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### **SSI Tube 1000 Complete Aeration System Specification**

#### 1.01 Scope:

Furnish all materials and equipment for a fine bubble membrane tube aeration system, beginning with a Van Stone flange and a 90 degree stainless steel elbow, and including all pre-engineered and pre-fabricated stainless steel and PVC piping within the tank, all fine bubble diffusers and accessories required to connect diffusers to pipe, as well 304L SS support stands, 304L SS shell expansion joints with PVC liners, and a moisture purge system for each piping grid.

#### 1.02 Submittals:

Submit the following information to establish compliance with the specifications

A. Submittal detail drawing showing plan, elevation and appropriate cross section of the aeration equipment and anchor locations. In addition, these drawings shall show all pipe sizes and lengths, distances between air distribution headers, and the location of all diffusers, plugs, supports, and expansion joints.

B. Complete headloss calculations for the aeration equipment from the manufacturer's point of responsibility. Headloss calculations should be derived using air at standard conditions and at a design maximum airflow rate per diffuser.

C. Operation & maintenance manual and installation instructions to be submitted after the aeration equipment has been released for fabrication by the Owner.

#### 1.03 System Performance and Design

- A. Type of tanks:
- B. Quantity of tanks:
- C. Passes Each:
- D. Dimensions/Pass:

- Length:
- Width:
- Water Depth:
- Average Design Flow
- Per basin:
- E. Waste Characteristics
  - Monthly average BOD:
  - Monthly average NH3-N:
  - Monthly average TKN:
  - Average MLSS:
- F. Plant Effluent Requirements
  - Monthly average BOD:
  - Monthly average NH3-N:
- G. Design Conditions/Parameters
  - Lbs BOD/Lb BOD:
  - Lbs O2/Lb NH3-N:
  - Alpha factor:
  - Beta factor:
  - Theta factor:
  - MLSS Residual O2 required:
  - Water Temp:
  - Ambient Press:
  - AOR:
  - SOR:
  - Total air required:
  - Diffuser submergence:
- H. Diffuser Grid Configuration

Design and furnish the membrane tube aeration system to transfer the following pounds of oxygen per day per tank in tap water at 14.7 PSIA, 20 C, zero dissolved oxygen, and a diffuser submergence of \_\_\_\_\_ feet/meters (circle one)

Furnish the following minimum quantity of SSI Tube 1000 diffuser units in each tank as follows:

**Diffusers**

Total per tank \_\_\_\_\_  
 Oxygen (Oxygen/Day/Tank Clearwater) \_\_\_\_\_ Lb or Kg (circle one)

Air Rate (Per Tank) \_\_\_\_\_ SCFM or Nm3/hr  
 (circle one)

- I. Factory Oxygen Test

Provide clean water performance test data to demonstrate capacity of equipment to meet specified oxygen transfer requirements. The tests shall be approved by a Professional Engineer.

The tests must be in accordance with the latest ASCE Clean Water Test Procedure

The testing should be conducted in a tank having a surface area greater than 200 sq ft/18.4 sq meters to eliminate the potential of wall effects. Testing shall be conducted at the specific submergence and diffuser density equivalent to the actual project tank configuration, or a coefficient should be applied to allow the use of the bank of existing factory tests.

Submit test data for approval by Owner prior to equipment shipment.

## Part 2.00 Products

### 2.01 Acceptable Manufacturers

- A. Stamford Scientific International, Inc.
- B. In the event that a manufacturer elects to bid an air diffuser system that does not comply with the specifications, then the manufacturer shall submit with the shop drawings a maintenance bond executed by an Officer of the Corporation in the amount of 150% of the bid price, guaranteeing repair or replacement of the air diffusion system in the event of a failure for a period of three years after installation. The Owner will, at its sole option, make the necessary repairs or replacement and deduct the costs from the aforementioned bond of the manufacturer.

### 2.02 Stainless Steel Materials and Fabrication:

- A. Fabricate all welded parts and assemblies from sheets and plates of 304L stainless steel. Fabricate non-welded parts and pieces from sheets and plates of 304L stainless steel.
- B. Pickle all stainless steel assemblies and parts after welding, fabrication and wire brushing by complete immersion in an acid solution as specified in ASTM A380-88. The acid shall be a nitric-hydrofluoric solution as defined in Table A2.1, Annex A2 of ASTM A380. Providing a final rinse using ordinary industrial or potable water and dry in conformance with Section 8.3 of ASTM A380. Corrosion protection techniques not employing full immersion methods are not acceptable.

- C. Do all welding in the factory using MIG, TIG or plasma-arc welding inert gas processes. Field welding is not permitted.
- 2.03 PVC Materials and Fabrication
- A. Produce all PVC pipe and fittings from PVC compound with a minimum tensile strength of 7000 PSI.
- B. Provide lower drop pipes, manifold pipes and header pipes with a minimum of Sch 40 wall thickness. SDR sewer pipe is not acceptable for any in-tank piping.
- C. Factory solvent-weld all PVC joints. Field solvent welding is not permitted.
- D. Headers to terminate in removable end caps, to facilitate water flushing of the piping before installation of diffusers.
- E. One PVC drain line sump with airlift purge ejector line and eductor carrier column to be provided to drain the submerged aeration piping system. System to include one ball valve.
- 2.04 Membrane Aeration System Equipment Components
- A. Provide expansion joints with 304L SS shell and PVC liners. Minimum of 4 slotted bands with stainless steel screws to be used.
- B. Provide support stands, which include hold-down, guide straps, anchor bolts, and supporting structure. Guide straps shall be a minimum of 2" wide. Supports to have a mechanism to provide for +/- 2" vertical adjustment for alignment of the manifold in the field. Supports shall be designed to allow for complete removal from the tank (less anchor bolt) to enable cleaning and maintenance of tank bottom.
- C. Guide supports to consist of a self-limiting hold down and sliding mechanism. Hold down and sliding mechanism shall provide a full circumferential 2" wide contoured bearing surface with chamfered leading edges to minimize binding of the air distribution header. Sliding mechanism shall provide minimum resistance to movement of the air distribution header under full buoyant up-lit load. Mechanism to provide 1/8" clearance around header and be self-limiting if the mechanism is over-tightened. Worm gear clamps are not to be utilized for attaching header pipe to supports, and U-bolts are not acceptable.
- D. Fixed supports to consist of a self-limiting hold down and sliding mechanism. Hold down and sliding mechanism shall provide a full circumferential 2" wide contoured bearing surface. Clamping device shall positively grip the air distribution header when tight and be self limiting to prevent overstressing the header if the clamp is overtightened. Worm gear clamps are not to be utilized for attaching header pipe to supports, and U-bolts are not acceptable.
- E. Aligning and adjusting shall be infinitely adjustable within its limits to allow precise leveling of the air distribution headers and

diffuser assemblies to within 1/2"/12mm of a common horizontal plane without removing the header from the support.

- F. Attach supports to tank floor with a minimum of two stainless steel expansion type anchor bolts or Hilte type chemical anchors designed for embedment in 3000 PSI concrete. Supports which utilize only one anchor bolt or one chemical anchor, or which are made of plastic are not acceptable.

2.05

Diffuser assemblies

- A. Furnish tube type 3.7" (94mm) or 2.5" (65mm) dia membrane diffusers only. Disc or square panel type diffusers are not acceptable.
- B. Diffuser to consist of a premium quality membrane sleeve with perforated base, SSI Super Saddle with quick connect wedge type saddle, and air flow control orifice.. Diffusers with ceramic or plastic type diffusion media elements are not acceptable as alternatives to the membrane. Diffusers that require a center bolt are not acceptable.
- C. Membrane material to be premium quality extruded EPDM with an oil content of less than 15%. Maximum tolerance of membrane wall thickness is +/- 0.2 mm. Inside diameter should be +/- 1 mm and membrane length to +/- 5mm.
- D. Membrane shall collapse and seal when aeration system air is turned off. Membrane shall collapse onto base when air is not being diffused. Design should permit air to exit through the entire periphery of the membrane. Membrane shall be designed to resist clogging, and should have 1mm or 2mm straight slits with no "I" type slits. Membrane to be at least 70% hydrophilic. Characteristics follow:

Tensile strength	1850 PSI
Tear strength	90 Lb/linear inch
Ozone resistance	Pass
UV resistance	Pass
Durometer	45
Ultimate elongation	650%

- E. Diffuser saddle to be constructed of high strength type 2 PVC with carbon black to prevent UV degradation. Base tube to be constructed of PVC with 2% TiO2. Plastics that do not utilize UV protection shall not be acceptable. Saddle is adjustable and should be leveled upon installation to ensure that diffusers are within 1/2"/12mm on a common horizontal plane. Saddle is designed to fit over Imperial 4" pipe (4.5"/114.3mm OD) or Metric 110mm OD pipe. Saddle to accept 3.7" (93mm) or 2.5" (64mm) diameter tubular diffuser branches. One diffuser to be

installed per side up to a maximum length of 47"/1200 mm per diffuser.

- F. Diffuser is designed to prevent air escape at the support tube perforations. Unperforated strips on the membrane accomplish this.
- G. Diffuser is designed for neutral to minimum buoyancy with a proprietary internal pipe plug. Diffusers utilizing end plugs shall not be acceptable.

## 2.06

### Warranty

- A. Warrant all parts to be free from defects in material and workmanship for a period of one year after installation. Furnish replacement parts to the Owner for any items to be found to be defective within the one year warranty period.