

1. GENERAL

- 1.1 The following specifications direct attention to certain required features of the design package, but do not purport to cover all details entering into the design, construction, and/or installation of the equipment.
- 1.2 Furnish ___ mixers. Each mixer shall consist of a submersible motor, submersible gear reducer, a direct drive propeller driven at a constant speed, and a motor mount support without shroud. Non-submersible motors shall not be considered equal. All components of the mixer, including the motor shall be capable of continuous underwater operation while the mixer blades are completely submerged.
- 1.3 All parts shall be designed and proportioned for ample strength, stability, and stiffness for their intended purposes.
- 1.4 The guide rail mast arrangement shall permit the mixer to be rotated for flow and energy optimization.
- 1.5 The mixer shall be capable of handling raw, screened sewage. The mixer shall be designed to be raised, lowered, and removed for inspection or service without the need for personnel to enter the tank. A mixer mount with a guide bracket shall be an integral part of the mixer unit. The entire weight of the mixer shall be guided by the guide bracket up and down the guide rail mast and shall be able to handle all thrust created by the mixer. The mixer with its appurtenances and cable shall be capable of continuous submergence without loss of watertight integrity to a maximum depth of 200 feet or 200 P.S.I.

2. PERFORMANCE

- 2.1 Each mixer shall be capable of a minimum direct pumpage volume of _____ gpm. and produce a minimum of _____ pounds of thrust, at a maximum propeller speed of _____ rpm.

3. SUBMERSIBLE MOTOR

- 3.1 The motor shall be an ABB Duty Master Submersible AC motor designed for Class 1, Group D, Division 1, and Hazardous Location (as defined by the National Electrical Code). The motor shall be UL listed for Class 1, Group D, Division 1, explosion-proof, for installation in water or sewage. Motors not having a UL listing, Class 1, Group D, Division 1, explosion proof, for installation in water or sewage will not be considered equal. The high efficiency motor shall be designed for continuous duty and shall be capable of sustaining ten (10) evenly spaced starts per hour. The motor shall be ISO 9000 certified.

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- 3.2 The motor shall deliver ___ horsepower at 1800 rpms and shall be wired for ___ volts, 60 HZ, ___ phase service, ____ max amps.
- 3.3 All electrical parts shall be housed in an air filled, corrosion resistant, cast iron, Class 30, frame. All mating frame fits shall have rabbet joints with large overlap, as well as O-ring seals of nitrile rubber.
- 3.4 The motor shall have special Class F insulated windings rated for continuous duty in 25 degrees C liquids and shall be non-hygroscopic. The motor shall have a 1.15 service factor and three (3) thermal switches in the end turns of the motor windings.
- 3.5 The internal components of the motor shall be protected by heavy duty tandem mechanical seals Type 21, carbon ceramic. The mechanical seal shall be manufactured under ISO 9000 certification. Any motor using shaft lip seals or a combination of lip seals and mechanical seals shall not be considered equal.
- 3.6 The motor shaft, delivered with the rotor as an integral part, shall be 416 stainless steel. The motor shaft shall rotate on two permanently lubricated bearings. The bearings shall be single row, deep-groove ball bearings calculated for an L-10 life of 100,000 hours at full load.
- 3.7 The motor shall be provided with Bi-metallic thermal sensor, mounted in the stator windings end turns and wired into the mixer control, shall be used to monitor temperature.
- 3.8 The Cable entry shall be an integral part of the motor. The cable entry shall be composed of a cable holder with a flange bearing against a shoulder in the stator casing opening. The Cable entry shall be Class 30 cast iron. Sealing shall be accomplished by metal-to-metal contact between surfaces resulting in compression of the O-ring. The cable leads shall be cast into the cable entry.
- 3.9 The cable leads shall have strain relief internal to the entry consisting of a strain equalization plate and Buna-N grommets. The cable leads shall be butt spliced and epoxy sealed to prevent intrusion of any liquid from a damaged cable into the motor. Terminal boards shall not be considered equal to the leak proof threaded enclosure impregnated conductor epoxy seal system specified.
- 3.10 Each motor shall be furnished from the factory power and monitoring electrical cable of UL approved water resistant electrical cable of ____feet (30' standard).
- 3.11 All external hardware, including the motor name plate, shall be made of 316 stainless steel.

4. SUBMERSIBLE GEAR REDUCER

- 4.1 The submersible gear reducer shall be a special inline planetary foot-mounted design with a gear reduction ratio of _____ .
- 4.2 The internal components of the gear reducer shall be housed in a Class 30 cast iron frame.
- 4.3 The internal gears and ring gear are manufactured of case hardened alloy steel.
- 4.4 The output shaft shall be manufactured of 2.750 diameter, 304 stainless steel.
- 4.5 The output shaft shall be supported by two (2) heavy duty, single row bearings calculated for an L-10 life at 100,000 hours at full load and torque.
- 4.6 The internal components shall be protected from liquid intrusion by a special heavy duty Type 21 mechanical seal of silicon carbide. The mechanical seal shall be manufactured under ISP 9000 certification. Any use of shaft lip seals or a combination of lip seals and mechanical seals shall not be considered as equal.
- 4.7 The internal components and mechanical seal shall be lubricated with 90 weight gear lube.
- 4.8 All external hardware shall be made of 316 stainless steel.

5. PROPELLER

- 5.1 The propeller shall be manufactured of 316 stainless steel and shall be specifically designed for the application intended.
- 5.2 The propeller shall be 3 bladed and streamlined to prevent cavitation and reduce drag and shall have trailback blades for weedless, foul resistant operation.
- 5.3 The propeller shall be hydraulically balanced to assure equalization of load under full operation.
- 5.4 The propeller shall be dynamically balanced to within 5 gramcentimeters.
- 5.5 The propeller and motor rotor unit shall be dynamically balanced to a vibration level not to exceed .70 mils while hydraulically submerged.

6. MIXER MOUNT SUPPORT

- 6.1 The mixer mount support shall be constructed of 304 stainless steel and have a guide bracket constructed of stainless steel welded to the mixer mount to allow the mixer to slide up and down the guide rail mast for installation, removal, and service of the mixer. The guide bracket shall be provided with an LPE liner allowing a non-sparking contact between the guide bracket and guide rail mast.
- 6.2 All mixer mounting fasteners shall be type 316 stainless steel.
- 6.3 The mixer mounting support shall be designed in such a way as to furnish maximum rigidity and stability with minimum flow interference.

7. PAINT

- 7.1 All surfaces, other than stainless steel, will be coated with Tnemec Series 66 Hi-build epoxyline. Paint shall be chemical and corrosion resistant for protection against abrasion, moisture, corrosive fumes, chemical contact, and immersion in potable and waste water application. Color shall be Blue Sky (F066-26BLSK).
- 7.2 All surfaces shall receive two (2) coats for 6 mils thickness.

8. GUIDE RAIL MAST ASSEMBLY

- 8.1 The guide rail mast assembly shall be used to mount each mixer during operation and to guide the mixer during installation and removal for service.
- 8.2 The guide rail mast assembly shall consist of a stainless steel guide rail mast, anti-sway upper mast support with a directional locking clutch assembly, and a stainless steel lower base plate, with a pivot ball to interlock with mast for rotational service, and a jib boom with a manual winch and stainless steel cable to raise and lower the mixer.
- 8.3 The guide rail mast shall be a single 304 stainless steel, four (4) inch square tube with a minimum .188 wall thickness. The vertical guide rail mast facilitates vertical and directional adjustment, installation, removal, and required inspection of the mixer.
- 8.4 All parts shall be designed and proportioned for ample strength, stability, and stiffness for their intended purposes.

9. QUALITY

- 9.1 All mixers will be tested and verified for electrical and mechanical integrity. The following tests will be the minimum performed:
- A. An insulation test of the windings and balancing of the rotor.
 - B. A test of the mixer motor (run dry for 5 minutes at full load; to check electrical data measurement.
 - C. A submerged test of the mixer.
 - D. A motor end cable insulation test for moisture content and insulation defects.
 - E. A check of the mixer (run dry) to establish correct rotation and mechanical integrity.
 - F, A check of propeller, motor rating, and electrical connections for compliance with purchase order.

10. OPERATION & MAINTENANCE MANUALS

- 10.1 Operation and maintenance shall be furnished to the owner prior to start-up of the equipment.

11. WARRANTY

- 11.1 The Inter-Mix gear reduced mixer has a one year limited warranty against defects in material and workmanship.