

SECTION 11
CLARIFIER EQUIPMENT INSTALLATION

CLARIFIER EQUIPMENT INSTALLATION

Part 1 General

1.1 WORK DESCRIPTION

- .1 Remove the entire clarifier system inside the perimeter of the effluent launder including all related accessories such as the scum baffles, weir plates and scum box.
- .2 Install the 3 primary clarifier systems which will be supplied to the site by Eimco.
 - .1 Provide all field testing and commissioning services required to bring each clarifier back into service.
- .3 Work related to removal, refurbishment and reinstallation of each existing clarifier walkway and enclosure is covered in Division 5 and 9.

1.2 SCHEDULE

- .1 The City will shut-down operation of only one clarifier at a time.
- .2 The City will flush out the clarifiers with flushing water hoses before making them available for refurbishment.
- .3 The first clarifier will be flushed and available to the Contractor on July 1, 2008, plus or minus 3 days.
- .4 The second clarifier will be flushed and available for refurbishment after work on the first clarifier has been completed, tested and placed back into service, but not before August 1, 2008.
- .5 The third clarifier will be flushed and available for refurbishment after work on the second clarifier has been completed, tested and placed back into service, but not before September 1, 2008.
- .6 Once a clarifier is refilled it may take up to 2 weeks before the next clarifier is made available for refurbishment.
- .7 If a clarifier is not received by this contractor within 4 months of the dates listed in item 1.2.3, 4 and 5 above, the clarifier mechanism painter (WISL), will require storage charges. If applicable they shall be included in this contract.
- .8 The order in which the clarifiers are made available must be agreed to by the Contract Administrator.

Part 2 Products

2.1 EIMCO SUPPLIED MATERIALS

- .1 Eimco will be supplying the new clarifier mechanisms under Bid Opportunity – No. 361-2007. This Bid Opportunity document is available for review on the City’s website at <http://www.winnipeg.ca/finance/findata/matmgt/bidres/Past/2007.asp> .

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- .2 General information on the materials to be provided by Eimco is attached in Appendix A.
- .3 Eimco will provide fasteners required for assembly and installation of materials which they provide.

2.2 CONTRACTOR SUPPLIED MATERIALS

- .1 Provide shims, grout, temporary power and water, and other accessories not provided by Eimco as may be required to install their equipment and perform testing and provide a complete working clarifier system.

Part 3 Execution

3.1 REMOVE EXISTING CLARIFIER SYSTEM

- .1 See photos of existing clarifier systems attached as Appendix C to assist in assessing the work involved in removing them.
- .2 As each clarifier is taken out of service, coordinate walkway removal with scum trough removal as the trough is supported by the walkway.
- .3 Remove weirs and scum baffles. Cut bolts in concrete flush with existing concrete and apply protective paint.
- .4 Remove scum trough, scum box, scum blades, sludge rake arms, steel centre cone, drive system and other clarifier accessories.
- .5 Remove residual grout on concrete centre cone down to existing concrete.
- .6 Cut all existing bolts flush with existing concrete and apply protective paint.
- .7 Take care not to damage concrete during clarifier system removal. Repair any concrete damaged during equipment removal.
- .8 Dispose of oil in existing clarifier mechanisms.

3.2 INSTALL NEW CLARIFIER SYSTEM

- .1 Coordinate delivery schedule of clarifier systems to the site directly with Eimco in written or email form. Keep the Contract Administrator advised as to arrangements being made.
- .2 Eimco will be storing major clarifier components requiring painting at WISL's facilities in Winnipeg until delivery to site is requested. Their contact information follows:

Al Schmidt
Western Industrial Services Limited (WISL)
300 Dawson Road,
Winnipeg, MB
(204) 956-9475

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aschmidt@wisl.ca

- .3 Receive Eimco materials on-site. Unload material from delivery vehicles.
- .4 Field Procedures for Unloading and Installation of Clarifier Components
 - .1 At all times during the unloading and installation of clarifier components, take precautions to minimize damage to the protective coating. No metal tools or heavy objects shall be permitted to come into contact with the finished coating except where fastening is required. Workers shall be permitted to walk on the coated surfaces only when necessary, in which case only shoes with rubber or composition soles and heels shall be worn.
 - .2 **Hoisting.** Coated articles shall be hoisted using wide-belt or cloth slings. Chains, cables, tongs, or other equipment that causes damage to the coating will not be permitted; nor will dragging or skidding of the articles.
 - .3 **Protection during welding.** An 450 mm wide strip of heat resistant material shall be draped over the top half of the coated article on each side of the weld area during welding to avoid damage to the coating. No welding ground shall be made on the coated part of the article.
 - .4 **Protection during installation.** Shield materials approved by the Contract Administrator shall be used on the underside and ends of all articles being installed to protect them from damage due to dragging or coming into contact with concrete or other adjacent surfaces.
- .5 When accepting Eimco material on-site, the Contractor, Eimco and the contract Administrator shall be represented. Confirm material lists of delivered equipment. Note shortages or damage to material delivered. Determine how each deficiency will be resolved directly with Eimco. Facilitate and support resolution of each item. Keep the Contract Administrator informed as to actions being taken and obtain his approval before proceeding.
- .6 Once accepted by the Contractor, the Eimco material shall be either installed directly in the clarifier or appropriately stored until ready for installation. In either case the Contractor shall be responsible for care of the equipment until Substantial Performance is achieved.
- .7 Any material shortage or damage noted after the material has been accepted by the Contractor, will be the Contractor's responsibility. The Contractor shall resolve these issues, including payments, directly with Eimco, again keeping the Contract Administrator informed and obtaining his approval for arrangements made.
- .8 Install clarifier systems in accordance with instructions provided by Eimco. Sample installation/erection instructions taken from a similar project, are attached in Appendix B. These instructions along with project specific information attached in Appendix A, shall be used to estimate clarifier installation costs.
- .9 Once the Bid Opportunity is awarded, install instructions and erection drawings specific to this project will be provided. These instructions and drawings shall be used to perform the installation work. No extra will be permitted due to variations between the sample instructions in Appendix B and project specific install instructions and erection drawings issued after contract award.
- .10 Obtain site benchmark elevation from Contract Administrator as required for the clarifier system installation.

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- .11 Provide new grout, shims, and gaskets as required to provide a complete installation.
- .12 If materials do not fit as required, or quantities are short, resolve these issues including payment for any remedial work required directly with Eimco. The Contract Administrator must review all arrangements affecting the Eimco Contract or this Refurbishment Contract before any action is taken.
- .13 Coordinate clarifier system installation with the covered walkway installation. Support the scum trough from the walkway. Install electric scum trough drive.
- .14 Following inspection of the completed system by Eimco, make adjustments as required to obtain acceptance of each clarifier installation by Eimco and the Contract Administrator.
- .15 Remove and dispose of storage oil as applicable. Install all lubricants as per Eimco requirements.
- .16 Obtain permission from the Contract Administrator before operating the clarifier drive system.
- .17 Contact Eimco for clarifications or additional install information as required.
- .18 Any damage to painted systems must be repaired to the highest standard. This will involve sand blasting and repainting. Repainting damaged materials must be done at acceptable space temperatures.
- .19 Provide heating and hoarding as required to meet welding requirements and to permit high quality painting repair which will have resulted from material handling.
- .20 Note touch-up paint may take 10 days to cure at 10⁰C before it can be submerged and the clarifier tested under operating conditions and then placed back in service.
- .21 Be aware of Eimco equipment warranty concerns regarding their turntable and possible contamination from sandblasting required for touch-up painting, or other sources of on-site contamination. See Appendix A for details.
- .22 Confirm/verify to the Contract Administrator that weir plates, scum trough, feedwell and other equipment has been installed to critical elevations and tolerances.

3.3 TESTING, COMMISSIONING

- .1 Perform equipment alignment and testing as specified by Eimco and in these specifications.
- .2 Rotate equipment at intervals specified by Eimco.

END OF SECTION

SCUM DISPOSAL SYSTEM

Part 1 General

1.1 SUMMARY

- .1 Provide one partially submerged shaftless screw conveyor for conveyance of collected scum. The equipment shall be able to convey the scum to the waste bin as indicated on the contract drawing 1-0101P-M0006-001. The screw conveyor shall be able to convey sewage scum with bulk density of 1040kgs/m³ (65 lbs./ft³) with 1.5 to 5% solids content at a volume flow rate of .5 m³/hr.
- .2 The drawing that show the screw conveyor equipment is general in nature and are not intended to show exact detail. The Supplier shall work closely with the Contractor to resolve the detailed features and dimensions of the equipment and associated equipment and tanks provided by the Contractor.
- .3 Provide appurtenant fittings or materials necessary for the complete operation of the equipment.
- .4 Provide system complete with all drives, supports, controls, and all other appurtenances specified or required for proper operation.
- .5 Equipment provided under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by the Contract Administrator.
- .6 All conveyor systems are to be suitable for installation in Class 1, Div 2, Group D environment
- .7 Provide a scum disposal bin.

1.2 REFERENCES

- .1 Following is a list of standards referenced in this specifications:
 - .1 Anti-Friction Bearing Manufacturers' Association (AFBMA):
 - .1 Load Ratings and Fatigue Life for Ball Bearings.
 - .2 Load Ratings and Fatigue Life for Roller Bearings.
 - .2 American Society for Testing and Materials (ASTM):
 - .1 A48 Standard Specification for Gray Iron Castings.
 - .2 A576 Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
 - .3 American Iron and Steel Institute (AISI):
 - .1 316 Stainless Steel.
 - .2 416 Stainless Steel.
 - .3 1018 Steel.
 - .4 1045 Steel.
 - .5 4140 Alloy Steel.

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- .4 American National Standards Institute (ANSI):
 - .1 Cast Iron Pipe Flanges and Flanged Fittings, Class 125.
- .5 Province of Manitoba Occupational Health and Safety Act.
- .6 National Electrical Manufacturers Association (NEMA):
 - .1 MG 1-1.2.06 Testing Requirements.
 - .2 MG 1-12.5 Dynamic Balance of Motors.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with CW 1110.
- .2 Shop Drawings
 - .1 Certified process Mechanical drawing with general arrangement showing principal dimensions and weights of the shaftless screw conveyor, trough dimensions, flight diameter, spiral pitch, inlet and discharge connections sizes, motor drive, conveyor support size and location, and other information required for the installation of the equipment and accessories as a complete system.
 - .2 Summary of shaftless screw conveyor performance to confirm compliance with the specifications. Provide information on the following when operating at full load: shaft power, power input to electric motor, capacity.
 - .3 Motor data sheet showing nameplate markings which meet NEMA and UL/CSA requirements.
 - .4 Drawings of control panel including door layout, interior layout, electrical ladder diagram, interconnects to all components outside of panel, and structural and mounting details.
 - .5 Electrical single line diagram showing all power requirements.
 - .6 Wiring diagrams on all ancillary components, including motion sensors and other devices for safety and electrical controls.
 - .7 Operating description for the equipment and control panel, covering all logic and sequence of operation.
 - .8 List of spare parts provided.
 - .9 List of special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
 - .10 Sample nameplates for shaftless screw conveyor and motor.
 - .11 Bill of materials.
 - .12 List of configurable parameters c/w factory default settings, settings as shipped, and blank spaces for each field adjustable value.
- .3 Product Data
 - .1 Catalogue cut or equipment data sheets showing manufacturer's complete descriptive information which includes, but is not limited to, product literature, equipment make and model, material of construction, weight of product, electrical requirements, electrical and mechanical components for the collective system and individual components including motors and instrumentation and control devices.

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- .2 Cross sectional details of each shaftless screw conveyor showing major components and material of construction.
- .3 Mechanical seal details with material list and lubrication requirements (seal water flow and pressure if required) and connection sizes.
- .4 Quality Control
 - .1 Certified data on characteristics and performance of each shaftless screw conveyor.
 - .2 Factory Functional and Performance Test Reports.
 - .3 Material certificates and mill test reports.
 - .4 Field Functional and Performance Test Reports.
 - .5 Certificate of Proper Installation.
- .5 Operating and Maintenance Manuals.
 - .1 Submit 3 sets of operating and maintenance manuals.
- .6 Unit Responsibility
 - .1 The Work requires that the equipment complete with all accessories and all appurtenant work be the end product of one responsible system supplier. The system supplier shall assume the responsibility for mating motor to obtain the performance specified. The system supplier shall furnish all components and accessories of the system as necessary to ensure compatibility, ease of operation and maintenance, and to place the equipment in operation in conformance with the specified performance, features, and functions without altering or modifying the Contractor's responsibilities under the Contract Documents. The Contractor is responsible to the The City for providing the equipment system as specified herein.
 - .2 The Contractor shall coordinate the design of the conveyor discharge chute with the waste bin.

Part 2 Products

2.1 Screw Conveyor

- .1 General
 - .1 Shaftless Screw Conveyor Construction
 - .1 The shaftless screw conveyor equipment shall include the following:
 - .1 Trough, Liners
 - .2 Spiral Flighting
 - .3 End Shaft
 - .4 Electric Motor & Gear Reducer
 - .5 Mounting and Support Structure
 - .6 Safety Accessories
 - .7 Spare Parts
 - .2 Select and design the equipment specified herein specifically for continuous or intermittent duty handling concentrated solids, rags, grit and fibrous materials derived from municipal wastewater treatment.

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- .3 Provide equipment that is non-overloading and operates without vibration, heating or damage when operating at the specified operating conditions.
 - .4 Conveyor shall be capable of being cleared of material and shall continuously be able to remove material that would otherwise cling to walls of trough.
 - .5 Conveyor shall not spatter or drip.
 - .6 Fabrication: All welds to be continuous unless otherwise specified. Facing surfaces of field-welded components shall be beveled and match marked. Field welds at the jobsite by the Contractor for installation may be necessary when any overall conveyor length presents shipping or handling constraints. All welded joints shall be sealed watertight by continuous welds.
- .2 Performance and Design Requirements:
- .1 Design the shaftless screw conveyor system to meet the performance and design requirements shown in the conveyor schedule at the end of this Section.
- .3 Service Conditions
- .1 The scum conveyor will receive scum in the bottom, and convey the material to the waste bin as indicated on the Contract Drawings.
 - .1 Scum may include a combination of grease balls, scum or other sticky materials and large organic particles.
- .4 Materials
- .1 Materials used in the fabrication of the equipment under this section shall conform to the following:
 - .1 Chutes, Stuffing box, Troughs, End Plates, Hoppers, Supports: AISI 316 stainless steel
 - .2 Spiral Flighting: Special Chrome-Alloy Steel with minimum 22 Brinnell Hardness
 - .3 Wear Liner: BioWear UHMW liners.
 - .4 Hardware: AISI 316 stainless steel
 - .5 Gaskets: Neoprene, 50 durometer, 1/8inch thick
- .5 Shaftless Screw Conveyor
- .1 Spiral Flighting
 - .1 Spiral flighting for the shaftless screw conveyor 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 220 Brinnell, a minimum yield strength of 450 N/m and a minimum tensile strength of 600 N/m.
 - .3 The spiral flights shall be designed for the maximum torque requirements specified. The spiral flights shall be designed with adequate stability to prevent distortion and jumping in the trough under maximum load conditions. 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 250% of its nameplate horsepower. The

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- "spring effect" of the spiral shall not exceed + 0.0039 mm per 100 mm of length at maximum load conditions. The minimum outer spiral thickness shall be 20 mm for spiral diameters up to 225 mm and 25 mm for spiral diameters exceeding 225 mm.
- .4 The spiral flighting shall be formed in sections from one continuous flat bar with a minimum thickness of 20 mm and shall be concentric to within 1.3 mm. Sectional flighting formed from plate shall not be permitted.
 - .5 Pitch measured between flights, measured at outside diameter of screen flights, along and straight lines parallel to axial centerline through 0°, 90°, 180° and 270° positions shall not vary from design pitch by more than $\pm 2\%$ of outside diameter of screw flights.
 - .6 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 supplier's requirements. The spiral flights shall be coupled to the end shaft by a flanged, bolted connection.
- .2 A gland packing ring consisting of two teflon fiber packing rings shall seal the drive shaft at its penetration through the end plate, along with a greased labyrinth sealing system.
 - .3 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 back plate and spiral coupling connection.
 - .4 Hold Down Provisions: In order to avoid excessive wear and increased maintenance due to excessive vertical movement of the spiral flights, the conveyors shall be designed with hold down provisions at the midpoints and other points as required. Hold down provisions shall be of the welded steel construction supported by the conveyor troughs. Hold down provisions shall not interfere with the flow of conveyed product.
 - .5 Troughs:
 - .1 Troughs shall be U-shaped and similar to the dimensional standards of CEMA 350 and enclosure classification IIE.
 - .2 Troughs shall be fabricated from AISI 316 stainless steel plate with a minimum thickness of 3/8inch.
 - .3 Covers shall be furnished for any portion of each trough that is not covered by the filling section. Covers shall be manufactured in maximum 1.5 m length section to allow for easy access and ease of liner replacement.
 - .4 Covers shall be fabricated from AISI 316 stainless steel plate with a minimum thickness of 2.65 mm.
 - .5 The trough shall include a stainless steel expanded metal mesh screen at the submerged section to allow flow through of water. This trough/screen section shall be removable to facilitate cleaning of the conveyor.
 - .6 Wear Liner:
 - .1 Wear Liner Assembly The inside trough surfaces of the conveyor shall be lined with a layer of BioWear ultra high molecular weight polyethylene UHMW-PE. The liner shall be a single piece, formed and bonded with two

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(2) layers of the same material, each of a different color, to provide a visible indication when the liner is nearing the end of its useful life. Liners with a second layer of different material are not acceptable. The liner shall be removable and supplied in maximum 1.0 m long sections to provide ease of replacement. The liner shall be held in place with stainless steel clips; fasteners shall not be acceptable. Liner thickness shall be at a minimum 9.5 mm for vertical conveyors; 12 mm thick for spirals up to 350 mm diameter, and 16 mm thick for larger spirals. Liners less than the specified minimum thickness and molecular weight shall not be acceptable.

.6 Conveyor Supports:

- .1 Each conveyor shall be furnished complete with supports suitable for mounting as shown on the contract drawings and as required by the supplier's design. The supports shall be fabricated from of 316 stainless steel structural angle, minimum 10 mm thick.
- .2 The supports shall be shop fabricated from structural steel shapes and plates, and shall be assembled and fitted to the conveyor prior to its delivery to the jobsite. Provide saddle type supports shaped to the profile of the conveyor trough. Supports and conveyor segments shall be match marked and shipped to the jobsite for assembly by the Contractor. The manufacturer shall allow for 25 mm of grout beneath each support foot pad for the Contractor to compensate for uneven floor elevation. At a minimum, each conveyor shall be provided with supports spaced not greater than 3.0 m centre-to-centre at the inlet and discharge end, with intermediate supports as required.
- .3 All structural supporting members shall be designed such that the ratio of the unbraced length to least radius of gyration (slenderness ratio) shall not exceed 120 for any compression member and shall not exceed 240 for any tension member (of angles about Z axis). In addition, all structural members and connections shall be designed so that the unit stresses will not exceed the American Institute of Steel Construction allowable stresses by more than 1/3 when subject to loading of twice the maximum design operating torque of the screw conveyor drive motors. The supports shall be designed to prevent excessive vibration of any portion of the conveyor unit under all loading conditions.
- .4 All shop welding shall conform to the latest standards of the American Welding Society (AWS). The supports shall be designed to avoid interference with other equipment or equipment supports.

.7 Chute

- .1 Furnish discharge chute of the same gauge and construction material as the conveyor troughs, at locations as shown on the drawings. Flanges shall be a minimum 5 mm thick.

.8 Drive Support Assembly:

- .1 Provide a drive support assembly for mounting the conveyor drive external to the primary clarifier tank. Design drive support assembly to fit within the space constraints indicated on the Contract Drawings.

.9 Drive Units

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- .1 Each spiral conveyor shall be driven by a constant-speed gear reducer motor drive unit mounted to a bellhousing adapter flange mounted to the end plate of the conveyor.
- .2 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 shall not be acceptable.
- .3 The drive unit shall be rigidly supported so there is no visible "wobble" movement under any operating condition. In the event of a prolonged power failure or emergency system shutdown the drive system shall be designed, at a minimum, to start the conveyor from a dead stop with the trough filled at 2 times the design load.
- .4 Drive and End Shafts: Construct from SAE 4140, 2025, ST-50, ST-60 shaft steel. Provide flanged ends and mating bolt holes to match conveyor rotor center to be flanged end plates.
- .5 Electric Motor: The motors shall be 5HP, 600 volt, 60 Hz, 3 phase and shall be explosion proof and shall be suitable for Class I, Division II, Group D locations.
- .6 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 100,000 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.
 - .3 The gear housing shall be of 30,000 psi cast iron, with removable inspection covers, oil breathers, oil level indication, fill and drain holes with plugs, and gearing lubricated through an oil bath for the mounting position and inclination required.
- .10 Safety Devices and Electrical Controls
 - .1 Motion failure alarm unit: A motion failure alarm, utilizing either a submersible motion sensor or an electronic motor monitor, and conforming to the specifications below, shall be utilized in the conveyor design to detect spiral drive or shaft failure:
 - .1 Submersible motion sensing
 - .1 Specifically designed for sensing the rotation of submerged screw conveyors
 - .2 Provide one sensor.
 - .3 Provide adequate cable length to and from sensor and control panel, and all necessary mounting brackets.
 - .2 Electronic motor monitor
 - .1 Electronic motor monitor shall be employed to measure the "spiral turning" and "conveyor empty" amp reading.
 - .3 UL/CSA approved suitable for Class 1, Division 2, Group D hazardous areas.

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- .4 Suitable for 120 VAC, single phase, 60 hz power supply with adjustable time delay.
- .5 Dry contacts rated minimum 10 Amps, 120 VAC for interlocking and alarms.
- .6 Provide wiring in accordance with Division 26.
- .2 Electronic Motor Overload/Trip. Each conveyor motor starter shall incorporate a solid state electronic motor overload monitor that meets or exceeds NEMA protection Class IP20. The overload monitor shall be self powered and shall alarm at four set points; maximum overload warning, maximum overload alarm, minimum underload warning, minimum underload alarm. The monitor shall be capable of inhibiting a pre-alarm signal during start up load conditions. The alarm response delay will be adjustable from 0.01 to 3.0 seconds. All alarm setting and reset shall be easily adjustable by push button keypad and coded alarm conditions will be visible on an LED window, both on the accessible on monitor front panel.
- .11 Control Panel
 - .1 Provide one (1) control panel.
 - .2 Enclosure shall be NEMA 4X, 304 stainless steel construction, and shall be suitable for wall mounting. Doors shall have corrosion-resistant hinges and latches.
 - .3 Instrumentation and Controls: In accordance with the component qualities below. Provide panels and controls as follows:
 - .4 Suitable for 600 VAC 3 phase supply.
 - .5 Panel to contain all operator interface and local control devices and circuit breakers.
 - .6 Provide a single 600 volt breaker with a through the door lockable handle for the power supply.
 - .7 Control Components: Operate on 120-volt ac power.
 - .8 Provide terminals in the control panel. All equipment shall be wired to the control panel.
 - .9 Provide pre-wired control components.
 - .10 Ship control panel loose for installation on wall near the machine.
 - .11 Provide a thermostatically controlled heater.
 - .12 Provide a motor protection breaker type combination starter.
 - .13 Provide complete motor thermal protection.
 - .14 Provide an alarm beacon Light (with red lexan cover & metal guard) on top of the panel.
 - .15 Provide the following on the control panel door
 - .1 Conveyor LOCAL- REMOTE two position selector switch, with pad lockable handles.
 - .2 Conveyor Run (red) (push to test type).
 - .3 Motor Overload Alarm light (amber) (push to test type).
 - .4 Spiral shaft Alarm light (amber) (push to test type).
 - .5 Emergency stop pushbutton.

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- .6 Start and Stop pushbuttons for manual operation of conveyor from the control panel.
- .7 Non-resettable elapsed time meter.
- .8 Digital power (kW) meter.
- .9 Reset pushbutton to reset alarm lights for conveyor alarms.
- .16 Provide the following devices:
 - .1 Overload relays.
 - .2 Isolated contacts for the following:
 - .1 Output: "Remote selected" status
 - .2 Output: Running status
 - .3 Output: Motor overload alarm
 - .4 Output: Spiral/Shaft Failure alarm
 - .5 Output: Emergency stop pushbutton activated
 - .6 Input: Remote start/Stop (2 wire control)
 - .17 In the remote mode, conveyor start and stop function will be from remote (SCADA) isolated contact relays.
 - .18 Identify all wiring and terminals. Provide drawing pocket inside the panel.
- .12 Accessories
 - .1 Equipment Identification Plate: Type 304 stainless steel identification plate securely mounted on each separate equipment component in a readily visible location. Plate shall bear engraved black enamel filled block type identification number and letters.
 - .2 Lifting Lugs: Provide lifting lugs for handling of equipment.
 - .3 Anchor Bolts: Type 316 stainless steel, sized by equipment manufacturer, 1/2inch minimum diameter.
- .13 Spare Parts
 - .1 Furnish the following spare parts as a minimum:
 - .1 One (1) Packing gland set, for each conveyor supplied
 - .2 One (1) Liner set.
- .14 Source Quality Control
 - .1 The shaftless screw conveyor Vendor shall provide certified data for the following tests and submit for approval before equipment is released for shipment.
 - .1 Factory Tests and Adjustments: Test all equipment furnished.
 - .2 Factory Test Report: Include test data sheets and test results to substantiate specified tolerances and other material requirements.
- .15 Acceptable Manufacturer: BioSec Enviro Inc. (Supplier: Mequipco) or ML Separation & Conveying Inc. (Supplier: EDA Environmental Ltd)

2.2 Scum Disposal Bin

- .1 Provide one scum disposal bin of painted steel construction. The bin shall be approximately 1.5 x 1.5 1.0 meter high.

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- .2 It shall have a nominal capacity of 1.5 cubic meters.
- .3 The bin shall be suitable for lifting and transporting using a forklift.
- .4 The bin shall have tilt and dump mechanism to permit the bin to be dumped. The system shall be spring loaded to permit the bin to return to its normal position once it has been emptied.
- .5 Use standard commercial product manufactured by Bruder Built or equal.

Part 3 Execution

3.1 Surface Preparation and Shop Painting

- .1 All iron and mild steel surfaces to be painted shall be dry abrasive blasted in accordance with SSPC-SP6, and in accordance with manufacturer's recommended paint 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.
- .3 Machine surfaces that are not painted shall be protected by coating of grease.

3.2 Installation – General

- .1 Install all equipment in accordance with the manufacturer's details and recommendations.

3.3 Field Quality Control

- .1 Alignment:
 - .1 The Contractor shall test complete assemblies for proper alignment.
 - .2 Test with complete unit (including rotating assembly, couplings, and motor) installed and discharging to the connected conveyance systems at rates specified.
 - .3 If unit exhibits vibration in excess of limits, adjust or modify as necessary. Unit which cannot be adjusted or modified to conform as specified shall be replaced.
- .2 Performance Test
 - .1 Demonstrate that each conveyor is capable of its specified functions.
 - .2 Test for a continuous 3-hour period without malfunction.
 - .3 Test and record the following:
 - .1 Driving motor voltage and amperage measured for each phase, under full operating load.
 - .4 Adjust, realign, or modify units, and retest.

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3.4 Manufacturer's Service

- .1 The Equipment Manufacturer is to provide an experienced service representative for start-up testing, commissioning and training.
- .2 Provide, as a minimum, the following field services:
 - .1 1 person-day, 1 trip for installation assistance and inspection.
 - .2 1 person-day, 1 trip for functional and performance testing.
 - .3 1 person-day, 1 trip for facility training and startup.
 - .4 Certificate of Installation

END OF SECTION