

# ECS House Industries, Inc.

3720 Highway 1 South, Cherry Valley, Arkansas 72324

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## FLOATING BRUSH AERATOR SPECIFICATIONS

### Section I:

#### A. GENERAL

1. The design, fabrication, supply, and installation of the aeration system shall be as specified herein.
2. Floating brush aerators shall be equipped with all necessary equipment and materials to meet the specified requirements in the proposed wastewater treatment process.

#### B. QUALIFICATIONS

1. The aeration equipment manufacturer shall be approved by the Engineer and Owner. Manufacturers must have approval by both the Engineer and Owner to bid this project two (2) months prior to the advertised bid date.
2. The aeration system supplier shall be experienced in wastewater treatment processes and shall be prepared to demonstrate the effect on the client's process of the aeration systems supplied through documented analysis relating to flow, hydraulic retention time, and biological contact. Certified Oxygen Transfer & Mixing Tests performed by an independent third party shall be made available to the Engineer & Owner. These tests should support the aeration system design, and show the aeration system can provide the oxygen & mixing necessary for proper and effective wastewater treatment.
3. The floating brush aeration system Design Engineer shall have documented water and wastewater treatment and design experience for a minimum of fifteen (15) years.
4. Aerator assemblies and appurtenances shall be manufactured and designed according to the layout shown on the drawings. Aerators shall operate without objectionable noise or abnormal vibration. All rotating parts shall be balanced through precise CNC machining and precision rotor and shaft alignment. "Bolted-In", Piloted stub shaft assemblies are a requirement for each Floating Brush Aerator. Any other form of rotor & shaft alignment or assembly is not acceptable. Aerators shall have a nameplate that will include the manufacturer's name, serial number, model number, size, gear reducer speed, and horsepower.

## C. SUBMITTALS

1. The Manufacturer shall provide the Contractor submittals showing full details of all aeration equipment and appurtenances.
2. This submission shall be made as soon as feasible after Contract award or Approved Purchase Order is agreed upon between the Contractor and Manufacturer. The Manufacturer shall provide the Contractor with four (4) copies of the submittal for approval by the Engineer. After submittal approval, the Manufacturer shall receive an approved copy of the submittal for their records. Manufacturing of aeration equipment & systems will begin after the submittals are approved.
3. The information required on the submittals shall include, but not necessarily be limited to the following:
  - a. Full and complete specifications covering the proposed equipment and appurtenances to be furnished, including certified aeration design provided by Floating Brush Aeration Design Engineer. The design shall show the mixing and oxygen capabilities of the Floating Brush Aerator.
  - b. Detail drawings showing plan and elevation dimensions of the proposed equipment and appurtenances to be furnished.
  - c. Assembly, Installation, and adjustment instructions.
  - d. The location of the floating brush aerator manufacturer. This facility shall be able to provide product service, product support, and parts to the Owner. This factory shall be within 110 miles of the proposed wastewater treatment facility.
  - e. Full and complete specifications for the complete drive-train system that operates the floating brush aerators.
  - f. Provide Floating Brush Aerator assembled weight, and the weights of individual pieces that will be unloaded & installed.
  - g. Provide Manufacturing warranty as specified herein.
  - h. Floating Brush Aerator troubleshooting guide.
  - i. Electrical requirements, including power and control wiring schematics. Failure to submit the above data as set forth shall be cause for rejection of the submittal and equipment.

## D. OPERATION & MAINTENANCE MANUALS

1. Upon the Engineer's approval of submittals the manufacture shall provide four (4) copies of the operation and maintenance manuals to the Contractor.
2. The O&M manuals shall include details of all components, installation instructions, start-up procedures, and operation and maintenance procedures. The O&M Manuals shall include all lubrication specifications and lubrication maintenance details. The O&M manuals shall include specific instructions for receiving and handling, assembly, mooring, wiring, installation, repair, service and storage.

## Section 2

### A. PRODUCT DESCRIPTION & MANUFACTURER

1. The Contractor shall furnish and install a total of XXXXXXXXXXXXXXXX Floating Brush Aerators as a part of this project. The Floating Brush Aerators shall be manufactured by ECS House Industries, Inc., Cherry Valley, Arkansas.

### B. FLOATING BRUSH AERATOR ROTOR ASSEMBLY

1. The XX hp floating brush aerator rotor shall have a X" standard wall rotor pipe. The rotor shall be XXX" in length. The rotor shall have XXX brushes that are X" wide x XX" long. The brushes shall have a 133-degree V-shaped angle. The brushes shall be robotically welded, on both sides, in a spiral configuration to achieve superior balance and rotation. The rotor assembly shall be constructed of 304L Stainless Steel or TGIC Powder Coated, Mild Steel.
2. The rotor assembly shall have welded-in CNC machined inner plates that allow both the drive and non-drive end shafts the ability to be bolted-into the rotor. The bolt-in shafts are the "male" parts and the machined inner plates are the "female" parts. This is a definition of a piloted, bolt-in shaft assembly. A welded-flange on the outer diameter of the rotor pipe or torque tube with a bolted-on shaft is not acceptable. The drive and non-drive end shaft shall be fabricated from 316 stainless steel.

### C. DRIVE TRAIN: TRIPLE-SEAL PROTECTION SYSTEM

1. The "Triple-Seal Protection" (TSP) system prevents wastewater, solids in the wastewater, and corrosive wastewater gases from entering the drive-train enclosure. The TSP ensures that the drive-train (flange bearing, gear reducer, paraflex coupler, & electric motor) will not be exposed to the elements described above. This type of protection system is a necessity for a floating brush aerator. Any floating brush aerator that does not have the TSP described below cannot be considered an equal and will not be an accepted manufacturer for this project or future projects.
2. The TSP system begins as the 316 stainless steel drive shaft enters the drive-train enclosure through inner & outer seal plates. The XXhp floating brush aerator shall have a XXX" diameter drive shaft.

3. The inner and outer seal plates shall have spring loaded, non-metallic, double-lip nitrile seals. The outer seal is additionally protected with a v-ring shaft seal and protective stainless steel collar over the v-ring shaft seal. The cavity between the inner and outer seal plates are grease filled through a port on the side of the outer seal plate. Internally, the XXhp drive shaft is supported by a XXX” piloted flange bearing that is bolted internally to the drive case with a spacer ring that permits a close fit and aligns the shaft seals.
4. The piloted, flange bearing shall have a minimum L10 rating life of 100,000 hours. The piloted, flange bearing and gear reducer output hub bearings support the weight of the drive-end rotor assembly. This reduces the weight The XXhp drive shaft reduces diameter to XXX” to permit mounting of the gear reducer to the drive shaft via a tapered bushing assembly.
5. A “Spring Loaded Grease Feeder” (SLGF) shall be provided with each floating brush aerator to lubricate the piloted, flange bearing. The SLGF provides grease to the bearing as needed. The SLGF requires a manual grease refill. The frequency for this refill is located in the O&M Manual.
6. The TSP housing is fabricated from 304L stainless steel. The housing consists of : welded drive case, drive case cover with a glued neoprene seal and hinge linkage, vented motor mounting bracket, motor height adjusting brackets with stainless steel adjusting bolts, vent hole splash prevention angle, 16 gauge, 304L stainless steel motor cover, stiffening angles bolted to the upper case sides and ends, and anti-rotation angles that lock the gear reducer into position after the motor and gear reducer input shafts are aligned. The stiffening angle closest to the rotor assembly shall provide an adjustable hinge point for compression of the seal around the top edge of the enclosure, enclosure sides, and motor bracket.
7. The motor bracket bolts directly to the TSP housing to provide room for installation and removal of the shaft mounted gear reducer. The motor is sealed to the TSP housing with silicone. This assembly ensures that the C-Face motor can be removed without having to reposition the gear reducer.
8. The 304L stainless steel cover of the TSP housing shall be held closed with two stainless steel clamp latches mounted on stainless steel blocks bolted to the TSP housing sides. The latching force shall be adjustable to maximize sealing of the cover. The stainless steel clamp catches shall be bolted to the TSP cover flange. When in the raised position for service and inspection, the cover shall be held open with manually inserted stainless steel pins with lanyard in the hinge linkage.
9. The TSP housing shall be bolted to the framework in four (4) places provided by four (4) angle brackets bolted to the TSP housing sides.

## D. GEAR REDUCER

1. The gear reducer shall be a constant-duty AGMA Class III DODGE gear reducer. The gear reducer shall be directly mounted to the rotor assembly's drive shaft with a tapered-bushing assembly. The shaft mounted helical gear reducer shall have tapered roller bearings. Ball bearings in the gear reducer are not acceptable.
2. The XXhp floating brush aerator will have the TAX model gear reducer. The TAX gear reducer shall be rated for XXhp @ 1750 RPM input speed, providing a minimum 2.0 service factor.
3. The input shaft and output hub seals shall be non-corrosive, non-metallic, stainless steel spring loaded double lip, nitrile seals. The output hub shall have two seals on each side.
4. A cooling fan shall be mounted to input shaft of the gear reducer. A keyed hub on the input shaft will provide rotating power for the fan.

## E. PARAFLEX COUPLING

1. The input shaft of the gear reducer shall be connected to the motor shaft with a Dodge Paraflex Coupler. This direct-driven assembly between the electric motor and gear reducer via a Paraflex coupler provide a "Dampened Drive System" (DDS). The DDS absorbs start-up forces and allows for 4° of misalignment. The coupler shall be high speed and the coupler element shall be constructed of high density reinforced rubber. The gear reducer shall produce a nominal rotor speed of 70 RPM. The gear reducer shall not be connected to the motor using any type of V-belt driven system or a "low speed coupled" direct driven system.
2. The XXhp floating brush aerator uses a PXXX Dodge Model Coupler.

## F. ELECTRIC MOTOR

1. Each floating brush aerator shall use a premium efficiency, severe-duty C-face motor with mounting feet. The motors shall be XXhp, 3-phase, 60 Hertz, 230/460 volt, 1750 RPM with a 1.25 operating service factor when motor is operating at 90% of rated full load during normal operation.
2. Motor shall be totally enclosed, fan cooled (TEFC), rated for severe corrosive-duty, NEMA Class F insulation, cast iron construction with an epoxy coating, and stainless steel hardware and nameplate. (Premium efficiency; meets or exceeds the requirements of EPACT '92 and Canadian Federal Efficiency Levels defined in CSA C390-93. Full load efficiency of all ratings is certified under the EEV Program of the CSA.)

## G. ELECTRIC MOTOR CERTIFICATION

1. The aerator manufacturer shall provide certification that the nameplate data affixed to the aerator's electric motor is valid, specific data applicable to that particular motor

## H. NON-DRIVE END ROTOR BEARING

1. The non-drive end bearing shall be a grease lubricated, stainless steel, eccentric collar, ball-bearing assembly. The bearing shall have a 304L stainless steel inspection cover and an auxiliary, non-corrosive seal mounted in a 304L stainless steel seal plate on the rotor assembly side of the non-drive end bearing bracket.
2. The eccentric collar shall have a stainless steel, rear cover mounted above and around the non-drive end bearing bracket sides.
3. The bearing shall have an L10 bearing life over 100,000 hours.
4. A "Spring Loaded Grease Feeder" (SLGF) shall be provided with each floating brush aerator to lubricate the non-drive end bearing. The SLGF provides grease to the bearing as needed. The SLGF requires a manual grease refill. The frequency for this refill is located in the O&M Manual.
5. Plastic bearings that may or may not use wear sleeves or bushings will not be acceptable. Water lubricated bearings are also not acceptable.

## I. FLOATATION ASSEMBLY

1. Each floating brush aerator shall have (2) two, 16 gauge, 304L stainless steel tanks. All stainless steel floats shall be seam welded and pressure checked after fabrication. The stainless steel floats shall be foam filled with "closed celled" two part foamular foam.
2. The XXhp drive-end tank shall be XX' long x XX" diameter, and the non-drive end tank shall be XX' long x XX" diameter.

## J. FLOATATION ATTACHMENT BANDS

1. Each floatation tank shall be attached to the floating brush aerator mainframe using 304L stainless steel bands. The bands are connected to the mainframe with stainless steel pins and 304L stainless steel bolted brackets. The mainframe shall be connected to the anchoring system in such a manner that external forces, resulting from wave action and other external movement, are not transferred to the floatation attachment bands.

2. Each floatation tank shall have adjusting linkage attached to each corner of the aerator main frame. Adjusting linkage shall be capable of changing the operating depth of the horizontal rotor blades; the horsepower requirement and amperage draw, and provide aerator leveling. Adjusting linkage shall be fabricated from 304L stainless steel rods with brass adjusting nuts. Adjusting linkage shall not be connected directly to the anchoring system nor shall it mechanically depend upon the anchoring system for it to be effective.

## K. AERATOR MAIN FRAME

1. The main frame of the aerator shall be fabricated from 304L stainless steel or TGIC Powder Coated, Mild Steel, and shall use X" schedule 40 pipe & 3/16" plate. The frame shall be welded and bolted together with stainless steel hardware.

## L. ANCHORING SYSTEM

1. The anchoring system shall hold the aerator firmly in position. The type of anchoring system to be used is determined by the placement of the floating brush aerator(s), and the wastewater application.
2. The anchoring system shall be fabricated from 304L stainless steel or TGIC Powder Coated, Mild Steel. The anchoring system shall not restrict the unit's floatation and shall allow for continuous aerator operation with fluctuations in the water surface elevation up to (plus/minus) three feet ( $\pm 3$ ft.).
3. The anchoring system for this lagoon application shall consist of two (2) parallel mooring arms, one (1) cross-brace assembly, and two (2) vertical bank stake poles in order to anchor to the levee of the lagoon.

## M. POWDER COATING SPECIFICATIONS

1. GENERAL: As an ALTERNATE to a 100% STAINLESS STEEL FLOATING BRUSH AERATOR manufactured by ECS House Industries, Inc., the following aerator part(s) and/or assemblies can be manufactured from ASTM A36 Mild Steel, and Powder Coated after the part(s) and/or assemblies are completely fabricated. The remaining aerator parts(s) and/or assemblies shall be manufactured from stainless steel.
  - a. Rotor Assembly: This includes rotor pipe, brushes, drive and non-drive end shafts, and machined, rotor inner plates.
  - b. Triple Seal Protection Housing: This includes the entire TSP case, cover, housing, and inner & outer seal plates
  - c. Aerator Main Frame: This includes the pipe and plate material for the aerator main frames.

2. Powder Paint Description: All metals that have been specified to be TGIC Powder Coated shall follow the process below in order to achieve a superior coating system. Polyester TGIC coatings utilize the epoxy functional cross-linker TGIC (triglycidylisocyanurate). Use of this low molecular weight, multifunctional cross-linker enables polyester TGIC formulations to contain 90% or greater resin within the binder system. All powder coating shall use this type of TGIC formulation with a minimum thickness of three (3) mils.
3. Metal Shot-Blast Process: The cleaning process shall begin with the steel components being steel shot blasted to an SSPC-6 commercial gray quality (Manual steel shot blast for touch up if required). The BCP shot blast room is utilized for compressed air cleaning to remove shot from crevices and horizontal surfaces of steel components.
4. Four-Stage Wash: The components then shall enter a four (4) stage batch washing system consisting of:
  - a. Combination Cleaner Phosphate Coater 180 seconds
  - b. 1st Fresh Water rinse 120 seconds
  - c. 2nd Fresh Water rinse 60 seconds
  - d. Non-chrome seal rinse 60 seconds
5. Batch Dry-Off: The metal part (s) shall dry in the IHEI batch dry-off oven at 225 degree Faranheit to flash off any moisture remaining on the steel components.
6. Electrostatic Application: Electrostatic applications of TGIC powders are manually applied in an environmental room that controls humidity at less than 50%. The environmental room shall have a grounded booth for the applications of TGIC powder.
7. Powder Curing: Curing of these components shall be accomplished in a 450 degree maximum temperature curing oven. The oven has three load bar locations to permit proper curing time that may vary from 40 to 55 minutes (these times are dependent on metal thickness).
8. Quality Control: Coating thickness shall be checked prior to unloading the steel components with a thickness meter. If the proper thickness is not met (3 mils minimum), the steel components go to an 850-degree F oven where the powder-paint is burned off and easily removed from the metal. After this, the metal goes through the system again.

## Section 3

### A. EXECUTION

1. The floating brush aerators shall be installed as shown on the drawings and in strict accordance with the manufacturer's instructions.
2. The floating brush aerator supplier, through their field service technician or representative, shall provide service to verify the proper installation and supervision of equipment start-up. Operation and maintenance instruction shall be given to the Engineer/Owner through the use of illustrated material within the manual.



3. Installation supervision and start-up services shall be provided only to the extent required to comply with the manufacturer's warranty conditions.
4. After completion of the equipment installation, testing of the floating brush aerators shall be done continuously for a period of 24 hours.

## B. WARRANTY

ECS House Industries, Inc. will warranty its equipment as free of defects in material and workmanship for a period of twelve (12) months to the original purchaser subject to the restrictions and conditions listed herein. Warranty period will begin upon delivery to the original purchaser or its designee. ECS House Industries, Inc. will replace or repair any part built and manufactured by ECS House Industries, Inc. within the warranty period that have failed under normal use subject to the restrictions and conditions listed herein. ECS House Industries, Inc. will not be responsible for shipping or handling on parts returned for warranty. All parts returned for warranty replacement or repairs must be returned within thirty (30) days of failure, have proper serial number and should have a RMA number attached. All motors, bearings, gear reducers, chains, sprockets, or any other part or component purchased by ECS House Industries, Inc. will be subject to the original warranty and warranted separately by their respective manufacturer. Some, but not all, original manufacturer's warranties are listed on the following pages. ECS House Industries, Inc. is not obligated to bear the cost of labor, lodging, and removal of equipment from water and/or wastewater, meals or transportation of any warranty provided herein.

**RESTRICTIONS, LIMITATIONS, AND CONDITIONS.** ECS House Industries, Inc. expressly limits the repair or replacement of defective material, parts or workmanship to be performed at ECS House Industries, Inc. facility or another place designated by ECS House Industries, Inc. No warranty will be honored by ECS House Industries, Inc. when in the sole opinion of ECS House Industries, Inc. there is loss or damage resulting from any cause beyond the control of ECS House Industries, Inc. including, but not limited to, abuse, neglect, alterations or modifications, an accident, unauthorized repairs or attempted repairs, improper installation, or damages from acts of God or governments, floods or fires, or other parties, specifically including, but not limited to purchaser. ECS House Industries, Inc. will not be responsible for failures of any kind due to pH levels that vary outside normal limits or abnormal water density in any application. All warranties as stated herein will be null and void upon failure of any kind that is determined by ECS House Industries, Inc. to have been caused by lack of routine maintenance and proper fluid changes as required by the operator's manual and the original equipment manufacturer. All warranties stated herein will be null and void upon any failure due to foreign objects coming in contact with any ECS House Industries, Inc. equipment. All serial numbers shall remain intact and together as recorded and coordinated by ECS House Industries, Inc. All parts replaced during the warranty period shall be purchased from ECS House Industries, Inc. and be of the correct part for the correct model. ECS House Industries, Inc. shall not be liable for any damage caused by corrosion to any material, part, or workmanship during the warranty period or any other time. This warranty is subject to any existing conditions of supply which may directly affect our ability to obtain materials or manufacture replacement parts. Any repair or replacement under this warranty shall not extend the original warranty expiration date.

**LIMITED WARRANTY AND LIABILITY.** ECS House Industries, Inc. shall have no obligation or liability of any kind whatsoever and shall not be liable for lack of oxygenating, loss of product or crop, time or delays, special or consequential damages of any kind of damage whatsoever arising out of the use of or failure of any product manufactured or sold by ECS House Industries, Inc. during the warranty period or anytime thereafter due to corrosion, bacteria, amoeba, or any cause whatsoever. ECS House Industries, Inc makes no other warranty,

**expressed or implied, and, specifically, ECS House Industries, Inc disclaims any implied warranty or merchantability or fitness for a particular purpose.**

If any provision of this Warranty or the application thereof to any party or circumstance shall to any extent be invalid or unenforceable, the remainder of this Warranty, or the application of such provision to parties or circumstances other than those as to which it is invalid or unenforceable, shall not be affected thereby and each provision of this Warranty shall be valid and enforceable as to the fullest extent permitted by law. This warranty shall become null and void upon the dissolution of ECS House Industries, Inc. This warranty supersedes and voids any and all previous warranty statements and guarantees issued by ECS House Industries, Inc.