



SCREW PRESS

Proposal for Complete Sludge Dewatering System

for

City of San Luis

West WWTP 3 MGD MBR Phase 1 Upgrades

December 2, 2024

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Fixed Price Proposal

OPTION A - NOT SELECTED

Exhibit C - Proposed Equipment Summary	
Sludge Dewatering System	
Manufacturer/Equipment System General Information	
Name of Manufacturer:	FKC Co., Ltd.
Model Info.	BHX-1350x7500L
Total # of Units for System (Including Redundancy)	One
Main Drive - Horsepower per Unit (Hp)	5 HP, 1200 RPM
Flocculation Tank Drive - Horsepower per Unit (Hp)	1.5 HP, 1800 RPM
Conveyor Drive - Horsepower per Unit (Hp)	3.0 HP, 1800 RPM
Sludge Pump - Horsepower per Unit (Hp)	10 HP, 1800 RPM
Polymer System - Horsepower per Unit (Hp)	1 HP
Total Unit Max Connected Electrical Load (kW)	6.4 kW. See electric calc's sheet for assumptions.
Equipment Size - per Unit (LxWxH) (in)	414" x 78" x 184" (screw press only. See drawings provided for complete dimensions)
Equipment Dry Weight - per Unit (lbs)	34,479 lbs empty (screw press only. See drawings provided for additional weights)
Equipment Max Operational Weight - per Unit (lbs)	46,298 lbs full (screw press only. See drawings provided for additional weights)
Equipment Skid Mounted (y/n)	n (no). All equipment proposed is shipped loose and separate for field installation by others.
Drum Diameter (in)	53 inches (1350 mm)
Max Screw Speed (RPM)	0.24 rpm (screw press only. Up to 64 rpm for flocculation tank)
Emergency Shutdown Equipment Included (y/n)	y (yes)
Construction/Fabrication Materials	
Equipment Component Construction/Fab Materials info provided in proposal (y/n)	y (yes)
Frame / Base Fabrication Materials and Surface Prep Type and Finish	Galvanized carbon steel screw press channel base. Standard manufacturer's prep and finish for drives and motors. SSPC-SP-6 with Zinc Primer / Epoxy / Polyurethane coating system for others.
Fastening Hardware Materials	316 stainless steel in the wetted area. Others (like drive to discharge box) are 304 stainless steel.
Seal and Support/Wear Materials of Construction	Inlet and outlet bearing seals on the screw are nitrile Buna-N. There are no wear materials within the drum/screen/screw dewatering area for the screw press.
Perforated Plate Material and Opening Size	304 stainless steel with 2.5 mm holes
Drainage Pipe Size, Type, and Material	ANSI 10-inch 150lb Flange, 304 stainless steel
Discharge Hopper Materials of Construction	304 stainless steel wetted parts. Bearing housings & gussets are painted carbon steel.
Bearing Type, Material, Life Rating	Spherical roller bearings, carbon steel, >100,000 hours for screw press.
Motor Types, Service Factor, Insulation Class Ratings	Severe Duty, NEMA Premium Efficiency, Class I-Div 2-Group D compliant, 1.15 SF (1.0 for ASD Duty), Class F Insulation
Drive Mechanism, Type/Model/Rating	SEW, 5 HP, 1200 RPM for screw press.
Floc Tank Drive Mechanism, Type/Model/Rating	Helical Wormgear, SEW Eurodrive, SAF47AM145 29:1, 1.5 HP
Wash System and Nozzles Materials of Construction	304 stainless steel or better
Electrical Equipment Ratings:	Motors & solenoid valves are Class I, Div 2, Group D. NEMA 12 for MCP. Local Control Station & Estop push button control stations are NEMA 4X.
Safety Devices:	Two (2) NEMA 4X Estop Push Button Control Stations (loose), One (1) Process Stop Push Button on MCP door)
Local/Main Control Panel Materials of Construction (NEMA Rating)	Local NEMA 4X, Main Control Panel NEMA 4X, 304 SS
Performance Information	
Maximum Hydraulic Capacity (gpm)	200 gpm
Maximum Solids Loading Capacity (lbs/hr)	1000 dry lbs/hr
Hydraulic Capacity @ 1.0% DS (gpm)	200 gpm
Solids Loading Capacity @ 1.0% DS (lbs/hr)	1000 dry lbs/hr
Dry Solids (cake - assume 1.0% DS feed) (%)	15 % TS or Higher
Minimum Solids Capture Rate - assume 1.0% DS feed (%)	95%
Wash Water Requirements (gpm, psi)	55 gpm @ 35 psi, intermittent, solenoid is open for 15 seconds every 10 minutes. Opens 3.0 minutes total per hour of operation.
Lbs. of Polymer used at design dry solids of 2.25% feed (lbs active polymer per ton DS)	30 active lbs per dry ton
Capital Costs	
Total Primary Dewatering Unit Equipment Cost (\$)	\$813,297.00
Total Conveyance System Equipment Costs (\$)	\$69,250.00
Total Sludge Pumping Equipment Costs(\$)	\$44,100.00
Total Polymer System Equipment Costs (\$)	\$71,500.00
Price of spare parts (\$)	Included
Start-up / Training Costs (\$)	Included
Total Freight (FOB to Jobsite)(\$)	\$48,360.00
Total System Capital Costs (\$)	\$1,046,507.00
Total Cost Addition to Reach BABA Compliance (\$)	Not Available
Warranty	
Equipment System Warranty Period (months)	24 months after start-up or 30 months after delivery. 5 year extended mechanical warranty.
Service & Support	
Start-up Period (days)	two trips, total of 8 days for inspection, functional/operational testing, training, and performance.
Is Spare Parts List Provided? (y/n)	y (yes)
Location of Parts Distribution Center (city, distance in miles to project)	Port Angeles, Washington. 1,550 miles.
Location of Design Support Center (city, distance in miles to project)	Port Angeles, Washington. 1,550 miles.
Quote for 10-Year Full Maintenance Contract Included with proposal (y/n)	y (yes)
Full Maintenance Contract Costs (\$)	\$75,000
Delivery Schedule	
Submittal Period (months)	8 weeks after date of signed Purchase Order
Fabrication and Delivery Period (months)	not to exceed 7 months after submittal approval and notice to proceed with manufacturing.

OPTION B - SELECTED OPTION

Exhibit C - Proposed Equipment Summary	
Option B	
Sludge Dewatering System	
Manufacturer/Equipment System General Information	
Name of Manufacturer:	FKC Co., Ltd.
Model Info.	BHX-1250x6500L
Total # of Units for System (Including Redundancy)	One
Main Drive - Horsepower per Unit (Hp)	5 HP, 1800 RPM
Flocculation Tank Drive - Horsepower per Unit (Hp)	1.5 HP, 1800 RPM
Conveyor Drive - Horsepower per Unit (Hp)	3.0 HP, 1800 RPM
Sludge Pump - Horsepower per Unit (Hp)	10 HP, 1800 RPM
Polymer System - Horsepower per Unit (Hp)	1 HP
Total Unit Max Connected Electrical Load (kW)	6.4 kW. See electric calc'c sheet for assumptions.
Equipment Size - per Unit (LxWxH) (in)	345" x 74" x 112" (screw press only. See drawings provided for complete dimensions)
Equipment Dry Weight - per Unit (lbs)	28,660 lbs empty (screw press only. See drawings provided for additional weights)
Equipment Max Operational Weight - per Unit (lbs)	35,274 lbs full (screw press only. See drawings provided for additional weights)
Equipment Skid Mounted (y/n)	n (no). All equipment proposed is shipped loose and separate for field installation by others.
Drum Diameter (in)	49 inches (1250 mm)
Max Screw Speed (RPM)	0.24 rpm (screw press only. Up to 64 rpm for flocculation tank)
Emergency Shutdown Equipment Included (y/n)	y (yes)
Construction/Fabrication Materials	
Equipment Component Construction/Fab Materials info provided in proposal (y/n)	y (yes)
Frame / Base Fabrication Materials and Surface Prep Type and Finish	Galvanized carbon steel screw press channel base. Standard manufacturer's prep and finish for drives and motors. SSPC-SP-6 with Zinc Primer / Epoxy / Polyurethane coating system for others.
Fastening Hardware Materials	316 stainless steel in the wetted area. Others (like drive to discharge box) are 304 stainless steel.
Seal and Support/Wear Materials of Construction	Inlet and outlet bearing seals on the screw are nitrile Buna-N. There are no wear materials within the drum/screen/screw dewatering area for the screw press.
Perforated Plate Material and Opening Size	304 stainless steel with 2.5 mm holes
Drainage Pipe Size, Type, and Material	ANSI 10-inch 150lb Flange, 304 stainless steel
Discharge Hopper Materials of Construction	304 stainless steel wetted parts. Bearing housings & gussets are painted carbon steel.
Bearing Type, Material, Life Rating	Spherical roller bearings, carbon steel, >100,000 hours for screw press.
Motor Types, Service Factor, Insulation Class Ratings	Severe Duty, NEMA Premium Efficiency, Class I-Div 2-Group D compliant, 1.15 SF (1.0 for ASD Duty), Class F Insulation
Drive Mechanism, Type/Model/Rating	Cyclo, 5 HP, 1800 RPM for screw press.
Floc Tank Drive Mechanism, Type/Model/Rating	Helical Wormgear, SEW Eurodrive, SAF47AM145 29-1, 1.5 HP
Wash System and Nozzles Materials of Construction	304 stainless steel or better
Electrical Equipment Ratings:	Motors & solenoid valves are Class I, Div 2, Group D. NEMA 12 for MCP. Local Control Station & Estop push button control stations are NEMA 4X.
Safety Devices:	Two (2) NEMA 4X Estop Push Button Control Stations (loose), One (1) Process Stop Push Button on MCP door
Local/Main Control Panel Materials of Construction (NEMA Rating)	Local NEMA 4X, Main Control Panel NEMA 4X, 304 SS
Performance Information	
Maximum Hydraulic Capacity (gpm)	170 gpm with Cake Dryness of 15% TS or Higher; 200 GPM Guaranteed to Pass the Paint Filter Test
Maximum Solids Loading Capacity (lbs/hr)	1000 dry lbs/hr
Hydraulic Capacity @ 1.0% DS (gpm)	170 gpm
Solids Loading Capacity @ 1.0% DS (lbs/hr)	1000 dry lbs/hr
Dry Solids (cake - assume 1.0% DS feed) (%)	15% TS or Higher
Minimum Solids Capture Rate - assume 1.0% DS feed (%)	95%
Wash Water Requirements (gpm, psi)	55 gpm @ 35 psi, intermittent, solenoid is open for 15 seconds every 10 minutes. Opens 3.0 minutes total per hour of operation.
Lbs. of Polymer used at design dry solids of 2.25% feed (lbs active polymer per ton DS)	30 active lbs per dry ton at 170 GPM; 40 active lbs per dry ton at 200 GPM
Capital Costs	
Total Primary Dewatering Unit Equipment Cost (\$)	\$636,677.00
Total Conveyance System Equipment Costs (\$)	\$69,250.00
Total Sludge Pumping Equipment Costs(\$)	\$44,100.00
Total Polymer System Equipment Costs (\$)	\$71,500.00
Price of spare parts (\$)	Included
Start-up / Training Costs (\$)	Included
Total Freight (FOB to Jobsite)(\$)	\$48,360.00
Total System Capital Costs (\$)	\$869,887.00
Total Cost Addition to Reach BABA Compliance (\$)	Not Available
Warranty	
Equipment System Warranty Period (months)	24 months after start-up or 30 months after delivery. 5 year extended mechanical warranty.
Service & Support	
Start-up Period (days)	two trips, total of 8 days for inspection, functional/operational testing, training, and performance.
Is Spare Parts List Provided? (y/n)	y (yes)
Location of Parts Distribution Center (city, distance in miles to project)	Port Angeles, Washington. 1,550 miles.
Location of Design Support Center (city, distance in miles to project)	Port Angeles, Washington. 1,550 miles.
Quote for 10-Year Full Maintenance Contract Included with proposal (y/n)	y (yes)
Full Maintenance Contract Costs (\$)	\$75,000
Delivery Schedule	
Submittal Period (months)	8 weeks after date of signed Purchase Order
Fabrication and Delivery Period (months)	not to exceed 7 months after submittal approval and notice to proceed with manufacturing.

FKC CO., LTD.

2708 West 18th Street
Port Angeles, WA 98363



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

December 5, 2024

Re: Scope of Supply – City of San Luis, Arizona
CDN Project Number: 9395167

This document outlines FKC's Scope of Supply for the City of San Luis Request for Proposals for a Complete Sludge Dewatering System. This proposal includes all items outlined in the RFP.

In summary this scope of supply includes:

- Qty (1) BHX-1350x7500L screw presses
 - Or BHX 1250 x 6500L (up to 170 GPM) – **Option B**
 - with Screw Press Legs
 - with Headbox Level Transmitter
 - with all Solenoid Valves
 - with Legs as shown in the equipment layout drawings
 - with access platforms on both sides of the equipment
 - Qty (1) 540GL flocculation tanks
 - with access platform as shown in the equipment layout drawing
 - Qty (1) Custom Control Panel
 - Qty (1) 12" Dia x 30' Long Shaftless Screw Conveyor
 - With Stainless Steel inlet chute
 - With support legs as shown in the equipment layout drawings
 - Qty (2) Seepex Sludge Feed Pumps
 - Qty (1) FKC Emulsion Polymer system with PLC Controls
 - with variable water controls
 - with FKC Polymer Injection Ring and Manifold
- Warranty as specified
All required Manufacturer's Field Services as outline
All documentation, such as submittal, O&M, ext.

All items listed are shipped separate and loose to be assembled/installed by others.

We hope this information is helpful. Please contact this office if you have questions or require any further information.

Thank you,

A handwritten signature in black ink, appearing to read "Wesley Bond", written over a horizontal line.

Wesley Bond
FKC Co., Ltd.

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A. Proposed Equipment OPTION A - NOT SELECTED

1. Screw Press

Quantity	Description	Unit Price FOB San Luis, Arizona
1	FKC Screw Press Model BHX 1350x7500L	
	Material to process:	Secondary Sludge from MBR plant
	Inlet Consistency:	1.0% Total Solids or Higher
	Max Flow:	200 gpm @ 1.0 % Total Solids (polymer excluded)
	Max Solids Thru put:	1,000 dry pounds per hour 12 BDST/d
	Outlet Consistency:	15% or Higher, Lab testing required to verify cake dryness
	Solids Capture:	95% minimum
	Typical Operation:	24 hours per Day or less
	Polymer Use:	30 Lbs. / Dry Ton of Active Polymer

A. Proposed Equipment

1. Screw Press (con't)

Quantity	Description	Unit Price FOB San Luis, Arizona
(con't – FKC Screw Press Model BHX-1350x7500L)		

Materials of Construction:

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

Other:

- 1 set standard tools in tool box
- 1 set drum covers
- 1 motor coupling
- 5 solenoid valves
- 1 headbox level transmitter

Speed Reducer: SEW Speed Reducer

Motor: Toshiba C-face severe duty motor or equivalent
5.0 HP, 1200 RPM, 460V, 3ph, 184TC Frame

A. Proposed Equipment – Option B SELECTED OPTION

1. Screw Press

Quantity	Description	Unit Price FOB San Luis, Arizona
1	FKC Screw Press Model BHX 1250x6500L	
	Material to process:	Secondary Sludge from MBR plant
	Inlet Consistency:	1.0% Total Solids or Higher
	Max Flow:	170 gpm @ 1.0 % Total Solids (polymer excluded)
	Max Solids Thru put:	1,000 dry pounds per hour (170 GPM @ 1.2% TS) 12 BDST/d
	Outlet Consistency:	15% or Higher, Lab testing required to verify cake dryness
	Solids Capture:	95% minimum
	Typical Operation:	24 hours per Day or less
	Polymer Use:	30 Lbs. / Dry Ton of Active Polymer

A. Proposed Equipment

1. Screw Press (con't)

Quantity	Description	Unit Price FOB San Luis, Arizona
(con't – FKC Screw Press Model BHX-1250x6500L)		

Materials of Construction:

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

Other:

- 1 set standard tools in tool box
- 1 set drum covers
- 1 motor coupling
- 5 solenoid valves
- 1 headbox level transmitter

Speed Reducer: Cyclo Speed Reducer

Motor: Toshiba C-face severe duty motor or equivalent
5.0 HP, 1800 RPM, 460V, 3ph, 184TC Frame

A. Proposed Equipment

2. Flocculation Tank

Quantity	Description	Unit Price FOB San Luis, Arizona
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1	FKC Flocculation Tank Model 540GL	Included
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Material to flocculate: Secondary Sludge from MBR plant

Inlet Consistency: 1.0 % Total Solids or Higher

Max Flow: 200 gpm @ 1.0 % Total Solids (polymer excluded)

Ave Detention Time: 2.7 minutes @ 1.0% Total Solids

Materials of Construction:

Tank	304 Stainless Steel
Covers	304 Stainless Steel
Agitator Support Stand	304 Stainless Steel
Agitator Blades & Shaft	304 Stainless Steel
Fasteners (B,N,W,Clips) in wetted area	304 Stainless Steel

Other: 1 Hi-Hi Level Floc Tank Probe

Speed Reducer: SEW Standard Varimot Gearmotor
with mechanical hand wheel for speed adjustment

Motor: SEW Standard
1.5 HP, 460V, 3ph, integral to gearbox

A. Proposed Equipment

3. Control Panel

Quantity	Description	Unit Price FOB San Luis, Arizona
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1 System Controls

(Qty. 1) Screw Press Control Panel (60" x 49" x 18" NEMA 4X (316SS), Flange Mount Disconnect Enclosure) including:

- Allen Bradley 5069-L310ER Processor w/ Ethernet Connection Including:
 - 32 Digital Inputs
 - 16 Digital Outputs ▪ 8 Analog Inputs
 - 8 Analog Outputs
- Maple Systems 9.7" OIT – w/ Sun Shield
- (Qty.1) Sludge Feed Pump VFD, 15 HP PowerFlex 525 w/ 3% Line Reactor & Ethernet Connection.
 - o HOA, running light, fail light & potentiometer.
- (Qty.1) Floc Tank Mixer VFD, 2 HP PowerFlex 525 w/ 3% Line Reactor & Ethernet Connection.
 - o HOA, running light, fail light & potentiometer.
- (Qty.1) Screw Press VFD, 7.5 HP PowerFlex 525 w/ 3% Line Reactor & Ethernet Connection.
 - o HOA, running light, fail light & potentiometer.
- (Qty.1) Conveyor VFD, 5 HP PowerFlex 525 w/ 3% Line Reactor & Ethernet Connection.
 - o HOA, running light, fail light & potentiometer.
- Process Stop, Power on Light on Panel Door
- UPS 1000VA
- Air Conditioner – 8000 BTU
- TVSS & 480/120 VAC Transformer - 120 VAC Power for 1 - Polymer System - Controls for 3 – Washwater Solenoids.
- Controls for 1 - Polymer System.

1.1 INSTRUMENTATION LIST

(Qty.1) Floc Tank Hi-Hi Level Switch (Warrick 316SS Probe w/ Electronics Module) (Qty.1) Headbox Level Transmitter (IFM 2" Sanitary Connection)

A. Proposed Equipment

1. Inclined Shaftless Screw Conveyor

Quantity	Description	Unit Price
1	<p>Inclined Shaftless Conveyor 12-inch diameter Approximately 30-feet 5 HP, 460V, 3ph, 1800 rpm motor</p> <p>To include:</p> <p>Reducer: SEW Eurodrive, Type FAF, "Snuggler" Parallel Helical Gearmotor with AM type "C" face adapter.</p> <p>Spiral Flighting: Diameter of 12" minimum, 2-1/2" wide x 3/4" thick spiral. Spring effect at full load will not elongate more than .08" per foot of length. 8620 steel material. Drive end of flighting to include shop installed torque plate for bolting to drive shaft. Shop/field full penetration welds at all splice connections.</p> <p>Troughs: 10-gauge, 304 stainless steel formed flange u-troughs fabricated in maximum 8' lengths. Trough end plates will be minimum 3/8" thick 304 stainless steel.</p> <p>Trough Liners: 1/2" thick UHMW two color trough liner in 4' long sections. Liners held in place with 304 stainless steel 1/2" square bar retaining rods.</p> <p>Covers: 10-gauge 304 stainless steel formed conveyor covers in maximum 48" lengths. Covers will be gasketed and bolted to trough flange.</p>	See Bid Form
1	Screw Press inlet connections	
1	Omron ER6022 Emergency Stop Switches with pull cords	
1	Siemens Milltronics Zero Speed Switch Probe	
1	Set Support Legs	

A. Proposed Equipment

1. FKC Polymer Systems

Quantity	Description	Unit Price FOB San Luis, Arizona
2	FKC Model PMS-M-5-P-120-P	

Polymer Flow Range: 0.5 – 5.0 GPM
 Dilution Water Flow: 5 to 20 GPM

Each Unit will include the following:

-
- | | |
|---|--|
| 1 | Progressive Cavity Neat Polymer Pump: <ul style="list-style-type: none"> • 1" Polymer Inlet • ½ HP, 1800 RPM, AC Inverter Duty Motor • Loss of Polymer Switch by IFM • Calibration Column |
| 1 | Inlet Water Piping: <ul style="list-style-type: none"> • 1" NPT Water Inlet • Incoming Water Pressure Relief Valve • FlowTec Motorized Ball Valve • Make-Down Water flow meter: IFM Magnet Flow Meter • Water Pressure Gage • Differential Pressure Switch |
| 1 | Mechanical Neat Polymer : Water Mixing Chamber: <ul style="list-style-type: none"> • Polymer / Water injection assembly <ul style="list-style-type: none"> a. 316 L injection Valve • 1/3 HP, 3600 RPM, AC Inverter Duty Motor • 316L SS Mixing blades • PVC Body with Clear Polycarbonate face • Manual Drain Valve • Discharge Pressure Gage |

A. Proposed Equipment

1. FKC Polymer Systems

Continued from page 1.

1 Controls:

- Enclosure: NEMA 4X, 304SS 42x36x12
- Power Requirements: 120 VAC, 30A service
- PLC Control w/ HMI interface
- Operator Controls:
 - a. Hand / Off / Auto
 - b. Alarm Status
 - c. E-Stop
- Inputs by Others
 - a. Remote Start / Stop
 - b. 4 – 20 mA speed control
- Outputs to Others:
 - a. System Running
 - b. System in Remote
 - c. Alarm Status

1 System Skid:

- Manufactured in USA
- 304L SS, 1" square tube

1 FKC Services:

- Engineer Drawing 2D and 3D available
- Pump Flow Curves
- Submittal
- Operation and Maintenance Manuals

1 Start-Up Services:

- Included 1-Day Start-Up and Training

A. Proposed Equipment (con't)

3. Screw Press Aluminum Platform

<u>Qty.</u>	<u>Description</u>	<u>Unit Price, FOB</u>
1	Marine Grade Aluminum Platform Structure	

Material: Marine Grade Aluminum 6061-T6

A. Screw press manufacturer to provide access platform on both sides of screw press and stairways as shown in drawings provided.

B. Platform and stairs shall be made out of 6061-T6 or 5052 marine grade aluminum shapes.

C. Platform shall be made of 6" channel, while stair sidewalls shall be made out of 8" channel.

D. Legs shall be made out of 4" x 4" x 1/4" square tubing. The platform shall be bolted to the concrete risers below the screw press for support where the platform runs along the edge of the screw press. Otherwise, the square tubing legs shall be provided to anchor the platform to the floor.

E. Handrails and guards shall be made out of 1 1/2" pipe and tubing.

F. Decking shall be 1 1/2" by 3/16" I-Bar grating.

G. Toe board shall be 4" x 1/4" flat bar.

H. All hardware and fasteners shall be Aluminum. Anchor bolts will be sized by screw press manufacturer and provided by contractor.

I. Provide structural calculations stamped by a professional engineer in the state of Arizona for legs, bracing and anchorage of the platform and stairways.

A. Proposed Equipment

1. Sludge Feed Pumps

Offer No. 500315890/1/
FKC Co.Ltd.

SEEPEX.
An Ingersoll Rand Business

11/20/2024	Item 10
qty.: 2	pump to handle secondary waste activated Progressive cavity pump BN 70-6L / A1-C1-L8-F0-GA

Application data

Conveyed product	secondary waste activated
Flowability	flowable
Viscosity	low viscosity (< 500 cP/mPas)
Solids content	3.0% max.
Size of solids	not specified
Density	unknown, 1 kg/dm ³ assumed
Product temperature	56°F - 86°F
Product temperature (norm.)	68°F
pH value	5-9
Kind of operation	continuous
Operating hours	8 h/day
Location	indoor, dry atmosphere
Altitude of installation	up to 1000 m assumed
Surrounding temperature	normal (32-104 °F)

Performance data

	Capacity	Pressure	Speed
Starting torque	240 USGPM	18 psi	246 rpm
Inlet pressure	332 lb.ft	flooded suction (up to 0,5bar)	

Tolerances according to SEEPEX standards.

Materials and executions

Installation	horizontal
Direction of rotation	counter clockwise (left)
Lantern - Design	with cover plates
Lantern - Material	EN-JL 1040 (gci-25)
Suction casing - Design	standard
Suction casing - Material	EN-JL 1040 (gci-25)
Pressure branch - Design	standard
Pressure branch - Material	EN-JL 1040 (gci-25)
Position of branch	position 1
Suction connection	NPS 6, drilled acc. to ASME B 16.5, Class 150, RF
Pressure connection	NPS 6, drilled acc. to ASME B 16.5, Class 150, RF
Joint - Design	pin joint with joint sleeve, grease filled
Joint - Material	standard, holding bands 1.4401
Joint - Universal joint sleeve: material	NBR - Perbunan
Coupling rod - Design	standard
Coupling rod - Material	1.4021 / AISI 420
Rotor - Design	standard
Rotor - Material	1.0503 (C45) / AISI 1045
Rotor - Coating	ductile chromium coating
Stator - Design	standard
Stator - Material	NBR - Perbunan
Shaft sealing	mechanical seal
Code	GA - single acting mechanical seal
Shaft diameter	80 mm
Rotating/stationary seal face	SiC SiC
Elastomers	FPM
Spring	1.4571 / AISI 316Ti
Metal parts	1.4571 / AISI 316Ti
Casing - material	1.4408 / ASTM A351 grade CF8M
Casing - connection standard	NPT

A. Proposed Equipment

1. Sludge Feed Pumps, Cont.

Offer No. 500315890/1/ Item 10
FKC Co.Ltd.



Plug-in Shaft - Design	standard
Plug-in Shaft - Material	1.4021 / AISI 420
Bolting - Design	standard
Painting - Number of colors	single-colored
Painting - Painted components	complete combination
Painting - Color	Primer Coat: Tnemec Hi-Build Epoxoline II series N69-1211/Red, 4 mil, DFT Finish Coat: Tnemec Hi-Build Epoxoline II series N69-04BR/Desert Sands, 4 mil DFT
Painting - Surface protection	SSPC-SP1 Solvent Cleaning SSPC-SP3 Power Tool Cleaning SSPC-SP6 Commercial Blast on base plate only

Drive

Type	Gear & Motor at freq. inv. (Inverter is not included)		
Mounting type	Flange design		
Mounting orientation	M1		
Ratio (i)	6.42		
	Norm	Min	Max
Speed	275 rpm	246 rpm	246 rpm
Motor speed	1765 rpm	1580 rpm	1580 rpm
Frequency	60 Hz	53 Hz	53 Hz
Rated output	15 HP		
Rated speed	1765 rpm		
Starting	direct on frequency inverter		
Efficiency class	premium efficiency		
Terminal box position acc. to supplier	right		
Cable entry position acc. to supplier	not specified		
Voltage	3x 230/460 V		
Frequency	60Hz		
Enclosure	TEFC		
Thermal class	F		
Winding protection	Thermostats		

The frequency inverter has to follow a linear U/f characteristic curve (constant torque).
It's essential to have a minimum overload capability of 150% for at least 60 seconds. (see technical data sheet)

Baseplate

Design	extended - with motor support
Material	steel, painted
GPU Type Code	B-ST-LS-EM

Packing

Type of packing	skid (US)
Type of transport	truck
Quantity of pumps per position	1 pump

Price composition

B. Miscellaneous

1. Delivery

Delivery will be within eight (8) months after approved submittals and notice to proceed with manufacturing.

2. Shipping Arrangements

The FKC screw press will be shipped via open top container from FKC Ishinomaki, Japan factory to a local port then best way overland to the WWTP.

Purchaser is responsible to remove the top of the container, unload the screw press and other miscellaneous crates/boxes via a crane, then replace and close up the container.

The flocculation tanks and other ancillary equipment provided will be delivered on a flatbed trailer from the FKC Port Angeles, WA facility then best way overland to the WWTP.

3. Price Summary

Qty	Description	Price US\$
1	Primary Dewatering Equipment	813,297.00
	Option B Screw Press	636,677.00
1	Conveyance System	69,250.00
1	Sludge Pumping Equipment	44,100.00
1	Polymer System	71,500.00
1	Start-Up	Included
1	Freight	48,360.00
	Total FOB San Luis, AZ	1,046,507.00
	Total FOB San Luis, AZ Option B	869,886.00

FKC cannot offer pricing at this time that is BABA compliant. The following equipment is manufactured in the USA with US materials and would be BABA compliant, break-out pricing can be provided upon request:

Flocculation Tank – BABA Compliant

Conveyor – BABA Compliant

Polymer System – BABA Compliant

Aluminum access platforms and Screw Press support legs – BABA Compliant

Pricing does not include taxes or bonding.

Additional ancillary equipment necessary for a complete dewatering system such as conveyors, valves, disposal bin, etc. are not included.

4. Purchase Options Offered

No purchase options are offered at this time.

5. Effective Period

This proposal shall remain valid 6-months days from the date of the proposal.

FKC will also agree to hold the price for an additional year, with an inflation rate not to exceed 1% increase per quarter or less as stated by the Phoenix Tender Price Index, whichever is lower.

6. Payment Terms

10% with approved drawings & submittals
90% with delivery

Net 30 days

FKC realizes that up to 10% of the total purchase price may be retained until final performance testing and acceptance are completed.

7. Installation

The screw press is shipped as one piece. The screw press motor and coupling will require field installation by Purchaser.

Each piece of equipment offered is loose and separate. Purchaser would need to unload, field assemble, install and provide utilities and connections to and in between all pieces of equipment offered in this proposal.

Anchor bolts are to be provided by the Contractor.

Installation and erection assistance are not included in the price of the equipment and generally are not required. However, the service is available for our standard service rates found in paragraph B.12.

8. On-Site Services

Seven (7) days of on-site services are included with the price of this proposal. Each day consists of one man 8-hour day. Holidays and weekends days are not offered for on-site services. Time of on-site service is exclusive of travel time.

On-site services can include installation inspection, start-up, testing, calibration, performance, optimization, and training for the equipment. Operator & maintenance instruction is usually completed in one (1), 8-hour day. Performance testing normally occurs within two (2) consecutive days of operation.

9. Warranty

- A. Warranty shall extend for 24 months after start-up or 32 months after delivery, whichever comes first.
- B. Warranty shall include all parts, labor, and coatings for repairing or replacing equipment that fails during the warranty period. Defects occurring within the warranty period shall be repaired or replaced by the manufacturer at no cost to the OWNER.

10. Performance Guarantee

The performance figures and conditions denoted in section A of this proposal constitute FKC Co., Ltd.'s performance guarantee and the conditions required to meet the guarantee. All of the consistency figures are based on total solids (TS) not total suspended solids (TSS).

In the event that performance is not met, FKC will provide all parts, engineering, and labor associated with the work necessary to bring the equipment into conformance with the performance guarantee.

11. Documentation Schedule

- a. Submittals for Approval – Screw press and flocculation tank submittals and drawing within three (3) weeks of written purchase order. Control panel submittal and drawing within six (6) weeks after receipt of purchase order.
- b. Certified Drawings - within 2 weeks after submittal approval
- c. Operation & Maintenance Manuals – before delivery of equipment

12. Spare Parts List

The following spare parts are provided with this quotation:

1. Screw Press
 - a. 4 each screens per screw press
 - b. 1 each motor coupling per screw press
2. Flocculation Tank
 - a. None.

There are no spare parts required for the first 24 months after startup. A list of spare parts are listed below:

Screw Press:

ITEM #	DESCRIPTION	Lead Time	Q'TY	UNIT PRICE
1	CYCLO REDUCER CHVJ-6275DA-7569 / SUMITOMO	6 – 8 weeks	1	\$73,668
2	OIL SEAL UD 270x330x25 / MUSASHI	6 – 8 weeks	1	\$560
3	SPHERICAL ROLLER BEARING 23056	6 – 8 weeks	1	\$572
4	OIL SEAL UD 300x360x25 / MUSASHI	6 – 8 weeks	1	\$432
5	OIL SEAL UE 220x260x22 / MUSASHI	6 – 8 weeks	2	\$428
6	OIL SEAL UD 220x260x20 / MUSASHI	6 – 8 weeks	1	\$2,970
7	SPHERICAL ROLLER BEARING 23040	6 – 8 weeks	1	\$3,173

Flocculation Tank:

ITEM #	DESCRIPTION	Lead Time	Q'TY	UNIT PRICE
1	SEW Gearbox	1 – 3 weeks	1	\$3,750
2	Motor	Shelf Item	1	\$960

12. Spare Parts List, continued

Conveyor:

ITEM #	DESCRIPTION	Lead Time	Q'TY	UNIT PRICE
1	SEW Gearbox	1 – 3 weeks	1	\$4,350
2	Motor	Shelf Item	1	\$1,250
3	4' Section UHMW Liner	Shelf Item	1	\$450

Polymer System:

ITEM #	DESCRIPTION	Lead Time	Q'TY	UNIT PRICE
1	Neat Polymer Pump	1 – 3 weeks	1	\$5,050
2	Mixer Motor	Shelf Item	1	\$960
3	Polymer Injection Check-Valve	Shelf Item	1	\$275

Sludge Feed Pump:

ITEM #	DESCRIPTION	Lead Time	Q'TY	UNIT PRICE
1	Gearbox and Motor	1 – 3 weeks	1	\$4,800
2	Stator	1 – 3 weeks	1	\$850
3	Rotor	1 – 3 weeks	1	\$1,850

13. Service Rates

Note: For off-site work beyond this quotation scope of supply, final billing of airfare, lodging, and rental car expenses will be based on actual costs plus 10% for administrative costs.

Weekdays

\$1800.00 - per eight (8) hour day on weekdays plus, lodging, & rental car expenses.

\$337.50 - per hour for all hours exceeding eight (8) hour workday on weekdays.

\$225.00 - per hour for office engineering services and telephone consultations.

Saturdays, Sundays and Holidays

\$2,700.00 - per eight (8) hour day plus lodging and rental car expenses.

\$450.00 - per hour for all hours exceeding eight (8) hour workday.

Travel Time - Weekdays

\$150.00 - per hour travel time.

Travel Time – Weekends and US Holidays

\$225.00 - per hour travel time

14. Notes and Clarifications

- See Attached document

Insurance

FKC CO., LTD.

2708 West 18th Street
Port Angeles, WA 98363



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

December 5, 2024

Re: FKC Co., Ltd. Performance Bond

To Whom It May Concern:

FKC has reviewed the Performance Bond (Exhibit B) & Performance guarantee and is willing to provide a Performance Bond in the amount of 100% of the contract price for the duration of the warranty. FKC can supply this Bond for a period of two years.

FKC can provide this bond for an additional US\$ 12,489.60

FKC will offer this Bond from Travelers Insurance. See letter attached.

Sincerely,
FKC Co., Ltd.

A handwritten signature in black ink, appearing to read "Wesley Bond", with a stylized flourish extending to the right.

Wesley Bond



Laura Harris

*Account Executive Officer
Travelers Bond & Financial Products
Commercial Surety, Seattle*

(206) 326-4264
(206) 326-4292 (fax)

1501 Fourth Avenue, Suite 1000
Seattle, WA 98101

March 13, 2024

Re: FKC Co., LTD

To Whom It May Concern:

It has been the privilege of Travelers Casualty and Surety Company of America ("Travelers")¹ to provide surety bonds for FKC Co., Ltd., for over 15 years. During that time, they have completed, and we have bonded, projects for a wide variety of owners. They currently have a bonding line of \$9,000,000 in the aggregate.

At their request we will give favorable consideration to providing the required performance and payment bonds. We are licensed in all States.

Please note that the decision to issue performance and payment bonds is a matter between FKC Co., Ltd. and Travelers, and will be subject to our standard underwriting at the time of the final bond request, which will include but not be limited to the acceptability of the contract documents, bond forms and financing. We assume no liability to third parties or to you if for any reason we do not execute said bonds.

If you have any questions or need any additional information, please do not hesitate to contact me.

Sincerely,

Travelers Casualty and Surety
Company of America

Laura Harris

¹ Travelers Casualty and Surety Company of America is rated A++ (Superior) by A.M. Best Financial Size Category XIV (\$1.5 Billion to \$2.0 Billion).

A.M. Best's rating of A+ applies to certain insurance subsidiaries of Travelers that are members of the Travelers Insurance Companies pool; other subsidiaries are included in another rating pool or are separately rated. For a listing of companies rated by A.M. Best and other rating services visit www.travelers.com. Ratings listed herein are as of May 23, 2014, are used with permission, and are subject to changes by the rating services. For the latest rating, access www.ambest.com.

Example Insurance Certificate



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

8/6/2020

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Fryer Insurance Agency Inc. PO Box 1347 Port Angeles WA 98362	CONTACT NAME: Cathy Wahlsten PHONE (A/C No. Ext): 360-457-1144 E-MAIL ADDRESS: fryer.pa@fryerins.com	FAX (A/C, No): 360-457-9440
	INSURER(S) AFFORDING COVERAGE	
INSURED FKCOMP-01 FK Company Ltd. 2708 West 18th Street Port Angeles WA 98362	INSURER A : The Ohio Casualty Insurance Co NAIC # 24074	
	INSURER B : Ohio Security Insurance Compan NAIC # 24082	
	INSURER C :	
	INSURER D :	
	INSURER E :	
INSURER F :		

COVERAGES

CERTIFICATE NUMBER: 365305725

REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: <input checked="" type="checkbox"/> POLICY <input checked="" type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC OTHER:	Y	Y	BKO56092021	7/20/2020	7/20/2021	EACH OCCURRENCE \$ 1,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 1,000,000 MED EXP (Any one person) \$ 15,000 PERSONAL & ADV INJURY \$ 1,000,000 GENERAL AGGREGATE \$ 2,000,000 PRODUCTS - COMP/OP AGG \$ 2,000,000 \$
B	AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO <input type="checkbox"/> OWNED AUTOS ONLY <input type="checkbox"/> SCHEDULED AUTOS <input checked="" type="checkbox"/> HIRED AUTOS ONLY <input checked="" type="checkbox"/> NON-OWNED AUTOS ONLY	Y	Y	BAS56092021	7/20/2020	7/20/2021	COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ \$
A	<input checked="" type="checkbox"/> UMBRELLA LIAB <input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE <input type="checkbox"/> DED <input checked="" type="checkbox"/> RETENTION \$ 10,000	Y	Y	USO56092021	7/20/2020	7/20/2021	EACH OCCURRENCE \$ 5,000,000 AGGREGATE \$ 5,000,000 \$
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N	N/A	BKO56092021	7/20/2020	7/20/2021	<input type="checkbox"/> PER STATUTE <input checked="" type="checkbox"/> OTH-ER WA STOP GAP E.L. EACH ACCIDENT \$ 1,000,000 E.L. DISEASE - EA EMPLOYEE \$ 1,000,000 E.L. DISEASE - POLICY LIMIT \$ 2,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Operations of the above named insured. GL form CG8810 & Auto Liability form AC 8501 which respectively includes: Additional Insureds by written contract, written agreement or permit; Waiver of transfer of rights of recovery against others to us when required in a contract or agreement with you; Primary and Non-Contributory - Additional Insured Extension by written contract or written agreement.

CERTIFICATE HOLDER**CANCELLATION**

EXAMPLE ONLY

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

© 1988-2015 ACORD CORPORATION. All rights reserved.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.
BUSINESS AUTO COVERAGE ENHANCEMENT ENDORSEMENT

This endorsement modifies insurance provided under the following:

BUSINESS AUTO COVERAGE FORM

With respect to coverage afforded by this endorsement, the provisions of the policy apply unless modified by the endorsement.

If the policy to which this endorsement is attached also contains a Business Auto Coverage Enhancement Endorsement with a specific state named in the title, this endorsement does not apply to vehicles garaged in that specified state.

COVERAGE INDEX

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SECTION I - COVERED AUTOS is amended as follows:

1. TRAILERS - INCREASED LOAD CAPACITY

The following replaces Paragraph **C.1. Certain Trailers, Mobile Equipment And Temporary Substitute Autos** of **SECTION I - COVERED AUTOS**:

"Trailers" with a load capacity of 3,000 pounds or less designed primarily for travel on public roads.

SECTION II - LIABILITY COVERAGE is amended as follows:

2. NEWLY FORMED OR ACQUIRED SUBSIDIARIES

SECTION II - LIABILITY COVERAGE, Paragraph A.1. - Who Is An Insured is amended to include the following as an "insured":

- d. Any legally incorporated subsidiary of which you own more than 50 percent interest during the policy period. Coverage is afforded only for 90 days from the date of acquisition or formation. However, "insured" does not include any organization that:
 - (1) Is a partnership or joint venture; or
 - (2) Is an "insured" under any other automobile policy except a policy written specifically to apply in excess of this policy; or
 - (3) Has exhausted its Limit of Insurance or had its policy terminated under any other automobile policy.

Coverage under this provision d. does not apply to "bodily injury" or "property damage" that occurred before you acquired or formed the organization.

3. EMPLOYEES AS INSURED

SECTION II - LIABILITY COVERAGE, Paragraph A.1. Who Is An Insured is amended to include the following as an "insured":

- e. Any "employee" of yours while using a covered "auto" you do not own, hire or borrow but only for acts within the scope of their employment by you. Insurance provided by this endorsement is excess over any other insurance available to any "employee".
- f. Any "employee" of yours while operating an "auto" hired or borrowed under a written contract or agreement in that "employee's" name, with your permission, while performing duties related to the conduct of your business and within the scope of their employment. Insurance provided by this endorsement is excess over any other insurance available to the "employee".

4. ADDITIONAL INSURED BY CONTRACT, AGREEMENT OR PERMIT

SECTION II - LIABILITY COVERAGE, Paragraph A.1. Who Is An Insured is amended to include the following as an "insured":

- g. Any person or organization with respect to the operation, maintenance or use of a covered "auto", provided that you and such person or organization have agreed in a written contract, written agreement, or permit issued to you by governmental or public authority, to add such person, or organization, or governmental or public authority to this policy as an "insured".

However, such person or organization is an "insured":

- (1) Only with respect to the operation, maintenance or use of a covered "auto";
- (2) Only for "bodily injury" or "property damage" caused by an "accident" which takes place after you executed the written contract or written agreement, or the permit has been issued to you; and
- (3) Only for the duration of that contract, agreement or permit.

The "insured" is required to submit a claim to any other insurer to which coverage could apply for defense and indemnity. Unless the "insured" has agreed in writing to primary noncontributory wording per enhancement number 24, this policy is excess over any other collectible insurance.

5. SUPPLEMENTARY PAYMENTS

SECTION II - LIABILITY COVERAGE, Coverage Extensions, 2.a. Supplementary Payments, Paragraphs (2) and (4) are replaced by the following:

- (2) Up to \$3,000 for cost of bail bonds (including bonds for related traffic violations) required because of an "accident" we cover. We do not have to furnish these bonds.
- (4) All reasonable expenses incurred by the "insured" at our request, including actual loss of earnings up to \$500 a day because of time off from work.

6. **AMENDED FELLOW EMPLOYEE EXCLUSION**

In those jurisdictions where, by law, fellow "employees" are not entitled to the protection afforded to the employer by the workers compensation exclusivity rule, or similar protection, the following provision is added:

SECTION II - LIABILITY, Exclusion B.5. Fellow Employee does not apply if the "bodily injury" results from the use of a covered "auto" you own or hire if you have workers compensation insurance in force for all of your "employees" at the time of "loss".

This coverage is excess over any other collectible insurance.

SECTION III - PHYSICAL DAMAGE COVERAGE is amended as follows:

7. **HIRED AUTO PHYSICAL DAMAGE**

Paragraph **A.4. Coverage Extensions of SECTION III - PHYSICAL DAMAGE COVERAGE**, is amended by adding the following:

If hired "autos" are covered "autos" for Liability Coverage, and if Comprehensive, Specified Causes of Loss or Collision coverage are provided under the Business Auto Coverage Form for any "auto" you own, then the Physical Damage coverages provided are extended to "autos":

- a. You hire, rent or borrow; or
- b. Your "employee" hires or rents under a written contract or agreement in that "employee's" name, but only if the damage occurs while the vehicle is being used in the conduct of your business, subject to the following limit and deductible:
 - a. The most we will pay for "loss" in any one "accident" or "loss" is the smallest of:
 - (1) \$50,000; or
 - (2) The actual cash value of the damaged or stolen property as of the time of the "loss"; or
 - (3) The cost of repairing or replacing the damaged or stolen property with other property of like kind and quality, minus a deductible.
 - b. The deductible will be equal to the largest deductible applicable to any owned "auto" for that coverage.
 - c. Subject to the limit, deductible and excess provisions described in this provision, we will provide coverage equal to the broadest coverage applicable to any covered "auto" you own.
 - d. Subject to a maximum of \$1,000 per "accident", we will also cover the actual loss of use of the hired "auto" if it results from an "accident", you are legally liable and the lessor incurs an actual financial loss.
 - e. This coverage extension does not apply to:
 - (1) Any "auto" that is hired, rented or borrowed with a driver; or
 - (2) Any "auto" that is hired, rented or borrowed from your "employee" or any member of your "employee's" household.

Coverage provided under this extension is excess over any other collectible insurance available at the time of "loss".

8. **TOWING AND LABOR**

SECTION III - PHYSICAL DAMAGE COVERAGE, Paragraph **A.2. Towing**, is amended by the addition of the following:

We will pay towing and labor costs incurred, up to the limits shown below, each time a covered "auto" classified and rated as a private passenger type, "light truck" or "medium truck" is disabled:

- a. For private passenger type vehicles, we will pay up to \$75 per disablement.
- b. For "light trucks", we will pay up to \$75 per disablement. "Light trucks" are trucks that have a gross vehicle weight (GVW) of 10,000 pounds or less.
- c. For "medium trucks", we will pay up to \$150 per disablement. "Medium trucks" are trucks that have a gross vehicle weight (GVW) of 10,001 - 20,000 pounds.

However, the labor must be performed at the place of disablement.



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9. PHYSICAL DAMAGE - ADDITIONAL TRANSPORTATION EXPENSE COVERAGE

Paragraph **A.4.a. Coverage Extensions, Transportation Expenses** of **SECTION III - PHYSICAL DAMAGE COVERAGE**, is amended to provide a limit of \$50 per day and a maximum limit of \$1,500.

10. RENTAL REIMBURSEMENT

SECTION III - PHYSICAL DAMAGE COVERAGE, A. Coverage, is amended by adding the following:

- a. We will pay up to \$75 per day for rental reimbursement expenses incurred by you for the rental of an "auto" because of "accident" or "loss", to an "auto" for which we also pay a "loss" under Comprehensive, Specified Causes of Loss or Collision Coverages. We will pay only for those expenses incurred after the first 24 hours following the "accident" or "loss" to the covered "auto."
- b. Rental Reimbursement requires the rental of a comparable or lesser vehicle, which in many cases may be substantially less than \$75 per day, and will only be allowed for the period of time it should take to repair or replace the vehicle with reasonable speed and similar quality, up to a maximum of 30 days.
- c. We will also pay up to \$500 for reasonable and necessary expenses incurred by you to remove and replace your tools and equipment from the covered "auto". This limit is excess over any other collectible insurance.
- d. This coverage does not apply unless you have a business necessity that other "autos" available for your use and operation cannot fill.
- e. If "loss" results from the total theft of a covered "auto" of the private passenger type, we will pay under this coverage only that amount of your rental reimbursement expenses which is not already provided under Paragraph **4. Coverage Extension**.
- f. No deductible applies to this coverage.
- g. The insurance provided under this extension is excess over any other collectible insurance.

If this policy also provides Rental Reimbursement Coverage you purchased, the coverage provided by this Enhancement Endorsement is in addition to the coverage you purchased.

For the purposes of this endorsement provision, materials and equipment do not include "personal effects" as defined in provision **12.B**.

11. EXTRA EXPENSE - BROADENED COVERAGE

Under **SECTION III - PHYSICAL DAMAGE COVERAGE, A. Coverage**, we will pay for the expense of returning a stolen covered "auto" to you. The maximum amount we will pay is \$1,000.

12. PERSONAL EFFECTS COVERAGE

A. SECTION III - PHYSICAL DAMAGE COVERAGE, A. Coverage, is amended by adding the following:

If you have purchased Comprehensive Coverage on this policy for an "auto" you own and that "auto" is stolen, we will pay, without application of a deductible, up to \$600 for "personal effects" stolen with the "auto."

The insurance provided under this provision is excess over any other collectible insurance.

B. SECTION V - DEFINITIONS is amended by adding the following:

For the purposes of this provision, "personal effects" mean tangible property that is worn or carried by an "insured." "Personal effects" does not include tools, equipment, jewelry, money or securities.

13. ACCIDENTAL AIRBAG DEPLOYMENT

SECTION III - PHYSICAL DAMAGE COVERAGE, B. Exclusions is amended by adding the following:

If you have purchased Comprehensive or Collision Coverage under this policy, the exclusion for "loss" relating to mechanical breakdown does not apply to the accidental discharge of an airbag.

Any insurance we provide shall be excess over any other collectible insurance or reimbursement by manufacturer's warranty. However, we agree to pay any deductible applicable to the other coverage or warranty.

14. PHYSICAL DAMAGE DEDUCTIBLE - VEHICLE TRACKING SYSTEM

SECTION III - PHYSICAL DAMAGE COVERAGE, D. Deductible, is amended by adding the following:

Any Comprehensive Deductible shown in the Declarations will be reduced by 50% for any "loss" caused by theft if the vehicle is equipped with a vehicle tracking device such as a radio tracking device or a global position device and that device was the method of recovery of the vehicle.

15. AUDIO, VISUAL AND DATA ELECTRONIC EQUIPMENT COVERAGE

SECTION III - PHYSICAL DAMAGE COVERAGE, B. Exclusions, Paragraph **a.** of the exception to exclusions **4.c.** and **4.d.** is deleted and replaced with the following:

Exclusions **4.c.** and **4.d.** do not apply to:

- a. Electronic equipment that receives or transmits audio, visual or data signals, whether or not designed solely for the reproduction of sound, if the equipment is:
 - (1) Permanently installed in the covered "auto" at the time of the "loss" or removable from a housing unit that is permanently installed in the covered "auto"; and
 - (2) Designed to be solely operated by use from the power from the "auto's" electrical system; and
 - (3) Physical damage coverages are provided for the covered "auto".

If the "loss" occurs solely to audio, visual or data electronic equipment or accessories used with this equipment, then our obligation to pay for, repair, return or replace damaged or stolen property will be reduced by a \$100 deductible.

16. LOAN / LEASE GAP COVERAGE (Not Applicable In New York)

A. Paragraph C. Limit Of Insurance of SECTION III - PHYSICAL DAMAGE COVERAGE is amended by adding the following:

The most we will pay for a "total loss" to a covered "auto" owned by or leased to you in any one "accident" is the greater of the:

- 1. Balance due under the terms of the loan or lease to which the damaged covered "auto" is subject at the time of the "loss" less the amount of:
 - a. Overdue payments and financial penalties associated with those payments as of the date of the "loss";
 - b. Financial penalties imposed under a lease due to high mileage, excessive use or abnormal wear and tear;
 - c. Costs for extended warranties, Credit Life Insurance, Health, Accident or Disability Insurance purchased with the loan or lease;
 - d. Transfer or rollover balances from previous loans or leases;
 - e. Final payment due under a "Balloon Loan";
 - f. The dollar amount of any unrepaired damage which occurred prior to the "total loss" of a covered "auto";
 - g. Security deposits not refunded by a lessor;
 - h. All refunds payable or paid to you as a result of the early termination of a lease agreement or as a result of the early termination of any warranty or extended service agreement on a covered "auto";
 - i. Any amount representing taxes;
 - j. Loan or lease termination fees; or
- 2. The actual cash value of the damage or stolen property as of the time of the "loss".
An adjustment for depreciation and physical condition will be made in determining the actual cash value at the time of the "loss". This adjustment is not applicable in Texas.

B. Additional Conditions

This coverage applies only to the original loan for which the covered "auto" that incurred the "loss" serves as collateral, or lease written on the covered "auto" that incurred the "loss".



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C. SECTION V - DEFINITIONS is changed by adding the following:

As used in this endorsement provision, the following definitions apply:

"Total loss" means a "loss" in which the cost of repairs plus the salvage value exceeds the actual cash value.

A "balloon loan" is one with periodic payments that are insufficient to repay the balance over the term of the loan, thereby requiring a large final payment.

17. GLASS REPAIR - WAIVER OF DEDUCTIBLE

Paragraph **D. Deductible** of **SECTION III - PHYSICAL DAMAGE COVERAGE** is amended by the addition of the following:

No deductible applies to glass damage if the glass is repaired rather than replaced.

18. PARKED AUTO COLLISION COVERAGE (WAIVER OF DEDUCTIBLE)

Paragraph **D. Deductible** of **SECTION III - PHYSICAL DAMAGE COVERAGE** is amended by the addition of the following:

The deductible does not apply to "loss" caused by collision to such covered "auto" of the private passenger type or light weight truck with a gross vehicle weight of 10,000 lbs. or less as defined by the manufacturer as maximum loaded weight the "auto" is designed to carry while it is:

- a. In the charge of an "insured";
- b. Legally parked; and
- c. Unoccupied.

The "loss" must be reported to the police authorities within 24 hours of known damage.

The total amount of the damage to the covered "auto" must exceed the deductible shown in the Declarations.

This provision does not apply to any "loss" if the covered "auto" is in the charge of any person or organization engaged in the automobile business.

19. TWO OR MORE DEDUCTIBLES

Under **SECTION III - PHYSICAL DAMAGE COVERAGE**, if two or more company policies or coverage forms apply to the same "accident", the following applies to Paragraph **D. Deductible**:

- a. If the applicable Business Auto deductible is the smaller (or smallest) deductible, it will be waived; or
- b. If the applicable Business Auto deductible is not the smaller (or smallest) deductible, it will be reduced by the amount of the smaller (or smallest) deductible; or
- c. If the "loss" involves two or more Business Auto coverage forms or policies, the smaller (or smallest) deductible will be waived.

For the purpose of this endorsement, company means any company that is part of the Liberty Mutual Group.

SECTION IV - BUSINESS AUTO CONDITIONS is amended as follows:

20. UNINTENTIONAL FAILURE TO DISCLOSE HAZARDS

SECTION IV- BUSINESS AUTO CONDITIONS, Paragraph **B.2.** is amended by adding the following:

If you unintentionally fail to disclose any hazards, exposures or material facts existing as of the inception date or renewal date of the Business Auto Coverage Form, the coverage afforded by this policy will not be prejudiced.

However, you must report the undisclosed hazard of exposure as soon as practicable after its discovery, and we have the right to collect additional premium for any such hazard or exposure.

21. AMENDED DUTIES IN THE EVENT OF ACCIDENT, CLAIM, SUIT, OR LOSS

SECTION IV - BUSINESS AUTO CONDITIONS, Paragraph **A.2.a.** is replaced in its entirety by the following:

- a. In the event of "accident", claim, "suit" or "loss", you must promptly notify us when it is known to:
- (1) You, if you are an individual;
 - (2) A partner, if you are a partnership;
 - (3) Member, if you are a limited liability company;
 - (4) An executive officer or the "employee" designated by the Named Insured to give such notice, if you are a corporation.

To the extent possible, notice to us should include:

- (a) How, when and where the "accident" or "loss" took place;
- (b) The "insureds" name and address; and
- (c) The names and addresses of any injured persons and witnesses.

22. WAIVER OF TRANSFER OF RIGHTS OF RECOVERY AGAINST OTHERS TO US

SECTION IV - BUSINESS AUTO CONDITIONS, Paragraph **A.5. Transfer Of Rights Of Recovery Against Others To Us**, is amended by the addition of the following:

If the person or organization has in a written agreement waived those rights before an "accident" or "loss", our rights are waived also.

23. HIRED AUTO COVERAGE TERRITORY

SECTION IV - BUSINESS AUTO CONDITIONS, Paragraph **B.7. Policy Period, Coverage Territory**, is amended by the addition of the following:

- f. For "autos" hired 30 days or less, the coverage territory is anywhere in the world, provided that the "insured's" responsibility to pay for damages is determined in a "suit", on the merits, in the United States, the territories and possessions of the United States of America, Puerto Rico or Canada or in a settlement we agree to.

This extension of coverage does not apply to an "auto" hired, leased, rented or borrowed with a driver.

24. PRIMARY AND NON-CONTRIBUTING IF REQUIRED BY WRITTEN CONTRACT OR WRITTEN AGREEMENT

The following is added to **SECTION IV - BUSINESS AUTO CONDITIONS, General Conditions, B.5. Other Insurance** and supersedes any provision to the contrary:

This Coverage Form's Covered Autos Liability Coverage is primary to and will not seek contribution from any other insurance available to an "insured" under your policy provided that:

1. Such "insured" is a Named Insured under such other insurance; and
2. You have agreed in a written contract or written agreement that this insurance would be primary and would not seek contribution from any other insurance available to such "insured".

SECTION V - DEFINITIONS is amended as follows:

25. BODILY INJURY REDEFINED

Under **SECTION V - DEFINITIONS**, Definition **C.** is replaced by the following:

"Bodily injury" means physical injury, sickness or disease sustained by a person, including mental anguish, mental injury, shock, fright or death resulting from any of these at any time.



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THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

COMMERCIAL GENERAL LIABILITY EXTENSION

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

INDEX

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With respect to coverage afforded by this endorsement, the provisions of the policy apply unless modified by the endorsement.

A. NON-OWNED AIRCRAFT

Under Paragraph **2. Exclusions** of **Section I – Coverage A - Bodily Injury And Property Damage Liability**, exclusion **g. Aircraft, Auto Or Watercraft** does not apply to an aircraft provided:

1. It is not owned by any insured;
2. It is hired, chartered or loaned with a trained paid crew;
3. The pilot in command holds a currently effective certificate, issued by the duly constituted authority of the United States of America or Canada, designating her or him a commercial or airline pilot; and
4. It is not being used to carry persons or property for a charge.

However, the insurance afforded by this provision does not apply if there is available to the insured other valid and collectible insurance, whether primary, excess (other than insurance written to apply specifically in excess of this policy), contingent or on any other basis, that would also apply to the loss covered under this provision.

B. NON-OWNED WATERCRAFT

Under Paragraph **2. Exclusions** of **Section I – Coverage A – Bodily Injury And Property Damage Liability**, Subparagraph **(2)** of exclusion **g. Aircraft, Auto Or Watercraft** is replaced by the following:

This exclusion does not apply to:

- (2)** A watercraft you do not own that is:
 - (a)** Less than 52 feet long; and
 - (b)** Not being used to carry persons or property for a charge.

C. PROPERTY DAMAGE LIABILITY – ELEVATORS

1. Under Paragraph **2. Exclusions** of **Section I – Coverage A – Bodily Injury And Property Damage Liability**, Subparagraphs **(3)**, **(4)** and **(6)** of exclusion **j. Damage To Property** do not apply if such “property damage” results from the use of elevators. For the purpose of this provision, elevators do not include vehicle lifts. Vehicle lifts are lifts or hoists used in automobile service or repair operations.
2. The following is added to **Section IV – Commercial General Liability Conditions**, Condition **4. Other Insurance**, Paragraph **b. Excess Insurance**:

The insurance afforded by this provision of this endorsement is excess over any property insurance, whether primary, excess, contingent or on any other basis.

D. EXTENDED DAMAGE TO PROPERTY RENTED TO YOU (Tenant’s Property Damage)

If Damage To Premises Rented To You is not otherwise excluded from this Coverage Part:

1. Under Paragraph **2. Exclusions of Section I - Coverage A - Bodily Injury and Property Damage Liability**:
 - a.** The fourth from the last paragraph of exclusion **j. Damage To Property** is replaced by the following:

Paragraphs **(1)**, **(3)** and **(4)** of this exclusion do not apply to "property damage" (other than damage by fire, lightning, explosion, smoke, or leakage from an automatic fire protection system) to:

 - (i)** Premises rented to you for a period of 7 or fewer consecutive days; or
 - (ii)** Contents that you rent or lease as part of a premises rental or lease agreement for a period of more than 7 days.

Paragraphs **(1)**, **(3)** and **(4)** of this exclusion do not apply to "property damage" to contents of premises rented to you for a period of 7 or fewer consecutive days.

A separate limit of insurance applies to this coverage as described in **Section III – Limits of Insurance**.

- b. The last paragraph of subsection **2. Exclusions** is replaced by the following:
Exclusions **c.** through **n.** do not apply to damage by fire, lightning, explosion, smoke or leakage from automatic fire protection systems to premises while rented to you or temporarily occupied by you with permission of the owner. A separate limit of insurance applies to Damage To Premises Rented To You as described in **Section III – Limits Of Insurance.**
- 2. Paragraph **6.** under **Section III – Limits Of Insurance** is replaced by the following:
 - 6. Subject to Paragraph **5.** above, the Damage To Premises Rented To You Limit is the most we will pay under Coverage **A** for damages because of "property damage" to:
 - a. Any one premise:
 - (1) While rented to you; or
 - (2) While rented to you or temporarily occupied by you with permission of the owner for damage by fire, lightning, explosion, smoke or leakage from automatic protection systems; or
 - b. Contents that you rent or lease as part of a premises rental or lease agreement.
- 3. As regards coverage provided by this provision **D. EXTENDED DAMAGE TO PROPERTY RENTED TO YOU (Tenant's Property Damage)** - Paragraph **9.a.** of **Definitions** is replaced with the following:
 - 9.a. A contract for a lease of premises. However, that portion of the contract for a lease of premises that indemnifies any person or organization for damage by fire, lightning, explosion, smoke, or leakage from automatic fire protection systems to premises while rented to you or temporarily occupied by you with the permission of the owner, or for damage to contents of such premises that are included in your premises rental or lease agreement, is not an "insured contract".

E. MEDICAL PAYMENTS EXTENSION

If **Coverage C Medical Payments** is not otherwise excluded, the Medical Payments provided by this policy are amended as follows:

Under Paragraph **1. Insuring Agreement** of **Section I – Coverage C – Medical Payments**, Subparagraph **(b)** of Paragraph **a.** is replaced by the following:

- (b)** The expenses are incurred and reported within three years of the date of the accident; and

F. EXTENSION OF SUPPLEMENTARY PAYMENTS – COVERAGES A AND B

- 1. Under **Supplementary Payments – Coverages A and B**, Paragraph **1.b.** is replaced by the following:
 - b. Up to **\$3,000** for cost of bail bonds required because of accidents or traffic law violations arising out of the use of any vehicle to which the Bodily Injury Liability Coverage applies. We do not have to furnish these bonds.
- 2. Paragraph **1.d.** is replaced by the following:
 - d. All reasonable expenses incurred by the insured at our request to assist us in the investigation or defense of the claim or "suit", including actual loss of earnings up to **\$500** a day because of time off from work.

G. ADDITIONAL INSUREDS - BY CONTRACT, AGREEMENT OR PERMIT

- 1. Paragraph **2.** under **Section II – Who Is An Insured** is amended to include as an insured any person or organization whom you have agreed to add as an additional insured in a written contract, written agreement or permit. Such person or organization is an additional insured but only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused in whole or in part by:
 - a. Your acts or omissions, or the acts or omissions of those acting on your behalf, in the performance of your on going operations for the additional insured that are the subject of the written contract or written agreement provided that the "bodily injury" or "property damage" occurs, or the "personal and advertising injury" is committed, subsequent to the signing of such written contract or written agreement; or

- b. Premises or facilities rented by you or used by you; or
- c. The maintenance, operation or use by you of equipment rented or leased to you by such person or organization; or
- d. Operations performed by you or on your behalf for which the state or political subdivision has issued a permit subject to the following additional provisions:
 - (1) This insurance does not apply to “bodily injury”, “property damage”, or “personal and advertising injury” arising out of the operations performed for the state or political subdivision;
 - (2) This insurance does not apply to “bodily injury” or “property damage” included within the “completed operations hazard”.
 - (3) Insurance applies to premises you own, rent, or control but only with respect to the following hazards:
 - a) The existence, maintenance, repair, construction, erection, or removal of advertising signs, awnings, canopies, cellar entrances, coal holes, driveways, manholes, marquees, hoist away openings, sidewalk vaults, street banners, or decorations and similar exposures; or
 - b) The construction, erection, or removal of elevators; or
 - c) The ownership, maintenance, or use of any elevators covered by this insurance.

However:

- 1. The insurance afforded to such additional insured only applies to the extent permitted by law; and
- 2. If coverage provided to the additional insured is required by a contract or agreement, the insurance afforded to such additional insured will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

With respect to Paragraph 1.a. above, a person’s or organization’s status as an additional insured under this endorsement ends when:

- (1) All work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) at the location of the covered operations has been completed; or
- (2) That portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project.

With respect to Paragraph 1.b. above, a person’s or organization’s status as an additional insured under this endorsement ends when their written contract or written agreement with you for such premises or facilities ends.

With respects to Paragraph 1.c. above, this insurance does not apply to any “occurrence” which takes place after the equipment rental or lease agreement has expired or you have returned such equipment to the lessor.

The insurance provided by this endorsement applies only if the written contract or written agreement is signed prior to the "bodily injury" or "property damage".

We have no duty to defend an additional insured under this endorsement until we receive written notice of a “suit” by the additional insured as required in Paragraph b. of Condition 2. **Duties In the Event Of Occurrence, Offense, Claim Or Suit** under **Section IV – Commercial General Liability Conditions**.

2. With respect to the insurance provided by this endorsement, the following are added to Paragraph 2. **Exclusions under Section I - Coverage A - Bodily Injury And Property Damage Liability:**

This insurance does not apply to:

- a. "Bodily injury" or "property damage" arising from the sole negligence of the additional insured.
- b. "Bodily injury" or "property damage" that occurs prior to you commencing operations at the location where such "bodily injury" or "property damage" occurs.
- c. "Bodily injury", "property damage" or "personal and advertising injury" arising out of the rendering of, or the failure to render, any professional architectural, engineering or surveying services, including:
 - (1) The preparing, approving, or failing to prepare or approve, maps, shop drawings, opinions, reports, surveys, field orders, change orders or drawings and specifications; or
 - (2) Supervisory, inspection, architectural or engineering activities.

This exclusion applies even if the claims against any insured allege negligence or other wrongdoing in the supervision, hiring, employment, training or monitoring of others by that insured, if the "occurrence" which caused the "bodily injury" or "property damage", or the offense which caused the "personal and advertising injury", involved the rendering of, or the failure to render, any professional architectural, engineering or surveying services.

- d. "Bodily injury" or "property damage" occurring after:
 - (1) All work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) at the location of the covered operations has been completed; or
 - (2) That portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project.
- e. Any person or organization specifically designated as an additional insured for ongoing operations by a separate **ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS** endorsement issued by us and made a part of this policy.

3. With respect to the insurance afforded to these additional insureds, the following is added to **Section III – Limits Of Insurance:**

If coverage provided to the additional insured is required by a contract or agreement, the most we will pay on behalf of the additional insured is the amount of insurance:

- a. Required by the contract or agreement; or
 - b. Available under the applicable Limits of Insurance shown in the Declarations;
- whichever is less.

This endorsement shall not increase the applicable Limits of Insurance shown in the Declarations.

H. PRIMARY AND NON-CONTRIBUTORY ADDITIONAL INSURED EXTENSION

This provision applies to any person or organization who qualifies as an additional insured under any form or endorsement under this policy.

Condition 4. **Other Insurance of SECTION IV – COMMERCIAL GENERAL LIABILITY CONDITIONS** is amended as follows:

- a. The following is added to Paragraph a. **Primary Insurance:**

If an additional insured's policy has an Other Insurance provision making its policy excess, and you have agreed in a written contract or written agreement to provide the additional insured coverage on a primary and noncontributory basis, this policy shall be primary and we will not seek contribution from the additional insured's policy for damages we cover.

- b.** The following is added to Paragraph **b. Excess Insurance**:

When a written contract or written agreement, other than a premises lease, facilities rental contract or agreement, an equipment rental or lease contract or agreement, or permit issued by a state or political subdivision between you and an additional insured does not require this insurance to be primary or primary and non-contributory, this insurance is excess over any other insurance for which the additional insured is designated as a Named Insured.

Regardless of the written agreement between you and an additional insured, this insurance is excess over any other insurance whether primary, excess, contingent or on any other basis for which the additional insured has been added as an additional insured on other policies.

I. ADDITIONAL INSUREDS - EXTENDED PROTECTION OF YOUR "LIMITS OF INSURANCE"

This provision applies to any person or organization who qualifies as an additional insured under any form or endorsement under this policy.

- 1.** The following is added to Condition **2. Duties In The Event Of Occurrence, Offense, Claim or Suit**:

An additional insured under this endorsement will as soon as practicable:

- a.** Give written notice of an "occurrence" or an offense that may result in a claim or "suit" under this insurance to us;
 - b.** Tender the defense and indemnity of any claim or "suit" to all insurers whom also have insurance available to the additional insured; and
 - c.** Agree to make available any other insurance which the additional insured has for a loss we cover under this Coverage Part.
 - d.** We have no duty to defend or indemnify an additional insured under this endorsement until we receive written notice of a "suit" by the additional insured.
- 2.** The limits of insurance applicable to the additional insured are those specified in a written contract or written agreement or the limits of insurance as stated in the Declarations of this policy and defined in **Section III – Limits of Insurance** of this policy, whichever are less. These limits are inclusive of and not in addition to the limits of insurance available under this policy.

**J. WHO IS AN INSURED - INCIDENTAL MEDICAL ERRORS / MALPRACTICE
WHO IS AN INSURED - FELLOW EMPLOYEE EXTENSION - MANAGEMENT EMPLOYEES**

Paragraph **2.a.(1)** of **Section II - Who Is An Insured** is replaced with the following:

- (1)** "Bodily injury" or "personal and advertising injury":
- (a)** To you, to your partners or members (if you are a partnership or joint venture), to your members (if you are a limited liability company), to a co-"employee" while in the course of his or her employment or performing duties related to the conduct of your business, or to your other "volunteer workers" while performing duties related to the conduct of your business;
 - (b)** To the spouse, child, parent, brother or sister of that co-"employee" or "volunteer worker" as a consequence of Paragraph **(1) (a)** above;
 - (c)** For which there is any obligation to share damages with or repay someone else who must pay damages because of the injury described in Paragraphs **(1) (a)** or **(b)** above; or
 - (d)** Arising out of his or her providing or failing to provide professional health care services. However, if you are not in the business of providing professional health care services or providing professional health care personnel to others, or if coverage for providing professional health care services is not otherwise excluded by separate endorsement, this provision (Paragraph **(d)**) does not apply.

Paragraphs **(a)** and **(b)** above do not apply to “bodily injury” or “personal and advertising injury” caused by an “employee” who is acting in a supervisory capacity for you. Supervisory capacity as used herein means the “employee’s” job responsibilities assigned by you, includes the direct supervision of other “employees” of yours. However, none of these “employees” are insureds for “bodily injury” or “personal and advertising injury” arising out of their willful conduct, which is defined as the purposeful or willful intent to cause “bodily injury” or “personal and advertising injury”, or caused in whole or in part by their intoxication by liquor or controlled substances.

The coverage provided by provision **J.** is excess over any other valid and collectable insurance available to your “employee”.

K. NEWLY FORMED OR ADDITIONALLY ACQUIRED ENTITIES

Paragraph **3.** of **Section II - Who Is An Insured** is replaced by the following:

- 3.** Any organization you newly acquire or form and over which you maintain ownership or majority interest, will qualify as a Named Insured if there is no other similar insurance available to that organization. However:
 - a.** Coverage under this provision is afforded only until the expiration of the policy period in which the entity was acquired or formed by you;
 - b.** Coverage **A** does not apply to "bodily injury" or "property damage" that occurred before you acquired or formed the organization; and
 - c.** Coverage **B** does not apply to "personal and advertising injury" arising out of an offense committed before you acquired or formed the organization.
 - d.** Records and descriptions of operations must be maintained by the first Named Insured.

No person or organization is an insured with respect to the conduct of any current or past partnership, joint venture or limited liability company that is not shown as a Named Insured in the Declarations or qualifies as an insured under this provision.

L. FAILURE TO DISCLOSE HAZARDS AND PRIOR OCCURRENCES

Under **Section IV – Commercial General Liability Conditions**, the following is added to Condition **6. Representations**:

Your failure to disclose all hazards or prior “occurrences” existing as of the inception date of the policy shall not prejudice the coverage afforded by this policy provided such failure to disclose all hazards or prior “occurrences” is not intentional.

M. KNOWLEDGE OF OCCURRENCE, OFFENSE, CLAIM OR SUIT

Under **Section IV – Commercial General Liability Conditions**, the following is added to Condition **2. Duties In The Event of Occurrence, Offense, Claim Or Suit**:

Knowledge of an “occurrence”, offense, claim or “suit” by an agent, servant or “employee” of any insured shall not in itself constitute knowledge of the insured unless an insured listed under Paragraph **1.** of **Section II – Who Is An Insured** or a person who has been designated by them to receive reports of “occurrences”, offenses, claims or “suits” shall have received such notice from the agent, servant or “employee”.

N. LIBERALIZATION CLAUSE

If we revise this Commercial General Liability Extension Endorsement to provide more coverage without additional premium charge, your policy will automatically provide the coverage as of the day the revision is effective in your state.

O. BODILY INJURY REDEFINED

Under **Section V – Definitions**, Definition **3.** is replaced by the following:

- 3.** “Bodily Injury” means physical injury, sickness or disease sustained by a person. This includes mental anguish, mental injury, shock, fright or death that results from such physical injury, sickness or disease.

P. EXTENDED PROPERTY DAMAGE

Exclusion a. of **COVERAGE A. BODILY INJURY AND PROPERTY DAMAGE LIABILITY** is replaced by the following:

a. Expected Or Intended Injury

"Bodily injury" or "property damage" expected or intended from the standpoint of the insured. This exclusion does not apply to "bodily injury" or "property damage" resulting from the use of reasonable force to protect persons or property.

Q. WAIVER OF TRANSFER OF RIGHTS OF RECOVERY AGAINST OTHERS TO US – WHEN REQUIRED IN A CONTRACT OR AGREEMENT WITH YOU

Under **Section IV – Commercial General Liability Conditions**, the following is added to Condition **8. Transfer Of Rights Of Recovery Against Others To Us**:

We waive any right of recovery we may have against a person or organization because of payments we make for injury or damage arising out of your ongoing operations or "your work" done under a contract with that person or organization and included in the "products-completed operations hazard" provided:

1. You and that person or organization have agreed in writing in a contract or agreement that you waive such rights against that person or organization; and
2. The injury or damage occurs subsequent to the execution of the written contract or written agreement.

Power Requirements

San Luis Power Requirements

	FLA	Operating AMPS	Qty	kW	Annual Hrs	Annual kWh
Screw Press Motor	7.2	5.76	1	3.63	2080	7541.0
Flocculation Tank Motor	2.4	1.92	1	1.21	2080	2513.7
Conveyor Motor	6.6	5.28	1	3.32	2080	6912.6
1KVA Transformer	2.1	1.68	1	1.06	2080	2199.5
					Total	19166.8

Assumes kW is calculated as $p(kW) = \sqrt{3} \times PF \times I \times V / 1000$

Assumes power factor is 0.79 for all motors.

Assumes power factor for kVA transformer is 1.0

Assumes voltage is 460V 3ph

Assumes 40 hours per week of runtime

Maintenance Requirements and Schedule

FKC Maintenance Requirements and Schedule

Item #	Task	Schedule
1	Grease Screw Press Inlet Bearing	Monthly
2	Grease Screw Press Outlet Bearing	Monthly
3	Change Oil in Screw Press Gearbox	Annually
4	Inspect and cleaning of the flocculation Tank agitator	Monthly
5	Change Oil in SEW GB for Flocculation Tank	Annually
6	Inspect Conveyor Liners	Quarterly
7	Change Oil in SEW GB on Conveyor	Annually
8	Sludge Pump Gearbox oil	Annually
9	Polymer system pump gearbox oil	Annually

Recommended Maintenance over a 20 year period

(Based on 40 hours operation per week ; 2,080 hrs per year)

Item	Description of Activity	Labor Time Man-Hours	List of Parts and Consumables	Activity Frequency per Year
1	Screw Press Gearbox Oil Changeout	1.5 Hours	6.1 gallons oil, \$130	0.05 times per year. Only once after 1st 500 hours of operation (not yearly) per unit
2	Screw Press Gearbox Oil Changeout	1.5 Hours	6.1 gallons oil, \$130	0.832 times per year. Every 2,500 hours of operation.
3	Flocculation Tank Gearbox Oil Changeout	1.5 Hours	0.66 gallons of oil, \$14	0.05 times per year. Only once after 1st 500 hours of operation (not yearly) per unit
4	Flocculation Tank Gearbox Oil Changeout	1.5 Hours	0.66 gallons of oil, \$14	0.208 times per year. Every 10,000 hours of operation.
5	Screw Press Inlet and Outlet Bearing Grease Replenishment	1.0 Hour	1 tube grease, \$4	6.0 times per year. Every 2 months.
6	Flocculation Tank Gearbox AM Adapter Renew Grease & Replace Oil Seal	2.0 Hour	1 oil seal, dab of grease, \$9	2.0 times per year. Every 3,000 hours, at least every 6 months.
7	Screw Press Drum Screen Washdown and Flocculation Tank Agitator Cleaning	3.0 Hour	No parts, consumables, or supplies	8.7 times per year. Every 6 weeks.
8	Screw Press High Pressure Drum, Screens, and Flight Inspection	16 Hours	No parts, consumables, or supplies	0.1 times per year. Every 10 years.
9				
10	Motors, Solenoid Valves, Level Transmitters, Level Probes, Control Panel Hardware	Statistical Analysis, environmental conditions, operator adjustments, etc. are beyond FKC ability to offer frequency or annual cost for these items. They are AS NEEDED.		

Assume \$25 / hr labor rate.

ITEM	LABOR	PARTS	times yearly rate	TOTAL per year (over 20 years)
1	\$37.50	\$130.00	0.05	\$8.38
2	\$37.50	\$130.00	0.832	\$139.36
3	\$37.50	\$14.00	0.05	\$2.58
4	\$37.50	\$14.00	0.208	\$10.71
5	\$25.00	\$4.00	6	\$174.00
6	\$50.00	\$9.00	2	\$118.00
7	\$75.00	\$0.00	8.7	\$652.50
8	\$400.00	\$0.00	0.1	\$40.00

rounded up SUM

\$1,146

Maintenance and Repair Contract

OPTIONAL FKC SCREW PRESS 5-YEAR SERVICE CONTRACT INFORMATION

With 5-Year Optional Extension

- A. FKC offers the optional 5 or 10-year service contract as outlined below. This warranty is for FKC Manufactured equipment ONLY. The sludge feed pumps and Local Control Panel are NOT part of this extended warranty. This optional 5 or 10-year service contract does not include the incidental maintenance items listed or washing/cleaning of the equipment.
- B. An Optional 5 or 10-year Service Contract is offered for all mechanical components of the flocculation tank and dewatering screw press. The Service Contract shall be for up to 10 years after start-up.
1. Optional 5 / 10-year Service Contract shall include maintenance of:
 - a. Gearboxes, drums, screens, screw(s), bearings, bushings and spray showers,
 - b. Any normal wearing parts such as brushes, squeegees and/or oscillating rings.
 - c. Annual sampling and analysis of screw press gearbox oil.
 2. Optional 10-year Service Contract does not cover:
 - a. Damage or failures due to lack of proper lubrication types, quantities or schedules.
 - b. Damage due to processing non-specified materials, operating the equipment outside of normal parameters, jogging the screw, reversing the screw.
 - b. Motors, field instrumentation, power control, logic control, or any other electronic component.
 - c. Coatings and/or corrosion.
 - d. Lubrication of gearbox or bearings.
(FKC technician can assist in an oil changeout during annual visits.)
 - e. Cleaning of the flocculation tank and screw press.
 3. One annual site visit by a certified service technician for equipment / system inspection and service is included.
 4. Optional 10-year Service Contract includes all parts, shipping and labor for repairing or replacing components to maintain the screw press minimum performance requirements listed.
- C. The FKC certified technician to provide the services may be a certified FKC representative technician, or an FKC field technician from the Port Angeles, WA facility.

Detailed approach to address technical support and service calls

If an incident (alarm or component failure) occurs, then the following steps can be taken to reach a decision that an FKC technician should be invited to make an on-site service call. (These steps do not discuss whether the work is covered under warranties and/or service contracts. It only helps to decide whether an FKC technician should come on-site.)

1. Determine if it is a process, controls, electrical or mechanical incident.
 - A. Process Incident
 - i. Use the troubleshooting guidelines in the O&M Manual and the training received at startup to make the necessary cleaning, corrections and/or setpoint adjustments to solve the problem. FKC is available by phone during business hours to discuss the incident and help with troubleshooting.
 - ii. Examples: hi-hi flocculation tank level alarm, hi headbox level alarm, loss of polymer, loss of sludge flow, poor flocculation, poor solids capture, low cake solids, excessive high screw press speeds, excessive low sludge flows, excessive high headbox level.
 - B. Controls Incident
 - i. Have the plant's electrician check to see if it is a programming or software problem, or an electric failure.
 - a. For a programming or software problem, call FKC and describe the concern. FKC is available by phone during business hours to discuss the incident and help with troubleshooting. If the problem persists then FKC will have the control panel sub-supplier (CPSS) call the Owner to discuss the problem. If the problem will not go away, then the Owner will need to arrange for the CPSS to get remote access to the control panel by tunneling in through the ethernet or some other method. If

CPSS cannot resolve the problem with remote access, then an FKC technician should be invited to make an on-site service call.

C. Electrical Incident

i. Have the plant's electrician determine if there is an issue with the plant's power supply, wiring or field connections. If this is the problem, then the electrician should take corrective steps as needed. FKC and the CPSS are available by phone during business hours to discuss the plant's electrical problem and help with troubleshooting.

ii. For an FKC electronic component problem, the plant's electrician should use the alarm description or equipment status to troubleshoot the field instrumentation, wiring, connections, relays, fuses, etc. to determine which component has failed. FKC is available by phone during business hours to discuss the incident and help with troubleshooting. If the component cannot be re-started, then FKC will have the CPSS call the Owner to discuss the problem. If the component needs to be replaced, then the Owner and FKC can arrange for shipping and delivery of a new component. Once the component arrives, the Owner can choose to have the plant's electrician install the replacement or invite an FKC technician to make an on-site service call. The CPSS will remotely coordinate the replacement with the Owner and/or the FKC technician.

D. Mechanical Incident

i. Call FKC by phone during business hours to discuss the incident. Information about amperages, lubrication, data and photos will be shared. If after discussion the cause of the problem remains unknown, then an FKC technician should be invited to make an on-site service call.

ii. When the cause of the problem is confirmed, then FKC will coordinate with the Owner and propose a corrective action plan. This will include FKC and Owner personnel to be

scheduled for the work, parts availability (onsite, online, FKC factory, components factories, etc.), equipment/tools needed, work schedule and a description of how the incident will be resolved. With Owner approval, FKC will execute the corrective action plan.

iii. Examples include excessive gearbox noise or failure, loss of lubrication, catastrophic screen/drum/cover destruction (like by a forklift or dropping tools in the headbox), excessive motor coupling noise or failure, excessive bearing noise or failure, leaking oil seals, motor/VFD trip overload alarms, hi current readings from the gearbox/motor VFD's, spring cone rods/springs immobility, screw not rotating while running, flocculation tank agitator not rotating while running, etc.

Guaranteed On-site Response Time

FKC onsite response time for the 10-year service contract offered is 48 hours.

Depending on the type of equipment/system malfunction, the technician may be a control panel technician, a certified FKC representative technician, or an FKC technician from the Port Angeles, WA facility.

FKC acknowledges that the manufacturer will pay liquidated damages of \$500 for each day of delay.

Additional terms, conditions and wording for the service contract will be negotiated at the time of signing.

Incidental / Routing Maintenance Items

1. Grease replenishment of the Screw Press Inlet Bearing
2. Grease replenishment of the Screw Press Discharge Bearing
3. Inspection and Cleaning of the Flocculation Tank Agitator Blades

Guarantee

OPTION A GUARANTEE

FKC CO., LTD.



2706 West 16th Street
Port Angeles, WA 98363

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

GUARANTEE

Project: City of San Luis West WWTP, AZ
Project Engineer: Wesley Bond
Equipment Name: FKC Screw Press and associated equipment

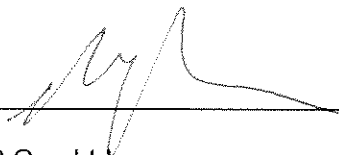
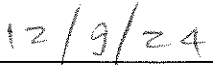
FKC has reviewed the bid documents for the City of San Luis West WWTP. Although we listed a couple notes and clarifications in this bid package, FKC can guarantee the performance of our equipment, per Table A listed below.

Table A

Material to be dewatered:	Secondary Waste Activated (with minimal digestion)
Capacity:	11.928 BDST/Day (24-hours) or 994 Dry Lbs. / Hr.
Average Flowrate:	200 GPM @ 1.0%TS
Inlet Consistency:	1.0% or Higher
Outlet Consistency:	15% or Higher
Maximum Polymer Dose:	30 Lbs. / Dry Ton (Active)
Capture Rate:	95% or Higher

The performance figures and conditions denoted in this proposal constitute FKC Co., Ltd.'s performance guarantee and the conditions required to meet the guarantee. FKC further guarantee's the equipment provided in this bid package, after installation, is a full and functioning system.

FKC's packages does not include installation, assembly, field piping or field wirings. All other equipment is included in this proposal. Any subsystems or appurtenances omitted will be provided by FKC at no additional cost to the owner. In the event that performance is not met, FKC will provide all parts, engineering, and labor associated with the work necessary to bring the equipment into conformance with the performance guarantee.

FKC Co., Ltd. Date
Roger Olson
President

UPDATED GUARANTEE - OPTION B

FKC CO., LTD.

2708 West 18th Street
Port Angeles, WA 98363



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

January 14, 2025

Steven Seymour
490 Latigo Row
Encinitas, CA 92024

Tel: (760) 304-4224
Cell: (949) 291-0555
Email: Steven@saddlebackenviro.com

**Re: Correction for Sludge Dewatering Screw Press System
City of San Luis West WWTP 3 MGD MBR Phase 1 Upgrades**


Steven,

With this letter, FKC offers a correction to the FKC's Option B bid offered for the Complete Sludge Dewatering Screw Press System, for the City of San Luis West WWTP 3 MGD MBR Phase 1 Upgrades.

FKC's Option "B" bid was for a BHX 1250 Screw Press with a capacity of 1,000 Dry Lbs. / HR with a maximum Hydraulic Capacity of 170 GPM. This capacity is better defined as 170 GPM and guaranteed to achieve cake dryness of 15% or Higher and 200 GPM to achieve cake dryness guaranteed to pass the paint filter test with less than 40 Lbs. / Dry Ton of polymer.

No other changes to the original FKC proposal are offered. Please see attached the corrected Exhibit C – Proposed Equipment Summary sheet.

Thank you,



Roger Olson
President
FKC Co., Ltd.

1/14/25

Date

UPDATED GUARANTEE

Exhibit C - Proposed Equipment Summary	
Option B	
Sludge Dewatering System	
Manufacturer/Equipment System General Information	
Name of Manufacturer:	FKC Co., Ltd.
Model Info.	BHX-1250x6500L
Total # of Units for System (Including Redundancy)	One
Main Drive - Horsepower per Unit (Hp)	5 HP, 1800 RPM
Flocculation Tank Drive - Horsepower per Unit (Hp)	1.5 HP, 1800 RPM
Conveyor Drive - Horsepower per Unit (Hp)	3.0 HP, 1800 RPM
Sludge Pump - Horsepower per Unit (Hp)	10 HP, 1800 RPM
Polymer System - Horsepower per Unit (Hp)	1 HP
Total Unit Max Connected Electrical Load (kW)	6.4 kW. See electric calc'c sheet for assumptions.
Equipment Size - per Unit (LxWxH) (in)	345" x 74" x 112" (screw press only. See drawings provided for complete dimensions)
Equipment Dry Weight - per Unit (lbs)	28,660 lbs empty (screw press only. See drawings provided for additional weights)
Equipment Max Operational Weight - per Unit (lbs)	35,274 lbs full (screw press only. See drawings provided for additional weights)
Equipment Skid Mounted (y/n)	n (no). All equipment proposed is shipped loose and separate for field installation by others.
Drum Diameter (in)	49 inches (1250 mm)
Max Screw Speed (RPM)	0.24 rpm (screw press only. Up to 64 rpm for flocculation tank)
Emergency Shutdown Equipment Included (y/n)	y (yes)
Construction/Fabrication Materials	
Equipment Component Construction/Fab Materials info provided in proposal (y/n)	y (yes)
Frame / Base Fabrication Materials and Surface Prep Type and Finish	Galvanized carbon steel screw press channel base. Standard manufacturer's prep and finish for drives and motors. SSPC-SP-6 with Zinc Primer / Epoxy / Polyurethane coating system for others.
Fastening Hardware Materials	316 stainless steel in the wetted area. Others (like drive to discharge box) are 304 stainless steel.
Seal and Support/Wear Materials of Construction	Inlet and outlet bearing seals on the screw are nitrile Buna-N. There are no wear materials within the drum/screen/screw dewatering area for the screw press.
Perforated Plate Material and Opening Size	304 stainless steel with 2.5 mm holes
Drainage Pipe Size, Type, and Material	ANSI 10-inch 150lb Flange, 304 stainless steel
Discharge Hopper Materials of Construction	304 stainless steel wetted parts. Bearing housings & gussets are painted carbon steel.
Bearing Type, Material, Life Rating	Spherical roller bearings, carbon steel, >100,000 hours for screw press.
Motor Types, Service Factor, Insulation Class Ratings	Severe Duty, NEMA Premium Efficiency, Class I-Div 2-Group D compliant, 1.15 SF (1.0 for ASD Duty), Class F Insulation
Drive Mechanism, Type/Model/Rating	Cyclo, 5 HP, 1800 RPM for screw press.
Floc Tank Drive Mechanism, Type/Model/Rating	Helical Wormgear, SEW Eurodrive, SAF47AM145 29-1, 1.5 HP
Wash System and Nozzles Materials of Construction	304 stainless steel or better
Electrical Equipment Ratings:	Motors & solenoid valves are Class I, Div 2, Group D. NEMA 12 for MCP. Local Control Station & Estop push button control stations are NEMA 4X.
Safety Devices:	Two (2) NEMA 4X Estop Push Button Control Stations (loose), One (1) Process Stop Push Button on MCP door
Local/Main Control Panel Materials of Construction (NEMA Rating)	Local NEMA 4X, Main Control Panel NEMA 4X, 304 SS
Performance Information	
Maximum Hydraulic Capacity (gpm)	170 gpm with Cake Dryness of 15% TS or Higher; 200 GPM Guaranteed to Pass the Paint Filter Test
Maximum Solids Loading Capacity (lbs/hr)	1000 dry lbs/hr
Hydraulic Capacity @ 1.0% DS (gpm)	170 gpm
Solids Loading Capacity @ 1.0% DS (lbs/hr)	1000 dry lbs/hr
Dry Solids (cake - assume 1.0% DS feed) (%)	15 % TS or Higher
Minimum Solids Capture Rate - assume 1.0% DS feed (%)	95%
Wash Water Requirements (gpm, psi)	55 gpm @ 35 psi, intermittent, solenoid is open for 15 seconds every 10 minutes. Opens 3.0 minutes total per hour of operation.
Lbs. of Polymer used at design dry solids of 2.25% feed (lbs active polymer per ton DS)	30 active lbs per dry ton at 170 GPM; 40 active lbs per dry ton at 200 GPM
Capital Costs	
Total Primary Dewatering Unit Equipment Cost (\$)	\$636,677.00
Total Conveyance System Equipment Costs (\$)	\$69,250.00
Total Sludge Pumping Equipment Costs(\$)	\$44,100.00
Total Polymer System Equipment Costs (\$)	\$71,500.00
Price of spare parts (\$)	Included
Start-up / Training Costs (\$)	Included
Total Freight (FOB to Jobsite)(\$)	\$48,360.00
Total System Capital Costs (\$)	\$869,887.00
Total Cost Addition to Reach BABA Compliance (\$)	Not Available
Warranty	
Equipment System Warranty Period (months)	24 months after start-up or 30 months after delivery. 5 year extended mechanical warranty.
Service & Support	
Start-up Period (days)	two trips, total of 8 days for inspection, functional/operational testing, training, and performance.
Is Spare Parts List Provided? (y/n)	y (yes)
Location of Parts Distribution Center (city, distance in miles to project)	Port Angeles, Washington. 1,550 miles.
Location of Design Support Center (city, distance in miles to project)	Port Angeles, Washington. 1,550 miles.
Quote for 10-Year Full Maintenance Contract Included with proposal (y/n)	y (yes)
Full Maintenance Contract Costs (\$)	\$75,000
Delivery Schedule	
Submittal Period (months)	8 weeks after date of signed Purchase Order
Fabrication and Delivery Period (months)	not to exceed 7 months after submittal approval and notice to proceed with manufacturing.

Warranty



WARRANTY CERTIFICATION

Project: City of San Luis West WWTP, AZ
Project Engineer: Wesley Bond
Equipment Name: FKC Screw Press and associated equipment

Conditions of Warranty:

- A. General Warranty – the General Warranty shall cover all components of the system for a period of 24 months after component acceptance. It will cover all parts, labor and coating for repair or replacement of equipment that fails during the warranty period at no cost to the Owner.
- B. This warranty includes meeting the performance requirements as outlined in the Guarantee tab in this bid proposal.
- C. FKC will expend this warranty an additional 12 months (36 months total) for an additional US\$12,500.00

A handwritten signature in black ink, appearing to read "Wesley Bond", with a stylized flourish extending to the right.

12/5/24

FKC Co., Ltd.
Wesley Bond
Project Manager

Date

Installation References

REFERENCE LIST (EXHIBIT A)

Ref #	Job / Operating Facility Name	Process Used For? (Municipal WWTP Sludge Dewatering)	Year Commissioned	Years in Operation	Installation Location (Indoor / Outdoor)	Number of and Size of Units	Operation Period (24,7, etc.)	Design Capacity (Hydraulic -gpm & Dry Solids-lbs/hr)	Design Active Polymer Demand (lbs/DT)	Job / Facility Contact Name	Contact Phone Number	Contact Email
1	East Lansing, MI WWTP	Municipal WWTP Sludge Dewatering	2021	4	Indoor	BHX 1250, 3 Units	18 hrs per day	120 GPM, 1200 Dry Lbs. / Hr.	25 active lbs per dry ton	Josh Moore	(517) 371-2240	
2	Salt Lake City, UT WWTP	Municipal WWTP Sludge Dewatering	2021	4	Outdoor	BHX 1350, 2 Units	18 hrs per day	110 GPM , 1375 Dry Lbs. per Hr.	20 active lbs per dry ton	Jose Rubalcaba	801-799-4080,	Jose.Rubalcaba@slcgov.com
3	City of Petaluma, CA WWTP	Municipal WWTP Sludge Dewatering	2019	6	Indoor	BHX 1350, 1 Unit	8 - 12 hrs per day	75 GPM, 1125 Dry Lbs.per HR.	20 active lbs per dry ton	Matthew Pierce	(707) 776-3777	
4	Pahrump, NV WWTP	Municipal WWTP Sludge Dewatering	2020	5	Indoor	BHX 1100, 1 Unit	8 - 12 hrs per day	170 GPM, 680 Dry Lbs.per Hr.	18 active lbs per dry ton	Brian Magana	(775) 764-0321	Brian.Magana@greatbasinwaterco.com
5	Lake Wales, FL WWTP	Municipal WWTP Sludge Dewatering	2003	17	Outdoor	BHX-1050, 1 unit	8 - 12 hrs per day	75 gpm, 300 dry lbs per hour	27.4 active lbs per dry ton	Ted Long, WW Division Manager ; Chris Jackson, WWTP operator	(863) 678- 4114	tlong@cityoflakewales.com ; cjackson@cityoflakewales.com
6	Puyallup, WA WWTP	Municipal WWTP Sludge Dewatering	2015	5	Indoor	BHX-1000, 1 unit	8 - 12 hrs per day	65 gpm, 650 dry lbs per hour	21.2 active lbs per dry ton	Daniel Messier	(253) 435-3658	dmessier@ci.puyallup.wa.us
7	City of Merrimack, NH WWTP	Municipal WWTP Sludge Dewatering	2010	10	Indoor	BHX-1100, 1 unit	8 - 12 hrs per day	95 gpm, 1,660 dry lbs per hour	7.4 active lbs per dry ton	Leo Gaudette, Lead Operator	(603) 420-1621	lgaudette@merrimacknh.gov
8	Visalia, CA WWTP	Municipal WWTP Sludge Dewatering	2015	5	Outdoor	BHX-1200, 2 units	8 - 12 hrs per day	110 gpm, 625 dry lbs per hour	19.1 active lbs per dry ton	Jason Rodriques, Lead Operator	(559) 713-4671	Jason.rodriques@visalia.city
9	Sonoma, CA WWTP	Municipal WWTP Sludge Dewatering	2012	8	Outdoor	BHX-1250, 1 unit	8 - 12 hrs per day	80 gpm, 600 dry lbs per hour	15.4 active lbs per dry ton	John Albrecht	(707) 547-1073	John.Albrecht@scwa.ca.gov
10	Pendleton, OR WWTP	Municipal WWTP Sludge Dewatering	2011	9	Indoor	BHX-1050, 1 unit	8 - 12 hrs per day	100 gpm, 1,000 dry lbs per hour	34.6 active lbs per dry ton	Mark Milne, WW Treatment Superintendent	(541) 276-3372	mark.milne@ci.pendleton.or.us

**Information on the facility and operation was valid at the year of startup. Current operation periods, etc. may vary.

**CONTACT LIST FOR MUNICIPAL BIOLOGICAL SLUDGE
DEWATERING APPLICATIONS UTILIZING FKC SCREW PRESSES**

Screw Press Location:	City of Victoriaville, Quebec
Screw Press Model #:	SHX-1000x7000L (2 each) [3 HP]
Year Started:	1997

Screw Press Location:	City of Mirabel, Quebec
Screw Press Model #:	SHX-1100x7000L [3 HP]
Year Started:	2001

Screw Press Location:	City of Sequim, WA
Screw Press Model #:	SHX-600x5000L for Class A Biosolids [3 HP]
Year Started:	2003

Screw Press Location:	City of Forks, WA
Screw Press Model #:	SHX-300x2000L for Class A Biosolids [1 HP]
Year Started:	2003

Screw Press Location:	City of Lake Wales, FL
Screw Press Model #:	SHX-1050x8000L [3 HP]
Year Started:	2003

Screw Press Location:	City of Anson-Madison, ME
Screw Press Model #:	SHX-650x4500L [15 HP]
Year Started:	2003

Screw Press Location:	California American Water Company – Las Palmas Facility in Salinas, CA
Screw Press Model #:	SHX-400x3500L [2 HP]
Year Started:	2004

Screw Press Location:	Marin Sanitation District #5 – Tiburon, California
Screw Press Model #:	SHX-400x3000L [1 HP]
Year Started:	2007

Screw Press Location:	California American Water Company – Pasadera Facility by Monterey, CA
Screw Press Model #:	SHX-300x2500L [1 HP]
Year Started:	2005

Screw Press Location:	California American Water Company – Carmel Valley Ranch by Carmel, CA
Screw Press Model #:	SHX-300x2500L [1 HP]
Year Started:	2005

Screw Press Location:	City of St. Cloud, FL
Screw Press Model #:	SHX-900x7500L [3 HP]
Year Started:	2005

Screw Press Location:	City of Aberdeen, WA
Screw Press Model #:	SHX-900x6000L [3 HP]
Year Started:	2005

Screw Press Location:	Monterey Regional Water Pollution Control Authority / Monterey, CA
Screw Press Model #:	SHX-1250x9000L (2 each) [7.5 HP]
Year Started:	2007

Screw Press Location:	City of Cambria, CA
Screw Press Model #:	SHX-900x7000L for Class A Biosolids [3 HP]
Year Started:	2008

Screw Press Location:	City of Petaluma, CA
Screw Press Model #:	SHX-1250x9000L [7.5 HP]
Year Started:	2009

Screw Press Location:	City of Hampstead, MD
Screw Press Model #:	SHX-800x5000L [3 HP]
Year Started:	2008

Screw Press Location:	California American Water Company – Fillmore WRF, CA
Screw Press Model #:	SHX-900x6000L Biosolids [3 HP]
Year Started:	2009

Screw Press Location:	City of Yachats, OR
Screw Press Model #:	SHX-300x2500L for Class A Biosolids [1 HP]
Year Started:	2009

Screw Press Location:	City of Enterprise, OR
Screw Press Model #:	HX 400 x 3000L Skid system, [1 HP]
Year Started:	2009

Screw Press Location:	City of Bainbridge Island, WA
Screw Press Model #:	SHX-900x6000L [3 HP], Class "A" Capable
Year Started:	2009

Screw Press Location:	City of Toppenish, WA
Screw Press Model #:	SHX-650x4000L [3 HP]
Year Started:	2009

Screw Press Location:	City of Sausalito, CA
Screw Press Model #:	SHX-900x5000L [2 HP]
Year Started:	2009

Screw Press Location:	City of Fairfield, CA
Screw Press Model #:	SHX-1250x8000L [7.5 HP]
Year Started:	2009

Screw Press Location:	City Live Oak, FL
Screw Press Model #:	SHX-600x4000L [3 HP]
Year Started:	2010

Screw Press Location:	Sun n' Lake, Sebring, FL
Screw Press Model #:	BHX-600x4000L [2 HP]
Year Started:	2010

Screw Press Location:	City of Hamilton, MT
Screw Press Model #:	BHX-400x2500L [1 HP]
Year Started:	2010

Screw Press Location:	Oroville, WA
Screw Press Model #:	SHX-350x3000L
Year Started:	2010

Screw Press Location:	City of Kerman, CA
Screw Press Model #:	SHX-1000x8000L
Year Started:	2010

Screw Press Location:	City of Umatilla, FL
Screw Press Model #:	SHX-800x6500L
Year Started:	2010

Screw Press Location:	City of Erie, Co
Screw Press Model #:	SHX-800x6500L
Year Started:	2011

Screw Press Location:	City of Merrimack, NH
Screw Press Model #:	BHX-1100x6000L
Year Started:	2011

Screw Press Location:	City of Lapwai, ID
Screw Press Model #:	SHX-400x3500L
Year Started:	2012

Screw Press Location:	Waikoloa, HI / Hawaii Water Service Co.
Screw Press Model #:	SHX-900x7000L, [5HP] Class "A" Capable
Year Started:	2012

Screw Press Location:	City of Avon Park, FL #1
Screw Press Model #:	BHX-700x4000L [2 HP]
Year Started:	2012

Screw Press Location:	City Skagway, AK
Screw Press Model #:	HX-350x2000L [2 HP]
Year Started:	2012

Screw Press Location:	City of Pendleton, OR
Screw Press Model #:	BHX-1050x5500L [5 HP]
Year Started:	2012

Screw Press Location:	City Raymond/South Bend, WA
Screw Press Model #:	SHX-500x4000L [3 HP]
Year Started:	2013

Screw Press Location:	City of Brookings, OR
Screw Press Model #:	BHX-800 x 4500L [2 HP]
Year Started:	2012

Screw Press Location:	City of Guadalupe, CA
Screw Press Model #:	BHX-500 x 3000L [2 HP]
Year Started:	2012

Screw Press Location:	City of Tehachapi, CA
Screw Press Model #:	BHX-550 x 4000L [2 HP]
Year Started:	2013

Screw Press Location:	City of Gold Beach, OR
Screw Press Model #:	BHX-500 x 3000L [2 HP]
Year Started:	2013

Screw Press Location:	Polk County, FL
Screw Press Model #:	BHX-900 x 5000L (2 each) [3 HP]
Year Started:	2012

Screw Press Location:	City of Waterloo, WI
Screw Press Model #:	BHX-1000x5000L [3 HP]
Year Started:	2012

Screw Press Location:	Mackinac Island, MI
Screw Press Model #:	SHX-700x5000L [5 HP] Class "A" Capable
Year Started:	2013

Screw Press Location:	Fort Meade, MD
Screw Press Model #:	BHX-600x4000L
Year Started:	2012

Screw Press Location:	North of the River Sanitation District - Shafter, CA
Screw Press Model #:	SHX-1100x8500L
Year Started:	2013

Screw Press Location:	City of Graceville, FL
Screw Press Model #:	SHX-600x5000L [3 HP] Class "A" Capable
Year Started:	2013

Screw Press Location:	City of Tacoma, WA
Screw Press Model #:	BHX-1100x6000L (3 each) [5HP]
Year Started:	2014

Screw Press Location:	Oceanside Wastewater Treatment Plant - San Francisco, CA
Screw Press Model #:	BHX-1100x6000L (2 each) [5 HP]
Year Started:	2013

Screw Press Location:	City of Mt Sterling, OH
Screw Press Model #:	SHX-600x5000L
Year Started:	2014

Screw Press Location:	City of Bridgeport, WA
Screw Press Model #:	BHX-450x2500L [1HP]
Year Started:	2014

Screw Press Location:	City of Roseburg, OR
Screw Press Model #:	BHX-1000x5500L
Year Started:	2014

Screw Press Location:	Sonoma, CA
Screw Press Model #:	SHX-1250x9000L [7.5 HP]
Year Started:	2014

Screw Press Location:	Quincy, FL
Screw Press Model #:	BHX-500x3000L Skid [3 HP]
Year Started:	2014

Screw Press Location:	Hualalai, HI
Screw Press Model #:	BHX-700x4000L [3 HP]
Year Started:	2014

Screw Press Location:	Berlin NH
Screw Press Model #:	BHX-1100X6000L [5 HP]
Year Started:	2014

Screw Press Location:	Bay City MI
Screw Press Model #:	BHX-700X4000L (2 each) [5 HP]
Year Started:	2014

Screw Press Location:	Visalia, CA
Screw Press Model #:	BHX-1200X6500L (2 each) [5 HP]
Year Started:	2016

Screw Press Location:	San Luis Obispo CA
Screw Press Model #:	BHX-1000x5500L [5 HP]
Year Started:	2015

Screw Press Location:	Stonegate CO
Screw Press Model #:	BHX-600X4000L
Year Started:	2016

Screw Press Location:	Monroe MI
Screw Press Model #:	BHX-1000x5500L (3 each) [5 HP]
Year Started:	2015

Screw Press Location:	Galt, CA
Screw Press Model #:	BHX-900x5000L [3 HP]
Year Started:	2016

Screw Press Location:	Lynnwood WA
Screw Press Model #:	BHX-800x4500L [5 HP]
Year Started:	2015

Screw Press Location:	Puyallup WA
Screw Press Model #:	BHX-1000x5500L [3 HP]
Year Started:	2016

Screw Press Location:	Paris Illinois
Screw Press Model #:	BHX-600x3500 [3 HP]
Year Started:	2015

Screw Press Location:	Davis CA
Screw Press Model #:	BHX-1000x5500 (2 each) [5 HP]
Year Started:	2016

Screw Press Location:	Holland MI
Screw Press Model #:	BHX-1250x7000 (4 each) [7.5 HP]
Year Started:	2015

Screw Press Location:	Hill Canyon WWTP, Thousand Oaks CA
Screw Press Model #:	BHX-1100x6000 (2 each) [5 HP]
Year Started:	2015

Screw Press Location:	Lewiston ME
Screw Press Model #:	BHX-900x5000 (2 each) [3 HP]
Year Started:	2016

Screw Press Location:	Myrtle Point OR
Screw Press Model #:	SHX-400x3500 [2 HP]
Year Started:	2016

Screw Press Location:	Middleborough MA
Screw Press Model #:	BHX-700x4000 (2 each) [5 HP]
Year Started:	2016

Screw Press Location:	Fredericksburg, TX
Screw Press Model #:	BHX-900x4000 [2 HP]
Year Started:	2016

Screw Press Location:	Carmel CA
Screw Press Model #:	BHX-900x4500 [2 HP]
Year Started:	2016

Screw Press Location:	Hartsville TN
Screw Press Model #:	BHX-700x4000 [2 HP]
Year Started:	2017

Screw Press Location:	Miller Creek Treatment Plant, SSSD, Normandy Park WA
Screw Press Model #:	BHX-800x4500L [2 HP]
Year Started:	2016

Screw Press Location:	Keene NH WWTP
Screw Press Model #:	(2) BHX-1000x5500L (5 HP)
Year Started:	2017

Screw Press Location:	Ocala, FL American Pipe & Tank
Screw Press Model #:	BHX-1250x7000 [7.5 HP]
Year Started:	2017

Screw Press Location:	Central Davis Sewer Dist., Kaysville UT
Screw Press Model #:	BHX 1100 x 6000L
Year Started:	2016

Screw Press Location:	Palmyra, MO
Screw Press Model #:	BHX-400x2500L [1 HP]
Year Started:	2017

Screw Press Location:	Talbot County MD
Screw Press Model #:	Two each BHX-500x3000L [3 HP] Skid Systems
Year Started:	2017

Screw Press Location:	City of Avon Park, FL #1
Screw Press Model #:	BHX-700x4000L [2 HP]
Year Started:	2018

Screw Press Location:	Benton IL WWTP
Screw Press Model #:	BHX 600x3500L
Year Started:	2018

Screw Press Location:	Sydney Water Corp, Sydney Australia
Screw Press Model #:	BHX-1250x7000 [7.5 HP]
Year Started:	2018

Screw Press Location:	Sunnyside WA WWTP
Screw Press Model #:	BHX 800x4500L
Year Started:	2018

Screw Press Location:	West Sound Utility District WWTP, Port Orchard WA
Screw Press Model #:	BHX-700x4000L [2 HP]
Year Started:	2018

Screw Press Location:	Port Angeles WA WWTP
Screw Press Model #:	BHX-800x4500L [2 HP]
Year Started:	2018

Screw Press Location:	Woodland WA WWTP
Screw Press Model #:	BHX-500x3000L [2 HP] Skid System
Year Started:	2018

Screw Press Location:	Mount Vernon WA WWTP
Screw Press Model #:	BHX-1050x5500L [3HP]
Year Started:	2017

Screw Press Location:	Pleasant Hills PA WWTP
Screw Press Model #:	BHX-1050x5500L [3HP]
Year Started:	2019

Screw Press Location:	City of Coulee Dam WA WWTP
Screw Press Model #:	BHX-500x3000L [2 HP] Skid System
Year Started:	2019

Screw Press Location:	Lyon County NV WWTP
Screw Press Model #:	BHX-800x4500L [2 HP] Skid System
Year Started:	2018

Screw Press Location:	Hermiston OR WWTP
Screw Press Model #:	BHX-800x4500L [2 HP] Skid System
Year Started:	2018

Screw Press Location:	Salmon Creek Treatment Plant, SSSD, Burien WA
Screw Press Model #:	BHX800x4500L (2 HP)
Year Started:	2019

Screw Press Location:	Harrisonburg WWTP
Screw Press Model #:	BHX-1100x6000L [3 HP]
Year Started:	2018

Screw Press Location:	Santaquin WWTP
Screw Press Model #:	BHX-800x4000L [2 HP]
Year Started:	2019

Screw Press Location:	Tesuque Casino WWTP, Santa Fe NM
Screw Press Model #:	BHX-350x2000L [1 HP] Skid System
Year Started:	2018

Screw Press Location:	Evansville WI WWTP
Screw Press Model #:	BHX-1000x5500L [3HP]
Year Started:	2019

Screw Press Location:	Epping NH WWTP
Screw Press Model #:	BHX-700x4000L [5 HP]
Year Started:	2019

Screw Press Location:	Depoe Bay WWTP
Screw Press Model #:	SHX-500x4000L [2 HP]
Year Started:	2018

Screw Press Location:	Sutherlin OR WWTP
Screw Press Model #:	BHX-900x5000L [3 HP]
Year Started:	2019

Screw Press Location:	Cayucos CA WWTP
Screw Press Model #:	BHX-600x3500L [3 HP]
Year Started:	2020

Screw Press Location:	Hawaii American Water, Hawaii Kai, HI
Screw Press Model #:	BHX-700x4000L (2 each) [2 HP]
Year Started:	2019

Equipment Performance and Layout Information

Proposal Performance Information

FKC CO., LTD.

2708 West 18th Street
Port Angeles, WA 98363



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

Equipment Performance

Project: City of San Luis West WWTP, AZ
Project Engineer: Wesley Bond
Equipment Name: FKC Screw Press and associated equipment

Screw Press Performance is as follows:

Material to be dewatered:	Secondary Waste Activated (with minimal digestion)
Capacity:	11.928 BDST/Day (24-hours) or 994 Dry Lbs. / Hr.
Average Flowrate:	200 GPM @ 1.0%TS
Inlet Consistence:	1.0% or Higher
Outlet Consistency:	15% or Higher
Maximum Polymer Dose:	30 Lbs. / Dry Ton (Active)
Capture Rate:	95% or Higher

Sizing calculation are proprietary.

Flocculation Tank size is based on Hydraulic retentions time. FKC sizes the flocculation tank for 2 – 3 minutes of retention time. At 200 GPM we specified a 540 gallon tank, giving us 2.7 minutes.

Conveyor Calculations are attached

Sludge Pump Calculations are attached

Polymer System:

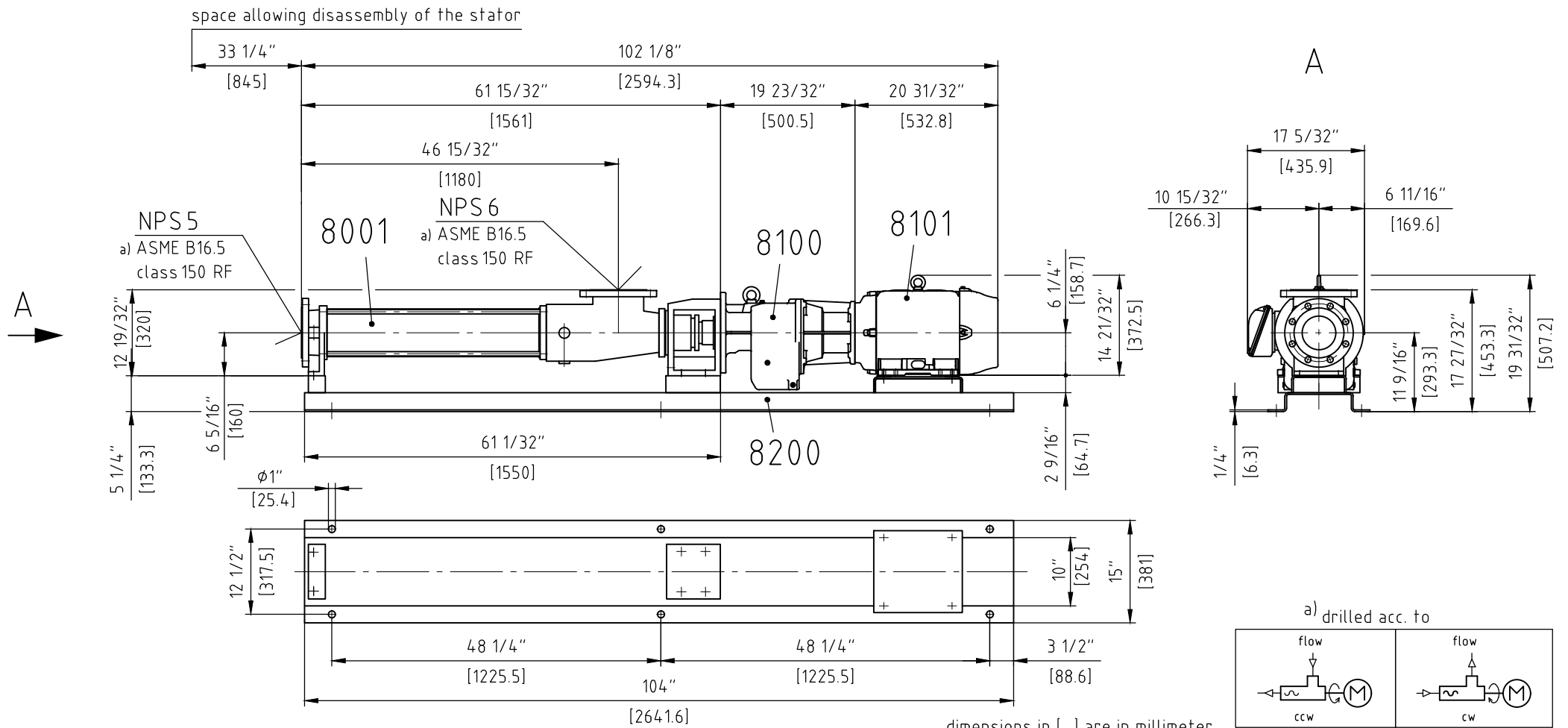
FKC assumes 30 Lbs. / DT of active polymer or 66.7 Lbs. / DT of neat Polymer

To process 0.5 Dry Ton/ Hr., we will need 33.3 Lbs. of neat polymer per hour or 3.7 Gallons.

The polymer system is provided with a 5 GPH Neat Polymer Pump.

Make-Down solution is 0.5% or approximately 12.5 GPM of Make-down water.

Copyright: This drawing is our property and patented for us according to the law of copyright and associated rights !

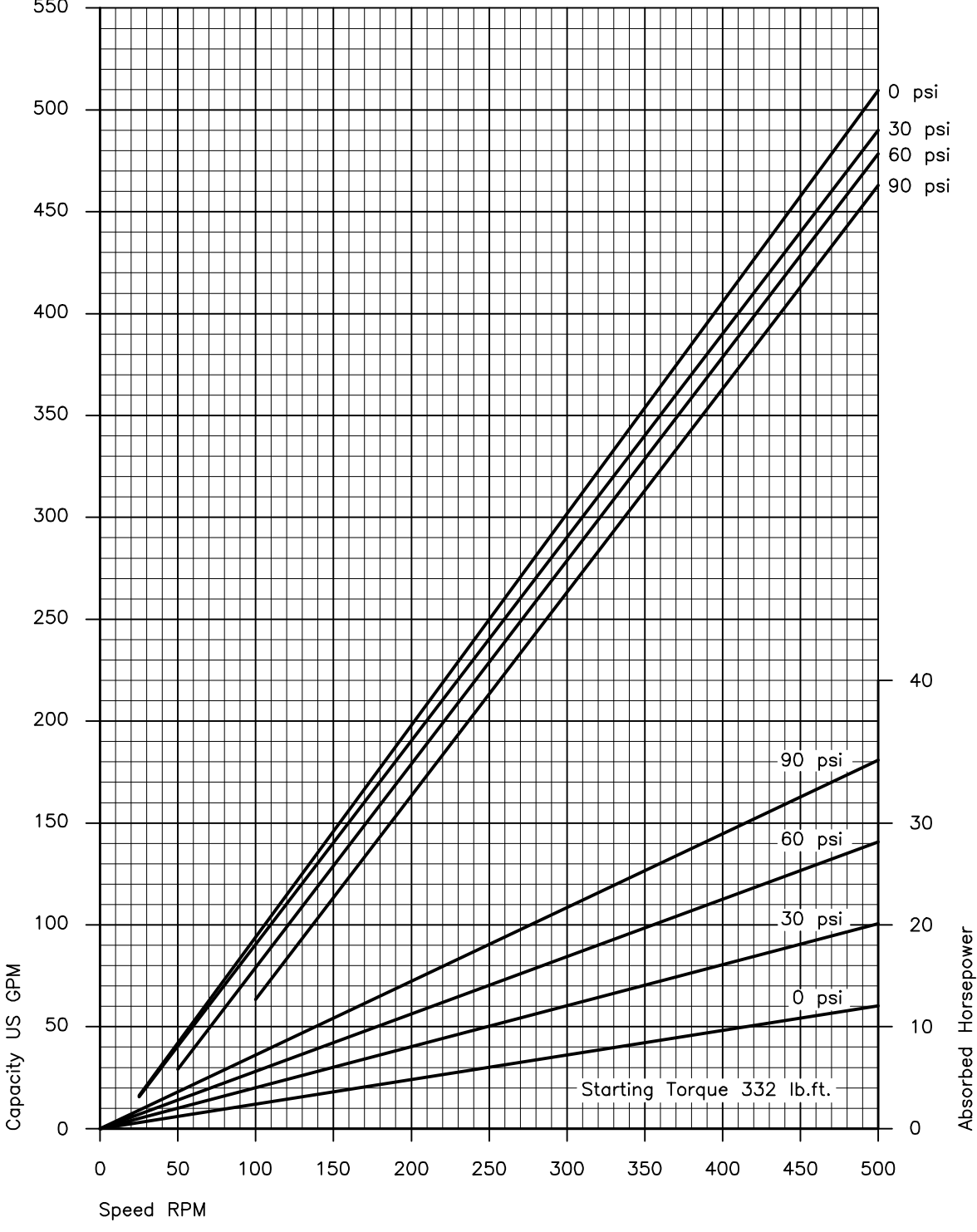


1	baseplate:	8200	Var.: 801-200/0350-C-815	70	
1	motor: WEG 01518ET3E254TC-W22	8100		143	
1	gear: Nord SK52F-250TC	8100		121	
1	pump: BN 35-12 / 70-6L / 110-6LT / 55-12T	8001		160	
Quant.	Denomination	Item	Material	Note	Weight / kg

2023	Name	Day	Scale	Note	Denomination
Drawn	lsh	04.05	1:20	Weight	dimensional drawing
Checked	gf	04.05.	EDP-No.	494 kg	Drawing-no.
			224155.dwg		262-C65/0350-C-758A4

SEEPEX.

Characteristic Curves
 Size
 70-6L



Values based upon water 68°F ; For notes on drive selection refer to PER

Making life better together

We are Ingersoll Rand Businesses

Benefiting from over 160 years of experience, which comes from serving 100,000 industrial customers across 50 countries, being 'an Ingersoll Rand business' brings unparalleled value to our customers and markets.

This portfolio of industry-leading brands provide customers the most precise and innovative solutions in the market for monitoring, dosing and transfer of high-value fluids and gases. These solutions also deliver significant sustainability impact to clean energy, water, food and human health that makes life better for our society and planet.

SEEPEX is proud to be an Ingersoll Rand business.



TERMS & CONDITIONS OF SALE AND/OR REPAIR 12.22

The following terms and conditions shall apply to an order for all or any part of the articles covered by the accompanying offer unless a specific exception is included therein. Acceptance of any order by SEEPEX Inc. is expressly made conditional upon Buyer/Customer's acceptance of SEEPEX Inc. Terms and Conditions of Sale and/or Repair. All prior or future terms, conditions or negotiations (whether written or oral) by Buyer/Customer will therefore be considered void and inapplicable unless otherwise agreed in writing. SEEPEX Inc. reserves the right, in its sole discretion, to refuse any order, unconditionally, for any reason including but not limited to: expiration of the validity of the offer, errors in the offer, unacceptable payment risks, conflicts with contractual commitments made to other potential customers and the chance that a customer may try to enforce an implied warranty or merchantability of the products offered.

1.0 PRICES

1.1 Any prices quoted shall only be valid for orders placed within 30 days from the date of issue of the offer. Prices are Ex-Works SEEPEX Inc. plant (Enon, Ohio USA) in U.S. dollars, unless otherwise agreed. SEEPEX Inc. reserves the right to correct typographical or clerical errors.

2.0 TERMS

2.1 All orders are subject to approval by the SEEPEX Inc. Credit Department. Unless otherwise agreed, if payment for the invoice due is not made in full within thirty (30) days after shipment, late fees of eighteen percent (18%) per year (equivalent to a nominal monthly interest rate of 1.5%) will be applied on the unpaid balance until paid in full. The terms and conditions herein set forth are based upon tariffs, taxes, foreign exchange rates, delivery, and other conditions in effect on the date of the Buyer/Customer's order. In the event that such tariffs, taxes, foreign exchange rates, delivery, and/or other conditions should change prior to delivery of the goods, SEEPEX Inc. reserves the right to charge such increased duties, taxes, or charges to the Buyer/Customer.

2.2 Unless the order includes the appropriate exemption certificates and/or licenses, duties and taxes levied by Federal, State, or other governments are required to be charged automatically at the rate imposed at time of importation/shipment. Any change in law, regulations, or Government practice which causes a variation of any kind in the applicable charges from the amounts stated in the offer shall result in an equivalent change in the price quoted.

2.3 Until payment is made in full, SEEPEX Inc. shall retain the right, without notice, to repossess and/or retain the items, and/or dispose of them, for its benefit and hold the Buyer/Customer responsible for any loss. Buyer/Customer agrees to enter into any agreements, contracts, or notices required confirming such rights.

2.4 Except where prohibited by law, all products and services paid with a credit card will be subject to a 2.5% convenience fee added to the price of the order. This fee will not exceed our cost of acceptance and will not apply to orders placed through an online platform.

3.0 SECURITY

3.1 In order to secure any obligations due to SEEPEX Inc. from the Buyer/Customer, the Buyer/Customer grants to SEEPEX Inc. a security interest in:

- a.** The merchandise covered by the Buyer/Customer's order (s), and
- b.** All property and funds of the Buyer/Customer now or hereafter in SEEPEX Inc.'s possession, and in all additions and proceeds of such merchandise and/or property. The Buyer/Customer hereby authorizes SEEPEX Inc. to sign alone any financing statement or statements and to do all and any other things which may be necessary to perfect such security interest.

4.0 CANCELLATION

4.1 After acceptance, orders may be cancelled only with the express approval of SEEPEX Inc. In the event of an approved cancellation, the Buyer/Customer shall remain responsible for payment for all work performed and/or material expenses incurred by SEEPEX Inc. as of the time of cancellation. SEEPEX Inc. reserves the right to cancel the order if SEEPEX Inc. determines, in its sole discretion, that the Buyer/Customer's financial condition renders the Buyer/Customer unable or unlikely to pay for the order as agreed.

5.0 RETURN

5.1 No credit will be allowed for returns unless SEEPEX Inc. has authorized such returns in writing in advance. A copy of this authorization must be returned with the item as the packing slip. All returns are subject to restocking charges and to the SEEPEX Inc. Return Goods Authorization (RGA) Policy, which is available on www.seepex.com, and is incorporated herein by reference. SEEPEX Inc. will only issue credits for items that are covered under warranty or can be resold. Items that are specially produced for a specific Buyer/Customer, including but not limited to: special hoppers, baseplates, electrical panels, gear reducers and electric motors are specifically excluded from consideration for credit. Any items not received in good, clean and uncontaminated condition or items that cannot be put back into stock will not be accepted. Any elastomer material with over three (3) years of fabrication will not be accepted for return and/or credit. Buyers/Customers must pay for all freight associated with any return, including parts or equipment that may be considered to be covered by the limited warranty protection clause below. If an item is deemed to be covered under warranty, the value of the item, and freight associated with the replacement of the item, will be reimbursed by the issuance of a credit to the Buyer/Customer's account. Outstanding RGA's that have declined repair will be scrapped automatically after ninety (90) days if no other written instructions are provided.

6.0 SHIPMENT

6.1

a. Handling Charge: Buyer/Customer shall be responsible for making all arrangements for shipment of the order with a suitable carrier. In the event that Buyer/Customer requests that SEEPEX Inc. makes arrangements for shipment, then Buyer/Customer agrees to pay to SEEPEX Inc., in addition to the applicable shipping charges, a handling charge in the amount of 10% of the shipping charges with a minimum \$5.00 to a maximum charge of \$150.00, with special services requiring additional charges.

b. New Articles: Where shipping instructions dictate no specific routing, SEEPEX Inc. will utilize its best judgement in determining routing but shall not be liable for any charges once the goods have reached their agreed upon point of delivery. If changes are made at Buyer/Customer's request in a) the agreed upon point of delivery, or b) in the routing selected by SEEPEX Inc. and if such changes involve additional costs to be incurred, such costs shall be borne exclusively by the Buyer/Customer, unless otherwise agreed in writing.

c. Repair Work: All items for which the Buyer/Customer requests repair or other services by SEEPEX Inc. shall be delivered to and picked up from the SEEPEX Inc. plant (Enon, Ohio USA) unless otherwise agreed in writing. All costs of delivery shall be paid by the Buyer/Customer unless otherwise agreed to in writing prior to shipment. Items returned to SEEPEX Inc. must be returned in good, clean and uncontaminated condition. Any cost of cleaning or decontamination will be charged back to the Buyer/Customer's account at the standard service rate. SEEPEX Inc. has the right to refuse acceptance of any dirty or contaminated shipment that may be suspected of being hazardous.

d. All Orders: On collect freight shipments, cartage charges from plant to carrier are the responsibility of the Buyer/Customer. Title to articles passes to Buyer/Customer upon delivery to carrier acting as Buyer/Customer's agent subject to any right of retention by SEEPEX Inc. All claims for shortage in, and damages in, shipment or otherwise must be reported to carrier immediately upon receipt with copy or report to ourselves within five (5) business days.

7.0 WARRANTIES & LIABILITY LIMITATIONS

7.1

a. New Articles: SEEPEX Inc. warrants articles of our manufacture against defects in material and/or workmanship for a period of one (1) year from date of delivery, provided that the articles have been installed, maintained, and operated in strict accordance with SEEPEX Inc. recommendations and instructions. For any pump that Buyer/Customer registers with SEEPEX Inc., the warranty period, as expressed above, shall be extended by two (2) additional years for a total of three (3) years from date of delivery, and provided that the articles are installed, maintained and operated in strict accordance with SEEPEX Inc. recommendations and instructions for the duration of such warranty period. Registration must be confirmed and can be completed online at <http://warranty.seepex.us>.

TERMS & CONDITIONS OF SALE AND/OR REPAIR 12.22

b. Repair Work: Defined herein as work and services performed by SEEPEX Inc. SEEPEX Inc. warrants all repair work and services that it performs against defects in workmanship and/or materials for a period of one (1) year from the date of delivery of the repaired articles or for the remainder of the applicable original warranty period under Section 7.1 a., if not yet expired, whichever period is longer.

c. All Orders: All warranty claims shall be submitted promptly in writing to SEEPEX Inc. Any warranty replacement and/or repair shall be made Ex-Works SEEPEX Inc. plant (Enon, Ohio USA). SEEPEX Inc.'s warranty obligation shall be limited to the replacement and/or repair only of defective material and/or workmanship.

7.2 In no event shall SEEPEX Inc. be liable for any incidental or indirect/consequential loss or damage of whatever kind of nature including but not limited to loss of business income or profits, revenue or loss of production or damage resulting from delay in manufacture or delivery, loss of use or damage to any installation into which the article may be installed, whether arising out of contract or tort.

7.3 Force Majeure: SEEPEX Inc. shall not be liable or responsible to Buyer/Customer or any other party, or be deemed to be in default or breach of its obligations to Buyer/Customer or any other party, for any failure or delay in fulfilling or performing any of its obligations, when and to the extent such failure or delay is caused by or results from acts beyond SEEPEX Inc.'s reasonable control, including, without limitation, war, invasion, hostilities, calamity, riot, civil commotion or disorder, act of civil disobedience, threats or acts of terrorism, plague, epidemic, pandemic, outbreaks of infectious disease, including but not limited to COVID-19, or any other public health crisis, quarantine or other work-related restrictions, act of authority whether lawful or unlawful, compliance with any law or governmental order, rule, regulation or direction, embargoes or blockades, national or regional emergency, act of God or natural disaster, explosion, fire, destruction, general labor disturbance such as but not limited to boycott, strike and lockout, or shortage or inability to obtain critical labor, material or supplies, telecommunication breakdowns, power outages or shortages, lack of warehouse, dock, cargo container or storage space, inadequate shipment or transportation services, port delays or backups such as but not limited to shortage of labor, equipment, trailers, trucks, vehicles or other services to unload ships or haul cargo away, or inability or delay in obtaining supplies of adequate or suitable materials, or any other event which is beyond the reasonable control of SEEPEX Inc. that renders its performance inadvisable, commercially impracticable, illegal, or impossible ("Force Majeure Event"). Upon the occurrence of any Force Majeure Event, SEEPEX Inc., in its sole discretion and without prior notice to Buyer/Customer or any other party, shall be entitled to terminate the performance of its obligations immediately without Buyer/Customer or any other party having recourse against SEEPEX Inc., or otherwise suspend performance of its obligations to Buyer/Customer or any other party, including without limitation the payment of any funds, monies, wages, compensation or remuneration to Buyer/Customer or any other party, and such performance shall be deemed permanently excused and released hereunder or otherwise suspended until such time that SEEPEX Inc. in its sole discretion determines that it can and should resume performance of its obligations, whether in full or in part.

7.4 Notwithstanding anything herein to the contrary, SEEPEX Inc.'s liability to Buyer/Customer on any cause of action shall be limited to the amount paid by the Buyer/Customer on the subject order. SEEPEX Inc. makes no warranties, express or implied, with respect to articles or products manufactured or provided by any party other than SEEPEX Inc., except to transfer to the Buyer/Customer, where permissible, any warranty provided to SEEPEX Inc. by the original manufacturer. On any claims for repairs and/or replacement under such warranty, all costs incurred by SEEPEX Inc., which are not underwritten by the original manufacturers, shall be borne by the Buyer/Customer. Except as provided herein, SEEPEX Inc. expressly disclaims all representations, promises, or warranties, express or implied, with respect to any products, articles, work, or services, including any warranties of merchantability and of fitness for a particular purpose. All warranties made by SEEPEX Inc. shall be void where the goods have been subject to misuse, neglect, damage or alteration. SEEPEX Inc. shall be held free and harmless from any dispute or claim anywhere arising from and relating to infringement of patent, design, trademark, or copyright of items, sold or repaired under this contract.

8.0 PROPERTY RIGHTS AND RISKS

8.1 SEEPEX Inc. disclaims any liability or responsibility whatsoever with regard to loss or damages to the Buyer/Customer's property while in the possession, custody or control of SEEPEX Inc. for requested repairs or other services, and the Buyer/Customer expressly agrees to indemnify and hold SEEPEX Inc. harmless against any and all claims for such loss or damage.

9.0 HAZARDOUS MATERIALS

9.1 Any hazardous materials or the existence of any hazards relative to the condition of any product tendered to SEEPEX Inc. for service or repair work must be disclosed by Buyer/Customer in writing in the RGA Request Form, whether or not required to be disclosed per federal law on the MSDS sheet. Buyer/Customer shall defend, indemnify and hold SEEPEX Inc. harmless from and against any and all claims of injury or damage, including attorney's fees, caused by any hazardous condition or material on or about products accepted for service/ repair. This obligation includes but is not limited to claims of bodily injury or death suffered by SEEPEX Inc. employees, or by other parties.

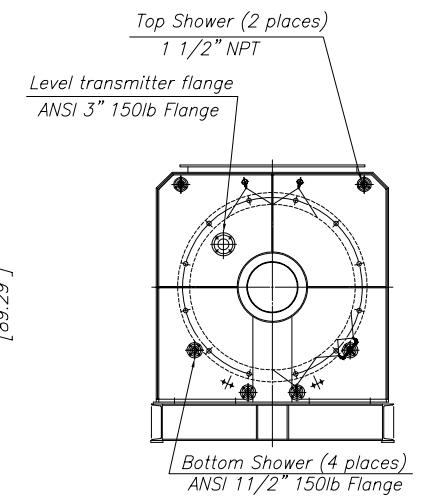
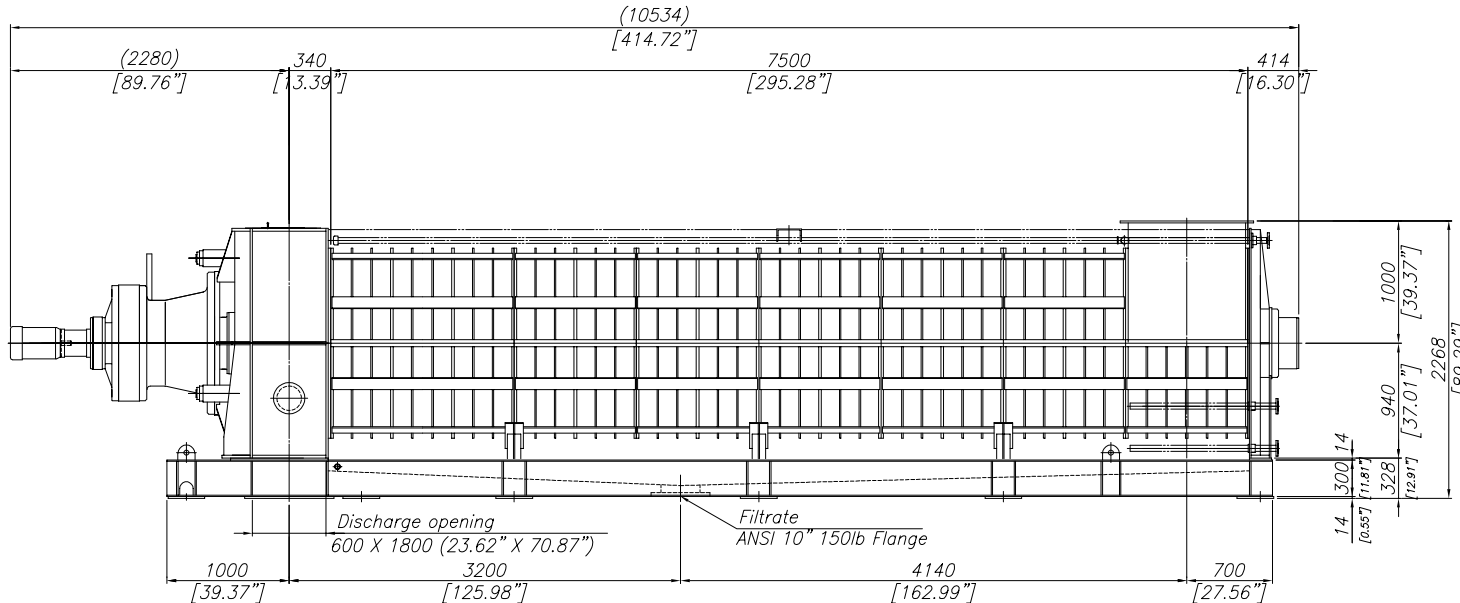
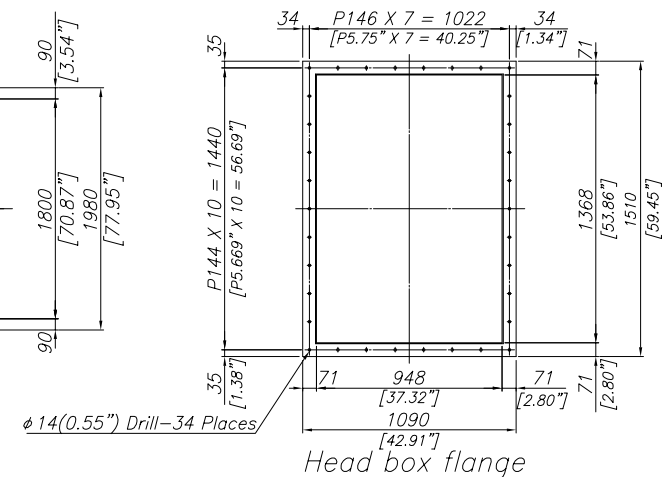
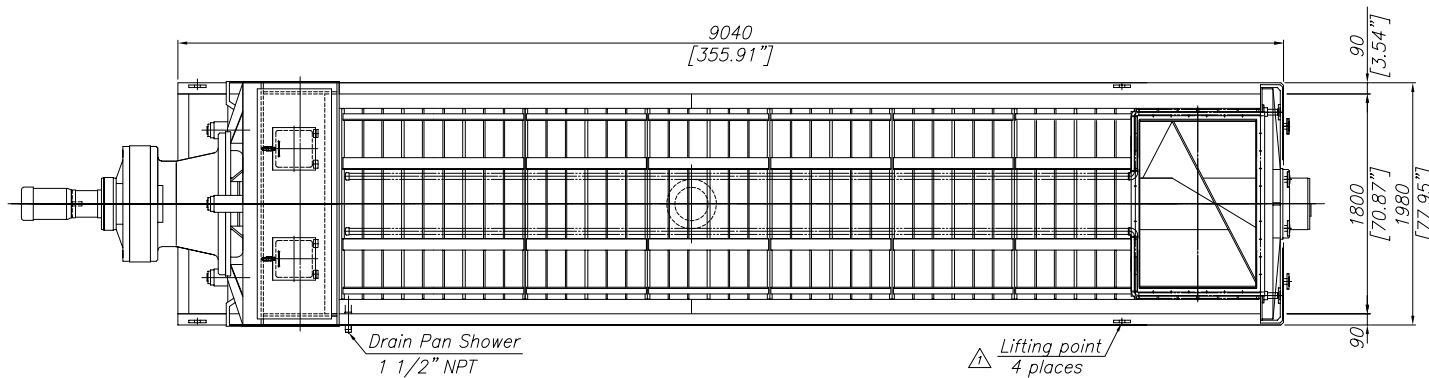
10.0 GENERAL CONDITIONS

10.1 No modification, amendment, rescission, discharge, abandonment or waiver of these terms and conditions shall be binding upon SEEPEX Inc. unless set forth in writing and signed by a duly authorized officer or representative of SEEPEX Inc.. In any action or proceeding to enforce these terms and conditions against Buyer/Customer or any other party, SEEPEX Inc. shall be entitled to recover all of its costs and expenses, including reasonable attorney's fees and expenses incurred in connection with such action or proceeding. These terms and conditions shall be governed by and construed in accordance with the laws of the State of Ohio, and any contract resulting here from shall be deemed to be made in the State of Ohio, and SEEPEX Inc. and Buyer/Customer hereby consent to the exclusive jurisdiction of the courts of the State of Ohio located in Clark County, with respect to any controversy or claim arising out of, or relating to, any contract resulting from these terms and conditions.

SEEPEX Inc.
511 Speedway Drive
Enon, Ohio 45323
USA

T +1 937 864-7150
sales.us@seepex.com
www.seepex.com

Shop Drawings



Cyclo reducer, CHVJ-6275DA-7569
 Motor 7.5 HP, 1800rpm (213TC)

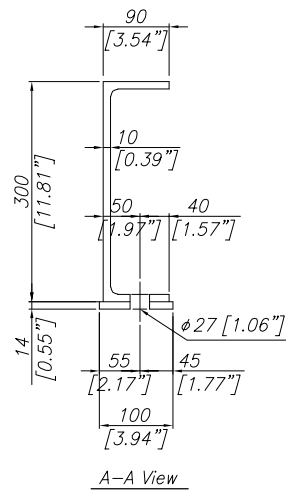
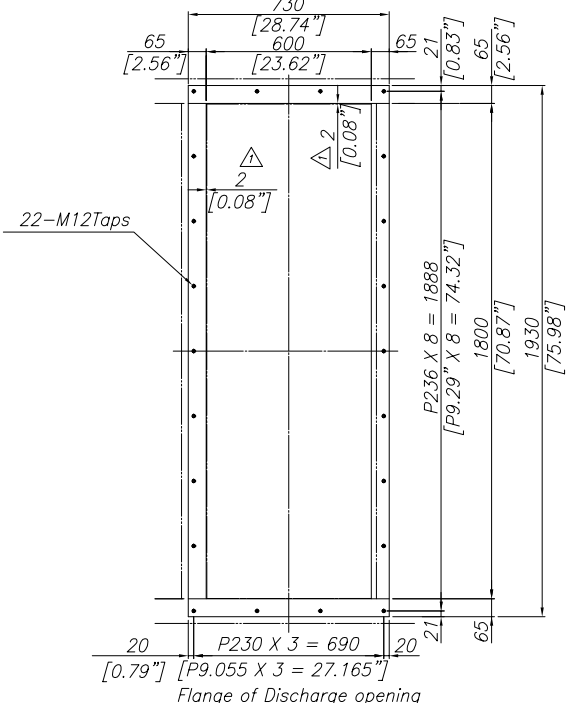
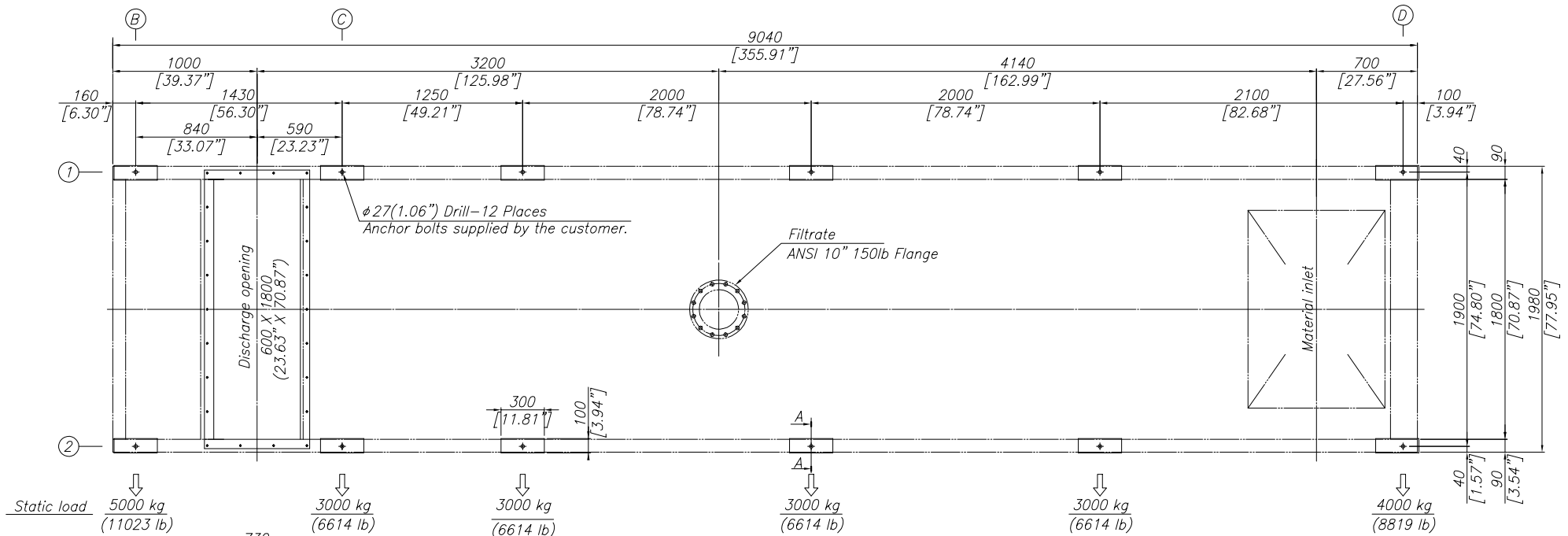
Screw rev.
 0~1800 X 1/7569 = ~0.238 rpm.

Total weight = 17,000 kg (34,479 lbs)
 Operating weight = 21,000 kg (46,298 lbs)

Rev.	Date	Description	Drawn by	Rev. by	Appd. by
△	4/6 23	Issued as Certified	TC		
△	3/14 23	Lifting point	S.ENDO		
△	1/10 23	Approval	S.ENDO	Y.ITO	H.ABE

発注先 Purchaser	FKC CO., LTD.	Quantity	2	配布先 貿易部	
最終客先 End user	Sabine Creek WWTP, TX	Scale		F K C	
工事名称 Job name	BHX-1350X7500L Screw press	1/30		営業部	
図面名称 Dwg. name	Assembly			QC 部	
工事番号 Job No.	M-3510			QC 工程	
図面番号 Dwg. No.	S3510-1	Ref. job No.		製造部	
				設計部	
				鋼路工場	
				大阪営業所	
				富士営業所	
				合計	





Dynamic load

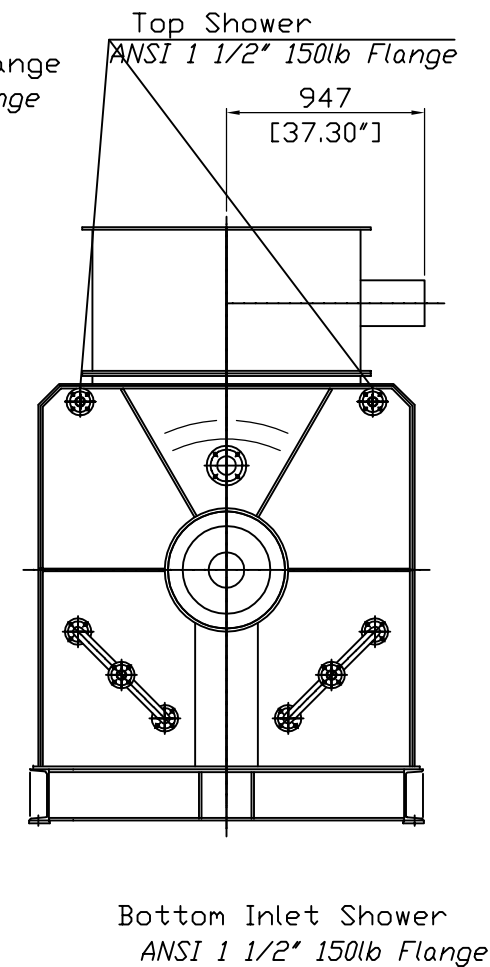
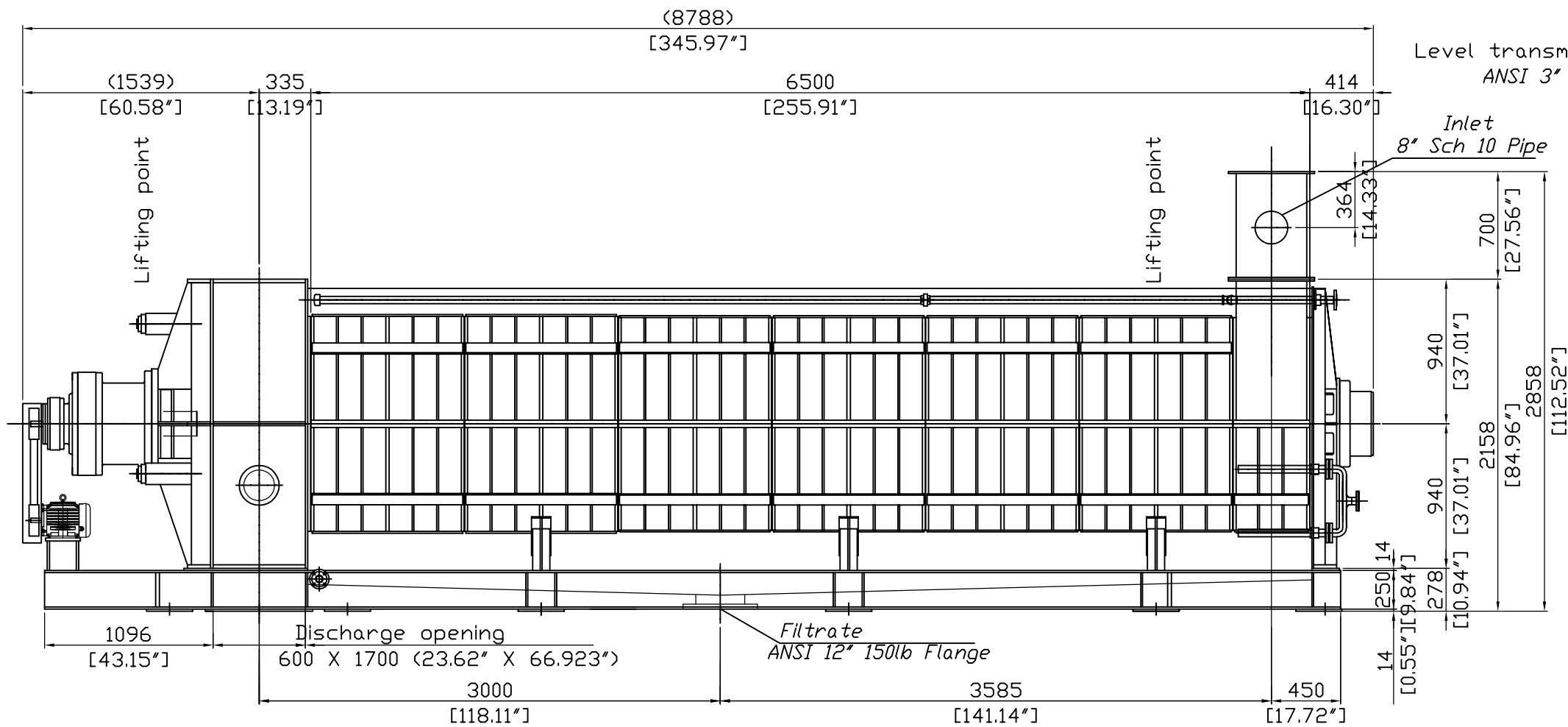
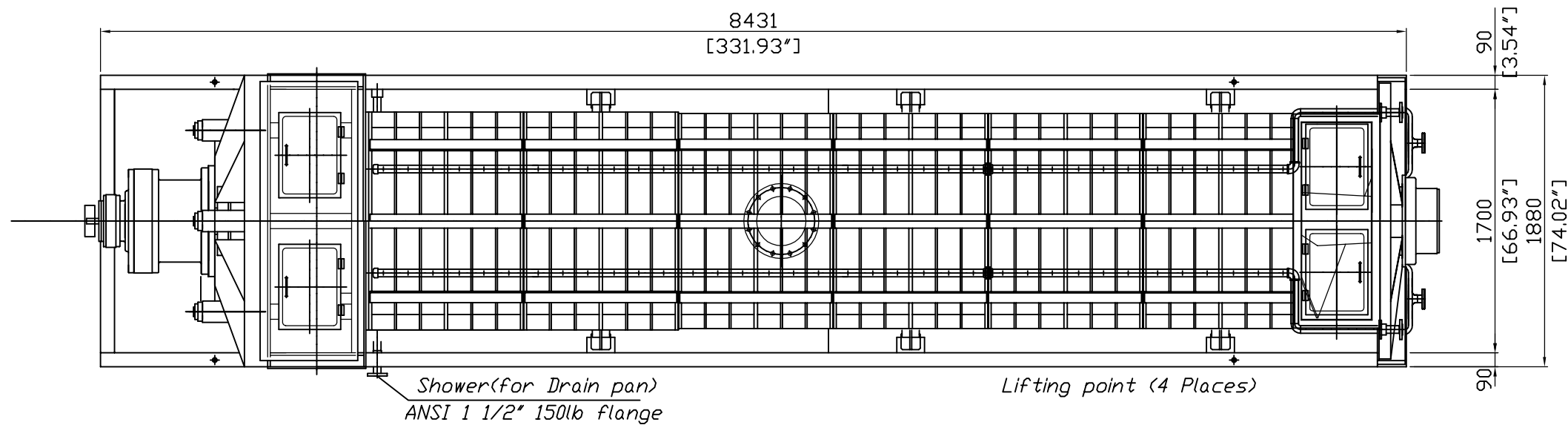
	B	C	D
1	232 Kg (511 lbs) ↓	330 Kg (728lbs) ↓	-562 Kg (-1239 lbs) ↑
2	-232 Kg (-511 lbs) ↑	-330 Kg (-728 lbs) ↑	562 Kg (1239 lbs) ↓

Note: Loads shown above are worst case dynamic loads during plugged condition.

Total weight = 17,000 kg (37,479 lbs)
Operating weight = 21,000 kg (46,298 lbs)

Rev.	Date	Description	Drawn by	Rev. by	Appd. by
△	4/6 23	Issued as Certified	TC		
△	3/14 23	Lining (SS316L)	S.ENDO		
△	1/10 23	Approval	S.ENDO	Y.ITO	H.ABE

発注先 Purchaser	FKC CO., LTD.	Quantity	2	配布先 貿易部	
最終客先 End user	Sabine Creek WWTP, TX	Scale		営業部	
工事名称 Job name	BHX-1350X7500L	1/20		QC部	
図面名称 Dwg. name	Foundation			製造部	
工事番号 Job No.	M-3510			設計部	
図面番号 Dwg. No.	S3510-02			鋼路工場	
				大阪営業所	
				富士営業所	
				合計	



Cyclo reducer, CHVJ-6255DA-7569
 Motor 5 HP, 1800rpm (184T)

Screw rev.
 0~1800 X 1/7569 = ~0.238 rpm

Total weight = 13,000 kg (28,660 lbs)
 Operating weight = 16,000 kg (35,274 lbs)

Rev.	Date	Description	Drawn by	Rev. by	Appd. by
△	9/15/16	Approval	S.ENDO	H.ABE	T.OGAWA

Messrs. Purchaser	FKC CO., LTD.	Quantity	1
End user	Messrs.	Scale	Scale
Job name	BHX-1250X6500L Screw Press	1/25	
Dwg. name	Assembly		
Job No.			
Dwg. No.		Ref. job No.	

FKC FUKOKU KOGYO CO., LTD.

Specificaitons

Screw Press

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SECTION 11340

FLOCCULATION TANK AND DEWATERING SCREW PRESS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. There shall be furnished a dewatering system including in-line flocculation tank and dewatering screw press with drivers and features specified in this Section and scheduled below. All equipment shall be provided by a single manufacturer. The dewatering system line shall be capable of dewatering municipal waste activated sludge.
- B. Tag Numbers.
1. Flocculation Tank: SP-FT-**XXX**
 2. Flocculation Tank Gearmotor: SP-FT-M-**XXX**
 3. Screw Press: SP-**XXX**
 4. Screw Press Motor: SP-M-**XXX**
 5. Screw Press Local Control Panel: SP-LCP-**XXX**
 6. Screw Press Headbox Level Transmitter: SP-LT-**XXX**
 7. Screw Press Headbox Hi Level Switch: SP-LH-**XXX**
- C. The purchase price of the Flocculation Tank and Dewatering Screw Press, as specified herein has been pre-negotiated with the manufacturer. The pre-negotiated price is \$**XXX,XXX**. The price shall be used in preparing a lump sum base bid. The purchase price shall include the scope of supply identified in this specification as outlined in the attached Scope of supply letter from the manufacturer. The Contractor shall review the scope of supply and provide all additional appurtenances, equipment, installation labor, testing, and other services for a complete system.

1.2 REFERENCES

- A. American Bearing Manufacturers Association (ABMA)
- B. American Gear Manufacturers Association (AGMA)
- C. American Society of Mechanical Engineers (ASME)
- D. Institute of Electrical and Electronics Engineers, Inc. (IEEE)
- E. American Welding Society (AWS) D1.1, Structural Welding Code.

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- F. National Electric Code (NEC).
- G. National Electrical Manufacturers Association (NEMA).
- H. American National Standards Institute (ANSI).

1.3 SCREW PRESS DESCRIPTION

- A. Screw press system shall be capable of municipal waste activated sludge described below.
- B. Dewatering screw press with components as specified in this Section and shown on the Drawings and as required for a complete and functional screw press system, including:
 - 1. Screw press with all 304 stainless steel wetted parts.
 - 2. Sludge inlet headbox.
 - 3. Removable drums.
 - 4. Removable drum covers.
 - 5. Three screen spray showers.
 - 6. Speed reducer.
 - 7. Galvanized carbon steel base.
 - 8. Flanged filtrate outlet.
 - 9. Back pressure cone.
 - 10. Flocculation tank with mixer.
 - 11. Equipment Motors.
 - 12. Anchor age/seismic support calculations.
 - 13. Pressure transducer type level element with indicating transmitter and high level probe.

C. Design Requirements:

- 1. Screw Press Minimum Performance Requirements

Type of Sludge	XXXXXXXXXXXXX
Feed Solids, % total solids (TS)	XX – XX %
Discharge Solids, % TS	XX - XX % with polymer addition

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Design Inlet Capacity XXX dry pounds per hour

2. Motor Characteristics – as described in this Section.

1.4 SUBMITTALS

- A. Submit as specified in Section XXXXX – Submittals.
- B. Product Data:
 1. Submit data completely describing product including plan and section views and listings of materials of construction.
 2. Submit surface preparation and finishes to be applied to all equipment.
- C. Shop Drawings:
 1. Complete manufacturer fabrication/assembly drawings stamped by a registered Engineer.
 2. Certified drawings showing dimensions, weights, loading information and location of all components; Include details on interconnecting piping, supports, and control panel.
 3. Wiring, control schematics, and control logic diagrams for all electrical and control components furnished.
 4. Manufacturer's Drawings shall be coordinated with the Contract Drawings, including equipment numbers and piping designations.
 5. List of Recommended Spare Parts with price information
- D. Structural Calculations
 1. Structural anchor points to concrete foundation.
 2. Seismic loads on frame and anchor bolts.
- E. Resume of Technician to perform thickener screw press adjustments, inspections, observations of test operations, supervision of functional and performance testing, and training.
- F. Training Course Outline
- G. Operating and Maintenance Manuals: Include complete lubrication, maintenance, and operation instructions, including initial start-up instructions, and unloading and handling methods.
- H. Manufacturer's references

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- I. Quality Control Submittals:
 - 1. Special shipping storage, protection, and handling instructions
 - 2. Manufacturer's Installation Instructions
 - 3. Factory Test Results

1.5 QUALITY ASSURANCE

A. **Manufacturer Qualifications:** Consideration will be given only to the equipment of Manufacturers who are regularly engaged in such work and thoroughly experienced in the design and manufacture of screw press equipment specifically manufactured for municipal, secondary treated, waste activated sludge. Manufacturer shall meet the requirements below:

- 1. Have a minimum of 10 years of experience of producing substantially similar equipment, and show evidence of satisfactory operation in North America for presses dewatering XXXXXXXXX sludge.
- 2. Must have a company-owned service and parts facility within the continental United States.

B. **Certifications:** The dewatering equipment supplier must provide the "Certification of Compliance" (COC) letter with their priced equipment proposal to the general contractor(s) bidding the project. The general contractor must include the dewatering equipment supplier COC in their bid proposal submitted to the OWNER at bid closing.

1. **Certification of Compliance:** In the initial submittal for the equipment, included a certification of compliance with this specification on the screw press manufacturer's letterhead (certification by manufacturer's representatives is not acceptable), worded as follows:

- a. "[Insert manufacturer's name] proposes to supply equipment included in Specification 11340 for the Flocculation Tank and Dewatering Screw Press. We have examined the specification and have a clear understanding of the requirements insofar as they affect the proposed products. We certify that the products will operate satisfactorily under the conditions described in the specification and that the products meet the requirements of the specification with the exception of the following (if none, print "NONE"):

[List exceptions, deviations or changes necessary to accommodate the proposed products. It shall be at the County's sole discretion to accept or reject deviations. If "NONE" is listed, it shall be understood and agreed that the vendor meets or exceeds the specifications hereinafter.]

We further certify that the products to be furnished shall meet the performance criteria as required in the specification and as listed in

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the solicitation response as submitted by [Insert manufacturer's name] on [Insert date of solicitation response] including:

[List performance criteria as required in response to this solicitation]

Authorized Signature & Title

Date”

- b. Provide justification for exceptions, variations, deviations, or changes (such as advancements in technology that benefit the OWNER, changes in design or material sources that have no impact on overall performance of the unit, or changes made necessary due to differing conditions noted in the specification). COUNTY will determine whether exceptions, deviations, and changes are acceptable. Exceptions, variations, deviations, and changes may result in rejection of submittal and original specified requirements must be met.
- c. Acceptance of certification shall not relieve SUPPLIER of responsibility for adequacy of all equipment.
- d. Submittal of certification shall not relieve SUPPLIER of requirement to comply with submittal procedure requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Contractor shall unload, store, and handle the equipment per the manufacturer's instructions.

1.7 WARRANTY

- A. Warranty shall extend for 12 months after start-up or 18 months after delivery, whichever comes first.
- B. Warranty shall include all parts, labor, and coatings for repairing or replacing equipment that fails during the warranty period. Defects occurring within the warranty period shall be repaired or replaced by the manufacturer at no cost to the OWNER.
- C. An Extended Mechanical Warranty shall be offered for all mechanical components of the flocculation tank and dewatering screw press. The Extended Mechanical Warranty shall be for 10 years after start-up.
 - 1. Extended Warranty shall include coverage of:
 - a. Gearboxes, bearings, bushings, spray showers, and any wear items.
 - 2. Extended Mechanical Warranty does not cover:
 - a. Damage or failures due to lack of proper lubrication types, quantities

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or schedules.

- b. Motors, field instrumentation, power control, logic control, or any other electronic component.
 - c. Coatings.
3. Extended Mechanical Warranty shall include all parts and labor for repairing or replacing components to maintain the screw press minimum performance requirements listed.

1.8 PROJECT CONDITIONS

- A. Deliver screw press and flocculation tank as completely assembled as practical to minimize field assembly. Contractor shall be responsible for unloading and any necessary field assembly. Contractor shall contact manufacturer for screw press field assembly requirements during bid.

1.9 SEQUENCING AND SCHEDULING

- A. Coordinate work with restrictions as specified.

1.10 MAINTENANCE

- A. Special Tools: Provide standard manufacturer supplied toolbox with all tools needed to assemble and disassemble the screw press.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Manufacturer: FKC Co., LTD. No other manufacturers will be accepted.
 - 1. Screw press, flocculation tank, and appurtenances shall be provided by one (1) manufacturer.

2.2 MATERIALS

- A. Wetted Parts : Stainless Steel, Type 304, unless otherwise indicated.
- B. Drive Unit: As scheduled.
- C. Galvanized carbon steel base
- D. Other parts : Coated carbon steel
- E. Miscellaneous hardware, including bolts, nuts, washers, and fastener clips in the wetted area: Stainless steel.

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2.3 HOUSING

- A. Housing shall be rigid Type 304 stainless steel weldment, supported by structural carbon steel base and shall have removable Type 304 stainless steel covers for screen access.
- B. Sludge feed connections and filtrate discharge connections shall be Type 304 stainless steel 6-inch pipe stub and 4-inch (respectively) flanged meeting ANSI/ASME B 16.1, Class 125, or ANSI/ASME B 16.5, Class 150; provide higher pressure class as required to meet Design Working Pressure.
- C. Press shall have Type 304 stainless steel discharge box with hinged lid. Dimensions as indicated on the Drawings.
- D. Housing shall be designed for noise reduction, to act as a protective guard and to provide a complete enclosure for odor containment.
- E. The screw press shall be provided with Type 304 stainless steel spray covers on the top and sides of the screw press drums where necessary for sanitation and personnel protection. Side covers shall be easily removable by a single person.
- F. If applicable, include 304 stainless steel foul air connections suitable for flexible duct connections with clamps for as shown on the Drawings.
- G. Headbox shall include hinged top inspection doors (12 inch by 12 inch min).

2.4 DRIVE SYSTEM

- A. Drive system shall consist of an electric motor suitable to use with a variable speed drive system as required to provide full load capacity and also to withstand the full starting torque of the system. VFD shall be provided as part of the Dewatering Control Panel.
- B. Screw speed shall be electronically controlled by means of a VFD in a NEMA 4X enclosure. Maximum screw speed shall be XX rpm or lower.
- C. Speed Reducer:
 - 1. Provide speed reducer rated for uniform shock load classification with a SUM ITOMO-CYCLO reducer service factor of 1.00.
 - 2. Speed reducer shall be Sumitomo Cyclo Reducer or equal.
- D. Shaft Seals shall be Musashi double lip spring-loaded Nitrite oil seal or equal.
- E. Bearings:
 - 1. Bearings:
 - a. Screw press shall be designed so that the entire rotating assembly is supported on the discharge end by a grease lubricated ball or

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spherical roller type bearing. The bearing shall be conservatively designed to withstand all stresses of the service specified. Main bearings shall have a minimum B-10 life rating of 500,000 hours at standard operating speeds.

- b. Bearings for the screw shall be anti-friction with grease lubrication.
- F. Flexible connectors for the drive motor and screw press junction boxes shall be furnished by the installing Contractor such that all local electrical codes are met.
- G. Screw Press Motor SP-M-XXX:
 - 1. Provide inverter rated, severe duty motor, 1.15 SF, NEMA Premium Efficiency, cast iron frame with manufacturer's standard, corrosion resistant, epoxy finish.
 - 2. Minimum screw press motor requirements of XX HP, (480v/3 phase)

2.5 SCREW ASSEMBLY

- A. Screw Shell: Stainless steel, Type 304.
- B. Helical flight welded to screw shell: Stainless steel Type 304 Brushless Flight.
- C. The screw supported in the head by a radial bearing.

2.6 SCREEN ASSEMBLY

- A. Type 304 stainless steel panels with punched holes.
- B. Wedgewire screens are not acceptable.

2.7 DRUM ASSEMBLY

- A. Drums shall be 0.5 to 1.0 meters in length and split into two, removable drum halves.
- B. Drum configuration shall allow maintenance work in the screw press flight area without removal of the screw from the press.

2.8 PRESS ASSEMBLY

- A. Screw press assembly shall be such that clearances around the entire perimeter of the unit for maintenance work shall not exceed 36 inches.

2.9 FLOCCULATION TANK SP-FT-XXX

- A. Flocculation tank wetted parts shall be constructed of 304 stainless steel throughout.

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- B. Flocculation tank shall be designed for a retention time of XX to XX minutes under the normal design flow rate. The inlet of the tank shall be located at the bottom of the tank and conditioned sludge shall overflow from the discharge pipe located near the top of the tank. Provide XX-inch discharge pipe stub with flexible rubber hose sleeve connection.
- C. Flocculation tank shall be supplied complete with an agitator. The agitator drive SP-FT-M-XXX shall be an SEW Eurodrive Varimot speed reducer/mechanical variator or equal. Agitator speed shall be adjusted manually at the flocculation tank.
- D. Flocculation tank, agitator, and agitator drive shall be designed to handle the entire flow capacity range of the screw press.
- E. Motor for the SP-FT-M-XXX drive shall be a minimum XX hp, 480 v / 3-phase unit. Motor shall have an aluminum cast frame. Motor efficiency will be 77% or greater. Motor bearings shall be 6306 C3-2RS or equal on the drive end and 6205 C3-2RS or equal on the fan end.
- F. Provide split flocculation tank cover with a hinged inspection port. Include a 4-inch pipe stub vent connection on the fixed portion of the cover.

2.10 INSTRUMENTATION AND CONTROLS

- A. Screw press manufacturer shall provide the dewatering control panel, PLC and field instrumentation for the dewatering system, as described and shown on the Drawings as SP-LCP-XXX. See section XXXXX for details on the SP-LCP-XXX dewatering control panel.
- B. Within 180 days of Contract Notice to Proceed, screw press manufacturer shall provide a detailed written description of the modes of operation, interlocking and process control requirements for use by the Contractor, sufficient for proper operation of the dewatering system.
- C. The PLC for SP-LCP-XXX will be programmed by the screw press manufacturer. See section XXXXX for details on all logic and process control requirements. Screw press manufacturer is responsible to direct all programming changes required to meet the system performance standards.
- D. The HMI for SP-LCP-XXX will be programmed by the screw press manufacturer. See section XXXXX for details on all required display, setpoints, alarms and parameter ranges.
- E. Screw press manufacturer shall provide a pressure sensing type level indicating transmitter SP-LT-XXX as follows:
 - 1. Manufacturer: One of the following or equal:
 - a. Rosemount
 - b. Fischer and Porter

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- c. Leeds and Northrup
- d. Foxboro
- 2. Level Indicating Transmitters: Pressure sensing, 24 volt direct current 2 wire type with the following:
 - a. 3-inch ANSI B16.5, Class 150 carbon steel mounting flange
 - b. 1/2 inch National Pipe Tread pressure or reference connection
 - c. No mechanical fulcrum points
 - d. Electronic span
 - e. Zero adjustments
 - f. Adjustable damping feature
 - g. Positive over-range protection
 - h. Field adjusted zero elevation or suppression
 - i. 3 valve manifold
- 3. Transmitters Housings: NEMA 4X corrosion resistant and weatherproof, with operation temperature range of from 0 to 175 degrees Fahrenheit with relative humidity of 0 to 100 percent.
- 4. Wetted Material: Cadmium-plated carbon steel, stainless steel, or other corrosion-resistant materials, compatible with process fluid.
- 5. Accuracy: Within 0.25 percent of span with repeatability of 0.10 percent.
- 6. Output: 4 to 20 milliampere direct current without need for external load adjustments.
- 7. Calibrate transmitters to required range.
- 8. Provide flange on headbox for mounting the level element.
- F. Conductivity Level Probe SP-LH-XXX by Screw Press Manufacturer
 - 1. Manufacturers, Products: Omega LVC-E511 or equal.
 - 2. 303 Stainless Steel electrodes, 1/4" diameter.

2.11 ANCHOR BOLTS

- A. Anchor bolts will be sized by the screw press Manufacturer and provided by the

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Contractor.

2.12 FINISHES

- A. Surface preparation of carbon steel surfaces on the screw press and flocculation tank shall be in accordance with SSPC-SP6 standards and shall be coated as follows:
 - 1. Prime Coat: 5 mils of Carboline 890
 - 2. Top Coat: 2 mils of Carboline 890 (if outdoors & exposed to direct sunlight), 5 mils (if indoors or covered outdoors)
- B. Motors and gearboxes for the screw press and flocculation tank shall be prepared and coated with the manufacturer's standard surface preparation, prime coat and top coat for corrosion resistance.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. The Contractor shall provide all hardware and accessories required for installation.
- C. Manufacturer's Field Services
 - 1. Include the following:
 - a. Inspection and Functional/Operational Testing: One trip with 3 days service.
 - b. Performance Testing/Training: One trip with 2 days service.
 - 2. Additional trips resulting from failed tests shall be the sole responsibility of the manufacturer.

3.2 EQUIPMENT STARTUP AND TESTING

- A. Perform start-up and functional testing for entire dewatering system, with all units operating in AUTO mode. The Contractor shall complete all electrical/instrumentation and loop testing prior to functional performance testing
- B. Provide Major Certificate of Proper Installation.
- C. Operational Test:
 - 1. Functional/operational tests may be performed in the same trip.

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- D. Guaranteed Performance Testing:
1. Include the minimum number of trips and duration of service as previously indicated.
 2. Include demonstration that dewatering system meets minimum specified performance requirements of this specification.
 3. Manufacturer's representative shall supervise all performance testing and be solely responsible for operating the dewatering and ancillary equipment (e.g., sludge and polymer feed systems). The OWNER shall furnish personnel to assist in operating the equipment and take samples. Manufacturer shall provide certified test reports.
 4. After adjustments are made to achieve the operating requirements, the dewatering system will be operated at the design conditions to demonstrate consistent performance. Samples of feed, filtrate, and cake shall be collected by Engineer's appointed representative or Owner and evaluated by the Owner. The test will be deemed successful if average test results meet or exceed those specified.
 5. Sample testing and analysis costs shall be the responsibility of the Owner.
 6. Polymer shall be as selected by the polymer representative and supplied by the Owner for testing.
 7. Data collected during each test run used to complete guaranteed performance testing shall include, as a minimum:
 - a. Run number.
 - b. Date.
 - c. Time.
 - d. Feed sludge percent total solids, %TS
 - e. Sludge feed rate, gpm.
 - f. Polymer name.
 - g. Polymer percent active, %.
 - h. Polymer feed rate (neat), gph.
 - i. Screw press speed, rpm.
 - j. Amperage draw by the screw press drive.
 - k. Cake percent total solids, %TS.

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8. Provide calculated values for the following:
 - a. Solids throughput, lbs TS/hr.
 9. Solids concentrations will be determined using "Standard Methods."
 10. Guaranteed Performance Test Runs:
 - a. Test runs shall consist of two 5 hour steady state runs performed on two consecutive days. Maintain the average design solids throughput of XXXX dry pounds per hour throughout the test runs.
 - b. All test data and values and previously described and required to demonstrate compliance shall be recorded at the start of each run and every hour thereafter. The averaged results for each sample shall meet or exceed the minimum and guaranteed performance standards.
 - c. The units shall be operated in AUTO mode at all times during the Guaranteed Performance test runs.
 - d. Should the installed equipment fail to meet the specified minimum performance requirements, the manufacturer shall within 30 days make all necessary changes to the equipment and/or operation at no cost to the Owner. The equipment shall be retested using the same procedure indicated above. If after the second test the equipment still does not meet the minimum performance requirements and/or guaranteed performance standards, damages will be assessed and/or equipment replaced. If assessed, damages will be limited to ten percent (10%) retention, if performance requirements are not met.
 - e. The screw press dewatering system shall meet every item of the performance criteria as specified prior to acceptance of the Owner.
 11. MANUFACTURER shall prepare and submit a written report documenting the test data listed above.
 12. Provide a computer spreadsheet compatible with Microsoft Excel (latest version) with the test data listed above.
- E. Witnessing: All field testing shall be witnessed by the Engineer.
- F. A representative of the screw press manufacturer shall be provided for the following:
1. To inspect the equipment and installation
 2. To make any field adjustments to ensure proper equipment operation
 3. To furnish affidavit stating that the dewatering system has been tested and is ready for installation as specified.

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4. To inspect start-up
- G. Manufacturer shall inspect system before initial start-up and certify that system has been correctly installed and prepared for start-up.
- H. Training:
 1. Provide operator training for at least 2 days on-site by factory trained representative. Operator training to include:
 - a. Operations and inspection training.
 - b. Safety instruction.
 - c. Preventative maintenance instruction.
 - d. Calibration and other pertinent services.

END OF SECTION

Conveyor

City of **XXXXXXXX, XX**
XXXXXXXXXXXXXXXXXXXXXXXXXX - Dewatering Project

SECTION 14555

SHAFTLESS SCREW CONVEYOR SYSTEM

PART 1 GENERAL

1.1 WORK INCLUDED

- A. There shall be furnished a shaftless screw conveyor including support legs and inlet hopper with drivers and features specified in this Section and scheduled below. All equipment shall be provided by a single manufacturer. The shaftless screw conveyor shall be capable of conveying dewatered municipal anaerobically digested sludge.

- B. Tag Numbers.
 - 1. Shaftless Screw Conveyor: **CV-001**
 - 2. Shaftless Screw Conveyor Motor: **CV-M-001**
 - 3. Shaftless Screw Conveyor Zero Speed Switch: **CV-ZS-001**
 - 4. Shaftless Screw Conveyor Emergency Stop Switches: **CV-ES-001, CV-ES-002**

- C. The purchase price of the shaftless screw conveyor, as specified herein has been pre-negotiated with the manufacturer. The pre-negotiated price is **\$XXX,XXX**. The price shall be used in preparing a lump sum base bid. The purchase price shall include the scope of supply identified in this specification as outlined in the attached Scope of supply letter from the manufacturer. The Contractor shall review the scope of supply and provide all additional appurtenances, equipment, installation labor, testing, and other services for a complete system.

1.2 REFERENCES

- A. American Bearing Manufacturers Association (ABMA)
- B. American Gear Manufacturers Association (AGMA)
- C. American National Standards Institute (ANSI).
- D. American Society of Mechanical Engineers (ASME)
- E. American Welding Society (AWS) D1.1, Structural Welding Code.
- F. Conveyor Equipment Manufacturer's Associations (CEMA).
- G. National Electric Code (NEC).
- H. National Electrical Manufacturers Association (NEMA).

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1.3 SCREW PRESS DESCRIPTION

- A. Shaftless screw conveyor CV-001 system shall be capable of conveying dewatered municipal anaerobically digested sludge.
- B. Shaftless screw conveyor with components as specified in this Section and shown on the Drawings and as required for a complete and functional shaftless screw conveyor, including:
 - 1. Shaftless screw conveyor with all 304 stainless steel wetted parts.
 - 2. Spiral Flight, Shaftless.
 - 3. End Shaft.
 - 4. Speed Reducer.
 - 5. Motor.
 - 6. Trough and Liners.
 - 7. Covers, bolt-on.
 - 8. Inlet chute.
 - 9. Support Legs, 304 stainless steel.
 - 10. Zero Speed Switch.
 - 11. Emergency Stop Pull-Cords.
 - 12. Anchor age/seismic support calculations.

C. Design Requirements:

- 1. Shaftless screw conveyor shall be suitable for both intermittent and continuous loading and operation.
- 2. Shaftless screw conveyor minimum performance requirements

Type of Biosolids	Anaerobically Digested Sludge
Dewatered Biosolids, % total solids (TS)	16 to 18 % total solids
Design Capacity @ 35% Trough Loading	1,600 dry pounds per hour
	10,000 wet pounds per hour
	160 cubic feet per hour

- 3. Motor Characteristics – as described in this Section.

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1.4 SUBMITTALS

- A. Submit as specified in Section 01330 and Section 15050.
- B. Product Data:
 - 1. Submit data completely describing product including plan and section views and listings of materials of construction.
- C. Shop Drawings:
 - 1. Complete manufacturer fabrication/assembly drawings including location of conveyor relative to locations of associated feed equipment, inlet chute and leg supports.
 - 2. Certified drawings showing dimensions, weights, loading information and location of all components.
 - 3. Wiring diagrams for all motors and electrical field instrumentation furnished.
- D. Structural Calculations
 - 1. Structural calculations prepared, sealed and signed by a registered professional structural engineer in the State of California.
 - a. Structural anchor points to concrete foundation.
 - b. Seismic loads on frame and anchor bolts.
- E. Resume of Technician to perform conveyor adjustments, inspections, observations of test operations, supervision of functional and performance testing, and training.
- F. Training Course Outline
- G. Operating and Maintenance Manuals: Include complete lubrication, maintenance, and operation instructions, including initial start-up instructions, and unloading and handling methods.
- H. Manufacturer's references.
- I. Quality Control Submittals:
 - 1. Special shipping storage, protection, and handling instructions
 - 2. Manufacturer's Installation Instructions
 - 3. Factory Test Results

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Consideration will be given only to the equipment of

**City of XXXXXXX, XX
XXXXXXXXXXXXXXXXXXXX - Dewatering Project**

Manufacturers who are regularly engaged in such work and thoroughly experienced in the design and manufacture of screw press equipment specifically manufactured for municipal, secondary treated, waste activated sludge. Manufacturer shall meet the requirements below:

1. Have a minimum of 5 years of experience of producing substantially similar equipment, and show evidence of satisfactory operation in North America for conveying **municipal wastewater treatment plant** sludge.
 2. Must have a company-owned service and parts facility within the continental United States.
- B. Certifications: The dewatering equipment supplier must provide the “Certification of Compliance” (COC) letter with their priced equipment proposal to the general contractor(s) bidding the project. The general contractor must include the dewatering equipment supplier COC in their bid proposal submitted to the OWNER at bid closing.

1. Certification of Compliance: In the initial submittal for the equipment, included a certification of compliance with this specification on the screw press manufacturer’s letterhead (certification by manufacturer’s representatives is not acceptable), worded as follows:

- a. “[Insert manufacturer’s name] proposes to supply equipment included in Specification **14555** for the Shaftless Screw Conveyor System. We have examined the specification and have a clear understanding of the requirements insofar as they affect the proposed products. We certify that the products will operate satisfactorily under the conditions described in the specification and that the products meet the requirements of the specification with the exception of the following (if none, print “NONE”):

[List exceptions, deviations or changes necessary to accommodate the proposed products. It shall be at the County’s sole discretion to accept or reject deviations. If “NONE” is listed, it shall be understood and agreed that the vendor meets or exceeds the specifications hereinafter.]

We further certify that the products to be furnished shall meet the performance criteria as required in the specification and as listed in the solicitation response as submitted by [Insert manufacturer’s name] on [Insert date of solicitation response] including:

[List performance criteria as required in response to this solicitation]

Authorized Signature & Title Date”

- b. Provide justification for exceptions, variations, deviations, or changes (such as advancements in technology that benefit the OWNER, changes in design or material sources that have no impact on overall

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performance of the unit, or changes made necessary due to differing conditions noted in the specification). COUNTY will determine whether exceptions, deviations, and changes are acceptable. Exceptions, variations, deviations, and changes may result in rejection of submittal and original specified requirements must be met.

- c. Acceptance of certification shall not relieve SUPPLIER of responsibility for adequacy of all equipment.
- d. Submittal of certification shall not relieve SUPPLIER of requirement to comply with submittal procedure requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Contractor shall unload, store, and handle the equipment per the manufacturer's instructions.

1.7 WARRANTY

- A. Warranty shall extend for 12 months after start-up or 18 months after delivery, whichever comes first.
- B. Warranty shall include all parts, labor, and coatings for repairing or replacing equipment that fails during the warranty period. Defects occurring within the warranty period shall be repaired or replaced by the manufacturer at no cost to the OWNER.

1.8 PROJECT CONDITIONS

- A. Deliver shaftless screw conveyor as completely assembled as practical to minimize field assembly. Contractor shall be responsible for unloading and any necessary field assembly. Contractor shall contact manufacturer for screw press field assembly requirements during bid.

1.9 SEQUENCING AND SCHEDULING

- A. Coordinate work with restrictions as specified.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Manufacturer: FKC Co., LTD. No other manufacturers will be accepted.
 - 1. Shaftless screw conveyor shall be provided by one (1) manufacturer.

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2.2 MATERIALS

- A. Wetted Parts: Stainless Steel, Type 304, unless otherwise indicated.
 - 1. Troughs and inlet chute: 10 gauge.
 - 2. Covers: 10 gauge.
 - 3. Drive and end plates: 3/8-inch minimum.
- B. Support Legs: 304 stainless steel.
- C. Spiral Flights: Cold-formed flat hot-rolled carbon, spring steel bar, Brinell 220 minimum.
 - 1. For 9-inch diameter conveyor, use 3/4 x 2-1/2 inch.
 - 2. For 12-inch diameter conveyor, use 1 x 3 inch.
- D. Drive Shaft: AISI 1045.
- E. Drive Unit: As scheduled.
- F. Wear Liners: UHMW, 1/2-inch thickness, 1 color.
- G. Other parts: Coated carbon steel
- H. Miscellaneous hardware, including bolts, nuts, and washers in the wetted area: 18-8 Stainless steel.

2.3 SPIRAL FLIGHTING

- A. Design spiral flighting to convey material without a center shaft and designed with the stability to prevent distortion and jumping in the trough.
- B. Connect spiral flighting to the drive shaft:
 - 1. For 9-inch conveyors, connection by welding the spirals to a 3-1/2 O.D. x 1/4-inch thick inner shaft sleeve. Shaft is inserted into sleeve and fastened by two cross bolts.
 - 2. For 12-inch conveyors, connection by welding the spirals to a 5-1/2 O.D. x 3/8-inch thick inner shaft sleeve. 1/2-inch plate is welded to sleeve. Another 1/2-inch plate is welded to the drive shaft. The two 1/2-inch plates are fastened to each other by four 1/2-inch 304 stainless steel bolts, nuts and washers.
- C. Spiral Flights to be concentric to within 1/16-inch.

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2.4 DRIVE SYSTEM

- A. The drive units shall be hollow shaft-mounted, roller-bearing gear motor rated a minimum AFMA Class II, single or double reduction or triple reduction.
- B. Drive finish shall be severe duty wash-down surface protection finish as provided by manufacturer.
- C. Drive system shall consist of an electric motor as required to provide full load capacity and also to withstand the full starting torque of the system.
- D. Screw speed shall be electronically controlled by means of a motor starter in a NEMA 4X enclosure. Motor starter shall be provided as part of the Dewatering Control Panel **SP-VCP-001**.
- E. Maximum conveyor shall be **32** revolutions per minute or lower.
- F. V-belt driven speed reducer, or chain driven reducers are not permitted.
- G. Speed Reducer:
 - 1. Speed reducer shall be SEW Eurodrive Reducer or equal.
- H. Shaftless Screw Conveyor Motor **CV-M-001**:
 - 1. Provide inverter rated, severe duty motor, 1.15 SF, NEMA Premium Efficiency, cast iron frame with manufacturer's standard, corrosion resistant, epoxy finish.
 - 2. Minimum screw press motor requirements of **3.0** HP, (480v/3 phase)
- I. Motors shall be mounted at the end of the conveyors as shown in the contract plan drawings.

2.5 TROUGH AND LINERS

- A. Construction shall be of U-trough design with gasketing at each trough flange. Trough sections in 8-foot lengths.
- B. Trough end plates shall be 3/8-inch minimum, removable, with wastepack seal at drive end.
- C. Provide each conveyor with a 2-inch NPT drain outlet at the lowest end of the conveyor.
- D. Liner sections in 4-foot lengths. Liners are 1/2-inch minimum plastimeric-type ultra-high molecular weight (UHMW) polyethylene, 1 color.

2.6 INLET CHUTE

- A. Purpose: Convey the dewatered cake from the screw press discharge box to the

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inlet trough of the shaftless screw conveyor.

- B. Fabricated and provided by the shaftless screw conveyor manufacturer.
- C. Construct of 12-gauge wall and flange thickness for connection to conveyors.
- D. Provide chute with external body reinforcing stiffeners as required.
- E. Provide chute with both the interior and exterior surfaces smooth, free from sharp edges, burrs, and projections, and with all welds ground smooth and all edges and corners rounded.
- F. The minimum incline angle of the chute is 60 degrees.
- G. The chute shall not be supported by any element of the screw press frame.
- H. No part of the chute shall come in contact with the screw press drive, screw, flight, nor interfere with normal operation of the screw press.
- I. Bolt hole pattern for fastening to screw press to match pattern at bottom of screw press discharge box. Bolts and washers for this connection included with shaftless screw conveyor.

2.7 INSTRUMENTATION AND CONTROLS

- A. All electrical equipment shall conform to applicable standard of NEMA and the NEC.
 - 1. Both power and control equipment shall be insulated for not less than 600 volts even though operating voltages may be lower.
- B. Shaftless screw conveyor motor **CV-M-001** shall have power control from a motor starter housed in the screw press vendor control panel **SP-VCP-001**.
- C. Shaftless screw conveyor manufacturer shall provide motion sensor probe and control relay box **CV-ZS-001** as follows:
 - 1. Manufacturer: Siemens Milltronics MFA 4P or equal:
 - a. 100/115.200 VAC, 50/60 Hz, 15 VA.
 - b. 2 relay outputs with S.P.D.T. fail-safe contracts operating in unison.
 - c. 2 to 3,000 pulses per minute adjustment setpoint range.
 - d. Polycarbonate NEMA 4/4X Enclosure for relay circuit board
 - e. MSP-12 standard probe, cast aluminum body and zinc flange.
- D. Shaftless screw conveyor manufacturer shall provide emergency pull-cords and

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safety switches CV-ES-001 and CV-ES-002 as follows:

1. Manufacturer: Omron STI or equal:
 - a. Housing: Heavy-duty painted zinc-based die-cast alloy.
 - b. Indicator: Glass-filled nylon.
 - c. Switch color: Yellow body, blue reset button.
 - d. Switch lockout on cable pulled and cable slack.
 - e. Cable-status indicator on switch lid.
 - f. 6A @ 120 VAC, 3A @ 240 VAC
 - g. 2 N.C. direct-operating safety contacts.
 - h. 1 N.O. direct-opening auxiliary contacts.
 - i. IP67 enclosure type for switches.
 - j. All cables, eyebolts, hooks, springs and clips necessary to run pull cords down both sides of the conveyor.

2.8 ANCHOR BOLTS

- A. Anchor bolts will be sized by the screw press Manufacturer and provided by the Contractor.

2.9 FINISHES

- A. Motors and gearboxes for the screw press and flocculation tank shall be prepared and coated with the manufacturer's standard surface preparation, prime coat and top coat for corrosion resistance.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. The Contractor shall provide all hardware and accessories required for installation.
- C. Manufacturer's Field Services
 1. Include the following:
 - a. Inspection, Functional/Operational Testing: Two trips for a total of 2

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days, 8 hours per day.

2. Additional trips resulting from failed tests shall be the sole responsibility of the manufacturer.

3.2 SHOP TESTING

- A. Units shall be full assembled at the factory and test run for 15 minutes to check for equipment tolerances and proper operation.
- B. Conveyors shall be corrected as necessary.

3.3 FIELD QUALITY CONTROL

- A. Witnessing: All field testing shall be witnessed by the Engineer.
- B. A representative of the screw press manufacturer shall be provided for the following:
 1. To inspect the equipment and installation
 2. To make any field adjustments to ensure proper equipment operation
 3. To furnish affidavit stating that the dewatering system has been tested and is ready for installation as specified.
 4. To inspect start-up
- C. Manufacturer shall inspect system before initial start-up and certify that system has been correctly installed and prepared for start-up.
- D. Training:
 1. Provide operator training for at least 1 day on-site by factory trained representative. Training can be coordinated and occur during same days as functional/operational testing. Operator training to include:
 - a. Operations and inspection training.
 - b. Safety instruction.
 - c. Preventative maintenance instruction.

END OF SECTION

Polymer System

FKC Liquid Polymer Blending System

PART 1 GENERAL

1.01 SUMMARY

- A. Furnish **one (1)** polymer blending system with progressive cavity pump, motors and controls, including all integral piping, valves, fitting, pipe supports, special equipment and appurtenances in accordance with these specifications, including all incidental work necessary to make it complete, satisfactory and ready for operation.
- B. The polymer dilution and feed system shall be capable of effectively activating and fully blending with water a homogenous polymer solution ranging from 0.1% to 1% concentration of emulsion polymers with active contents up to 75%.

1.02 SYSTEM DESCRIPTION

- A. DESIGN CRITERIA
 - 1. Polymer Type: Emulsion
 - 2. Polymer Activity (percent active): 30 to 75
 - 3. Solution Concentration Range: 0.1% to 1%

Neat Polymer Flow Range (GPH)	Dilution Water Range (GPH)
0.25 – 5	120 – 1200

1.03 SUBMITTALS

- A. Product Data:
 - 1. Submit data completely describing product, including detailed scope of supply, detailed bill of materials and annotated specification sheets of all components.
- B. Shop Drawings:
 - 1. Submit detailed specifications and shop drawings with both shaded isometric and orthogonal views of the proposed system, including dimensions and weights.
 - 2. Submit wiring, control schematics, and control logic diagrams for all electrical and control components furnished.
- C. Provide detailed Operations and Maintenance Manuals including storage, installation start-up and operating instructions. Provide safety precautions and warnings of all hazards operating equipment.

1.04 QUALITY ASSURANCE

- A. Prior to shipment the system shall be inspected for quality of construction verifying all fasteners and fittings are tight, all wires are secure and connections whisker-free. The system shall be tested under pressure for a minimum of one hour at 100 psi. If leaks are found they shall be fixed and a new test shall be conducted for one hour at 100 psi until the plumbing system is verified to be leak free.

1.05 DELIVERY & STORAGE

- A. The equipment will be shipped in a new, high quality completely enclosed weather proof wooden crate constructed of 2" x 4" studs and 3/8" thick ply wood. Access to the crate shall be by a front panel removable by lag bolts. A skid shall be constructed of 4" x 4" or two 2" x 4" each, allowing fork-lifting. The crate shall include a shock sensor to warn of equipment mishandling during shipment.

1.06 WARRANTY

- A. The system shall be covered by a one (1) year limited warranty against defects in materials and workmanship.

1.07 SPARE PARTS

- A. One (1) polymer injection check valve

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:
 1. FKC Co., Ltd., No Equal.

2.02 IDENTIFICATION

- A. Provide a name plate securely affixed to the unit providing Manufacturer with phone number, model number, serial number.

2.03 MATERIALS

- A. The following material requirements will be strictly adhered to:
 1. System skid: 304 stainless steel
 2. Hardware: Type 18-8 stainless steel.
 3. Piping & pipe fittings: schedule 80 PVC
 4. Tubing and tube fittings: polyethylene, polypropylene, stainless steel and Viton
 5. Water solenoid valve: brass
 6. Pressure gauges: stainless steel, liquid filled
 7. Pressure switches: NEMA 4, brass connection
 8. Flow meter: acrylic, stainless steel, PVC and or polypropylene
 9. Water control valve: stainless steel with stainless steel seat
 10. Mixing chamber body / flanges: PVC
 11. Mixing chamber cover / chamber: clear polycarbonate
 12. Impeller: 304 stainless steel
 13. Impeller shaft seal: Viton, stainless steel, ceramic, carbon
 14. Mixing chamber pressure relief valve: brass, stainless steel or PVC
 15. Metering pump wetted parts: stainless steel & Viton

16. Seals: Viton, ceramic, Teflon, and or carbon
17. Control enclosure: FRP.

2.04 EQUIPMENT

A. Polymer Activation & Blending Chamber:

1. These specifications are based on a multi-stage, multi-zone, Hydro-Mechanical polymer activation & blending technology. Alternate technologies will only be considered if proven to provide an equal level of performance, versatility, reliability and quality, otherwise the following technology will be provided without exception.
2. In order to provide control and versatility to optimize the performance of the wide range of polymers available and to optimize system reliability, a multi-stage Hydro-Mechanical polymer blending technology shall be provided with both a non-mechanical and mechanical mixing stage:
 - a. Non-Mechanical Stage: To optimize reliability, the device shall be capable of activating and blending polymer based on plant water pressure alone at 30 psid or greater. Polymer shall be injected directly into a water jet by means of an injection quill positioned such that the non-mechanical mixing energy is no way diminished prior to polymer and water contact. The non-mechanical zone shall be designed such that the velocity of the mixing energy-producing water jet is maintained or increases as flow decreases.
 - b. Hydro-Mechanical mixing Stage: In order to provide optimal polymer performance under all operating conditions and to provide total control over mixing energy, in addition to the non-mechanical mixing stage the device shall be capable of producing its mixing energy independent of plant water pressure through a variable intensity, controllable stainless steel hydro-mechanical mixer. The mixing impeller shall be fully controllable and capable of inducing ultra high, non-damaging mixing energy at all flow rates. This shall be accomplished by controlling mixing intensity and preventing over exposure to, or damaging recirculation through the impeller. The polymer mixing impeller shall be designed to produce both axial and radial flow to optimize mixing effectiveness and to effectively inducing high, non-damaging mixing energy over the systems full flow range.
 - c. Mixers that rely solely on plant water pressure and or flow for mixing energy will not be acceptable. Mixers where performance is affected by flow rate and therefore retention time resulting in under or over exposure to mixing energy, or which rely on constant speed impellers or that rely on close tolerances for blending shall not be acceptable.
3. In order to prevent polymer build-up, the mixing chamber shall maintain high velocity in the entire chamber - at no time shall there be low velocity within any portion of the mixing chamber.
4. The mixing impeller shall be controlled by VFD motor controller and driven by a wash-down duty AC motor. The motor shall be mounted horizontally. Motors mounted under the mixing chamber where seal failure or leaks can damage the motor shall not be acceptable.
5. The mixer drive shaft shall be sealed by a mechanical seal which shall have an integrally mounted and factory plumbed seal flush. A drain port behind the seal shall be provided in the mixing chamber to drain the

polymer solution in case of a seal failure. The seal shall be easily accessible for replacement. All bearings shall be external from the mixing chamber. Internal bearings shall not be acceptable.

6. Both mechanical and non-mechanical mixing zones shall be clear polycarbonate to view the mixing action and blending effectiveness. Acrylic chambers prone to becoming brittle over time and cracking, or opaque pipe shall not be acceptable to meet this requirement.
7. The mixing chamber shall have a maximum rated pressure of 100 psi. Provide a pressure relief on the mixing chamber factory set at 75 psi.
8. Provide a neat polymer check valve specifically designed to isolate neat polymer from dilution water.

B. Dilution Water Assembly:

1. The dilution water flow rate shall be monitored by a Rotameter type flow meter having the range as specified under paragraph 1.02 above. Unions or flanges shall be provided on the flow meter to allow easy removal for cleaning.
2. The unit shall have an electric solenoid valve for on/off control of total dilution water flow.
3. A differential pressure type low water differential pressure alarm shall be provided. The switch shall be adjustable between 25 and 100 psid. Proof pressure shall be 500 psi minimum. The pressure switch shall be as manufactured by Ashcroft.
4. Provide a 2-1/2" stainless steel liquid filled pressure gauge to monitor dilution water inlet pressure.

C. Progressive Cavity Neat Polymer Metering Pump

1. The unit shall have one (1) neat polymer metering pump(s) integrally mounted on the systems skid. The metering pump(s) shall have a range as specified under paragraph 1.02 above. The pump shall be a positive displacement, progressive cavity type constructed of stainless steel and Viton. The shaft seal shall be mechanical seals, packing type shall not be used. A 240 VAC wash-down duty motor shall drive the pump. DC motor are not acceptable. A gear reducer shall be provided to produce a maximum pump shaft speed of not more than 545 RPM. The motor shall be controlled by an VFD located in the system control panel.
2. Provide a calibration column with two full port PVC ball valves having Viton o-rings. The column shall be calibrated for a one minute draw-down and read in GPH and milliliters. The calibration column shall be rigidly mounted to the systems frame with a minimum of two heavy duty brackets. Mounting the calibration to the neat polymer inlet piping shall not be acceptable.
3. Provide a thermal type loss of polymer flow sensor.

D. Solution Discharge Assembly:

1. Provide a 2-1/2" stainless steel liquid filled pressure gauge to monitor system discharge pressure.

E. Controls:

1. A control panel integral to the systems frame shall be provided. The enclosure shall be rated NEMA 4X and constructed of FRP. The control panel shall consist of all controllers, digital displays,

potentiometers, switches, lights, relays, and other control devices required for a complete operable system. The control panel and all components shall be industrial duty. All skid mounted electrical components interconnected to the control panel shall terminate at numbered and labeled terminal blocks. The terminal blocks shall be sized for 14 ga. wire. Wires shall be neatly run through wire race-way and numbered with shrink tubing type labels. Adhesive labels shall not be used. The control panel shall be positioned such that there are no obstructions in front of the control panel per related NFPA requirements. Control.

2. Power: 120 VAC, 1Ph, 60/50 Hz.

D Control Series:

3. Operator Interface – Discrete Selector Switch:
 - a. System ON / OFF(reset) / Remote
 - b. One-Turn Potentiometer – Mixer Speed
 - c. Ten-Turn Potentiometer – Progressive Cavity Metering Pump Control
4. Status / Alarm Indicators:
 - a. Main Power ON Indication
 - b. LED display of Metering Pump Rate
 - c. Low Water Differential Pressure Alarm
 - d. Low Polymer Flow Alarm
5. Inputs (signals by others):
 - a. Remote Start / Stop (discrete dry contact)
 - b. Pacing Signal Based on Process Flow (4-20mA)
6. Outputs:
 - a. System Running (discrete dry contact)
 - b. Remote Mode (discrete dry contact)
 - c. Common Alarm (discrete dry contact)

F. System Skid:

1. The system's frame shall be of rugged 304 stainless steel construction. No mild steel shall be used. All piping shall be rigidly supported.
2. Under no circumstance shall the pump suction exceed 5" from the bottom of the skid for progressive cavity pumps and 12" from the bottom of the skid for diaphragm pumps.
3. The overall system dimensions shall not exceed 36"W x 26"D X 60"H.

PART 3 Field Services

3.01 Field Services:

- A. Process equipment manufacturer shall provide the services of a qualified field service technician to inspect and certify the installation, start-up the equipment, trouble shoot any problems that may arise and providing complete and thorough training of operator personnel.

-END SECTION-

Equipment / System Automation

Simplified Control Narrative for an FKC Dewatering System

Does not define FKC Scope of Supply – Example Only

1. To run equipment in HAND:
 - a. Screw press, flocculation tank, and sludge feed pumps
 - i. If you are going to run the sludge feed pump in HAND, then verify all gates and/or valves between the sludge pump and the flocculation tank are manually adjusted to be open.
 - ii. For a given piece of equipment, set the HOA switch to HAND on the front of the dewatering control panel.
 1. Ex: To run the flocculation tank in HAND, turn the HOA switch for the flocculation tank to HAND on the front door of the dewatering control panel.
 - iii. For the sludge feed pump, enter the desired running speed on the sludge feed pump pop-up on the HMI and set the HOA switch on the same HMI pop-up to HAND.
 - b. Polymer Makedown System
 - i. The polymer system can either be run in HAND at the dewatering control panel, or in LOCAL at the polymer system control panel.
 1. To run the polymer system in HAND at the dewatering control panel, press (to select) the polymer makedown system graphic on the Screw Press Overview Screen of the HMI on the dewatering control panel. The polymer makedown system Equipment Control Pop-Up Screen will appear. Press (to select) the HAND label on the PLC Control HOA switch.
 2. To run the polymer system in LOCAL, press the LOCAL START button on the HMI screen of the polymer system control panel.
 - a. Adjust neat polymer gph setpoint on the RUN RP MANUAL screen on the polymer makedown system control panel HMI.
 - b. Adjust the polymer makedown water using the dilution water flow valve % open setpoint on the RUN RP MANUAL screen on the polymer makedown system control panel HMI.
 - c. Solenoid Valves
 - i. To open a solenoid valve in HAND at the dewatering control panel, set the OCA switch to OPEN on the front of the dewatering control panel.
 1. As another option, with the OCA switch in AUTO, press (to select) a solenoid valve graphic on the Screw Press Overview Screen of the HMI on the dewatering control panel. The solenoid valve Equipment Control Pop-Up Screen will appear. Press (to select) the HAND label on the PLC Control HOA switch.

(con't) Simplified Control Narrative for an FKC Dewatering System

2. To run the screw press dewatering system in AUTO:
 - a. Verify all HOA switches on the front of the dewatering control panel are set to AUTO.
 - i. This includes the HOA switches for the sludge pumps, the flocculation tank, the screw press, and the OCA switches for the solenoid valves.
 - b. Press the ENABLE REMOTE START/STOP button on the polymer makedown system control panel HMI.
 - c. Verify all the gates and/or valves between the sludge pumps and the flocculation tank are adjusted to be open.
 - d. On the Screw Press Overview Screen of the HMI on the dewatering control panel, press (to select) the FLOW MODE button.
 - i. Once the FLOW MODE pop-up screen appears on the HMI, press (to select) either the CONSTANT or the VARIABLE button. The notice under these buttons will change to read which flow mode is currently active.
 - e. On the Screw Press Overview Screen of the HMI on the dewatering control panel, press (to select) the SETPOINTS button.
 - i. For steps “ii” thru “iv” below, refer to the page entitled SETPOINT VALVES AT TIME OF START UP that was inserted into the O&M Manual after startup of the equipment was completed.
 - ii. Verify that all the operator setpoints listed on the screen are set to correct values.
 - iii. Press (to select) the WASHWATER SETPOINTS button and verify that all the operator setpoints listed on the screen are set to correct values. Press (to select) the CLOSE button after verification is complete.
 - iv. Press (to select) the PID SETPOINTS button and verify that all the operator setpoints listed on the screen are set to correct values. Press (to select) the CLOSE button after verification is complete.
 - v. Press (to select) the CLOSE button on the SYSTEM SETPOINTS SCREEN to return to the Screw Press Overview Screen.
 - f. On the Screw Press Overview Screen of the HMI on the dewatering control panel, press (to select) the SEQUENCE button.
 - i. Once the SEQUENCE pop-up screen appears on the HMI, press (to select) the ALL IN AUTO button.
 - ii. Press (to select) the SYSTEM START button on the SEQUENCE pop-up screen.
 - iii. Press (to select) the CLOSE button on the SEQUENCE pop-up screen.

(con't) Simplified Control Narrative for an FKC Dewatering System

3. Auto sequence of operation

a. Auto Startup

- i. Auto startup occurs when the operator has successfully put the dewatering system into AUTO by pressing the SYSTEM START button.
- ii. The following sequence occurs during Auto Startup:
 1. The polymer system is turned on and polymer begins to flow to the flocculation tank.
 2. The duty sludge feed pump is turned on and sludge begins to flow to the flocculation tank.
 3. The flocculation tank is turned on.
 4. Flocculated sludge begins to enter the screw press headbox and the headbox level begins to rise.
 5. Once the HEADBOX DESIRED LEVEL is reached, the screw press will turn on.

b. Running in Auto

- i. Once the Auto Startup sequence has been completed, the screw press dewatering system will then run in either Constant Flow Mode or Variable Flow Mode based on operating settings.
- ii. In Constant Flow Mode:
 1. The PLC maintains constant sludge and polymer flows while varying the screw press speed to maintain a relatively constant headbox level over time.
- iii. In Variable Flow Mode:
 1. The PLC maintains a constant screw press speed while varying the sludge and polymer flow to maintain a relatively constant headbox level over time.

c. Auto Shutdown

- i. Auto shutdown occurs when one of three conditions occur:
 1. While the dewatering system is running in AUTO, the operator presses (to select) the SYSTEM STOP button on the SEQUENCE pop-up screen.
 2. Except for the screw press motor alarms or any conveyor alarm, the dewatering system will go into auto shutdown when an alarm occurs.
 3. When the AUTO SHUTDOWN TIMER reaches 0.0 hours.

(con't) Simplified Control Narrative for an FKC Dewatering System

- ii. The following sequence occurs during Auto Shutdown:
 - 1. The polymer system is turned off and polymer flow stops.
 - 2. The sludge feed pump is turned off and sludge flow stops.
 - 3. The flocculation tank is turned off.
 - 4. If the screw press is still running, then the screw press will continue to run for XX minutes according to the SCREW PRESS SHUT DOWN DELAY setpoint.
 - 5. If the screw press is running, then the screw press is turned off.

4. Alarms

- a. With the screw press dewatering system running in AUTO, the following alarm conditions will cause an Auto Shutdown to occur:
 - i. Sludge Feed Pump Motor VFD Fault
 - ii. Sludge Flow Meter Low Flow
 - iii. Polymer System General Fault/Alarm
 - iv. Flocculation Tank Motor VFD Fault (or motor trip if applicable)
 - v. Flocculation Tank Hi-Hi Level
 - vi. Screw Press Headbox Hi-Hi Level
- b. With the screw press dewatering system running in AUTO, the following alarm conditions will cause the entire screw press dewatering system to immediately shutdown:
 - i. Screw Press Motor VFD Fault
 - ii. Process Stop Mushroom Button is pressed on the Screw Press Dewatering Control Panel.

CONTROL PANEL SCREENS & OPERATION

ACTUAL SCREENS AND SETPOINTS MAY VARY

DOES NOT DEFINE FKC SCOPE OF SUPPLY
EXAMPLE ONLY

NOTE:

see
other sections of O&M MANUAL
for
hardware itemized cut sheets

SETPOINT VALVES AT TIME OF START UP

DATE: _____

BY: _____

PARAMETER	VALUE	UNITS
Headbox Desired Level		Inches
Headbox Hi-Hi Level Alarm		Inches
Headbox Hi Level Warning (Stop Feed)		Inches
Headbox Level to Resume Feed		%
Constant Flow Mode Feed Pump Speed		%
Variable flow Mode Screw Press Speed		%
Polymer Ratio to Feed Pump		
Screw Press Shutdown Delay		Minutes
Maximum Pause Time Allowed		Minutes
Screw Press Auto Shutdown Timer		Hours
Washwater Top Solenoid ON Time		Seconds
Washwater Top Solenoid OFF Time		Minutes
Washwater Headbox Solenoid ON Time		Seconds
Washwater Headbox Solenoid OFF Time		Minutes
Washwater Bottom Solenoid ON Time		Seconds
Washwater Bottom Solenoid OFF Time		Minutes
Constant Flow PID		
Gain / Proportional		n/a
Integral		n/a
Derivative (typ zero)		n/a
Min Speed		%
Max Speed		%
Zero Cutoff Deadband		Inches
Use on Startup	Initial CV	Initial CV
Initial CV		%
Variable Flow PID		
Gain / Proportional		n/a
Integral		n/a
Derivative (typ zero)		n/a
Min Speed		%
Max Speed		%
Zero Cutoff Deadband		Inches
Use on Startup	Initial CV	Initial CV
Initial CV		%

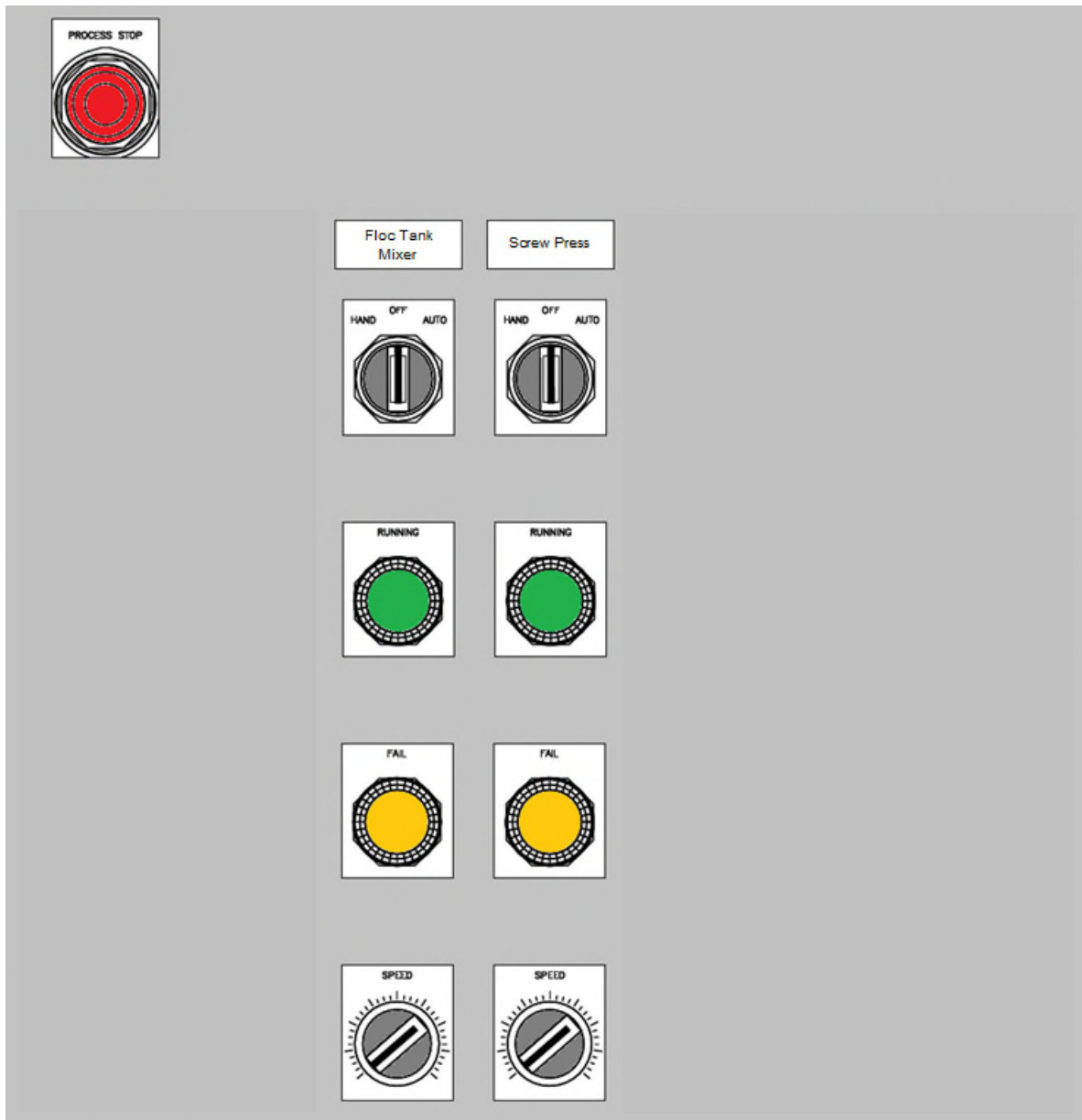


Figure CP-1 : Example Control Panel Door Layout – EXAMPLE ONLY. Actual layout may vary.

Process Stop Button

Pressing this button at any time will stop all equipment labeled on the front door of the control panel, i.e. screw press and flocculation tank mixer. This equipment will not be able to re-start until this alarm is cleared on the HMI alarm screen.

HOA (OCA) Switches

HAND - To run a piece of equipment without any interlocks to other equipment, rotate its HOA switch to the HAND position. The piece of equipment will run continuously until the HOA switch is returned to the OFF position.

OFF – The piece of equipment will not run in HAND or in AUTO with its HOA switch in the OFF position.

AUTO – This gives control of all the equipment listed to the PLC. At this point the equipment is now controlled by the selector switches and buttons on the HMI screen. The operator can now use the HMI to put the equipment in HAND, OFF or AUTO mode for PLC control.

Running Green Lights

For each piece of equipment labeled on the front door of the control panel, the green light below its HOA switch will be lit up when it is running in HAND or AUTO.

FAIL Orange Lights

For each piece of equipment labeled on the front door of the control panel, the red light below its HOA switch will be lit up when a fault has occurred with its respective motor starter or VFD. The piece of equipment will not be able to re-start until the alarm is cleared on the HMI alarm screen.

Potentiometers

There is a potentiometer for the sludge feed pumps, flocculation tank (optional, only if there is VFD for the flocculation tank motor), and the screw press. When the HOA switch of one the screw press is switched to HAND, then the potentiometer below its HOA switch is used to set the speed of its motor anywhere between the minimum and maximum speed programmed into the VFD.

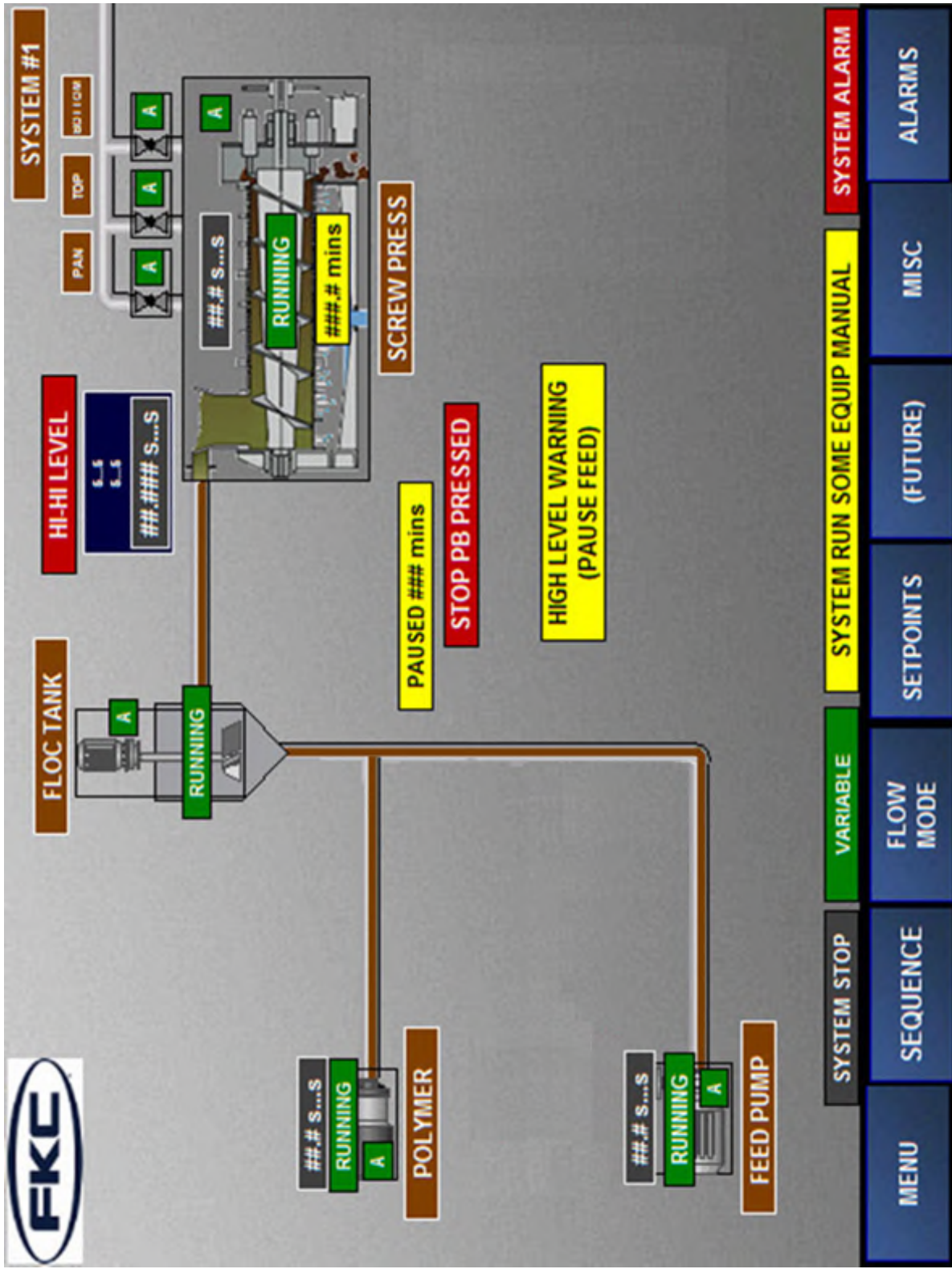


Figure CP-2 : Screw Press Overview Screen – EXAMPLE ONLY. Actual screens may vary.

System Labels

System Labels appear as white text with brown backgrounds. The operator cannot select or change these labels. They are for information display only, showing what the graphic, switch or value is referring to. They remain constant over time and do not change.

Alarms

Alarms are displayed as white text with red backgrounds. They are not normally displayed and appear only when an alarm occurs. If an alarm is displayed, then it will disappear only when the alarm has been cleared on the Alarm screen.

FAILURE

This alarm occurs when the motor starter trips or VFD faults for a specific piece of equipment. It will be displayed next to the graphic of the equipment that has faulted. The motor starter or VFD will need to be reset, then the alarm cleared from the Alarm screen before system operation can proceed.

HI-HI LEVEL

This alarm occurs when the level in the screw press headbox hits the hi-hi level probe electrode mounted on the headbox.

RUN/FAIL

This alarm occurs when a piece of equipment does not run when it is being called by the control panel to run. It will be displayed next to the graphic of the equipment that has faulted. The cause of the alarm will need to be resolved, then the alarm cleared from the Alarm screen before system operation can proceed.

STOP PB PRESSED

This alarm occurs when the Process Stop Button is pressed on the front door of the control panel. See Figure CP-1 : Control Panel Door Layout for more information.

SYSTEM ALARM

This alarm can occur for several reasons. When this alarm is displayed then the operator will need to go to the Alarm screen to see what the specific alarm is, then clear the alarm before system operation can proceed.

System Status Labels

System Status Labels appear as black text with yellow backgrounds. They are for information display only and may change over time depending on the current status of the system.

HIGH LEVEL WARNING (PAUSE FEED)

This occurs when a high level is reached in the screw press headbox while running in AUTO. See Systems Setpoint screen for the Headbox High Level Warning setpoint. The sludge and polymer flows stop along with the flocculation tank. Once the screw press headbox level drops to zero then the flows and flocculation tank start back up again.

SYSTEM RUN SOME EQUIPMENT IN MANUAL

If the system is running in AUTO and one or more pieces of equipment are then set to HAND, then this system status label appears to let the operator know that not all equipment is in AUTO. This means that some of the interlocks programmed for the equipment in HAND may not be active. Typically, all equipment should be set to AUTO while the system is running in AUTO.

###.# mins

If the system is in an auto shutdown, then the system uses operator setpoints for the amount of time left to run the screw press and/or conveyor. This “###.# mins” label displays for the operator how much time is left for the screw press and/or conveyor to run in auto shutdown.

Paused ###.# mins

If the system has detected a high level in the screw press headbox, then the system pauses all the equipment except for the screw press and conveyor. This is an attempt to drop the headbox back down to normal levels. A “High Level Warning (Pause Feed)” and “Paused ###.# mins” status labels are then displayed. The “Paused ###.# mins” label displays for the operator how much the system has been paused due to a high level warning.

Equipment Status Labels

Equipment Status Labels appear as white text with a green background. They are for information display only and may change over time depending on the current status of the piece of equipment. They display if a piece of equipment is currently "RUNNING", "H" for in HAND, or "A" for in AUTO. This type of display can also show if the equipment which flow mode (VARIABLE or CONSTANT) is active for running in AUTO.

CONSTANT

If CONSTANT is selected in FLOW MODE, then the HMI will display CONSTANT on the main overview screen. The PLC will maintain constant sludge and polymer flows while varying the screw press speed to maintain a relatively constant headbox level over time.

VARIABLE

If VARIABLE is selected in FLOW MODE, then the HMI will display VARIABLE on the main overview screen. The PLC will maintain a constant screw press speed while varying the sludge and polymer flow to maintain a relatively constant headbox level over time. This is the preferred mode over CONSTANT.

Analog Parameter Value Displays

Analog Parameter Value Displays appear as white numbers with a dark gray background. They are for information display only and change over time depending on the current value of the analog signal. The values shown correspond to flow for flow meters and the level for the screw press headbox. See the Equipment Control Pop-Up screen description for how to set HAND speeds of these analog parameters. See the System Setpoints screens description for how to set AUTO speed for these analog parameters.

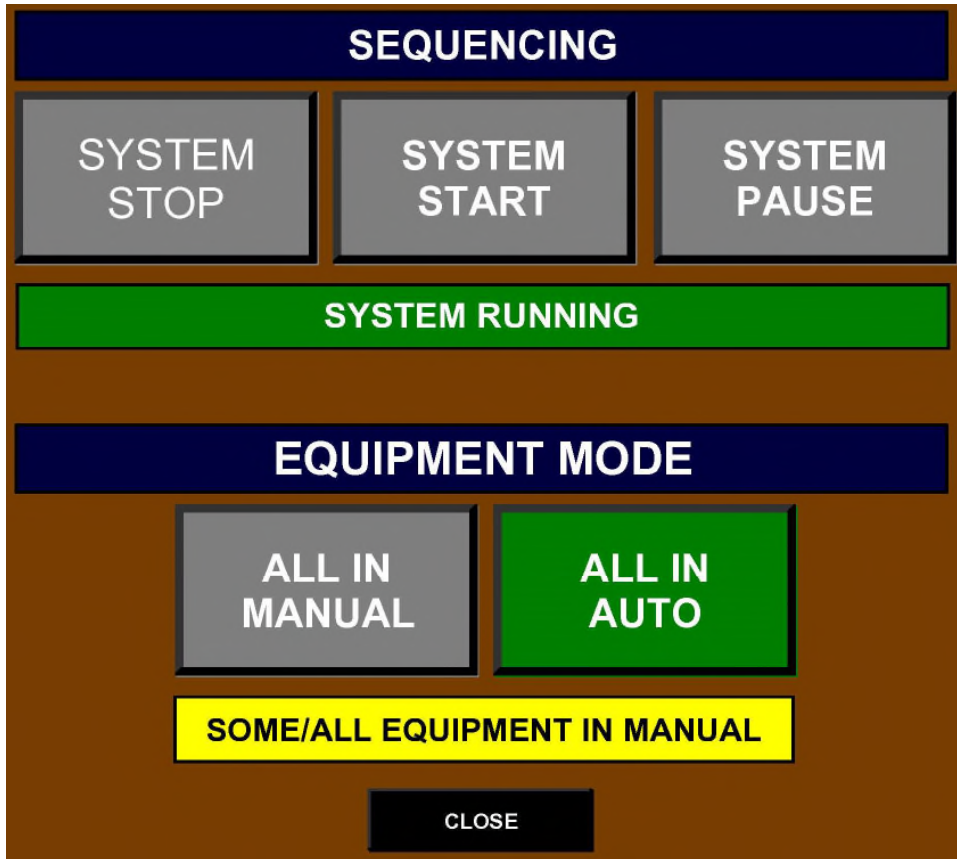


Figure CP-3 : Sequence Screen EXAMPLE ONLY. Actual screens may vary.

SYSTEM STOP

Pressing this button will set all equipment to OFF on the HMI controls. This does not stop any equipment that is set to HAND with their HOA switch on the front panel of the control panel.

SYSTEM START

With all the HOA switches set to AUTO on the front door of the control panel, and with all equipment set to AUTO on the HMI control screens, the entire dewatering system will startup in AUTO when this SYSTEM START button is pressed.

SYSTEM PAUSE

With all the HOA switches set to AUTO on the front door of the control panel, and with all equipment set to AUTO on the HMI control screens, the entire dewatering system will pause when this SYSTEM PAUSE button is pressed. See System Status Labels in the Screw Press Overview screen description for more information.

SYSTEM RUNNING

This shows the status of the entire dewatering system. It will either show that the system is OFF, the system is running, or the system is in PAUSE.

ALL EQUIPMENT IN MANUAL

With all the HOA switches set to AUTO on the front door of the control panel, pressing this button will cause all the equipment to be set in HAND by the PLC Control. See the Equipment Control Pop-Up screen for more information.

ALL EQUIPMENT IN AUTO

With all the HOA switches set to AUTO on the front door of the control panel, pressing this button will cause all the equipment to be set in AUTO by the PLC Control. See the Equipment Control Pop-Up screen for more information.

SOME/ALL EQUIPMENT IN MANUAL

This shows the status of all the equipment. It will either show that that all equipment is in HAND, all equipment is in AUTO, or SOME/ALL EQUIPMENT IN MANUAL.

CLOSE

Pressing this button will return you to the Screw Press Overview Screen.

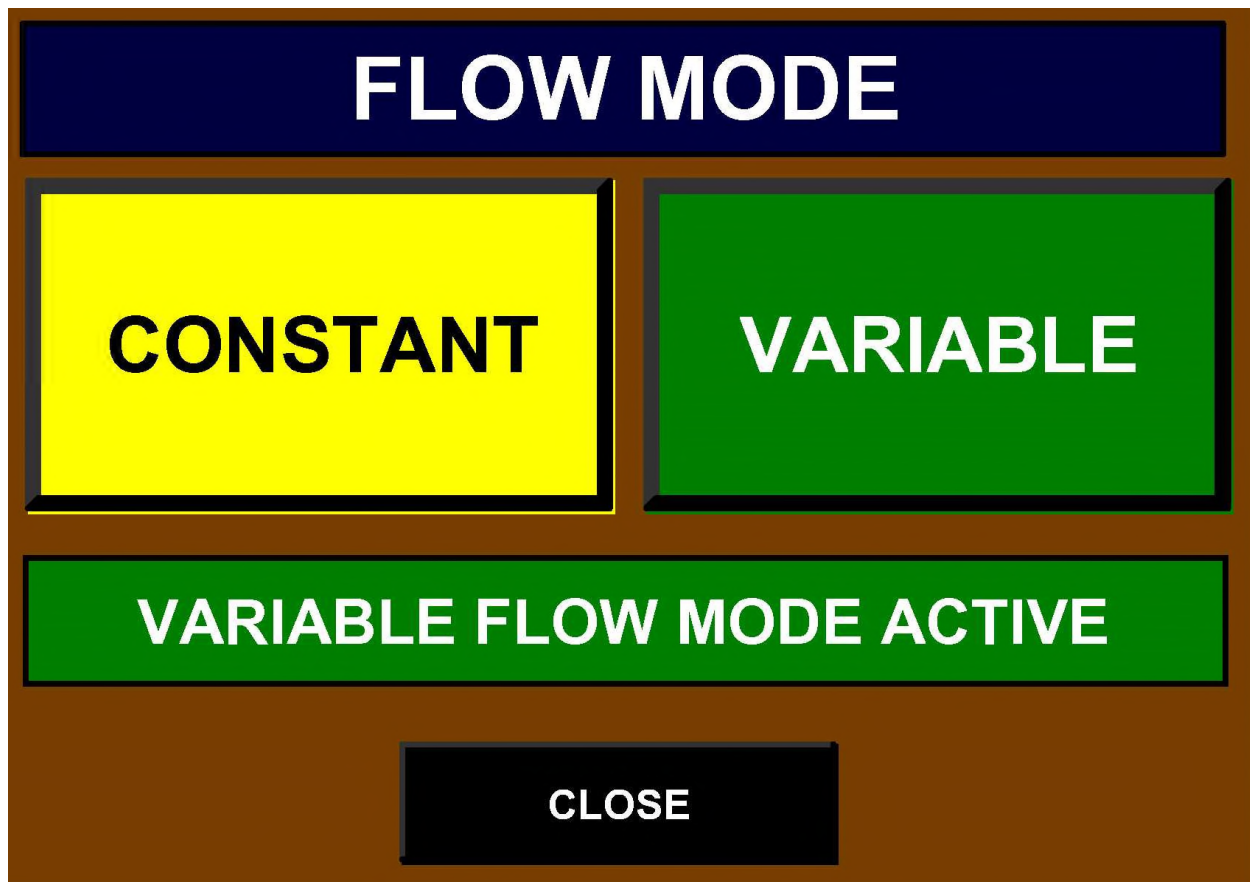


Figure CP-4 : Flow Mode Screen EXAMPLE ONLY. Actual screens may vary.

CONSTANT

This button affects how the system runs the process while in AUTO mode. If CONSTANT is selected, then the PLC will maintain constant sludge and polymer flows while varying the screw press speed to maintain a relatively constant headbox level over time.

VARIABLE

This button affects how the system runs the process while in AUTO mode. If VARIABLE is selected, then the PLC will maintain a constant screw press speed while varying the sludge and polymer flow to maintain a relatively constant headbox level over time. This is the preferred mode over CONSTANT.

VARIABLE FLOW MODE ACTIVE

This shows the current status of the system. It will either show VARIABLE FLOW MODE ACTIVE or CONSTANT FLOW MODE ACTIVE.

CLOSE

Pressing this button will return you to the Screw Press Overview Screen.

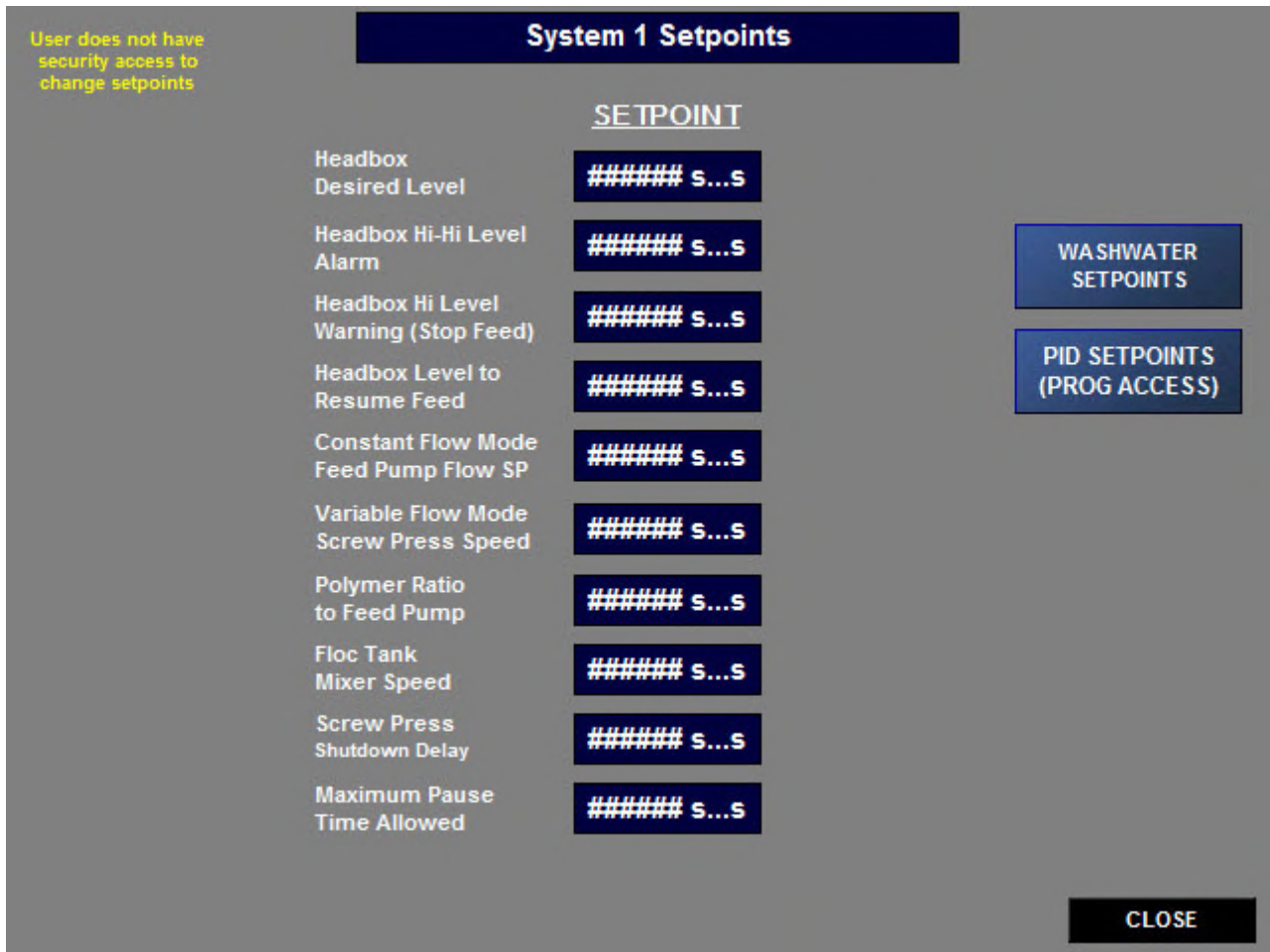


Figure CP-5 : System Setpoints Screen EXAMPLE ONLY. Actual screens may vary.

Headbox Desired Level

When running in AUTO, the PLC attempts to maintain a relatively stable screw press headbox level by varying either the screw speed or the sludge & polymer flows. The Headbox Desired Level setpoint is the operator selected target level that the PLC is always trying to achieve.

Headbox Hi-Hi Level Alarm

Whether in AUTO, HAND or OFF, the headbox level sensor continually measures the level in the screw press headbox. This Headbox Hi-Hi Level Alarm setpoint is the level at which the Hi-Hi Level Alarm will occur. A backup for this alarm (should the headbox level sensor fail) is the conductance level probe mounted on the headbox that will also cause the Hi-Hi Level Alarm to occur.

Headbox Hi Level Warning (Stop Feed)

When running in AUTO, the PLC attempts to maintain a relatively stable screw press headbox level. Situations like poor screw press screen drainage or poor flocculation will cause the headbox level to rise regardless of the PLC's attempt to bring the level down. This Headbox Hi Level Warning setpoint is the level at which the operator would like the sludge and polymer flows to stop in an attempt to prevent hitting the headbox hi-hi level. Once the headbox level drops to zero then the sludge and polymer flows will start up again.

Headbox Hi Level to Resume Feed

After a Headbox Hi Level Warning stops the sludge and polymer flow, the flows will resume after the Headbox Hi Level to Resume Feed has been reached. The system then continues to run in normal AUTO operation.

Constant Flow Mode Feed Pump Speed

This value sets the sludge feed pump speed at a constant speed for CONSTANT FLOW MODE operation while running in AUTO. The polymer pump will also maintain a constant speed since in AUTO it proportionally follows the sludge feed pump speed.

Variable Flow Mode Screw Press Speed

This value sets the screw press speed at a constant speed for VARIABLE FLOW MODE operation while running in AUTO.

Polymer Ratio to Feed Pump Flow

In AUTO mode, the polymer pump speed proportionally follows the sludge feed pump speed. The polymer pump % speed is calculated using this setpoint. The simplified calculation can be expressed as [Sludge Pump Speed] x [Polymer Ratio to Feed Pump Flow setpoint] = [Polymer Pump Speed].

Flocculation Tank Mixer Speed

In AUTO mode, the flocculation tank mixer speed is set and adjusted using this setpoint.

Screw Press Shutdown Delay

When the system undergoes an AUTO shutdown cycle, the flocculation tank, sludge and polymer flows shutdown immediately. However, the screw press will continue to run based on the time entered in the Screw Press Shutdown Delay setpoint. This allows the operator to select how empty he would like to leave the screw press after an AUTO shutdown.

Maximum Pause Time Allowed

See the Headbox Hi Level Warning setpoint description. The Headbox Max. Pause Time Allowed setpoint is used to time how long the system remains PAUSED after the screw press headbox hi level is reached. If the Max. Pause Time Allowed is exceeded, then the system will alarm and shutdown with the expectation that something is wrong with the process. The operator will need to troubleshoot the dewatering process and correct the problem before starting up again.

WASHWATER SETPOINTS

Press this button to access the Washwater Setpoints screen.

PID SETPOINTS

Press this button to access the PID Setpoints screen.

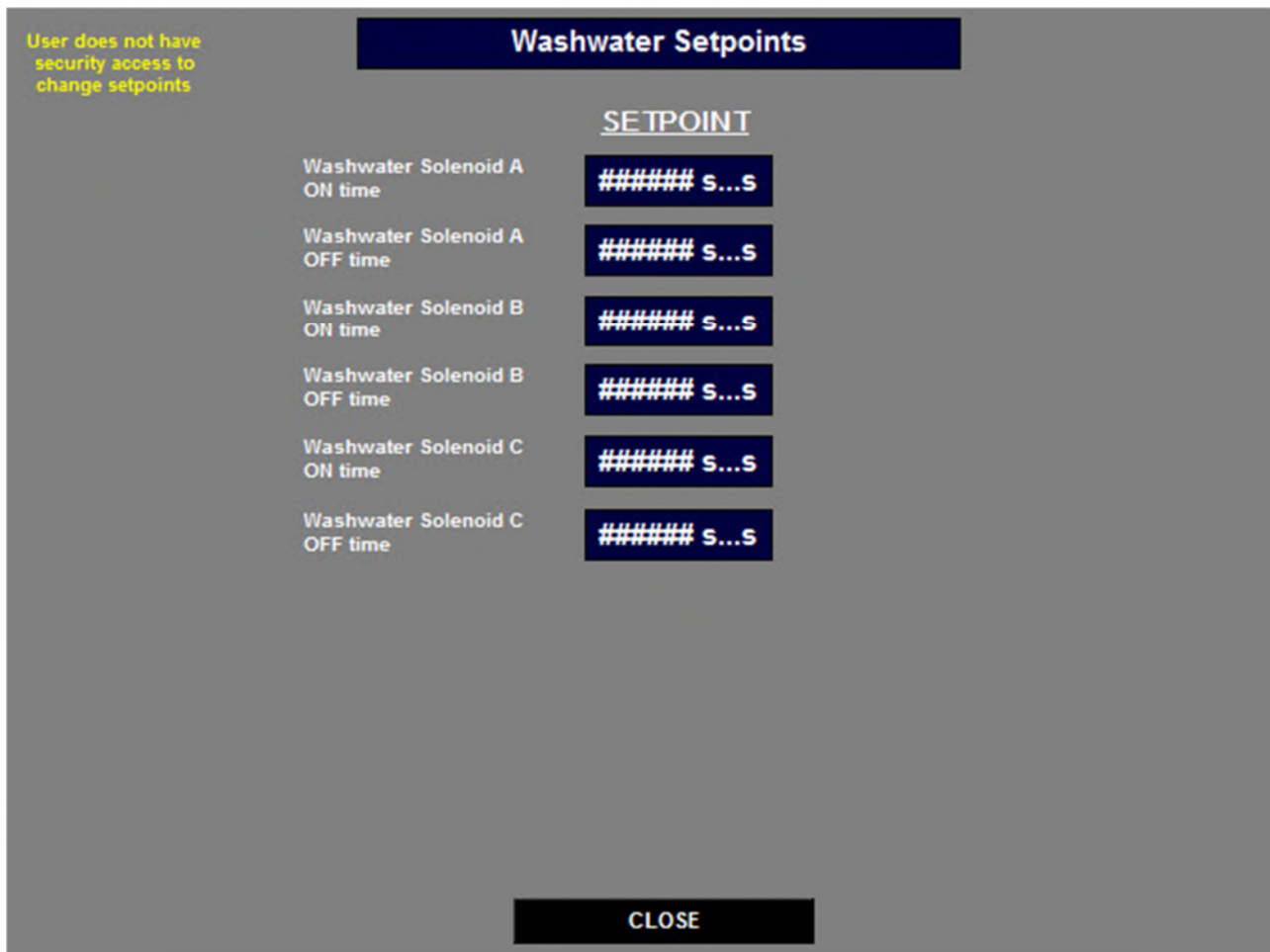


Figure CP-6 : Washwater Setpoint Screen EXAMPLE ONLY. Actual screens may vary.

The PLC will ensure that only one solenoid valve will be on at one time.

Washwater Top Solenoid ON Time

This is the amount of time in seconds that the top solenoid valve will be open.

Washwater Top Solenoid OFF Time

This is the amount of time in minutes that the top solenoid valve will be closed.

Washwater Headbox Solenoid ON Time

This is the amount of time in seconds that the headbox solenoid valve will be open.

Washwater Headbox Solenoid OFF Time

This is the amount of time in minutes that the headbox solenoid valve will be closed.

Washwater Bottom Solenoid ON Time

This is the amount of time in seconds that the bottom solenoid valve will be open.

Washwater Bottom Solenoid OFF Time

This is the amount of time in minutes that the bottom solenoid valve will be closed.



Figure CP-7 : PID Setpoints Screen EXAMPLE ONLY. Actual screens may vary.

Gain / Proportional

This value is the Proportional Gain of the PID loop that attempts to maintain relatively constant headbox level. For Constant Flow, the screw press speed is adjusted. For Variable flow, the sludge & polymer flows are adjusted. Proportional Gain accounts for the present value of the headbox level error from the desired setpoint. The operator does not have security access to change this setpoint. Please consult with FKC before making any PID setpoint changes.

Integral

This value is the Integral Gain of the PID loop that attempts to maintain relatively constant headbox level. For Constant Flow, the screw press speed is adjusted. For Variable flow, the sludge & polymer flows are adjusted. Integral Gain accounts for past values of the headbox level errors away the desired setpoint. The operator does not have security access to change this setpoint. Please consult with FKC before making any PID setpoint changes.

Derivative (typically zero)

This value is the Derivative of the PID loop that attempts to maintain relatively constant headbox level. For Constant Flow, the screw press speed is adjusted. For Variable flow, the sludge & polymer flows are adjusted. The derivative accounts for possible future values of headbox level errors away the desired setpoint. The operator does not have security access to change this setpoint. Please consult with FKC before making any PID setpoint changes.

Min Speed

When running in AUTO Constant Flow Mode, this sets the minimum speed of the screw press. In AUTO Variable Flow Mode, this sets the minimum speed of the sludge feed pump. The operator does not have security access to change this setpoint. Please consult with FKC before making any PID setpoint changes.

Max Speed

When running in AUTO Constant Flow Mode, this sets the maximum speed of the screw press. In AUTO Variable Flow Mode, this sets the maximum speed of the sludge feed pump. The operator does not have security access to change this setpoint. Please consult with FKC before making any PID setpoint changes.

Zero Cutoff Deadband

For the PID loop that attempts to maintain a relatively constant headbox level, this setpoint determines the deadband (+/-) around the headbox level setpoint that is insignificant. This generally means that although the current headbox level is not EXACTLY at the desired level setpoint, the PID loop does not consider the error to be significant enough for a change to occur. The operator does not have security access to change this setpoint. Please consult with FKC before making any PID setpoint changes.

Use on Startup

This determines what value is plugged into the Process Value (PV) of the PID at startup. The operator does not have security access to change this setpoint. Please consult with FKC before making any PID setpoint changes.

Initial CV

This is the value that will be plugged into the Current Value (CV) of the PID loop at startup. The operator does not have security access to change this setpoint. Please consult with FKC before making any PID setpoint changes.

Primary Setpoints

Press this button to access the Setpoints screen.

Washwater Setpoints

Press this button to access the Washwater Setpoints screen.



Figure CP – 8 : Equipment Control Pop-Up Screen EXAMPLE ONLY. Actual screens may vary.

This pop-up is accessed for each piece of equipment on the main overview screen by pressing the logo beside the equipment's graphic.



LOCAL STATUS HAND/OFF/REMOTE

This graphic shows the status of the given equipment's HOA switch found on the front door of the control panel. The operator can only change the state of this graphic by switching the front door HOA switch to a different position.

PLC CONTROL HAND/OFF/AUTO

This graphic allows the operator to switch PLC Control from HAND, OFF or AUTO. In order for this HMI switch to work, the HOA switch on the front door of the control panel for this particular equipment must be set to AUTO. This can be verified by the LOCAL STATUS HAND/OFF/AUTO graphic showing that the switch is set to REMOTE.

RUNNING AMPS

This label shows the current running status and amp draw for the given equipment's motor.

MOTOR SPEED

This label shows the current running speed for the given equipment's motor.

FAIL TO START

This label indicates that a FAIL TO START alarm has occurred for this equipment. To reset and make this alarm disappear, touch this FAIL TO START label.

VFD FAULT

This label indicates that a VFD FAULT has occurred for this equipment's motor. To clear the fault and make this alarm disappear, touch this VFD FAULT label.

RUNTIME HOURS

This label displays the runtime hours for this equipment's motor since the last reset. To reset this value, touch this RUNTIME HOURS label and it will reset to zero.

NUMBER OF STARTS

This label displays the number of starts that has occurred with this equipment's motor since the last reset. To reset this value, touch this NUMBER OF STARTS label and it will reset to zero.

FAIL TO START DELAY

This is a setpoint for motor operation. This value is the wait time between a motor not starting and a FAIL START ALARM occurring.

CLOSE

Pressing this button will return you to the Screw Press Overview Screen.

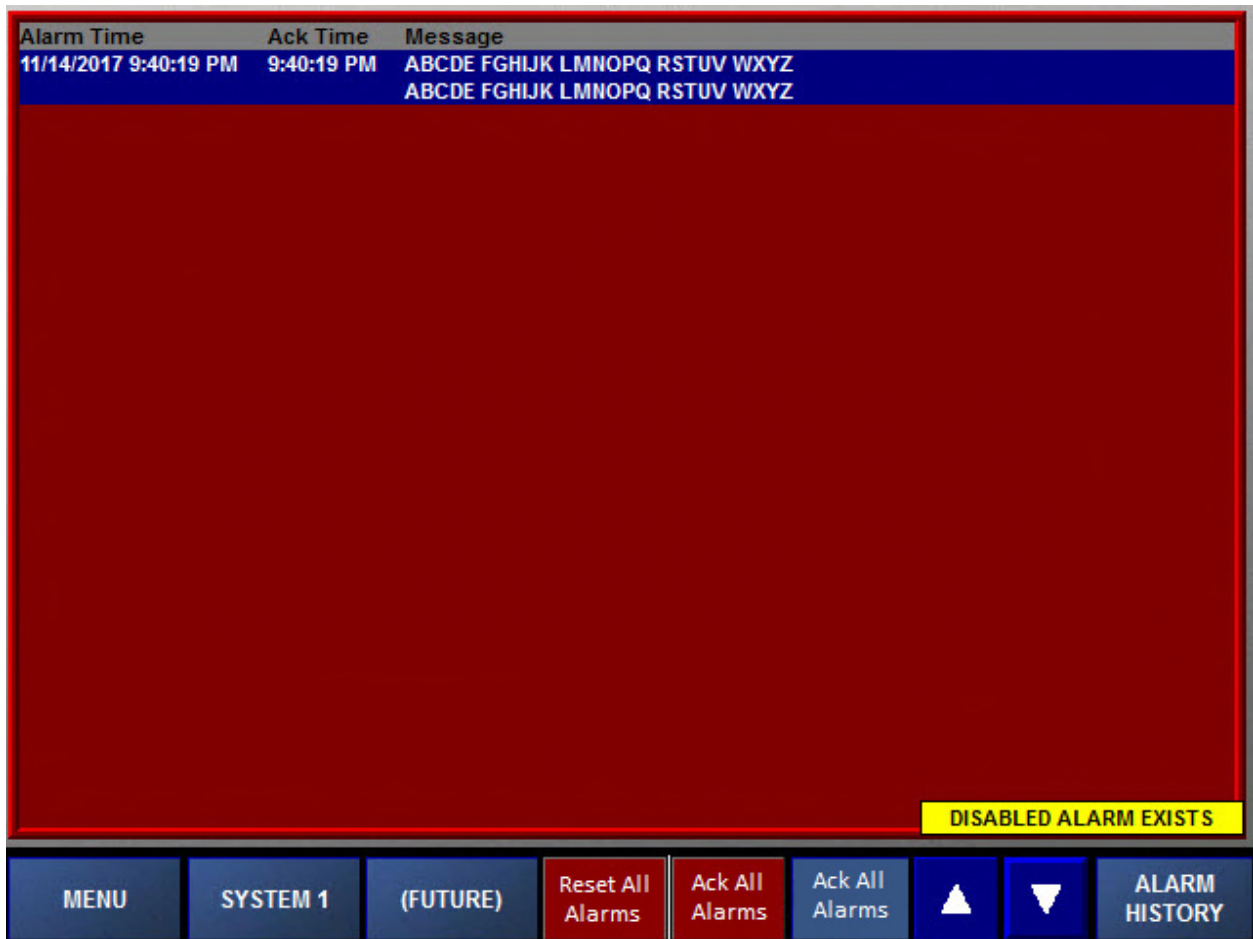


Figure CP –9: Alarm Screen EXAMPLE ONLY. Actual screens may vary.

RESET ALARMS

Press this button to reset and clear all the current alarms.

ACK ALL

Press this button to acknowledge all current alarms. This will allow the alarms to clear and the equipment to be re-started in HAND or AUTO.

ALARM HISTORY

Press this button to view the list of alarms in the order they occurred.

Equipment / System Redundancy

FKC CO., LTD.

2708 West 18th Street
Port Angeles, WA 98363



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

System Redundancy

Project: City of San Luis West WWTP, AZ
Project Engineer: Wesley Bond
Equipment Name: FKC Screw Press and associated equipment

FKC's bid package includes two sludge feed pumps.

No other equipment has redundancy, including the conveyor, screw press, flocculation tank, or polymer system.

O&M Manual



SCREW PRESS

Operation and Maintenance Data
BIOSOLIDS DEWATERING EQUIPMENT

Screw Press
Flocculation Tank
Controls

FKC Co., Ltd.
2708 W. 18th St.
Port Angeles, WA 98363
(360) 452-9472
www.fkcscrewpress.com

Reference Only

Reference Only

Screw Press



**OPERATION AND MAINTENANCE
MANUALS
FOR
FKC SCREW PRESS**

**Visalia Water Conservation Plant
Visalia, California**

**FKC CO., LTD.
2708 West 18th Street
Port Angeles, WA 98363
Tel: (360) 452-9472 • Fax: (360) 452-6880
e-mail: mail@fkcscrewpress.com**

Screw Press

Part 1 – Equipment Summary



FKC Biosolids Dewatering

Equipment Summary

FKC Screw Press

FKC Serial Number	M-2795 1/2
City of Visalia Tag #	8SDPRO1 / 8SDPRO2
Process Area	Sludge Dewatering Facility

FKC Flocculation Tank

FKC Serial Number	FT-302 1/2
City of Visalia Tag #	8SCT01 / 8SCT02
City of Visalia Tag # Mixer	8MXR01 / 8MXR02
Process Area	Sludge Dewatering Facility

Part 1
General Principles

SECTION 1

GENERAL PRINCIPLES

1A SCREW PRESS INTRODUCTION	Page 1-1
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1C GENERAL OPERATING PRINCIPLES	Page 1-3
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b) HEADBOX LEVEL	Page 1-4
c) PRESSURE CONE SETTING	Page 1-4
d) SCREW INLET CONSISTENCY	Page 1-5
1D ADDITIONAL PERFORMANCE INFORMATION	Page 1-6
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c) SLUDGE PROPERTIES	Page 1-6
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SECTION 1A

SCREW PRESS INTRODUCTION

A screw press will achieve maximum performance only if the operator controls the various factors affecting its operation. In order to control these various conditions, the screw press operator must have the basic understanding regarding screw press operation this manual provides.

FKC screw presses have been in use with municipal biosolids, pulp & paper, food, chemical, and industrial applications since 1958. Some uses include, secondary sludges (Waste Activated, Aerobically Digested), primary and secondary sludge dewatering, wood pulp dewatering, spent grains and many others.

The function of the screw press is to remove liquid from a solid/liquid mixture. This is accomplished by squeezing the solid/liquid mixture while allowing liquids to escape through perforated screens surrounding the screw while retaining the solids inside the press.

As shown in Figure 1A, the solid/liquid mixture enters the screw press by way of the head box at the inlet end. The mixture is conveyed from the inlet end to the outlet end of the press by the rotating screw. As the material is conveyed along the length of the press it is squeezed between the tapered screw shell and the screen drums. The dry solids exit the press at the discharge end and fall down the discharge box. The liquid (pressate) that was forced out through the screens is collected in the pressate pan and flows to the discharge flange.

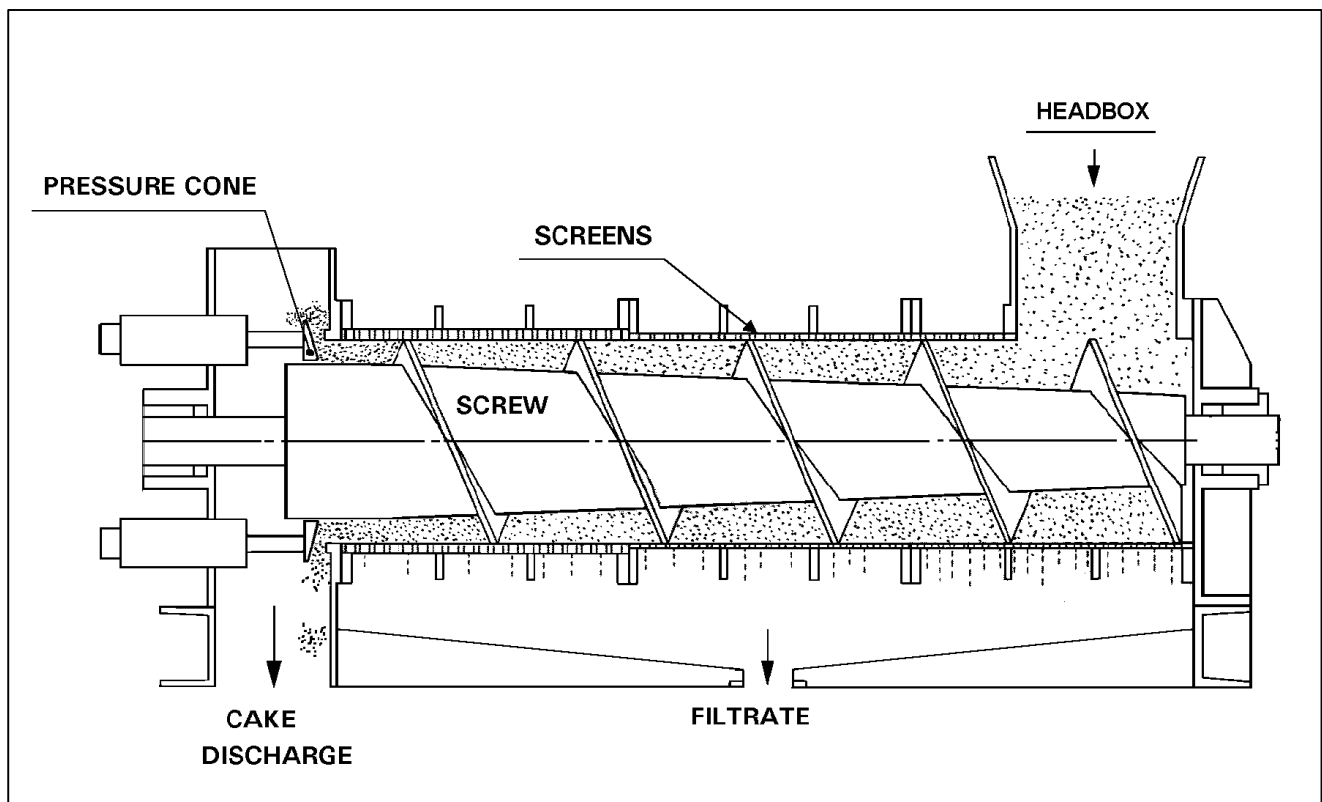


FIGURE 1A SCREW PRESS CROSS SECTION

SECTION 1B

GENERAL MECHANICAL CONSTRUCTION

The key component of the screw press is the screw. As Figure 1B shows, the screw consists of a tapered shell to which a helical flight is attached. The outside diameter of the flight is constant. The tapered shell is smallest at the inlet end and largest at the discharge end. The screw rotates inside a series of drums lined with replaceable, perforated, stainless steel screens.

The screw is supported by two radial, spherical roller bearings. The screw and bearings can be accessed by lifting the top half of the drums and bearing stands as shown in Figure 1B.

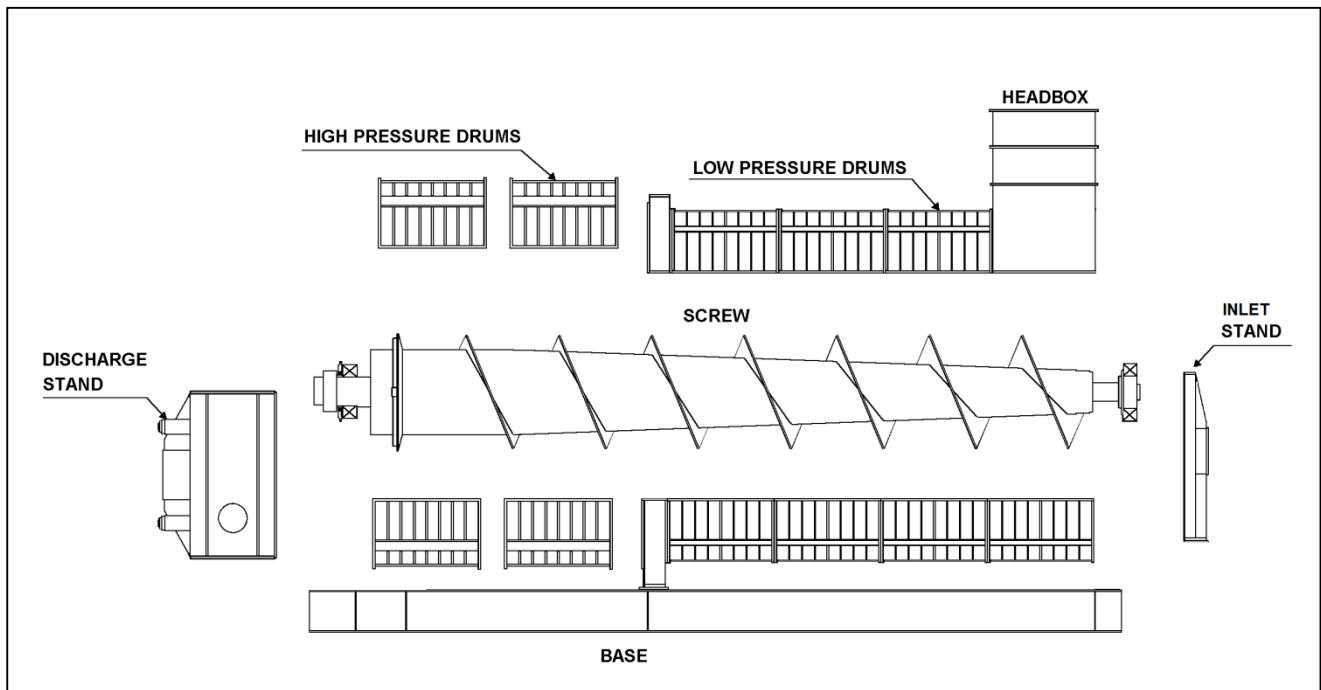


FIGURE 1B - SCREW PRESS EXPLODED VIEW

SECTION 1C

GENERAL OPERATIONAL PRINCIPLES

Screw Press throughput and discharge cake consistency are determined by many factors including screw speed, headbox level, sludge feed rate, back pressure, sludge inlet consistency, sludge conditioning, and other sludge properties. To thoroughly facilitate overall screw press performance, the effect each factor has on throughput and discharge cake consistency must be understood.

Table 1D below summarizes the resulting screw press performance caused by varying screw speed, headbox level, and backpressure. Detailed explanations can be found on the following pages.

OPERATING PARAMETER		OUTPUT CONSISTENCY	THROUGHPUT CAPACITY	MOTOR LOAD
a.	SCREW SPEED	UP	DOWN	UP
		DOWN	UP	DOWN
b.	HEADBOX LEVEL	UP	UP	UP
		DOWN	DOWN	DOWN
c.	BACK PRESSURE	UP	UP	DOWN
		DOWN	DOWN	UP
d.	INLET CONSISTENCY	UP	SAME	GPM DOWN
		DOWN	SAME	GPM UP

TABLE 1C - FUNDAMENTAL OPERATING RELATIONSHIPS

Assuming sludge pump speed is controlled by headbox level and all other factors remain constant, adjustments to the operational parameters listed will have the effects noted on the chart above.

Note: The effects of backpressure on discharge cake solids should be relatively minimal compared with the resulting increase of required motor amperage.

SECTION 1C (con't)

a) SCREW SPEED

Screw speed is directly related to throughput and inversely related to discharge cake consistency, assuming all other factors (listed below) remain constant.

Throughput will increase if screw speed is increased and will decrease if screw speed is decreased. The screw press works similar to a screw conveyor in that the faster it turns, the more material it conveys.

Discharge cake consistency will decrease if screw speed is increased and will increase if screw speed is decreased. A faster screw speed reduces retention time of the sludge in the press resulting in less dewatering or lower discharge cake consistency. A slower screw speed allows for a longer retention time of sludge in the press, which results in more dewatering and a higher discharge cake consistency.

The screw speed or throughput rate at which a given discharge cake consistency can be achieved/maintained will vary as sludge characteristics change.

b) HEADBOX LEVEL

Headbox level is directly related to both throughput and discharge cake consistency, assuming all other factors remain constant.

If headbox level is increased (i.e. sludge flow is increased), throughput, discharge cake consistency, and drawn motor amperage will increase. This is because the higher headbox level promotes increased dewatering in the "gravity drainage" section (first section at the inlet end of the press), resulting in a higher consistency material (more solids per volume) being fed into the press.

Conversely, if headbox level is decreased (i.e. sludge flow is decreased) both throughput and discharge cake consistency will decrease. This is because less gravity drainage occurs at the inlet end of the press resulting in a lower consistency material (less solids per volume) being fed into the press.

c) PRESSURE CONE SETTING (BACK PRESSURE)

The pressure cone applies backpressure on the cake in the high-pressure section of the press (see Figure 1A). The pressure is adjusted by moving the cone closer or further from the discharge of the screw press. This adjustment is done with the equipment is off and the cake is removed from the discharge of the machine. Generally, as backpressure is increased, the discharge cake consistency of fibrous materials increases and the throughput remains constant (or possibly decreases) due to increased rotation of sludge with the screen. The adverse effects of increasing back pressure include accelerated wear, higher motor load, increased chance of plugging, and decreased capture efficiency for low fiber sludges.

d) INLET CONSISTENCY

At a given screw speed and sludge type, the screw press over time will process the same amount of dry pounds per hour. When the inlet consistency varies, the dry pounds per hour capacity stays the same while the flow or gallons per minute capacity will change.

INLET CONSISTENCY	DRY SOLIDS LBS/HR	GALLONS PER MINUTE
2.0%	625	62.5
2.1%	625	59.5
2.2%	625	56.8
2.3%	625	54.3
2.4%	625	52.0
2.5%	625	50.0

TABLE 1D-2 Relationship to inlet consistency and gallons per minute.

It is also important to keep the same polymer dosage rate, even when the inlet consistency varies. If the inlet consistency varies greatly overtime, then increased operator attention or monitoring of the inlet consistency may be required to maintain a proper polymer dose.

SECTION 1D

ADDITIONAL PERFORMANCE INFORMATION

a) FEED RATE

Feed rate (which is a function of both sludge flow & consistency) and headbox level are interrelated. If the screw speed is kept constant, then an increase in feed rate will result in an increase in headbox level. The increase in headbox level will promote gravity drainage at the inlet end of the press and result in increases in throughput and discharge cake dryness. Conversely, if the feed rate decreases (with screw speed remaining constant), the headbox level will decrease and less gravity drainage will occur resulting in decreased throughput and discharge cake consistency.

b) CHEMICAL CONDITIONING (FLOCCULATION)

Most sludges, require flocculation prior to being dewatered. Typically, the chemical conditioning rate is ratioed to the sludge feed rate to insure correct dosage.

In order to minimize polymer consumption (i.e. maximize polymer efficiency) and improve dewaterability, it is important to choose the chemical or combination of chemicals (e.g. coagulant and/or flocculant) best suited for the specific sludge to be dewatered.

Poor conditioning results in decreased capture efficiency for the press and reduces dewaterability of the sludge yielding lower throughput capacity and discharge cake consistency.

c) SLUDGE PROPERTIES

The most important, yet least controllable factor in sludge dewatering is the sludge itself. Dewaterability depends upon the type, freeness, fiber content, ash content, pH level, etc. of the sludge.

Although it is generally difficult to control sludge properties it is important to understand the effects of sludge characteristics on sludge dewaterability.

As fiber content and/or length increases, dewaterability generally increases. As ash content increases, discharge cake consistency generally also increases; however, both capture efficiency and wear due to abrasion can increase.

Primary sludges are easier to dewater than secondary sludges. As the ratio of primary to secondary sludge varies in a blended sludge, the dewaterability of the sludge blend will vary accordingly.

Changes in the pH level of the sludge indirectly affect dewaterability. Generally, chemical Conditioners (polymers) added to flocculate the sludge work best within a certain pH range. If the pH level of the sludge swings outside the functional range of the polymer, then poor conditioning results, leading to reduced dewaterability, throughput, discharge cake consistency, and capture efficiency.

SECTION 1E

CONCLUSION

A screw press operator needs to understand the various factors involved in press performance to be able to operate the screw press efficiently and safely.

In ideal situations, sludge conditions do not change so that the operational settings of the screw press (screw speed, headbox level, etc.) remain constant. In the real world, sludge conditions change on a day-to-day, and sometimes hour-to-hour, basis.

As sludge conditions (flow rate, inlet consistency, fiber content, etc.) vary, appropriate changes need to be made to screw press operational settings to optimize performance or to avoid overload situations. Since every sludge is different and each mill experiences unique periodic variations in their sludge, it is not possible to itemize specific operational changes for each change in sludge characteristics. However, with good operational records, see section 10, FKC can assist in making recommendations for fine-tuning.

Initial screw press operation should be based on operational settings determined by FKC during start-up. If significant changes occur in the sludge properties after start-up, contact FKC for revised operational settings.

Contact your FKC representative if you have any questions or concerns about FKC Screw Press operations.

Screw Press

Part 2 – Operational Procedures

Part 2

Assembly & Installation Instructions

SECTION 2

ASSEMBLY & INSTALLATION INSTRUCTIONS

2A SCREW PRESS DRUM COVERS	Page 2-1
a) DRUM COVER INSTALLATION INSTRUCTIONS	Page 2-1
b) DRUM COVER ASSEMBLY DIAGRAMS	Page 2-2
2B TIGHTENING TORQUE FOR RIGID SCREWS	Page 2-3

SECTION 2A

SCREW PRESS DRUM COVERS

a) DRUM COVER INSTALLATION INSTRUCTIONS

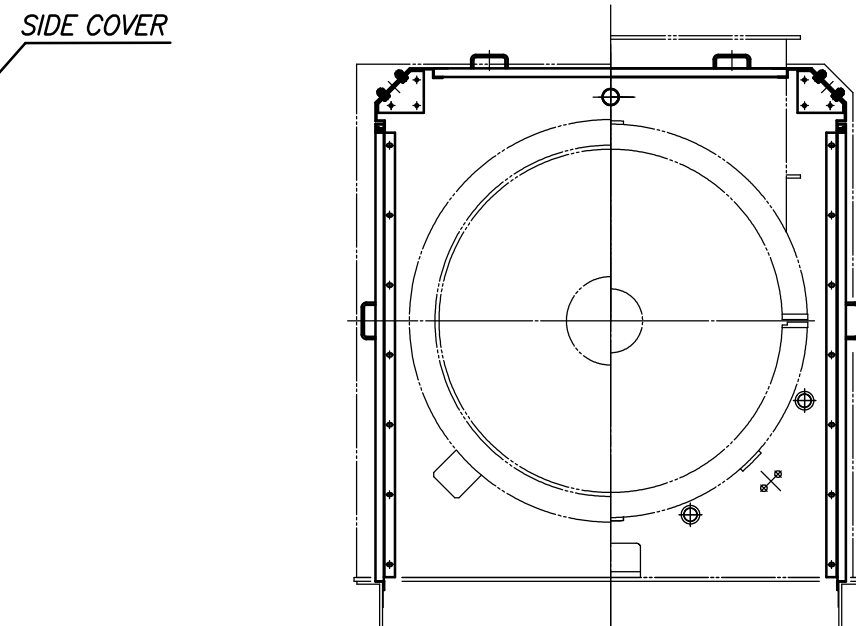
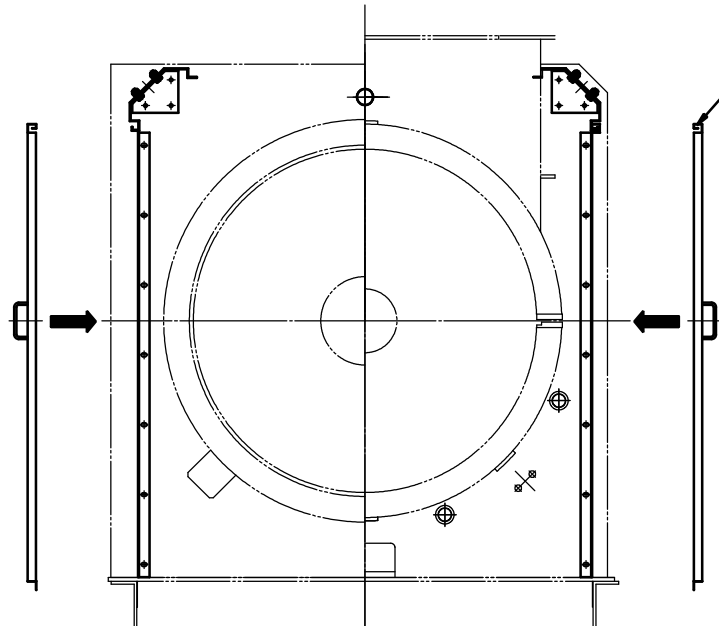
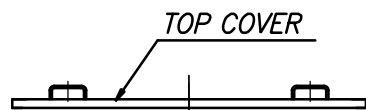
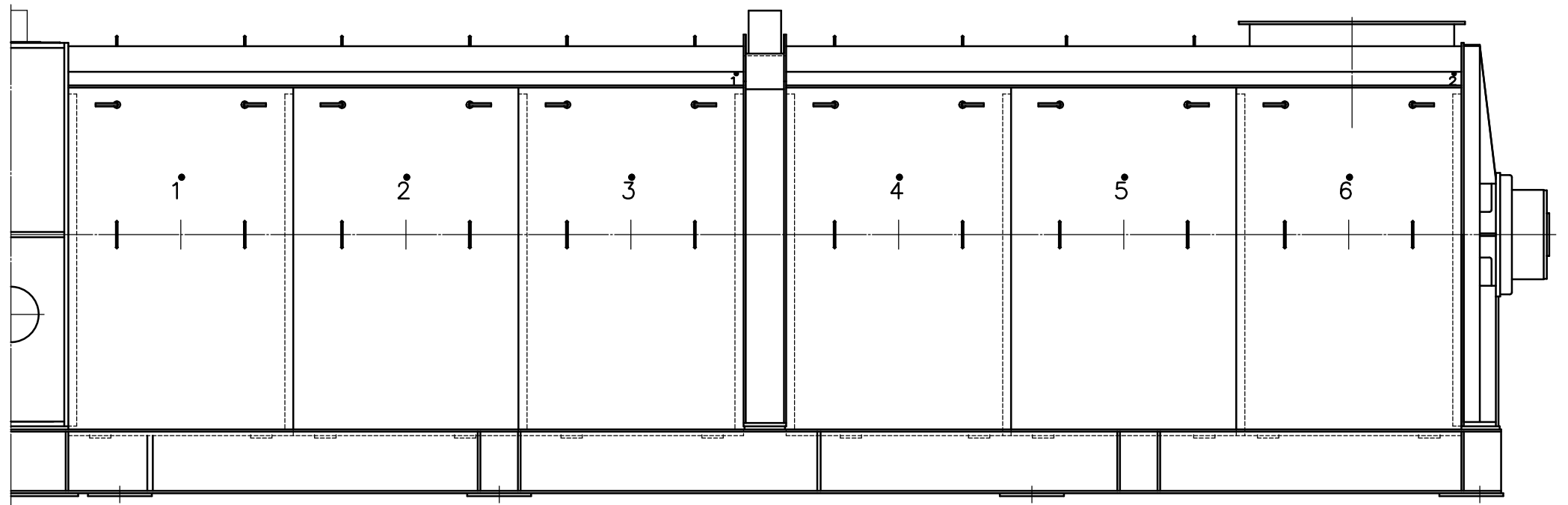
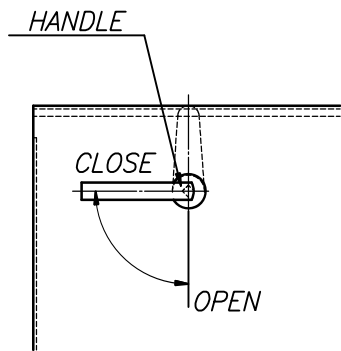
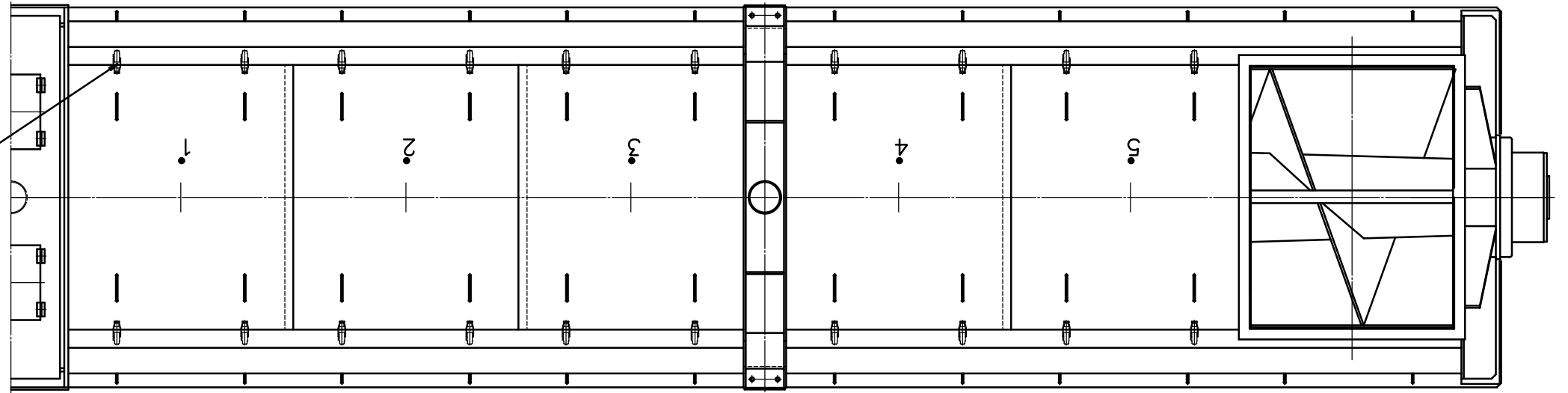
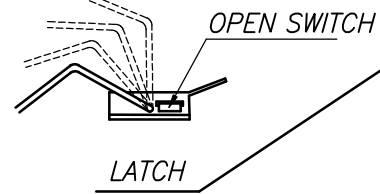
The lightweight drum covers are designed to be installed and removed easily by one person without the use of tools.

Note that there are two types of covers - top covers and side covers. All of the covers are numbered.

Note that the draw latches which attach the side covers to the top covers have a LOCK BUTTON on the side of the latch. The LOCK BUTTON must be pressed before the latch can be opened. If the latch is forced open it will be permanently damaged.

For simple installation and removal, refer to the following instructions and drawings:

1. Hang the cover clips on the drums as shown on the attached DRUM COVER ASSEMBLY DIAGRAMS 1-3. Note that the clips should be positioned about 7 inches from the drum ends. There are four different types of clips - two sizes used with the upper drum halves, and two sizes used with the lower drum halves. Of the two upper drum types, the clips used on the low pressure drums (the drums toward the inlet end) are longer in length. Conversely, clips used on the lower half of the the low pressure drums are the shorter of the two lower half types.
2. Install the #2 top cover.
3. Install the #1 and #3 top covers.
4. Install the #5 top cover.
5. Install the #4 and #6 top covers.
6. Install the #2 side cover.
Note that one side has dots over the numbers and the other side does not.
7. Install the #1 and #3 side covers.
8. Install the #5 side cover.
9. Install the #4 and #6 side covers.
6. Use the draw latches to attach the side covers to the top covers.



THE ORDER OF ASEMBLY OF DURM COVER

2→1→3	2→1→3
5→4	5→4→6
(TOP COVER)	(SIDE COVER)

JOB No. M-2795	Messrs. City of Visalia, CA WWTP	Quantity 2	Scale 1/15
Drawing No.	Title BHX-1200X6500L Drum cover assembly	Date 8/7/15	Drawn by S.Endo
			Ref. JOB No.

SECTION 2B

TIGHTENING TORQUES FOR RIGID SCREWS

TIGHTENING TORQUES & PRE-STRESSING FORCES FOR RIGID SCREWS (NORMAL THREADS)

	Pre-stressing forces (kN)					Tightening Torques (Nm)				
Class (Mat. No.)	5.6	8.8	A4-50	A4-70	C3-80	5.6	8.8	A4-50	A4-70	C3-80
Thread										
M-16	28	60	20	42	60	75	160	53	115	160
M-20	44	94	31	66	94	145	315	105	220	315
M-24	64	436	44	53	436	255	545	180	210	545
M-30	101	215	71	84	215	505	1080	355	420	1080
M-36	147	314	103	123	314	885	1890	620	735	1890
M-42	202	430	-	-	430	1420	3020	-	-	3020
M-48	265	566	-	-	566	2130	5430	-	-	4530

The thread and screw head should be lubricated with an appropriate lubricant (for example Molykote Plus by Loctite) in order to obtain the required friction coefficient. This applies in particular to stainless and acid-resistant screws since the friction coefficient for these two materials can be much higher without lubricant.

The above pre-stressing figures are standard bolt connection.

Part 2

Initial Prestart Inspection

SECTION 3

INITIAL PRESTART INSPECTION

3A INITIAL PRESTART INSPECTION

Page 3-1

SECTION 3

INITIAL PRESTART INSPECTION

Prior to FKC arriving on-site for screw press start-up, confirm the following items:



A)	Verify screw press is mounted on rigid foundation, installed with the specified anchor bolts, and leveled per FKC requirements. See Section 3A for leveling specifications.	
B)	Verify that all anchor bolts are tight.	
C)	Re-torque all bolts on screw press prior to startup.	
D)	Verify that the press is completely assembled including safety guards.	
E)	Verify screw press covers are properly installed.	
F)	Verify that the supplied motor matches the motor specified by FKC.	
G)	Verify that the motor and speed reducer have been properly aligned. Send copies of alignment records if motor was not installed at the factory.	
H)	Verify lubrication of: ⇒ Speed Reducer ⇒ Main Screw Shaft Bearings	
I)	Verify electrical connections are complete.	
J)	Verify control headbox level / flow control system is complete including flow meter.	
K)	Verify calibration of headbox level transmitter and flow meter.	
L)	Verify high motor load alarm trip set-point is set per FKC recommendations.	
M)	Program DCS/PLC to stop the screw press when the actual % motor load exceeds high motor load alarm set-point.	
N)	Verify polymer delivery systems are complete and functional.	
O)	Bump Floc Tanks and Screw Press motors for no more than 10 seconds to: ⇒ Verify rotation Check and record amp draw, load on equipment	
P)	Verify clearance between screw flight and inner screen surface along entire screw. Clearance is adjusted at factory however drums occasionally shift during shipment. See Section 7C for instructions on checking clearances. This item will be completed by FKC personnel prior to start-up. Retorque <u>all</u> drum bolts after checking clearances.	

Part 2
Operating Instructions

SECTION 4

OPERATING INSTRUCTIONS

4A STARTING THE SCREW PRESS	Page 4-1
4B STOPPING THE SCREW PRESS	Page 4-2
4C CLEANING THE SCREW PRESS	Page 4-3
4D WARNING: FREEZING CONDITIONS	Page 4-4
4E WARNING: OVERLOADING	Page 4-5
4F UNPLUGGING THE SCREW PRESS	Page 4-6
4G WARNING: MECHANICAL WARRANTY	Page 4-7

SECTION 4A

STARTING THE SCREW PRESS

AUTO START

1. For an initial screw press startup, the checklist in section 4 must be completed before the following instructions. Verify that the press is empty, that is, the press was emptied of sludge/stock during the previous shutdown.

Note that since the screw flight does not extend all of the way to the discharge end, there will normally be some material visible at the discharge end although the rest of the press is empty.

2. Set all the equipment to AUTO using the HOA switches on the front of the control panel.
3. Set the two polymer system control panels to REMOTE.
4. Ensure that the inlet pipe to the sludge feed pump is full of liquid, either by the sludge itself or with water filled from a priming port.
4. Set all the equipment to AUTO in the HMI of the control panel.
5. Verify that all the control setpoints have the desired values.
6. Press the Start system in AUTO button.
7. Ensure that the stroke length is set properly for each polymer system pump running.
8. Verify proper flocculation of the sludge in the flocculation tank just before it enters into the screw press headbox.

MANUAL START

1. Set the screw press speed potentiometer on the front of the control panel to the desired screw press speed.
2. Set the HOA switch of the screw press to HAND.

SECTION 4B

STOPPING THE SCREW PRESS

AUTO STOP

1. Verify that the “*SP Run Timer After Shutdown*” setpoint is set to the proper amount of time.
2. Press the Auto System Shutdown button.

MANUAL STOP

1. Set the HOA switch of the screw press to OFF.

SECTION 4C

CLEANING THE SCREW PRESS

The screw press should be cleaned at least once every month. The press should be cleaned as follows:

1. The press does not need to be shut down to be cleaned. It is recommended that the person doing the cleaning wear protective raingear with full face shield.
2. The top and side covers on the press should be removed. See section 3C.
3. Wash the press from top to bottom the entire length with mill water washdown hose. If there is significant hard deposits of dried sludge, scale, etc. the press may need to be pressure washed.
4. After cleaning the press it should be inspected and the high and low pressure drum bolts checked. See section 7.

SECTION 4D

WARNING: FREEZING CONDITIONS

Do not allow sludge/pulp or condensate to freeze in the equipment! Failure to do so may result in mechanical damage due to freezing expansion!

Please note the following guidelines for operating the FKC screw press under freezing conditions.

1. Completely discharge the sludge/pulp from the screw press prior to stopping the equipment.
2. If the sludge/pulp becomes frozen in the equipment it must be thawed prior to starting. Equipment overload and damage will occur if the equipment is started without thawing the frozen sludge.

SECTION 4E

WARNING: OVERLOADING

Overloading (plugging) of the screw press and drive train should be avoided at all times. However, FKC realizes that at times overload situations occur which can cause the screw press to electrically trip out and stop operating. When an overload situation arises the recommended procedure for restarting/returning to service an overloaded or plugged press is as follows:

1. Inspect the screw press outlet cake. If the material is compressed/compacted to an extremely high consistency and is very hard or if knots, chips, or very long fiber are present, do not attempt to restart the press. Digging out the plugged area of the press must be completed, as described in Section 5E, before restarting. The high-pressure drums should be removed as described in Section 7B, after which the compacted material should be removed. With the top high pressure drums removed the press can be restarted to assist with unplugging.

2. Screw press with variable frequency drive (VFD)

If the outlet cake is soft and has normal fiber and ash content then the press can be restarted as follows:

- a. Back out the pressure cone.
- b. For a VFD (Variable Frequency Drive) unit set speed at 25% and **restart only once**. If the press trips out on overload again **DO NOT RESTART**, unplugging the press must be completed as described in Section 5F.
- d. If the press remains running after restarting at 25% speed then as the motor load drops the speed can be increased slowly until the normal operating speed is achieved.

SECTION 4F

UNPLUGGING THE SCREW PRESS

To unplug a screw press, the following procedure should be followed:

1. Remove the covers on the high pressure section of the press and remove the upper half of the high pressure drums as described in Section 7B.
2. Dig out as much compacted material as possible. With the upper high pressure drums removed start the press. Starting the press will allow the compacted material in the lower portion of the high-pressure drums to rotate out of the press.
3. Once the press is clear of compacted material then reassemble the high pressure drums as described in Section 7B.
4. Replace the covers and restart the press. Increase the screw speed to a faster RPM than normal. Re-establish flow with a low headbox level. Let the system run until it stabilizes and then fine tune operation by adjusting headbox level, RPM, polymer and pressure cone.

SECTION 4G

WARNING: MECHANICAL WARRANTY

1. *Jogging*

Repetitive restarts (jogging) of the screw press should never be attempted. Failure to follow the unplugging recommendations in section 5D and 5E could result in damage to the screw and/or drive train components. The Mechanical Equipment Warranty does not cover damage to any screw press component caused by jogging an overloaded machine.

2. *Reversing*

Running the screw backwards **is not** an acceptable method of unplugging the screw press. Reversing a plugged screw press can result in damage to the screw press (Inlet and discharge bearings, chain tensioner, screw flight, and drums). The Mechanical Equipment Warranty does not cover damage caused by reversing the screw.

Part 2

Troubleshooting

SECTION 5

TROUBLESHOOTING

5A PROBLEM: Low Cake Discharge Dryness	Page 5-1
5B PROBLEM: High Screw Press Motor Load	Page 5-1
5C PROBLEM: Low Screw Press Throughput Capacity	Page 5-1
5D PROBLEM: Poor Capture Rate	Page 5-2
5E PROBLEM: Headbox Level Too High	Page 5-2
5F PROBLEM: Unusual Vibration	Page 5-2
5G PROBLEM: Covers Difficult to Install	Page 5-2

SECTION 5

TROUBLESHOOTING

5A PROBLEM: Low Cake Discharge Dryness	
POSSIBLE CAUSES:	REMEDY / ACTION REQUIRED:
- Screw Speed Too Fast.....	Reduce Screw Press Speed
- Poor Conditioning.....	Adjust Polymer Flow & Agitation
- Changing Sludge Properties.....	Adjust Polymer/Screw speed/Headbox
- Low Headbox Level.....	Raise Headbox Level Setpoint
- Plugged Screens.....	Remove Covers and Wash Press
- Clearance Problems.....	Readjust Clearances (also, see SECTION 7, parts C,D, and E)
- Low Feed Consistency.....	Check Sludge Properties/Conditioning

5B PROBLEM: High Screw Press Motor Load	
POSSIBLE CAUSES:	REMEDY / ACTION REQUIRED:
- Too High Headbox Level.....	Lower Headbox Setpoint
- Too Slow Screw Speed.....	Increase Screw Speed
- Increased Fiber Content.....	Reduce Headbox Lvl/Increase Screw Speed
- Too Much Backpressure.....	Back Off Pressure Cone

5C PROBLEM: Low Screw Press Throughput Capacity	
POSSIBLE CAUSES:	REMEDY / ACTION REQUIRED:
- Low Headbox Level.....	Raise Headbox Level Setpoint
- Low Feed Consistency.....	Check Sludge Properties/Conditioning
- Low Screw Speed.....	Increase Screw Speed
- Poor Conditioning.....	Adjust Polymer Flow & Agitation
- Clearance Problems.....	Readjust Clearances (also, see SECTION 7, parts C,D, and E)
- Low Sludge Flow.....	Increase Sludge Flow/Headbox Level

TROUBLESHOOTING (con't)

5D PROBLEM: Poor Capture Rate

POSSIBLE CAUSES:	REMEDY / ACTION REQUIRED:
- Poor Conditioning.....	Adjust Polymer Flow, Adjust Agitator
- Too Much Backpressure.....	Back Off Pressure Cone
- Screw Speed Too Fast.....	Reduce Screw Press Speed
- Screen Damage.....	Inspect/Replace Damaged Screens
- Low Feed Consistency.....	Check Sludge Properties/Conditioning

5E PROBLEM: Headbox Level Too High

POSSIBLE CAUSES:	REMEDY / ACTION REQUIRED:
- Conditioning Problem.....	Adjust Polymer Flow, Adjust Agitator
- Flow Rate Too High.....	Reduce Flow Rate
- Plugged Overflow.....	Unplug Overflow
- Feedback Loop Overcompensation.....	Adjust Headbox Level Control Setpoints

5F PROBLEM: Unusual Vibration

POSSIBLE CAUSES:	REMEDY / ACTION REQUIRED:
- Lack of Chain Lubrication.....	Lubricate Chain/Sprockets (check wear)
- Motor Coupling.....	Inspect for Wear
- Loss of Steam Pressure.....	Increase Steam Pressure/Temperature
- Screw & Screen Contact.....	Readjust Clearances
- High Motor Load.....	Lower Headbox Lvl, Increase Screw Speed
- Stock Spill/ Wood Chips.....	Lower Headbox Lvl, Increase Screw Speed
- Drive Misalignment.....	Realign Drive Train

5G PROBLEM: Covers Difficult to Install

POSSIBLE CAUSES:	REMEDY / ACTION REQUIRED:
- Missing Clips/holders.....	Install New Clips/holders
- Bent Covers.....	Rebend Covers to Proper Radius
- Installed in Wrong Order.....	See SECTION 3B for Instructions
- Latches Damaged.....	Remove and straighten LOCK BUTTON

Screw Press

Part 3 – Preventive Maintenance Procedures

Part 3

Maintenance Instructions

SECTION 6

MAINTENANCE INSTRUCTIONS

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6B OPENING THE SCREW DRUM	Page 6-2
a) DRUM REMOVAL	Page 6-2
b) DRUM REINSTALLATION	Page 6-3
6C CLEARANCES	Page 6-4
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b) CLEARANCE MEASUREMENT	Page 6-5
c) CLEARANCE ADJUSTMENT: SHIM METHOD	Page 6-6
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SECTION 6A

LUBRICATION (SEE SECTION 6F FOR LUBRICATION DIAGRAM)

a) *SPEED REDUCER*

1. The oil should be replaced every 6 months when the press is operated less than 10 hours per day.
2. The oil should be replaced every 2500 hours when the press is operated 10 to 24 hours per day.
3. The oil should be replaced every 1 – 3 months when the press is operated high temperature, high humidity, or atmospheric active gases are present.
4. Please refer to the respective SM-CYCLO 6000 series manual for specific recommended schedules, lubricant specifications, replenishment and grease change guidelines.

b) *INLET STAND BEARING / OUTLET STAND BEARING*

1. Lubricate each bearing monthly using a high quality EP 1 grease. All bearings on the screw press are fitted with grease nipples and spring loaded relief valves. Grease should be injected until it begins to come out the pressure relief valve.
2. **NOTE: These bearings must be kept totally full of grease** due to the extreme low speed operation.

SECTION 6B

OPENING THE SCREW DRUM

a) *Drum Removal*

Note: Numbers in parenthesis correspond to items shown on the maintenance diagram in Section 6H.

It is usually not necessary to open the Screw Press for inspection, repair, etc. But you may run into a case where a screw inspection is warranted. Often removal of only the upper half of a drum is required. The procedure to remove a complete drum is as follows:

1. Remove all of the bolts from the vertical flanges of the drum half (#3).
2. Remove all of the bolts from the horizontal flanges of the drum half (#2).
3. Lift off the upper drum slowly using a cable and chain block or crane as shown in Maintenance Diagram 6H.
4. Record the number of shims (#1) between the left and right sections and set these shims aside for reinstallation.
5. Support the lower drum half to prevent it from falling. Remove all of the bolts from the vertical flanges (#3).
6. Remove the lower drum from the bottom. If it is tight then use a lead hammer (or the equivalent) to tap it downward. Use caution when removing a bound drum half. Excessive force can cause damage to the drums and fixed supports.

For municipal sludges, high pressure drum removal usually occurs within 7-10 years for an inspection.

SECTION 6B

OPENING THE SCREW DRUM

b) DRUM REINSTALLATION

Note: Numbers in parenthesis correspond to items shown on the maintenance diagram in Section 6H of this manual.

1. Verify that there are no burrs on the drum end flanges, which can make reinstallation difficult.
2. Install the lower drum half from the bottom. Slowly pull the lower drum half in place until the screw flight to screen clearance (#6) is 0.5 mm to 1.5 mm. See Diagram 6C.
3. Install and tighten the vertical flange bolts (#3) for the lower drum.
4. Replace the shims (#1) which were removed during disassembly.
5. Lower the upper drum half into place. If the upper drum is tight, use a lead hammer to tap it into position.
6. Install and tighten the horizontal flange bolts (#2) for the upper drum.
7. Install and tighten the vertical flange bolts (#3) for the upper drum.
8. Check to confirm that all bolts are tight.
9. Verify that the screw flight to screen clearance (#6) for the upper drum half is 0.5 mm to 1.5 mm.
10. Turn the screw press over at minimum speed setting to confirm no contact between the screw flight and screen surfaces.

For municipal sludges, high pressure drum removal usually occurs within 7-10 years for an inspection.

SECTION 6C

CLEARANCES

a) GENERAL INFORMATION

Proper clearance between the inner surface of the screens and the screw flight is very important for optimum Screw Press performance. Check clearances every six to twelve months and adjust as required to maintain maximum screw press performance.

Although the screw shaft rotates very slowly, the outer edge of the screw flight may gradually wear. As the screw flight wears, the clearance slowly increases. Increased clearance can result in screen blinding, decreased dewatering ability, and decreased throughput capacity.

In most cases, the clearance between the inner surface of the screens and the screw flight should be 0.5 to 1.5 mm depending upon the location along the length of the screw press. A greater clearance is generally acceptable at the high pressure section.

Clearance is adjusted by moving the drums in relation to the screw. Clearances can be adjusted in two ways - by removing or inserting shims between the upper and lower halves of the drum sections and by using the jacking bolts to move the drums in relation to the screw. Removing shims is helpful to compensate for wear of the screw flight. The jacking bolts are used to center the drums around the screw. In many instances it is sufficient to adjust clearances along the bottom half of the screw press only.

Note that on new presses there are 0.5 and 1.0 mm shims. If removal of more than 5 mm of shims is required to bring the top & bottom clearances within tolerances then weld build up of the screw flight may be recommended (see SECTION 7E).

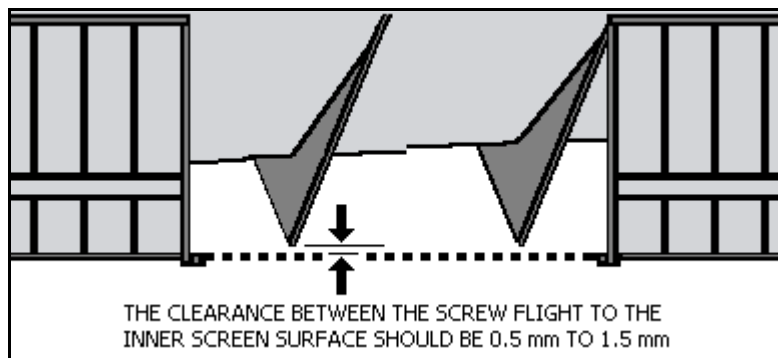


FIGURE 6C – SCREEN CLEARANCE DIAGRAM

SECTION 6C

CLEARANCES

b) CLEARANCE MEASUREMENT

A depth gage is required to measure clearances. The depth gage must have a rod/blade small enough to pass through the screen plate holes (Check the parts list in Part 4 for the screen plate hole sizes). A metric vernier caliper with a depth rod is recommended.

1. With the screw press stopped and empty, locate the screw flight by looking through the screen plate holes.
2. Measure the distance from the outer surface of the screen plate to the screw flight using a depth gage.
3. Subtract the thickness of the screen plate from the previous measurement to get the clearance between the inner surface of the screens and the screw flight.
4. Repeat steps 1-3 for the top, bottom, and both sides of each drum along the length of the screw press.
5. Record the clearances on a Screen Clearance Measurement Diagram similar to that shown on page 6-17.

For municipal sludges, this only occurs at the initial startup services by an FKC technician.

SECTION 6C

CLEARANCES

c) **CLEARANCE ADJUSTMENT: SHIM METHOD**

Note: Numbers in parenthesis correspond to items shown on the Maintenance Diagram in Section 6H.

1. Using the clearance information recorded on the Screen Clearance Measurement Diagram (pg. 6-22), determine the number of shims (#1) to be removed (or added) to adjust the clearances at the top and/or bottom of the press to within tolerance.
2. Loosen the vertical flange bolts (#3) on the lower half of the drum section(s).
3. Loosen the horizontal flange bolts (#2) on the drum section(s) to be adjusted. Note: All of the drum halves in the low-pressure section may be adjusted together as one unit rather than adjusted separately. Separate adjustment of the drum sections may be required to achieve desired tolerance.
4. Back off on the jacking bolts (#4) to allow the lower half of the drum section(s) to drop slightly.
5. Remove all horizontal flange bolts (#2) and remove (or insert) the appropriate number of shims between the upper and lower half of the drum section(s). Verify that the same number of shims are used on both sides of each drum section.
6. Insert and securely tighten all horizontal flange bolts (#2) to draw the lower half of the drum section(s) up to the upper half drum section(s).
7. Securely tighten all vertical flange bolts (#3) on the lower half of the drum section(s). Tighten the jacking bolts (#4) up against the lower drum halves and lock in place with the jam nuts.
8. Recheck clearances to confirm that the proper screw flight to inside screen clearance has been achieved. If the screw is not centered side to side in the drums and the top and bottom clearances are not within tolerance then use the jacking bolts (#4) for the final adjustment.
9. After clearances are rechecked (page 7-6), rotate the screw at minimum speed setting to confirm no contact between the screw flight and inside screen surfaces along the entire length of the Screw Press.

Warning: If the screw is touching the screen at any point, do not operate the press until the proper clearance is achieved. Failure to do so may result in serious mechanical damage.

SECTION 6C

CLEARANCES

d) CLEARANCE ADJUSTMENT: JACKING BOLT METHOD

Note: Numbers in parenthesis correspond to items shown on the Maintenance Diagram in Section 6H.

1. Loosen the vertical flange bolts (#3) on the drum(s) to be adjusted.
2. Turn the jacking bolts (#4) to adjust the position of the drum(s). Adjust the drum position to achieve the clearances required (page 6-6).
3. Securely tighten the vertical flange bolts (#3) on the upper and lower drum halves.
4. Recheck clearances to confirm that the proper screw flight to inside screen clearance has been achieved.
5. After clearances are rechecked, rotate the screw at minimum speed setting to confirm no contact between the screw flight and inside screen surfaces along the entire length of the Screw Press.

Warning: If the screw is touching the screen at any point, do not operate the press until the proper clearance is achieved. Failure to do so may result in serious mechanical damage.

For municipal sludges, high pressure drum removal usually occurs within 7-10 years for an inspection.

SECTION 6D

SCREEN REPLACEMENT

a) GENERAL

The screens lining the screw press drums can become damaged by several means. Depending on the abrasiveness of the sludge, they can wear over the years until they weaken and break. Screen damage can also occur during severe overload conditions or if foreign objects (pipe wrenches, etc.) are introduced into the press.

b) DRUM REMOVAL

Numbers in parenthesis correspond to items shown on the Maintenance Diagram on page 6-17.

Note: remove only the drum half with the damaged screen. Removal of both upper and lower sections at the same time will make reinstalling more difficult.

1. Remove the bolts (#3) from the vertical annular joint between the damaged drum half and the adjacent drum or fixed stand.
2. Remove the bolts (#2) from the horizontal joint joining the upper and lower halves. Note, if the lower drum half is being removed brace the lower drum so it does not fall when the bolts are removed.
3. Remove the drum half from the press. Record the number of shims between the upper and lower sections and set these shims aside for reinstallation.

Screen replacement for municipal sludges does not typically occur in the 1st 15 to 20 years.

SECTION 6D

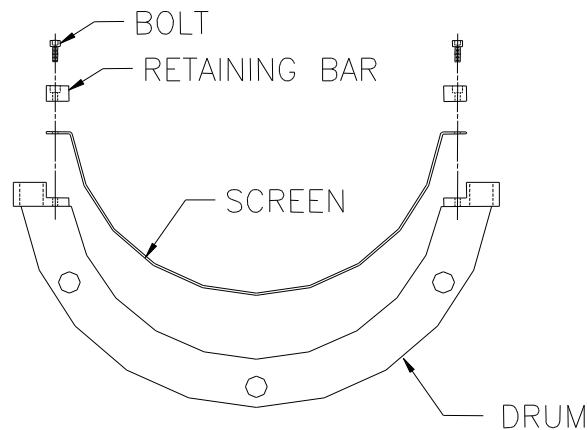
SCREEN REPLACEMENT (BOLT-IN TYPE)

a) **SCREEN REMOVAL (BOLT-IN)**

1. Remove the drum in accordance with 6b, then put it on a flat workbench with its split surface upside.
2. Remove the screws the retainer bar and screens can be detached.

b) **SCREEN INSTALLATION (BOLT-IN)**

1. Install the screen along the drum inner surface with equal margin at both ends of the drum.
2. Replace the retaining bars and screws. Tighten retaining bar screws evenly on both sides of drum. Tightening drum strainers evenly. Tap the convex part marked 4 slightly with a hammer to lay the strainer tightly to the drum surface. Then repeat the procedure until the retainer bars are completely seated and the screws are tightened fully.



**FIGURE 6D - SCREEN REPLACEMENT DIAGRAM
BOLT-IN TYPE**

Screen replacement for municipal sludges does not typically occur in the 1st 15 to 20 years.

SECTION 6D

SCREEN REPLACEMENT

e) *DRUM REINSTALLATION*

Reinstall the drum half on the press using the same number of shims that existed when the drum half was removed. Note that when assembled at the factory, a total of 10 mm of shims are normally installed using a combination of 2 mm and 1 mm thick shims.

FOR AN UPPER DRUM HALF:

1. Replace the shims (#1) which were removed during disassembly.
2. Lower the upper drum half into place. If the upper drum is tight, use a lead hammer to tap it into position.
3. Align the reinstalled drum half with the adjacent drums.
4. Install and tighten the horizontal flange bolts (#2) then the vertical flange bolts (#3).
5. Check and adjust clearances as described in Maintenance Instruction TOPIC: CLEARANCES.

FOR A LOWER DRUM HALF:

1. Slowly pull the lower drum half in place. If the drum is tight, use a lead hammer to tap it into position.
2. Replace the shims (#1) which were removed during disassembly.
3. Install and tighten the horizontal flange bolts (#2) then the vertical flange bolts (#3).
4. Check and adjust clearances as described in Section 6C b) CLEARANCES.

Warning: If the screw is touching the screen at any point, do not operate the press until the proper clearance is achieved. Failure to do so may result in serious mechanical damage. If the clearance between the inner surface of the screen and the screw is not within acceptable tolerances then the clearance must be adjusted.

Screen replacement for municipal sludges does not typically occur in the 1st 15 to 20 years.

SECTION 6 E

FLIGHT REPAIR

The flight at the high-pressure end of the screw will slowly wear. The rate of wear is dependent upon two main factors; the screw speed and the abrasiveness of the material being dewatered. As the abrasiveness and screw speed increase, the rate of wear will also increase. For municipal applications with very low screw speed and low sludge abrasiveness, no significant wear is expected in the first 20 years of operation.

As the screw flight wears, the performance of the screw press declines and the wear of the high-pressure screens accelerates.

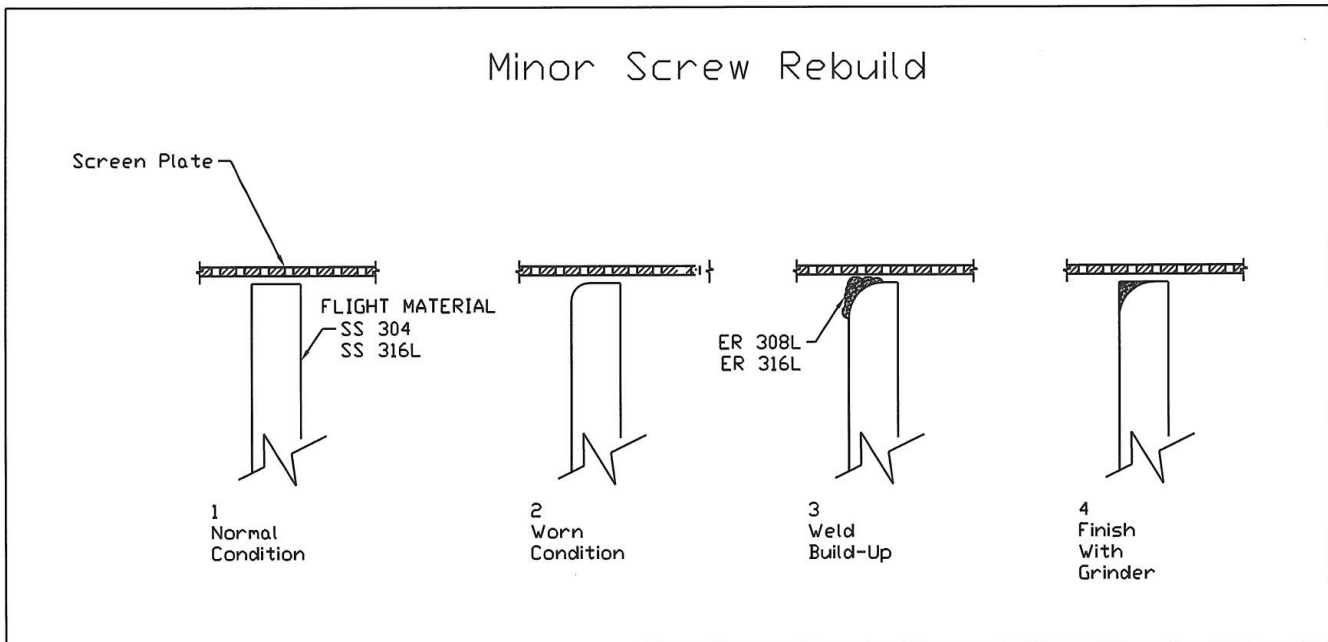
FKC recommends inspecting the high pressure screw flight on an annual basis and repairing the worn flight as required.

a) **FLIGHT BUILD-UP**

Figure 6E shows the method for field weld build-up of the screw flight to repair minor flight wear.

WARNING:

During weld build-up of the screw flight, ground the welding unit to the screw only. If the welding unit is grounded to the screw press foundation, the electric current will arc through the bearings causing expensive damage.



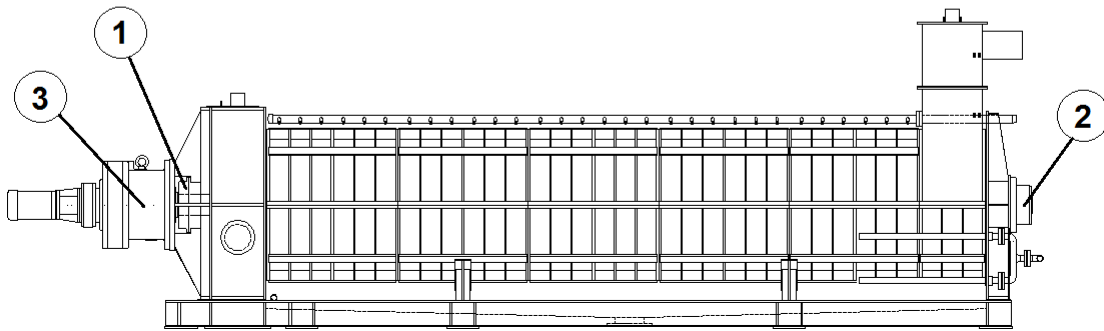
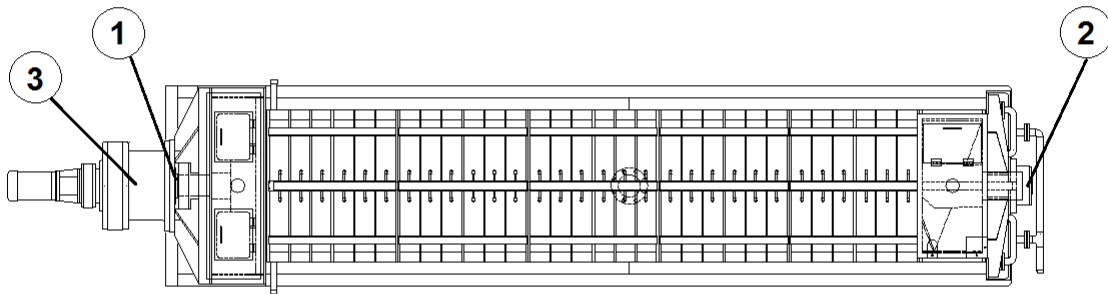
To date (2020), no FKC municipal screw presses supplied in the United States or Canada have needed any flight repair.

FIGURE 6E - FLIGHT BUILD-UP DIAGRAM

SECTION 6F

LUBRICATION DIAGRAM

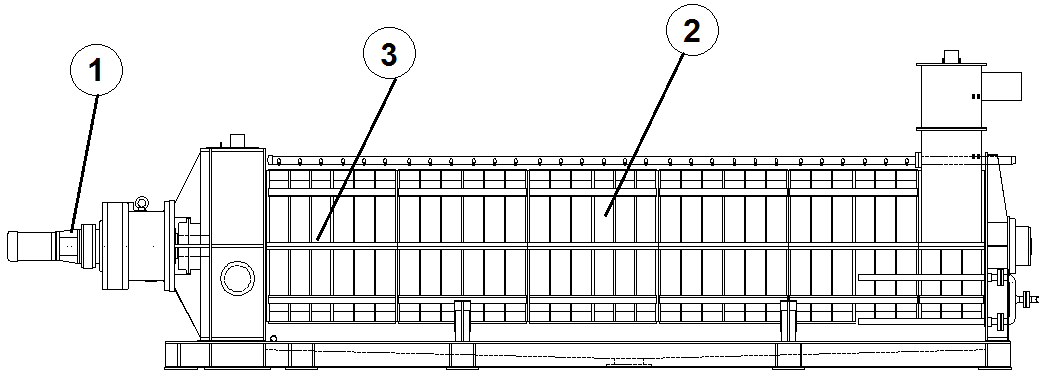
Part #	Part	Inspection Interval	Lubrication Interval	Lubrication Specification
1	Bearing	1 Week	1 - 3 Months	Shell Alvania EP 1
2	Bearing	1 Week	1 - 3 Months	Shell Alvania EP 1
3	Reducer	1 Month	2,500 Hours	See Section 8



SECTION 6G

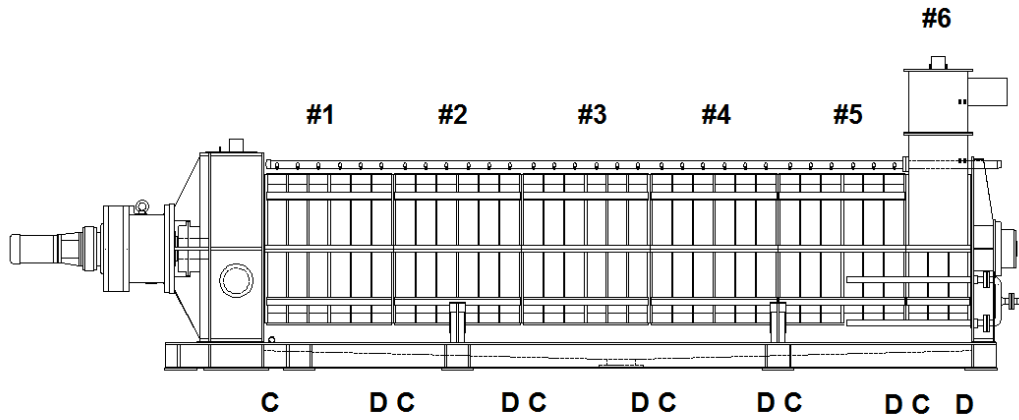
INSPECTION DIAGRAM

PART #	PART	INSPECTION INTERVAL	INSPECTION NOTES
1	COUPLING	1 YEAR	CHECK FOR EXCESSIVE WEAR CHECK FOR EXCESSIVE VIBRATION
2	CLEARANCES	5 YEARS	CHECK SCREW FLIGHT CLEARANCES CHECK DRAINAGE PATTERN
3	BOLTS	5 YEARS	CHECK TORQUE'S AT HIGH PRESSURE DRUMS

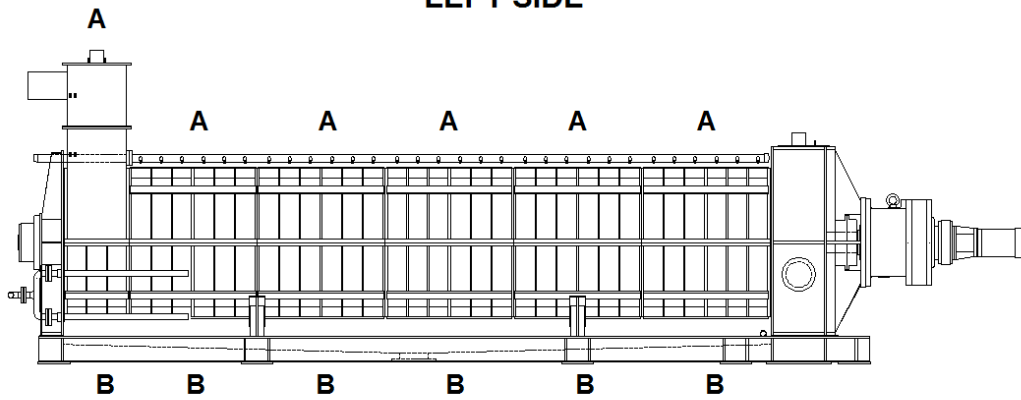


SECTION 6H SCREW PRESS SCREEN CLEARANCE & INSPECTION DIAGRAM - 6500L

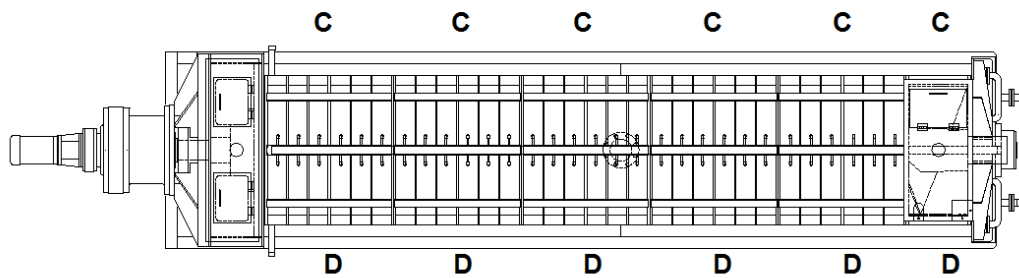
FINAL SCREEN CLEARANCES				
	A	B	C	D
#1				
#2				
#3				
#4				
#5				
#6				



LEFT SIDE



RIGHT SIDE



TOP

SECTION 6I

Screw Press Screw Removal & Re-Assembly

FKC screw presses rarely need the removal of their screws. However, when it is necessary to remove the screw from a press the following describes the preferred procedure for completing the job. FKC recommends that our service representative be present during the screw removal and reinstallation process.

A) Screw Removal

1. Disconnect power to the machine. (Lock machine out.)
2. Remove all process piping, electrical and instrumentation items from the headbox, drum covers, and main body of the screw press.
3. Remove all the drum covers from the press.
4. Remove the headbox.
5. Remove the bolts from the reducer low speed coupling outer sleeve.
6. Remove all drum halves from the press.
7. Remove the bolts and alignment pins holding down the inlet and discharge stands.
8. Support the screw at each end between the stands.
9. At the inlet end of the screw, remove the following items in the order listed;
 - a. Gear coupling hub
 - b. Thrust nut
 - c. Bearing cover
 - d. Split bearing housing
 - e. Bearing
10. Remove the inlet stand from the screw.
11. At the discharge end of the screw, remove the following items in the order listed;
 - a. Rotary joint
 - b. Thrust nut
 - c. Bearing cover
 - d. Split gearing housing
 - e. Bearing
12. Remove the discharge stand from the screw.

There are no preventative maintenance or typical repair procedures that requires screw removal on any of the FKC municipal screw presses.

SECTION 6I (con't)

Screw Press Screw Removal & Re-Assembly

B) Screw Reinstallation

The new or rebuilt screw should be reinstalled in the reverse order as described in the removal section above. The following should be completed during the reassembly process.

NOTE: *FKC recommends that all new bearings be installed on the screw.*

1. After the screw with the bearing stands has been set in place, install all of the drum halves along on side of the screw press first.
2. The clearance between the screw and screens should be adjusted and set as described in section 6C along one side of the press before installation of the drum halves on the remaining side of the press.
3. The remaining drum halves should be reinstalled and aligned one at a time. Clearances should be adjusted and set as described in section 6C.
4. After all the clearances have been checked and set and the bearings lubricated, the press should be run briefly to check for unusual noise or screw to screen contact.
5. Prior the restarting the press the items on the pre-start up inspection checklist should be re-verified.

There are no preventative maintenance or typical repair procedures that requires screw removal on any of the FKC municipal screw presses.

Flocculation Tank

Flocculation Tank

Part 1 – Equipment Summary



FKC Biosolids Dewatering

Equipment Summary

FKC Flocculation Tank

FKC Serial Number	FT-302 1/2
City of Visalia Tag #	8SCT01 / 8SCT02
City of Visalia Tag # Mixer	8MXR01 / 8MXR02
Process Area	Sludge Dewatering Facility

FKC Screw Press

FKC Serial Number	M-2795 1/2
City of Visalia Tag #	8SDPRO1 / 8SDPRO2
Process Area	Sludge Dewatering Facility

FKC FLOCCULATION TANK FOR DIGESTER THICKENING APPLICATIONS

GENERAL DESCRIPTION

The FKC Flocculation Tank is designed to optimize the mixing of sludge and polymer prior to thickening. Typically, the conditioned sludge from the flocculation tank flows into a rotary screen thickener.

Optimum mixing of the sludge and polymer benefits the sludge dewatering system operator in two ways. First, by controlling the mixing energy involved, polymer dosage is minimized. Too little agitation and the polymer does not disperse fully in the sludge. This results in some un-reacted polymer scattered throughout the sludge. Too much agitation and the flocculated sludge particles are broken up before they make it to the next process. Excessive agitation requires excessive polymer to hold the flocculated particles together. Optimum agitation results in optimum polymer usage. Second, the flocculation tank is sized to allow sufficient retention time for the polymer to react with the sludge. With too little retention time the sludge does not have sufficient time to flocculate prior to exiting the tank.

The open top flocculation tank also allows the sludge dewatering system operator to visually check the conditioning of the sludge as it overflows to the rotary screen thickener. The visual check is a very fast and simple method of verifying proper flocculation tank operation.

The flocculation tank consists of a tank with the sludge/polymer inlet on the bottom and the conditioned sludge overflow on one side near the top. The flocculation tank is supplied with a variable speed top mounted agitator for controlled mixing of the sludge and polymer. The agitator speed is adjusted with either a mechanical speed variator or a variable speed motor.

Flocculation Tank

Part 2 – Operational Procedures

OPERATION

START-UP

- Start-up of the flocculation tank is normally performed in conjunction with the rotary screen thickener and screw press start-up.
- Verify that the agitator gear reducer is properly lubricated and that the agitator mounting bolts are tight.
- Start the flocculation tank agitator motor. Verify proper rotation. The axial vane impellers should force the sludge downwards towards the sludge inlet to provide for proper mixing of the sludge and polymer.
- Begin polymer flow. Begin sludge flow.

OPTIMIZING PERFORMANCE

Optimum sludge conditioning involves minimizing polymer costs while producing a flocculated sludge that can be mechanically dewatered by the equipment that follows. The flocculation tank is the last element of the sludge conditioning system. For optimum performance of the flocculation tank, the other elements in the system must first be optimized.

Factors affecting the performance of the sludge conditioning system include: polymer selection, post make-down concentration, polymer age, post dilution water addition, and polymer injection point location(s). Polymer sales representatives should be consulted to determine the best polymer for each application and for recommendations on polymer makedown equipment, tanks and pumps. Optimum post make-down concentration and post dilution water addition is normally determined after equipment startup.

FKC recommends that the polymer injection point be within five feet of the flocculation tank inlet to prevent uncontrolled mixing of the polymer and the sludge prior to entering the tank.

SHUT DOWN

- Stop sludge flow. Stop polymer flow. Stop Floc Tank agitator motor.
- Drain the flocculation tank if the sludge dewatering system will be shut down for an extended period of time.

Flocculation Tank
Part 3 – Preventive Maintenance
Procedures

FKC FLOC TANK MAINTENANCE

MAINTENANCE

The oil level and oil quality in the agitator drive should be checked at frequent intervals due to the wet, humid, and dirty atmosphere that the equipment normally operates in. Oil changes are required at intervals of 10,000 operating hours or every two years, whichever comes first. See the SEW Operations Manual for details.

Schedule

FKC's Proposed Project Schedule



*FKC assumes the start-date is after the PO has been fully executed

Item	Time	
Equipment Submittals	6	Weeks
Manufacturing after Approved Submittals	8	Months
Delivery of O&M	6	Months
Delivery of Complete Equipmet Systems	8	Months

FKC acknowledges that the manufacturer will pay liquidated damages of \$500 for each day of delay. Including shop drawings, equipment fabrication, delivery, and O&M's.

Addendum Acknowledgement Form

EXHIBIT E - ADDENDUM ACKNOWLEDGEMENT

ADDENDUM	DATE ISSUED	SIGNATURE
1	11/22/24	 FKC Co., Ltd
2	11/26/24	 FKC Co., Ltd.

Exclusions / Exceptions Form

Notes, Clarifications & Exceptions

1. Page 2 of 6 – As certain grants require BABA compliance; the contract must provide an additional line item with the total cost associated with providing a BABA compliant system.

FKC cannot provide a BABA compliant screw press of this size. Our proposal does not comply with the BABA requirements and we have not proved a price for this option.

2. Page 11 of 16 – SDU Maximum Polymer Usage – 20 Lbs. / dry ton.

FKC will guarantee 30 Lbs. / dry ton or less of active polymer.

3. FKC's proposal does not include any sales tax rate amounts. Taxes will not be collected or go through FKC.
4. FKC offers the standard insurance limitations offered by Liberty Mutual. A sample copy of FKC's certificate of liability insurance is provided in the Example Insurance Certificate tab.
5. FKC takes exception to, does not have, and does not offer professional or contractual liability insurance.
6. Copies and licensing for the PLC and HMI programming software are not included. The programs and ladder logic to be used at this facility for the PLC and HMI are included along with services to inspect, commission, and startup the control panels.
7. FKC guarantees the 15% TS screw press outlet and the 30 active lbs per dry ton of polymer. The sludge to be dewatered however is currently not available to testing, so maximum cake dryness and effective polymer dose cannot be measured or verified at this time. In the event that one or both of these guarantees are not met, then verification of maximum possible cake dryness and effective polymer dose will be obtained from a reputable, agreed upon polymer vendor. Once these two parameters have been verified, then FKC will be required to meet the cake dryness and polymer dose submitted by the polymer vendor.