

## ADDENDUM NO. 2

Project: 2019 South Side Wastewater Treatment Plant Primary Clarifier Equipment Placement

Owner: City of Kingsville

Engineer: Rutilio P. Mora, Jr., P.E.

Addendum No. 2

Specifications Section: 464321

Issue Date: 05/017/19

Acknowledge receipt of this Addendum in the BID PROPOSAL submitted for this Project. Failure to acknowledge receipt of this Addendum in the BID PROPOSAL may render the BID as non-responsive and serve as the basis for rejecting the BID.

Approved by: Rutilio P. Mora, Jr., P.E.

Rutilio P. Mora Jr.

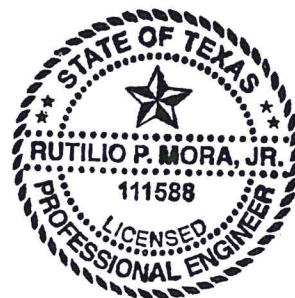
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Addendum Items:

1. Envirodyne Systems Inc. is an approved equal – See revisions to Section 464321 Circular Secondary Clarifier Equipment Pier Supported – Center Feed Specification.



REVISED 5-17-2019

**Section 464321**  
**CIRCULAR SECONDARY CLARIFIER EQUIPMENT**  
**PIER SUPPORTED - CENTER FEED**

**PART 1 - GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. The contractor shall furnish and install one (1) secondary circular clarifier mechanism, 70'-0" diameter x 14'-0" SWD, in the existing 1 MGD package plant basins in accordance with the details shown on the drawings and as specified herein.
- B. The equipment furnished for the clarifier mechanism shall include but not be limited to: center drive assembly, center drive platform to bolt onto the existing two (2) access bridges, center support column with inlet openings and concentric RAS pipe, draw band coupling(band sleeve coupling), center sludge sight well collection box with control valves, influent well, center cage(drive cage), sludge collection arms with rake blades and PVC sludge collection piping, dual skimmer assembly scum skimming and single trough equipment, effluent troughs, knee brace supports, air main support, drop box, dual effluent weir plates, and scum baffle and supports , controls and anchor bolts with assembly fasteners.
- C. The equipment shall be designed to effectively settle mixed liquor suspended solids and rapidly remove the settled solids from the basin floor through the sludge collection piping. Visual observation of the sludge removal shall be at the clarifier's center work platform. The clarified effluent shall be collected uniformly by the peripheral launder and the collected sludge shall be discharged to the sludge collection box and funneled to the sludge withdrawal pipe as shown on the contract drawings. Surface scum shall be collected by the scum skimming equipment and discharged through the scum withdrawal pipe.
- D. The clarifier equipment meeting these specifications shall be the Model HVS as manufactured by AMWELL, A Division of McNish Corporation, Envirodyne Systems Inc. or an engineer pre-approved equal. Formal request for equipment substitutions shall be submitted a minimum of 10 days before the bid date and shall include at a minimum a job specific shop drawing of the proposed equipment along with 10 contacts and telephone numbers of existing installations of this type in the last 5 years. The engineer shall show those pre-approved to bid via addendum prior to the bid date.
- E. Per Alternative No. 1 A-1, please note in this specification where indicated the items shall be manufactured out of 316 stainless steel.

## 1.2 MANUFACTURERS SERVICE

- A. Manufacturer shall provide two (2) trips for and four (4) days on site for the clarifier to check the final installation, performance acceptance test and instruct owner in the operation and lubrication of the equipment.
- B. The installing contractor shall provide a professional surveyor to take measurements and elevations of the existing tank and clarifier mechanism as required for confirmation of tank dimensions and equipment location/elevation/detail. The installing contractor shall drain and clean the tank. The cost of this survey shall be included in the bid by the installing contractor. (See general notes on C2/8 & 9).

## 1.3 SUBMITTALS / MANUALS

- A. Shop drawings shall be submitted in accordance with the General Conditions of these specifications.
- B. (4) Operation and maintenance manuals shall be submitted to the City.

## PART 2 - PRODUCTS

### 2.1 CLARIFIER DESIGN CRITERIA

- A. Clarifier mechanisms shall be designed to satisfactorily handle the following flows **per basin:**

	<u>Minimum</u>	<u>Average</u>	<u>Maximum</u>	<u>Peak</u>
Influent	0.5 MGD	0.7 MGD	4.0 MGD	1.5 MGD
Sludge Return (RAS)	695 GPM		868 GPM	

### 2.2 DRIVE MECHANISM

- A. Gear Design - The continuous output torque rating and the allowable stress values used in the design of the intermediate worm gear reduction unit and the final gear reduction unit shall be in **strict** conformance with the latest revision of the following standards:

Worm & Worm Gearing: ANSI/AGMA 6034-B92, "Practice for Enclosed Cylindrical Worm gear Speed Reducers and Gear motors."

Spur and Pinion Gearing: ANSI/AGMA 2001-C95, "Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth."

The continuous output torque rating of the spur and pinion gearing shall be based on the smaller of the rating values determined from the above ANSI/AGMA

standard and a design life of 20 years. The drive shall be designed and rated to develop the following minimum torque values:

<u>Operating Condition</u>	<u>Torque (Foot-Pounds)</u>
Continuous	<u>10,000</u>
Alarm	<u>10,000</u>
Motor Cut-Off	<u>12,000</u>
Shear Pin	<u>15,000</u>
Peak	<u>20,000</u>

The equipment manufacturer shall submit calculations to the ENGINEER for approval substantiating the continuous output torque rating and design life. Calculations shall include the spur gear, pinion, worm gear set, and all bearings used in the intermediate worm gear reduction unit and the final gear reduction unit.

The spur gear and pinion calculations shall clearly specify the values used for the following design parameters for surface durability and strength ratings:

Number of Pinions	Pinion Pitch Diameter
Actual Face Width	Tooth Diametrical Pitch
Tooth Geometry Factors (I and J Factors)	Hardness Ratio Factor
Load Distribution Factor	Elastic Coefficient
Aspect Ratio	Life Factor
Allowable Contact Stress	Application Factor
Allowable Bending Stress	Rim Thickness Factor

Load distribution factors (Cm and Km) used in the calculations shall not exceed 1.28. For parameters which are material dependent, such as allowable contact stress, the calculations shall include a full description of the materials, quality grade, and heat treatment used. Momentary peak torque calculations shall use a maximum of 75% of yield strength.

- B. Primary Gear Reduction Unit - The primary gear reduction unit shall consist of a totally enclosed, horizontal type gear motor or gear reducer with C-face mounted drive motor, mounted on top of the intermediate worm gear housing. The primary gear reducer shall be a heavy-duty parallel shaft helical type, conforming to ANSI/AGMA 6019-B89, and shall have a service factor of 1.15. All gearbox bearings shall be of the anti-friction type and running in oil in a cast iron housing. The totally enclosed primary reduction unit shall operate on 3 phase, 60 hertz, 230/460-volt power source, and shall be at least 1/2 HP. The motor shall conform to NEMA specifications for AC motors and be designed for continuous operating condition.

- C. Chain Drive - Power transmission between the primary gear reduction unit and the intermediate worm gear reduction unit shall be through a ½" pitch 40L steel roller chain and steel sprocket assembly. The chain drive shall be enclosed with a stainless-steel chain guard meeting OSHA requirement. The shear pin overload shall be easily accessible by removal of the chain guard.
- D. Intermediate Worm Gear Reduction Unit - The intermediate worm gear reduction unit shall consist of a worm gear driven by an integral straddle mounted worm and shaft, supported by heavy duty anti-friction bearings running in an oil bath, and housing. All bearings shall have a minimum L10 life of 20 years, based on the continuous torque rating. The integral worm and shaft shall be single piece and made from AISI 8620H alloy steel carburized, hardened and ground and shall have a case hardness of 55-60 RC. The worm gear shall be centrifugally cast, conforming to ASTM B271 and ANSI/AGMA 2004-B89, high strength, and manganese bronze.

The worm gear shall have a minimum 200 Brinell hardness and shall have a minimum pitch diameter of 12.79 inches and have a minimum face width of 2.25 inches. Approved equivalent is a double-enveloping worm gear per AGMA 6017-E86.

The worm gear shall be keyed to the pinion shaft. The intermediate worm gear housing shall be ASTM A48 Class 40 cast iron complete with seals, oil fill, and oil level sight gauge and drain plugs. The intermediate worm gear housing shall have full 360° contact and support from the final gear housing.

- E. Final Gear Reduction Unit - The final gear reduction unit shall consist of a pinion, internal split spur gear, anti-friction ball bearing assembly, and housing.

The pinion shall be AISI 4150 minimum grade 2 steel, heat treated to a minimum 321 BHN hardness, have a minimum 6.00-inch pitch diameter and have a minimum 2.56-inch face width.

The pinion shall be one solid piece, extending from the worm gear to the spur gear, straddle mounted between anti-friction ball bearings to maintain accurate pinion to spur gear alignment and contact. All bearings shall have a minimum L10 life of 20 years based on the continuous torque. The pinion shall be manufactured to have a minimum AGMA quality class 8, in conformance with ANSI/AGMA 2000-A88.

The internal spur gear shall be ductile iron normalized, quenched & tempered, conforming to grade 120-90-02, with micro-structure of fine tempered pearlite, conforming to ASTM A536, manufactured to have a minimum base hardness of 270 BHN and have a minimum AGMA quality Class 6, in conformance with ANSI/AGMA 2000-A88. The spur gear shall have a minimum 42-inch pitch

diameter and have a minimum 2.56-inch face width. The internal spur gear shall be of split construction to provide for replacement of balls and race liners without removing the drive unit or other parts of the clarifier mechanism. Internal spur gears that are not split are not considered acceptable for this application.

Approved equal equivalent is an alloy steel spur gear designed per AGMA 2001-D04.

The internal spur gear shall be mounted on a large, full complement anti-friction ball bearing assembly designed to support the entire rotating clarifier mechanism. The ball bearing assembly shall consist of a minimum 97- 1-1/2" diameter AISI E52100 GRADE 50 chrome alloy steel bearing balls running in an oil bath protected from contamination by a dust shield. Nylon spacer balls are not acceptable to handle the clarifier thrust and radial loads.

The minimum ball race diameter shall be 46 inches, to assure stability. The race liner inserts shall be heat treated to a hardness of no greater than 39-43 RC to avoid fatigue cracking. The race liners and bearing balls shall be designed for a minimum L10 life of 20 years. Approved equivalent is Race 58-60 RC eliminating the need for liners and the associated periodic replacement. L10 life exceeds 100 years. Bearing life calculations shall include all combined horizontal and vertical loads on the bearing assembly. Four-point angular contact bearings are not considered acceptable for this application.

The ball bearing assembly shall be mounted in an ASTM A48 Class 40 cast iron housing. Fabricated steel housings are not acceptable for this application. The housing shall be cast as a single piece to provide a leak proof enclosure. Seals or gaskets located below the oil level will not be acceptable. The base of the housing shall be mounted on the top flange of the stationary center column and designed to support the internal spur gear, the rotating clarifier mechanism and the access bridge.

The housing shall be complete with seals, oil level sight gages, oil fill, and valved oil and condensation drains. A positive means of removing condensation and contaminant from the lower pinion bearing pocket must be provided.

Lubrication of the gear teeth shall be accomplished by means of an oil dam and the meshing action of the pinion and the internal gear teeth which shall force lubricant up the face of the teeth. Designs shall not require auxiliary oil pumps or circulating systems for lubrication.

- F. Overload protection shall consist of two (2) NEMA 4 limit switches located on the worm gear housing and operated by a spring-loaded actuator and aluminum pivot arm from the worm shaft. One (1) limit switch (N.O. contact) is for alarm torque and one (1) limit switch (N.C. contact) is for cut-out torque. An aluminum pointer with aluminum graduated scale marked in 0, 25, 50, 75 and 100 percentages is provided for indicating load on drive at all times. Switches shall be

easily accessible for routine monthly checking. A shear pin overload device shall also be included.

### 2.3 ACCESS BRIDGE, HANDRAILING AND TOE PLATE

- A. The existing HDG steel access bridge, HDG grating and handrail shall be reused.
- B. A new drive service platform, approximately 8'-0" long x 8'-0" wide fabricated from HDG steel shall be provided to bolt into place to the existing two (2) bridge sections to replace the existing service platform. The new platform shall have removable sections to provide access to the drive mechanism and the sludge control valves.
- C. The new drive platform shall be designed to support, in addition to the dead load, a live load of at a minimum 50 pounds per square foot without deflection in excess of 1/360 of the span.
- D. The existing handrail system shall be reworked and attached to the new drive service platform as required.

### 2.4 CENTER COLUMN

- A. A minimum 24-inch diameter x 1/4-inch wall thickness HDG steel stationary center column shall be provided which shall serve as the influent pipe. One end shall have a support flange for bolting to the foundation with a minimum of eight (8) - 1-inch diameter anchor bolts as shown on the plans. A similar flange shall be provided at the top of the column for supporting and securing the center drive assembly.
- B. Two (2) sets of ports shall be provided at the upper end of the center column. One set of ports shall convey the fresh sludge from the sludge collection box to the central discharge pipe. The other set of ports shall diffuse the flow and reduce the inlet velocity as it enters the influent well at a maximum of 1.0 FPS.
- C. Inside the support column there shall be a 12-inch diameter sludge discharge HDG Steel pipe. The sludge discharge pipe shall extend from the bottom of the sludge collection drum to 1 foot above the bottom flange of the stationary influent column as shown on the drawings. The sludge discharge pipe shall connect to the cast-in-place sludge discharge pipe by way of a stainless-steel band coupling provided by the clarifier equipment manufacturer.
- D. Per Alternative No. 1 A-1, this center column shall be manufactured out of 316 stainless steel.

### 2.5 DRIVE CAGE AND TRUSS ARMS

- A. A minimum 4'-0" square HDG steel drive cage shall be furnished, connected to and rotated by the central driving mechanism. The skimmer assembly and sludge collector arms shall be fastened to and rotate with the drive cage, which shall be made up of structural steel members having a minimum thickness of 1/4", using all welded construction.
- B. The collector mechanism shall be furnished with two (2) fabricated structural HDG steel arms all welded truss construction conforming to the slope of the tank floor. The arms shall be rigidly connected to the collector mechanism drive cage. Each arm shall be furnished with 1/4" HDG steel flights complete with adjustable spring brass squeegee blades and PVC sludge piping. The flights shall be arranged to provide scraping of the floor twice per revolution.
- C. Each rake arm shall be equipped with three (3) 4-inch PVC schedule 40 sludge withdrawal pipes located along the arms as detailed by the clarifier manufacturer. The pipe sizing shall accommodate the maximum sludge return flow rate. The withdrawal pipes shall be secured to the rake arms with stainless steel clamps and shall pass along the arms and vertically upward to the rotating sludge collection box.
- D. Per Alternative No. 1 A-1, this drive cage, truss arms and flights shall be manufactured out of 316 stainless steel.

## 2.6 SLUDGE COLLECTION BOX AND SLUDGE CONTROL VALVES

- A. A 1/4" thick HDG steel rotating sludge collection box shall be provided inside the feed well to collect and convey freshly returned sludge to the return sludge pipe located within the center support column. A neoprene seal shall be provided between the rotating sludge collection box and the center column.
- B. The sludge collection box shall contain a sludge control valve for each sludge draw-off pipe. A durable label shall be provided on the sludge collection box to indicate the location, along the rake arm, of each sludge withdrawal pipe and respective control valve.
- C. The control valve shall be a concentric tube type valve to allow visual observation of relative flow from each valve and to allow for easy sampling of the return sludge from each valve. The tube shall be PVC and shall be provided with an aluminum handle for adjustment with an appropriate tool to turn the valve from the operating platform.
- D. Per Alternative No. 1 A-1, this sludge collection box shall be manufactured out of 316 stainless steel.

## 2.7 INFLUENT FEEDWELL

- A. The influent feed well shall be fabricated out of 3/16" HDG steel plate. The well shall measure a minimum of 16'-0" in diameter and 8'-0" in depth. The top of the well shall be approximately 6" above the surface of the water.
- B. Sufficient reinforcing rim angles shall be provided as required. The well shall be supported by structure attached to the drive cage.
- C. Scum ports with adjustable baffles shall be provided as required to allow scum to escape out of the influent well.
- D. Per Alternative No. 1 A-1, this influent well shall be manufactured out of 316 stainless steel.

## 2.8 SURFACE SKIMMER, SCUM TROUGH AND SKIMMER BLADE RAMP

- A. A full radius skimming assembly shall be furnished for each clarifier. Each skimmer assembly shall consist of two (2) rotating skimming arms with scum blade and one (1) fixed scum trough.
- B. The rotating scum deflector shall have an L-shaped scum blade supported from structural braces extended from the truss arm and influent well. The deflector shall extend tangentially from the influent well to the scum baffle.
- C. A pivoting wiper assembly shall be mounted on the outer end of the deflector blade to form a pocket for trapping the scum. There shall be two pivot joints to ensure continual contact and proper alignment between wiper blade, scum baffle and beach as the blade travels up the beach and over the scum trough.
- D. The wiper blade shall have a wearing strip on its outer end which contacts the effluent scum baffle and a neoprene strip on its lower and inner edge. The scum shall be trapped as the wiper blade meets the skimmer blade ramp and is raised up the beach to be dumped into the scum trough. Skimmers which rely on support from the scum baffle will not be acceptable.
- E. The scum trough and beach plate shall be of welded construction, 1/4" thick HDG steel plate, and shall have a minimum width of 4'-0" and a minimum overall length along the scum baffle of 5'-3". The scum trough shall consist of beach plate, submerged shelf, baffle, hopper, flushing valve and discharge pipe. The trough and beach plate shall be adequately supported from the tank wall.
- F. The scum hopper shall be a minimum 12" wide and shall extend the full width of the trough. A flushing device shall be provided on the scum trough. The flushing

device shall consist of a counterweighted flapper valve actuated by the skimmer arm. The valve shall be designed to provide flushing water of 10 to 20 gallons per skimmer pass. The actuator arm shall be counterweighted with steel plates to ensure positive valve closure. Valve seat shall be 1/4" thick resilient neoprene.

- G. A standard diameter flange connection for the scum discharge pipe shall be furnished. Scum piping beyond the scum trough flange shall be as shown on the drawings.
- H. Per Alternative No. 1 A-1, these surface skimmer arms and scum trough/hopper shall be manufactured out of 316 stainless steel.

## 2.9 EFFLUENT WEIRS, SCUM BAFFLE, EFFLUENT TROUGHS AND SUPPORTS

- A. Effluent weir plates shall consist of 9-inch-deep x 1/4-inch-thick HDG steel sections with 2-1/2"-inch deep 90° v-notches at 6 inch intervals. Weirs shall be attached to both sides of the effluent trough. The weir sections shall be fastened to the effluent trough wall using 316 stainless steel bolts, hex nuts and 5-inch diameter washers, allowing for vertical adjustment.
- B. The scum baffle plates shall consist of 12-inch-deep x 1/4 inch thick HDG steel sections supported from the effluent trough by HDG steel angle brackets secured with 316 stainless steel bolts and hex nuts, allowing for vertical and radial adjustment.
- C. The effluent troughs shall be fabricated from 1/4" thick HDG steel and shall measure 16-3/4" wide x 13" deep and be supported off of the wall approximately 45" at midpoint of the trough with knee braces and designed for the effluent troughs being full of water and the tank empty and the tank full of water and the effluent troughs empty.
- D. A drop box shall be fabricated from 1/4" thick HDG steel and shall be provided to match up to the existing tank wall penetrations and/or configuration.
- E. Per Alternative No. 1 A-1, these effluent weirs, scum baffles, troughs, drop boxes and supports shall be manufactured out of 316 stainless steel.

## 2.11 SPARE PARTS

- A. The clarifier manufacturer shall furnish as a minimum the following spare parts per clarifier.
  - A. One (1) set of neoprene skimmer wipers for each skimmer assembly.
  - B. Twelve (12) shear pins.

## 2.12 ANCHOR BOLTS / FIELD BOLTS

- A. All equipment anchor bolts and assembly bolts shall be 316 stainless steel, furnished by the equipment manufacturer, and of ample size and strength for the purpose intended. All anchor bolts shall be set by the Contractor in accordance with the equipment manufacturer's instructions.

## 2.13 SHOP PAINTING AND FIELD COATINGS

- A. All submerged and non-submerged un-galvanized steel work to be sandblasted per Spec. No. SSPC-SP6 and to receive one (1) shop coat, 2.0 mils dry film thickness per coat of Tnemec epoxy primer or approved equal. The spur gear drive assembly shall be factory finish painted with the manufacturer's standard paint system.
- B. Stainless steel shall be passivated per ASTM 380 using a citrus based cleaner.
- C. The installing contractor shall touch up and/or any paint that is damaged during installation.

## 2.14 ACCEPTANCE TEST

- A. After installation, the sludge collector mechanism shall be field torque tested in the presence of the Engineer to confirm and verify the structural and mechanical compliance to the torque requirements specified by loading the collector mechanism with 120% and 140% of rated continuous torque specified. Also, this field test shall substantiate operation of warning and drive shutdown circuitry.
- C. All labor, materials and test apparatus necessary for conducting the above tests shall be furnished by the Contractor at no additional cost to the Owner.

## 2.15 CONTROL PANEL

- A. A control panel (460V/3 Phase service) shall be provided with the new clarifier by the equipment manufacturer and shall be wired in place and tested by the installing contractor. All new wire, conduit, supports, and all other required materials and shall be provided by the installing contractor.
- B. The control panel shall contain the following components:
  - 316 NEMA 4X STAINLESS STEEL ENCLOSURE
  - U/L LABEL
  - 14ga. CONTROL WIRE
  - MOTOR CIRCUIT PROTECTOR(S)
  - PHASE FAILURE RELAY

- NEMA SIZE 1 MOTOR STARTER(S)
- OVERLOAD RESET PUSH BUTTON(S)
- TRANSFORMER CIRCUIT BREAKER
- CONTROL TRANSFORMER(S)
- POWER ON PILOT LIGHT(S) PUSH-TO-TEST (2)
- HAND-OFF-AUTO SELECTOR SWITCH(ES)
- RUN PILOT LIGHT(S) PUSH-TO-TEST TYPE
- AUX. RUN CONTACT(S)
- SET(S) OVERLOAD AUX. CONTACTS
- HIGH TORQUE ALARM PILOT LIGHT PUSH TO TEST TYPE
- SET(S) AUX. CONTACTS
- TORQUE SHUTDOWN ALARM PILOT LIGHT PUSH TO TEST
- SET(S) AUX. CONTACTS
- MANUAL RESET PUSH BUTTON(S)
- 120VAC FLASHING ALARM LIGHT
- ALARM HORN WITH SILENCE PUSH BUTTON
- ALARM HORN OFF-ON SELECTOR SWITCH(ES)

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION**

- A. The collector mechanism shall be erected and installed in strict conformance with the approved shop drawings and Manufacturer's installation instructions.

#### **3.2 START-UP & COMMISSIONING**

- A. Provide Manufacturer service technician for start-up, field testing, operator training and final adjustment.
- B. Field testing, start-up, and operator training: minimum of two (2) trips totaling four (4) full days on-site.
- C. A written report covering the technician's findings and installation approval shall be submitted to the Engineer/Owner covering all inspections and outlining in detail any deficiencies noted.

#### **3.3 MAINTENANCE**

- A. The equipment supplier shall furnish four (4) copies of operation and maintenance manuals which will be retained at the installation site to assist plant operators. The manual shall include the supplier's erection and assembly recommendations and a complete list of recommended spare parts.

END OF SECTION