SECTION 467627 – SCREW PRESSES

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This section shall include furnishing One (1) Volute Dewatering Press' together with associated sludge conditioning tank(s), control panel, polymer system, and all appurtenances as specified in the Contract Documents and as required to meet the specified performance requirements and to provide a full and properly functioning sludge dewatering system.

B. Unit responsibility: All equipment furnished under this section shall be the responsibility of a single Supplier to fabricate or procure, integrate, factory test, and deliver to the project site. It shall be the responsibility of the Supplier to coordinate all details and components required for a properly functioning system.

C. The Dewatering Unit provided must include at least four (4) separate Dewatering Drums that operate independently such that in the event that one Drum is inoperable for any reason, the unit can still dewater sludge at a minimum of 75% of its full capacity.

1.2 RELATED REQUIREMENTS

1. Section 432358 – Rotary Lobe Pumps

2. Section 409123 – Miscellaneous Properties Process Measurement Devices

1.3 REFERENCES

A. ASTM A36 – Carbon Structural Steel

B. ASTM A48 – Gray Iron Castings

C. ASTM A322 – Carbon and Alloy Steel Bar

D. ASTM A507 – Drawing Alloy Steel, Sheet and Strip, Hot-Rolled and Cold Rolled

E. ASTM A536-84 – Ferritic Ductile Iron Castings

F. ASTM A743 – Stainless Steel Casting

G. AISI 303 Stainless Steel

H. AISI 316 Stainless Steel

I. AISI 4130 Heat Treated Alloy Steel

J. AISI 4140 Heat Treated Alloy Steel

K. AISI 8620 Heat Treated Alloy Steel

L. AISI 17-4 Stainless Steel

M. ANSI 9 – Load Ratings and Fatigue Life for Ball Bearings

N. ANSI 11 – Load Ratings and Fatigue Life for Roller Bearings

O. American Institute of Steel Construction (AISC)

P. American Welding Society (AWS)

Q. American Structures Painting Council (ASPC)

1.4 SUBMITTALS

A. Design Submittals:

1. Detailed descriptive literature for all equipment being offered must be included with the proposal.

2. General control narrative and strategy for operating all equipment included in the scope of work.

3. Supplier's catalog sheets showing specified equipment, control panel, connecting piping and valves, spare parts package, O&M Manuals, and warranty information

4. Motor characteristics and performance information.

5. Complete Bill of Materials including a list of recommended spare parts and all components located within the control panel.

6. Anchorage: the Supplier shall provide anchor bolt design calculations, stamped and signed by a licensed professional engineer in the State of New Mexico.

B. Shop Drawings:

1. General Assembly drawings of all equipment to be supplied detailing:
   a. Relevant dimensions,
   b. Specific footprint and space requirements (including maintenance and service areas),
   c. Appropriate cross sections,
   d. Location of utility and/or ancillary service or equipment connections.
   e. Electrical and instrumentation wiring drawings and requirements.

2. Electrical drawings for all control panels showing all necessary field connections to be made.

C. Maintenance Data:

1. Submit maintenance data and spare parts list for all equipment. Include this data, product data, shop drawings in maintenance manual; in accordance with requirements of Section 017823.

D. Factory Test Data: Signed, dated, and certified factory test data for the screw press system, submitted before shipment of equipment.

E. Certifications

1. Supplier's certification of proper installation.

2. Contractor's certification of satisfactory field testing.

1.5 QUALITY ASSURANCE

A. All components of the sludge dewatering equipment shall be engineered for long, continuous, and uninterrupted service with minimal operator intervention. Provisions shall be made for easy maintenance, adjustment, or replacement of all parts.

B. The Supplier shall have at least ten (10) full-scale systems utilizing the exact technology at the same scale size proposed for this project operating successfully for at least three (3) years in North America at municipal wastewater treatment plants that were furnished under the Supplier’s own name.

1.6 PERFORMANCE GUARANTEE

A. At the six-month site visit, the SUPPLIER shall conduct testing of the system to verify cake solids. Where the system is not dewatering sludge to the percentage indicated above, the SUPPLIER shall, at his own cost, provide solutions to achieve the dryness indicated.

1.7 WARRANTY

A. The Supplier shall warrant, in writing, that all equipment supplied by them shall be free from defects in material and workmanship, for a period of twelve (12) months from the date of startup, not to exceed eighteen (18) months from the date of delivery, unless noted otherwise within the specifications.

PART 2 PRODUCTS

2.1 DESIGN CRITERIA

A. The System shall receive sludge and then flocculate, condition, and dewater the feed waste activated sludge specified herein, and neatly discharge the dewatered sludge cake into a collection chute for handling by solids conveying equipment, without blinding or plugging.

B. The System shall be complete prefabricated system consisting of:

1. Sludge conditioning system consisting of two-stage flocculation tank, including a mixing tank with gear motor and mixing impeller to allow efficient mixing of polymer in the sludge and a flocculation tank including gear motor and large cross-sectional area agitator.

2. Four (4) “dewatering drums” including spray wash down system and gear drives.

3. Support structure for the dewatering drums including filtrate collection pan and outlet plumbing.

4. A polymer mixing and feed system for dilution of neat polymer and pumping for introduction to sludge prior to the mixing tank.

5. A self-contained electrical and control panel including control for ancillary equipment such as feed pumps and solids conveyance.

C. The System shall operate continuously or intermittently on demand, with no requirement for operator attention other than periodic inspection and chemical replenishment. The System shall be suitable for dewatering the specified sludge and shall perform the required dewatering operations at the loading and operating conditions specified in Table 1 herein.

Table 1. Screw Press Dewatering System Design Criteria.

Dewatering System Design Requirements	Units	Value
Minimum Solid Capacity per Unit	lbs/day lbs/hr	4,800 600
Minimum Hydraulic Capacity per Unit	gpm	240
Minimum Number of Units	each	1
Sludge Feed Concentration	%	0.5 to 2.0%
Required Solids Capture Rate	%	>95%
Minimum Sludge Cake Solids	%	16%

2.2 GENERAL

A. All components of the equipment shall be amply proportioned for all stresses that may occur during fabrication, erection and intermittent or continuous operation.

B. All components shall be balanced so that jamming at any point will not result in structural failure but will cause the drive motor to stall. All components shall be designed to withstand, without damage or permanent distortion, the full stalling torque of the drive motor.

C. The Supplier shall provide equipment, motors, gear reducers, controls, control panels and lifting attachments as a complete integrated package to ensure proper coordination, compatibility, and operation of the system.

2.3 MATERIALS

A. All wetted parts of the screw press and flocculation Tank, shall be Type 304L stainless steel.

B. The following table indicates the materials and coatings that shall be provided for the Volute Dewatering Press and related components unless specified otherwise herein:

Table 2. Screw Press Dewatering System Materials of Construction

Item of Equipment	Material
Tanks and support frame	Type 304 stainless steel
Plumbing and spray bars	Type 304 stainless steel
Dewatering drums	Type 304 stainless steel
Dewatering drum screw	Type 304 stainless steel
Gear Motors	Cast Aluminum, 304 stainless steel, and Carbon Steel
Gear Motor Coating	Acrylic Paint
Spray nozzles	Polypropylene

2.4 STRUCTURAL COMPONENTS

A. The structural support frame shall be fabricated of type 304 stainless steel members conforming to the latest ASTM Standard Specifications for Structural Steel, Designation A36. It will be a rigid structure, adequately braced to withstand intended loads without excessive vibration or deflection.

B. Design and fabrication of structural steel shall be in accordance with AISC and AWS Standards.

C. The framework shall be of welded and/or bolted construction. All welding shall conform with the American Welding Society Structural Welding Code.

D. The structure shall be designed for installation on a prepared concrete foundation, suitable flat concrete slab, or fabricated platform and secured with anchor bolts.

E. The construction shall allow easy access and visual inspection of all internal components.

2.5 DEWATERING UNIT

A. Dewatering unit shall be a screw press, designed to dewater sludge conditioned with an emulsion polymer by slowly squeezing the flocculated sludge and allowing liquid to escape through perforated screens surrounding the screw while retaining solids inside the press.

B. The dewatering drums will be constructed of ATSM type 304 SS. All circular components will be laser cut to ensure maximum evenness of wear and therefore operating life.

C. Each Dewatering Drum shall be equipped with individual spray bars. Each spray bar shall consist of a spray pipe fitted with spray nozzles, located above the dewatering drum. The spray pipe and spray nozzle assembly shall be readily removable. Nozzle spacing and spray pattern shall be such that the sprays from adjacent nozzles overlap one another on the dewatering drum surface. The sprays will operate periodically and will remove solids built up externally on the drum such that over time no significant buildup of solids occurs on the drum.

D. Each Dewatering Drum will have a drive motor:

1. The Dewatering Drum drive motor will be a close coupled gearmotor. Gearmotors will be hollow shaft design designed to drive the dewatering drum screws with no additional couplings or joints. Screw rotational speed shall be obtained through a helical-bevel gear reduction. Input power to the dewatering drum drive shall be supplied through an A.C. variable frequency drive unit.

2. Maximum horsepower is 3.

3. Output shaft speed: 3.5 RPM @ 60 Hz

4. Enclosure shall be TEFC, made from carbon steel. Insulation class shall be IP56.

E. Each screw press frame shall be provided with removable ASTM Type 304 SS covers. Covers shall permit enclosure of entirety of screw press frame and shall consist of multiple sections to facilitate installation and removal. Covers shall be slotted for connection to screw press frame and shall have bolt holes along at least one edge.

2.6 MIXING AND FLOCCULATION TANKS:

A. Each Volute Dewatering Press shall have an integrated two-stage mixing system comprising of a flash/rapid mix tank and flocculation tank, each with mixers and drive motors. Tank sizing and design will ensure adequate residence times and mixing conditions to ensure complete flocculation and satisfactory dewatering performance. Tank design will minimize the possibility of any short circuiting of flow.

B. Flocculation tank shall be capable of being visually inspected so that operators can monitor the sludge/polymer reaction.

C. Design and manufacture of tanks and spill trays must ensure no leakage or spillage of fluids under normal working conditions.

D. Mixing and flocculation tanks will be manufactured in type 304 stainless steel and will be a minimum of 11 gauge (0.12”). Tanks and spill containment trays will be fully welded internally and externally.

E. Each Mixer will have a drive motor:

1. The mixer and flocculation tank drive motors will be a one piece gearmotor. Gearmotors will be hollow shaft design designed to drive the mixing impeller shafts with no additional couplings or joints. Motors will be filled with grease on assembly and sealed for life. Mixer rotational speed shall be obtained through a hypoid reduction gear. Input power to the dewatering drum drive shall be supplied through an A.C. variable frequency drive unit allowing variable mixing energy to be input to the system.

2. Flash Mixing tank drive motor shall have gear reduction of 10:1 with an output shaft speed of 180 RPM at 60 Hz.

3. Flocculation tank drive motor shall have gear reduction of 60:1 with an output shaft speed of 30 RPM at 60 Hz.

4. Motor enclosure shall be TEFC made of Die Cast Aluminum. Insulation shall be IP65.

2.7 POLYMER MIXING SYSTEM

A. The polymer station shall be self-contained with pumps, piping, fittings, and accessories, and shall be factory assembled and tested to eliminate field assembly work and therefore to minimize installation and start up time. The frame shall be 304 stainless steel and the piping SCH 80 PVC. The following mixing Suppliers are acceptable:

1. VeloDyne;

2. Or Equal.

B. A polymer mixing chamber shall be provided. The mixing chamber shall have a translucent front cover. The mixing chamber shall be designed to produce variable intensity, back flow mixing action to optimize polymer performance without damaging polymer molecular structure.

C. Materials: Impeller - PVC; body of mixing device – PVC; cover – clear Lexan; fastener – 316 SS; seals – Viton; pressure rating – maximum 150 PSI.

D. The water piping connection to the polymer blend system shall include a minimum 1 in inlet (NPT female), an UL listed solenoid valve (rated IP65), and a flow meter with a rate adjusting valve and low-pressure alarm switch.

E. A neat polymer metering pump with hose connector shall be provided and connected through a 1/2 in barbed hose to the polymer mixing device. The neat polymer pump shall be a progressive cavity type pump.

F. Junction Box: NEMA 4X FRP or SS enclosure.

G. Polymer system shall be controlled and monitored by the dewatering press control panel.

1. Status / Alarm indicators: system running indication; LCD display of metering pump rate (on metering pump); low pressure switch alarm.

2. Inputs: remote start / stop (discrete dry contact); pacing signal from main control panel (4-20 mA).

3. Outputs: system running (discrete dry contact); remote mode (discrete dry contact); low pressure alarm (discrete dry contact); low flow alarm (discrete dry contact).

H. The pressure side of the polymer system shall be connected through a minimum 1 in diameter PVC pipeline and a magnetic inductive flow meter to the polymer injection point.

2.8 CONTROLS AND INSTRUMENTATION

A. The dewatering press system shall have an integrated electrical and control system that will allow for safe, simple and automated operation of the unit. All electrical work, motors and drives will comply with any relevant NEMA standards.

B. The entire control system shall be provided by the SUPPLIER. The CONTRACTOR shall provide wiring between all system components as required.

1. Control panel shall be mounted to back of flash mix tank and shall be pre-wired by the SUPPLIER to the extent possible.

C. The dewatering unit shall be provided with a NEMA 4X stainless steel control panel. The enclosure shall be of style suitable for wall mounting, shall have hinged covers which swing horizontally and shall be held closed with 3-Point Latch, and shall include main disconnect switches, transformers, surge arresters, control switches, starters, sensors, PLCs, OITs, air conditioner and all other controls/instrumentation required for a complete and operable system.

D. See Division 40 for complete control system requirements.

E. Programmable Logic Controller (PLC) shall be an Allen Bradley CompactLogix 5069 Series PLC with a Panelview 5000 series HMI.

1. PLC shall be installed, wired, and programmed to perform the following functions:

a. Operational Control: Control of all components of the dewatering system including the ability to set times and operating speeds for any feed pump installed, solids conveyor, dewatering drums, mixers, polymer dosing system and wash-down sprays.
b. System Tuning: PLC will allow suitably qualified operators to adjust operating parameters such as delay timers for fault alarms and system calibration constants.
c. Monitoring Operation: PLC will allow the operator to inspect the operation of all the components including indicators such as output frequency, current draw, thermal condition, elapsed operating times, and any faults present. Operator will be able to view approximated readouts of all operational speeds and flowrates relevant to the operation of the system.
d. Manual operation of components: Operator will be able to manually operate each item of equipment from the PLC interface for inspection and maintenance reasons.
e. Time Clocks: Operator will be able to set the unit to operate at specific time or on specific days with no operators present.

2. HMI shall be located on the enclosure so that it is centered at 5’-2” above the surrounding finished floor.

PART 3 EXECUTION

3.1 TESTING

A. Prior to shipment, Supplier shall conduct factoring testing and verification of the dewatering press system and control panel at the place of assembly. Factory test each pre-assembled, pre-wired, dewatering press system and its associated control panel to be supplied to the job site. Prior to shipment, verify through a one-hour continuous operating test that the dewatering press system and associated equipment operate smoothly, noiselessly, vibration free, and without overheating of any bearing or motor. Test period shall demonstrate accurate measurement of sensors and function of run sequences.

B. The owner/engineer shall, at their option, be permitted to witness the factory quality control test at the Supplier's facility. The Supplier shall give the Owner and Engineer a minimum of one (1) weeks' notice prior to testing.

3.2 INSTALLATION

A. Contactor will undertake installation of equipment in this section as per the Supplier's submitted instructions and in accordance with these specifications and associated plans.

B. Supplier will provide phone/email consultation as necessary to ensure correct installation and resolve any issues that arise during installation.

C. No on-site supervision should be required for installation, however should the Contractor deem it necessary, onsite services may be provided and charged to the Contractor at the Supplier's standard service rates plus travel.

3.3 FIELD INSTALLATION SERVICES

A. SUPPLIER shall furnish the services of a factory-trained service engineer for a period of 6 days onsite over 3 trips to perform the following:

1. Verify installation of dewatering equipment

2. Perform initial startup and commissioning of dewatering equipment.

3. Instruct facility personnel in the operation and maintenance of equipment.

4. Verify system performance after 6 months of operation.

END OF SECTION 467627

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