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SSI Disc AFD12/AFD350 Complete Aeration System Specification

1.01 Scope:

Furnish all materials and equipment for a fine bubble membrane disc 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 disc 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 12" diameter membrane disc diffuser units in each tank as follows:

	Diffusers	Plugged holes
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.

Provide a 1,000,000 cycle test to prove diffuser flexibility and lifetime. Test to be signed by a Professional Engineer.

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-lift 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 1/4"/6mm 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 Hilti 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 disc type 12"/350mm membrane diffusers only. Odd sizes and cylindrical diffusers are not acceptable.
- B. Diffuser to consist of a membrane with integral gasket, base, retaining ring, air flow control orifice, and pipe saddle or grommet. Diffusers with ceramic or plastic type diffusion media elements are not acceptable as alternatives to the membrane. Diffusers that require a center bolt or webbing to limit membrane deflection are not acceptable.
- C. Diffuser to have two connection methods to pipe
 - 1) Threaded 3/4" connection to grommet or threaded pipe
 - 2) SSI AFD Quick Connect ring –patent pending
- D. Membrane material to be premium quality compression molded EPDM with an oil content of less than 12%. Membranes which are injection molded, or have an oil content of above 12% are not acceptable.
- E. 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 a minimum of 6600 perforations. Membrane to be at least 70% hydrophilic. Characteristics follow:

Tensile strength	2000 PSI
Tear strength	110 Lb/linear inch
Ozone resistance	Pass
UV resistance	Pass
Durometer	60
Ultimate elongation	700%

- F. Diffuser base and retaining ring to be constructed of polypropylene with organic UV stabilizers. Plastics that do not utilize UV protection shall not be acceptable. Characteristics follow:

Specific Gravity	0.905
Water absorption	0.02%
Tensile Strength	5000 PSI
Coefficient of thermal expansion	05
Maximum Temperature	100C

- G. Furnish AFD Quick Connect Saddle or PVC grommets to connect diffusers to pipe. PVC saddle clamps to be attached over a 5/8"/16mm straight drilled hole. Saddle is adjustable and should be leveled upon installation to ensure that diffusers are within 1/4"/6mm on a common horizontal plane. Grommets may be used as an alternative if perforations in the pipe can be drilled at exactly the same locations on the crown of the pipe. Grommet requires a 1-1/4"/31.75mm straight drilled hole. Diffuser may also be directly connected to pipe with a minimum wall thickness of 0.337"/8 mm, however this pipe thickness is required only when diffusers are directly threaded to pipe. Saddle and grommet connections may be made to Schedule 40 pipe.
- H. Diffuser is designed to prevent air escape at the seal. Gasket is integral with diffuser membrane.
- I. Sealing method of retaining device shall generate a minimum of 50 pounds per inch/58 Kg/cm of circumference of the sealing gasket to provide a long term positive seal and to prevent air escape.

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.