

ADDENDUM NO. 1

WEST KNOX UTILITY DISTRICT
KARNS WASTEWATER TREATMENT PLANT MODIFICATIONS
GRW ENGINEERS, INC. PROJECT NO. 3433-15

BID OPENING DATE: MARCH 20, 2018 (TUESDAY) @ 11:00 A.M.

DATE OF ADDENDUM: MARCH 14, 2018

1. General Project Approach:

Flow data from the existing Karns WWTP indicates flows ranging from a dry weather average daily flow of approximately 3.0 MGD to an average daily flow slightly over 4 MGD. Peak wet weather flows can be greater than 12 MGD but peak flows should be limited to approximately 6 MGD during normal weather conditions with minimal rainfall. The Contractor shall be responsible for any temporary bypass pumping required when connecting to existing force main or modifying the existing influent pumping station. Provisions for bypass pumping shall include making allowances for maintaining traffic flow in and out of the WWTP facility. The Contractor should schedule any work requiring bypass pumping during an extended dry weather forecast period and shall be prepared to place the existing facility back into operation ASAP if conditions change. The Contractor shall be allowed to bypass the existing drum screens during bypass pumping but shall minimize the time required by careful planning, scheduling multiple crews, etc.

According to WKUD operating personnel, the existing 24" x 48" sluice gate shown in the existing wetwell is operable and should allow for separation of the wetwell compartments during normal flow conditions.

2. Additions to Project Scope:

- A. The Contractor shall clean out the existing wetwell by removing any and all sediment and debris.
- B. The Contractor shall rotate the existing sludge conveyor 180 degrees from its existing position. The Contractor shall provide required supports for the conveyor and shall also install a 15' wide by approximately 25' long by 12" thick concrete slab with #5's at 12" OCEWEF for the sludge dumpsters. The existing curb shall be removed across the entrance to the pad which shall be poured flush with the roadway. WKUD personnel will disconnect and reconnect the electrical wiring to the conveyor motor to facilitate the work.

C. The Contractor shall demolish and remove from the site the existing steel amendment silo. The Contractor shall be allowed to use the support legs from the silo (with appropriate cross beams added) for support of the conveyor if feasible.

D. The connection to the existing 16" force main shown on Drawing C-00-101 shall also include a new 16" plug valve on the new line prior to the 16" x 24" increaser. If the Contractor desires to make this connection while keeping the existing force main in service, the Contractor may install an insertion valve (suitable for working pressures of 200 psi; Advanced Valve Technologies, Inc., EZ2TM or approved equal) in the existing line and use a tapping sleeve and valve for the new line.

3. Specification Section 00410 – Bid, Paragraph 6.01 – Time of Completion, and Section 00500 – Agreement, Article 4, Paragraph 4.02:

Change the time for substantial completion from 360 to 420 calendar days and the time for final completion from 420 to 480 calendar days. A revised Bid form is attached as part of the Bid packet for the General Contractors.

4. Specification Section 11288 - Stainless Steel Gates:

Add the attached specification Section 11288 to the documents.

5. Specification Section 11330 – Open Channel – Electric Grinder with Rotating Screen Drums:

Add the attached specification Section 11330 to the documents.

6. Specification Section 15086 - Duct Insulation and Drawing H-00-001 - Note 38; add Notes 40 and 41:

40. Delete the duct insulation and jacketing in Building/Structure 01 (the existing influent pump station).

41. Delete the duct insulation and jacketing in Building/Structure 02 (the new transfer pumping station), except for the duct connecting outside air louvers to heating and ventilating (HV) units.

7. Specification Sections 16050 – Basic Electrical Materials and Methods, Paragraph 1.02 B:

The Generator and Automatic Transfer Switch furnished by the Owner will be delivered to the job site by the supplier (Stowers Power Systems) for off-loading

by the Contractor. The weight of the generator package is anticipated to be in the range of 65,000 pounds.

8. Specification Section 16230 – Standby Power Generator Systems – Fixed, Paragraph 3.01.F:

The generator package furnished by the Owner for installation by the Contractor will include the stairs and platform. The Contractor shall coordinate with the final shop drawings for the required final dimensions of the generator pad.

9. Drawing C-00-101 and Drawing E-00-101:

The note on Drawing C-00-101 referring to the existing electrical trench in the footprint of the new structure has already been addressed by the Owner by relocating the conduit and wiring to an alternate location. No relocation work is required.

10. Drawing C-00-101 and Drawing C-00-401:

Due to the extensive nature of the work in the area around the new transfer pumping station, the expectation is that the existing pavement will be removed and/or damaged to the extent that it will need to be replaced. The Contractor shall rebuild and pave the entire area shown as existing pavement in the immediate work area, including the entrance road from the connection to the existing force main. The thickness of base stone and asphalt shall be as shown on the Pavement Drive Section on Drawing G-003, except that the geotextile fabric shall not be required. The drive section of the repair shall blend smoothly with the existing pavement. The Contractor shall also be responsible to repair any other damage caused by the Contractor's work/equipment.

11. Drawing C-02-301:

The beam hoist with trolley referred to on the Drawing shall be a Yale Model YL ITG ATEX 3000 (3 ton) chain operated hoist with integrated geared-type trolley, double fall, spark resistant, copper coated suspension and load hooks, SS load chain and hand chains for a minimum 12' lift, and bronze trolley wheels, or approved equal.

The 8" piping, including the two lever operated 8" plug valves (shown but not called out), to and from the odor control skid unit shall be furnished by the Contractor. The scope of piping by the odor control system supplier should end at the base tee on each end of the saturator skid. The Contractor shall verify the scope of supply by the supplier.

12. Drawing C-02-502:

Note K refers to the drain line tying into an existing 12" drain pipe; the drain is shown on the site plan to tie into the new 8" drain near the vault structure, which is correct. In addition, the Contractor shall furnish and install an inline APCO 100 rubber flap check valve (with SS bolting for buried service) in the 4" drain line to prevent reverse flow into the vault. Flange adapters shall be furnished for connection to the valve.

13. Drawing C-03-101, Drawing P-02-102 and Electrical Power Plans for Structures 02 and 03:

The Contractor shall heat trace and insulate the water lines for flushing connections on the wastewater screens and the grit washer, and the exposed discharge piping between the grit pump and Structure 02. Electrical requirements are as follows:

- A. Contractor shall furnish and install new 20-ampere/1-pole circuit breaker at Panelboard 2-LA (circuit 2-LA-17) for power connection to heat tracing at water lines to Screens and Grit Washer. Contractor shall utilize 2#12, 1#12 ground in a ¾" conduit for branch circuit conductors. Please note all wiring within a 10' envelope of each Screen and Grit Washer are designated as a Class I, Division 2 hazardous location. All heat tracing and wiring methods within the hazardous location shall meet the requirements of NEC Article 500 and 501.
- B. Contractor shall furnish and install new 20-ampere/1-pole circuit breaker at Panelboard 2-LA (circuit 2-LA-19) for power connection to heat tracing at the discharge line from the Grit Pump. Contractor shall utilize 2#12, 1#12 ground in a ¾" conduit for branch circuit conductors. Please note all wiring within a 10' envelope of the Grit Equipment and open channel is designated as a Class I, Division 2 hazardous location. All heat tracing and wiring methods within the hazardous location shall meet the requirements of NEC Article 500 and 501.

14. Drawing C-03-301:

The valve shown on the grit pump discharge is an actuated pinch valve which should be furnished by the grit system supplier to be installed by the Contractor.

15. Drawing S-00-001, Cast-In-Place Concrete, Note 4:

Clarification: All structural concrete shown on the structural drawings shall be with the 5000 psi mix indicated. Other civil features separate from the structure indicated in other divisions and specified with other concrete mix strengths may be furnished as specified. For purposes of consistency and since the volume of

concrete in the other components is minimal in comparison, the Contractor may standardize on the 5000 psi mix for all components if desired.

16. Drawings S-03-103 and S-03-501:

Clarification: The grating on the grit removal structure shall be aluminum grating with aluminum angle frame as indicated on the Civil Drawings.

17. Drawing H-00-601:

Heating Ventilation Unit Schedule: Delete the leaving air temperature (LAT) of HV-02-3 of 73 F.

Heating Ventilation Unit Schedule: Add the leaving air temperature (LAT) of HV-02-3 to 70 F.

A handwritten signature in cursive script, reading "Louis E. Robbins". The signature is written in black ink and is positioned above a horizontal line.

Louis E. Robbins, P.E.

Tennessee P.E. Registration No. 14,525

GRW Engineers, Inc.

SECTION 11288 – STAINLESS STEEL GATES

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment and incidentals required to install, ready for operation and field test stainless steel gates and appurtenances as shown on the Contract Drawings and as specified herein.
- B. The gates and appurtenances shall be supplied in accordance with the latest edition of AWWA C561 Standard for Fabricated Stainless Steel Slide Gates as modified herein. The allowable leakage rate for the stainless steel gates in this specification shall be 1/2 the allowable leakage listed in the latest revision of AWWA C561.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Precision Grouting Section 03600

1.03 SUBMITTALS

- A. Descriptive literature, catalog cuts, and dimensions\al prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein.
 - 1. Installation drawings showing all details of construction, details required for installation, dimensions and anchor bolt locations.
 - 2. Maximum bending stress and deflection of the slide under the maximum design head.
 - 3. The location of the company headquarters and the location of the principle manufacturing facility. Provide the name of the company that manufactures the equipment if the supplier utilizes an outside source.
- B. Comply with the requirements of Section 01340.

1.04 QUALITY ASSURANCE

- A. Qualifications
 - 1. All of the equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 20 years of experience designing and manufacturing water control gates.
 - 2. This design basis specification is for the 900 Series Stainless Steel Gates as manufactured by Whipps, Inc. of Athol, Massachusetts.
 - 3. Additional manufacturers that are acceptable for this project are Rodney Hunt (Fontaine Series 20) and Golden Harvest (GH-44).

PART 2 - PRODUCTS

2.01 GENERAL

- A. Gates shall be as specified herein and have the characteristics and dimensions shown on the Contract Drawings.
- B. Leakage shall not exceed 0.05 gpm/ft of wetted seal perimeter in seating head and unseating head conditions.
- C. The gate shall utilize self-adjusting seals. Due to the difficulty of accessing gates when they are in service, gates that utilize adjustable wedges, wedging devices or pressure pads are not acceptable.
- D. All structural components of the frame and slide shall be fabricated of stainless steel having a minimum thickness of 1/4-inch and shall have adequate strength to prevent distortion during normal handling, during installation and while in service.
- E. All welds shall be performed by welders with AWS certification.
- F. Finish: Mill finish on stainless steel. Welds shall be sandblasted to remove weld burn and scale. All iron and steel components shall be properly prepared and shop coated with a primer.
- G. Materials:

<u>Components</u>	<u>Materials</u>
Frame Assembly and Retainers	Stainless Steel, Type 304L, ASTM A240
Slide and Stiffeners	Stainless Steel, Type 304L, ASTM A240
Stem	Stainless Steel, Type 304, ASTM A276
Fasteners, Nuts and Bolts	Stainless Steel, Type 304, ASTM A276
Invert Seal (Upward Opening Gates Only)	Neoprene ASTM D-2000 or EPDM
Seat/Seals and Facing	Ultra-High Molecular Weight Polyethylene ASTM D4020
Lift Nuts	Bronze ASTM B584
Pedestals and Wall Brackets	Stainless Steel, Type 304L, ASTM A276
Operator Housing	Cast aluminum or ductile iron

2.02 FRAME

- A. The frame assembly, including the guide members, invert member and yoke members, shall be constructed of formed stainless steel plate with a minimum thickness of 1/4-inch.
 - 1. Frame design shall allow for embedded mounting, mounting directly to a wall with stainless steel anchor bolts and grout or mounting to a wall thimble with stainless steel mounting studs and a mastic gasket material. Mounting style shall be as shown on the Contract Drawings.
 - 2. All wall mounted or wall thimble mounted gates shall have a flange frame. Flat frame gates are not acceptable.
 - 3. The structural portion of the frame that incorporates the seat/seals shall be

formed into a one-piece shape for rigidity. Guide members that consist of two or more bolted structural members are not acceptable. Guide member designs where water loads are transferred through the assembly bolts are specifically not acceptable.

4. Gussets shall be provided as necessary to support the guide members in an unseating head condition. The gussets shall extend to support the outer portion of the guide assembly and shall be positioned to ensure that the load is transferred to the anchor bolts or the wall thimble studs.
5. The frame shall extend to accommodate the entire height of the slide when the slide is in the fully opened position on upward opening gates or downward opening weir gates.
6. On self-contained gates, a yoke shall be provided across the top of the frame. The yoke shall be formed by two structural members affixed to the top of the side frame members to provide a one-piece rigid assembly. The yoke shall be designed to allow removal of the slide.
7. A rigid stainless steel invert member shall be provided across the bottom of the opening. The invert member shall be of the flush-bottom type on upward opening gates. The shape of the seal will produce a seating having a minimum bottom length of 3/4-inch.
8. A rigid stainless steel top seal member shall be provided across the top of the opening on gates designed to cover submerged openings.
9. A rigid stainless steel member shall be provided across the invert of the opening on downward opening weir gates.

2.03 SLIDE

- A. The slide and reinforcing stiffeners shall be constructed of stainless steel plate. All structural components shall have a minimum thickness of 1/4-inch.
 1. The slide shall not deflect more than 1/360 of the span or 1/16 inch, whichever is smaller, under the maximum design head.
 2. When the width of the gate opening multiplied by the maximum design head is 80 square feet or greater, the portion of the slide that engages the guide members shall be of a "thick edge" design. The thick edge portion of the slide shall have a minimum thickness of 3 inches.
 3. Reinforcing stiffeners shall be welded to the slide and mounted horizontally. Vertical stiffeners shall be welded on the outside of the horizontal stiffeners for additional reinforcement.
 4. The stem connector shall be constructed of two angles or plates. The stem connector shall be welded to the slide. A minimum of two bolts shall connect the stem to the stem connector.

2.04 SEALS

- A. All gates shall be provided with a self-adjusting seal system to restrict leakage in accordance with the requirements listed in this specification.
1. All gates shall be equipped with UHMW polyethylene seat/seals to restrict leakage and to prevent metal to metal contact between the frame and slide.
 2. The seat/seals shall extend to accommodate the 1-1/2 x the height of the slide when the slide is in the fully closed or fully opened position.
 3. All upward opening gates shall be provided with a resilient seal to seal the bottom portion of the gate. The seal shall be attached to the invert member or the bottom of the slide and it shall be held in place with stainless steel attachment hardware.
 4. All downward opening weir gates shall be provided with UHMW polyethylene seat/seals across the invert member.
 5. The seal system shall be durable and shall be designed to accommodate high velocities and frequent cycling without loosening or suffering damage.
 6. All seals must be bolted or otherwise mechanically fastened to the frame or slide. Arrangement with seals that are force fit or held in place with adhesives are unacceptable.
 7. The seals shall be mounted so as not to obstruct the water way opening.
 8. Gates that utilize rubber "J" seals or "P" seals are not acceptable.
 9. The seal system shall have been factory tested to confirm negligible wear (less than 0.01") and proper sealing. The factory testing shall consist of an accelerated wear test comprised of a minimum of 25,000 open-close cycles using a well-agitated sand/water mixture to simulate fluidized grit.

2.05 HANDWHEEL OPERATOR

- A. Operation of the gate will be by means of an anti-friction hand-wheel bench-stand. The bronze operating nut will be accurately machined and internally threaded to accept the rising stem counterpart. Maximum effort on the hand-wheel shall not exceed 40 pounds pull to open or close the gate with the maximum operating head on it.
1. An arrow with the word "OPEN" shall be permanently attached or cast onto the operator to indicate the direction or rotation to open the gate.
 2. Handwheel operators shall be fully enclosed and shall have a cast aluminum housing.
 - a. Handwheel operators shall be provided with a threaded cast bronze lift nut to engage the operating stem.
 - b. Handwheel operators shall be equipped with roller bearings above and below the operating nut.

- c. Positive mechanical seals shall be provided above and below the operating nut to exclude moisture and dirt and prevent leakage of lubricant out of the hoist.
 - d. The handwheel shall be removable and shall have a minimum diameter of 15 inches.
- 3. Crank-operated gearboxes shall be fully enclosed and shall have a cast aluminum or ductile iron housing.
 - a. Gearboxes shall have either single or double gear reduction depending upon the lifting capacity required.
 - b. Gearboxes shall be provided with a threaded cast bronze lift nut to engage the operating stem.
 - c. Bearings shall be provided above and below the flange on the operating nut to support both opening and closing thrusts.
 - d. Gears shall be steel with machined cut teeth designed for smooth operation.
 - e. The pinion shaft shall be stainless steel and shall be supported on ball or tapered roller bearings.
 - f. Positive mechanical seals shall be provided on the operating nut and the pinion shafts to exclude moisture and dirt and prevent leakage of lubricant out of the hoist.
 - g. The crank shall be cast aluminum or cast iron with a revolving nylon grip.
 - h. The crank shall be removable.
- 4. An extended operator system utilizing chain and sprockets shall be furnished by the manufacturer when the centerline of the crank or handwheel, on a non-g geared operator, is located over 48-in above the operating floor. Chain wheels are not acceptable.
 - a. A removable stainless steel or aluminum cover shall be provided to enclose chain and sprockets.
 - b. The extended operator system shall lower the centerline of the pinion shaft to 36-in above the operating floor.
 - c. A handwheel may be utilized in conjunction with a gearbox in lieu of the extended operator system if the centerline of the pinion shaft is 60-in or less above the operating floor.
- 5. Pedestals shall be constructed of stainless steel. Aluminum pedestals are not acceptable.

- a. The pedestal height shall be such that the handwheel or pinion shaft on the crank-operated gearbox is located approximately 36-in above the operating floor.
 - b. Wall brackets shall be used to support floor stands where shown on the Drawings and shall be constructed of stainless steel.
 - c. Wall brackets shall be reinforced to withstand in compression at least two times the rated output of the operator with a 40 lb. effort on the crank or handwheel.
 - d. The design and detail of the brackets and anchor bolts shall be provided by the gate manufacturer and shall be approved by the ENGINEER. The gate manufacturer shall supply the bracket, anchor bolts and accessories as part of the gate assembly.
6. Operators shall be equipped with fracture-resistant clear butyrate or Lexan plastic stem covers.
- a. The top of the stem cover shall be closed.
 - b. The bottom end of the stem cover shall be mounted in a housing or adapter for easy field mounting.
 - c. Stem covers shall be complete with indicator markings to indicate gate position.
7. When shown on the Contract Drawings, provide 2 inch square nut, mounted in a floor box, with a non-rising stem.
- a. The square nut shall be constructed of bronze.
 - b. The floor box shall be constructed of stainless steel or cast iron and shall be set in the concrete floor above the gate as shown.
 - c. Provide one aluminum or stainless steel T-handle wrench for operation.
8. The lift mechanism must be capable of withstanding without damage an effort up to 200 lbs.

2.06 STEM

- A. A threaded operating stem shall be utilized to connect the operating mechanism to the slide. On rising stem gates, the threaded portion shall engage the operating nut in the manual operator or motor actuator. On non-rising stem gates, the threaded portion shall engage the nut on the slide.
- 1. The threaded portion of the stem shall have a minimum outside diameter of 1-1/2 inches. Stem extension pipes are not acceptable.
 - 2. The stem shall be constructed of solid stainless steel bar for the entire length, the metal having a tensile strength of not less than 90,000 psi for stems that are 3 inches or less in diameter. Stems that are in excess of 3 inches in diameter shall have a tensile strength of 85,000 psi.

3. The stem shall be threaded to allow full travel of the slide unless the travel distance is otherwise shown on the Contract Drawings.
4. Maximum L/R ratio for the unsupported part of the stem shall not exceed 200.
5. In compression, the stem shall be designed for a critical buckling load caused by a 40 lb. effort on the crank or handwheel with a safety factor of 2, using the Euler column formula.
6. The stem shall be designed to withstand the tension load caused by the application of a 40 lb. effort on the crank or handwheel without exceeding 1/5 of the ultimate tensile strength of the stem material.
7. The threaded portion of the stem shall have machine rolled threads of the full Acme type with a 16 micro-inch finish or better. Stub threads are not acceptable.
8. Stems of more than one section shall be joined by stainless steel or bronze couplings. The coupling shall be bolted to the stems.
9. Stems, on manually operated gates, shall be provided with adjustable stop collars to prevent over closing of the slide.

2.07 WALL THIMBLES

- A. Wall thimbles shall be provided when shown on the Contract Drawings.
 1. The wall thimble depth shall be equal to the thickness of the concrete wall in which the thimble is to be mounted.
 2. Wall thimbles shall be fabricated stainless steel construction of adequate section to withstand all operational and reasonable installation stresses.
 3. Wall thimbles shall be constructed of 1/4-inch minimum thickness stainless steel and the front face shall have a minimum thickness of 1/4-inch.
 4. The fabrication process shall ensure that the wall thimble is square and plumb and the front face is sufficiently flat to provide a proper mounting surface for the gate frame.
 5. The face of the wall thimble shall only be machined if recommended by the gate manufacturer. If the wall thimble is to be machined, the front face shall have a minimum thickness of 1/4-inch after machining.
 6. A water stop shall be welded around the periphery of the thimble. Wall thimbles shall be designed to allow thorough and uniform concrete placement during installation.
 7. Studs and nuts shall be stainless steel. Water stop may be stitch welded.
 8. A suitable gasket or mastic shall be provided to seal between the gate frame and the wall thimble.

2.08 FULL OPEN GATE

- A. Each gate system will be designed to open fully above the maximum water level or to achieve a full open port unless otherwise shown on the contract drawings or specified herein.

2.09 ANCHOR BOLTS

- A. Stainless steel anchor bolts shall be provided by the gate manufacturer for mounting the gates and appurtenances.
 - 1. Quantity and location shall be determined by the gate manufacturer.
 - 2. If epoxy type anchor bolts are provided, the gate manufacturer shall provide the studs and nuts.
 - 3. Anchor bolts shall have a minimum diameter of 1/2-inch.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation of the gates and appurtenances shall be done in a workmanlike manner. It shall be the responsibility of the Contractor to handle, store and install the equipment specified in this Section in strict accordance with the manufacturer's recommendations.
- B. The Contractor shall review the installation drawings and installation instruction prior to installing the gates.
- C. The gate assemblies shall be installed in a true vertical plane, square and plumb.
- D. The Contractor shall fill the void in between the gate frame and the wall with non-shrink grout as shown on the installation drawing and in accordance with the manufacturer's recommendations.
- E. The Contractor shall add a mastic gasket between the gate frame and wall thimble (when applicable) in accordance with the manufacturer's recommendations.

3.02 FIELD TESTING

- A. After installation, all gates shall be field tested in the presence of the Engineer and OWNER to ensure that all items of equipment are in full compliance with this Section. Each gate shall be cycled to confirm that they operate without binding, scraping, or distorting. The effort to open and close manual operators shall be measured, and shall not exceed the maximum operating effort specified above. Electric motor actuators shall function smoothly and without interruption. Each gate shall be water tested by the Contractor, at the discretion of the Engineer and Owner, to confirm that leakage does not exceed the specified allowable leakage.

END OF SECTION

SECTION 11330 - OPEN CHANNEL-ELECTRIC GRINDER WITH ROTATING SCREEN DRUMS

PART 1 - GENERAL

1.01 SUMMARY

- A. This section of the specification describes the grinder(s) and controller(s). The equipment shall be installed as shown on the plans, as recommended by the supplier, and in compliance with all OSHA, local, state and federal codes and regulations.
- B. The number of Channel Grinders and controllers for this project shall be 2 each.
- C. All stainless steel will be 304 unless noted otherwise.

1.02 REFERENCES

- A. Grinder(s) shall, as applicable, meet the requirements of the applicable ASTM, AISI and SAE industry standards.
- B. Controllers shall, as applicable, meet the requirements of the following Regulatory Agencies:
 - 1. National Electrical Manufacturer's Association (NEMA) Standards
 - 2. National Electric Code (NEC)
 - 3. Underwriters Laboratory (UL and cUL)
 - 4. International Electrotechnical Commission (IEC)

1.03 SUBMITTALS

- A. Submit under provisions of Section 01340.
- B. Shop drawings, as a minimum, shall show:
 - 1. Dimensions, screen assembly, electrical devices, drive assembly and cleaning mechanisms.
 - 2. Materials of construction.
 - 3. Location of structural members, connections, attachments, openings, and fasteners.
- C. Manufacturer's installation instructions shall be furnished for all units.
- D. Operation and Maintenance Manuals: The supplier shall provide two (2) hard copies of the Operation & Maintenance manuals. In addition, two electronic versions shall be supplied. The manuals shall include equipment descriptions, operating instructions, drawings, troubleshooting techniques, a recommended schedule, and the recommended lubricants.

1.04 QUALITY ASSURANCE

A. Identification

1. Equipment shall be identified with a corrosion resistant nameplate affixed in a conspicuous location. Nameplate information shall include manufacturer's name and address, equipment model number, and serial number.

B. Manufacturer

1. Supplier shall have a minimum 30 years experience as a manufacturer of municipal waste water equipment and a minimum 1,000 prior installations of similar equipment.
2. Supplier shall provide a list of reference sites for similar equipment for verification by the Engineer or Owner's Representative.
3. Supplier shall conduct factory testing and verification of equipment prior to shipment.

C. Installation & Start-up

1. Supplier shall provide services of a factory trained representative to check installation and review start-up of equipment and controls.
2. Supplier Representative shall inspect and approve site installation and supervise a review of the operation of the equipment.
3. Supplier Representative shall provide training on operation and maintenance requirements of the equipment.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packaging

1. Containers or skids shall be constructed for normal shipping, handling, and storage.
2. Containers shall provide adequate protection for the equipment in a dry indoor environment between +40°F (+4.5°C) and +100°F (+37.8°C).

1.06 WARRANTY

The Manufacturer shall provide a 12-month limited warranty on all provided equipment. The warranty period will not start until the manufacturer's representative has inspected and approved the installation of the equipment.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- #### **A.**
- Grinder(s) and controller(s) shall be in accordance with these specification and drawings and shall be supplied by the following manufacturer, or approved equal:

1. JWC Environmental, 2850 Red Hill Ave., Suite 125, Santa Ana, CA 92705; Tel: 800-331-2277; www.jwce.com
JWC Environmental Model CDD6010-XDM2.5 Channel Monster.
JWC Environmental Model PC2223 Controller.
- B. Manufacturers requesting to be selected as an approved equal shall submit certified documentation including installation lists with phone numbers, equipment drawings, flow performance curves, electrical schematics and cut sheets, and O&M draft showing compliance with these specifications a minimum of ten (10) days prior to bid opening. Selected equipment manufacturers shall be added to the list of approved manufacturers.
- C. Selected approved equal manufacturers shall conduct an onsite test within ten (10) days of installation demonstrating compliance with all areas of this specification.

2.02 GRINDER

A. General

Grinder shall reduce or shred influent solids for protection of downstream equipment. Grinder shall be two shafted design consisting of individual cutters and spacers, with cutters on drive and driven shafts of equal diameter. The grinder shall have two rotating screen drums that shall collect solids too large to pass through the screen drums and direct them to the cutters for solids reduction. Grinder shall have individual motors and speed reducers for cutter drive shaft and each screen drum.

B. Components

1. Cutters and Spacers

- a. Cutting stack shall be a nominal height of 60-inches (1524.0 mm).
- b. Cutter shall be an individual disk constructed of AISI alloy steel surface ground to thickness of .875-inches $\pm .000/- .001$ (22.2 mm $\pm .000/- .003$).
- c. Cutters shall be heat treated to produce a hardness of 45-53 Rockwell C.
- d. Cutters shall have 7 cam shaped teeth. Tooth height shall not be greater than 11/16-inch (17.5 mm) above root diameter of the cutter. OD shall be 7.50-inches (190 mm).
- e. Spacers shall be an individual disk constructed of AISI alloy steel surface ground to a thickness of .884-inches $\pm .001/- .000$ (22.4 mm $\pm .003/- .000$).
- f. Spacers shall have a hardness of 34-38 Rockwell C.
- g. Spacers shall have a smooth outside diameter with no tooth profiles.

2. Shafts

- a. Shafts shall be constructed from AISI 4140 alloy steel with a minimum tensile strength of 170,000 PSI (1,172 kPA).
- b. Shafts shall be measure a nominal 2-1/2inches (63.5 mm) across flats of hex.

- c. Shafts shall be hardened to 38-42 Rockwell C.
- 3. Intermediate Shaft Collars with Vertical Support Structure
 - a. Intermediate shaft collars shall be constructed of ASTM A743 stainless steel, AISI 17-4 stainless steel and SAE 660 bearing bronze.
 - b. Shaft collars shall be lubricated with high temperature marine grade grease at the factory.
 - c. Grease fittings on the shaft collars shall be provided for periodic maintenance.
 - d. Intermediate shaft collars shall provide radial support to the shafts during severe grinding demands.
 - e. Vertical support structure shall be constructed of stainless steel.
 - f. Vertical support structure shall have brackets to locate and secure intermediate shaft collars within the cutter stack.
 - g. Vertical support structure shall have a shape that coincides with the radial profile of the cutters to allow for a close interface.
 - h. Vertical support structure shall have adjustable brackets for mounting to the top and bottom end housings.
- 4. Seal Cartridges
 - a. Seal cartridges shall be rated to a maximum of 90 PSI (620 kPA).
 - b. Seal cartridges shall not require flushing.
 - c. Dynamic and rotating seal faces shall be constructed of tungsten carbide with 6% nickel binder.
 - d. O-rings shall be constructed of Buna-N (Nitrile).
 - e. Radial and axial loads shall be borne by sealed, oversized, deep-groove ball bearings.
- 5. Housings and Covers
 - a. End housings and top cover shall be constructed of ASTM A536-84 ductile iron.
 - b. End housings shall have integral bushing deflector to guide solids from seal cartridges.
 - c. Bottom cover shall be constructed of ASTM A-36 rolled steel.
- 6. Side Rails

- a. Side rails shall be constructed of ASTM A536-84 ductile iron.
 - b. Side rails shall have a brush sealing strip for creating an adjustable interface between the side rail and the rotating drum.
 - c. Side rails shall have integral guide slot for installing into framework.
7. Perforated Screen Drum
- a. Perforated screen drum shall be constructed of 11 gauge (.120") stainless steel with 1/2-inch (12.7 mm) diameter holes.
 - b. Perforated screen drum shall have center ring supports, end flanges, and stub shafts to properly support the perforated screen.
 - c. Perforated screen drum shall have no shaft in center of drum.
 - d. Perforated screen drum shall be electropolished.
8. Speed Reducer-Cutters
- a. Reducer shall be manufactured by Sumitomo Machinery Corporation of America.
 - b. Reducer shall be internal planetary mechanism with trochoidal curved tooth profile.
 - c. Reducer shall be a vertically mounted with 29:1 single reduction.
 - d. Reducer shall be grease lubricated.
9. Speed Reducer-Screen Drums
- a. Reducer shall be manufactured by Sumitomo Machinery Corporation of America.
 - b. Reducer shall be internal planetary mechanism with trochoidal curved tooth profile.
 - c. Reducer shall be a vertically mounted 377:1 double reduction.
 - d. Reducer shall be grease lubricated.
10. Motor-Cutters
- a. Motor shall be 10 hp (7.5 kW), XPNV, 1765 rpm, 460 volt, 3 phase, 60 Hz
 - b. Motor shall be U.L. rated NEMA 6P, Class I, Div. I Groups C&D, Class II, Div. II, Groups F&G, Class II, Div.I.
 - c. Motor shall have additional rating of 7 consecutive days of submergence at a maximum depth of 30 feet (9 m).
 - d. Motor shall not utilize fan cooling at any time during operation.

- e. Motor shall utilize ceramic shaft seal requiring no oil lubrication.
- f. Motor shall have a minimum service factor of 1.15, 91% minimum efficiency factor at full load, minimum 80% power factor at full load.

11. Motor-Screen Drums

- a. Motors shall be 1 hp (3/4 kW), XPNV, 1740 rpm, 460 volt, 3 phase, 60 Hz.
- b. Motors shall be U.L. rated NEMA 6P, Class I, Div. I Groups C&D, Class II, Div. II, Groups F&G, Class II, Div. I
- c. Motors shall have additional rating of 7 consecutive days of submergence at a maximum depth of 30 feet (9 m).
- d. Motors shall not utilize fan cooling at any time during operation.
- e. Motors shall utilize ceramic shaft seal requiring no oil lubrication.
- f. Motors shall have a minimum service factor of 1.15, 85.5% minimum efficiency factor at full load, minimum 70% power factor at full load.

C. Performance

- 1. Each grinder shall be capable of processing 15 MGD (2365.9 m³/h).
- 2. Grinder shall provide a minimum peak shaft torque of 3,724 lb-in/hp (564 Nm/kW).
- 3. Grinder shall provide a minimum peak force at cutter tip of 993 lb_f/hp (5,923 N/kW).

2.03 FRAME AND SUPPORTS

A. General

Frame and/or supports shall provide a method for properly securing the grinder in an open channel or wet well. The frame shall allow installation or removal without any disassembly of the frame or grinder. Appropriate guiderails, lifting hooks, cables, etc., shall be provided and installed to provide for removal/re-installation of the equipment.

B. Components

- 1. Frame and/or supports shall be constructed of AISI 304 stainless steel.
- 2. Frame shall provide proper support and interface to prevent unwanted bypass.
- 3. Frame shall utilize guides that insert into the grinders' side rail slots to properly position and locate the grinder.

2.04 CONTROLLER

A. General

Controller shall provide control of the grinder and screen drums and be designed to control one (1) 10 hp (7.5 kW) and two (2) 1 hp (3/4 kW) at 460 volts, 3 phase, 60 Hz. Each controller shall have an Operator Interface Terminal, indicator lights, switches and other control devices.

B. Components

1. Enclosures
 - a. Enclosure shall be 304 stainless steel NEMA 4X.
 - b. Enclosure shall house the OIT, control devices, motor starters, and PLC.
2. Operator Interface Terminal
 - a. OIT shall be manufactured by Red Lion and display equipment status, alarm and fail conditions.
 - b. OIT shall provide operational information on reversals, jams, overloads and over temps.
3. Grinder ON-OFF-REMOTE three-position 22mm type, NEMA 4X selector switch
 - a. In the OFF position, the grinder shall not run.
 - b. In the ON position, the grinder shall run continuously.
 - c. In the REMOTE position, the grinder shall start and stop as controlled by an external device.
4. Screen Drum ON-OFF-AUTO three-position 22mm type, NEMA 4X selector switch
 - a. In the OFF position, the screen drum shall not run.
 - b. In the ON position, the screen drum shall run continuously.
 - c. In the AUTO position, the screen drum shall start and stop as controlled by grinder operation.
5. Reset Pushbutton
 - a. Pushbutton shall be momentary type 22 mm, rated NEMA 4X.
 - b. Pushbutton shall be the only method of resetting the controller after failure.
6. Pilot Lights
 - a. Lights shall be LED type 22 mm, rated NEMA 4X.
 - b. Lights shall indicate GRINDER RUN, SCREEN DRUM RUN, and FAIL.
7. Programmable Logic Controller (PLC)

- a. A programmable logic controller shall be provided within the controller. PLC shall be Allen-Bradley (CompactLogix or ControlLogix) with a minimum of 16K of memory.
- 8. Motor Starters
 - a. Starters shall be a full-voltage reversing type with 120 volt operating coils.
 - b. Overload relays shall be adjustable and sized to full load amperes (FLA) of the motor.
- 9. Main Circuit Breaker Disconnect and Motor Branch Circuit Protection Circuit Breakers
 - a. Circuit breakers shall be molded case type 3-pole, 480 volt.
 - b. Circuit breakers shall be sized to applicable NEC and UL standards.
- 10. Control Transformer
 - a. Control transformer shall be minimum 250VA.
 - b. Control transformer primary and secondary shall be fused for over current protection.
- 11. Current Transducers
 - a. Current transducers shall be manufactured by Veris Industries.
 - b. Current transducers shall have adjustable set point from 1-135A with a 200ms or less response time.
- 12. Control Relays
 - a. Control Relays shall be manufactured by Idec Corp.
 - b. Control relays shall be rated for 10A (resistive load), DPDT, 120V with indicator light.

C. Performance

- 1. When a grinder jam condition occurs, the controller shall stop the grinder and reverse the grinder rotation to clear the obstruction. If the jam is cleared, the controller shall return the grinder to normal operation. If three (3) reverses occur within a 30 second interval, the controller shall stop the grinder motor and activate the grinder FAIL indicator and relay.
- 2. When a Screen Drum jam condition occurs, the controller shall stop the screen drum and reverse the screen drum rotation to clear the obstruction. If the jam is cleared, the controller shall return the screen drum to normal operation. If two (2) reverses occur within a 30 second interval, the controller shall stop the screen drum motor and activate the FAIL indicator and relay. The grinder and other screen drum shall continue to operate.

3. When a power failure occurs while the grinder and screen drum is operating, the grinder and screen drums will resume operation once power is restored.
4. When a power failure occurs while the grinder or screen drum(s) is in a fail condition, once power is restored the fail indicator shall reactivate and remain until reset.
5. Reset of the grinder and drums shall be accomplished from the controller only.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. The screen grinder manufacturer shall provide written instruction for proper handling.
- B. Immediately after off-loading, Contractor shall inspect screens, cutter units and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery.
- C. Validate all serial numbers and parts lists with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

3.02 INSTALLATION

Grinder(s) and controller(s) shall be installed in accordance with supplier's installation instructions, and in accordance with all OSHA, local, state, and federal codes and regulations.

3.03 TESTING

Test of grinder(s) shall demonstrate correct alignment, smooth operation. Test period shall demonstrate simulated jam conditions for both grinder and screen drums.

3.04 TRAINING

A field training course shall be provided for operation and supervisory staff members. Field instruction shall cover items for successful operation contained in the operation & maintenance manuals.

3.05 FACTORY SERVICE

The drum screen manufacturer will provide factory service, during two (2) separate trips to the jobsite for a total of three (3) days minimum, for inspection of installation, equipment start up and operator training.

END OF SECTION