

Stainless Steel Aeration Equipment Specification

Part 1 - General

1.01 Description

A. Scope of Work

1. Furnish, install and test aeration system including air mains, drop pipes, valves, expansion joints, couplings, diffusers, supports and appurtenances necessary to make the aeration system complete and operable as indicated on the plans and herein specified.
2. Pipe diameters shall be as shown on the plans. Smaller pipe diameters will not be permitted.

1.02 Related Work

As is described elsewhere.

1.03 Qualifications

- A. The aeration equipment covered by these specifications shall be obtained from a single manufacturer. The aeration equipment covered by these specifications are intended to be standard aeration equipment of proven quality as manufactured by a reputable manufacturer having significant experience in the production of diffuser aeration systems. The aeration equipment furnished shall be designed, constructed, and installed in accordance with the best practices and methods and shall operate satisfactorily when installed.

1.04 Submittals

- A. The Contractor shall submit information from the aeration system supplier to the Engineer for approval and include at least the following:
1. Literature and drawings describing the aeration equipment in sufficient details, to show full compliance with the detail specifications and plans including a parts list and details of construction.
 2. Certified dimensional drawing of each item of equipment to be furnished.
 3. Certified foundation and anchor bolt plans and details.
 4. Bolts and nuts materials and dimensions.
 5. A complete bill of material of the material to be supplied.

6. A one year warranty on all materials supplied to cover material defects and diffuser performance. The warranty shall include the costs of replacing any defective materials and diffusers with new ones.

1.05 Operating Instructions

- A. Operating and maintenance instructions shall be furnished to the engineer one week before start up.
- B. A factory representative who has complete knowledge of the proper operation and maintenance of the aeration system shall be provided for instructing the representatives of the owner on the proper operation and maintenance.

1.06 Tools and Spare Parts

- A. The required spare parts for the diffuser assemblies shall be those as recommended by the manufacturer and shall include the following items as a minimum:
 1. All special tools required for normal operation and maintenance.
- B. All spare parts shall be packed in containers, which are clearly identified with indelible markings on containers.

Part 2 - Products

2.01 Materials and Fabrication

- A. Fabricated all welded parts and assemblies from sheets and plates of 304L stainless steel with a 2D finish conforming to AISI 304L and ASTM A240-78a.
- B. Fabricate non-welded parts and pieces from sheet and plates of 304 stainless steel conforming to AISI 304 and ASTM A240-78a.
- C. Provide air distribution headers as shown on the plans with dimensional tolerances conforming to ASTM A554-72 and ASTM A540-72.
- D. Furnish air distribution headers and connectors with the following minimum nominal wall thickness shall be Sch 5.
- E. Welding:
 1. Perform all welding in the factory using shielded arc, inert gas, MIG, or TIG method.
 2. Add filler wire to all welds to provide for a cross section of weld metal equal to or greater than the parent metal.
 3. Fully penetrate butt weld to the interior surface and provide gas shielding to interior and exterior of joint.
 4. Interior weld beads shall be smooth, evenly distributed with an interior projection not exceeding 1/16 inch beyond the I.D. of the air header or fittings.

5. Continuously weld both sides of face rings and flanges.

6. Field welding will not be permitted.

F. Corrosion Protection and Finishing:

Passivate all stainless steel surfaces by using the following procedure:

1. Wire brush all outside weld areas to remove weld splatter. Brushes shall be of stainless steel and used only on stainless steel.
2. Remove all carbon deposits, greases, and oils by pickling and neutralization to aid the regeneration of a uniform corrosion resistant, chromium oxide film.
 - a. Completely immerse all stainless steel assemblies and parts after welding and brushing in a pickling solution of 6 percent nitric acid and 3 percent hydrofluoric acid for a minimum of 15 minutes and conforming to ASTM A380-88. Parts shall be free of iron particles or other foreign material after this procedure.
 - b. Neutralize all stainless steel assemblies and parts previously pickled by immersion in a tri-sodium phosphate rinse.

G. Furnish all nuts, bolts and washers including anchor bolts in Type 304 stainless steel.

H. Furnish 304L stainless steel diffusers with a cast inlet and cap in the equivalent of 304L stainless steel.

I. Furnish gaskets suitable for environmental temperature expected.

J. Furnish appropriately sized molded nylon orifice inserts when required.

2.02 Fixed Aeration Headers

A. Provide a droplet from the air main connection as shown on the plans.

1. Provide a loose follower flange for the top connection or as shown on the plans.
2. Provide a slip joint for the dropleg connection to the air distribution header for ease of installation and alignment.
3. Support dropleg from its upper connection.
4. Provide floor anchor at dropleg connection to the air distribution header.

B. Fabricate air distribution headers in sections up to 40 feet in length. Bottom elevation of the air distribution header shall be the same throughout the tank.

1. Accomplish changes in diameter by using eccentric reducers.

C. Join sections of air distribution headers with special flanged joints, expansion joints or compression-

sleeve couplings so that individual header sections can be rotated independently of adjacent sections for alignment purposes during installation.

1. Special joints shall consist of face rings, follower flanges and through bolts.
2. Compression-sleeve couplings must be stainless steel and restrained by through bolts and threaded limit rods attached to reinforced welded tabs on the header.
3. Design all joints to structurally transmit the longitudinal forces caused by expansion and contraction of the header and provide positive means to prevent joint blow-apart as required.

D. Diffuser Connectors:

1. Factory weld to the bottom or centerline of the air header and located in accordance with the plans.
2. Place diffuser connectors on a common horizontal plane.
3. Release air from the diffuser on or below this common horizontal plane.
4. Provide connectors of length appropriate to the header diameter and position so that air exiting the diffusers clears the header. Connectors of lesser length shall be extended with schedule 80 pipe, welded to the connector outlet. Threaded fittings will not be permitted.
5. Design air headers and connectors to resist a vertical load applied at the threaded end of the connector that results in a bending moment of 2000 inch-pounds without exceeding 24,000 psi design stress in any part of the header wall or connector.
6. Diffuser Tee connectors shall be a stainless steel investment casting conforming to ASTM 296, Grade CF3. The diffuser investment cast Tee connection to the air header shall have a minimum 2-1/8inch diameter opening. The Tee connection shall have 1/4inch wide beveled surface to insure a full penetration fillet weld can be made eliminating crevice corrosion.
7. If other types of tees are supplied, gussets shall be installed with a minimum cross sectional area of 0.1875 inches thick, 2 inches wide. Calculations shall be provided with the submittal showing the Tee connection will meet the intended use and comply with the specifications described in section 2.02 D.5., herein.

E. Supports:

1. Provide each section of air header with a minimum of two supports with the maximum spacing between supports not to exceed 17'-6".
2. Header supports shall include header hold down, adjusting and locking mechanism, cradle or crosstree and supporting structure.
3. Supports shall be designed to resist the following uplift without exceeding 24,000 psi design stress.

Header Diameter (inches)
4,6, & 8

Uplift Force per support (pounds)
239

10 & 12
14 & 20

560
1517

4. Provide support with an adjustable cradle or crosstree and be a minimum of 2 inches wide.
5. Supports will be constructed to provide for plus or minus two inches vertical and plus or minus 1/2 inch lateral adjustment for alignment of the air header in the field.
6. Provide one support for each header section with an integral rotational-locking mechanism. All adjusting devices and mechanisms shall lock to maintain header position after final adjustments have been made.
7. Provide with all crosstee supports, "U" bolts a minimum of 1/2" diameter.
8. Design thrust anchors and supports to transmit loads to tank structure.

2.03 Air Diffusers

- A. Provide diffusers as shown on the plans and specified herein. The arrangement and spacing shall not exceed the dimensions shown.
- B. Provide diffusers of proven non-clog wide-band design.
- C. Diffusers shall consist of a balancing nozzle with orifice insert, an inverted air reservoir, air exit ports, cast end cap at inlet end and a full length deflector.
 1. Diffuser designed to provide full wide band aeration. Release air uniformly along a minimum 2 foot band beyond each side of the header.
 2. Diffuser shall have a minimum air release perimeter of 48 inches.
 3. Construct diffusers of 304L stainless steel with schedule 80 3/4inch NPT male pipe thread connection and integral hex head nut.
 4. Deflector designed to prevent stringy material from wrapping around or entering the bottom of the diffuser.
 5. Deflectors may be integral with diffuser and supported by diffuser end caps.
 6. After all the diffusers are installed, the diffusers shall be leveled to within plus or minus 3/8 inch of a common horizontal plane.
- D. Diffuser Capacity:
 1. Air release shall be distributed along the 48 inch perimeter uniformly at air rates up to 60 SCFM with no disproportionate air flow from any single point.

3.01 Installation

- A. Installation shall be in strict accordance with the manufacturer's instructions and recommendations in locations shown on the plans. Anchor bolts shall be set in accordance with manufacturer's recommendations.
- B. The contractor shall submit a certification from the aeration equipment manufacturer, stating that the installation of the aeration system is satisfactory, that the aeration system is ready for operation and that the operating personnel have been suitably instructed in the operation and maintenance of the aeration system.

3.02 Inspection and Testing

A. General:

1. A factory representative shall be provided for 4 hours and shall have complete knowledge of proper operation and maintenance to inspect the final installation and supervise the test run of the equipment. The factory representative shall provide a written report to the contractor verifying that the aeration system is properly installed and ready to start-up.

B. Field Testing:

1. Upon completion of all the mechanical work, the contractor shall conduct testing to demonstrate that the equipment performs in accordance with all specifications.
2. The field test shall demonstrate that all items of these specifications have been met by the equipment as installed and shall include, but not be limited to, the following tests:
 - a. That all units have been properly installed and are in correct alignment.
 - b. That there are no mechanical defects in any of the parts.
3. In the event that the equipment does not meet the demonstration test, the contractor shall, at his own expense, make such changes and adjustments in the equipment which he deems necessary and shall conduct further tests until full satisfaction is indicated by the engineer.