THE CITY OF DAYTONA BEACH
OFFICE OF THE PURCHASING AGENT

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ADDENDUM NO. 3

DATE: **January 25, 2019**

PROJECT: **ITB 19202**
BIOSOLIDS DEWATERING EQUIPMENT PURCHASE AT WESTSIDE REGIONAL WASTEWATER TREATMENT PLANT

OPENING DATE: **January 31, 2019**

This addendum is hereby incorporated into the Request for Proposal for the project referenced above. The following items are clarifications, corrections, additions, deletions and/or revisions to and shall take precedence over the original documents. Additions are indicated by underlining, deletions are indicated by ~~strikethrough.~~

1. Bidders on the above-named project are hereby notified that the Bidding Documents are modified as indicated by this addendum.

2. All other terms and conditions remain the same.

Proposers shall acknowledge receipt of this addendum on Page BID PROPOSAL LETTER-3.

The City of Daytona Beach

Joanne Flick, CPPO, CPPB
Purchasing Agent

THE CITY OF DAYTONA BEACH
DAYTONA BEACH, FL

WESTSIDE REGIONAL WATER RECLAMATION FACILITY DEWATERING SYSTEM IMPROVEMENTS

BID NO. 19202

ADDENDUM NO. 3
TO THE
CONTRACT DOCUMENTS

JANUARY 24, 2019

SUDHANVA PARANJAPE
LICENSE
No 64472
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

CA #8571

This item has been electronically signed and sealed by Sudhanva Paranjape on the date adjacent to the seal using a SHA authentication code.

Printed copies of this document are not considered signed and sealed and the SHA authentication code must be verified on any electronic copies.

200 EAST ROBINSON STREET, SUITE 1400 • ORLANDO, FLORIDA 32801 • P. 407.478.4642 • F. 407.478.4643

Bidders on the above-named project are hereby notified that the Bidding Documents are modified as indicated below. Bidders are required to acknowledge receipt of this Addendum in the space provided on the Document 00410 Bid Form.

This Addendum shall become part of the Contract and provisions of the Contract apply.

SPECIFICATIONS

The following sections are modified as indicated below.

1. SECTION 11362 - BELT FILTER PRESS:
    a. Replace spec section in its entirety with the attached.

CLARIFICATIONS

Question - Is the PCP-DW panel to be included in our scope? This was originally in the system integrator's scope. If so, the specified CompactLogix PLC for the LCP panel is fine. But a Compactlogix won't handle all the I/O in the PCP. It will need to be a ControlLogix processor to handle the increased I/O. Please comment if the PCP panel is to be included and if it is modify the spec to ControlLogix.

Answer - The PCP-DW panel is included in the BFP manufacturer's scope of supply. Due to duplicate I/O points between BFP local control panel and BFP master control panel, some I/O points associated with individual BFP will only be connected to the associated BFP local control panel. The BFP master control panel I/O list in specification 11362 is updated to eliminate the duplicate I/O points. See attached revised specification 11362, 2.18.D. Compactlogix PLC will be able to handle the updated I/O points. Controllogix PLC is not needed.

This Addendum No. 3, pages 1 through 2, shall become part of the Contract and all provisions of the Contract shall apply thereto.

The time provided for completion of the Contract is not changed.

Bidders shall acknowledge receipt of all Addenda by number in the space provided in the Proposal.

CAROLLO ENGINEERS, INC.

Sudhanva Paranjape, P.E.

<u>Attachments:</u>
Section 11362

SECTION REPLACED IN ITS ENTIRETY[AD3]

SECTION 11362

BELT FILTER PRESS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Requirements for belt filter press (BFP) systems for dewatering waste activated sludge complete with auxiliary equipment, and control panels.

B. The BFP MANUFACTURER shall furnish the BFPs and assume the full responsibility of coordinating with the manufacturers of the shaftless screw conveyors, and the polymer blending units for all instrumentation, controls and integration of programming.

C. The BFP MANUFACTURERS as listed in this specification section shall provide complete dewatering belt filter press systems including two (2) dewatering BFP units. The two (2) units will be installed by the Installing Contractor at the Westside Regional Water Reclamation Facility (WRF) under a separate contract.

D. The BFP MANUFACTURERS as listed in this specification section shall provide associated BFP local control panel (LCP) and BFP master control panel (PCP-DW) as shown on Instrumentation drawings and as describes in this specification. Refer to Instrumentation communication block diagram for anticipated network connection between belt filter press LCP's, conveyor control panels, and a BFP master control panel (PCP-DW).

E. Related sections:
1. Section 01010 - Summary of Work.
2. Section 01330 - Submittal Procedures.
3. Section 01600 - Product Requirements.
4. Section 01756 - Testing, Training, and Facility Start-Up.
5. Section 01782 - Operation and Maintenance Data.
6. Section 11246 - Polymer Blending Units.
7. Section 14555 - Shaftless Screw Conveyors.
8. Division 15 - Mechanical.
9. Division 16 - Electrical.
10. Division 17 - Instrumentation and Control.

F. Tag numbers:
1. WR-BFP-01 - Dewatering BFP No. 1.
2. WR-BFP-02 - Dewatering BFP No. 2.
3. WR-BFP-03 - Dewatering BFP No. 3 (Future).
4. WR-BFP-04 - Dewatering BFP No. 4 (Future).
5. LCP-BFP1 - BFP#1 Local Control Panel.
6. LCP-BFP2 - BFP#2 Local Control Panel.
7. LCP-BFP3 - BFP#3 Local Control Panel (Future).
8. LCP-BFP4- BFP#4 Local Control Panel (Future).

9. PCP-DW - BFP Master Control Panel.

1.02 REFERENCES

A. American Bearing Manufacturer's Association (ABMA):
   1. 11 - Load Ratings and Fatigue Life for Roller Bearings.

B. American Society of Mechanical Engineers (ASME):
   1. B36.19 - Stainless Steel Pipe.

C. ASTM International (ASTM):
   1. A36 - Standard Specification for Carbon Structural Steel.
   2. A48 - Standard Specification for Gray Iron Castings.
   3. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   4. A242 - Standard Specification for High-Strength Low-Alloy Structural Steel.
   5. A276 - Standard Specification for Stainless Steel Bars and Shapes.
   6. A312 - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
   7. A320 - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for Low-Temperature Service.
   8. A519 - Standard Specification for Seamless Carbon and Alloy Steel Mechanical Tubing.
   9. D394 - Method of Test for Abrasion Resistance of Rubber Compounds.
   10. D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
   11. D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
   12. D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
   13. D638 - Standard Test Method for Tensile Properties of Plastics.
   14. D785 - Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials.
   15. D789 - Standard Test Methods for Determination of Solution Viscosities of Polyamide (PA).
   16. D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
   17. D2240 - Standard Test Method for Rubber Property-Durometer Hardness.
   18. D2294 - Standard Test Method for Creep Properties of Adhesives in Shear by Tension Loading (Metal-to-Metal).
   19. D2632 - Standard Test Method for Rubber Property—Resilience by Vertical Rebound.
   20. D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.

D. International Organization for Standardization (ISO).

E. National Electrical Manufacturers Association (NEMA):
   1. 250 - Enclosures for Electrical Equipment (1000 V Maximum).

F. Society for Protective Coatings (SSPC):
   1. 10 - Near-White Blast Cleaning.

G. Underwriters Laboratories, Inc. (UL).

1.03 DEFINITIONS

A. NEMA Type 4X enclosure in accordance with NEMA 250.

1.04 SYSTEM DESCRIPTION

A. Description of sludge to be fed to belt press:
   1. Type of sludge: Waste activated sludge from 5-stage Bardenpho process.
   2. Feed solids: 0.5 to 1.0 percent.
   3. Volatile suspended solids: 78 to 85 percent.
   4. pH range: 5 - 8 with normal pH range of 6.5 to 7.5.
   5. Sludge temperature: 50 to 95 degrees F with normal range of 65-75 degrees Fahrenheit.
   6. Suitable for sludge containing the following trace compounds: Hydrogen sulfide, nitrogen, carbon dioxide, and methane gas.
   7. Operation: Designed to operate continuously.

B. Performance requirements: As a minimum, each belt filter press shall be capable of operating at the following conditions with piping, pumping, and auxiliary systems rated for a higher hydraulic capacity when operating in accordance with project conditions and under normal sludge feed conditions specified above.

Hydraulic feed rate (sludge only) Maximum Design Minimum	 425 gallons per minute (@ 0.6 percent inlet solids concentration) 275 gallons per minute (@ 0.6 percent inlet solids concentration) 200 gallons per minute (@ 0.6 percent inlet solids concentration)
Solids feed rate Maximum Design Minimum	 1,410 lbs/hour at inlet solids of 0.6% 840 lbs/hour at inlet solids of 0.6% 580 lbs/hour at inlet solids of 0.6%
Belt washwater	120 gpm
Belt washwater pressure	120 psi minimum
Active polymer dosage	Maximum 30 pounds polymer/ton dry solids of the polymer currently used by the Owner. Coordinate with the Owner for polymer selection and optimization.
Belt life	2,000 hours of operation minimum
Minimum Percent Dry Solids	16 - 18.0
Solids capture	Minimum 95 percent

C. The belt filter press shall have the maximum dimensions, 117 inches high, 268 inches long, and 142 inches wide. The overall static weight of the belt filter press shall not exceed 30,000 pounds so as to minimize installation and civil work.

D. The minimum clearance requirements specified herein shall not relieve the BFP MANUFACTURER and the installing Contractor from allowing additional clearances for the proper installation, operation, and maintenance of the units. The Contract Drawings show a general layout. BFP MANUFACTURER shall be fully responsible to take field measurements and coordinate with the Installing Contractor before fabrication of the BFPs to prepare a proper layout to provide sufficient access for operation and maintenance.

1.05 SUBMITTALS

A. Submit as specified in Section 01330 - Submittal Procedures.

B. Product data: As specified in Section 15050 - Common Work Results for Mechanical Equipment.

C. Shop drawings: As specified in Section 15050 - Common Work Results for Mechanical Equipment:
   1. Submit “draft” standard shop drawings within 30 days of award of the contract.
   2. Include additional details on belt filter press, conveyors, polymer blending units, motors, gear drives, hydraulic system, control panel layouts, schematic wiring diagrams and interconnections wiring diagrams, interconnecting piping, pipe supports, and size and length of each support frame member.
   3. Details of the discharge deflection plate including dimensions and details for operator access to and operation of the scraper blades.

D. Calculations: As specified in Section 15050 - Common Work Results for Mechanical Equipment:
   1. Structural anchor points to concrete foundation.
   2. Distribution of stresses through belt filter press frame.
   3. Seismic loads on frame and anchor bolts.
   4. Member deflection.
   5. Maximum roller deflection.
   6. Roller bearing compliance bearing life requirement at maximum loading, based on ABMA/ISO capacity formula.
   7. Roller factor of safety calculations at maximum loading conditions.
   8. Roller maximum deflection calculations at maximum loading conditions.

E. Vendor operation and maintenance manuals: As specified in Section 01782 - Operating and Maintenance Data.

F. Quality assurance submittals:
   1. Resume of technician for start-up and training services.
   2. BFP MANUFACTURER's references.

G. Electrical drawings showing the belt filter press unit wiring, routing of conduits at the unit, and locations of all unit mounted electrical and instrumentation equipment, motors, and terminal junction boxes. Include termination wiring diagram identifying manufacturer terminations and customer terminations for power, signal and control.

H. Schematic process & Instrumentation diagram of actual system to be supplied.

I. Software and Programming:
   1. Provide electronic copy of the PLC program (operating software) and all software used to program the master BFP PLC, and all non-PLC software (all proprietary software as applicable).
   2. Provide hard copies or electronic pdf files of all programming and parameters stored within the PLC.
   3. Control logic descriptions and narrative for the intended operation of the supplied unit and the actual PLC program to be loaded into the master BFP PLC panel.
   4. Coordinate with Owner and submit HMI (Human Machine Interface) screen captures for Owner/Engineer approval and incorporate Owner/Engineer's comments.

J. Commissioning submittals:
   1. Provide Manufacturer's Certificate of Source Testing as specified in Section 01756 - Commissioning.
   2. Provide Manufacturer's Certificate of Installation and Functionality Compliance as specified in Section 01756 - Commissioning.
   3. Provide training course materials.

1.06 PATENTS

A. The BFP MANUFACTURER shall warrant that the use of this system and its equipment, in the process for which the system has been expressly designed, will not infringe any U.S. or foreign patents or patents pending. In the event of any claim of infringement the manufacturer shall defend and indemnify the owner free from any liabilities associated with the use of the patented equipment or process.

B. The BFP MANUFACTURER shall grant to the owner, in perpetuity, a paid-up license to use any inventions covered by patent or patents pending, owned, or controlled by the manufacturer in the operation of the facility being constructed in conjunction with the equipment supplied under this contract, but without the right to grant sublicenses.

1.07 DELIVERY, SHIPPING, AND HANDLING

A. BFP MANUFACTURER shall coordinate delivery, shipping and handling, field dimensions and coordination with the installing Contractor and Owner. The BFP MANUFACTURER shall deliver the BFPs at agreed upon dates with the installing Contractor and Owner. BFP MANUFACTURER shall request the construction schedule from the Installing Contractor after the Contractor receives the Notice-to-Proceed (NTP) from the OWNER for the construction of dewatering system improvements. BFP MANUFACTURER shall request the equipment delivery schedule confirmation at a minimum 60 days in advance and another at a minimum 15 days in advance of shipping the unit(s). BFP MANUFACTURER shall provide the installing Contractor all necessary information to proper handling of the delivery and storage of the equipment and any assembly required on-site as necessary before installation.

B. A tentative schedule for the delivery of the equipment is described below. It should be noted that the final delivery of these units will vary and actual dates shall be coordinated with the Owner and installing Contractor:

1. Westside Regional WRF - Delivery of two (2) BFP units on or before October, 2019.

C. Also see as specified in Section 15050.

1.08 SCHEDULE AND SEQUENCING

A. Coordinate with Installing Contractor and Owner for work restrictions, scheduling constraints, and sequencing requirements.

1.09 WARRANTY

A. General:
   1. BFP MANUFACTURER shall supervise any disassembly of the shipped units and reassembly of the units in place inside the dewatering building by the installing Contractor (as applicable). Coordinate with installing Contractor on this.
   2. BFP MANUFACTURER shall assume full responsibility for proper installation of all equipment and provide complete warranty of the equipment and parts as described below.

B. The following warranties shall be for each BFP:
   1. Provide a standard warranty of 12 months from substantial completion (beneficial use), unless otherwise noted for individual components below.
   2. Frame and coating:
      a. Warrant for 5 years to be free of manufacturing defects without preventative maintenance.
      b. Defects or corrosion occurring within the 5 years to the frame shall be repaired or replaced by BFP MANUFACTURER at no cost to the Owner.
   3. Belt life:
      a. Warrant belt life for a minimum of 2,000 hours of continuous operation at the rated design conditions.
      b. Minimum belt life shall cover wear and belt damage due to defects in the manufacture of the press or any of its components.
      c. Belts not meeting the running hour minimum shall be replaced at no charge; running time begins the date of project acceptance or date of first beneficial use excluding testing and start-up use.
   4. Performance:
      a. Warrant press performance as specified.
      b. Presses not meeting the specified performance shall provide additional belt designs or shall modify the press as necessary until the specified performance level is reached at no additional cost to the Owner.
   5. Bearings:
      a. Warrant the bearings for 3 years from substantial completion.
      b. Warranty shall include all parts and labor for repairing or replacing bearings that fail during the warranty period providing the Owner has properly lubricated the bearing.

1.10 SPARE PARTS AND SPECIAL TOOLS

A. Deliver spare parts in a crate to the Owner. Include the following for the BFPs:
   1. 1 set of filter belts guaranteed for 2,000 hours operating life for each press supplied:

a. Provide same spare belts as supplied with the presses.
2. A complete set doctor blade (or discharge blade).
3. 1 set of special tools and jacking tools for maintenance and belt replacement.
4. 2 complete sets of sludge guides and rubber seals for the gravity and wedge zone.
5. 1 set of washwater box seals and edge seals.
6. Metric to English pipe coupling adapter for each metric drain pipe installed.
7. Seals on drive unit.
8. Oil filter screen for the hydraulic power unit for each press supplied.

PART 2 PRODUCTS.

2.01 MANUFACTURERS

A. One of the following for the BFPs:
1. BDP Industries 2.0 m 3DP.
2. Alfa Laval G3 200 Klampress 3 Belt.
3. Andritz SMX-S8.
4. Approved Equal.

B. For manufacturers to be considered as “Approved Equal”, submit all documentation to the Owner as per Specification 01600, Section 1.05.E.

C. Naming of the model number above does not relieve the BFP MANUFACTURER from meeting the details of manufacturing requirements within this specification.

D. For other equipment (Polymer Blending Units) and Conveyors, see specifications Sections 11246 and 14555 respectively.

E. The BFP MANUFACTURER shall take the lead on providing system responsibility for a completed dewatering equipment and handling system.

2.02 MATERIALS

A. Frame: ASTM A36 steel, galvanized after fabrication in accordance with ASTM A123 (hot dipped galvanized), galvanizing process shall apply zinc at a minimum thickness of 4 to 7 mils.

B. Drain trays: ASTM A242, Type 316 stainless steel, minimum 14 gauge.

C. Internal piping: Schedule 80 polyvinyl chloride or ASTM A312, Type 316, schedule 10S stainless steel.

D. Spray header housing: ASTM A242, Type 316L stainless steel, minimum 14 gauge.

E. Belt wash spray tube: ASTM A312, Type 316 stainless steel pipe, schedule 10S.

F. Belt wash spray nozzles: Flat non-clog ASTM A276, Type 316 stainless steel.

G. Belt wash piping: Schedule 80 PVC.

H. In-line venturi mixer: Flanged ASTM A276, Type 316 stainless steel housing.

I. Polymer injection device: Flanged ultra-high molecular weight polyethylene injection ring and splitter manifold.

J. Belt filter cloth: Seamed and fabricated of monofilament polyester twill.

K. Belt seam closures: ASTM A276, Type 316 stainless steel.

L. Rollers (solid):
   1. ASTM A36 carbon steel, or ASTM A519 tubing, minimum 1/2 inch wall thickness with 3/4-inch end plates.
   2. Drive rollers coated with minimum 1/4-inch thick Buna-N rubber.
   3. Other solid rollers coated with 25 mils minimum of thermoplastic nylon or 1/4-inch minimum of Buna-N rubber.

M. Rollers (perforated): ASTM A242, A276, or A312, Type 316 stainless steel, minimum 10 gauge wall thickness.

N. Inlet distribution assembly: ASTM A242, Type 316 stainless steel, minimum 10 gauge.

O. Side skirts: ASTM A242, Type 316 stainless steel, minimum 14 gauge with replaceable rubber or urethane seals.

P. Plows: ASTM A242, Type 316 stainless steel holders or galvanized cast iron holders with ultra-high molecular weight polyethylene (UHMW) blades.

Q. Plow rods: ASTM A276, Type 316 stainless steel.

R. Belt support grid: ASTM A242, Type 316 stainless steel grid (10 gauge minimum) with replaceable ultra-high molecular weight polyethylene (UHMW) wear bars.

S. Belt support within wedge zone: ASTM A242, Type 316 stainless steel grid with replaceable ultra-high molecular weight (UHMW) wear bars or carbon steel hot-dip galvanized frame with UHMW polyethylene wear plates or ASTM A320 Type 316 stainless steel frame with perforated polyethylene sheets.

T. Doctor blades: Ultra high molecular weight high-density polyethylene.

U. Discharge deflection plate: ASTM A242, Type 316 stainless steel, and minimum 1/8-inch thick or 10 gauge.

V. Anchor bolts and miscellaneous hardware, including bolts, nuts, washers, and fastener clips: ASTM A320, Type 316 stainless steel.

W. Non-listed miscellaneous equipment: ASTM A242 or A276, Type 316 stainless steel, nylon coated.

X. Bearing housings: ASTM A48 Class 30 cast iron.

Y. Structural steel plates: ASTM A36 steel, minimum 1/4-inch thick, galvanized after fabrication in accordance with ASTM A123, galvanizing process shall apply zinc at a minimum thickness of 4 to 7 mils.

Z. Electrical junction boxes (all electrical enclosures): NEMA Type 4X, Type 316 stainless steel or FRP.

AA. Electrical conduit: Rigid steel, PVC coated.

BB. Hydraulic cylinders:
   1. Body: FRP tube with high strength glass filled nylon head.
   2. Rod: ASTM A 242, Type 316 stainless steel with stainless steel tie rods, teflon seals, and graphite bearing.

CC. Roller shafts: Forged steel ASTM 572 Grade 50.

DD. Doctor blades: UHMW polyethylene.

EE. Hydraulic tubing: Type 316 stainless steel rigid tubing.

FF. Note: All carbon steel surfaces to be hot dip galvanized in accordance with ASTM A123 at a minimum thickness of 3.9 mils.

2.03 GENERAL REQUIREMENTS

A. Each belt filter press shall be a complete prefabricated unit of at least a sludge conditioning system, a gravity drainage section, a pressure section, a belt alignment and tensioning system, and a belt washing system.

B. Each belt filter press shall have a minimum effective dewatering width of 2.0 meters with 3 dewatering zones; gravity dewatering zone, wedge zone, and the pressure/shear section zone.

C. Effective dewatering width: Belt area in contact with sludge performing a dewatering function.

D. Belt replacement: Design system to allow belt replacement without disassembly of machine components or changes to belt pressure or alignment settings.

2.04 STRUCTURAL

A. Framework:
   1. Designed to withstand operating (belt tension of 50 pounds per lineal inch, belt speed 5 meters per minute) and static loads without deformation or vibration during operation and without exceeding specified maximum deflection with the following minimum factor of safety of < 5.0:
      a. Maximum load shall be based upon the summation of forces applied to the frame including but not limited to roller and bearing mass forces and tension forces.
   2. Welded or bolted construction. No field welding of members allowed.
   3. Framework surface shall be prepared for hot-dipped galvanizing in accordance with SSPC-SP-8 (pickling method) after fabrication. Galvanizing process shall apply zinc at a minimum thickness of 3.9 mils in accordance with ASTM A 123.
   4. Provide permanent lifting lugs.
   5. Load bearing members in the high pressure dewatering section:
      a. Wide flange beams with minimum moment of inertia of 53 inches to the fourth power in the principal load-bearing direction.

b. Beams shall be a minimum flange thickness of 1/2 inch minimum web thickness of 5/16 inch.

6. Cross members: Minimum of 3 cross members each with a minimum moment of inertia of 3.01 inches to the fourth power.
7. Maximum stress in all frame members: Not more than 1/5 of the structural member's yield strength.
8. Maximum deflection in each structural member: Not more than L/480 where L equals span length.

2.05 DRAINAGE

A. Drain pans: General:
1. Provide drainage pans and piping to collect and discharge filtrate from the gravity dewatering and pressure/shear dewatering sections.
2. Extend drain pans minimum of 3 inches beyond the belt width on both sides.
3. Provide minimum of 2-inch high sides all around the drain pans.
4. Provide minimum 6-inch diameter flanged connection at low point for drainage piping.
5. Drain piping connection: Standard NPS American schedule pipe per ASME B36.19.
6. Drain connections: Self-venting with flushing connections for cleaning.
7. Drainage pan location shall not interfere with the moving belts and shall be rigidly connected to press frame.

B. Drain pan under the entire length of the gravity zone:
1. Drainage pan(s) and discharge pipes: Designed to withdraw a minimum of 375 gallons per minute without overflowing.
2. Designed to prevent discharge of filtrate along the wedge zone.
3. Gravity drainage piping combined into 1 common pipe which shall extend to allow for hard piping into a common drain line.
   a. Drain line shall be extended to within 3 inches of the floor of the sump.

C. Drain pan(s) in wedge and pressure zones:
1. Interconnected and designed to allow for hard piping into a common drain line:
   a. Drain line shall be extended to within 3 inches of the floor of the sump.

D. Spray wash enclosure drain lines:
1. Drain lines from each spray wash enclosure separated from drainage pan piping and interconnected into a common drain line:
   a. Drain line shall be extended to within 3 inches of the floor of the sump.

2.06 BELT WASH SYSTEMS

A. Manufacturers: The following or equal:
1. Appleton Manufacturing, Menasha Corp., Menasha, WI.

B. Design belt wash water system to use water with the following characteristics:
1. Available washwater: Non-chlorinated, UV disinfected, plant reuse water.
2. Minimum pressure available at the connection to the press washwater piping in accordance with specified performance requirements specified in this Section.
3. Maximum pressure available at the connection to the press washwater piping: 120 pounds per square inch gauge.

4. Solids content: Up to 50 milligrams per liter of suspended solids.
5. Each belt press shall be provided with a 1-1/2 inch PVC connection for belt washing.

C. Components:
1. Upper and lower belt wash systems positioned so that washing is performed after the cake has been discharged from the belt.
2. Pressure regulating valve: Sized to provide flow and pressure required for the belt wash system with inlet pressures as specified above.
3. Nozzles: Replaceable, designed with a built in hand wheel operated stainless steel brush to provide cleaning action without disassembly; handwheel to extend to outside of press so brush can be operated without interruption of the belt press operation able to wash either side of the belt.
4. Spray header housing:
   a. Totally enclose the belt extending the full width of the belt plus 2 inches on either side.
   b. Replaceable double rubber or nylon brush seals provided where the belt enters and exits the housing to eliminate spray in the work area.
   c. Easily removable.
5. Spray piping and nozzles:
   a. Braced and of sufficient pressure rating to withstand pressure caused by sudden valve closure.
   b. Spray pattern overlaps at the belt surface.
6. Provide a motor operated ball valve or solenoid valve that operates the washwater system as specified.
7. Low water pressure switch: Adjustable, provided to shut down the belt press and actuate alarm on the local control panel on low washwater pressure.

2.07 FILTER BELTS

A. Belt filter cloth:
1. Split type continuous belt design.
2. Fixed edges along belt operating surface: Chamfered.
3. Belt sides: Provide 1 inch wide protective resin coating.
4. Minimum effective belt width: 2.0 meters.
5. Minimum belt life: 2,000 operating hours.
6. Minimum overall belt width: 2.2 meters.

B. Belt seams:
1. Repairable and easily replaceable.
2. Connecting splice: designed for a minimum tensile strength equal to 5 times the normal maximum dynamic tension to which the belt is subjected.
3. Seam designed to fail before the belt and constructed of Type 316 stainless steel.
4. Seam designed not to interfere with doctor blades or any other equipment.

C. Belt selection:
1. As recommended by the BFP MANUFACTURER obtained from experience testing the sludge during start-up and as required to meet specifications:
   a. The supplier shall test a minimum of 2 belts.

2.08 ROLLER AND DRUM ASSEMBLIES

A. General:
   1. Provide three distinct dewatering zones, independent gravity zone, wedge compression zone and high pressure-dewatering zone. Each zone shall at a minimum have the specified minimum filtration area or working area. Independent gravity zone 92 feet square, the wedge zone 94 feet square and the high pressure zone 108 feet square.
   2. Provide minimum 24-inch diameter perforated drum followed by a 16" diameter perforated roll immediately following the wedge compression zone.
      a. Perforations shall have a minimum diameter of 1 inch.
   3. Following the perforated roller, the belts shall travel through a series of rollers as determined by the BFP MANUFACTURER.

B. Rollers:
   1. Construction:
      a. Continuous shaft or double separated plate stub end shaft type with stub end shafts and roller heads welded in place.
      b. Bolted-in-place stub end roller shafts are unacceptable.
   2. Minimum safety factor for the bending stress of the roller shafts at maximum loading as specified:
      a. 5.0 for the pressure zone and drive rollers.
      b. 5.0 for non-drive rollers and other rollers not in the pressure zone.
   3. Maximum loading: Based on the maximum summation of all forces applied to the roller including the forces exerted by the tension of the belts from the belt drive and belt tensioning devices (minimum of 200 pounds per lineal inch of belt width), friction forces, sludge and equipment loads, drive torque, and roller mass forces.
   4. Maximum roller deflection at maximum loading 0.05 inches at roller center:
      a. Calculations shall include roller diameter and lengths, all shaft diameters and lengths, wall thickness, and degree of belt wrap.
   5. Rollers machined to ensure total concentricity.
   6. Pressure section roller shafts:
      a. Minimum shaft diameter inside the roller: 5.0 inches.
      b. Minimum shaft diameter inside the bearing journal: 2.95 inches.
   7. Perforated roller: Fitted with internal vanes to direct filtrate water to outlet ports at each end of the roller, to prevent re-wetting of the downstream cake.

C. Roller surface preparation:
   1. Mechanical pipe sandblasted per steel structures painting council SSSP-10.
   2. Outside diameter tolerance to within 0.02 inch concentricity.
   3. End plate thickness minimum 1-inch at contact with inside diameter of roller.
   4. End plates welded to roller.
   5. Following lathing process, minimum roller wall thickness shall be 0.5 inches.
   6. All roller surfaces free of pits, blemishes, depressions, and ridges.

D. Roller coatings:
   1. Drive rollers coated with minimum 1/4-inch thick vulcanized Buna-N rubber coating with a rubber hardness of Shore A 90-95.
   2. Rollers other than drive rollers: Coated with a minimum 1/4-inch thick Buna-N or 25-mil thick coating of “Rilsan” nylon.
   3. Buna-N coating properties:

Test	Value
Hardness (Shore A) (ASTM D676)	90
Hardness (Shore A) Vulcanized Buna-N	90-95
Tensile Strength (psi) (ASTM D412)	2,500
Tear Strength (pli) (ASTM D624)	250
Elongation (%) (ASTM D412)	160
Taber Wear Index (ASTM D394)	064
Resilience (%) (ASTM D2632)	17
Coefficient of friction	1-.4
Specific Gravity (water = 1.0)	1.31
Coefficient of Expansion (in/in/degree Fahrenheit)	$40x10^{-6}$

4. “Rilsan” nylon coating properties:

Test	Conditions	Value
Shore D Hardness (ASTM D2240)	20 degrees C	77
Hardness Persoz (AFNORT 30-016)	Pendulum 20 degrees C	190
Specific Gravity (ASTM D792)	R Scale, 20 degrees C	1.06-1.20
Rockwell Hardness (ASTM D785)	20 degrees C, 20 sec. under load	106
Surface Hardness (DIN 53-456)	Clemen Apparatus	80 N/sq mm
Scratch Resistance (0.44 mm thickness)		59 N
Shear Strength (D 732)	RT & 45 degrees F	35 - 42 N/sq mm
Impact Resistance (ASTM D2294)		160 in-lbs
Elongation (ASTM D638)		15%
Abrasion Resistance (ASTM D4060)		8-18 mg wt loss
Coefficient of friction	Measured at thickness	0.10 - 0.30
Tensile Strength (ASTM D638)		6,000 psi
Inflammability greater than 3 mm (ASTM D635)		Self-extinguishing
Melting Point (ASTM D789)		370 degrees F

5. All rollers shall be coated up to the point of insertion into the bearing block, or shall have shafts and heads of Type 316 stainless steel.

2.09 BEARINGS

A. Roller bearings:
   1. All rollers supported by externally mounted, self-aligning spherical roller bearings in sealed, splashproof, and grease lubricated horizontal split case pillow block housings.
   2. Bearings: Attached to turned, ground, and polished shaft journals on the rollers by direct mounting using an interference fit.
   3. Minimum bearing L-10 life: 600,000 hours at minimum belt speed of 5 meters per minute and belt tension of 50 pounds per inch. L-10 life calculated in accordance with ABMA 11 shall be based on the summation of all forces applied to the bearings including roller mass forces, belt tension, and drive torque on the rollers.
   4. Bearings: Series 222 spherical bearings with minimum self-alignment capability of plus or minus 3/8 of a degree and mounted in expansion and non-expansion pillow block housings.
   5. Lubrication: Required no more than every 6 months.
   6. Bearing shall be press fit to the roller shaft.

B. Steering roller bearings:
   1. Bearings: Non-self-aligning cylindrical roller bearings in pivot mounted pillow block housings.

C. Bearing housings:
   1. Housing: ASTM A48 Class 30 cast iron with minimum of 4 Type 316 stainless steel cap bolts and 2 mounting bolts.
   2. Housings cleaned, iron phosphated, and coated with a heat-treated thermoplastic nylon or Buna-N coating as specified with a minimum thickness of 8 - 12 mils.
   3. Located centrally on the structural beams with 2 mounting bolts on each side of the web.
   4. Outer side of the bearing housings: Solid without end caps or filler plugs.

D. Bearing lubrication:
   1. Bearing lubrication shall be performed through Monel® or Type 316 stainless steel buttonhead grease fittings.
   2. All bearings shall be greasable while unit is in operation.

2.10 DEWATERING ZONES

A. Gravity dewatering zone:
   1. General:
      a. Minimum effective area of the gravity section shall be 88 square feet.
   2. Components:
      a. Inlet distribution assembly:
         1) Distribute sludge evenly through a chute or distribution head box onto the horizontal section of the belt press with minimal turbulence at maximum hydraulic loading as specified in this Section.
         2) Provide adjustable baffles or similar devices to uniformly distribute the sludge feed across the entire working width of the filter belt.
      b. Number of plows: Minimum of 7 rows distanced laterally across the filter belt.

c. Plastic row of plows provided with single lifting handle:
   1) Plows shall pivot to clear obstructions and move in either lateral direction to prevent belt seam damage.
   2) Plows designed to allow 1 inch vertical obstruction on the belt to pass under the plows without damage to the belt or plow with the plow able to return to its original position.
d. Side skirts: Provide side skirts with replaceable seals along both sides of the belt to contain sludge on the belt.
e. Belt support grid: Minimum 2 inches wider than the width of the belt spaced at a minimum of 2-1/2 inches.
f. Wear strips: Designed to be removable and replaceable.
g. Note: Vacuum assisted, inclined gravity section or gravity section that requires a separate belt drive motor are not acceptable.
h. The independent gravity section shall be provided with hydraulic tension and tracking system as specified in this specification. Manual tensioning or tracking systems will not be acceptable.

B. Wedge dewatering zone:
   1. General:
      a. Minimum effective filtration area of the wedge zone shall be 28 square feet (measured on one belt only).
      b. Wedge zone:
         1) Low pressure dewatering stage provided to gradually increase the filtration force on the cake for dewatering without leakage of sludge cake.
         2) Zone consists of a wedge shaped section in which the 2 pressure belts carrying the sludge are gradually converged to form a cloth/cake sandwich.
         3) Wedge angle shall be adjustable between 1 and 6 inches while the belt press is in operation.
      c. Splash guards: Provide to contain leakage from the wedge stage inside the belt press frame.
      d. No extrusion or spillage of sludge is allowed over solids and hydraulic loadings as specified.
      e. Maximum deflection: 0.06 inches at 2 pounds per square inch wedge pressure at mid-span.

C. Pressure/shear section:
   1. General:
      a. Minimum effective working belt area of pressure/shear stage shall be 187 square feet.
      b. Effective working belt area: Effective width times the belt length in actual contact with the rollers.
      c. Pressure/shear section consisting of a minimum of 8 rollers developing an “S” shaped pattern of belt travel with decreasing diameter rollers toward the cake discharge.
      d. Pressure zone configuration: Able to remove filtrate from the sludge cake without rewetting the downstream cake.
      e. No extrusion or spilling of sludge is allowed from the belt within the pressure/shear stage.
      f. Sludge subjected to incremental increases in pressure without an increase in belt tension as sludge travels over decreasing diameter rollers.

g. The use of impervious belts or nip rollers to apply external pressure to the sludge shall not be considered acceptable.

2.11 DOCTOR BLADES AND DEFLECTOR PLATE

A. General: Provide doctor blades and discharge deflector plate to assist the separation of cake from the belt at the point of cake discharge.

B. Doctor blades:
   1. Doctor blades:
      a. Minimum length equal to length of roller.
      b. Blades replaceable.
      c. Provide lifting handle to allow quick release of the doctor blade from the belt for inspection and servicing.
   2. Blades with adjustable counter-weighted or spring tensioned on the ends of the doctor blade to allow adjustment of the force of the doctor blade against the belt.

C. Deflector plate:
   1. If necessary to access scraper blades, provide discharge deflection plate hinged to the belt press frame on both ends to allow rotation up and designed with positive clasps to hold the deflection plate in the up and down positions.

2.12 BELT TRACKING AND TENSIONING SYSTEMS

A. General:
   1. Provide automatic belt tracking and tensioning systems using hydraulic control systems:
      a. Belt tension shall be infinitely variable up to 50 pounds per inch.
   2. Hydraulic piping:
      a. Type 316 stainless steel with a design working pressure 1.25 times the operating pressure, rigidly anchored to the belt press frame.
      b. All lines sized according to use and operating pressure with a conservative factor of safety by equipment manufacturer.
   3. Furnish sufficient piping for installation between the hydraulic unit or the air compressor unit and the connection to the belt press with locations indicated on the Drawings.
   4. Hydraulic systems: Include pumps, motor starters, reservoirs, motors, gauges, filter, oil level sight glasses, temperature gauge, valves, low/high pressure sensors, piping, and controls for system operation.

B. Belt tracking system:
   1. Automatic sensing devices: Continuously monitors the position of the belt by use of a spring-loaded arm fitted with a ceramic plate which rides on the edge of the belt or a rubber covered roll situated across the machine's width.
   2. Alignment roller: Continuously adjusts the belt position to keep the belt within the belt track.
   3. Designed to smoothly adjust belt position without sharp, sudden movements of the belt or alignment roller.
   4. Provide on each side of the belt filter press in NEMA Type 4X enclosures to detect malfunctioning of the tracking system:
      a. Switches shall close on belt misalignment or over travel and shall shut down the press as specified with the controls.

b. The use of electric servos or systems which utilize devices that maintain alignment by a large snap action are not acceptable.

C. Belt tensioning system:
1. Automatic sensing devices: Continuously monitor the tension of the belt shall be hydraulic actuated.
2. Each belt shall be provided with a belt tensioning system. The belt tensioning system shall be hydraulically actuated. The design of the tensioning system shall be such that the dewatering pressure is directly proportional to belt tension and that adjustments in the tension shall result in immediate changes in dewatering pressure. Manual tensioning systems are not acceptable.
3. Each belt tensioning shall be furnished with an individual control station such that independent adjustment for each belt is possible. The control stations shall incorporate an on/off selector, calibrated pressure regulating valve and a pressure gauge to indicate actual operating pressure on each system.
4. Tension roller: Continuously adjusts to maintain a preset tension under varying dewatering sludge thicknesses.
5. Capable of tensioning the belts to 50 pounds force per lineal inch of belt width.
6. Limit switches: Provide manual adjustment to belt tensioning which can operate without stopping the belt press.
7. Design tension rollers such that the dewatering pressure is directly proportional to the belt tension and that adjustments in tension shall result in immediate changes in dewatering pressure.
8. Belt tensioning accomplished through parallel and simultaneous movement of the tension rollers.
9. Tension rollers to have a pressure ram or piston on each end of the roller with mechanisms to ensure parallel and simultaneous movement of the tension rollers.
10. Pressure gauge or similar device shall be provided to indicate belt tension in pounds per linear inch:
    a. Indicate normal operating range on the gauge.
11. Designed to accommodate a minimum of 2.5 percent increase in belt length.
12. Provide sensor able to detect belt breakage and signal an alarm to the local control panel to shut down the belt press.
13. Each belt shall be provided with a belt tensioning system:
    a. Manual or electro servo tensioning systems are not acceptable.

2.13 HYDRAULIC SYSTEM

A. General: Each belt filter press system shall be provided with a dedicated hydraulic power system to provide pressurized oil for the steering and tensioning.

B. Hydraulic system:
1. Unit shall consist of appropriately sized oil reservoir (316 SS), variable-displacement pressure compensated hydraulic oil pump and drive motor, oil filters, pressure switches and gauges, piping, valves, and other components required for a complete steering and tensioning system for each belt filter press.
2. The pump, motor, reservoir, oil filter, and valves shall be mounted directly to the belt filter press frame. Alternatively, the hydraulic unit shall be mounted away from the press with a minimum ½ inch 316 SS tubing connecting the

hydraulic unit to the press. Hydraulic systems schematics and catalog cuts must be included in the equipment bid package.

3. Pressurized lines shall be 316 SS tubing and shall be rigidly supported on the structural frame of the press.
4. Hydraulic reservoir shall be made of 316 SS and include a 316L stainless steel drain valve to allow for draining to the hydraulic oil.
5. Reservoir and legs or base: Type 316 stainless steel.
6. Provide a variable displacement pressure compensated hydraulic pump with directly connected TEFC electric motor:
   a. Reservoir capacity shall be 2 gallons or as applicable.
7. Provide fill, drain, clean out, and level gauge connections in each reservoir.
8. System to include oil strainer and line valves, pressure reducing valves, pressure gauge, flow control valves, hydraulic oil, and appurtenances.
9. Hydraulic pump motor:
   a. Minimum 1 horsepower, maximum speed 1,200 revolutions per minute with motor starter mounted in the local control panel.
   b. Motor shall not exceed noise level of 70 dBA.
10. Provide air cooled heat exchanger if necessary to prevent hydraulic fluid temperature from exceeding 140 degrees Fahrenheit.
11. Piping and valves: Minimum 1/4 inch size.
12. Provide pressure gauges at each point of application of hydraulic oil to the belt tracking and tensioning system.
13. Hydraulic tubing: Type 316 stainless steel.
14. All hydraulic devices including hydraulic cylinders and micro torque tracking devices connected by hydraulic tubing to a single manifold mounted on each press frame.
15. Provide a high and a low-pressure switch on hydraulic system to actuate an alarm at the press local control panel and shut down the press on high or low hydraulic pressure as specified with the controls.
16. All hydraulic components rated for maximum system operating pressure of 1,000 pounds per square inch.
17. Hydraulic system controls shall be grouped for easy access and ease of operation.
18. There shall be means provided to retract the belt tension cylinders for service.

2.14 EMERGENCY STOP TRIP CORDS

A. Provide an emergency stop trip cord around each press with a switch mounted in a NEMA Type 4X enclosure. The switch shall be factory pre-wired to the control/signal terminal junction box. The switch shall have two contacts – one shall be connected to the associated BFP local control panel.

2.15 BELT PRESS DRIVE UNIT

A. Variable speed drive units for each drive will be provided by Division 16 Installing Contractor and not part of the BFP supplier's scope:
   1. Speeds shall be adjustable while the machine is running.
   2. Variable frequency drive will be provided in the MCC line-up by Division 16 Installing Contractor and not part of the BFP supplier's scope. MCC will be located in the new Electrical room.

B. Electric motor shall be premium efficiency type drive unit meeting the requirements as specified in Section 16405 - Electric Motors:
   1. Manufacturers: The following or equal:
      a. Eurodrive.
      b. Baldor

C. Variable frequency drives to be provided by Division 16 Installing Contractor will meet the requirements as specified in Section 16485 - Variable Frequency Drives 0.50 - 50 Horsepower:
   1. Variable frequency drive controls both motors wired in parallel so that rotational timing at the 2 drive rollers is controlled and frequency is matched, unless the Belt Filter Press Manufacturer is controlling drive rollers differently.

D. Drive unit:
   1. Helical bevel right angle gearshaft mounted gear reducer totally enclosed with all gears running in oil and all drive chains and sprockets completely enclosed in a housing.
   2. AC motor mounting to be C face.

E. Safety guards: Type 316 stainless steel meeting the requirements as specified in Section 15050 - Common Work Results for Mechanical Equipment.

F. Drive data:
   1. Quantity per machine: 2.
   2. Variable speed driven:
      a. Output speed: 0 to 7.50 revolutions per minute.
      b. Belt speed: 0 to 19 feet per minute minimum.
      c. AGMA HO Rating (input): 4.64.
      d. Service factor: Minimum 1.5.
      e. Service rating: AGMA Class II.
   3. Motor data:
      a. Quantity per machine: 2 (Ashbrook) 2 (Andritz).
   4. Horsepower: Minimum 3 horsepower.
   5. Power requirements: 460 volts, 3 phase, 60 hertz.
   6. Maximum speed: 1,800 revolutions per minute.
   7. NEMA design: B.
   8. Ambient temperature: 40 degrees Celsius.
   9. Insulation class: F.
   10. Full load amps: 4.45
   11. Service factor: 1.15.
   12. Rated for continuous duty.
   13. Enclosure: TEFC, mill and chemical severe duty.

2.16 BELT FILTER PRESS LOCAL CONTROL PANEL

A. Enclosures:
   1. NEMA Type 4X, Type 316 stainless steel panel.
   2. Panel suitable for mounting free standing as shown on drawings.
   3. Panels shall be free-standing vertical panels as specified in Section 17000 - Control Systems: Panels, Enclosures, and Panel Components modified to meet the above specification.

4. Panel shall be U.L. listed and shall be assembled in a U.L. listed facility. Panel shall have a UL label affix to the panel.
5. Provide a minimum of one LED light strip inside each panel that shall turn on when the door is opened. Provide and limit switch to active the interior light.
6. Panels shall come with enough room to allow for construction of all planned mechanical equipment as shown in the Drawings without the need to construct or enlarge any future panel space (with the exception of the local control panels).

B. Each belt filter press local control panel shall be prewired and tested with terminal strips for external wiring connections and shall have the following:
   1. 120 VAC, 60 hertz, 1 phase power input.
   2. Main disconnect circuit breaker.
   3. Each belt filter press local control panel shall have a remote I/O (input/output) system and RIO system shall meet the requirements as specified in Section 17000 - Control Systems: There are no ”or equal“ substitutions allowed:
      a. Allen-Bradley Compactlogix PLC (5370-L33ER) family remote I/O system including power supply, Ethernet communication module, discrete input, discrete output, analog input, analog output modules, etc.
      b. Furnish and install fiber optic patch panel, Ethernet switch, Panelview touchscreen HMI, power supply, surge suppressors, terminal blocks, wireways, wirings, etc. as needed for a complete and functional belt filter press local control panels.
      c. Furnish and install UPS (minimum size of 550VA) with bypass switch in each BFP local control panel.
   4. Alarm horn and strobe alarm light: LED alarm light on top of the local control panel to illuminate on any alarm condition with silence/reset buttons.
   5. LED Lights, pushbuttons, and switches as specified in this Section.
   6. Allen-Bradley Panelview Plus 6 graphic terminal, minimum 10.4 inch shall be provided on each belt filter press local control panel. Refer to Section 17000 for additional requirements. Panelview shall be mounted to the front of the belt filter press local control panel and operator shall be able to operate without needing to open the panel.
   7. Refer to Section 17000 for wiring, wiring marking, terminal blocks, fuse, surge protection device (SPD), surge arrestors, and other accessories requirements.

C. Each belt filter press control system shall be in accordance with requirements specified:
   1. The local control panel design will allow local manual operation or remote automatic operation of the BFPs. Furnish all necessary selector switches, E-stop mushroom type button, LED indication lights, push buttons, etc. for manual operation of the BFP and as listed in this specification and as shown on Instrumentation drawings (N-series drawings).
   2. The local control panel shall accept hard-wired I/O points as shown on Instrumentation drawings (N-series drawings). If additional I/O points are needed by BFP system such as pull cord trip signal, E-stop signal, etc. shall be included in the local control panel I/O system.

D. Each belt filter press local control panel shall have the following control and LED indication lights located on the front of the control panel:
   1. MANUAL/OFF/AUTO selector switch.

2. Control power ON/OFF switch and LED indicator light.
3. Emergency stop pushbutton (Red mushroom type).
4. Belt press system alarm horn and strobe indication light.
5. Alarm silence pushbutton.

E. Located on the front of the control panel shall be a control power ON/OFF switch:
1. When in the ON position, the control power ON pilot light will be illuminated and control power shall be distributed to the control system.
2. When in the OFF position, the control system shall be held de-energized.
3. Also located on the control panel shall be an emergency stop pushbutton.
4. It shall be an illuminated mushroom head style pushbutton that when depressed shall immediately de-energize all moving equipment in the system.
5. An alarm horn shall be included for audible alarm annunciation.

F. Panelview Touchscreen HMI located on the front of each belt filter press local control panel shall have a minimum of the following:
1. Auto Start pushbutton (Only visible in Auto Selection mode).
2. Auto Stop pushbutton (Only visible in Auto Selection mode).
3. Washdown cycle on indicator.
4. Washwater valve OPEN pushbutton and OPEN indicator.
5. Washwater valve CLOSE pushbutton and CLOSED indicator.
6. Low washwater pressure alarm.
7. Hydraulic pump START pushbutton.
8. Hydraulic pump STOP pushbutton.
9. Hydraulic pump RUNNING indicator (or air compressor RUNNING).
10. Hydraulic HIGH PRESSURE FAULT alarm indicator.
11. Hydraulic LOW PRESSURE FAULT alarm indicator.
12. Belt drive START pushbutton with belt drive RUNNING indicator.
13. Belt drive STOP pushbutton.
14. Belt drive FAIL indicator.
15. Belt speed potentiometer.
16. Belt speed indicator in feet/minute.
17. Sludge feed pump AUTO indicator.
18. Sludge feed pump RUNNING indicator.
19. Sludge feed pump FAIL alarm indicator.
20. Sludge pump speed potentiometer.
21. Sludge flow rate indicator (gallons per minute).
22. Belt misaligned alarm indicator.
23. Belt broken alarm indicator.
24. High sludge alarm indicator.
25. Emergency stop alarm indicator.
26. Sludge feed pump START and STOP push buttons.
27. Timer Shut-Off Mode ON/OFF indicator.
28. 24-hour timer in 15-minute increments.
29. Horizontal Conveyor system ON.
30. Inclined Conveyor system ON.
31. Conveyance system fail alarm indicating.
32. And additional indicators and push buttons, if required by belt filter press manufacturer.

G. BFP Control Description:

1. The control system for the presses will allow unattended operation, and must provide automated shutdown and system clean-up in AUTO mode.

H. Operation - Belt Filter Press No. 1, and No. 2:
1. Each belt filter press local control panel (LCP) shall have a MANUAL/OFF/AUTO switch and HMI Panelview touchscreen.
2. In the MANUAL mode, the BFP and all associated equipment necessary to operate the press will be manually started and controlled from the LCP thru HMI Panelview touchscreen.
3. In AUTO mode, operator presses the AUTO START pushbutton at the LCP thru HMI Panelview touchscreen or the press receives the START signal from the PLC. The automatic start sequence involves a series of adjustable time delayed steps as described below. The adjustable time delays are set by the operator at the PLC.
4. In AUTO, the start sequence is as follows:
    1) Washwater motorized valve opens.
    2) Hydraulic unit starts and the belts are automatically tensioned.
    3) After a preset time delay for belt tensioning, the belt drives start and the horizontal and incline conveyor system starts.
    4) The press operates for an adjustable time (initial setting 5 minutes) to pre-wet the belts.
    5) After the belts are pre-wetted, a signal shall be sent to start the sludge feed pump and polymer solution pump. The sludge feed pump and polymer solution pump shall start simultaneously. Note that the polymer feed pump and belt filter press feed pump are interlocked only when both units are in AUTO mode.
    6) In Auto mode, the sludge feed rate, and belt speed shall be automatically controlled by the PLC to the adjustable preset setpoints. Refer to specification 11246 (Polymer Blending and Feed Equipment – Liquid) for new Polymer system information. New polymer feed pump shall be automatically controlled by the PLC.
    7) Sludge and polymer feed rate and polymer usage shall be monitored by the PLC, if applicable. Sludge and polymer feed flow shall be indicated on the LCP Panelview HMI touchscreen.
    8) An emergency trip cord mounted on the press shall stop the press at any time. An emergency stop pushbutton on the LCP and graphical emergency stop pushbutton at the Panelview HMI touchscreen shall also stop the press and all associated equipment and pumps at any time. An emergency stop alarm light shall be indicated on the LCP. The emergency stop shall be interlocked to shut down all belt filter press system equipment whether in MANUAL or AUTO mode.
    9) The above sequence shall be programmed such that in each case, for a particular equipment (or motor) to start, the preceding equipment (or motor) in the sequence must be running. Otherwise, an alarm shall be annunciated and the sequence shall not resume until all alarms have been cleared.
5. Under AUTO, the stop sequence is as follows:
    a. Initiated by pressing the AUTO STOP pushbutton or by receiving a STOP signal from the PLC.
    b. The sludge feed pump shall stop. The polymer pump shall also stop.
    c. Horizontal and Inclined conveyors will stop after a preset time delay.

d. The press shall enter washdown mode and the WASHDOWN ON indicator will be active on Panelview HMI screen.
e. After a preset time delay, the belt drives and hydraulic unit shall stop and the washwater motorized valve shall close:
   1) The time delay shall be adjustable.

6. The belt press may be started in manual mode by placing the MANUAL/OFF/AUTO selector switch in MANUAL. In MANUAL mode, the start sequence is as follows:
   a. MANUAL mode indicator is illuminated in HMI screen.
   b. Operator presses the washwater valve OPEN pushbutton thru HMI screen.
   c. Operator presses the hydraulic pump START pushbutton thru HMI screen.
   d. After the belts are fully tensioned, the operator presses the belt drive START pushbutton thru HMI screen.
   e. After a pre-wet time delay, the PRESS READY indicator light in HMI screen will be illuminated.
   f. The sludge feed pump may be controlled at the LCP via HMI screen, if the pump HAND/OFF/REMOTE switches at each sludge feed pump VFD are in the REMOTE position. The polymer feed pump may be controlled at the LCP via HMI screen, if the polymer dilution system HAND/OFF/REMOTE switches at each polymer dilution system are selected in the REMOTE position. The sludge feed pump shall be controlled at the LCP with start/ stop pushbuttons and speed adjustment thru HMI screen. When the sludge feed pumps are operated in HAND mode, the pumps must be started from their respective VFD panels with speed adjusted locally at the MCC.
7. The belt press systems and associated pumps are stopped manually by pressing the respective STOP push buttons in the reverse order to that stated above.
8. When any of the following fault conditions occur, whether the belt press is in AUTO or MANUAL mode, the appropriate fault indicator will be illuminated in HMI screen, and the belt press and all associated equipment will be shut down:
   a. Emergency stop.
   b. Low washwater pressure.
   c. Hydraulic low-pressure fault.
   d. Belt misaligned.
   e. Belt broken.
   f. Belt drive fail.
   g. Conveyor failure.
9. The following fault conditions will cause the AUTO STOP sequence to be initiated in the automatic mode. In MANUAL mode, the fault conditions will immediately stop the belt press and all associated equipment. Associated equipment includes all devices started in MANUAL mode as specified in this Section:
   a. No cake.
   b. Sludge feed pump fail.
   c. Loss of sludge flow.

I. Polymer Feed Control:
   1. As part of on-going RAS/WAS project, there will be two TSS analyzers installed to the sludge feed pipes connected to the Dewatering Feed Box. The PLC program shall message with other Plant PLC to get the TSS values and perform an average calculation. PLC program shall use sludge feed flowmeter for each belt filter press and the calculated TSS values to determine the appropriate Polymer feed rate for each skid mounted polymer dilution system.

2.17 TERMINAL JUNCTION BOXES

A. Each belt filter press shall be supplied with power terminal junction box and separate control/signal terminal junction box mounted on the belt filter press unit. Each terminal junction box shall be NEMA 4X 316 stainless steel and size as per NEC requirements. Factory installed wiring and raceways between each termination junction box and associated motor and belt filter press devices that are part of belt filter press assembly shall be provided with each belt filter press. Field wiring from belt filter press control panel, MCC, and other field devices shall be interfaced at the terminal junction.

B. Electrical system components as specified in Division 16, including wiring, raceway, etc.

2.18 BELT FILTER PRESS MASTER CONTROL PANEL (PCP-DW)

A. Enclosures:
   1. NEMA Type 12, minimum of 14 gauge or thicker aluminum, three-point latching mechanisms.
   2. Panel suitable for mounting free standing as shown on drawings.
   3. Panels shall be free-standing vertical panels as specified in Section 17000 - Control Systems: Panels, Enclosures, and Panel Components modified to meet the above specification.
   4. Panel shall be U.L. listed and shall be assembled in a U.L. listed facility. Panel shall have a UL label affix to the panel.
   5. Provide a minimum of one LED light strip inside the panel that shall turn on when the door is opened. Provide and limit switch to active the interior light.

B. BFP master control panel shall be prewired and tested with terminal strips for external wiring connections and shall have the following:
   1. 120 VAC, 60 hertz, 1 phase power input.
   2. Main disconnect circuit breaker.
   3. BFP master control panel shall have a PLC and associated remote I/O (input/output) system. The PLC and RIO system shall meet the requirements as specified in Section 17000 - Control Systems: There are no ”or equal“ substitutions allowed:
      a. Allen-Bradley Compactlogix PLC (5370-L33ER) family CPU and remote I/O system including power supply, Ethernet communication module, discrete input, discrete output, analog input, analog output modules, etc.
      b. Furnish and install fiber optic patch panel, Ethernet switch, Panelview touchscreen HMI, other power supply, surge suppressors, terminal blocks, wireways, wirings, etc. as needed for a complete and functional PLC control panel.

c. Furnish and install UPS (minimum size of 550VA) with bypass switch in the BFP master control panel.

4. LED Lights, pushbuttons, and switches as specified in this Section.
5. Allen-Bradley Panelview Plus 6 graphic terminal, minimum 10.4 inch shall be provided on each belt filter press local control panel. Refer to Section 17000 for additional requirements. Panelview shall be mounted to the front of the BFP master control panel and operator shall be able to operate without needing to open the panel.
6. Refer to Section 17000 for wiring, wiring marking, terminal blocks, fuse, surge protection device (SPD), surge arrestors, and other accessories requirements.

C. BFP master control panel shall be provided a minimum of 12-ports fiber optic patch panel with ST connectors, Allen-Bradley Stratix 2000 industrial unmanaged switch (model 1783-US6T2TG2F) and N-tron/Red Lion PoE switch Model 1000-POE4+. N-tron/Red Lion switch is for future camera system to be installed by installing Contractor.

D. BFP master control panel shall communicate with BFP local control panels via Ethernet communication protocol thru fiber optic media and shall accept hard-wired signals from new truck loading conveyor control panel, new conveyor control panel, new polymer dilution skids, new MCC-3, and other miscellaneous system as shown on Instrumentation drawings. BFP master control panel shall be provided with all signals shown on instrumentation drawings and spare 25 percent input/output active spare points of each I/O type supplied plus additional 25 percent input/output module expansion capacity/spare slot in the I/O rack. The PLC power supply shall have sufficient capability to handle the power requirements of all the PLC components and I/O points and spare I/O points as describes in specification 17000. Below are the I/O list to assist with Contractor to identify the I/O point type and quantity. If any conflicts between the I/O list and the instrumentation drawings, Contractor shall adjust as needed and bring the conflicts to Engineer's attention with the proposed resolution. If the I/O listed below are connecting to the associated BFP local control panel, BFP supplier shall have the option to eliminate those signals from the BFP master control panel:

1. Polymer Tote No.1 Weight (AI – Analog Input), WI-TKPL01.
2. Polymer Tote No.2 Weight (AI), WI-TKPL02.
3. ~~Polymer Dilution System No.1 Start/stop (DO – Discrete Output), HS-PDS01.~~ AD3
4. ~~Polymer Dilution System No.1 Running Indication (DI – Discrete Input), QI-PDS01.~~
5. ~~Polymer Dilution System No.1 Fail Alarm (DI), QA-PDS01.~~
6. ~~Polymer Dilution System No.1 In Auto (DI), QI-PDS01A.~~
7. ~~Polymer Dilution System No.1 Speed Command (AO – Analog Output), SC-PDS01.~~
8. ~~Polymer Dilution System No.1 Speed Indication (AI), SI-PDS01.~~
9. ~~Polymer Dilution System No.1 Water Flow Rate (AI), FI-PDS01A.~~
10. ~~Polymer Dilution System No.1 Calculated Pump Flow (AI), FI-PDS01B.~~
11. ~~Polymer Dilution System No.1 Polymer Solution Concentration Setpoint (AO), SP-PDS01.~~
12. ~~Polymer Dilution System No.2 Start/stop (DO), HS-PDS02.~~
13. ~~Polymer Dilution System No.2 Running Indication (DI), QI-PDS02.~~
14. ~~Polymer Dilution System No.2 Fail Alarm (DI), QA-PDS02.~~
15. ~~Polymer Dilution System No.2 In Auto (DI), QI-PDS02A.~~

~~16. Polymer Dilution System No.2 Speed Command (AO – Analog Output), SC-PDS02.~~
~~17. Polymer Dilution System No.2 Speed Indication (AI), SI-PDS02.~~
~~18. Polymer Dilution System No.2 Water Flow Rate (AI), FI-PDS02A.~~
~~19. Polymer Dilution System No.2 Calculated Pump Flow (AI), FI-PDS02B.~~
~~20. Polymer Dilution System No.2 Polymer Solution Concentration Setpoint (AO), SP-PDS02.~~
~~21. Future Polymer Dilution System No.3 Start/stop (DO), HS-PDS03.~~
~~22. Future Polymer Dilution System No.3 Running Indication (DI), QI-PDS03.~~
~~23. Future Polymer Dilution System No.3 Fail Alarm (DI), QA-PDS03.~~
~~24. Future Polymer Dilution System No.3 In Auto (DI), QI-PDS03A.~~
~~25. Future Polymer Dilution System No.3 Speed Command (AO), SC-PDS03.~~
~~26. Future Polymer Dilution System No.3 Speed Indication (AI), SI-PDS03.~~
~~27. Future Polymer Dilution System No.3 Water Flow Rate (AI), FI-PDS03A.~~
~~28. Future Polymer Dilution System No.3 Calculated Pump Flow (AI), FI-PDS03B.~~
~~29. Future Polymer Dilution System No.3 Polymer Solution Concentration Setpoint (AO), SP-PDS03.~~
~~30. Future Polymer Dilution System No.4 Start/stop (DO), HS-PDS04.~~
~~31. Future Polymer Dilution System No.4 Running Indication (DI), QI-PDS04.~~
~~32. Future Polymer Dilution System No.4 Fail Alarm (DI), QA-PDS04.~~
~~33. Future Polymer Dilution System No.4 In Auto (DI), QI-PDS04A.~~
~~34. Future Polymer Dilution System No.4 Speed Command (AO), SC-PDS04.~~
~~35. Future Polymer Dilution System No.4 Speed Indication (AI), SI-PDS04.~~
~~36. Future Polymer Dilution System No.4 Water Flow Rate (AI), FI-PDS04A.~~
~~37. Future Polymer Dilution System No.4 Calculated Pump Flow (AI), FI-PDS04B.~~
~~38. Future Polymer Dilution System No.4 Polymer Solution Concentration Setpoint (AO), SP-PDS04.~~
~~39.~~3. BFP Feed Pump No.1 Start/stop (DO), HS-FP001.
~~40.~~4. BFP Feed Pump No.1 Running Indication (DI), QI-FP001.
~~41.~~5. BFP Feed Pump No.1 Fail Alarm (DI), QA-FP001.
~~42.~~6. BFP Feed Pump No.1 In Remote (DI), QI-FP001A.
~~43.~~7. BFP Feed Pump No.1 Speed Command (AI), SC-FP001.
~~44.~~8. BFP Feed Pump No.1 Speed Indication (AO), ,SI-FP001.
~~45.~~9. BFP Feed Pump No.2 Start/stop (DO), HS-FP002.
~~46.~~10. BFP Feed Pump No.2 Running Indication (DI), QI-FP002.
~~47.~~11. BFP Feed Pump No.2 Fail Alarm (DI), QA-FP002.
~~48.~~12. BFP Feed Pump No.2 In Remote (DI), QI-FP002A.
~~49.~~13. BFP Feed Pump No.2 Speed Command (AI), SC-FP002.
~~50.~~14. BFP Feed Pump No.2 Speed Indication (AO), ,SI-FP002.
~~51.~~15. BFP Feed Pump No3 Start/stop (DO), HS-FP003.
~~52.~~16. BFP Feed Pump No.3 Running Indication (DI), QI-FP003.
~~53.~~17. BFP Feed Pump No.3 Fail Alarm (DI), QA-FP003.
~~54.~~18. BFP Feed Pump No.3 In Remote (DI), QI-FP003A.
~~55.~~19. BFP Feed Pump No.3 Speed Command (AI), SC-FP003.
~~56.~~20. BFP Feed Pump No.3 Speed Indication (AO), SI-FP003.
~~57.~~21. BFP Feed Pump No.4 Start/stop (DO), HS-FP004.
~~58.~~22. BFP Feed Pump No.4 Running Indication (DI), QI-FP004.
~~59.~~23. BFP Feed Pump No.4 Fail Alarm (DI), QA-FP004.
~~60.~~24. BFP Feed Pump No.4 In Remote (DI), QI-FP004A.
~~61.~~25. BFP Feed Pump No.4 Speed Command (AI), SC-FP004.
~~62.~~26. BFP Feed Pump No.4 Speed Indication (AO), SI-FP004.
~~63.~~27. BFP Feed Pump No.5 Start/stop (DO), HS-FP005.

~~64.~~28.BFP Feed Pump No.5 Running Indication (DI), QI-FP005.
~~65.~~29.BFP Feed Pump No.5 Fail Alarm (DI), QA-FP005.
~~66.~~30.BFP Feed Pump No.5 In Remote (DI), QI-FP005A.
~~67.~~31.BFP Feed Pump No.5 Speed Command (AI), SC-FP005.
~~68.~~32.BFP Feed Pump No.5 Speed Indication (AO), SI-FP005.
~~69. BFP No.1 Sludge Feed TSS (AI), AI-BFP01.~~ AD3
~~70. BFP No.2 Sludge Feed TSS (AI), AI-BFP02.~~
~~71. Future BFP No.3 Sludge Feed TSS (AI), AI-BFP03.~~
~~72. Future BFP No.4 Sludge Feed TSS (AI), AI-BFP04.~~
~~73. BFP No.1 Sludge Feed Flow (AI), FI-BFP01.~~
~~74. BFP No.2 Sludge Feed Flow (AI), FI-BFP02.~~
~~75. Future BFP No.3 Sludge Feed Flow (AI), FI-BFP03.~~
~~76. Future BFP No.4 Sludge Feed Flow (AI), FI-BFP04.~~
~~77. BFP Inlet Valve No.1 In Remote (DI), QI-BFPV01.~~
~~78. BFP Inlet Valve No.1 Position Command (AO), ZC-BFPV01.~~
~~79. BFP Inlet Valve No.1 Position Indication (AI), ZI-BFPV01.~~
~~80. BFP Inlet Valve No.2 In Remote (DI), QI-BFPV02.~~
~~81. BFP Inlet Valve No.2 Position Command (AO), ZC-BFPV02.~~
~~82. BFP Inlet Valve No.2 Position Indication (AI), ZI-BFPV02.~~
~~83. Future BFP Inlet Valve No.3 In Remote (DI), QI-BFPV03.~~
~~84. Future BFP Inlet Valve No.3 Position Command (AO), ZC-BFPV03.~~
~~85. Future BFP Inlet Valve No.3 Position Indication (AI), ZI-BFPV03.~~
~~86. Future BFP Inlet Valve No.4 In Remote (DI), QI-BFPV04.~~
~~87. Future BFP Inlet Valve No.4 Position Command (AO), ZC-BFPV04.~~
~~88. Future BFP Inlet Valve No.4 Position Indication (AI), ZI-BFPV04.~~
~~89. BFP No.1 Washwater Valve In Remote (DI), QI-WWV01.~~
~~90. BFP No.1 Washwater Valve Open Command (DO), ZCO-WWV01.~~
~~91. BFP No.1 Washwater Valve Close Command (DO), ZCC-WWV01.~~
~~92. BFP No.1 Washwater Valve Open Indication (DI), ZIO-WWV01.~~
~~93. BFP No.1 Washwater Valve Close Indication (DI), ZIC-WWV01.~~
~~94. BFP No.2 Washwater Valve In Remote (DI), QI-WWV02.~~
~~95. BFP No.2 Washwater Valve Open Command (DO), ZCO-WWV02.~~
~~96. BFP No.2 Washwater Valve Close Command (DO), ZCC-WWV02.~~
~~97. BFP No.2 Washwater Valve Open Indication (DI), ZIO-WWV02.~~
~~98. BFP No.2 Washwater Valve Close Indication (DI), ZIC-WWV02.~~
~~99. Future BFP No.3 Washwater Valve In Remote (DI), QI-WWV03.~~
~~100. Future BFP No.3 Washwater Valve Open Command (DO), ZCO-WWV03.~~
~~101. Future BFP No.3 Washwater Valve Close Command (DO), ZCC-WWV03.~~
~~102. Future BFP No.3 Washwater Valve Open Indication (DI), ZIO-WWV03.~~
~~103. Future BFP No.3 Washwater Valve Close Indication (DI), ZIC-WWV03.~~
~~104. Future BFP No.4 Washwater Valve In Remote (DI), QI-WWV04.~~
~~105. Future BFP No.4 Washwater Valve Open Command (DO), ZCO-WWV04.~~
~~106. Future BFP No.4 Washwater Valve Close Command (DO), ZCC-WWV04.~~
~~107. Future BFP No.4 Washwater Valve Open Indication (DI), ZIO-WWV04.~~
~~108. Future BFP No.4 Washwater Valve Close Indication (DI), ZIC-WWV04.~~
~~109. BFP No.1 Washwater Flow (AI), FI-WW001.~~
~~110. BFP No.2 Washwater Flow (AI), FI-WW002.~~
~~111. Future BFP No.3 Washwater Flow (AI), FI-WW003.~~
~~112. Future BFP No.4 Washwater Flow (AI), FI-WW004.~~
~~113. BFP No.1 Washwater Pressure (AI), PI-WW001.~~
~~114. BFP No.2 Washwater Pressure (AI), PI-WW002.~~
~~115. Future BFP No.3 Washwater Pressure (AI), PI-WW003.~~

~~116. Future BFP No.4 Washwater Pressure (AI), PI-WW004.~~
~~117.~~33.Horizontal Conveyor No.1 Start/stop (DO), HS-HSC001.
~~118.~~34.Horizontal Conveyor No.1 Running Indication (DI), QI-HSC001.
~~119.~~35.Horizontal Conveyor No.1 Fail (DI), QA-HSC001.
~~120.~~36.Horizontal Conveyor No.1 In Remote (DI), QI-HSC001A.
~~121.~~37.Inclined Conveyor No.1 Start/stop (DO), HS-ISC001.
~~122.~~38.Inclined Conveyor No.1 Running Indication (DI), QI-ISC001.
~~123.~~39.Inclined Conveyor No.1 Fail (DI), QA-ISC001.
~~124.~~40.Inclined Conveyor No.1 In Remote (DI), QI-ISC001A.
~~125.~~41.Future Horizontal Conveyor No.2 Start/stop (DO), HS-HSC002.
~~126.~~42.Future Horizontal Conveyor No.2 Running Indication (DI), QI-HSC002.
~~127.~~43.Future Horizontal Conveyor No.2 Fail (DI), QA-HSC002.
~~128.~~44.Future Horizontal Conveyor No.2 In Remote (DI), QI-HSC002A.
~~129.~~45.Future Inclined Conveyor No.2 Start/stop (DO), HS-ISC002.
~~130.~~46.Future Inclined Conveyor No.2 Running Indication (DI), QI-ISC002.
~~131.~~47.Future Inclined Conveyor No.2 Fail (DI), QA-ISC002.
~~132.~~48.Future Inclined Conveyor No.2 In Remote (DI), QI-ISC002A.
~~133.~~49.Truck Loading Conveyor Running Left (DI), QI-TLC001A.
~~134.~~50.Truck Loading Conveyor Running Right (DI), QI-TLC001B.
~~135.~~51.Truck Loading Conveyor Start/stop (DO), HS-TLC001.
~~136.~~52.Truck Loading Conveyor Fail (DI), QA-TLC001.
~~137.~~53.Truck Loading Conveyor In Remote (DI), QI-TLC001C.
~~138.~~54.Truck Loading Gate No.1 In Remote (DI), QI-EMG01.
~~139.~~55.Truck Loading Gate No.1 Open Command (DO), ZCO-EMG01.
~~140.~~56.Truck Loading Gate No.1 Close Command (DO), ZCC-EMG01.
~~141.~~57.Truck Loading Gate No.1 Open Indication (DI), ZIO-EMG01.
~~142.~~58.Truck Loading Gate No.1 Close Indication (DI), ZIC-EMG01.
~~143.~~59.Truck Loading Gate No.2 In Remote (DI), QI-EMG02.
~~144.~~60.Truck Loading Gate No.2 Open Command (DO), ZCO-EMG02.
~~145.~~61.Truck Loading Gate No.2 Close Command (DO), ZCC-EMG02.
~~146.~~62.Truck Loading Gate No.2 Open Indication (DI), ZIO-EMG02.
~~147.~~63.Truck Loading Gate No.2 Close Indication (DI), ZIC-EMG02.
~~148.~~64.Truck Loading Gate No.3 In Remote (DI), QI-EMG03.
~~149.~~65.Truck Loading Gate No.3 Open Command (DO), ZCO-EMG03.
~~150.~~66.Truck Loading Gate No.3 Close Command (DO), ZCC-EMG03.
~~151.~~67.Truck Loading Gate No.3 Open Indication (DI), ZIO-EMG03.
~~152.~~68.Truck Loading Gate No.3 Close Indication (DI), ZIC-EMG03.
~~153.~~69.Truck Loading Gate No.4 In Remote (DI), QI-EMG04.
~~154.~~70.Truck Loading Gate No.4 Open Command (DO), ZCO-EMG04.
~~155.~~71.Truck Loading Gate No.4 Close Command (DO), ZCC-EMG04.
~~156.~~72.Truck Loading Gate No.4 Open Indication (DI), ZIO-EMG04.
~~157.~~73.Truck Loading Gate No.4 Close Indication (DI), ZIC-EMG04.
~~158.~~74.Truck Loading Gate No.5 In Remote (DI), QI-EMG05.
~~159.~~75.Truck Loading Gate No.5 Open Command (DO), ZCO-EMG05.
~~160.~~76.Truck Loading Gate No.5 Close Command (DO), ZCC-EMG05.
~~161.~~77.Truck Loading Gate No.5 Open Indication (DI), ZIO-EMG05.
~~162.~~78.Truck Loading Gate No.5 Close Indication (DI), ZIC-EMG05.
~~163.~~79.Truck Loading Gate No.6 In Remote (DI), QI-EMG06.
~~164.~~80.Truck Loading Gate No.6 Open Command (DO), ZCO-EMG06.
~~165.~~81.Truck Loading Gate No.6 Close Command (DO), ZCC-EMG06.
~~166.~~82.Truck Loading Gate No.6 Open Indication (DI), ZIO-EMG06.

~~167.~~83.Truck Loading Gate No.6 Close Indication (DI), ZIC-EMG06.
~~168.~~84.PLC Panel power fail alarm (DI), QA-PCPDW.

E. BFP master control panel shall have a minimum of 120V surge protection device (SPD) for incoming 120V, 1-phase power supply and surge arrestor for 4-20mA signals coming from field instruments located outside the building.

2.19 BELT FILTER PRESS SYSTEM PLC PROGRAMMING AND COORDINATION MEETINGS

A. The PLC program of belt filter press, horizontal and incline conveyor, polymer dilution system, sludge feed pumps, truck loading conveyor, etc. shall reside in the BFP master control panel (PCP-DW). The BFP master control panel (PCP-DW) will be located in the new Electrical Room. BFP's software programmer shall program BFP control strategy, including horizontal and incline conveyor, polymer dilution system, truck loading conveyor and associated motorized gates, etc. in the BFP master control panel PLC system. BFP's software programmer shall be mainly responsible for PLC programming associated with the Owner's pre-purchased packages (belt filter press system, polymer dilution system, and shaftless screw conveyors system). The installing Instrumentation Contractor shall be responsible for PLC programming associated with everything relating to the dewatering building system, except belt filter press systems, horizontal and incline conveyor, polymer dilution system, truck loading conveyor and associated motorized gates, etc. Belt filter press manufacturer shall provide HMI screens of local control panel and BFP master control panel. Installing Instrumentation Contractor shall create other HMI screens such as sludge feed pump system, other miscellaneous instruments, etc. that are not covered in the belt filter press manufacturer's scope.

B. Belt filter press manufacturer shall include a minimum of three coordination meetings with the installing Instrumentation Contractor to coordinate the PLC programming of the BFP master control panel PLC and perform accordingly. The above coordination meetings shall be held at the construction site, unless otherwise agree by Owner/Engineer. Additionally, BFP manufacturer shall include 24 hours of phone calls and 24 hours of face-to-face meetings, a total of 48 hours.

C. BFP's software programmer shall include an additional 60 hours on-site to fine tune control system and make minor software modifications in order to resolve any logic discrepancies encountered during start-up and testing. This shall be part of the bid price with no additional cost to the Owner. Only main control strategy will be listed in this specification. BFP's software programmer shall also provide other minor control strategies not specifically listed but stated in the drawings or in other specifications. The additional programming hours additional to the time required to perform start-up and testing of the system.

2.20 BELT FILTER PRESS SYSETM HMI PROGRAMMING

A. Belt filter press manufacturer shall be responsible for HMI programming of the Panelview touchscreen HMI at each belt filter press local control panel.

2.21 SOURCE QUALITY CONTROL

A. Un-witnessed Factory Testing (non-witness test):
   1. The complete BFP control system shall be an un-witnessed factory test, as much as possible before the witness test. Provide a written un-witnessed Factory Test Report for review and approval from Owner/Engineer prior to the witness test.

B. Factory Acceptance Testing (Witness test):
   1. BFP supplier shall test the entire control system at the BFP's supplier factory. The BFP's software programmer shall simulate all inputs and outputs as applicable to the BFP system supplied. The BFP's software programmer shall load the application program into the PLC and HMI system. BFP supplier shall provide a daily schedule for FAT and at the end of each day to have a meeting to review the day's test results.
   2. BFP supplier and BFP's software programmer shall check each loop, including I/O mapping, scaling, setpoints, alarms, displays, and HMI screens. Correct deficiencies found and complete correction of deficiencies prior to shipment to site.
   3. BFP supplier and BFP's software programmer shall test the applicable control strategy listed in this specification and other specifications. Failed tests shall be repeated and witnessed by the Owner/Engineer.
   4. BFP supplier shall include in his bid for travel expenses for 2 persons (Engineers) and 2 Owner personnel, a total of 4 persons for the entire system WFT duration. WFT duration shall be a maximum of 2 days. Travel expense shall include airfare (one round trip per person), accommodation and food, and car rental for each person during WFT period.

C. Instrumentation and Controls Meeting:
   1. In addition to the field services required per the sections, the BFP MANUFACTURER shall provide a qualified instrument and controls engineer to coordinate with the installing Contractor's Instrumentation System Supplier (ISS) during construction for the following meeting:
      a. Pre-Construction Meeting:
         1) Meeting to coordinate all controls required from and to BFP vendor control panels to Plant SCADA. BFP MANUFACTURER shall share HMI screens with ISS for duplication at Plant SCADA for monitoring.
      b. Pre-Start-up Meeting:
         1) Meeting to coordinate all loop check and functional readiness test, and start-up procedures before start-up of the BFP system. BFP MANUFACTRER shall coordinate with ISS for loading the BFP control function into the master BFP PLC panel and perform functional readiness test. ISS will perform loop check for all instrument and panels to be provided by BFP as well as provided by ISS.

PART 3 EXECUTION

3.01 INSTALLATION (BY INSTALLING CONTRACTOR – THIS IS PROVIDED FOR INFORMATION ONLY)

A. Install products in accordance with manufacturer's instructions.

B. Connect electrical power, water piping, polymer solution piping, and sludge piping.

C. BFPs shall not, under any conditions be allowed to sit out-of-doors unprotected. At a minimum BFP units shall be covered with a waterproof material in the event of any precipitation and also at all times that construction does not require exposure of the equipment. Covering shall be securely anchored.

3.02 ADJUSTING

A. Within 30 days after equipment is installed, prior to start-up testing and training, allow a minimum of 8 hours for factory-trained technician to adjust equipment.

3.03 MANUFACTURER'S FIELD SERVICES

A. Provide training as specified in Sections 01756 and 01010; require factory trained technician to train Owner in proper operation and maintenance of equipment:
   1. Allow minimum 4 training sessions of maximum 4 hours each following a course outline acceptable to the Design Engineer.
   2. Training sessions shall occur on 4 consecutive days at times acceptable to the Owner.
   3. Training to include both classroom and field training. As a minimum, cover the following subjects:
      a. Start-up procedures.
      b. Shutdown procedures.
      c. Troubleshooting.
      d. Selection of polymer types and dosages.
      e. Replacement of dewatering belts.
      f. Operating adjustments for performance optimization.
      g. Preventive maintenance.
      h. Maintenance procedures.
      i. Emergency procedures.
      j. Records keeping.

B. Provide training within 30 days after completion of initial start-up and before handing over the operations to the Owner:
   1. Start training when sufficient experience with sludge character has been obtained.

C. Produce and deliver electronic format of training to Owner upon completion of training.

D. The BFP MANUFACTURER shall also provide three hard copies of the Engineer-approved Operations and Maintenance (O&M) Manuals 30 days prior to the training sessions.

3.04 PERFORMANCE TESTING

A. Provide manufacturer's services for conducting field performance test to demonstrate equipment can meet specified performance requirements as specified in 01756 and below.

B. Each belt filter press will be tested one at a time. The test period shall consist of one 6-hour steady state test runs on 3 consecutive days with sludge feed, sludge cake, and effluent (combined filtrate and washwater) samples taken at the start of each run and every hour thereafter resulting in a total of 7 samples of each type per day and 21 samples for the 3 day test per belt filter press. At a minimum, the testing shall be done at the design feed rate (both hydraulic and solids loading) during the test. If sufficient WAS is available, the testing shall be done at the maximum feed rate (both hydraulic and solids) to the extent possible. Coordinate with the Owner and installing Contractor to determine the test loading rates before the test and submit a field performance test protocol in coordination with the BFP manufacturer, to the Owner and Engineer for approval. The BFP manufacturer shall hire and pay for the services of a certified laboratory for all lab analysis:
   1. The sludge feed, dewatered cake, and effluent samples shall be analyzed for total suspended solids content. The sludge feed shall also be tested for percent VSS and percent ash content.
   2. The resulting solids contents shall be averaged and the average value of each type shall be used to judge satisfactory performance.
   3. Polymer solution strength and flow rate shall be recorded and dose in active pounds per dry ton. Maximum polymer usage shall be less than or equal to 30 active lb/DT.
   4. Sludge feed rate shall also be recorded.

C. The BFP MANUFACTURER's representative shall operate the equipment during the test:
   1. The Owner shall furnish personnel to assist in the operation and to take samples.
   2. The Owner working with the installing Contractor shall also furnish sludge, water, utilities, sludge cake disposal, and routine test equipment.

D. The BFP MANUFACTURER in consultation with the Owner and the Owner's current polymer supplier shall recommend the most suitable and cost effective polymer. BFP MANUFACTURER shall perform necessary polymer testing to determine the most appropriate polymer. If necessary, the BFP MANUFACTURER may choose to perform prior testing with different polymer types to determine the type of polymer and optimum dose for meeting the performance requirements. For any such testing, BFP MANUFACTURER shall coordinate with the installing Contractor and Owner and provide a detailed polymer test plan and also supply the polymer for this test. The BFP MANUFACTURER shall also provide field service staff to collect samples and also hire an outside laboratory for all analysis. Submit the test plan and results to the Owner and ENGINEER for review and approval. BFP MANUFACTURER shall coordinate with the installing Contractor for any instrumentation for measuring sludge feed or polymer feed rates.

E. The equipment shall have passed the performance test if the specified cake solids, solids capture, and polymer use requirements are met with the press operating under design and maximum hydraulic and solids loading rates.

F. Should the installed equipment fail to meet the specified performance requirements, the BFP MANUFACTURER shall within 30 days make changes in the equipment or method of operation as necessary and the equipment shall be retested at no cost to the Owner. If after a second 30-day period, the equipment still does not meet the performance criteria, the equipment shall have failed the performance test and the Owner shall require its removal and replacement with the specified equipment at no additional cost to the Owner.

END OF SECTION

[AD3] Addendum No. 3 - January 24, 2019