

Krebs Engineering, Inc.
15 LaGrange Street
Newnan, GA 30263
470-724-5050
June 1, 2022

ADDENDUM NO. 01

CONTRACT NO.: 21508.4 – Biosolids Dryer Equipment RFP
OWNER: Coweta County Water & Sewerage Authority
PROJECT: Shenandoah WWTF – Biosolids Dryer Equipment RFP

BID DATE: June 15, 2022
TO: ALL PROSPECTIVE CONTRACTORS AND SUPPLIERS

The changes, modifications, and/or additions covered by and set forth in this Addendum No. 01 shall become part of and be incorporated in the Contract Documents for the above referenced project:

Clarifications:

AD1.1 **Question:** The RFP drawings show an electrical room. The RFP asks for all equipment in the dryer RFP to be provided with control panels that include VFDs, motor starters, etc. Can you give us an idea of where you intend to mount all the various panels? Not sure if you want certain ones near the equipment item it controls or all of them to be remotely placed in the electrical room shown on the drawing.

Krebs Response: The plans are preliminary, so the electrical room has not been sized and the panel locations have not been determined. Generally, our preference is to locate larger and/or critical VFD's in an air-conditioned electrical room, and generally, our approach is to include the VFD's, motor starters, etc. in one panel as long as the motor HP's are small (<10HP?). Where line-of-sight visibility and/or other concerns/preferences exist, the panels are sometimes located in the room with the process equipment.

If the control panel(s) are located in the electrical room then it/they will generally consist of a NEMA12 painted steel panel(s) in the electrical room and also a local panel view HMI in the dryer building. If the control panel(s) are located in the dryer building, then they will be stainless steel NEMA4 panels with built-in HMI. Since a decision has not been made for the dryer equipment, the actual control panel configuration is unknown due to varying process manufacturers. Location and type of control panel should follow the logic describe above.

AD1.2 **Question:** In order to price the discharge conveyors that will transport the dried material, can you provide us with an assumed distance you want to convey to the dried

biosolids

container/truck?

Krebs Response: Please see the preliminary drawings (C15-05 and C15-06) provided with the RFP.

AD1.3 **Question:** Can you tell us what type of Stainless Steel (304, 316 or other material) you want the dried material conveyors to be manufactured with? Can you provide us with a section view of the dryer building that shows the height of the conveyors off the floor and if you want floor leg supports or other type of support for the conveyors?

Krebs Response: The height, configuration, and supports for the conveyors will vary with the dryer configuration/manufacturer. Either 304 or 316 stainless steel will be acceptable. Please provide specific recommendation(s)/preference(s) if needed for your equipment/system.

AD1.4 **Question:** Can we propose conveyors in lieu of pumping equipment from the screw press to the dryer?

Krebs Response: Yes. Please note that flexibility (in moving/transporting solids) will be considered in the evaluation of the proposals. The same flexibility provided in the preliminary drawings shall be provided in the proposed conveyor proposal.

AD1.5 **Question:** Can Keystone Conveyor can be added as an approved manufacturer of the hopper and associated conveyors.

Krebs Response: Yes. See the attached revised Specification 41 52 13.13 – Fixed Bins & Hoppers.

AD1.6 **Question:** Are the dried biosolids discharged to one location on the storage pad and then spread via the front loader? Also, how will the product be removed or moved from the storage pad to the truck, dumpster, or bags?

Krebs Response: Yes, biosolids are discharged to one location on the storage pad. It is to be determined what will be done with the biosolids after the discharge to the storage area.

AD1.7 **Question:** Please provide the Solids Handling Building GA drawing in ACAD format to incorporate Vendor's dryer system general arrangement.

Krebs Response: CAD drawings of sheets C15-05 and C15-06 have been provided as an attachment to this addendum.

AD1.8 **Question:** A single vendor or manufacturer for both the spiral and hopper could impact the lead time. Vendor will submit the inspection & test plan (I&TP) for each component (spiral & hopper) manufacturer to maintain the highest quality assurance standard. Will this be acceptable to the Owner/engineer for the spiral fabrication by a sub vendor and not the hopper manufacturer?

Krebs Response: In accordance with Specification 41 52 13.13 – Section 1.4.C.1: “All equipment included in this section shall be furnished by a single Manufacturer who shall be responsible for the design, coordination, and the satisfactory operation of the system.”

AD1.9 **Question:** All the MCC & VFD for the dryer & all ancillary process units are installed in one centralized panel instead of installed at each process unit. Is this acceptable?

Krebs Response: Yes.

AD1.10 **Question:** Vendor would like to clarify that the UPS will be only for the control system and does not include any low voltage devices- pumps, gear motor, etc.

Krebs Response: We agree that the UPS system(s) should typically provide backup/continuous power for the controls but not be required to provide backup/continuous power for equipment remote from control panels (pumps, gearmotors, etc.), such as to allow continuous MONITORING of the process and continuity of power to the PLCs, but not continuity of power to the process itself.

AD1.11 **Question:** Vendor’s equipment generates about 100 SCFH of non-condensable gas with mercaptans and odor-causing compounds from the biosolids drying process. Typically Vendor supplies a chemisorption odor control unit. Vendor would like to clarify if this is part of the dryer system scope of supply.

Krebs Response: Yes, the Odor Control system shall be supplied as a part of the dryer scope if required as a part of the manufacturer’s dryer equipment process.

AD1.12 **Question:** Vendor’s equipment condenser uses once through cooling water. Typically, we use reuse water from the wastewater treatment and do not need any additional pre-treatment or consumables like filters. The drain from the condenser is returned to the headworks and does not require additional maintenance or a consumable filter. Vendor would like to clarify this is acceptable to the owner/engineer.

Krebs Response: Yes, reuse/plant water will be available.

AD1.13 **Question:** Vendor’s equipment used a small Nitrogen to inert in the atmosphere inside the dryer. Vendor would like to clarify if the air compressor and the nitrogen generator are part of the dryer system’s scope of supply.

Krebs Response: Yes, if required by the dryer manufacturer as a part of the biosolids process.

AD1.14 **Question:** Vendor would like to clarify that all instrumentation, control panel & the motors installed on the dryer or within a 10’ boundary would be hazard area rated.

Krebs Response: We agree that equipment/devices/components mounted within 10' of drying equipment should be rated for Class II, Div II application, per NFPA 820 requirements. Furthermore, equipment/devices/components mounted WITHIN drying equipment should be rated for Class II, Div I application per NFPA 820 requirements.

AD1.15 **Question:** Vendor would like to clarify that the control panel would be designed for non-Hazard area classification and installed at least 10' away from the dryer.

Krebs Response: We agree that areas more than 10' from drying equipment will generally be unclassified (and associated equipment/devices/components in those areas are therefore not required to be hazardous-location rated) per NFPA 820. Specifically, the design intent is for the dryer system control panel(s) to be located outside of hazardous zones.

SPECIFICATIONS TO BE REVISED BY ADDENDUM:

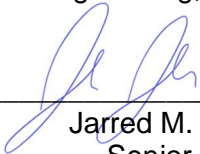
AD1.16 Specification 41 52 13.13 – Fixed Bins & Hoppers. Replace entire section with attached, to include Keystone Conveyor as an approved manufacturer of the hopper and associated conveyors

INFORMATION ADDED BY ADDENDUM TO APPENDIX

AD1.17 CAD drawings of sheets C15-05 and C15-06 have been provided as an attachment to this addendum.

This Addendum No. 01 shall be attached to the front of your set of specifications and made a part of the Contract Documents. Receipt of this Addendum No. 01 shall be acknowledged on the Proposal Form.

Krebs Engineering, Inc.

By  _____
Jarred M. Jackson, PE
Senior Associate

THIS IS THE LAST PAGE

Attachments to Addendum No. 01 preceding this page:

A total of _____ pages or sheets of drawings (including this page) have been included in Addendum No. 01.

General Contractors are requested to return this page as an acknowledgment that you have received this Addendum by email. This will NOT be mailed. A copy of this Addendum may be picked up at the office of the Engineer.

Return to Krebs Engineering, Inc. by email to Jarred.Jackson@krebseng.com

Received By _____

Contractor _____

Date _____

SECTION 41 52 13.13 – FIXED BINS & HOPPERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish and install all labor, materials, equipment and incidentals and install complete and ready for operation of a twin shaftless live bottom screw and storage bin for the storage and out-loading of sludge.

1.2 ACTION SUBMITTALS

- A. Product Data:
 - 1. Descriptive literature regarding the conveying equipment to be supplied.
 - 2. Reference information and certifications as required under subsection 1.5.
 - 3. Detailed specifications for the equipment proposed.
 - 4. Manufacturer's certification, signed by a corporate officer of the Manufacturer, confirming that the proposed equipment fully complies with these specifications.
 - 5. General arrangement drawing(s) for the proposed equipment.
 - 6. Cut sheets for electric motors and ancillary items manufactured by others.
 - 7. Live bottom conveyor torque requirement calculations.
 - 8. Torque calculations for the gear reducer and reducer motor.
 - 9. Horsepower calculations for the drive motor(s).
 - 10. Spiral strength calculations using Mark's Handbook calculation for spring (spiral) compression and elongation showing the supplied spiral meets or exceeds spring effect intent specified herein.
 - 11. Complete schematic diagrams for electrical control panel(s) if applicable.
 - 12. Operations & Maintenance Manual
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in Manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For Sludge Storage Hoppers to include in operation and maintenance manuals.

1.4 GENERAL REQUIREMENTS

- A. Fabricate and assemble all equipment under this section in full conformity with this specification and as shown in the contract drawings.
- B. Furnish equipment complete with all supports; all mechanical equipment required for proper operation, including complete drive units; all steel and other metal construction specified herein; and all additional materials or fabrication as required by the Manufacturer's design.
- C. Unless otherwise noted:

1. All equipment included in this section shall be furnished by a single Manufacturer who shall be responsible for the design, coordination, and the satisfactory operation of the system.
 2. For optimum quality control, spirals furnished with the shaftless spiral live bottoms shall be produced from spiral manufacturing equipment actually owned by the hopper Manufacturer. Submittals shall include the Conveyor Manufacturer's certification, signed by a corporate officer of the Manufacturer, confirming that the proposed equipment fully complies with these specifications, including this requirement.
- D. Manufacturer must be able to demonstrate understanding of unique characteristics of sludge handling requirements by listing at least 5 sludge hoppers designed and fabricated by the Manufacturer in the past 5 years. In addition to listing the hoppers, provide contact information for the Owner of the hoppers.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers for fixed bins and hoppers shall be as follows:
1. SPIRAC, Inc.
 2. A & A Machine & Welding, Inc.
 3. Keystone Conveyor
 4. Or Equal.
- B. Any costs for redesign or additional materials required due to the specific features of the hoppers provided shall be the responsibility of the hopper Manufacturer.

2.2 MECHANICAL SCOPE OF SUPPLY

- A. The hopper and equipment supplied shall include the following:
1. W Troughs, & Liners
 2. Spiral Flighting
 3. Chutes
 4. End Shaft
 5. Leveling Augers
 6. Electric Motors & Gear Reducers
 7. Storage Bin Container
 8. Mounting and Support Structure
 9. Load Cells for Weighing Hopper Contents
 10. Rectangular Port Valves (Where Applicable)
 11. Motor Control Centers for each Hopper System (2 total)
 12. Safety Accessories
 13. Spare Parts
- B. Power supply to the equipment will be 230/460 volts, 60 Hz, 3 ph. Power supply for electrical controls shall be 120 volts, 60 Hz, single phase.
- C. Fabrication:
1. All welds to be continuous unless otherwise specified. Facing surfaces of field-welded components shall be beveled and match marked.
 2. Sharp corners of all cut and sheared edges shall be made smooth.
- D. All bolts, nuts, washers, and other fasteners shall be 316 stainless steel.

E. Surface Preparation

1. All iron and mild steel surfaces to be painted shall be dry abrasive blasted in accordance with SSPC-SP6 for external surfaces and SSPC-SP10 for internal surfaces, and in accordance with the painting section of these specifications. Surfaces shall be painted or hot dip galvanized within 24 hours to prevent rusting and surface discoloration.
2. Stainless steel shall be cleaned with mild abrasive wheels and/or nonferrous blast media to remove heavy scale and welding carbon and/or passivated with stainless steel cleaner then rinsed.

F. Painting - After surface preparation, ferrous metal surfaces, if any, except for the spiral flighting shall receive a minimum of one (1) coat of epoxy primer. Provide a total minimum dry film thickness of 3 mils prior to shipment to jobsite. Primer shall be compatible with the paint system specified for the equipment under Division 9 "High Performance Coatings" section of these specifications.

1. The spiral shall be furnished with one coat of shop primer only
2. Electric motors, gear reducers, electrical control panels, and other purchased sub-components shall be furnished with the Manufacturer's standard finish.
3. Stainless steel surfaces do not require painting.

2.3 PERFORMANCE AND DESIGN REQUIREMENTS

A. Design the shaftless screw live bottom system to meet the performance and design requirements listed below. Live bottom selection design standards to be based on the operational experience of the Manufacturer with shaftless screw conveyors and live bottoms, and not shafted screw conveyors. Shafted screw live bottoms will not be accepted due to blockage and bridging issues inherited with the shaft and the ability for the shaftless screw to handle the high torque required at start-up with a full bin.

B. Complete System Properties:

1. Required Dimensions:
 - a. Dryer Feed Hopper (1 Required):
Capacity: 40 Cubic Yards
Maximum Structure Height: 14 feet
Maximum Length (Including Discharge & Drives): 26 feet
Maximum Width (2 Units Combined): 18 feet
Discharge Min. Height: 30 Inches (From Finished Floor)
Cover Requirements: 200 psf loading, gasketed manway
2. Performance and Design Load:
 - a. Material Conveyed = Dewatered sludge
 - b. Density, average = 60 lbs/cu.ft.
 - c. Trough filling rate @ Design load = 100%

3. Live Bottom Design Requirements shall be as follows:

Live Bottom Hopper-Basis of Design	
Live Bottom Conveyor Position	Feed Hopper 1
Performance	
Material Conveyed	Sludge
Density, Average, lbs/cu. ft.	60
Cu. Yds/hr discharge rate	7.5
Max. Screw Speed, rpm	5
Trough Fill Rate @ Design Load	100
System Design	
Degrees Incline. Approx.	0
Feed Inlet From	See Drawing
Discharge Outlet to:	Pump
No. of Discharges	1
Discharge Type (axial or vertical)	Vertical
Conveyor Size (U or OK trough)	U500
Trough Width, I.D. Inches, min.	20
Trough Thickness, Inches, min.	3/16
Chute Thickness, Inches, min.	3/16
Port Shut-Off Valve Required?	Yes
Spiral O.D., Inches, min.	16
Spiral, Outer Thickness, Inches, min.	2.0
Spiral Pitch (full or 2/3)	Full
Spiral Insert	Yes
Liner Type	SPX
Liner Length, Ft, max	4
Liner Thickness, Inches, min.	9/16
Location of Drives	Push

Drive Hp, min.	3
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C. MATERIALS

1. Materials used in the fabrication of the equipment under this section shall conform to the following:

HOPPER MATERIALS OF CONSTRUCTION	
Live Bottom Conveyor Troughs & End Plates:	AISI 304 Stainless Steel
Spiral Flighting:	Special Chrome-Alloy Steel w/ Minimum 225 Brinnell Hardness
Wear Liner:	UHMW Polyethylene, Duraflo SPX two color
Storage Bins & Tops:	A36 Carbon Steel, Plates and Structural Shapes
Supports, Storage Bin:	A36 Carbon Steel & Structural Shapes
Hardware, Conveyor (SS to SS):	AISI 304 Stainless Steel
Hardware Conveyor (CS to SS):	Carbon Steel, Grade 8 Bolts, Plated
Hardware, Bin & Supports (CS to CS):	Carbon Steel, Grade 8 Bolts, Plated
Structural Steel Frame and Supports:	A 36 Carbon Steel

LIVE BOTTOM MATERIALS OF CONSTRUCTION			
MATERIALS OF CONSTRUCTION			
U Trough, lids, end plates & flanges	304 S.S.	304 S.S.	304 S.S.
Hardware	304 S.S.	304 S.S.	304 S.S.
Supports, vertical	A36 Carbon Stl.	A36 Carbon Stl.	A36 Carbon Stl.
Drive Shafts	1045	1045	1045
Bell-Housings	HDG	HDG	HDG
Liners	UHMW	UHMW	UHMW
Spiral	HTMAS	HTMAS	HTMAS

2.4 SHAFTLESS SCREW LIVEBOTTOM CONSTRUCTION

A. Spiral Flighting

1. Spiral flighting for the shaftless screw conveyors shall be designed to convey material without a center shaft or hanger bearings.

2. Spiral flights shall be cold-formed high strength chrome alloy steel with a minimum hardness of 225 Brinnell. The spiral flights shall be designed with adequate stability to prevent distortion and jumping in the trough. A second, inner spiral, concentric with the outside spiral shall also be provided. The torsional rating of the auger flighting shall exceed the torque rating of the drive motor at 150% of its nameplate horsepower. The "spring effect" of the spiral shall not exceed + 1.0 mm per 100 mm of length at maximum load conditions. The minimum outer spiral thickness shall be 2.0" to allow high torque start up with bins full and to withstand loads from the truck dumps.
 3. The spiral flighting shall be formed in sections from one continuous flat bar and shall be concentric to within ± 2 mm. Sectional flighting formed from plate shall not be permitted.
 4. Spiral flighting shall have full penetration welds at all splice connections. The flights shall be aligned to assure true alignment when assembled in the field and shall be made in accordance with the Manufacturer's requirements. The spiral flights shall be coupled to the end shaft by a flanged, bolted connection.
 5. Field welds of live bottom spirals will not be allowed.
- B. A gland packing ring consisting of two aramid fiber packing rings shall seal the drive shaft at its penetration through the endplate, along with a greased labyrinth sealing system.
- C. The connection of the spiral to the drive system shall be through a flanged connection plate that is welded to the spiral forming a smooth and continuous transformation from the flange plate to the spiral. The drive shaft shall have a mating flange and shall be bolted to the spiral connection plate. Additionally, a grease-lubricated labyrinth seal shall be shaft mounted internally in the conveyor between the backplate and spiral coupling connection.
- D. Hold Down Provisions: The live bottom conveyors shall be designed with the use of steel hold-down bars to positively hold the spirals in the trough section under high torque. The hold-downs shall be integral to the storage bin, but shall be of a replaceable design.
- E. Horizontal Live Bottom Troughs: Troughs shall be W (Twin U) shaped and be similar to the dimensional standards of CEMA 350 and enclosure classification IIE.
1. Each trough shall be equipped with an open top inlet and discharge openings as shown on the contract drawings. The open trough inlet shall be flanged and bolted to the bin. The discharge openings shall be flanged suitable for interconnection to automatic gates.
 2. The W troughs shall be similar to a double design of the Manufacturer's standard U trough, so that all spirals and liners are interchangeable with the standard U design. The twin U design troughs will be connected as closely as possible to the troughs' radius horizontal centerline as the layout permits. The bin sides shall have sufficient slope to allow sludge to fall into the live bottoms. The slope shall be 60° from horizontal or as shown in the contract drawings.
- F. Wear Liner: The inside trough surfaces of shaftless live bottoms shall be lined with a min. 9/16" thick (minimum) layer of two-color ultra-high molecular weight polyethylene UHMW-PE. The wear liner shall be SPIRAC Duraflo type SPX or Xylethon by Durawear. The liner shall be a single piece, formed and bonded with two (2) layers, each of a different color, to provide a visible indication when the liner is nearing the end of its useful life. The liner shall be supplied in maximum 3.3 foot long sections to provide ease of replacement. The liner shall be held in place with stainless steel clips; no fasteners will be allowed. Liners less than the specified minimum thickness shall not

be acceptable. The liner material shall have the following physical properties, as a minimum:

Property	Value/Unit	Testing Method
Density	61.2 lbs/ft ³	DIN53479
Molecular Weight	9.2x10 ⁶ g/mol	Margolies
Ball Indentation Hardness	5,946 lbs/in ²	DIN53456
Shore Hardness D	64	DIN53505
Crystalline Melting Range	278° F	
Dynamic Coefficient of friction	0.1-0.12 ratio of tension/load	Plastic to steel

2.5 LEVELING SCREWS

- A. For each bin/hopper one (1) nominal 14" U-shaped trough shall be integral portion of the bin top used to support the shaftless spiral leveling screw. The trough shall be provide five openings to allow even distribution of sludge in the storage bin. A bolted lid for the spiral trough shall be incorporated into the bin lid.
- B. The spiral shall be shaftless designed minimum of 1" thick with nominal 12" pitch and the liner shall be ½" thick and of two-color design the same as the live bottom spiral and liner.
- C. Each leveling spiral shall be driven at a nominal speed of 16 RPM with a 3 Hp integral reducer of the same design as the live bottom spirals.
- D. The leveling spirals shall be activated when the feed pumps are activated.

2.6 DRIVE UNITS

- A. Each spiral live bottom conveyor shall be driven by a variable-speed integral gear reducer/motor drive unit mounted to an adapter flange mounted to the endplate of the conveyor.
- B. The adapter flange shall allow the leakage of any material from the conveyor trough to atmosphere rather than into the gear reducer/ motor drive unit. Direct coupling of the gear reducer/motor drive unit to the end flange of the conveyor will not be acceptable.
- C. The drive unit shall be rigidly supported so there is no visible "wobble" movement under any operating condition. Due to the nature of bins to become fully loaded the drive system shall be designed, at a minimum, to start the conveyor from a dead stop with the trough filled at 100% plus added torque for the overhead load. It is the responsibility of the live bottom Manufacturer to show by calculation the drive system is of adequate design.
- D. Each drive motor shall be 230/460 volt, 60 Hz, 3 phase conforming to the General Equipment specifications, except as modified herein. Each motor shall be high efficiency, 40°C ambient rated, 1.15 service factor and shall have Class F insulation. Motor shall have a TEFC enclosure with Design B speed/torque characteristics. The motor is located in a 4 environment.
- E. Gear Reducers:
 1. All gears shall be AGMA Class II, single or double reduction, helical gear units with high capacity roller bearings. Bearings shall be designed for the thrust loads

from the fully loaded startup condition and shall have an AFBMA B-10 life of 30,000 hours.

2. The reducer will be air-cooled unit with no auxiliary cooling requirement. The gear reducer shall be sized with a torque service factor of 1.5 times the absorbed power or 1.1 times the motor nameplate, at the driven shaft speed, whichever is greater.

2.7 STORAGE BINS & GATES

- A. Furnish storage bins and hoppers with a minimum ¼" A36 HR carbon steel plate and reinforced with structural steel shapes as required to hold the specified material without bulging the tank sides. Bolts at the live bottom conveyor connection shall be easily accessible. Supply inspection, sampling or access ports as shown on the contract drawings (if applicable).
- B. Covers for storage bins shall be provided to withstand a minimum load of 200 lbs/ square foot. Support beams for cover are allowed provided they do not reduce capacity beyond amount specified. Flanged connections shall be provided as indicated in the contract documents. Vents may be provided as flange connection or welded to cover. Each cover shall be provided with a 24" x 24" access hatch for cleaning and maintenance.
- C. The storage bin manufacturer shall ship the bin to the fullest extent practical without incurring addition shipping costs. The bin may be a bolted or site welded design. The contractor is responsible for field erection of the bin and final assembly of the live bottom conveyors to the bin. The contractor is responsible for coordinating with the bin manufacturer on the required supports to be furnished by the contractor.
- D. Discharge chute gates shall be provided as follows:

HOPPER	REQUIRED DISCHARGE GATE
Feed Hopper No. 1	Rectangular Port Gate, Electrically Actuated

- E. Electro-Mechanically Operated Slide Gates:
 1. The slide gates shall be designed with a maximum vertical dimension of 4" excluding the electric motor operator. The slide gate shall be designed so that in the full, open position at least one pitch rotation of the spiral is exposed to the opening in the direction of transport and where layout permits 1.5 x spiral pitch opening. The slide gates shall have an opening at least the full width of the conveyor trough. The slide gates shall be fabricated entirely of AISI 304 (316 option) stainless steel and suitable nonmetallic (UHMW PE) components, all minimum 3/16" thickness. The UHMW PE shall have a machined groove to accept the gate blade and give a positive seal. Roller gates are not allowed due to increased and difficult maintenance requirements.
 2. The conveyor manufacturer shall provide electric motor operated gate operator by Rotork model IQ 10, Limitorque model MX 05, AMUA or equal approved equal. The actuator shall be NEMA 4 rated, have internal adjustable limit switches, and a manual override handwheel. The actuator shall be supported underneath the conveyor trough by supports designed and supplied by the conveyor manufacturer. Actuator BUS cards (if applicable) shall be furnished by the controls Manufacturer.

- F. Furnish single-ply flanged discharge boots at locations as shown on the drawings. The flexible boots shall be EPDM rubber hose, neoprene, Linatrilite by Linatex Corporation, or approved equal.

2.8 ELECTRICAL EQUIPMENT

- A. All electrical equipment shall conform to applicable standard of the National Electrical Manufacturers Association (NEMA) and the National Electrical Code (NEC). Both power and control equipment shall be insulated for not less than 600 volts even though operating voltages may be lower.
- B. All motors shall be totally enclosed, fan-cooled (TEFC), designed in accordance with the detailed motor specifications and suitable for operation with a 480 volt, 3 phase, 60 Hz. Power supply.
- C. Emergency Shutdown. Each live bottom bin shall be furnished with an emergency stop push button station to be installed accessible to personnel at base of hopper.
- D. Load Cell System - Each hopper shall be designed for measurement of weight utilizing a load cell under each support leg and weight transmitter. The hopper shall include provisions to replace and remove the load cell via a jacking and leveling element. The weigh elements shall be suitable for installation in an outside humid, corrosive environment. The design and construction of the weigh element shall satisfy seismic design loading requirements.
 - 1. Weigh element sensors shall be strain type and shall produce an output voltage which is proportional to the weight weigh elements provide continuous operation throughout a temperature of 40 to 110 to degrees F. The elements shall provide full temperature compensation through same range of 40 to 110 F and have an accuracy of 0.25 percent of rated capacity with a repeatability of 0.10 percent of rated capacity.
 - 2. The weigh elements shall be designed and installed so that the elements can be maintained or replaced. Element shall be shipped with restraints installed for protection during shipping and erection.
 - 3. The weight indicating transmitter (required for each feed hopper) shall have a digital display that indicates net, gross and tare weight shall have six digits, 3/8 -inch characters with range of 0 to 999,999 with two fixed zeros.
 - 4. The weight indicating transmitter shall have an isolated 4 to 20 mA DC signal proportional to the weight of the load capable and driving an impedance load of 0 to 500 ohms load without adjustments.
- E. Electronic Motor Overload/Trip. Each conveyor motor starter shall incorporate a solid state electronic motor overload/trip relay. The overload relay shall be self-powered and shall trip in 2 seconds or less under phase loss conditions when applied to a fully-loaded motor. The relay shall include a visual trip indicator and shall be equipped with a test button that operates the normally closed contact.
 - 1. In addition to overload protection, the electronic relay shall also trip upon sensing either a ground fault, nominally at 50% of FLA setting or when sensing a jam, when the motor current exceeds 400% of the FLA setting. Jam protection shall be disabled for 30 seconds during startup.
 - 2. Relay shall be Allen Bradley model SMP-2 or equal.
- F. Instrumentation
 - 1. Load Cells shall be incorporated into hopper design where indicated.

- a. Load cells shall be provided with programming and local display of volume for each hopper.
- b. A minimum of four load cells shall be provided with each hopper.
- c. Load cells shall have accuracy of +/- 100 lbs.
- d. Load cells shall have a safe load limit of 200% Emax.
- e. Load cells shall have an ultimate load limit of 300% Emax.
- f. Load cell system shall be designed for approximate sludge load of 57,000 lbs in addition to the weight of the hopper itself.
- g. Load cells shall be Advantage Weigh Module – LPRA as manufactured by Hardy Process Solutions or equivalent.
- h. Weight controller system shall be model HI 4050 as manufactured by Hardy Process Solutions or equivalent.

G. Control Panels/MCCs

- 1. Control panels shall be of the wall-mounted type with NEMA 12 Stainless Steel enclosure.
- 2. Provide Control Panels as follows for each hopper system as follows:
 - a. Main Circuit Breaker 3-Pole, molded case, UL-489
 - b. Power Distribution Block, Finger-Safe, Tin-Plated Aluminum, IP20, UL-508A/-94V0/-1953
 - c. Enclosure Air Conditioning (AC) unit shall be ISC, NEMA 12 (Stainless Steel), UL, 4800 BTUH,, AC unit size shall be able to dissipate the thermal heating load generated inside enclosure 3700 BTU under the worse external temperature 105°F, and maintain an enclosure inside nominal temperature not higher than 95 °F or the lowest upper limit of any panel mounted equipment, whichever temperature is lower. Enclosure shall be sized and equipped to adequately dissipate heat generated by equipment mounted inside or in the panel face.
 - d. VFD's - Powerflex 40 w/ Ethernet IP Comm Cards, Allen Bradley 22-COMM-E, Panel mount IP20, NEMA/UL Type Open
 - e. Motor Circuit Protection - Allen Bradley high break, fixed magnetic only, UL-508A Type-E
 - f. Ethernet Switch - Industrial Ethernet Switch, Unmanaged, 16Ports Copper, 10-35VDC @ 0.4A, UL-508 Class1 Div2, ATEX Zone 2, -40 to 75 degrees C, Alarm Relay Contact, DIN-Rail, 24VDC @ 0.27A Reversed Polarity Protection, Warrant 5 years, shall be Moxa EDS-316-T.
 - g. Control transformer for Power Distribution and Air Conditioner, UL Listed shall be Hammond PH1000MGJ. 1000 VA, Primary 208/277/380VAC, 1Ø, Secondary 120/240VAC, 1Ø at 4.17Amps. Secondary fuse mounting kit included. Primary fuse kit optional, Part # PFK3. Primary and secondary fuses, and fuse covers not included.
 - h. 24VDC Power Supply shall be SOLA SDN4-24-100LP. Input 85-264VAC @ 2/1A, 47-63Hz, Output 24VDC @ 3.8A. ATEX, UL-508, Meets NEC Class 2 no secondary fusing required, -10 °C to 60 °C no derating. 60 °C to 70 °C derating to ½ power. Class 1, Division 2, DC OK Signal, Indefinite short-circuit, over-voltage and over-temperature protection, Inrush current <20A, DIR-Rail. Input fuse 10A slow.
 - i. IO Communication – All Instrumentation should be landed and communicated to the Dryer Control Panel thru FLEX IO. Digital and analog Signals for the following:

- 1) Shutoff Rectangular Port Valves (supply and feedback signals for each feed hopper)
- 2) Analog from Load Cells for weight of Hopper
- 3) Analog Level Sensor at Pump Inlet
- 4) Analog In and Out for Livebottom VFD's and Positive Displacement Pumps

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, clearances, service rough-ins, and other conditions affecting performance of Installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install each hopper according to Manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 1. Perform installation and startup checks according to Manufacturer's written instructions.
 2. Test and adjust controls, alarms, and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Prepare test and inspection reports.

3.4 MANUFACTURER'S FIELD SERVICES

- A. The conveyor system Manufacturer shall furnish the services at site of a factory-trained representative for a period of three days in no more than two trips to the jobsite. Service shall be provided as necessary after the Contractor has installed the equipment. These services shall be furnished for the purposes of;
 1. The equipment manufacturer's inspection of the equipment following installation by others, and to certify that the equipment has been properly installed and is ready to operate, to train the Owner's personnel in the operation, maintenance of the equipment, and to observe and supervise the initial operation of the equipment.
- B. After inspection of the installed equipment the Manufacturer shall furnish a written report certifying that the equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting piping or anchorage, has been operated under full load conditions and that it operates satisfactorily.

3.5 MANUFACTUER'S WARRANTY

- A. The Manufacturer shall warranty the equipment furnished under this section to be free from defects in material and workmanship for a period of twelve (12) months.

END OF SECTION 41 52 13.13