TORNADO ASPIRATING AERATOR SPECIFICATION

A. General

Provide a total of ____TORNADO horizontally mixing aspirating aerators as manufactured by AEROMIX Systems, Incorporated of Minneapolis, Minnesota, USA. Each aerator shall be____horsepower, and shall consist of an electric motor flexibly coupled to a solid rotating shaft. A propeller shall be affixed to the lower end of the shaft. The shaft shall be supported at the top and bottom by two sealed tapered roller bearings. A stationary draft tube shall be provided which allows the passage of air between the draft tube and solid shaft so that atmospheric air can be transferred through the unit and into the wastewater. The rotating propeller shall create a low-pressure zone at its hub, thus drawing air through the inlet, through the draft tube and into the wastewater. Specifications for accessories are available upon request.

B. Aerator Shaft

1. A minimum one inch (25.4 mm) diameter, one-piece, solid, 17-4 stainless steel shaft shall be used. The aerator shaft shall be, at least, 48 inches (1219 mm) long, thus placing the motor under normal operating conditions at least 10 inches (254 mm) above the liquid surface preventing the motor from being splashed and placing the tips of the propeller blades at 10 inches (254 mm), minimum, below the water surface for safety purposes, to prevent freezing in case of power failure, and to prevent floating debris from damaging equipment. Thin walled hollow shafts are not acceptable.

2. The shaft shall be precision machined with threads and keyways on the propeller end and on the motor end. Shaft run out shall not exceed 0.008 inches (0.2 mm) along its entire length to assure straightness and vibration free operation. Balancing the shaft to reduce vibration is not an acceptable measure of shaft straightness.

C. Aerator Shaft Bearings

1. Two tapered roller bearings shall be used to align the shaft and take up all thrust loads from the propeller. These bearings shall support the shaft near the top and bottom for maximum stability. Aerator shaft bearing design life (L_{10}) shall be at least 100,000 hours as documented by an independent registered Professional Engineer. This documentation shall be supplied with equipment submittals. Under no circumstances shall the thrust load generated by the propeller be transferred to the aerator shaft/motor shaft coupling or motor bearings. Sleeve type, ball bearing type, or wastewater lubricated bearings are not acceptable. Unsupported or cantilevered shafts are not acceptable.

2. All aerator shaft bearings shall operate within a grease lubricated environment, and be sealed to protect them against splashing, submergence and the wastewater.

Grease fittings shall be used to allow the addition of grease to each bearing. All aerator grease fittings shall be located above the liquid surface.

3. A 316 stainless steel bearing support tube shall firmly support the bearings and protect the rotating solid shaft.

4. Seal modules, containing bearing seals, shall be located at the ends of the bearing support tube for the protection of the bearings from the environment. The seal modules shall be removable so all bearings can be easily inspected and to ease seal replacement.

5. A splash guard cone made of 316 stainless steel shall be provided to protect the seal module at the lower end of the bearing support tube against foreign material and wastewater.

D. Draft Tube

A stationary draft tube and air inlet hole shall be used to minimize aerodynamic drag and interference. The draft tube shall be made of stainless steel and shall be shaped in such a way to maximize air flow. Each inlet hole shall be of sufficient size to give maximum air flow and minimum drag. Rotating hollow shafts or rotating air inlets shall not be used. The air passageway provided within the aerator shall be at least 4.2 square inches (2710 mm^2) in cross-sectional area along its length to minimize drag.

E. Propeller

A stainless steel cast, non-fouling, high efficiency, low vortexing, hollow hub propeller shall be used to minimize aerodynamic drag and interference. The propeller shall be made of stainless steel and shall include a key, or spline, to prevent the propeller from becoming loose regardless of direction of shaft rotation. The propeller shall be serviceable without a need for special tooling. The air flow outlet shall be at least 5.95 square inches (3839 mm^2) to maximize oxygen transfer.

F. Aerator Motor Coupling

A flexible coupling shall be used between the motor and aerator shafts which takes up parallel or angular misalignment between the aerator and motor shafts. The coupling shall be a Woods, or Lovejoy, type or equal with replaceable sleeve.

G. Motor Mount

Each aerator shall be provided with a stainless steel motor mount incorporating two pins which fit into mounting cradles allowing the aerator to be easily rotated from nearly vertical to nearly horizontal. For aerators smaller than 50 HP a semi-circular slot shall be provided on the mounting cradle allowing the aerator to be secured at various angles. The motor mount shall be of such design to allow removal of either the motor or the aerator

section for service without dismantling the entire aerator from the mounting system. The mounting cradle shall be indexed to display the angle of operation.

H. Aerator Motor

All motors furnished shall comply with EPACT 92 standards and all applicable provisions of the standards of the National Electric Manufacturers Association (NEMA). Each motor shall be standard TEFC (totally enclosed, fan cooled), NEMA Design B with 1.15 service factor or greater (1.0 service factor for 50 Hz) and Class F insulation. No special fittings, face plates or special design motors shall be used. Thrust loads shall not be placed on the motor bearings. All motors will operate at____AC, ____ hertz, three phase, _____ % efficiency, 1800 RPM.

I. Cold Weather Operation

To prevent addition of unnecessary controls related to heating devices the aerator shall have self-heating bearings that develop sufficient operating temperature to prohibit excessive ice buildup. To ensure longer aerator life the aerator shaft shall be shielded from the environment to prohibit ice from freezing around the shaft during shutdown periods. Aerators requiring heat packs or heaters are not acceptable.

J. Experience

The aerator manufacturer shall provide, upon request, documentation showing evidence of successful equipment operation under similar conditions for at least 5 years.

K. Factory Testing

Each aerator shall be tested at the factory for correct operation, lubrication, operating temperature, lack of vibration, and dry amp draw. Upon request, a test sheet certifying suitable operation shall be shipped with each aerator.

L. Warranty

A warranty statement shall be provided which defines the terms of a 12 month warranty.

M. Performance Testing

The manufacturer shall have available on site a testing tank with minimum volume of 100,000 gallons where oxygen transfer rate, velocity, and mixing tests can be executed. Upon request, the manufacturer shall provide independently certified oxygen transfer test results satisfying ASCE equipment performance requirements.

N. Safety

The manufacturer shall provide visible safety warning labels on the shipped equipment, that comply with OSHA regulations (29 CFR 1910).