing access for application of preventive measures.
 - 2. It may be expected that the material discharged to each screw press will be in an actively digesting state.
 - 3. Corrosive agents (moisture, hydrogen sulfide gas, sulfuric acid, etc.) will be present at all times.
- ☒ J. Inspection, Maintenance, Repair and Adjustment Provisions
 - 1. Provide sufficient room for inspection, maintenance, repair and adjustment.

2. All components shall be so arranged that they can be serviced from the operating floor or from the permanent access platforms shown on the Drawings.

- ☒ K. The sludge is expected to contain quantities of industrial and municipal wastes including solvents, petroleum products, grit, hair, rags, grease, rubber goods, and organic solids.

☒ 2.03 DESIGN CRITERIA & PERFORMANCE REQUIREMENTS

- ☒ A. Provide screw press equipment suitable for the following conditions:

| Item | Value | |
|---|-------------------------------------|-------------------------------------|
| | Condition 1 | Condition 2 |
| Type of sludge | Waste Activated Sludge | Anaerobically Digested Sludge |
| Upstream sludge storage/stabilization | Secondary Treatment | Anaerobic Digestion |
| Feed solids concentration | 0.5 – 2.0% | 1.0 – 2.5% |
| Hydraulic Loading Rate | 10 gpm, min 100 gpm, max | 10 gpm, min 100 gpm, max |
| Average Solids Throughput | 458 dry pounds per hour (per unit) | 458 dry pounds per hour (per unit) |
| Volatile solids ratio | 60 – 75 | 45 - 50 |
| Temperature | 45 – 95 °F | 45 – 95 °F |
| pH | 6.0 – 8.0 | 6.0 – 8.0 |
| Flocculant | Liquid Emulsion Polymer | Liquid Emulsion Polymer |
| Maximum polymer consumption, lbs active polymer/dry ton of solids | 30 | 35 |
| Effluent cake solids concentration | 15% | 18% |
| Minimum solids capture | 95% minimum or 750 mg/L TSS maximum | 95% minimum or 750 mg/L TSS maximum |

#5: FKC screw press offered has a capacity for WAS processing of 375 dry pounds per hour (per unit)

- ☒ B. Meet the performance requirements with either more than one commercially available polymer, or with a polymer that is commercially available from more than one vendor.

☒ 2.04 MATERIALS

- ☒ A. Screw press and flocculation reactor components shall be manufactured from Type 304 or better stainless steel shapes (rods, angles, and channels), pipes, and sheets unless otherwise specified.

1. This requirement includes, but is not limited to, the following:

- a. Screw
- b. Screw shaft
- c. Perforated plate basket
- d. Screw press cover and inspection lids
- e. Screw press frame

#6: Flex coupling for piping between screw press and flocculation tank is made of rubber.

f. Screw press and flocculation reactor support structures

g. Piping connections

#7: See Section 40 78 00 comments.

2. Control panel enclosure: Type 316 stainless steel

3. Fasteners and anchor bolts: Type 316 stainless steel or Type 304 stainless steel

4. Minimum stainless steel sheet thickness (excluding cover parts & assemblies): 1/8 inch.

5. Elastomer seals on helical screw flights, if required, shall be wear-resistant nylon or polyurethane. The seals shall be held in place by Type 316 stainless steel clamps and bolts which can be easily removed. Seals shall be replaceable without removal of the screw.

☒ B. Bearings shall be anti-friction, and may be grease lubricated.

☒ 2.05 FABRICATION

☒ A. Screw press shall be manufactured in a manner to prevent contamination of the stainless steel with rusty dust.

#8: See Attachment A: FKC Passivation Techniques

B. All stainless steel components and structures shall be pickled with nitric acid and hydrofluoric acid to remove any residues that may be present on the material as a result of forming, manufacture, or handling. After pickling, wash the equipment with a high-pressure wash of cold water to remove any remaining surface debris and promote the formation of an oxidized passive layer.

☒ C. Perform all welding in accordance with American Welding Society (AWS) D1.1 Structural Welding Code, or equivalent.

☒ 2.06 SCREW PRESS

☒ A. Design the screw press to be installed horizontally.

☒ B. Dewatering of the sludge shall take place in a perforated plate basket, consisting of a minimum of four sections of perforated plate.

1. Provide longitudinal flanges to allow basket disassembly.

☒ C. The screw press shall be completely enclosed to prevent odor emission.

1. The entire dewatering section and basket area shall be easily accessible through inspection lids, which are mounted on the sides of the machine.

2. Minimum five inspection lids each side of screw press.

3. Inspection lids shall be easily removed and contain all liquids and aerosols resulting from normal dewatering and spray washing operations.

a. Lifting weight of each inspection lid shall be limited to 21 lbs.

☒ D. Employ a shafted, helical screw installed inside of the screen basket to transport sludge from the inlet to the discharge area at the end of the pressure zone.

1. A shaftless screw is not acceptable.

2. Taper up screw shaft diameter towards the discharge section of the machine.

3. A bearing shall support the drive end of the screw shaft. Wear strips are not acceptable.
- ☒ E. Drive motor
1. Location
 - a. FKC: Provide an in-line, flange mounted motor at the inlet end of the screw press.
 - b. Other manufacturers: The screw press drive motor may be located at either end of the screw press.
 2. Motor speed shall be controlled with a VFD.
 3. Gear drive unit shall be directly coupled to the screw shaft.
 4. Motor shall be directly coupled to the gear reducer or may drive the gear reducer using a belt drive.
 5. All motor couplings and other high-speed rotating parts shall be provided with OSHA-approved guards.
- ☒ F. Clean the perforated screen basket from the outside using a spray bar washing system made of stainless steel piping and stainless steel or PVDF spray nozzles. Plastic nozzles are not acceptable.
1. Cleaning shall not interrupt dewatering operation.
 2. The spray area shall cover the entire length of the screen. One or more solenoid valves shall control the flow to the spray bar washing system.
 3. Clean the entire surface area of the basket during each cleaning cycle.
 4. Provide minimum 1.25-inch connections for cleaning water supply connections to the spray system.
 5. Water pressure at each nozzle of the spray bar shall be a minimum of 40 PSIG.
 6. Average spray water consumption shall not exceed 72 gallons at 40 PSIG per wash cycle.
- ☒ G. If required, provide a pneumatically actuated cone to adjust the pressure in the pressure zone at the discharge end of the screening basket.
1. Adjust pressure on the cone manually through an air pressure regulator installed on the screw press
 2. Provide a one-quarter inch (1/4") industrial style stainless steel female quick coupler for pressurized air supply connection at the manifold of the pneumatic system.
- ☒ H. Sludge cake shall be automatically discharged through a rectangular sludge discharge opening.



I. Screw Press Drive

1. The press screw shall be driven by a shaft mounted gearbox or speed reducer, and an electric motor
 - a. The gear reducer or speed reducer shall be bolted to a machined flange welded to the inlet end of the press.
 - b. The motor may be bolted directly to the gear reducer or speed reducer, or may drive the gear reducer using a belt drive.

#9: ????

- c. Minimum L-10 bearing life of motor and gear reducer or speed reducer: 100,000 hours.

2. Gear Reducer:

- a. Maximum gear reducer output speed: 0.35 rpm at 100 percent motor speed.

- b. AGMA Class 2, service factor 1.5

3. Drive motor:

- a. Comply with Section 11 05 13.
 - b. Type 2 Motor, inverter-duty, NEMA Design B.
 - c. Minimum service factor: 1.15
 - d. Size: maximum 2 hp
 - e. Power: 480 volt, 3 phase, 60 Hertz.
 - f. Nominal maximum speed: 1,800 rpm.

#10: FKC and Sumitomo reserve the right for gear reducer selection per Sumitomo catalog selection tables.



J. Piping connections:

1. All piping connections 3 inches or larger shall be ANSI, Class 150 standard raised face flanges:
 - a. Single 6-inch or larger bottom drain connection for conveyance of screw press filtrate

#11: Screw press inlet connection diameter is 8-inch.

- b. 6-inch minimum diameter inlet connection for feed sludge

2. All piping connections 2.5 inches and smaller shall be threaded

- a. 2-inch diameter connection for cleaning water supply on top of press
 - b. 1.5-inch diameter connection for cleaning water supply at sludge inlet

#12: connection for cleaning water supply at drive is 1.25-inch

- c. 1.5-inch diameter connection for cleaning water supply at drive



K. Headbox Level Transmitter

1. Provide pressure sensor for level with 4-20mA output.
2. IFM eFector PI-001BREZ02-MFRKG/US, or approved equal

#13: See FKC comments on P&ID drawing I-251.

2.07 UTILITY WATER MANIFOLD

- A. Provide utility water manifold and water panel per P&ID drawing I-251.
- B. Manifold shall have a common 2-inch header that serves three separate wash water headers.
- C. A flow switch shall be provided on the 2-inch common header.
- D. Each wash water header shall be provided with the following
 - 1. Solenoid valve
 - 2. Isolation ball valves
 - 3. Bypass pipe

☒ 2.08 FLOCCULATION TANK

- ☒ A. Provide a flocculation tank for mixing and aging of polymerized sludge prior to dewatering.
- ☒ B. Construct wetted parts of Type 304 or better stainless steel.
- ☒ C. Include anti-rotation baffles.
- ☒ D. Design for a retention time of 2.0 – 4.0 minutes at the design flow rate.
- ☒ E. Minimum tank volume shall be 285 gallons.
- ☒ F. Locate the inlet at the bottom and the conditioned sludge outlet near the top of the tank.
- ☒ G. Provide a mixer.
 - 1. Motor size: 1.0 hp minimum, 1,800 rpm, 480 volts, 3 phase.
 - 2. Drive:
 - a. Variable speed drive with shaft speed range of 13-64 rpm
 - b. Gear reducer: SEW Eurodrive Varimot Variable Speed Gearmotor, Nord, or equal.
 - 3. Control speed through dewatering system control panel.
- ☒ H. Provide stainless steel support structure for flocculation chamber, including mounting hardware.
- ☒ I. Provide the capability to visually inspect floc formation, either directly in the flocculation tank, or in discharge piping.
- ☒ J. Piping connections:
 - 1. 4-inch diameter ANSI, Class 150 standard raised face flange, bottom connection for inlet sludge
 - 2. 8-inch diameter pipe stub with flexible coupling outlet connection for polymer conditioned sludge
- ☒ K. Flocculation Tank High Level Alarm
 - 1. Provide level switch in the tank for high-high level alarm.
 - 2. Provide Warrick 16MA1B0, or approved equal.

#13: See FKC
comments in
Section 46 33
33.

✓ 2.09 POLYMER BLENDING AND INJECTION SYSTEM

A. Provide a skid mounted polymer blending unit per Section 46 33 33.

- ✓ B. Polymer blending unit shall meet the following requirements:
1. Designed to activate liquid emulsion polymer.
 2. Capable of mixing, blending and aging liquid polymer on a continuous basis to meet screw press requirements.
 3. Include a neat polymer pump and hose connections that allow for polymer to be withdrawn from either 55-gallon drums or 275-330-gallon IBCs (totes).

✓ 2.10 SHAFTLESS SCREW CONVEYORS

A. Provide shaftless screw conveyors per 41 12 13

#14: See FKC
comments in
Section 41 12 13.

✓ 2.11 COATINGS

A. Factory coat non-stainless steel components per Section 09 96 00.

✓ 2.12 CONTROL PANEL

- ✓ A. A control panel shall be provided for controlling the screw press, flocculation tank, polymer blending unit, and conveyors specified in this Section.
- ✓ B. The control panel shall be cooled to maintain the operating temperatures of all components inside the control panel.

C. The control panel shall be rated for 65,000 AIC minimum.

D. The control panel shall meet the requirements of Section 40 78 00 Panel Mounted Equipment. #16: See FKC comments in Section 40 78 00.

✓ E. The Control Panel shall have the following components

1. Housing See FKC comment #16 above.
- a. Provide stainless steel, NEMA 4X enclosure per 40 78 00.

- ✓ 2. Switches and Indicator Lights
- a. Provide switches and indicators per 40 78 00
- b. Flocculation Tank Mixer

- 1) Local-Off-Remote switch
- 2) On-Off-Auto switch
- 3) Running indicator
- 4) Failure indicator
- 5) Speed selector switch

#17: FKC to only provide
HOA switch for floc tank
mixer.

c. Screw Press

- 1) Local-Off-Remote switch
- 2) On-Off-Auto switch
- 3) Running indicator

#18: FKC to only provide
HOA switch for screw
press.

#15: Per
requested
delivery time,
breaker
availability
may prohibit
FKC from
supplying this
rating, but a
reasonable
effort will be
made to
accomplish
this.

- 4) Failure indicator
- 5) Speed selector switch

d. Conveyor #19 Conveyors (Qty 2)

- 1) Local-Off-Remote switch
- 2) On-Off-Auto switch
- 3) Running indicator
- 4) Failure indicator
- 5) Speed selector switch

#20: FKC to only provide HOA switch for each conveyor.



3. Hardwired Alarms

- a. Provide at minimum the following hardwired input alarms that shall be monitored by the control panel:

- 1) 120VAC Power OK
- 2) Flocc Tank Level Switch Hi-Hi
- 3) Flocc Tank Mixer In-Auto
- 4) Flocc Tank Mixer Running
- 5) Screw Press In-Auto
- 6) Screw Press Running
- 7) Screw Press Fail
- 8) Polymer System In-Auto
- 9) Polymer System Running
- 10) Polymer System Trouble

- b. Provide at minimum the following hardwired outputs from the control panel:

- 1) Flocc Tank Mixer Run Command
- 2) Screw Press Run Command
- 3) Polymer System Run Command

- c. Provide at minimum the following analog inputs that shall be monitored by the control panel:

- 1) Flocc Tank Mixer Speed Feedback
- 2) Screw Press Speed Feedback
- 3) Screw Press Headbox Level
- 4) Wastewater Solenoid 1 Open Command
- 5) Wastewater Solenoid 2 Open Command
- 6) Wastewater Solenoid 3 Open Command

d. Provide at minimum the following analog outputs from the control panel:

- 1) Sludge Feed Pump Speed Command
- 2) Floc Tank Mixer Speed Command
- 3) Screw Press Speed Command
- 4) Polymer System Speed Command



4. Touch Screen

#21: HMI provided
by FKC will be
24VDC.

a. Touch screen shall be Allen Bradley PanelView Plus 7 Color touch screen in minimum 15" size with minimum 640x480 resolution, 120VAC or approved equal.

b. Provide the following control functions on the touch screen, where applicable:

- 1) Auto/Manual Selection
- 2) Sludge Feed Flow
- 3) Screw Press Speed
- 4) Polymer Water Feed Rate
- 5) Alarm Silence
- 6) Alarm Reset
- 7) Manual Start/Stop
- 8) Screen Contrast
- 9) Low Polymer Water Fault
- 10) Washwater Selection
- 11) Automation Set Points
 - a) Feed sludge flow rate
 - b) Polymer dose relative to flow
 - c) Headbox level

c. Display the following on the touch screen:

- 1) Sludge feed flow (gpm)
- 2) Screw press speed (rpm)
- 3) Diluted polymer solution feed rate (gpm)
- 4) Neat polymer feed rate (gph)
- 5) Automation Status
- 6) Polymer Pump Status
- 7) Alarm indications
- 8) Fault History



5. Variable Frequency Drives

- a. AB Powerflex 525 series
- b. Variable frequency drives (VFDs) shall be provided for the screw press and flocculation tank
- c. Each variable frequency drive (VFD) shall be provided as a standalone unit. The VFD shall be of the latest technology capable of driving variable or constant torque motor loads at variable speeds to control and/or maintain a process variable (level, flow, pressure, etc.) by varying the motor speed. The VFD shall have the following attributes:
- d. The VFD shall use high efficiency sinusoidal PWM (pulse width modulation) control of IGBT power transistors.
- e. Alpha-numeric human interface module (HIM) digital display with keypad to view and adjust diagnostic and status indicators. HIM shall be on VFD inside panel enclosure.
- f. Continuously operable in ambient temperatures, 25°F to 110°F (-4°C to 43°C), and relative humidity, 95% non-condensing.
- g. Automatic fault reset to automatically restart the drive after any type of fault condition -- up to three attempts. When the drive is locked out after its automatic reset attempts the operator shall be able to reset the VFD by cycling power or via keypad.
- h. Digital inputs for start, preset speed and direction; relay outputs for alarm and run; 4-20 mA input for speed command; 4-20 mA output for speed indicator.



6. VFD Line Reactors

- a. Hammond Power Solutions CRX Series, or approved equal.
- b. Reactor construction shall be iron core with a minimum impedance of (3) percent.
- c. Reactor windings shall be copper or aluminum wound.
- d. Reactor insulation shall be Class H with a 115 degree C rise over 50 degree C ambient.
- e. Reactor shall be rated for system voltage and frequency.



7. Programmable Logic Controller (PLC)

- a. Allen Bradley CompactLogix 1769-L3X series, or 5069-L3X series.
- b. PLC shall have no imbedded input/output (I/O) controllers.
- c. Provide input/output (I/O) modules as required for a functional system as specified.



8. Unmanaged Ethernet Switch

- a. Allen Bradley 1783-US8T, or approved equal.

#22: PLC provided by FKC will be model 1769-L3x. Due to delivery times, exact model will be based on availability.

#25: All conduit provided on the skid and conveyors will not be PVC-coated galvanized steel. It will be Hubbel LFNC-B non-metallic liquidtight that meets NEC code for this application.

- b. Ethernet switch shall be modular style, suitable for use in harsh industrial environments.
- c. Switch shall be UL Listed and EtherNet/IP Certified.
- d. Port count shall be at minimum (8).
- e. Copper Ethernet connectors shall be RJ45.



9. Control Power Transformer

- a. Shall be GE, Hammond Power Solutions, or approved equal.
- b. Shall be 480VAC, 1-phase primary and 120/240VAC 1-phase secondary.
- c. Minimum output shall be 3000VA.



10. Uninterruptible Power Supply (UPS)

- a. Control panel shall include an uninterruptible power supply for backup power.
- b. Power supplies shall be rated for 1000VA, 120VAC, 60Hz.
- c. Power supplies shall be UL508 listed



11. Programmable Logic Controller (PLC)

- a. CompactLogix 1769-L3xER series CPU with standalone I/O



12. Programming

#23: For program provided by FKC, some programming will be in function block, but it will be very minimal.

- a. Provide all programming of PLC and OIT per this specification Section and Section 40 61 916.13 Control Descriptions. All programming shall be ladder code only.
- b. Provide graphics on OIT to be migrated to plant SCADA system as part of a future project.
- c. Program all alarms using the "ALMA" & "ALMD" blocks in the PLC to report to an Alarm Server installed as a future project. Also provide a digital output to a Relay that includes all Dialout Critical Alarms. This will be used to trigger a Banner Radio signal to a Dialer System. Radio and dialer system installed by others.

#24: No junction boxes for power or communication to the dewatering skid are provided. All power and communication connections will be made directly to the control panel on the skid.



2.13 OTHER ELECTRICAL COMPONENTS

- A. Manufacturer shall provide provisions for separate power and communication utility connections. Provide two junction boxes, sized by the Manufacturer, for power and communication. Provide power distribution blocks, including grounding provisions, for the power connection. Provide a grounded RJ45 connection, suitable for accepting 600-volt, CAT6 Industrial Ethernet cabling. The boxes shall be sized to include adequate space for terminations and cable bending radii as required by UL and the NEC.
- B. All equipment-mounted conduit shall be PVC-coated galvanized steel conduit or 2-foot maximum length non-metallic liquid tight conduit.

✓ 2.14 SPARE PARTS

✓ A. The following spare parts shall be included and supplied together with the equipment:

1. One (1) set of helical screw flight seals with mounting hardware (if required)
2. One (1) set bearing assemblies for screw shaft
3. One (1) solenoid valve of each size for spray bar washing system
4. Ten (10) nozzles for spray bar washing system

#26: Not applicable and not provided by FKC.

✓ B. Spare parts shall be packaged with labels indicating the contents of each package, and shall be delivered to Owner as directed.

✓ PART 3 - EXECUTION

#27: To meet delivery times, FKC standard testing forms and procedures will be used for factory testing without any prior submittal for their use.

3.01 FACTORY TESTING

A. All major system components shall be factory tested for compliance with the construction and functional requirements specified herein. A copy of the test reports, certified by an officer of the Supplier, shall be submitted prior to shipment.

✓ 3.02 WIRE MARKING

✓ A. All panel, enclosure and field wiring shall have wire labels on both ends of each wire. Labeling shall be neatly installed for visibility and shall be clearly legible. Each conductor of instrument shielded signal wiring shall be labeled. Wire labels shall be machine printed with on white heat shrinkable tubing. Each label shall fit a minimum 23 characters, 3/16" in height before shrink. Tubing shall be oversized for the wire and shrunk into place using an electric heat gun. The "shrunk" label shall have just enough give to allow the label to be rotated. Hand lettered wire labels are not acceptable and shall be replaced at the Supplier's expense. Provide Brady "PermaSleeve" or approved equal.

✓ B. Wiring Methods:

1. Wiring Separation: Wires carrying 100 volts and above shall be physically separated from lower voltage wiring by using separate bundles or wire ways with sufficient distance to minimize the introduction of noise, crossing only at 90 degree angles.
2. Harness: All wiring shall be neatly bundled and laced with plastic tie-wraps, anchored in place by screw attached retainer. Where space is available, wiring shall be run in slotted plastic wireways with dust covers. Wireways shall be sized such that the wire fill does not exceed 60%. Tie-wraps shall be T&B TY-RAP or approved equal.
3. Retainers: Wireways, retainers, and other devices shall be screw mounted with round-head 316 stainless steel screws or mechanically mounted by push-in or snap-in attachments. Glue or sticky back attachment of any type or style shall not be used. Retainers shall be T&B TC series or approved equal.
4. Hinge Loops: Where wiring crosses hinged surfaces, provide a "U" shaped hinge loop protected by clear nylon spiral wrap. The hinge loop shall be of sufficient length to permit opening and closing the door without stressing any of the terminations or connections. Spiral wrap shall be Graybar T25N or approved equal.

5. Routing: Wires and cable shall be routed along the shortest route between termination points, excepting routes which would result in routing 120 VAC and other wires and cables in the same duct or bundle. Wires and cables shall have sufficient length to allow slack and to avoid any strain or tension in the wire or cable.
6. Wires shall be routed in slotted plastic wireways with snap covers. Wires carrying 120 VAC shall be separated as much as possible from other wires and signal cables, and shall be routed only in ducts for 120 VAC. If the power wiring has to cross the signal wiring, the crossing shall be as close to a right angle as possible. Wireways for 24 VDC wiring shall be used for all other wires and cables. Routing of 120 VAC in combined wireways shall be minimized. Wires and cables shall be placed in the wireways in a straight, neat and organized fashion and shall not be kinked, tangled or twisted together. Additional wire ducting shall be provided for use by the electrical subcontractor for routing field wires to their landing points in the each electrical and instrumentation panel.
7. Provide 2" minimum separation between wireway and terminal blocks.
8. Wiring not routed in wireways shall be neatly bundled, treed, and laced with plastic ties.

☒ 3.03 ELECTRICAL CONSTRUCTION METHODS

- ☒ A. Mating fittings, bulkhead fittings, plugs, connectors, etc. required to field interface to the equipment and panels shall be provided by the when the equipment is delivered.
- ☒ B. All electrical and instrumentation drawings associated with the equipment shall be provided with the equipment when it is delivered to the job site. Drawings for each piece of equipment shall be placed in clear plastic packets of sufficient strength that will not tear or stretch from drawing removal and insertion.
- ☒ C. Electronic PDF version of O&M, electrical and instrumentation drawings associated with the equipment and electronic copies of the PLC and OI programs shall be provided on a USB drive with no password protection on a lanyard and placed within the panel. Label drives with clear plastic with black machine printed lettering as produced by a KROY or similar machine. The size of the nameplate tape shall be with 3/8-inch lettering unless otherwise approved by the Engineer. Securely fasten nameplates in place on the USB drive using the adhesion of the tape.

☒ 3.04 SHIPMENT AND STORAGE

- ☒ A. Comply with Section 01 66 00.
- ☒ B. Site Storage and Handling of Equipment
 1. Store the supplied equipment in accordance with the manufacturer's recommendations and instructions.
 2. Store gear reducers / speed reducers and motors in buildings or trailers and protected from dust, dirt, and moisture.
 3. Take responsibility for work, equipment, and materials until inspected, tested and finally accepted.

#28: FKC representative shall do site visit for installation compliance review during same trip as testing (Pre-Operational, Functional, & Operational testing combined trip).

- ☒ 3.05 INSTALLATION
 - A.

The equipment Supplier's representative shall be available by telephone as required during construction. During equipment installation, the Supplier's representative shall visit the site as needed to insure that the installation is in compliance with the Supplier's recommendations and instructions, and the requirements of this Proposal.
 - ☒ B. Contractor shall provide temporary or rental hoisting equipment to facilitate installation.
- ☒ 3.06 SUPPLIERS' CERTIFICATION
 - ☒ A. Prior to system startup and functional testing, all equipment described herein shall be inspected by the Supplier's representative for proper alignment, proper connection, and satisfactory performance of all components.
 - ☒ B. The Supplier's representative shall approve installation and provide certification using Manufacturer's Installation Certification Form in Section 01 99 00.
- ☒ 3.07 EQUIPMENT START-UP AND TESTING
 - ☒ A. Comply with Section 01 81 00.
 - ☒ B. Proposed test procedures shall be developed by the installation screw press equipment Supplier's representative. The procedures shall be submitted to the Owner and installation Contractor and reviewed by the Owner before scheduling and performing the functional test.
 - ☒ C. Testing shall be conducted by the Supplier's representative and installation Contractor and witnessed by the Owner. The testing shall demonstrate that the dewatering equipment and related control system operate in accordance with the specifications including all operating, monitoring, and shutdown functions. Testing shall also demonstrate that the performance of the system is stable and not subject to hunting, over-adjustments, and cycling of components.
 - ☒ D. Pre-Operational & Functional Testing
 - 1. Comply with Section 01 81 00 – 3.02 & 3.03.
 - 2. If, in the opinion of the Owner, the system meets the requirements specified herein, the system will advance to performance testing. If, in the opinion of the Owner, the pre-operational and functional test results do not meet the requirements specified herein, the system will be classed as nonconforming.
 - 3. In the case of a nonconforming system, advancement to subsequent testing and monitoring will not commence until the system is classed as conforming. The dewatering equipment Supplier's representative shall make, at no additional cost to the Owner, such adjustments, changes, and/or additions as are necessary to correct the system and retest it as specified above until, in the opinion of the Owner, the system has conformed to these Specification.
 - ☒ E. Performance Testing
 - 1. The screw press equipment Supplier's representative shall start up and operate the dewatering system continuously for two (2) eight-hour day shifts to demonstrate compliance with the performance requirements in paragraph 2.03.

#29: See FKC proposal pages provided with bid form. FKC can demonstrate min and max hydraulic loading rates as long as the given inlet consistency does not cause the average solids loading rate to be exceeded. Inversely, FKC can demonstrate the average solids loading rate as long as the given inlet consistency does not cause the max hydraulic rate to be exceeded.

2. Performance must be demonstrated at the minimum and maximum solids and hydraulic loading rates specified in paragraph 2.03.

3. ☒ Supplier shall be responsible for selecting and providing polymer used throughout the performance testing and demonstration. These activities shall comply with the following:

- a. Select one or more initial polymers based on bench scale testing specified in paragraph 1.05.E.
- b. Select initial polymer(s) based on sludge samples taken no more than one (1) month prior to the demonstration period.
- c. Selected polymer(s) shall be commercially available from more than one vendor.
- d. Inappropriate polymer selection(s) shall not relieve the Supplier from complying with performance or demonstration period requirements.

e. Supplier shall provide all polymer required to operate the screw press dewatering system until the Supplier has been notified of the official acceptance of the dewatering system. Supplier shall provide to the Owner contact information for the polymer vendor(s) which provide the polymer(s) used during the performance and demonstration periods.

#30: FKC will only supply one tote (275 gallons) of polymer. FKC estimates the use of 135 gallons for all the startup and testing of the FKC equipment.

4. ☒ Supplier shall endeavor to optimize polymer consumption for the dewatering equipment. Upon achieving the specified performance requirements during the two-day performance test specified above, Supplier's representative shall vary the polymer dose between 80% and 120% of the dose used for the successful two-day performance test, in increments of 10%, and provide to the Owner a written summary of the resulting dewatering performance parameters, including cake solids concentration and solids capture percentages

5. ☒ Contractor shall coordinate with the Owner to ensure that there is a sufficient volume of sludge stored in the aerobic digester to provide feed stock for the performance testing and the demonstration period specified in Paragraph 3.08.F.

F. Demonstration Period.

1. Following the successful two-day operational test as specified above, the screw press equipment Supplier's representative shall conduct the demonstration period testing specified in this Section.

2. Operate facility for four (4) eight-hour day shifts within a period of two (2) calendar weeks with plant personnel present. The system must operate under automatic controls continuously and meet the performance requirements specified in Paragraph 2.03 at all times during the test. Operator interface or adjustments must not exceed once per hour.

3. During the demonstration period, collect samples for cake solids and capture analysis after each two-hour period of operation.

#31: FKC scope and pricing offered does not include demonstration period on-sites services or sample testing or analysis. This service can be provided at an added rate of \$1,200 per 8-hour weekday on-site.

See FKC
comment #31 on
previous page.

4. Following the demonstration period, produce a report of the test results. For each sample, list the following:
 - a. Date
 - b. Time
 - c. Sludge feed rate (gpm)
 - d. Sludge feed concentration (%)
 - e. Polymer feed rate (lb/dry ton)
 - f. Cake solids (%)
 - g. Capture rate (%)
5. The Supplier shall be responsible for all aspects of sampling and analysis during the demonstration period.
6. At the conclusion of one of the day shifts described above, the dewatering system must be shut down automatically after a two (2) hour time delay. Automatic shutdown operations must include a washdown cycle (mandatory) and the expulsion of thin and dewatered sludge inside the screw press (if required by Supplier's typical operation). No operator interface or adjustments may be made during the programmed time delay or during the automatic shutdown operations.

See FKC
comment #29 on
previous pages.

7. For a continuous 4-hour period, the facility must operate at the specified maximum solids loading rate or hydraulic loading rate, whichever is limiting, while producing a minimum average sludge concentration of 15 percent and a minimum average capture rate of 95% or maximum filtrate solids of 750 mg/L TSS, as reflected in the performance requirements listed. No operator interface or adjustments may be made during this period.

See FKC
comment #31
on previous
page.

8. The above requirements must be met using 100% feed sludge from the subject facilities without any sludge conditioning or other supplemental additions, other than the polymer indicated.

G. ☒ If, in the opinion of the Owner, the system meets the performance requirements specified herein during the testing specified above, the Owner will notify the Supplier of the official acceptance of the dewatering system.

☒ H. If, in the opinion of the Owner, the system does not meet the performance requirements specified herein during the testing specified above, the Owner shall notify the Supplier in writing of the nonacceptable performance.

1. In the case of nonacceptable performance, the Supplier shall then have 45 days in which to perform at the Suppliers' expense, any supplemental testing, equipment adjustments, changes or additions and request an additional retest of the nonacceptable system.
2. Time required by the Supplier to perform such measures shall not relieve the Contractor from compliance with the completion times specified in Section 00510 (Construction Agreement).

3.08 MANUFACTURER FIELD SERVICES

#32: FKC scope and pricing is based on the one day of training occurring during the same trip as functional testing, and one day of training occurring during the same trip as performance testing.

#33: FKC scope and pricing does not include complete disassembly and re-assembly of all major parts and components of one screw press unit. FKC will instruct, both in the classroom and in the field, how to perform all preventative and corrective maintenance procedures to the owner's satisfaction.

- A. ☒ Provide field inspection and instruction services by a factory trained service representative of the manufacturer. Services by a sales representative are not acceptable.
1. Provide a minimum of two visits, each of a three-day duration; 8-hour minimum work hours per day, travel time excluded, for assistance during installation, equipment startup and testing.
 2. Submit a Manufacturer's Certificate of Installation (Section 01 99 00).
- B. Provide a minimum of 8 hours over two days, excluding travel time, to train plant operators.
1. Comply with Section 01 79 00.
 2. Conduct training sessions for Owner's staff in the proper operation and maintenance of the equipment, including all instrumentation and controls.
 3. Conduct training during the latter portion of the functional testing when the equipment is fully operational and before the equipment's Demonstration Period.
- ☒ 4. Include orientation of the Owner's staff to the operation and maintenance information provided by the Equipment Supplier.
5. Include a complete disassembly and re-assembly of all major parts and components of one screw press unit.
6. Submit a Manufacturers Instruction Certification Form. (Section 01 99 00).
- C. ☒ Make additional site visits as required to comply with these specifications at no additional cost to the Owner.

END OF SECTION

- ☒ Checkmark signifies FKC compliance with specification. A hashtag with a number (Example: #1) shows an FKC clarification or exception with description provided.

SECTION 41 12 13

SHAFTLESS SCREW CONVEYORS

☒ PART 1 - GENERAL

☒ 1.01 SECTION INCLUDES

- ☒ A. Description
 1. Shaftless screw conveyors and associated appurtenances for the transport of dewatered biosolids.
- ☒ B. Equipment Numbers
 1. Inclined Conveyor: Tag No. CON-250-03
 2. Horizontal Conveyor: Tag No. CON-250-04

☒ 1.02 REFERENCED SECTIONS

- ☒ A. The following Sections are referenced in this Section:
 1. Section 01 33 00 – Submittals
 2. Section 01 66 00 – Materials and Equipment
 3. Section 01 78 23 – Operation and Maintenance Data
 4. Section 01 79 00 – Training
 5. Section 01 81 00 – Equipment and System Testing
 6. Section 01 99 00 – Reference Forms
 7. Section 05 50 01 – Anchor Bolts and Anchoring Devices
 8. Section 09 96 00 – High Performance Coatings
 9. Section 11 05 13 – Electric Motors
 10. Section 46 05 13 – General Requirement for Equipment
 11. Section 46 05 14– Equipment Mounting
 12. Section 46 76 27 – Screw Press Dewatering Equipment

☒ 1.03 SUBMITTALS

- ☒ A. Comply with Section 01 33 00 and submit the following.
- ☒ B. General arrangement drawings showing the entire assembly. Include a materials list and descriptions of all major components such as all gears and support structure.
- ☒ C. Descriptive literature and/or catalogs of the equipment, including a detailed equipment specification.
- ☒ D. A list of at least 20 installations of similar size that have been operating successfully for at least five years in municipal wastewater treatment plants.

- ☒ E. Spiral strength calculations for spring (spiral) compression and elongation.
- ☒ F. Conveyor torque calculations stamped by a registered engineer.
- ☒ G. Torque calculations for the gear reducer and reducer motor.
- ☒ H. Motor data submittal in accordance with Section 11 05 13.
- ☒ I. Equipment mounting submittal information specified in Section 46 05 14.
- ☒ J. Anchor bolt design calculations and details in accordance with Section 05 50 01.
- ☒ K. Applicable operation and maintenance information specified in Section 01 78 23.
- ☒ L. Complete and submit the following forms from Section 01 99 00:
 - 1. Motor Data Form.
 - 2. Unit Responsibility Form.
 - 3. Additional forms required during startup per Part 3.

☒ 1.04 QUALITY ASSURANCE

- ☒ A. Unit Responsibility
 - 1. Provide unit responsibility for the equipment included in this section.
- ☒ B. Coordination
 - 1. Coordinate the shaftless screw conveyor design and installation requirements with the biosolids dewatering equipment manufacturer.
- ☒ C. Experience
 - 1. A minimum of not less than 10 years experience in the design and manufacture of shaftless screw conveyor systems.
 - 2. At least 20 shaftless screw conveyor systems operating successfully for at least five (5) years at municipal wastewater treatment plants.

☒ 1.05 PRODUCT SHIPMENT, PROTECTION, AND STORAGE

- ☒ A. Comply with Section 01 66 00.
- ☒ B. Site Storage and Handling of Equipment.
 - 1. Store the supplied equipment in accordance with the manufacturer's recommendations and instruction.
 - 2. Store gear reducers and motors in buildings or trailers which have concrete or wooden floor, a roof and fully enclosed walls, and will protect the equipment from dust, dirt, and moisture.
 - 3. Take responsibility for work, equipment, and materials until inspected, tested and finally accepted.

☒ 1.06 PROJECT CONDITIONS

- A. Install equipment in an outdoor, canopy covered location at the biosolids dewatering facility, as shown on the Drawings. The majority of the inclined conveyor will not be covered by a canopy and will be continuously exposed to the elements.

☒ 1.07 WARRANTY

☒ A. Warranty Against Wear

1. Warrant the liner and spiral against excessive wear for a period of three years following plant start-up.
2. Liner:
 - a. Excessive wear is indicated by the appearance of the bottom indicator layer (second color) along more than 30 percent of the conveyor length.
 - b. If excessive wear occurs within the warranty period, provide new formed and banded liner to replace all the liner in the conveyor that has excessive wear.
3. Screw
 - a. Excessive wear is indicated by loss of more than 50 percent of the height of the main outer screw section over 30 percent of the screw length.
 - b. If excessive wear occurs within the warranty period, provide new screw to replace the screw in the conveyor that has excessive wear.
4. Complete the Extended Warranty Form in Section 01 99 00. Modify the Extended Warranty Form to apply just for the warranty against wear specified above.

1.08 PERFORMANCE REQUIREMENTS

| Performance Requirement | Value |
|--|-------|
| Design Capacity of Inclined Conveyor, cubic feet/hour | 100 |
| Design Capacity of Horizontal Conveyor, cubic feet/hour | 100 |
| ⁽¹⁾ Size the conveyor trough the future condition. Design the motor to meet the design capacity. Provide the capability to replace the motor and reducer to meet the future capacity requirements of the horizontal conveyor. | |

☒ 1.09 DESIGN REQUIREMENTS

- ☒ A. Provide shaftless screw conveyor. Screw conveyor with shaft and intermediate hangers are not acceptable.
- ☒ B. Design motor and gear reducer to be removable without disassembly of conveyor.

#60 FKC scope and pricing is for a BHX-800 screw whose design requires conveyors for 70 cubic feet hour per CEMA calculation standards. Conveyors are sized for 70 cu. ft. / hr.



C.

Design requirements for the inclined conveyor are as follows:

#61 FKC design is per CEMA calculation standards. The following applies: density 55 lbs/ft³, 26 rpm, 35% max trough fill rate.

#71 No drawings to verify dimensions. FKC scope and price is for 22'-5" (linear feet of actual conveyor) length conveyor.

| Inclined Conveyor Design Requirement | Value |
|---|---------------------------|
| Material conveyed | Dewatered Digested Sludge |
| Approx. density of sludge, lbs/ft ³ | 70 |
| Maximum screw speed, rpm | 20 |
| Maximum trough fill rate @ design load, % | 45 |
| Approx. length, ft. (centerline of dewatered cake discharge chute to centerline of furthest conveyor discharge chute) | 22'-5" ⁽¹⁾ |
| Number of inlets | 1 |
| Feed inlet from | Screw Press Discharge Box |
| No. of discharges | 2 |
| Discharge to | Horizontal Conveyor |
| Discharge through | Discharge Chute |
| Discharge type | Axial |
| Location of drive | Pulling |
| Angle, degrees from horizontal | 23 |
| ⁽¹⁾ Verify dimensions with drawings. | |



D.

Design requirements for the horizontal conveyor are as follows:

#62 FKC design is per CEMA calculation standards. The following applies: density 55 lbs/ft³, 26 rpm, 35% max trough fill rate.

#72 No drawings to verify dimensions. FKC scope and price is for 9'-4" (linear feet of actual conveyor) length conveyor.

| Inclined Conveyor Design Requirement | Value |
|--|-----------------------------------|
| Material conveyed | Dewatered Digested Sludge |
| Approx. density of sludge, lbs/ft ³ | 70 |
| Maximum screw speed, rpm | 20 |
| Maximum trough fill rate @ design load, % | 45 |
| Approx. length, ft. (centerline of inlet chute to centerline of discharge chute) | 9'-4" |
| Number of inlets | 1 |
| Feed inlet from | Inclined Conveyor Discharge Chute |
| No. of discharges | 1 |
| Discharge to | Dumpster |
| Discharge through | Discharge Chute |
| Discharge type | Axial |
| Location of drive | Pulling |
| ⁽²⁾ Verify dimensions with drawings. | |

☒ **PART 2 - PRODUCTS**

☒ **2.01 MANUFACTURERS**

- ☒ A. One of the following:
1. FKC Co. Ltd.
 2. Or equal, as defined in Section 01300

☒ **2.02 MATERIALS**

- ☒ A. Table 1: Conveyor Component Material Requirements

| Component | Material |
|---|--|
| Chutes, Troughs, End Plates, Covers, Supports | Type 304 stainless steel |
| Drive Shaft | 1045 Steel |
| Spiral Flighting | Special Chrome-Alloy Steel w/min 225 Brinnell Hardness |
| Wear Liner | UHMW Polyethylene ⁽¹⁾ |
| Anchor bolts and other fastening hardware | ANSI, Type 304 stainless steel |
| ⁽¹⁾ See Table 2 for specific material properties for the wear liner. | |

- ☒ B. Table 2: Wear Liner Material Properties

| Property | Value/Unit | Testing Method |
|---------------------------------|--------------------------------|------------------|
| Density | 61.2 lbs/ft ³ | DIN53479 |
| Molecular Weight | 9.2 x 10 ⁶ | Margolies |
| Ball Indentation Hardness | 5,946 lbs/in ² | DIN53456 |
| Shore Hardness D | 64 | DIN53505 |
| Crystalline Melting Range | 278°F | |
| Dynamic Coefficient of Friction | 0.1-0.12 ratio of tension/load | Plastic to Steel |

☒ **2.03 FABRICATION**

- ☒ A. Minimum thickness for steel items
1. Trough lids: 10 gauge.
 2. All other components: 10 gauge.
- ☒ B. Shop welding
1. Comply with Structural Welding code, AWS D1.1, of the American Welding Society.
 2. For all welded connections, develop the full strength of the connected elements.

✓ 2.04 MECHANICAL COMPONENTS

✓ A. Spiral Flighting

1. Spiral flighting designed to convey material without a center shaft or hanger bearings.
2. Construct spiral flights of cold-formed high strength chrome alloy steel with a minimum hardness of 220 Brinnell. Provide spiral flights with adequate stability to prevent distortion and jumping in the trough.
3. Provide a second, inner spiral, concentric with the outside spiral.
4. Provide the auger flighting with a torsional rating that exceeds the torque rating of the drive motor at 150% of its nameplate horsepower.
5. Limit the "spring effect" of the spiral to 1.0 mm per 100 mm of length at maximum load conditions.
6. Provide a minimum outer spiral thickness of 0.75 inches for spiral diameters up to 9 inches and 1 inch for spirals diameters exceeding 9 inches.
7. Form the spiral flighting in sections from one continuous flat bar that is concentric within a tolerance of 2 mm. Sectional flighting formed from plate is not permitted.
8. Provide full penetration welds at all splice connections.
9. Couple the spiral flights to the end shaft by a flanged, bolted connection.

✓ B. Drive System

1. SEW Eurodrive FAF enhanced screw conveyor drive with four individual sealing areas.
2. Or equal

✓ C. Horizontal and Inclined Troughs

1. Provide U-shaped troughs.
2. Provide inclined conveyor with a 2-inch flanged drain outlet to facilitate cleaning. Pipe the drain outlet to the drain as shown on the drawings. Provide drains with 1-inch flushing connections.
3. Equip the inclined trough with an inlet opening to interconnect with the screw press dewatering unit. Coordinate the opening size with the screw press manufacturer. Flange the openings to provide for a suitable interconnection between the two pieces of equipment.
4. Provide bolted covers on all portions of each trough that is not covered by the filling chutes. Provide covers with a maximum five (5) foot length. To prevent unsafe access to the conveyors, quick opening covers will not be allowed unless they are also bolted to prevent access during operation. Provide each conveyor with the appropriate warning labels to call for lock out – tag out of the electrical system before the covers are removed. Provide one inspection hatch with finger guards on each of the two conveyors.

#63 Per CEMA design standards, coupling of spiral flight to the end shaft is by a solid shaft with tube coupling and cross bolts.



D. Wear Liner

1. Line the inside trough surfaces of the conveyors with a layer of ultra high molecular weight polyethylene (UHMW-PE). Provide liner by SPIRAC Duraflo SPX, or Xylethon by Durawear, Polystone M or equal.
2. Provide a single piece liner that is formed and bonded with two (2) layers of the same material, each of a different color, to provide a visible indication when the liner is nearing the end of its useful life.
3. Single color liner is acceptable if manufacturer provides ultrasonic thickener tester for testing liner thickness (Yanmis Thickens Gauge, GM100, ½-220 mm digital thickness tester or equal).
4. Provide liner sections that are a maximum length of four (4) feet.
5. Provide stainless steel clips to hold the liner in place. Fasteners are not allowed.
6. Provide a liner with a minimum thickness of 1/2" for spirals up to 14" diameter and a minimum thickness of 5/8" for larger spirals.
7. Proprietary hold-down guide liners mounted under the lids are acceptable as long as they do not interfere with the flow of sludge. Steel hold down bars are prohibited.



E. Conveyor Supports

1. Provide conveyor with supports suitable for mounting conveyors as shown on the drawings.
2. At a minimum, provide the inclined conveyor with supports at the inlet end and at the storage facility wall, with intermediate supports as required.
3. Provide Type 304 stainless steel structural angle supports with a thickness of minimum 0.25".
4. Shop fabricate supports from structural steel shapes and plates. Assemble and fit supports to the conveyor prior to delivery to the jobsite. Match mark supports and conveyor segments for easy Contractor installation.
5. Allow for 1-1/2 inch of grout beneath each support foot pad for the Contractor to compensate for uneven floor elevation.
6. Coordinate with dewatering equipment manufacturer to ensure that the supports avoid interference with other equipment or equipment supports.



F. Drive Units

1. Provide each spiral conveyor with a constant-speed gear reducer motor drive unit. Mount the drive unit to a bellhousing adapter flange that is mounted to the end plate of the conveyor.
2. Design the adapter flange to allow the leakage from inside the conveyor trough to atmosphere rather than into the gear reducer/motor drive unit. Direct coupling of the gear reducer/motor drive unit to the end flange of the conveyor is not acceptable.

3. Design the drive unit to be rigidly supported to prevent any visible vibration.
4. Design the drive system to start the conveyor with the trough filled at two times the design load for loads designed up to 67 percent fill rate, and 1.5 times for loads designed exceeding 67 percent fill rate.

☒ G. Motors

1. Comply with Section 11 05 13, except as modified herein.
2. Type 2, constant speed.
3. Motor Sizes:
 - a. Inclined conveyor: maximum 5.0 horsepower
4. Power Requirements: 480 volt, 3-phase, 60 Hertz.
5. Minimum Service Factor: 1.15
6. Nominal Speed: maximum 1,800 rpm

☒ H. Gear Reducers

1. Provide AGMA Class II gears with single or double reduction.
2. Provide helical gear units with high capacity roller bearings. Design bearings with thrust loads for a fully loaded startup condition.
3. Provide bearings with an ABMA L-10 life of 100,000 hours.
4. Design the reducer to be air-cooled with no auxiliary cooling requirement.
5. Size the gear reducer with a torque service factor of 1.5 times the absorbed power or 1.1 times the motor nameplate (at the driven shaft speed), whichever is greater.

☒ I. Chutes and Discharge Boots

1. Furnish inlet and discharge chutes of the same gauge and construction material as the conveyor troughs, at locations as shown on the drawings. Provide minimum 10 gauge thick flanges.
2. Furnish single-ply flanged discharge boots at locations and lengths shown on the drawings. Construct flexible boots of EPDM rubber hose, neoprene, Linatrilite by Linatex Corporation, or approved equal.

☒ J. Electrical Equipment

1. Provide electrical equipment that conforms to the applicable standard of the National Electrical Manufacturers Association (NEMA) and the National Electrical Code (NEC).
2. Motion Failure Alarm Unit
 - a. Provide an external conveyor mounted motion failure alarm, (alternately known as "zero speed" or "under-speed" switch) to detect spiral or drive shaft failure (one for each conveyor). Provide with a NEMA 4 enclosure.
 - b. Switch shall interface to the plant control system with 120 VAC rated dry contact or 120 VAC pulse output proximity switch.

#64 FKC scope and pricing includes Omron 3022 emergency trip cords and safety switches.

3. Emergency Shutdown:

- a. Provide an emergency trip cord and safety switch for each conveyor and for the motorized pivot mechanism. Run the cord the full length of each conveyor. Design the trip switch to immediately stop all conveyors and the motorized pivot mechanism when the switch is actuated. The switch shall be RS type by Conveyor Components Corporation or approved equal.



4. Electrical Controls

- a. Except as specified above, electrical controls for the shaftless conveying equipment furnished under this section will be provided by others, as part of the control panel(s) for the screw press dewatering equipment being furnished under Section 46 76 27.

2.05 ACCESSORIES

A. Anchor Bolts

1. Comply with Section 05 50 01.
2. Calculations are required.
3. Minimum diameter: 1/2".

#65 FKC scope and pricing provides anchor bolt Structural PE Oregon calculations for conveyors, but does not include anchor bolts. Anchor bolts to be provided by others.



B. Spare Parts

1. One (1) packing gland set, for each conveyor supplied
2. Comply with Section 46 05 13.

#68 FKC scope and pricing does not have any spare packing gland sets.



C. Lubricants

1. Furnish lubricants of the type and quantity as recommended by the conveyor manufacturer for (start-up) operation.



2.06 FACTORY COATING



- A. Furnish gear reducers and motors with the manufacturer's standard paint system.



B. Stainless Steel

1. Clean with mild abrasive wheels and/or nonferrous blast media to remove heavy scale and welding carbon. It is also acceptable to passivate with stainless steel cleaner and then rinse.



C. Iron and Mild Steel

1. Dry abrasive blast all iron and mild steel in accordance with SSPC-SP6 and Section 09 96 00. Paint surfaces within 24 hours to prevent rusting and surface discoloration.
2. Paint surfaces per Section 09 96 00 (with exception of spiral).
3. Provide spiral with one coat of shop primer.

☒ **PART 3 - EXECUTION**

☒ **3.01 INSTALLATION**

- ☒ A. Align, connect, and install equipment in accordance with the manufacturer's written instructions.
- ☒ B. Ensure true alignment of spiral flights during installation.
- ☒ C. Trial fit and match-mark mating parts in the factory to ensure field assembly is possible.
- ☒ D. Provide factory-trained personnel to check installation and test initial operation.
- ☒ E. Certify installation and initial operation of all components on the appropriate forms included in Section 01 99 00.

☒ **3.02 FIELD QUALITY CONTROL**

- ☒ A. Field quality control and inspections will be performed as specified in Section 01 81 00.
- ☒ B. Corrective Actions: Replace or repair work to eliminate defects, deficiencies and irregularities.

☒ **3.03 MANUFACTURER'S FIELD SERVICES**

- ☒ A. Provide field inspection and instruction services by factory-trained service technician of the manufacturer as specified in Sections 01 79 00 and 01 81 00. Services by a sales representative are not acceptable.

- 1. Provide minimum 1 visit of 8 hours, excluding travel time, to inspect and test initial operation.
- 2. Provide minimum 1 visit of 4 hours, excluding travel time, to train plant operators.

- ☒ B. Submit completed Manufacturer's Installation Certifications (Section 01 99 00).

- ☒ C. Submit Manufacturer's Instruction Certification (Section 01 99 00). #69: FKC conveyor training will be part of overall screw press dewatering training.

☒ **3.04 PERFORMANCE TESTING**

- ☒ A. Comply with Section 01 81 00.
- ☒ B. Torque Testing
 - 1. Operate conveyor under full load to ensure that torque design requirements are met.

3.05 DEMONSTRATION

- A. Comply with Section 01 81 00.

END OF SECTION

#70: FKC scope and pricing offered does not include demonstration period on-site services or sample testing or analysis. This service can be provided at an added rate of \$1,200 per 8-hour weekday on-site.

✓ Checkmark signifies FKC compliance with specification. A hashtag with a number (Example: #1) shows an FKC clarification or exception with description provided.

SECTION 46 33 33

POLYMER BLENDING UNITS

#34: The intent of FKC markups for the polymer blending unit is to provide the Velodyne standard model VM-5P-1200-D-0-A-1. The markups should reflect this Velodyne standard. Any deviation in the FKC markups or omissions is superceded by the Velodyne standard model VM-5P-1200-D-0-A-1.

✓ PART 1 - GENERAL

✓ 1.01 SECTION INCLUDES

- ✓ A. Requirements for a polymer blending and feed system to provide prepared polymer solution from a concentrated raw polymer supply.
- ✓ B. If required to meet the Project schedule, the polymer blending unit manufacturer may propose alternative components for consideration during bidding. The alternative components must be equal in quality and function to the components included in this specification. Alternative components must also be industry standard components and components that are typically used by the manufacturer.
- ✓ C. Equipment List

| Location | Equipment No. |
|--|---------------|
| Biosolids Mechanical Dewatering Facility | POL-250-06 |

✓ 1.02 REFERENCED SECTIONS

- ✓ A. The following Sections are referenced in this Section:
 - 1. Section 01 33 00 – Submittals
 - 2. Section 01 66 00 – Materials and Equipment
 - 3. Section 01 78 23 – Operation and Maintenance Data
 - 4. Section 01 81 00 – Equipment Startup and Testing
 - 5. Section 01 99 00 – Reference Forms
 - 6. Section 05 50 01 – Anchor Bolts and Anchoring Devices
 - 7. Section 09 96 00 – High Performance Coatings
 - 8. Section 11 05 13 – Electric Motors
 - 9. Section 46 05 13 – General Requirements for Equipment
 - 10. Section 46 05 14 – Equipment Mounting
 - 11. Section 46 76 27 – Screw Press Dewatering Equipment

✓ 1.03 COORDINATION

- ✓ A. Provide POL-250-06 to the dewatering equipment manufacturer for inclusion in the biosolids mechanical dewatering polymer system.
- ✓ B. Verify requirements for POL-250-06 with the dewatering equipment manufacturer.

✓ 1.04 DESIGN REQUIREMENTS

✓ A. Criteria

1. Provide an integrated equipment package designed to automatically meter, activate, dilute with water, and feed high molecular weight liquid polymer.
2. Include: Mounting skid, neat polymer metering pump, mixing chamber, booster pump (if required by this specification), piping and fittings, integral control panel, connections to automatic controls, and all necessary appurtenances required for proper and efficient operation.
3. Design unit to discriminately apply high mixing energy to maximize polymer activation while preventing polymer jelling, agglomeration or damage to its molecular structure.
4. Design mixing chamber to maximize the dilution and dynamic activation of liquid polymer. Not acceptable: conventional static mixers or mixing blocks for primary polymer dilution or activation.
5. Do not expose polymer to a centrifugal pump impeller or other cause of excessive shear.
6. Provide progressing cavity polymer metering pump to convey concentrated polymer to mixing chamber.
7. Design all components which require periodic maintenance to be readily accessible.
8. Design unit for working pressure of 100 psi, except as noted below.
9. Electrical Equipment
 - a. Comply with standards or requirements of National Electrical Manufacturer Association (NEMA) and National Electrical Code (NEC).
 - b. Insulate both power and control equipment for 600V even though operating voltage may be lower.
10. Mount all components securely on a single Type 304 stainless steel frame.
11. Plant Water Supply
 - a. Water for cleaning sprays and polymer blending will be plant effluent (UW) filtered through a tertiary disk filter with nominal 10-micron opening and that may contain small quantities of biological floc and dilute concentrations of industrial solvents.
 - b. If additional filtration is required, provide a strainer at the water connection point.
12. The water pressure as it enters the dewatering building is expected to range from 60 to 80 lbs/in².
13. If additional pressure is required, provide a booster pump system to meet the pressure needs of the screw press system.

**B. Performance****1. Conform to the following:**

| Equipment No. | POL-250-06 |
|---|------------|
| Dilution water capacity, gph | 60 - 600 |
| Polymer viscosity, centipoise | < 5,000 |
| Diluted polymer concentration, percent | 0.3 - 0.7 |
| Downstream dilution required | No |
| Polymer feed pump | |
| Discharge capacity, required range, gph | 0.25 - 5.0 |
| Maximum discharge pressure, psig | 65 |
| Functional turndown range, minimum | 20:1 |

#35: Due to delivery times the unit will be provided with 120-1200 gph of dilution water capacity.

**1.05 SUBMITTALS****A. Comply with Section 01 33 00.****B.**

Include a copy of the contract document control diagrams and process and instrumentation diagrams, with addenda updates, that apply to the equipment in this section.

1. Mark to show specific changes necessary for the equipment proposed in the submittal.
2. If no changes are required, mark the drawing or drawings "No Changes Required".
3. Failure to comply with this paragraph is sufficient cause to reject the entire submittal.

#36: Markups on drawings I-251, I-252, and I-253 will be provided, but Velodyne standard polymer system will be supplied.

**C. Include the following items:**

1. Complete equipment list, identifying all electrically powered equipment including pumps, powered valves, and motors, process control instruments, equipment safety instruments and switches, and motor starters.
2. Wiring and connection diagrams indicating all electrical connections.
3. Motor submittal information as specified in Section 11 05 13.
4. Equipment mounting submittal information specified in Section 46 05 14.
 - a. Applicable operating and maintenance information specified in Section 01 78 23.
 - b. Complete and submit the following forms from Section 01 99 00.
 - 1) Motor Data Form.
 - 2) Unit Responsibility Form.
 - 3) Additional forms required during startup per PART 3.

#37: Motor and equipment mounting submittal information will be provided, but Velodyne standard motors and equipment mounting will be supplied.

**1.06 QUALITY ASSURANCE****A. Unit Responsibility**

1. Assign unit responsibility as specified in Section 46 05 13 to the screw press dewatering equipment manufacturer for the equipment specified in this section.

☒ 1.07 SHIPMENT, PROTECTION AND STORAGE

- ☒ A. Comply with Section 01 66 00.

☒ 1.08 ENVIRONMENTAL CONDITIONS

- ☒ A. The equipment will be installed in a weather-exposed outdoor location covered by a canopy.

☒ **PART 2 - PRODUCTS**

☒ 2.01 MANUFACTURERS

- A. Dyna Blend as manufactured by Fluid Dynamics, Inc.
- B. Polyblend as manufactured by UGSI ChemFeed.
- ☒ C. VeloDyne as manufactured by Velocity Dynamics.
- D. Or equal as specified in Section 01 33 00.
- E. Modify equipment as required to meet the requirements of this section.
- F. Coordinate with dewatering equipment manufacturer.

☒ 2.02 MATERIALS

- A. Mounting Frame: Type 304 stainless steel
- B. Mixing Chamber: Type 304 stainless steel or PVC/acrylic
- C. Fasteners: Type 304 stainless steel.
- D. Control Panel: Type 304 stainless steel.

#38: FKC to provide 18-8 stainless steel fasteners.

#39: FKC to provide NEMA 4X Velodyne standard FRP control panel enclosure.

☒ 2.03 PIPING CONNECTIONS

- ☒ A. Dilution water inlet, 1.0" FNPT
- ☒ B. Neat polymer inlet, 1" NPT
- ☒ C. Polymer solution discharge, 1.0" FNPT

~~2.04 EQUIPMENT COMPONENTS~~

- ~~A. Hydrodynamic Mixing Chamber – Fluid Dynamics~~
- ~~1. Produce high fluid shear conditions without use of internal mechanical mixing systems. Employ hydrodynamic action to combine the polymer and dilution water.~~
 - ~~2. Stage mixing energy to provide for high, non-damaging mixing energy over the full operating range of the system which then dissipates through concentric chambers.~~
 - ~~3. Provide an integral, multi-stage, stainless steel dilution water booster pump with pressure regulating valve capable of producing a minimum 50 psi differential pressure across the water control orifice. Systems that rely on dilution water~~

distribution system pressure and flow alone to create mixing energy shall not be acceptable.

4. Provide an integral water control device to also produce mixing energy by creating a pressure drop across its orifice. Configure to allow orifice replacement without disassembly of any other part of the system.
5. Provide drain valve with 1/2" fitting.

B. Motorized Mixing Chamber – UGSI ChemFeed

1. Mix polymer and water in a chamber designed to create sufficient mixing energy.
 - a. Provide a motor-driven impeller that will create high fluid shear for mixing polymer and water.
 - b. Taper mixing intensity as solution exits the initial shear zone and passes through a second zone, isolated by a baffle.
 - c. Design so polymer activation efficiency is consistent over the dilution water range.
2. Motor
 - a. Comply with Section 11 05 13.
 - b. Size: 1 HP maximum.
 - c. Constant speed, washdown duty motor.
 - d. Nominal Maximum speed: 3,450 rpm.
 - e. Direct-coupled to impeller shaft.

☒ C. Hydro-Mechanical Mixing Chamber – Velodyne

☒ 1. Mixing Chamber

- a. Capable of operating on source water pressure alone at 30 psi differential pressure, or independently of plant water pressure through a motor-driven stainless steel mechanical mixer. Design mixing impeller to produce both axial and radial flow and to induce high, non-damaging mixing energy over the full flow range.

- b. Mixer drive shaft: sealed by a mechanical seal with an integrally mounted and factory plumbed seal flushing valve. Provide a drain port in the mixing chamber to drain polymer solution in case of seal failure. The seal shall be easily accessible for replacement.

- c. Bearings: external to the mixing chamber.

☒ 2. Motor

- a. Comply with Section 11 05 13.
- b. Wash-down duty
- c. Speed: Variable. Provide SCR motor controller.
- d. Size: 1 HP maximum
- e. Nominal maximum speed: 1,750 rpm
- f. Direct-coupled to impeller shaft
- g. Provide mechanical shaft seal flushing gland

#40: Velodyne standard seal flush hardware will be provided without a valve.

#41: Velodyne standard motors will be supplied.

✓ D. Mixing Chamber Pressure Relief Valve

1. Range: 25 to 65 psi.
2. Stainless steel body with stainless steel, Viton and Teflon internals.

#42: Velodyne standard 1/2" brass PRV will be supplied.

✓ E. Neat polymer check valve

1. Design to isolate neat polymer from dilution water.
2. Design with an open, unobstructed path to the valve seat.
3. Valve body: Teflon or stainless steel.
4. Seals: Viton
5. Ball and spring: Stainless steel.
6. Make valve readily accessible for cleaning and easily disassembled.
7. Check valves that are installed inside the mixing chamber, or which require mixing chamber disassembly for servicing are not acceptable.

✓ F. Pressure gauges:

1. Use to monitor the dilution water inlet and diluted polymer solution pressures.
2. Liquid filled and of stainless steel construction.
3. Size: 2-1/2" face
4. Range:
 - a. Dilution Water: 0-100 psig
 - b. Diluted Polymer Solution: 0-60 psig

#43: To be supplied by FKC: Velodyne standard stainless steel/brass construction with 0-160 psi range.

✓ G. Dilution Water Control

1. Flow measurement: Rotameter-type flow meter or electronic flow sensor
 - a. Range: 0-10 gpm.
 - b. Provide unions on the inlet and outlet to allow easy removal for cleaning.
 - c. Metering tube: Cast acrylic
 - d. Internal components: Type 316 stainless steel
 - e. Fittings: PVC
2. Flow control: Provide flow control valve
3. Pressure reducing valve:
 - a. Provide stainless steel body PRV in dilution water line
 - b. Minimum output pressure range: 25 - 75 psig.
4. Loss-of-flow indication: Differential pressure switch.
 - a. Set to sense loss of dilution water flow.
 - b. Static working pressure: minimum 150 psi
 - c. Rating: NEMA 4X.
 - d. On loss of dilution water flow, place metering pump on standby; restart automatically when flow is restored.

#44: To be supplied by FKC: Velodyne standard range 0-20 gpm.

#45: To be supplied by FKC: McMaster Carr #45805K824 PRV 1-inch quick set, stainless steel body, EPDM diaphragm & seal, threaded (F)NPT connections, 20 to 90 psi, 5 psi incremental change by dial.

5. Provide electric solenoid valve for on/off control of total dilution water flow:

- a. Body: Stainless steel or brass
- b. Rating: NEMA 4X.
- c. Power: 120VAC
- d. ASCO RedHat 8210G or equal.



H. Neat Polymer Metering Pump

1. Pump

- a. Type: Positive displacement, progressing cavity, with 316 SS rotor and Viton stator.
- b. Priming: Do not require the pump to be modified for priming.
- c. Mount directly on skid.
- d. Pump output control: Provide local manual control using a potentiometer, and automatic control in response to a 4-20 mA flow signal.
- e. Power: 120 VAC.
- f. Provide loss-of-flow sensor. On low flow/loss of flow, shut down system and provide local and remote indication of alarm. Pressure switches or mechanical or reed type switches are not acceptable.

#46: FKC scope and pricing does NOT include a hand vacuum pump for priming.

- g. Provide a hand vacuum pump for priming.

2. Motor

- a. Washdown duty.
- b. Direct-couple motor and pump to a gear reducer.
- c. Provide one of the following:
 - 1) 1/2 HP, 0-90 volt TENV DC motor with variable speed provided by an SCR controller
 - 2) Type 2 motor per Section 11 05 13, with VFD

#47: See FKC previous comment #41.



I. Skid

- 1. Construct of 3/16" minimum Type 304 stainless steel angle or structural stainless steel tubing.
- 2. Do not use mild steel.
- 3. Sheet metal supporting the control panel: Minimum thickness of 12 gauge.
- 4. Gusset vertical frame members.
- 5. Pipe Supports: Stainless steel.
- 6. Design for forklift.
- 7. Drill for anchor bolt mounting to concrete pad.
- 8. Maximum Dimensions
 - a. Overall: 48" wide x 36" deep x 70" high.
 - b. Mount control panel in vertical position at 60" above pad.

#48: FKC scope and pricing includes the standard skid for Velodyne model VM-5P-1200-D-0-A-1. This includes this model's pipe supports and control panel vertical location, pipe clamps and fasteners.

See FKC previous comment on previous page.

9. Polymer pump suction: do not exceed 18" above pad.
10. Mount piping and valves with rigid pipe clamps. Fasteners required to mount components: Minimum 1/4-20 stainless steel.

✓ 2.05 PROCESS CONTROLS AND INSTRUMENTATION:

✓ A. Require manufacturer to design all electrical components including motor starters, switches, instrument devices, conduit, cable and other miscellaneous components.

✓ B. Control Panel

1. Provide relays, digital displays, switches and status lights for all operating units to indicate control of electrical equipment.
2. Enclosure: NEMA 4X, fiberglass

3. Equip with a main disconnect switch, lockable in the OFF position and provide with a door interlock feature which prevents the panel front door from being opened unless the disconnect switch is in the OFF position.

4. Operating Mode: Determined by the position of a LOCAL/OFF/REMOTE switch mounted on the control panel.

5. Provide contacts for confirmation of polymer feed pump's running status.

6. Provide local control:

a. Panel mounted ten-turn potentiometer knob or membrane keypad with increase/decrease push button, for controlling the neat polymer metering pump in LOCAL mode with digital display of polymer pump speed on panel.

b. Internal potentiometer, for controlling the mixing chamber speed.

7. Provide cable, conduit, conductors, and other electrical hardware per electrical specifications.

8. Switches and indicator lights: Allen Bradley series 800F or 800H, NEMA 4X. "Mini" LED indicator lights, toggle switches and residential light switches are not acceptable as control devices or indicators.

9. Provide terminal blocks for all skid mounted electrical components interconnected to control panel. Size for 14 ga. wires with and include terminal block numbers and legend, as manufactured by Entrelec or equal.

10. Use wire raceway and number wires with adhesive labels.

11. Control Devices

a. Fused type door mounted disconnect (required for 480 VAC or greater).

b. LOCAL - OFF - REMOTE switch with contacts to receive remote start/stop signal (dry contact) in "Remote" mode. Unit is manually powered in the "Local" mode.

c. HAND-OFF-AUTO switch for operating mode selection. In AUTO mode, control pump speed via 4-20 mA input signal.

d. Alarm reset Push-Button.

#49: FKC scope and pricing does not include any items listed in paragraph 2.05.B.3.

#50: FKC scope and pricing does not include contacts for confirmation of polymer pump's running status, only contacts for system running status.

#51: FKC scope and pricing does not include any items in paragraph 2.05.B.11.a or 2.05.B.11.d.

12. Indicators

#52: LCD displays polymer pump flow not speed.

- a. LCD display of polymer pump speed.
- b. Power ON indicator.
- c. Low differential pressure or loss of water alarm.
- d. Loss of polymer

13. Alarms

- a. Provide Loss of Polymer Flow Alarm, thermal sensor type. Place system on standby when loss of polymer flow occurs, and require manual restart. Provide 0 to 60 second time delay relay to prevent nuisance alarms from occurring.
- b. Provide Loss of Water Alarm, differential pressure type. Place system on standby on loss of dilution water, and restart automatically when flow is restored.

14. Inputs (signals by others):

- a. Accept 4-20 mA analog input signal to provide automatic polymer pump pacing in "Auto" mode.
- b. Accept a run/stop signal (discrete dry contacts) to turn pump on/off in "Remote" mode.

15. Outputs

- a. 4-20 mA output proportional to pump speed.
- b. System "Running" status output, dry contact.
- c. System in "Remote mode" status output, dry contact.

#53: FKC scope and pricing does not include any items listed in paragraph 2.05.B.15.a.



2.06 ACCESSORIES

A. Anchor Bolts

1. Comply with Section 05 50 01.
2. Calculations are required.
3. Minimum diameter: 1/2"

#67 FKC scope and pricing provides anchor bolt Structural PE Oregon calculations for the polymer blending unit, but does not include anchor bolts. Anchor bolts to be provided by others.

#54: FKC scope and pricing includes Qty (2) polymer tote mixers, McMaster Carr #1155N1 with propellers to fit through standard tote opening. Second folding propeller not included. McMaster Carr standard motor will be provided with standard finish coatings.

B. Polymer Tote Mixers

1. Provide two (2) adjustable bracket-mounted vertical tote mixers:
 - a. Size for IBC 330-gallon totes.
 - b. Motor: 1/2-horsepower, 115/230 VAC.
 - c. Provide 3/4-inch 316 stainless steel shaft.
 - d. 316 stainless steel propeller shall fold to fit through 2-inch tote opening, and open to 9-inch operating diameter.
 - e. Provide a second folding propeller for mounting along 3/4-inch shaft.
 - f. Include adjustable aluminum mounting brackets. Contractor to coordinate with Owner and mixer supplier to ensure appropriate mounting bracket for IBC tote style in use by Owner.

See FKC previous comment on previous page.

- g. Include standard 3-prong power cord of sufficient length for the installation as depicted in the Drawings.
- h. Manufacturer:
 - 1) Neptune Chemical Pump Co., Inc. Model RGT 1.0, with RGT-BKT mounting bracket.
 - 2) Or equal.

C.

Polymer Tote Heating Blankets

#55: BriskHeat supply inventory at time of bid was either out of stock or delayed. If delivery time prohibits use of Briskheat, then FKC will supply McMaster Carr parts #1819N1 and #3571K96 which do not include a built-in manual reset high-limit safety thermostat. McMaster Carr part numbers may also not meet delivery schedule and may arrive late without liquidated damages or penalty.

- 1. Provide two (2) adjustable tote heating blankets:
 - a. Size for IBC 330-gallon caged, plastic or metal totes.
 - b. Voltage: 120 VAC
 - c. Wattage: 1440 W
 - d. Provide two heat zones each with an adjustable thermostat: 50-160 degrees Fahrenheit.
 - e. Provide built-in manual reset high-limit safety thermostat for each heat zone set at 195 degrees Fahrenheit.
 - f. Attachment method: adjustable nylon straps with plastic or non-ferrous metal buckles.
 - g. Provide silicone impregnated cloth facing and liner.
 - h. Insulation: 1/4-inch fiberglass
 - i. Include opening for tote spigot.
 - j. Include separate insulated top cover. Top cover shall be removable from remainder of heating blanket to accommodate installation and removal of tote mixers.
 - k. Include standard 3-prong power cord of sufficient length for the installation as depicted in the Drawings.
 - l. Manufacturer:
 - 1) BriskHeat.
 - 2) Or equal.



D.

Spare Parts

- 1. Provide 1 set manufacturer's recommended spare parts, including but not limited to the following:
 - a. Solenoid valve.
 - b. Neat polymer metering pump mechanical seal and pump stator.
 - c. Mixing chamber o-rings.
 - d. Neat polymer check valve.



E.

Comply with Section 46 05 13.

#56: Motor and gearbox come with factory standard coating. All other non-stainless components (PVC, brass, etc.) do not have factory finish.



2.07 FABRICATION



A.

Factory assemble each pump, drive, and motor to its common base.

B.

Factory finish any non-stainless steel components. Comply with Section 09 96 00.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Align, connect, and install each unit as shown and in accordance with the manufacturer's written instructions.
- B. Provide factory-trained personnel to check installation and test initial operation.
- C. Certify installation and initial operation of all components using the appropriate forms included in Section 01 99 00.

3.02 FIELD QUALITY CONTROL

- A. Field quality control and inspections will be performed as specified in Section 46 76 27 and Section 01 81 00.
- B. Corrective Actions: Replace or repair work to eliminate defects, deficiencies and irregularities.

3.03 PERFORMANCE TESTING

A. General:

- 1. Following installation, field test polymer system per Section 46 76 27 and Section 01 81 00 to demonstrate compliance with performance requirements as specified.
- 2. Schedule testing 30 days in advance with the Construction Manager.
- 3. Include operation of new equipment with new control system.
- 4. Contractor: responsible for all labor, chemical, water, power and other costs associated with polymer system testing.
- 5. Empty and dry polymer system equipment and piping following successful testing and commissioning of associated control loops, and prior to pumping chemicals.

B. Water Tests:

- 1. Subject polymer system to a field test using water.
- 2. Test for two hours to demonstrate the mechanical and electrical integrity of the system.
- 3. Inability to successfully complete clean water tests in three tries because of problems directly caused by the polymer system will be considered cause for the Construction Manager to reject the equipment.

C. Polymer Test:

- 1. Repeat clean water test using polymer.

#57: FKC scope and supply only includes 1 tote of polymer. Chemical, water, power, and other costs are not covered by FKC.

#58: Water and polymer tests to occur within functional and/or operational testing in the field.

3.04 MANUFACTURER'S FIELD SERVICES

#59: FKC will be trained agent of manufacturer and polymer system training will be part of overall screw press dewatering training.

- A. Provide field inspection and instruction services by factory-trained technician or factor trained authorized agent of the manufacturer as specified in Section 46 76 27 and Section 01 81 00.
 - 1. Provide minimum 1 visit of 8 hours, excluding travel time, to inspect and test initial operation, and make necessary adjustments.
 - 2. Provide minimum 1 visit of 8 hours, excluding travel time, to train plant operators to operate and maintain of equipment items included in this Section.
- B. Complete and submit the following forms in Section 01 99 00:
 - 1. Manufacturers Installation Certification.
 - 2. Manufacturers Instruction Certification.

3.05 DEMONSTRATION

- A. Comply with Section 46 76 27 and Section 01 81 00.

END OF SECTION



Checkmark signifies FKC compliance with specification. A hashtag with a number (Example: #1) shows an FKC clarification or exception with description provided.

SECTION 40 78 00

PANEL MOUNTED EQUIPMENT



PART 1 - GENERAL



1.01 SECTION INCLUDES



- A. Requirements pertaining to the construction and installation of the control panels.



1.02 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



1.03 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 - 260000.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. Product Data

1. Pursuant to Section 01 33 00 -- Submittals.
2. Manufacturer's data including materials of construction, methods of installation and related information for each item specified in PART 2 PRODUCTS.

☒ D. 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. The CONTRACTOR shall obtain the Drawings for the control panel layout and schematic from the ENGINEER. The CONTRACTOR shall modify the Drawings as required for submittal and for as-built documentation. The CONTRACTOR shall not generate their own drawings.
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.
4. Drawings shall list the equipment number of the box, control panel, or center submitted.
5. Component designations shall match those shown on the Drawings.
6. Complete bills of materials shall be included with submittal.

☒ 1.04 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.

- ☒ 1.05 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.

☒ **PART 2 - PRODUCTS**

☒ 2.01 COMPONENTS

- ☒ A. Stainless Steel, NEMA 4X Enclosures (407800.E01).
1. Enclosures shall be provided as shown on the Drawings.
 2. Enclosures shall be provided with accessories as shown on the Drawings and as specified below.
 3. Enclosures in damp, wet, corrosive, or outdoor locations shall be: constructed of stainless steel (NEMA 4X) with zinc electroplated (galvanized) steel back-panel; continuous hinged with gasketed doors and screw down clamps.
 4. Provide manufacturer supplied swing-out deadfront door within the enclosure.
 5. Enclosures in outdoor locations shall be equipped with a hasp and staple for padlocking.
 6. Provide Hoffman enclosures, or approved equal.
- ☒ B. Panel Vents (407800.V01).
1. Panel Vents shall be provided as shown on the Drawings.
 2. Provide Hoffman number ANMV3, or approved equal.
- ☒ C. Enclosure Heater (407800.H17).
1. Enclosure heaters shall be provided as shown on the Drawings.
 2. Enclosure heaters shall operate on 115 VAC.
 3. Enclosure heaters shall be provided with integral mounted thermostats.
 4. For 100W heaters, provide Hoffman model DAH1001A, or approved equal.
 5. For 200W heaters, provide Hoffman model DAH2001A, or approved equal.
- ☒ D. Enclosure Lighting (407800.L01).
1. Enclosure lighting shall be provided as shown on the Drawings.
 2. Enclosure lighting shall be LED.
 3. Lamp shall be provided by CONTRACTOR.
 4. Enclosure lighting shall be operated via a remote door switch.
 5. Enclosure lighting shall be 115 VAC powered.
 6. Provide Hoffman model LEDA1S35 light with door switch, or approved equal.

#71: Power breaker provided in the FKC scope of supply and pricing will be Allen Bradley or Square D based on availability.

See above comment.

#72: MCPs provided in the FKC scope of supply and pricing will be Allen Bradley MCP..

E. 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.
10. Provide Eaton Cutler-Hammer type FAZ-NA, or approved equal.

F. 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. Provide Eaton Cutler-Hammer busbar catalog number Z-SV/UL-16/___-___/_, or approved equal.
2. Provide busbar shroud on all unused terminals. The shroud shall be the same manufacturer as the busbar.
3. Provide Eaton Cutler-Hammer busbar shroud catalog number ZV-BS-UL, or approved equal.
4. 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.
5. Provide Eaton Cutler-Hammer bus connector catalog number Z-EB/50/UL, or approved equal.

G. Motor Circuit Protector (407800.C05).

1. Motor circuit protectors shall be provided as shown on the Drawings.
2. Motor circuit protectors shall be energy-limiting and designed to interrupt and isolate electrical power to individual power circuits and components deriving power from the enclosure.
3. Motor circuit protectors shall be UL489 listed.

See above
comment.

4. Motor circuit protectors shall have the number of poles as indicated on the Drawings.
5. Motor circuit protectors shall have current interruption ratings of 10K RMS symmetrical amperes, minimum, with voltage ratings and current trip ratings as shown on the Drawings.
6. Motor circuit protectors shall have fast acting, normal and high inrush trip characteristics as dictated by the connected load.
7. Motor circuit protectors shall be panel mounted.
8. Motor circuit protectors shall include a positively trip-free mechanism that cannot be defeated by holding the handle in the ON position.
9. Motor circuit protectors shall be wire connected and include terminal lugs.
10. Provide Cutler-Hammer type HMCP, or approved equal.

#72: Relays
provided in
the FKC
scope of
supply and
pricing will
be 700H-
HK series.
DPDT based
on space
availability.

- H. Miniature "Ice Cube" Relays (24 VDC) (407800.R05).
1. Provide relays as shown on Drawings.
 2. Relays shall be industrial plug-in blade style with the on/off status indicated by either a neon or LED indicating light or by mechanical means.
 3. Relays shall be Form C contacts with a minimum of 4 poles and 7-amp contact rating.
 4. Relay coil voltage shall be 24VAC.
 5. Provide with DIN rail mounting screw terminal socket and retainer clips.
 6. Relay bases shall be of the same manufacturer as the relay.
 7. Provide Allen-Bradley p/n 700-HC24A24 relays, p/n 700-HN104 screw terminal sockets, and p/n 700-HN114 retainer clips, or approved equal.



- I. 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.
 - a. Relay bases shall be of the same manufacturer as the relay.
9. Provide Idec RTE Series, or approved equal.
- ☒ J. 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.
 6. Provide Ferraz-Shawmut type GGM, or approved equal.
- ☒ K. 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 switch contacts shall be rated at 10 Amps.
 6. Provide Allen-Bradley Bulletin 800T pilot devices (30mm, NEMA Type 4/4X/13), or approved equal.
- ☒ L. 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 switch contacts shall be rated at 10 Amps.
 6. Provide Allen-Bradley Bulletin 800T pilot devices (30mm, NEMA Type 4/4X/13), or approved equal.



M. Key Switches (407800.S03).

1. Key switches shall be provided as shown on the drawings.
2. Key switches shall be of round construction with rotary operators.
3. Key switches operation shall be to maintain the position turned to unless shown otherwise on the Drawings.
4. Key switches shall be provided with the number of contacts, switch positions, and other details as shown on the Drawings.
5. Key switch contacts shall be rated at 10 Amps.
6. Provide Allen-Bradley Bulletin 800T pilot devices (30mm, NEMA Type 4/4X/13), or approved equal.



N. Mushroom Style Pushbutton Switch (407800.S04).

1. Mushroom Style Pushbutton switches shall be provided as shown on the drawings.
2. Mushroom Style Pushbutton switches shall be of round construction with push or push-pull operators.
3. Mushroom Style Pushbutton switch operation shall be momentary or maintained as shown on the Drawings.
4. Mushroom Style Pushbutton switches shall be provided with the number of contacts, switch positions, and other details as shown on the Drawings.
5. Mushroom Style Pushbutton switch contacts shall be rated at 10 Amps.
6. Mushroom Style 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.
7. Provide Allen-Bradley Bulletin 800T pilot devices (30mm, NEMA Type 4/4X/13), or approved equal.



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. Indicator light contacts shall be rated at 10 Amps.
8. Provide Allen-Bradley Bulletin 800T pilot devices (30mm, NEMA Type 4/4X/13), or approved equal.



P. Speed Setpoint Potentiometer (407800.P20).

1. Speed potentiometers shall be provided as shown on the Drawings.
2. Speed potentiometers shall be of round construction.
3. Speed potentiometers operation shall be as shown on the Drawings.
4. Speed potentiometers shall be 10k-ohm.
5. Provide Allen-Bradley 800H-UR29, or approved equal.



Q. 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.
2. Provide a Phoenix Contact marker carrier model number UBE/D, or approved equal.

R. 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.
9. Provide Phoenix Contact model UK5N, or approved equal.

S. 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.

#73:
Terminals
provided
in FKC
scope of
supply and
pricing will
be
Phoenix
Contact
UT4

#74:
Ground
Terminals
provided
in FKC
scope of
supply
and
pricing
will be
Phoenix
Contact
UT4

#74:
Ground
Terminals
provided
in FKC
scope of
supply
and
pricing
will be
Phoenix
Contact
UT4

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.
8. Provide Phoenix Contact model USLKG5, or approved equal.

#75:
Fusible
terminal
blocks
provided
in FKC
scope of
supply
and
pricing
will be
Allen
Bradley
1492–
WFB
series.

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.
8. Provide Phoenix Contact model UK5 HESILED 24, or approved equal.

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.
8. Provide Phoenix Contact model UK5 HESILA 250, or approved equal.



V. 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.
4. Provide Brady, Panduit, or approved equal

#76:
Power
supply in
FKC scope
and
pricing
may be
Trio series
based on
availability.

W. Power Supply (407800.P02).

1. Power Supplies shall be provided as shown on the Drawings.
2. Power supplies shall operate on 85 to 264V AC / 45 to 65 Hz.
3. Power supplies shall withstand 300V AC short term voltage input.
4. Power supplies shall be rated for 500,000 hours MTBF, minimum.
5. Power supplies shall be rated for less than 15A inrush surge current.
6. Power supplies shall include an internal slow-blow fuse.
7. Power supplies shall include integrated varistors-based transient surge protection.
8. Power supplies shall be adjustable from 22.5 to 29.5V DC output.
9. Power supplies shall be rated for 5A DC output between -25 and 55 degrees Celsius.
10. Power supplies shall be capable of being connected in parallel for increased capacity.
11. Power supplies shall be current limited to 10A short circuit.
12. Power supplies shall be rated for less than 40mV phase to phase residual ripple.
13. Power supplies shall be rated for 3W power loss when idling.
14. Power supplies shall be rated for 14W power loss under nominal maximum load.
15. Power supplies shall include an LED to indicate DC power active.
16. Power supplies shall include a relay contact to indicate DC power active.
17. Power supplies shall be rated at 90% efficient, minimum.
18. Power supplies shall be designed for DIN rail mounting.
19. Power supplies shall be UL508 listed.
20. Provide Phoenix Contact model 2866750 QUINT-PS1/AC24/DC5, or approved equal.

#77:
Surge
Suppressor
in FKC
scope of
supply and
pricing will
be
Phoenix
Contact
2907918

X. 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 **See above comment.**
Classification of 400 VAC for normal/common mode no
4. Transient voltage surge suppressors shall include L-N, I 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.
7. Provide Sola model STV25K-10S, or approved equal.



Y. 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.
8. Provide Panduit Type F, Thomas & Betts Type NPW, or approved equal.



Z. 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.
9. Provide Panduit model SD(_)EMI, or approved equal.

- ☒ AA. 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.
 4. Provide Panduit, Thomas & Betts, or approved equal.
- ☒ BB. 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.
 5. Provide Panduit, Thomas & Betts, or approved equal.
- ☒ CC. 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.
 3. Provide Phoenix Contact model NS 35/7.5, Allen-Bradley model 199-DR1, or approved equal.
- ☒ DD. 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.
 5. Provide Cutler-Hammer model GBK21, GE model TKG42, Square D model PK27GTA, or approved equal.
- ☒ EE. 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.

- ☒ FF. 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.
 13. Category Ethernet patch cable shall be Belden Data Tuff Industrial Ethernet Cord Set E505 Series, or approved equal.

☒ **PART 3 - EXECUTION**

☒ 3.01 INSTALLERS

- ☒ A. All identification labeling shall be in compliance with Section 46 76 27 and all other project specifications.
- ☒ B. CONTRACTOR shall install and connect junction boxes and control panels and to field devices as shown on the Drawings.
- ☒ C. 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.
- ☒ D. Individual conductors and cables shall be grouped together and routed through plastic wire ducts mounted on the backpanel surface.
- ☒ E. Bond each enclosure back-panel to the grounding electrode system with a # 8 AWG copper conductor.
- ☒ F. 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.

☒ 3.02 SOURCE QUALITY CONTROL

☒ A. Tests and Inspections

1. All equipment shall be tested prior to site delivery. All equipment shall be field tested prior to commissioning. CONTRACTOR shall notify the ENGINEER 14 days prior to commencement of field testing.
2. CONTRACTOR-developed test forms shall accompany the notification of testing.
 - a. Test forms shall list all field connections at terminal strips and all internal logic circuits, along with the method planned for simulation of field conditions to test these connections and circuits.
3. All analog instrument loops shall be tested using an analog signal generator by applying the appropriate control signal to the field termination terminal strip.
 - a. At a minimum, analog instrument tests shall be made at 0%, 25%, 50%, 75%, and 100% of maximum control signal.
 - b. Additional analog instrument tests shall be made as appropriate.
4. All digital control circuits shall be tested by: applying the appropriate control voltage to the field termination terminal strip when externally supplied; using a jumper at the field termination terminal strip when internally supplied; or, if applicable, at an internal panel connection point when field terminations are not used.

☒ B. Verification of Performance

1. Device functions shall be observed by the ENGINEER, to determine satisfactory operation of the device and connected circuit continuity, prior to shipment.

☒ 3.03 FIELD QUALITY CONTROL

☒ A. Site Tests, Inspection

1. CONTRACTOR shall install, calibrate and test, all systems prior to notifying ENGINEER of witness testing verification.
2. The ENGINEER shall systematically verify the process control system is operating as designed. The CONTRACTOR shall perform the tasks necessary to confirm proper operation to the ENGINEER.

END OF SECTION

Attachment A – Passivation Techniques

FKC Uses 4 methods for passivation of stainless steel members. The best method is selected based on component type and environmental conditions.

1. **Acid Bath:** A tank of nitric acid is used to immerse the component for a set period of time. After immersion, the component is rinsed with high pressure cold water.
2. **Pickle Paste:** A pickling paste, a mixture of hydrofluoric and nitric acids, is used on larger structural stainless steel members to passivate welds. Pickle paste is applied to the affected surface. The paste dissolves the oxide layer exposing the chromium rich stainless steel. The paste is removed with high pressure cold water. The chromium then naturally produces a thin layer of chromium oxide that protects the stainless steel from corrosion.
3. **Electro-Chemical Passivation:** Electro-chemical passivation is used on sheet metal parts to passivate welds. An electrical current is used with a nitric acid solution to remove oxide layer and expose the chromium rich stainless steel. The solution is removed with water. The chromium then naturally produces a thin layer of chromium oxide that protects the stainless steel from corrosion.
4. **Abrasives Weld Cleaning.** Abrasive weld cleaning is used on small welds or weld with a heavy oxide layer. Stainless steel wire brushed, abrasive pad or disk may be used as required. The mechanical removal of surface oxides exposes the chromium rich stainless steel. The chromium then naturally produces a thin layer of chromium oxide that protects the stainless steel from corrosion.

EXTENDED WARRANTY FORM (For Equipment, Material, Process)

Extended Warranty For: Screw Press Dewatering Equipment
Specification Section No: 46 76 27
Product Manufacturer: FKC Co., Ltd.
Project: Mahler WRF Improvements
Location: City of Sweet Home, Oregon

We hereby guarantee the Screw Press Dewatering Equipment that we have constructed for a period of 24 months from delivery or 18 months after startup, whichever comes first year(s), ~~as specified in the Section noted above,~~ from Date TBD, the date of acceptance of the work/substantial completion and the assumption of occupancy and beneficial use by delivery or startup to the City of Sweet Home, Oregon.

The following are excluded from the provisions of this warranty:

Coating Systems – coating systems will have warranty of 24 months from delivery or 18 months after startup, whichever comes first.

FKC warrants the equipment supplied per Section 46 76 27 including screw press, flocculation tank, polymer blending unit, control panel, instrumentation, skid and instrumentation for a period of 24 months from delivery or 18 months after startup, whichever comes first

FKC offers a 10-year Extended Mechanical Warranty which includes all the mechanical components of the dewatering screw press. The Extended Mechanical Warranty shall be for 10 years after start-up. The following mechanical items on the screw press will be covered by this warranty:

1. All screw shaft bearings and seals.
2. Screens and drums on the screw press.
3. The screw shaft, shell, and flights, i.e. the entire screw.
4. The Sumitomo Cyclo drive reducer.
5. Screw press base, inlet stand, and discharge box.

This Extended Mechanical Warranty requires that the WWTP staff document that the equipment is lubricated according to the Manufacturer's recommendations as follows.

- a. The screw shaft bearings will be lubricated per the FKC supplied O&M manual.
- b. The Sumitomo Cyclo drive reducer will have the recommended oil and the oil will be changed as specified in the Sumitomo maintenance manual.

This Extended Mechanical Warranty does not cover the following items:

- a. Flocculation tank, polymer blending unit, valves, piping, pipe fittings, conduit, conduit fittings and skid.
- b. Control Panel, motors, field instrumentation, power control, logic control, or any other electronic components.
- c. Routine maintenance such as lubrication, washing & cleaning, and periodic dismantling (once or twice in the ten-year period) for screw inspection and screw flight to screen clearance adjustment.
- d. Painting and coating systems.
- e. Corrosion caused by the sludge being processed or the local environmental conditions.
- f. Damage due to:
 - 1) Large foreign objects (wood, metal, rocks, etc.) getting into the screw press.
 - 2) Processing any material not conforming to the original design specification the unit was purchased under, this includes but is not limited to 100% primary sludge, 100% septic tank sludge, sludge with a high grit content that exceeds 50% non-volatile solids content, etc.

We agree that if any of the equipment, material, or process designated for Screw Press Dewatering Equipment should fail due to any reason other than improper maintenance or improper operation, or should any portion of the work fail to fulfill any of the requirements of the Specifications, we will, within ten days after written notice of such defects, commence to repair or replace the same together with any other work which may be damaged or displaced in so doing.

In the event of our failure to comply with the above-mentioned conditions within a reasonable time after being notified, or should exigent circumstances require repairs or replacements to be made before we can be notified or respond to notification, we do hereby authorize the Name of Owner to proceed to have the defect repaired and made good at our expense, and we will pay the cost therefor upon demand.

The warranty provided herein shall not be in lieu of but shall be in addition to any warranties or other obligations otherwise imposed by the Contract Documents and by law.

Manufacturer: FKC Co., Ltd.

Contractor:

Signed: ___ To be signed with written agreement _____ Signed:

Title: Vice President

Title: _____

Date: TBD

Date: _____

Phone: (360) 452-9472 x104

Phone: _____

E-mail: tbohman@fkcscrewpress.com

E-mail: _____

**EXAMPLE
ONLY**

EXTENDED WARRANTY FORM
(For Equipment, Material, Process)

Extended Warranty For: Shaftless Screw Conveyors
Specification Section No: 41 12 13
Product Manufacturer: FKC Co., Ltd.
Project: Mahler WRF Improvements
Location: City of Sweet Home, Oregon

We hereby guarantee the Shaftless Screw Conveyors that we have constructed for a period of three year(s), as specified in the Section noted above, from Date TBD, the date of acceptance of the work/substantial completion and the assumption of occupancy and beneficial use by delivery to the City of Sweet Home, Oregon.

The following are excluded from the provisions of this warranty:

Coating Systems – coating systems will have warranty of 24 months from delivery or 18 months after startup, whichever comes first.

We agree that if any liner or spiral of the equipment, material, or process designated for Shaftless Screw Conveyors should have excessive wear as defined in paragraphs 1.07.2.a & 1.07.3.a of Section 46 76 27, fail due to any reason other than improper maintenance or improper operation, or should any portion of the work fail to fulfill any of the requirements of the Specifications, we will, within ten days after written notice of such defects, commence to repair or replace the same together with any other work which may be damaged or displaced in so doing.

We also agree that if any of the equipment, material, or process designated for Shaftless Screw Conveyors should fail due to any reason other than improper maintenance or improper operation, or should any portion of the work fail to fulfill any of the requirements of the Specifications, we will, within ten days after written notice of such defects, commence to repair or replace the same together with any other work which may be damaged or displaced in so doing.

In the event of our failure to comply with the above-mentioned conditions within a reasonable time after being notified, or should exigent circumstances require repairs or replacements to be made before we can be notified or respond to notification, we do hereby authorize the City of Sweet Home, Oregon to proceed to have the defect repaired and made good at our expense, and we will pay the cost therefor upon demand.

The warranty provided herein shall not be in lieu of but shall be in addition to any warranties or other obligations otherwise imposed by the Contract Documents and by law.

Manufacturer: FKC Co., Ltd.

Contractor: _____

Signed: To be signed with written agreement _____ Signed: _____

Title: Vice President

Title: _____

Date: TBD

Date: _____

Phone: (360) 452-9472 x104

Phone: _____

E-mail: tbohman@fkcscrewpress.com

E-mail: _____

**EXAMPLE
ONLY**

EXTENDED WARRANTY FORM
(For Equipment, Material, Process)

Extended Warranty For: Polymer Blending Unit
Specification Section No: 46 33 33
Product Manufacturer: FKC Co., Ltd.
Project: Mahler WRF Improvements
Location: City of Sweet Home, Oregon

We hereby guarantee the Polymer Blending Unit that we have constructed for a period of 24 months from delivery or 18 months after startup, whichever comes first year(s), as specified in the Section noted above, from Date TBD, the date of acceptance of the work/substantial completion and the assumption of occupancy and beneficial use by delivery or startup to the City of Sweet Home, Oregon.

The following are excluded from the provisions of this warranty:

None.

We agree that if any liner or spiral of the equipment, material, or process designated for Shaftless Screw Conveyors should have excessive wear as defined in paragraphs 1.07.2.a & 1.07.3.a of Section 46 76 27, fail due to any reason other than improper maintenance or improper operation, or should any portion of the work fail to fulfill any of the requirements of the Specifications, we will, within ten days after written notice of such defects, commence to repair or replace the same together with any other work which may be damaged or displaced in so doing.

We also agree that if any of the equipment, material, or process designated for Shaftless Screw Conveyors should fail due to any reason other than improper maintenance or improper operation, or should any portion of the work fail to fulfill any of the requirements of the Specifications, we will, within ten days after written notice of such defects, commence to repair or replace the same together with any other work which may be damaged or displaced in so doing.

In the event of our failure to comply with the above-mentioned conditions within a reasonable time after being notified, or should exigent circumstances require repairs or replacements to be made before we can be notified or respond to notification, we do hereby authorize the City of Sweet Home, Oregon to proceed to have the defect repaired and made good at our expense, and we will pay the cost therefor upon demand.

The warranty provided herein shall not be in lieu of but shall be in addition to any warranties or other obligations otherwise imposed by the Contract Documents and by law.

Manufacturer: FKC Co., Ltd.

Contractor: _____

Signed: __To be signed with written agreement on _____

Signed _____

Title: Vice President

Title: _____

Date: TBD

Date: _____

Phone: (360) 452-9472 x104

Phone: _____

E-mail: tbohman@fkcscrewpress.com

E-mail: _____

**EXAMPLE
ONLY**

SCADA

PLC

FKC assumes this is PLC on dewatering skid

Note: OK in future cable change

Display on HMI

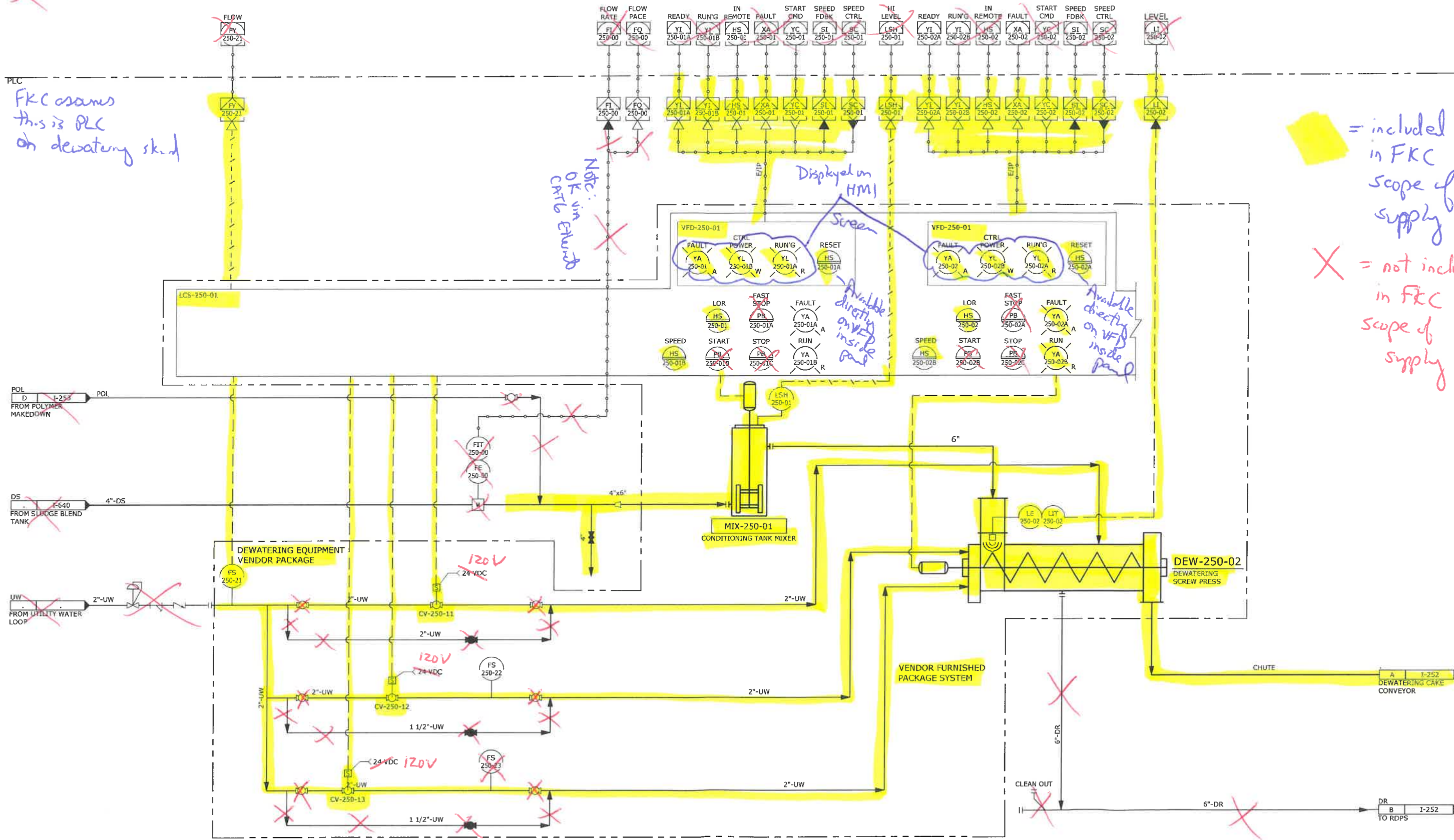
Screen

Available directly on VFD inside panel

Available directly on VFD inside panel

= included in FKC scope of supply

X = not included in FKC scope of supply



I-251.dwg 12/15/2022 8:56 AM AARON

| NO. | DATE | BY | REVISION |
|-----|------|----|----------|
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|--|----------|
| NOTICE | MB |
| 0 1/2 1 | DESIGNED |
| IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE | AT |
| | DRAWN |
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| | CHECKED |

PRELIMINARY ONLY
DO NOT USE FOR CONSTRUCTION

SEPT 2022

West Yost
www.westyost.com



MAHLER WATER RECLAMATION FACILITY IMPROVEMENT PROJECT

SOLIDS DEWATERING 1

PROJECT NO.: 936-50-21-09 SCALE: AS SHOWN DATE: SEPTEMBER 2022

SHEET

I-251

- of ###

SCADA

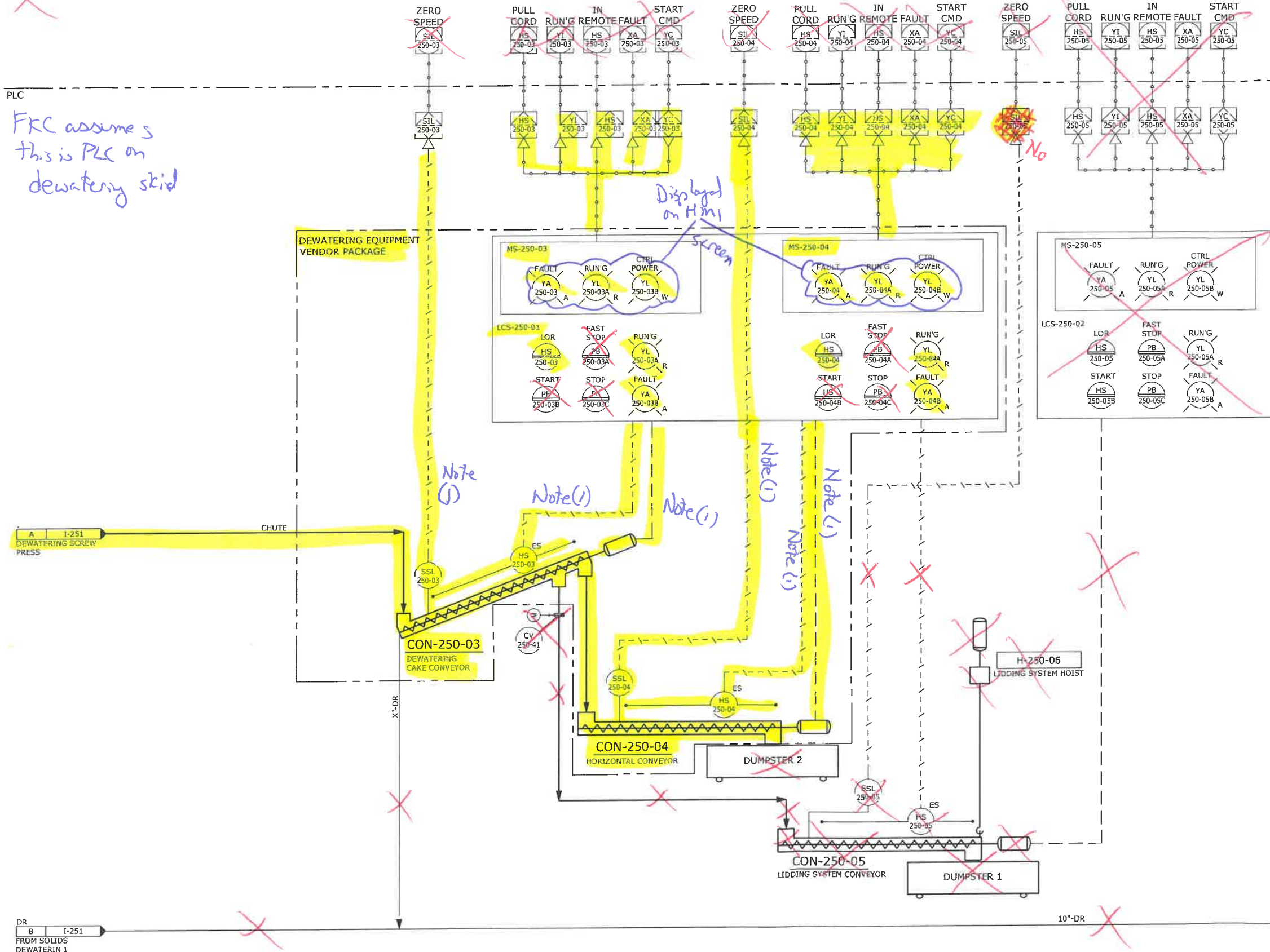
PLC

FKC assumes
this is PLC on
dewatering skid

= included in
FKC scope
of supply

X = not included
in FKC scope
of supply

Note (1)
Contractor to
make connections
to junction box
on skid.



I-252.dwg I-252 12/15/2022 9:16 AM AARON

DR B I-251
FROM SOLIDS
DEWATERIN 1

DR I-130
TO DRAIN

| NO. | DATE | BY | REVISION |
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NOTICE
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IF THIS BAR DOES
NOT MEASURE 1"
THEN DRAWING IS
NOT TO SCALE

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DESIGNED
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CHECKED

PRELIMINARY ONLY
DO NOT USE FOR CONSTRUCTION
SEPT 2022
West Yost
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WEST YOST
Water. Engineered.



MAHLER WATER
RECLAMATION FACILITY
IMPROVEMENT PROJECT

SOLIDS DEWATERING 2

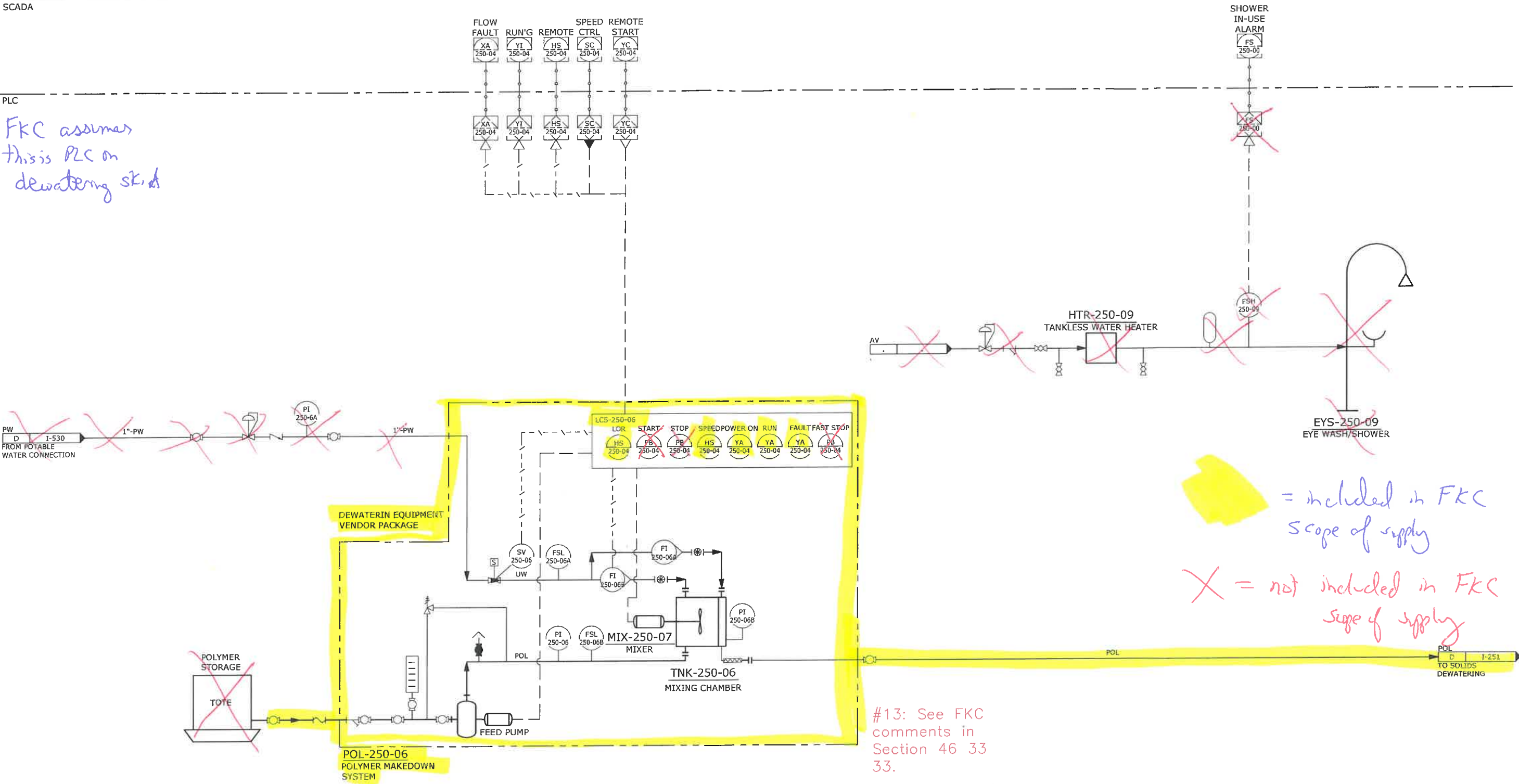
SHEET
I-252
- of ###

PROJECT NO.: 936-50-21-09 SCALE: AS SHOWN DATE: SEPTEMBER 2022

SCADA

PLC

FKC assumes
this is PLC on
dewatering skid



= included in FKC
scope of supply

X = not included in FKC
scope of supply

#13: See FKC
comments in
Section 46 33
33.

I-253.dwg I-253 12/6/2022 3:00 PM AARON

| NO. | DATE | BY | REVISION |
|-----|------|----|----------|
| | | | |
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NOTICE

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

MB
DESIGNED
AT
DRAWN
WJS
CHECKED

PRELIMINARY ONLY
DO NOT USE FOR CONSTRUCTION

SEPT 2022

West Yost
www.WESTYOST.COM



MAHLER WATER
RECLAMATION FACILITY
IMPROVEMENT PROJECT

| | | | |
|---------------------------|-----------------|----------------------|--|
| POLYMER MAKEDOWN | | | |
| PROJECT NO.: 936-50-21-09 | SCALE: AS SHOWN | DATE: SEPTEMBER 2022 | |

SHEET

I-253

- of ###