Weaver
CONSTRUCTION MANAGEMENT
3679 S Huron Street, Suite 404 Englewood, Colorado 80110
Phone: (303) 789-4111 FAX: (303) 789-4310

SUBMITTAL TRANSMITAL

August 27, 2012
Submittal No: 11376-001

PROJECT: **Harold Thompson Regional WRF**
Birdsall Rd.
Fountain, CO 80817
Job No. 2908

ENGINEER: **GMS, Inc.**
611 No. Weber St., #300
Colorado Springs, CO 80903
719-475-2935 Roger Sams

OWNER: **Lower Fountain Metropolitan Sewage Disposal District**
901 S. Santa Fe Ave.
Fountain, CO 80817
719-382-5303 James Heckman

CONTRACTOR: **Xylem Water Solutions – Sanitaire Products**
Bill Peretti
303-477-1970

SUBJECT: Submittal of Fine Bubble Diffusers

SPEC SECTION: 11376

PREVIOUS SUBMISSION DATES:

DEVIATIONS FROM SPEC: ___ YES _X_ NO

CONTRACTOR'S STAMP: This submittal has been reviewed by Weaver Construction Management and, unless indicated otherwise, has been found to be in conformance with the intent of the contract documents.

Contractor's Stamp:	Engineer's Stamp:
Date: 8/27/12 Reviewed by: John Jacob ( ) Reviewed Without Comments (X) Comments – Sub. Not Reviewed – See Comments for Review Request	

ENGINEER'S COMMENTS:_____

Weaver
CONSTRUCTION MANAGEMENT

PH 303-789-4111 3679 So. Huron St., Suite 404
FX 303-789-4310 Englewood, Colorado 80110

Project: HDTWRF **Submittal No.: 11376-001**

Location: Fountain, CO

Supplier: Xylem – Sanitaire Products

Date: 8/27/12

Submittal 11376-001 Fine Bubble Diffusers by Xylem – Sanitaire Products

Additional Submittal Review Comments:

1. **WCM has not conducted our review of the referenced submittal at this time. Time is of the essence and in an effort to expedite the submittal process, WCM request that GMS start their review of the submittal, and WCM will concurrently review the submittal and forward comments to GMS. Thank you.**

End of Review

EQUIPMENT SUBMITTAL
DATA SHEET BOOKLET

FOR

HAROLD D. THOMPSON REGIONAL WATER RECLAMATION FACILITY
LOWER FOUNTAIN METROPOLITAN SEWAGE DISPOSAL DISTRICT
COLORADO

SPECIFICATION SECTION 11376
FINE BUBBLE DIFFUSERS

AERATION BASINS NO.1, NO.2 & NO.3
9"Ø SSII MEMBRANE DISC DIFFUSERS

ENGINEER:
GMS CONSULTING ENGINEERS
611 N. WEBER, SUITE 300
COLORADO SPRINGS, CO 80903

PURCHASER:
WEAVER CONSTRUCTION MANAGEMENT, INC.
3679 SOUTH HURON ST. – SUITE 404
ENGLEWOOD, CO 80110
PH: 303-789-4111 / FX: 303-789-4310
P.O. #: 9103

SANITAIRE REPRESENTATIVE:
WATER CONTROL CORPORATION
2460 W. 26TH AVENUE, SUITE 215C
DENVER, CO 80211-5359
PH: 303-477-1970 / FX: 303-477-1981

SUPPLIER:
XYLEM – SANITAIRE PRODUCTS
9333 N. 49TH STREET
BROWN DEER, WI 53223 USA
PH: 414-365-2200 / FX: 414-365-5784

SANITAIRE PROJECT #: 12-7851S

DATE: AUGUST 23, 2012

PROJECT: LOWER FOUNTAIN, CO - WRF **SANITAIRE #: 12-7851S**

TABLE OF CONTENTS

NOTE: The above listed six sub-sections of the Fine Bubble Aeration System I, O&M Manual are broken down into specific topics and are listed on the table of contents of the I, O&M Manual

SECTION III: CATALOG CUT SHEETS

- HILTI EXPANSION ANCHOR
- JCM CLAMP COUPLING

SECTION IV: DRAWINGS

- SANITAIRE EQUIPMENT SUBMITTAL DRAWINGS S-1 THRU S-7

WARRANTY

Specification Section 11376
Fine Bubble Disc Aeration System
Sanitaire contract no. 12-7851S

Xylem (Seller) warrants all equipment supplied by it per Specification Section 11376 of the Contract Documents (Fine Bubble Disc Aeration System) to be free from defects in material and workmanship for a period of twelve (12) months from the date of Substantial Completion or eighteen (18) months from date of shipment, whichever expires first. Substantial Completion shall be defined as when the Owner receives beneficial use of the warranted equipment.

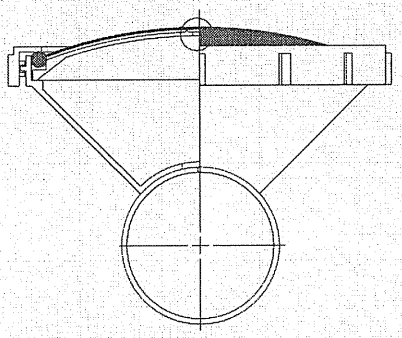
If within such warranty period any such equipment is proved to Seller's satisfaction to be defective, Seller shall, at its option, repair or replace the defective equipment or part without charge. Such repair or replacement shall be Seller's sole liability, and buyer's sole remedy, for breach of warranty, and is conditioned upon:

- Seller's receipt of written notice of any alleged defect within ten (10) calendar days of its discovery.
- Receipt by Seller of full payment for goods and services provided under this contract.
- The warranted equipment has not been repaired or altered by others without Seller's written authorization.

- The warranted equipment shall be properly installed, and operated and maintained, in accordance with Seller's written instructions provided to the end user.

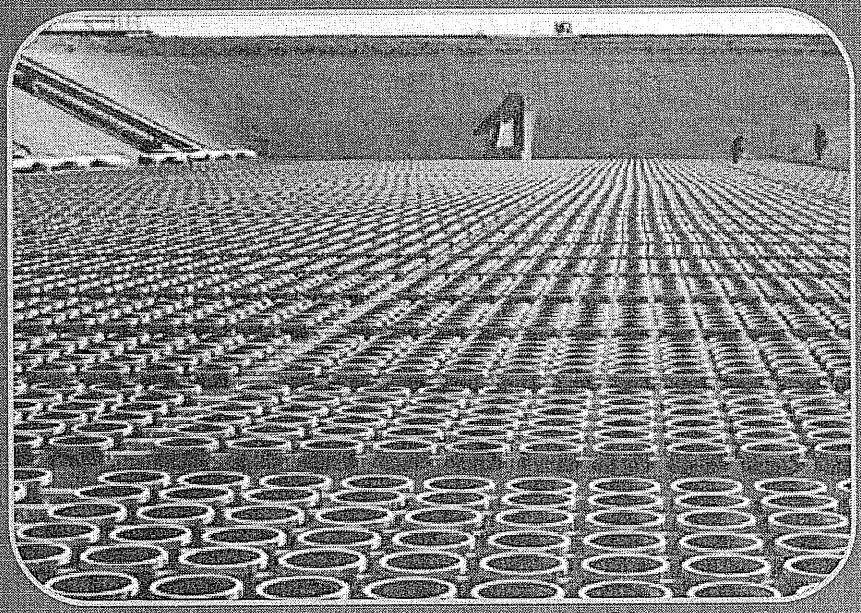
- Decomposition or deformation resulting from chemical action, wear caused by the presence of abrasive materials, and replaceable or consumable material reaching its useful life, shall not constitute defects under the foregoing warranty.

THE FOREGOING WARRANTY IS IN LIEU OF, AND SELLER DISCLAIMS, ALL OTHER EXPRESS AND IMPLIED WARRANTIES (EXCEPT OF TITLE), INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE. SELLER'S RESPONSIBILITIES UNDER THE FOREGOING WARRANTY ARE SELLER'S SOLE LIABILITY WITH RESPECT TO EQUIPMENT, PARTS OR SERVICES MANUFACTURED OR FURNISHED BY IT, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATING THERETO; AND SELLER SHALL HAVE NO OTHER LIABILITY WITH RESPECT THERETO, WHETHER BASED ON BREACH OF CONTRACT, NEGLIGENCE OR OTHER TORT OR ON ANY STRICT LIABILITY THEORY. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES.



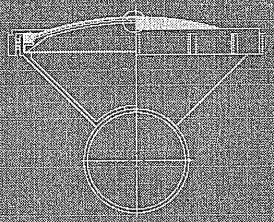
Membrane Disc

Fine Bubble Aeration Systems



Sanitaire

Membrane Disc
Fine Bubble Aeration Systems



SANITAIRE®

Technology You Can Count On

SANITAIRE® is the trade name recognized throughout the wastewater treatment industry for quality products and advanced technology. SANITAIRE Silver Series membrane fine bubble disc diffusers are recognized worldwide for their high oxygen transfer efficiency and durability in wastewater treatment plant aeration processes.

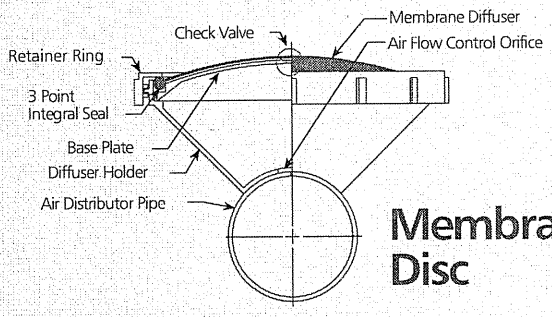
Owners and engineers prefer SANITAIRE fine bubble diffusers because:

- Power costs can be reduced by 50% or more.
- High oxygen transfer efficiency and low system headloss lead to low energy costs.
- Minimal maintenance is required.
- Gentle positive mixing action using full floor coverage aeration grids promotes excellent floc formation.

Sanitaire's leadership and experience in aeration technology has resulted in high quality SANITAIRE fine bubble disc aeration systems being specified more than any other. The SANITAIRE Membrane Disc fine bubble aeration system offers advantages in performance, ease of maintenance, construction integrity and quality. Ongoing research and developement shows Sanitaire's commitment to the most technologically advanced diffused aeration system.

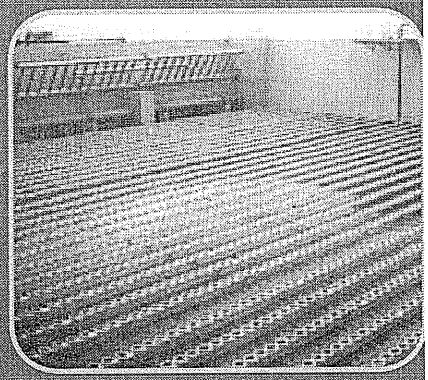
Diffuser and Holder Features

- Diffuser holders are factory solvent welded to the air distribution piping providing superior mechanical strength and eliminating the necessity for field installation and leveling of individual assemblies.
- Membrane diffusers include an integral check valve. The non-perforated center portion of the membrane collapses onto the air release port of the base plate when the air is turned off. The diffuser slits also act as check valves and close onto the base plate when the air is turned off.
- Integral seal and threaded retainer ring design prevents air leakage and resulting contamination from mixed liquor solids leakage into the aeration system.



Membrane Disc

Top centerline diffuser mounting prevents cantilever or torque forces from being transmitted to piping system.

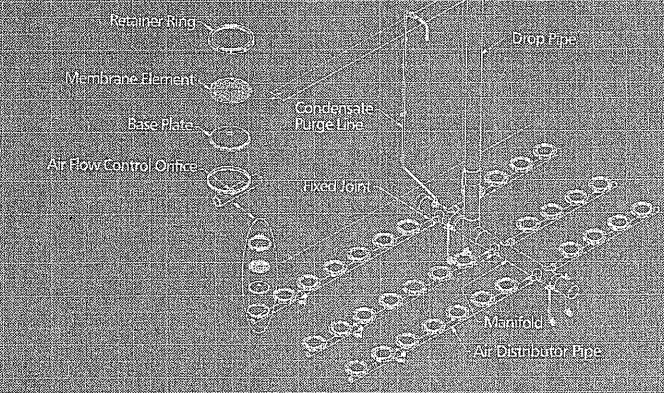


- Diffuser and holder are designed to provide full surface uniform air distribution and bubble release.
- The membrane is completely supported by the base plate, preventing reverse flexing.
- Available in 9-inch (229-mm) and 7-inch (178-mm) diameters.

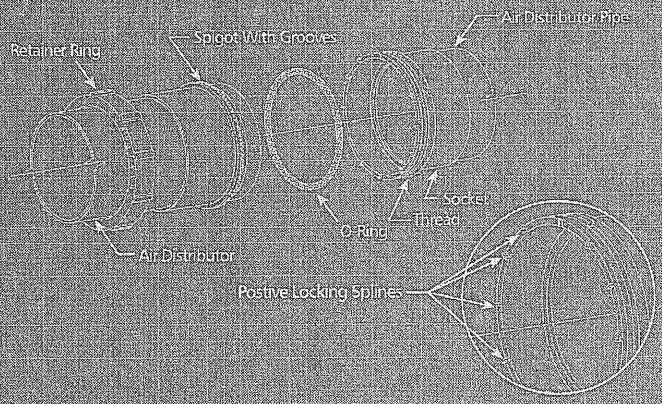
Proven System Components

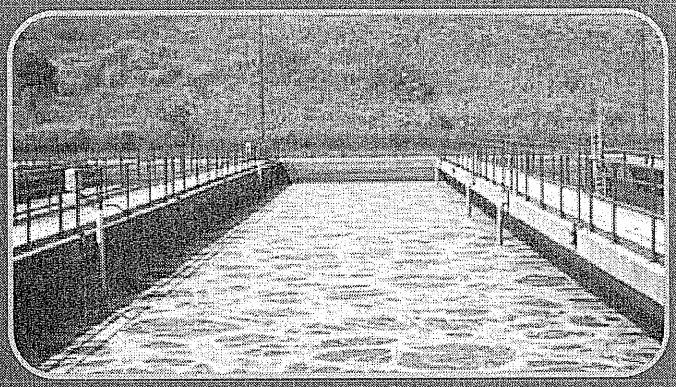
- The SANITAIRE air distribution system incorporates patented locking pipe joints combined with guide type supports that do not positively grip the pipe to accommodate thermal expansion and contraction. The unique system design allows the individual distributor pipes to move freely through the pipe supports.
- The patented SANITAIRE fixed joint features an airtight O-ring seal, anti-rotational splines and a positive locking threaded retainer ring to prevent air leakage, pipe blow apart and distributor rollover.
- PVC air distribution piping system provides long-term mechanical integrity.
- Submerged components of corrosion resistant materials.
- Unique all stainless steel anchorage system with threaded supports for infinite adjustments on sloped or irregular floors.
- Joint components are factory solvent welded to the pipe ends, allowing for quick and easy field assembly of air distributor sections.
- Condensate removal with sumps and purge system.
- Over 10 million fine bubble diffusers installed worldwide.

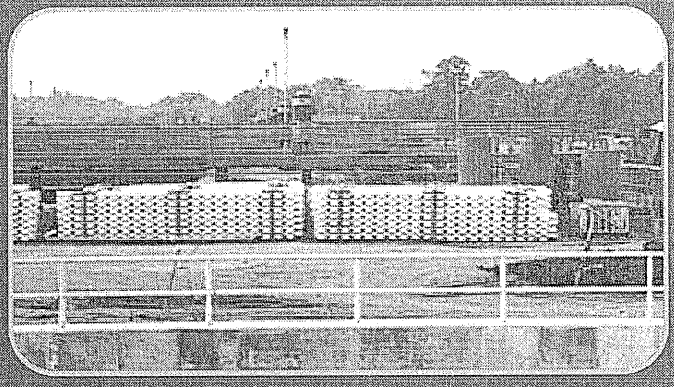
Typical Membrane Disc Grid Layout



Sanitaire Positive Locking Fixed Joint







Membrane Disc Diffuser Advantages

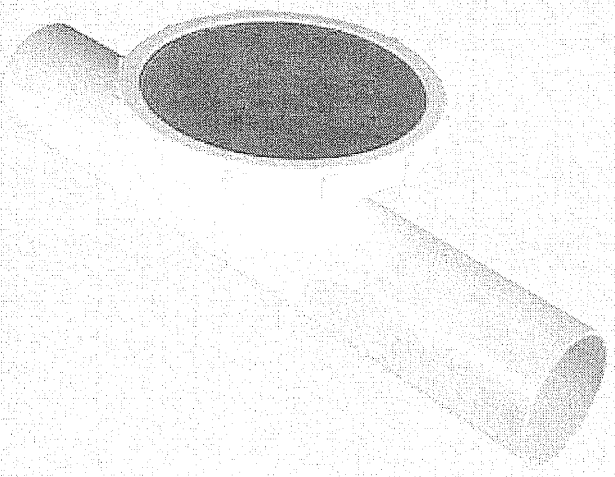
- Provides full surface, uniform air distribution and bubble release.
- Operating air pressure creates peripheral seal to eliminate air leakage.
- Precision die-formed slits are punched perpendicular to membrane grain direction for greater resistance to elongation and tearing.
- Proprietary technologically advanced membrane material blended from special synthetic rubber compound has been specifically engineered for domestic and industrial waste applications providing:
  - Extended service life.
  - Resistance to material property changes.
  - High modulus of elasticity.
  - Proper material thickness - lower unit stress.
  - Resistance to oils and ultraviolet light.
  - High oxygen transfer efficiency.
- Alternative materials and configurations available for specific applications.
- The unique design eliminates the use of hold-down bolts, lift limiters and metallic mechanical fasteners.
- Existing aeration tanks can be easily upgraded with membrane disc aeration, upgrading existing plant's organic treatment capacity without adding tankage.
- Convenient shipping - diffusers and piping are delivered in a compact palletized arrangement.
- Ease of installation - up to 12 units installed per man-hour. Step-by-step O&M manuals, educational videos and field service startup training provided with every system.
- Factory installed diffuser holders and pipe end fittings to reduce installation time.
- Pressure monitoring system available.

Applications

- Aeration Tanks
- Sludge Holding Tanks
- Aerobic Digesters
- Sequencing Batch Reactors
- Channel Aeration
- Air On/Air Off Processes
- Membrane Bioreactors

Those Who Choose Membrane Disc Aeration...
get the best of all worlds when they choose proven SANITAIRE systems for their wastewater treatment needs.

Sanitaire provides time-tested aeration technology and products for municipal and industrial markets worldwide.



Call Sanitaire - the aeration leader for more information
9333 N. 49th Street
Brown Deer, WI 53223 USA
Tel 414 365 2200
Fax 414 365 2210
www.sanitaire.com

Sanitaire

ITT Industries

11/04 US Patent # 5,714,062

PROJECT: LOWER FOUNTAIN, CO - WRF **SANITAIRE #:** 12-7851S

CERTIFICATE OF SPECIFICATION COMPLIANCE

SPECIFICATION SECTION 11376
FINE BUBBLE DISC AERATION SYSTEM

Xylem hereby certifies that the SANITAIRE® aeration equipment for this project as shown on the enclosed drawings and equipment data sheets is in compliance with the contract documents and specifications. All deviations are noted with requested exceptions to the specifications.

When reviewing the marked copy of the Specification Section 11376, a check mark (√) indicates Xylem is in compliance with the specification paragraph.

A circle with a number (e.g. 2) indicates a requested deviation. Please see the attached list of requested specification deviations.

Jon A. Klotz
Senior Project Engineer
9333 N. 49th Street
Brown Deer, WI 53223
Direct Line: 414-365-2224
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jon.klotz@xyleminc.com

PROJECT: LOWER FOUNTAIN, CO - WRF **SANITAIRE #: 12-7851S**

REQUESTED EXCEPTIONS TO SPECIFICATION

SPECIFICATION SECTION 11376
FINE BUBBLE DISC AERATION SYSTEM

1. Specification section 11376-1.2.D Xylem is proposing to provide SANITAIRE® SSII fine bubble membrane disc diffusers. Please see diffuser material properties, quality control requirements, performance data, headloss curve and Certified Oxygen Transfer test data included with this submittal.

2. Specification section 11376-2.2.A Xylem is proposing to provide SANITAIRE® SSII fine bubble membrane disc diffusers.

3. Specification section 11376-2.2.B Airflow to the SANITAIRE® SSII fine bubble membrane disc diffusers is routed through an air plenum molded into the diffuser support plate to the underside of the membrane disc.

4. Specification section 11376-2.2.C The SANITAIRE® SSII fine bubble membrane disc diffuser will collapse on top of the diffuser support plate when air supply to the diffuser is terminated. The base plate has a raised ring that aligns with the non-perforated 1"Ø center of the diffuser to create a watertight seal (check valve) preventing backflow of liquid into the pipe network.

5. Specification section 11376-2.2.E.6 The SANITAIRE® SSII fine bubble membrane disc diffuser has a Durometer of 58 ± 5 Shore A.

6. Specification section 11376-2.2.F.2 The SANITAIRE® SSII fine bubble membrane disc diffuser is attached to a PVC base plate with a PVC threaded retainer ring. The PVC base plate is factory solvent welded to the top centerline of PVC aeration pipe header and is a single diffuser design.

7. Specification section 11376-2.2.F.3 The SANITAIRE® SSII fine bubble membrane disc diffuser is attached to a PVC base plate with a PVC threaded retainer ring. The PVC base plate is factory solvent welded to the top centerline of PVC aeration pipe header and is a single diffuser design.

8. Specification section 11376-2.2.F.4 The SANITAIRE® SSII fine bubble membrane disc diffuser is attached to a PVC base plate with a PVC threaded retainer ring. The PVC base plate is factory solvent welded to the top centerline of PVC aeration pipe header and is a single diffuser design.

9. Specification section 11376-2.3A.4.b The SANITAIRE® aeration manifold design utilizes PVC saddles with integral patented SANITAIRE® 4"Ø fixed joint for connecting air header to manifold. The centerline of manifold and air distributor pipe is at the same elevation. The invert of the manifold pipe is lower than that of the air header pipes. Design allows the manifold to be used as the low point sump for the air lift purge which evacuates condensation from the pipe network.

10. Specification section 11376-2.3.E.5.c.1 / 3 / 4 The SANITAIRE® SSII fine bubble membrane disc diffuser is attached to a PVC base plate with a PVC threaded retainer ring. The PVC base plate is factory solvent welded to the top centerline of PVC aeration pipe header and is a single diffuser design.

11. Specification section 11376-2.3.E.5.c.5 The SANITAIRE® SSII fine bubble membrane disc diffuser will collapse on top of the diffuser support plate when air supply to the diffuser is terminated. The base plate has a raised ring that aligns with the non-perforated 1"Ø center of the diffuser to create a watertight seal (check valve) preventing backflow of liquid into the pipe network.

12. Specification section 11376-2.3.E.5.c.6 The SANITAIRE® SSII fine bubble membrane disc diffuser is attached to a PVC base plate with a PVC threaded retainer ring. The PVC base plate is factory solvent welded to top centerline of the PVC aeration pipe header and is a single diffuser design.

13. Specification section 11376-2.3.F.8.d Standard SANITAIRE® air distributor supports are designed to allow for installation with one (1) 3/8"Ø anchor bolt (expansion or adhesive) to secure support to tank slab. Xylem design for anchor is 10X calculated buoyant upload force.

14. Specification section 11376-2.3.G.3.b Standard SANITAIRE® air distributor supports are designed to allow for installation with one (1) 3/8"Ø anchor bolt (expansion or adhesive) to secure support to tank slab. Xylem design for anchor is 10X calculated buoyant upload force.

SECTION 11376

FINE BUBBLE DIFFUSERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope

1. Furnish and install fine bubble diffusers with fixed air distribution piping for aerating and mixing the contents of activated sludge process Aeration Basins as indicated on the Drawings and specified herein
2. Fine bubble diffuser aeration systems to be furnished complete with air diffuser assemblies, stainless steel drop pipe, air manifold piping, air distribution piping, pipe supports and all other appurtenances and accessories as specified herein and as required for proper installation and operation of a fully functional aeration and mixing system
3. Provide oxygen delivery design calculations with certified performance data, final air delivery construction drawings with all required modifications to design basis documents to accommodate manufacturer's products and systems and fulfill process design and operation requirements
4. Provide manufacturer's field services

B. Additional Requirements Specified Elsewhere

1. Section 01340: Shop Drawings, Product Data and Samples
2. Section 01400: Quality Control
3. Section 01600: Materials and Equipment
4. Section 01730: Operating and Maintenance Data

C. Related Work Specified Elsewhere

1. Section 02615: Ductile Iron Pipe
2. Section 02641: Valves and Accessories
3. Section 05500: Metal Fabrications
4. Section 05501: Anchor Bolts and Drilled-In Anchors

1.2 QUALITY ASSURANCE

A. All equipment supplied by a single manufacturer or supplier fully experienced in designing, fabricating and furnishing equipment of the type and size required

B. Equipment to be the standard product of the manufacturer with specified equipment and components

C. Provide list of installations and personnel contact information where fine bubble diffused aeration systems are in operation aerating and mixing activated sludge process aeration basins

D. Design Basis

1. Tideflex Model TFX-40 as manufactured by Red Valve Company, Inc., Carnegie, PA
2. Or equivalent
3. Equivalent products of other manufacturers may be acceptable, subject to compliance with design, function, materials and performance of the specified items

1.3 SUBMITTALS

A. In accordance with Section 01340

B. Shop Drawings and Product Data

1. Sufficient data to verify compliance with these specifications and to illustrate construction and assembly of the products
2. Complete fabrication, assembly, foundation and installation drawings and installation instructions
3. Detailed specifications and data describing all materials, parts, devices and accessories utilized in the complete fine bubble diffused aeration systems
4. Certified performance curves for proposed diffusers

C. Performance Data

1. Complete system design calculations
   a. To support proposed number and arrangement of diffusers
   b. List all assumptions, constants and correction factors
2. Construction drawings showing recommended
   a. Diffuser and air piping arrangement and sizing
   b. Air pipe valving
   c. Air piping and diffuser support system
3. Air supply requirements
   a. Required air volume and pressure
   b. Maximum particle size in supply air
   c. Other pertinent data

D. Certification of Compliance

1. Manufacturer's affidavit of compliance certifying
   a. All equipment and material comply with these specifications with any exceptions noted
   b. Equipment has been properly installed and is operating within specification tolerances
   c. All tests have been performed with satisfactory results

E. Operating and Maintenance Manuals in accordance with Section 01730

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. During loading, transporting, unloading and storage exercise care to prevent damage to piping and materials from impact, bending, compression or abrasion

B. Diffuser units to be wrapped in protective packaging and packaged separate from piping materials

C. Elastomeric materials to be protected from contact with rigid objects, and exposure to heat, sunlight and ozone-producing electric motors during handling, shipping and storage

D. Ship gaskets in cartons and store in a clean area away from grease, oil, ozone producing electric motors, heat and the direct rays of the sun

E. All flanges to be secured to pipe ends and protected by plastic inserts or wood planking with all openings plugged prior to shipment and during storage

F. Pipe to be shipped and stored on pallets or wood blocking capable of fully supporting the pipe sections over their entire length

G. Pipe sections to be fully supported to prevent pipe deflection or damage to fittings or connections

H. Use only wide belt slings, nylon protected slings or wide padded skids to handle pipe

I. Store materials on site in enclosures or under protective coverings

1. Do not store materials directly on the ground
2. Store pipe on flat surfaces that provide even support for the pipe barrel throughout its entire length
3. Do not stack pipe higher than 5 feet
4. Assure all materials are kept clean and dry
5. Take precautions to prevent accumulation of dirt or other foreign material within threaded connections
6. Do not store PVC pipe and fittings in direct sunlight for extended periods
7. Do not drop pipe, fittings or appurtenances
8. Do not roll, skid or otherwise move pipe, fittings or appurtenances when in contact with the ground at any point

1.5 JOB CONDITIONS

A. Provide aeration and mixing for the activated sludge process aeration basins

B. Install in three rectangular concrete basins with sloped floors as indicated on the Drawings. Each basin has the following inside dimensions

1. Length: 158'-0"
2. Width: 63'-3"
3. Sidewall height: Average = 27'-0", varies along floor slope from 26.61' to 27.40'

4. Operating liquid depth: Average = 24'-0", varies along floor slope from 23.61' to 24.40'

C. Nominal submergence on diffuser: 22.9'

D. Site Elevation: 5413 feet above mean sea level (AMSL)

E. Air supply from multi-stage centrifugal blowers

1. Located in Blower Building
2. Each basin is supplied by a single, dedicated blower
   a. HSI multi-stage centrifugal blower, Model MC8811
      1) Stages: Eleven (11)
      2) Motor speed controlled with variable frequency drives
      3) Performance points
         a) 1,588 SCFM at 68°F = 2,199 ICFM
         b) 2,199 ICFM with 11.4 psi blower discharge pressure
   b. Air supply delivery pressure at activated sludge basin wall = 10.4 psi minimum

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN REQUIREMENTS

A. Design Criteria

1. Aeration basin MLSS: 1,875 mg/l
   a. Volatile fraction of MLSS: 75%
   b. Reactor temperature range: 12°C to 23°C
   c. Standardized oxygen requirement (SOR) at design conditions and 23°C: 5,750 lb/day/basin
   d. Operating dissolved oxygen concentration: 2.0 mg/l
2. Maximum air flow per diffuser: 10 scfm
3. Maximum air supply pressure at top of drop pipe: 10.7 psig
4. Diffuser pressure loss not to exceed 0.5 psi
5. Oxygen transfer: Minimum 1.70% per foot of depth
6. Minimum number of diffusers: 288 total per basin
7. Activated sludge aeration basin process design parameters
   a. Parameters pertain to entire activated sludge system, i.e., 3 basins considered to be operating in parallel as one system
   b. Oxygen requirements (AOR)
      1) Winter conditions: 17,217 lbs/day at activated sludge temperature of 12°C and ambient air temperature of -10°F
      2) Summer conditions: 17,251 lbs/day at activated sludge temperature of 23°C and ambient air temperature of 100°F
   c. Air delivery conditions (SCFM and ICFM)
      1) Winter conditions: 4,571 SCFM and 4,765 ICFM
      2) Summer conditions: 4,762 SCFM and 6,176 ICFM

2.2 DIFFUSER ASSEMBLIES

A. Type: Cylindrical tube with elastomer membrane sheath (2)

B. Air flow to be routed to outside diameter of tube and released through membrane sheath (3)

C. Sheath to collapse around outside diameter of tube when air flow is discontinued (4)

D. Capable of operating through On/Off aeration cycles without clogging or affecting air flow discharge

1. Some diffusers lateral will not have air flow for extended periods of time, while some diffuser laterals will have air flow, generally, at all times

E. Diffuser Membrane

1. Manufactured from EPDM synthetic rubber
2. One-piece construction
3. Air flow perforations designed for fine bubble aeration with even distribution across entire length
4. Ultraviolet light and ozone resistant
5. Tensile strength: 1,200 psi minimum per ASTM D412
6. Durometer: 45 minimum per ASTM 2240 (5)

F. Diffuser Body

1. Constructed of PVC, ABS or other suitable plastic material
2. Tube outside diameter designed for proper operation and mating with membrane sheath (6)
3. Hollow tube construction designed for hydrostatic stability and minimized buoyancy (7)
4. Utilize stainless steel clamps to secure membrane to outside diameter (8)
5. Provide air flow control orifice designed for uniform air distribution between diffusers on a common air header lateral
6. Incorporate backflow control performance with check valve or shut off with collapsing sheath

2.3 DIFFUSER AIR PIPING

A. General

1. Furnished by diffuser supplier
   a. Provide fixed air distribution piping assemblies as indicated on the Drawings
   b. Attach to air header piping as indicated on the Drawings
   c. Provide fittings as required for installation and connection to the air header piping as indicated on the Drawings
2. Design for uniform air distribution
3. Size and arrange piping for proper operation at the maximum design air flow rate and at the specified maximum pressure

a. Size piping for minimum head loss

4. Design and fabrication of each aeration system to ensure that all diffuser assemblies can be installed and leveled to within ¼" of a common horizontal plane
   a. Maintain uniform diffuser discharge elevations for each aeration system
   b. Utilize eccentric reducers for changes in pipe diameter
5. Air distributor piping to be designed to allow for expansion and contraction over a 125°F range in ambient air temperature considering temperature of delivered air supply
6. Manifold piping, connections and supports to be designed to resist thrust generated by expansion/contraction of itself and distributor piping over a range of 125°F in ambient air temperature
7. Furnish all required nuts, bolts, and washers in Type 304 stainless steel
8. Gaskets to be of natural rubber/SBR, EPDM or neoprene for submerged plastic piping
   a. Manufacturer to confirm long-term performance of all submerged materials subject to delivered air temperature, activated sludge basin contents temperature and other environmental conditions
9. Gaskets to be of Viton or FKM for stainless steel piping and other appurtenances above the high water level
10. All flanged connections to have 150 lb. bolt pattern

B. Stainless Steel Pipe, Fittings and Supports

1. All welded parts and assemblies to be fabricated from sheets, plates or bars of 304L or better stainless steel with a 2D finish
2. All non-welded parts and flanges to be fabricated from sheets, plates or bars of 304 or better stainless steel
3. Welding
   a. All welding to be completed in factory by ASA certified welders
      1) Field welding will not be allowed
   b. Weld by plasma arc, inert gas, MIG or TIG method
   c. Add filler wire to all welds to provide a cross section of welded material equal to or greater than the parent material
   d. Butt welds
      1) Full penetration to interior surface
      2) Provide gas shielding of interior and exterior of joint
   e. Interior weld beads
      1) Smooth
      2) Evenly distributed
      3) Interior projection not exceeding 1/16 beyond the I.D. of the pipe or fitting
   f. Continuously weld both sides of face rings and flanges to eliminate potential for crevice corrosion
   g. Wire brush outside weld areas
   h. All discoloration and deposits left by welding to be removed by passivation
4. Corrosion protection and finishing
   a. After fabrication, all stainless steel parts and assemblies to be cleaned and passivated by immersion in an acid solution per ASTM A380

b. Pre-clean all outside weld areas to remove weld splatter with stainless steel brushes and/or deburring and finish grinding wheels
c. Finish clean all interior and exterior surfaces by full immersion passivation
d. Thoroughly rinse or otherwise neutralize the acid solution following immersion passivation
e. Parts to be free of iron particles and other foreign materials
f. Corrosion protection techniques not utilizing full immersion will not be acceptable
g. Manufacturer to certify that passivation has been performed in the manner specified
    1) Materials not properly passivated may be rejected at the discretion of the Engineer

C. PVC Pipe

1. All PVC pipe and fittings to be produced from PVC compound with a minimum tensile strength of 7,000 psi
2. Capable of withstanding 125°F wall temperature
3. Pipe and fittings to contain two (2) parts by weight of titanium dioxide per 100 parts of PVC resin to minimize ultraviolet light degradation
4. All factory assembled PVC joints to be solvent welded
5. All field assembled joints to be fixed threaded union or flanged with appropriate gasket

D. Drop Leg Pipes

1. To be fabricated from Type 304 stainless steel from air header connection near top of basin wall to pipe material transition above manifold pipe connection
2. Minimum nominal wall thickness: Schedule 5S or heavier
3. Provide Van Stone style flange with 150 lb. bolt pattern at top connection
4. Provide insulating bolt sleeves, washers and gaskets at connections to dissimilar metal pipe materials
5. Provide flanged expansion joint with gaskets at pipe material transition above manifold connection
6. Provide suitable supports for attachment of drop leg pipe to basin side wall

E. Distribution Pipe and Fittings

1. Fabricate from Schedule 40 or heavier PVC
    a. Direct threaded pipe sections to be Schedule 80 or heavier
2. Fabricate in sections not to exceed 35 feet in length
3. Provide threaded removable end caps complete with gasket and thread tape or lubricant, threaded coupling and end plate at both ends of each manifold assembly and far end of each distributor pipe run
4. Manifolds
    a. From drop leg to distributors
    b. Connect manifold sections with fixed threaded union or flanged joints to prevent rotation or blow apart
    c. Provide fixed threaded union or flanged joint for connection to distributors
    d. Bell and spigot, slip-on or compression type joints are not acceptable
5. Distributors

a. Connect distributor sections with fixed threaded unions or flanged joints to prevent rotation or blow apart
b. Fabricate distributors with diffuser port holes factory drilled
c. Diffuser connections
   1) Removable type saddle fitting on distributor pipe (10)
   2) Constructed of Schedule 40 or heavier PVC
   3) Composed of independent top and bottom sections connected together around distributor piping (10)
   4) Top or bottom section to be equipped with a stem extension that extends into the port hole on the distributor pipe to prevent rotation of the saddle assembly (10)
      a) Stem extension to be equipped with a recessed ring and EPDM ring gasket for sealing outlet port
   5) Diffuser connection shall include check valve to prevent backflow into distributor pipe when air supply is turned off (11)
   6) Diffuser connection shall accommodate installation of two diffusers, one to each side of the distributor pipe (12)
   7) All metallic hardware to be Type 304 stainless steel

6. Connections between sections of distributor piping
   a. Positive locking fixed threaded union or flanged joints to prevent rotation or blow apart
      1) Flanged expansion joints where required by expansion and contraction design
   b. Permit rotation of individual lateral sections for alignment purposes
   c. Flanged joints: Face ring-follower flange type with through bolts
   d. Flanged joints to be designed to transmit the longitudinal forces caused by expansion and contraction in the air distribution piping
   e. Bell and spigot, slip-on or compression type joints are not acceptable

F. Supports

1. Support assemblies to be fabricated entirely from Type 304 or better stainless steel materials
2. Support system to be designed for installation in new concrete tankage with a factor of safety of 2.0 or more against calculated buoyant forces
3. Provide a minimum of two (2) supports for each section of manifold and distributor piping
   a. Maximum support spacing: 6 feet on center
4. Supports to incorporate hold-down straps or clamps, support structure, level adjustment and locking mechanism and anchor bolts, unless otherwise indicated on the Drawings
5. Support assembly to provide ±2" vertical adjustment for leveling of air piping and ½" minimum lateral adjustment, unless otherwise indicated on the Drawings
   a. Adjustment mechanisms to include locking device to maintain pipe position after final adjustments have been made
6. Drop pipe supports
   a. Provide minimum of two (2) wall brackets for support of drop piping above manifold connection

b. Pipe strap to be minimum 2" wide with contoured bearing surfaces and chamfered edges
c. Support to be attached to basin wall with a minimum of two (2) stainless steel anchors bolts

7. Manifold supports
   a. Hold down straps to be minimum 1½" wide with contoured bearing surfaces and chamfered edges
   b. Supports to be attached to basin floor with a minimum of two (2) stainless steel anchor bolts
8. Distributor supports
   a. Hold down straps to be minimum 1½" wide with contoured bearing surfaces and chamfered edges
   b. Provide system of guide and fixed supports designed to accommodate expansion and contraction
   c. Hold down strap to be self-limiting such that it cannot be over-tightened
   d. Supports to be attached to basin floor with at least two (2) stainless steel anchor bolts (13)
9. Manufacturer's standard adjustable pipe supports conforming to the support specifications herein

G. Anchor Bolts

1. Type: Mechanical expansion or drilled-in chemical adhesive anchors
2. Material: Type 304 stainless steel
3. Size
   a. As required to resist applied loadings with a pullout safety factor of 4 when installed in 4,000 psi compressive strength concrete
   b. ½" minimum diameter (14)
4. Refer to Section 05501 for additional requirements

2.4 SPARE PARTS

A. Complete diffuser assemblies, minimum of 5% of total number provided

PART 3 - EXECUTION

3.1 INSTALLATION

A. Inspection

1. Inspect materials and equipment for signs of damage, pitting, rust, decay or other deleterious effects of storage, transportation, handling, etc.
   a. Replace or repair any materials or equipment showing such effects to the satisfaction of the Engineer and Owner
   b. Replace damaged materials or equipment with identical new materials or equipment

B. Equipment Installation

1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements
   a. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner
   b. Perform all work in accordance with manufacturer's instructions
      1) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents
      2) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding
   c. Shimming between machined surfaced is not permitted

C. Adjustment and Cleaning

1. Perform all required adjustments, tests, operational checks, cleaning and other startup activities required
2. All parts and equipment shall be locked in place to prevent displacement during operation per manufacturer's instructions

3.2 FIELD TESTING AND INSPECTION

A. Notify Owner and Engineer in writing when installation is ready for inspection

B. Perform inspections in presence of Engineer

C. Inspect all piping, joints and supports for proper installation and conformance to contract documents

D. Level Inspection

1. Use leveling instrument to insure all horizontal piping is level and diffuser outlets are within a maximum of ¼" of same elevation

E. Uniformity and Leakage Test

1. Fill tanks to a minimum depth of one (1) foot above the diffusers, unless otherwise recommended by the manufacturer
2. With blowers operating check for leakage and that air is evenly distributed throughout each tank
   a. Control blower discharge to prevent damage to air delivery system with minimum water submergence

3.3 FIELD QUALITY CONTROL

A. Provide Manufacturer's Field Service

1. Minimum two trips to project site at no less than 6-hours on site each day
2. Qualifications of manufacturer's representative
   a. Authorized representative of the manufacturer

b. Experienced in the application, installation, operation and maintenance of the subject work, materials and equipment

3. Services provided by representative
   a. Provide guidance regarding proper installation
   b. Supervise and verify proper installation of equipment furnished under this section
   c. Inspect, check, adjust and test equipment installed, as required, and approve final installation
   d. Be present when equipment is placed in operation
   e. Revisit site as often as required to correct all problems and until equipment installation and operation are acceptable to Engineer and Owner
4. Manufacturer's representative to instruct Owner's personnel in the operation and maintenance of the equipment furnished. Minimum one-half day including classroom and field training. May be combined with startup services

B. Furnish three (3) copies of written report to Engineer certifying that

1. Equipment is properly installed
2. Equipment is in accurate alignment and balance
3. Equipment is free from any undue stress imposed by connecting piping, anchor bolts, etc.
4. Equipment has operated satisfactorily under full load conditions and as specified through full operating range

3.4 PREPARATION FOR OPERATION

A. When all installation, testing, adjusting and other construction phase operations are complete, remove all diffusers in one basin as selected by Owner and Engineer

B. Owner will furnish on-site storage location and containers

C. Contractor shall place, stack and otherwise secure diffuser assemblies in manner recommended by manufacturer for extended storage (i.e., up to 5 years)

END OF SECTION

SANITAIRE MEMBRANE DISC INSTALLATION
REFERENCE LIST
MAY 2, 2002

1. LEWISVILLE, TX – QTY (7500) 9"Ø MEMBRANE DISC DIFFUSERS
   WASTEWATER TREATMENT PLANT
   897 TREATMENT PLANT ROAD
   LEWISVILLE, TX 75057
   MR. DOUG LIPSCOMB, OPERATIONS SUPERVISOR
   PHONE: 972-219-3545
   FAX: 972 219-3506

2. OSHKOSH, WI - QTY (6680) 9"Ø MEMBRANE DISC DIFFUSERS
   WASTEWATER TREATMENT PLANT
   233 CAMPBELL ROAD
   OSHKOSH, WI 54901-3488
   MR. TOM KRUSICK
   PHONE: 920 232-5365 (5360)
   FAX: 920-232-5366

3. GRAND HAVEN, MI - QTY (3888) 9"Ø MEMBRANE DISC DIFFUSERS
   WASTEWATER TREATMENT PLANT
   1525 SO. WASHINGTON ST
   GRAND HAVEN, MI 49417
   DAVID KROHN, ENVIRONMENTAL COMPLIANCE
   PHONE: 616 847-3485
   FAX: 616-847-4880

4. BATTLE CREEK, MI - QTY (37,388) 9"Ø MEMBRANE DISC DIFFUSERS
   WASTEWATER TREATMENT PLANT
   2000 WEST RIVER
   BATTLE CREEK, MI 49015
   MR. LARRY DELONG
   PHONE: 616 966-3513
   FAX: 616-965-3290

5. GOODYEAR, AZ - QTY (4500) 9"Ø MEMBRANE DISC DIFFUSERS
   WASTEWATER TREATMENT PLANT
   200 S. CALLE DEL PUEBLO
   GOODYEAR, AZ 85338
   MR. BARRY HESS
   PHONE: 623-932-3010
   FAX: 623-932-2171

6. LA JUNTA, CO -
   WASTEWATER TREATMENT PLANT
   P. O. BOX 469
   LA JUNTA, CO 81050
   MR. GLENN PLEASANTS
   PHONE: 719 384-3633
   FAX: 719-384-8412

7. NORTH EAST, PA - QTY (5100) 9"Ø MEMBRANE DISC DIFFUSERS
   WASTEWATER TREATMENT PLANT
   58 E. MAIN ST
   NORTH EAST, PA 16428
   MR. CRAIG NIGLEMAN
   PHONE: 814-725-8037
   FAX: 814-725-4996

8. WINOOSKI, VT - QTY (2160) 9"Ø MEMBRANE DISC DIFFUSERS
   WASTEWATER TREATMENT PLANT
   27 W. ALLEN ST
   WINOOSKI, VT 05404
   MR. TIM GROVER
   PHONE: 802-655-6421
   FAX: 802-655-6421

9. EAGLE RIVER, AK - QTY (1760) 9"Ø MEMBRANE DISC DIFFUSERS
   WASTEWATER TREATMENT PLANT
   1725 – 8 AVENUE SOUTH
   EAGLE RIVER, AK 99577
   MR. MIKE RUTHERFORD
   PHONE: 907-694-9684
   FAX: 907-694-8419

10. NAPERVILLE, IL
    WASTEWATER TREATMENT PLANT
    3712 PLAINFIELD/NAPERVILLE ROAD
    NAPERVILLE, IL 60566-7020
    MR. TIMOTHY CARDELLA
    PHONE: 630-420-6686
    FAX: 630-420-4118

4/24

MEMBRANE DISC AERATION SYSTEM MATERIAL AND MANUFACTURING SPECIFICATIONS (304L, PVC)

ITEM	MATERIAL SPECIFICATION	MANUFACTURING SPECIFICATION	NOTES
DROPLEG	304L STAINLESS STEEL ASTM A240	FITTINGS: ASTM A774 TUBULAR PRODUCTS: ASTM A778 DIMENSIONS: ASTM A554	150# DRILLING FOR TERMINATION FLANGE CONNECTION.
SUPPORTS	304L STAINLESS STL. SHEETS & PLATES PER ASTM A240 THREADED RODS PER ASTM A276	———	"L" GRADE NOT REQUIRED FOR NON-WELDED PARTS
BOLTS, NUTS, WASHERS	18-8 STAINLESS STL	———	———
FIXED JOINT O-RING	NATURAL RUBBER/SBR	———	45 ± 5 DUROMETER SHORE A COMPRESSION SET 5% MAX
EXPANSION JOINT O-RING	NATURAL RUBBER/SBR	———	40 ± 5 DUROMETER SHORE A 0.45 COEFFICIENT OF FRICTION MAX.
LOWER DROPLEG & MANIFOLD	PVC, ASTM D1784 COMPOUND 12454-B	PIPE: ASTM D1785 FITTINGS: ASTM D2466	———
AIR DISTRIBUTORS	PVC, ASTM D3915 COMPOUND 124524	PIPE: ASTM D3034 FITTINGS: ASTM D3034	MINIMUM 2% TITANIUM DIOXIDE
DIFFUSER HOLDER SUBPLATE, RETAINING RING	PVC, ASTM D3915 COMPOUND 124524	———	MINIMUM 2% TITANIUM DIOXIDE
DIFFUSER ELEMENT	EPDM	———	———
PVC SOLVENT WELDING	ASTM D2564	ASTM D2855	———

**STAINLESS STEEL DROPLEG FABRICATION*
FACTORY WELD ONLY WITH MIG, TIG, OR PLASMA-ARC WELDING INERT GAS PROCESSES, FULL PENETRATION BUTT WELDS, ER 316L FILLER WIRE. AFTER FABRICATION FINISH CLEAN ALL WELDED STAINLESS STEEL ASSEMBLIES BY FULL IMMERSION CLEANING TECHNIQUES IN ACCORDANCE TO 6.2.11 OF ASTM A380-88. THE ACID FOR USE DEFINED BY TABLE A2.1 OF ANNEX A2 OF ASTM A380. FINAL RINSE AND DRY IN ACCORDANCE TO SECTION 8.3 OF ASTM A380. ALL WELDED SURFACES TO CONFORM TO AISI NO. 2D FINISH.

Sanitaire
ITT Industries
BROWN DEER, WISCONSIN 53223

SPECIFICATIONS
MEMBRANE AERATION
(304L, PVC)

DRAWN BY JK	DATE 4-24-01	EQUIP.	STANDARD NO.	JOB SPEC-M1	
CHKD BY	DATE	REV.	SHEET OF	DWG NO.	
APPVD BY	DATE				

PROJECT: LOWER FOUNTAIN, CO - WRF SANITAIRE #: 12-7851S

GENERAL COMMENTS

1. All items furnished by Xylem are for installation by others.
2. Any valves on the air supply piping are supplied by others.
3. Bolts, gaskets, insulators and hardware for connecting the SANITAIRE aeration dropleg to the air supply piping are supplied by others.
4. Any penetrations, wall sleeves, wall spools or seals required for installation of the SANITAIRE aeration equipment are supplied by others.
5. Chemical treatment or lubrication of threaded stainless steel assemblies is supplied and installed by others.
6. Painting and protective coatings for any component supplied by Xylem are not included in the SANITAIRE equipment scope of supply for this contract.
7. The Xylem supplied stainless steel dropleg assemblies for the SANITAIRE equipment are fabricated by Felker Brothers in Marshfield, WI. Their welding procedures and qualifications were developed in accordance with ASME IX. Felker Brothers welders are current to date with ASME IX. Felker Brothers is ISO 9001:2000 certified.
8. The SANITAIRE equipment welded stainless steel dropleg assemblies are cleaned in accordance with ASTM A380-88 Section 6.2.11. The acid solution is as defined in ASTM A380 Table A2.1 Annex A2. Materials have a final rinse using ordinary industrial or potable water and are dried in conformance with ASTM A380 Section 8.3. Xylem can provide cleaning notification or verification if required.
9. The lower vertical PVC portion of the droplegs is shipped loose to the jobsite. The pipe is then cut to suit for proper length and field solvent welded into the manifold. Materials for the field solvent welding are not supplied by Xylem.
10. The actual TiO2 content of commercially available SCH 40 PVC is proprietary but is typically 1 to 1.5%. SCH 40 PVC does not require the same amount of UV protection as the distributor piping due to the greater wall thickness. The manifold, distributor and diffuser assemblies do have a minimum 2% TiO2 content per SANITAIRE material specifications.

11. XYLEM furnishes PVC pipe for the air distributors with materials per ASTM D3915 manufactured per ASTM D3034. ASTM 3034 was written specifically for sewer size pipe. Pipe and fitting manufacturing specification ASTM 3034 is required to be used with proprietary patented SANITAIRE fixed and expansion joint designs. PVC pipe manufactured following ASTM D3915 and D3034 has been supplied on SANITAIRE aeration projects for many years. Xylem is submitting pipe with 0.237" wall thickness – SCH 40 equivalent.

12. Manifold connections to the air distribution headers are SANITAIRE fixed joints with O-rings.

13. Expansion joints with fixed supports are not required by Xylem for distributors less than 80' in length.

14. The SANITAIRE equipment leveling standard for SANITAIRE Fine Bubble Aeration Equipment is +/- ¼". The supports allow leveling to within +/- 1/8" of a common horizontal plane without removing the header from the support.

15. The manifold and distributor clamps are oversized to permit pipe movement due to thermal expansion and contraction. The distributor header support clamps are 1 ½" wide. The manifold pipe support clamps are 2" wide.
16.

17. SANITAIRE supplies anchors (tie-downs) with a minimum safety factor of 10 for manifolds and distributors. Support assemblies for 4" sewer size manifolds and the distributors are designed with a safety factor of 4 for uplift loading.

18. No special tools other than those shown on the drawings are required for equipment maintenance.

19. No spare parts other than those specified are required or recommended by Xylem.

20. The equipment Installation, Operation & Maintenance (IOM) Manual is transmitted after submittal approval and before shipment.

21. A Bill of Materials is included in the IOM Manual

22. Information on equipment storage, protection, and handling before and after installation are included in the IOM Manual.

23. Erection drawings marked "Approved For Construction" with piece marks are included with the IOM Manual.

24. Instructions for the installation of SANITAIRE equipment are included in the IOM Manual.

25. Perform the Inspection, Level Uniformity, Leakage and Operations Tests per the specifications and the instructions in the IOM Manual.

26. Xylem will provide manufacturer's services as specified. All equipment, materials and manpower required for specified testing in the field is supplied by others.

27. Qualifications of the manufacturer's field service representative can be supplied when inspection, startup or training is requested.

28. Xylem utilizes the pre-printed IOM Manual for training.

29. Video taping of training sessions for the Owner's personnel, if required, is supplied by others.

9"Ø SSII MEMBRANE DISC GRID SYSTEM
FINE BUBBLE AERATION EQUIPMENT DATA SHEETS

PROJECT: LOWER FOUNTAIN, CO WRF **SANITAIRE #:** 12-7851S

LOCATION: AERATION BASINS NO.1, NO.2 & NO.3
GRID TYPE 1

DROPLEG

UPPER

MATERIAL: 304L STAINLESS STEEL SIZE: 6"Ø WALL THICKNESS: 0.109" (SCH 5S)

NUMBER: 12

LOWER

MATERIAL: UPVC SIZE: 6"Ø WALL THICKNESS: 0.280" (SCH 40)

NUMBER: 12

MANIFOLD

MATERIAL: UPVC SIZE: 6"Ø WALL THICKNESS: 0.280" (SCH 40)

NUMBER: 12

AIR DISTRIBUTOR

MATERIAL: UPVC SIZE: 4.215"O.D. WALL THICKNESS: 0.237" (Sch 40 eqv.)

DRAIN SUMP

MATERIAL: UPVC QUANTITY: 1/GRID

SUPPORTS

MATERIAL: 304 STAINLESS STEEL

ANCHORS

MATERIAL: 304 STAINLESS STEEL

MANIFOLD TYPE: EXPANSION SIZE: 1/2"Ø

HEADER TYPE: EXPANSION SIZE: 3/8"Ø

DIFFUSERS – SILVER SERIES II

MATERIAL: EPDM EFFECTIVE AREA: 0.41 SQ. FT.

(1) 1/4" DIAMETER DIFFUSER ORIFICE SHOP DRILLED

GRID INFORMATION

GRID TYPE	NO. OF GRIDS	DISTRIB. PER GRID	HOLDERS PER DISTRIB.	TOTAL HOLDERS PER GRID	TOTAL DIFFUSERS INSTALLED PER GRID	TOTAL DIFFUSERS THIS GRID TYPE
1	12	10	22	220	220	2640
					TOTAL	2640

PROJECT: LOWER FOUNTAIN, CO - WRF **SANITAIRE #: 12-7851S**

SPECIAL TOOLS LIST

QTY	DESCRIPTION	PART #
2	9" DIFFUSER WRENCH	WRENCH-9

SPARE PARTS LIST

QTY	DESCRIPTION	PART #
132	9"Ø MEMBRANE DIFFUSER	2261-WE9-R
132	9"Ø RETAINER RING	2300-2P9

NOTE: The above listed special tools and spare parts are required by this contract. No other special tools or spare parts are specified, required or recommended.

A separate list of provided spares to be used during installation and commissioning will be included with the BOM in the Final I,O&M manual.

To order parts or service contact: Local Vendor: WATER CONTROL CORPORATION
2460 W. 26TH AVENUE, SUITE 215C
DENVER, CO 80211-5359
PH: 303-477-1970
FX: 303-477-1981

SANITAIRE HEADQUARTERS: XYLEM – SANITAIRE PRODUCTS
9333 N. 49TH STREET
BROWN DEER, WI 53223 USA
PH: 414-365-2200
FX: 414-365-5784

xylem
Let's Solve Water

SANITAIRE®

9" SANITAIRE® MEMBRANE DISC DIFFUSER SPECIFICATIONS "SILVER SERIES II"

MATERIAL PROPERTIES	VALUE/UNITS	TEST PROCEDURE
Base Compound	EPDM With Carbon Black for UV Protection	--
Tensile Strength (Unperforated)	1,200 PSI/Min.	ASTM D412
Elongation at Break	350% Min.	ASTM D412
Hardness (Durometer)	58 ± 5, Shore A	ASTM 2240
Accelerated Aging Compression Set (Under Constant Deflection) 22 Hrs. @ 70°C	40% Max.	ASTM D395 Test Method B
Accelerated Aging (Elongation (% Retained) 70 Hrs. @ 100°C	75% Max.	ASTM D573
Ozone Resistance 72 Hrs.; 40°C, 50 pphm	No cracks @ 2X magnification	ASTM D1171 Method A
Modulus @ 300%	500 PSI/Min.	ASTM D412
Dynamic Wet Pressure	9.6" – 14.4" w.c.	@ 1.0 SCFM @ 2" w.c.
PHYSICAL PROPERTIES		
Nominal Diameter	9"	
Active Surface Area	0.41 $Ft.^2$	
Material Thickness	0.080"	
Check Valve Leakage Rate	0 ml H_2O after 48 hours unpressurized	

I/QC/Silver Series II MD Properties (5-12)

5/21/12(WE)

SANITAIRE MEMBRANE DISC DIFFUSER
SILVER SERIES II
QUALITY CONTROL TEST REQUIREMENTS

Manufacturing of the SANITAIRE Membrane Disc Diffuser is a two step process, which requires testing prior to and after the membrane perforation process.

STEP 1 – MANUFACTURING QUALITY CONTROL TEST

The following Quality Control test shall be performed at the point of manufacture, prior to membrane perforation.

PRIMARY

1. DUROMETER – 58 +/- 5%, Shore A, per ASTM 2240

PRIMARY SAMPLING CRITERIA

SPECIFICATION – MILITARY STANDARD 105E

TABLE 1 – SAMPLING SIZE AND CODE LETTER INFORMATION

- Lot or batch size 3201 to 10,000 units
- Primary test general inspection level II
- Primary test sample size code letter L

TABLE III-A - DOUBLE SAMPLING PLAN INFORMATION

- Primary test sample size code letter L
- Primary test sample size, 125 units each, (2) samples per batch
- Primary test AQL level 4.0

PRIMARY TEST ACCEPTANCE CRITERIA

SAMPLE #1 (i.e.: 125 units)

A.) If 7 or less units are found defective the entire batch is accepted and no further testing is required.
B.) If 8, 9 or 10 units found defective sample number 2 must be tested
C.) If 11 or more units are found defective in the first sample the batch is rejected. The manufacturer at their option may test any or all diffusers from the rejected batch and furnish those units that are within the acceptable range.

SAMPLE #2 (i.e.: 125 units)

A.) If a cumulative total of 18 units from sample #1 and sample #2 are found defective the entire batch is accepted and no further testing is required.
B.) If a cumulative total of 19 units from sample #1 and sample #2 are found defective the entire batch is rejected. The manufacturer at their option may test any and all diffusers from the rejected batch and furnish those units, which are within the acceptable range.

SECONDARY

1. TENSILE STRENGTH – 1200 PSI per ASTM D412

2. MINIMUM MODULUS OF ELASTICITY – 500 PSI per ASTM D 412

3. SPECIFIC GRAVITY – 1.10 +/- 5%

SECONDARY SAMPLING CRITERIA

SPECIFICATION – MILITARY STANDARD 105E

TABLE 1 – SAMPLING SIZE AND CODE LETTER INFORMATION

- Secondary test special inspection level S-2
- Secondary test sample size code letter D

TABLE III-A - DOUBLE SAMPLING PLAN INFORMATION

- Secondary test sample size code letter D
- Secondary test samples size, 5 units each, (2) samples per batch Secondary test samples to be taken from primary sample test lot.
- Secondary test AQL level 6.5

SECONDARY TEST ACCEPTANCE CRITERIA

SAMPLE #1 (i.e.: 5 units)

A) If 0 units are found defective the entire batch is accepted and no further testing is required.
B) If 1 unit is found defective sample #2 must be tested.
C) If 2 or more units are found defective in the first sample the batch is rejected. The manufacturer at their option may test any or all diffusers from the rejected batch and furnish those units that are within the acceptable range.

SAMPLE #2 (i.e.: 5 units)

A) If a cumulative total of 1 unit from sample #1 and sample #2 are found defective the entire batch is accepted and no further testing is required.
B) If a cumulative total of 2 units from sample #1 and sample #2 are found defective the entire batch is rejected. The manufacturer at their option may test any and all diffusers from the rejected batch and furnish those units, which are within the acceptable range.

STEP 2 – PERFORMANCE QUALITY CONTROL TEST

The following Quality Control test shall be performed at the point of manufacture, <u>after</u> membrane perforation.

1. DYNAMIC WET PRESSURE (DWP)

   9" Dia. Membrane: 9.6"- 14.4"w.c. @ 1.0 SCFM per diffuser.

   One diffuser per 25 shall be tested for DWP.

2. AIR FLOW UNIFORMITY

   Air flow uniformity is a visual inspection to verify substantially uniform air distribution when the diffusers submerged and operated at:

   0.5, 0.75 and 1.0 SCFM for the 9" Dia. Membrane Diffuser

   One diffuser per 100 shall be tested for Air Flow Uniformity.

3. Failure to meet the required test criteria requires all membranes be tested to previous passing test.
   Action required if a membrane disc diffuser does not meet the required DWP and/or Uniformity test requirements after the membrane perforation process.

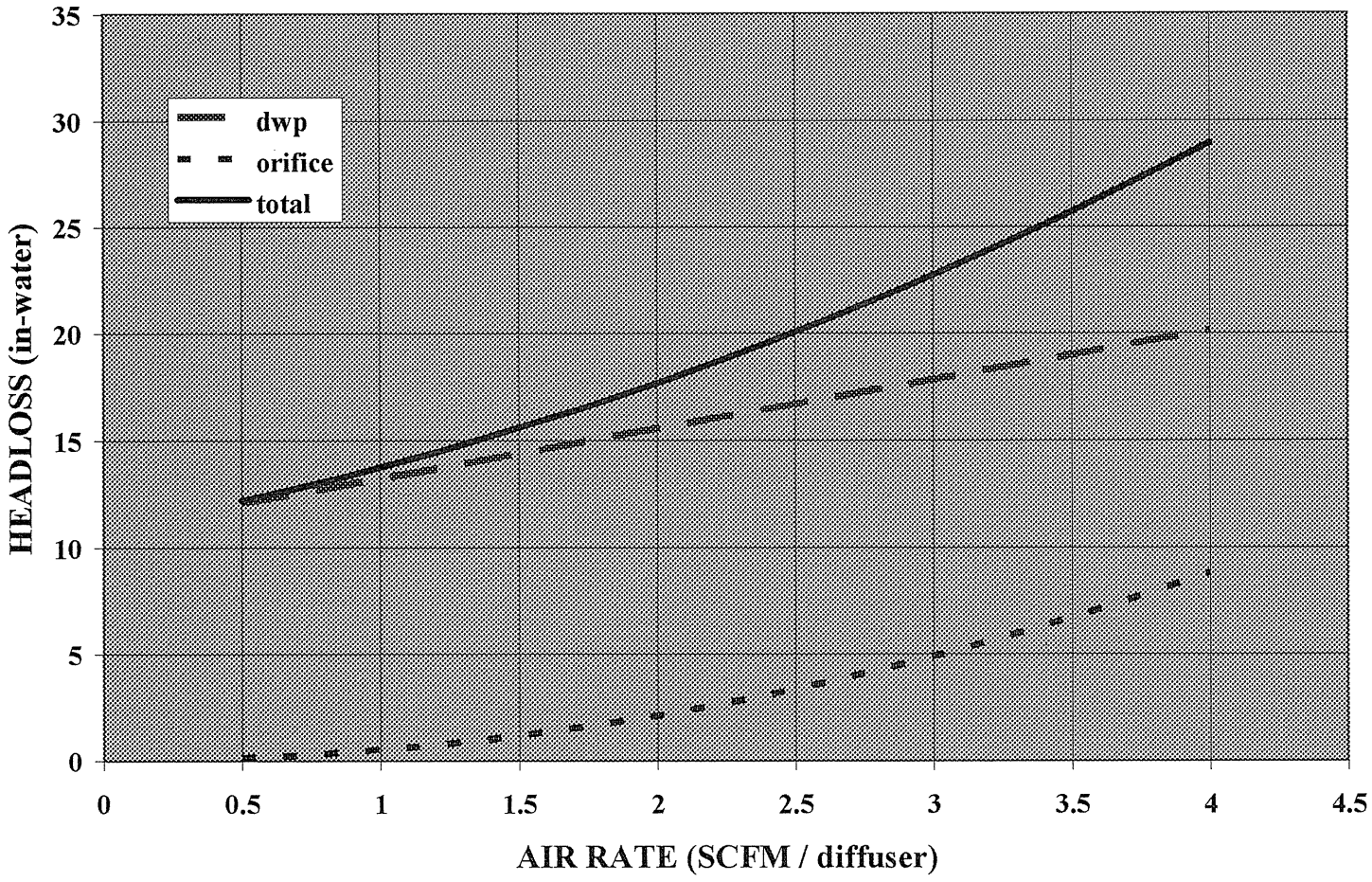
DWP Testing:

Test frequency for DWP is 1 in 25 after initial set-up. On testing of the 25th piece, if the DWP is not within specification it will be scrapped. The 24 pieces will all be tested to ensure that the DWP meets the requirement. Membranes that do not will be scrap. Determination as to the cause and subsequent correction as to why the DWP is not with-in specification will be made before production can proceed.

Uniformity Testing:

Test frequency for Uniformity is 1 in 100 after initial set-up. On testing of the 100th piece, if the Uniformity is un-acceptable the disc will be scrapped and the preceding 99 discs will be tested and ones that do not meet the Uniformity requirement will be scrapped. While the Uniformity is being assessed the DWP will also be checked to ensure that it is with-in specification. Determination of the cause and subsequent correction as to why the discs do not have a uniform pattern will be made before production can proceed.

LOWER FOUNTAIN, CO WRF: AERATION TANKS , with 9 inch Membrane Disc (WE style) diffusers, 1/4 inch orifice.



orifice (in-water)	Air/diffuser (SCFM)	Clean DWP (in-water)
0.1	0.45	11.96
1	1.38	14.11
2	1.94	15.40
3	2.36	16.37
4	2.72	17.19
5	3.03	17.91
6	3.31	18.56
7	3.57	19.15
8	3.81	19.70
9	4.04	20.22
10	4.25	20.71
11	4.45	21.17
12	4.65	21.61
13	4.83	22.04
14	5.01	22.44
15	5.18	22.84
16	5.35	23.21
17	5.51	23.58
18	5.67	23.94
19	5.82	24.28
20	5.96	24.62
21	6.11	24.94
22	6.25	25.26
23	6.38	25.57
24	6.52	25.88
25	6.65	26.18

Project no. 7851 hl

Operating Conditions at Diffuser: 21.71 Psia, 560 deg.R air. (5,413 ft. site elevation, 22.7 ft. submergence)

SANITAIRE

a xylem brand

Diffused Aeration Equipment

for

Harold D. thompson RWRF (Lower Fountain MSDD)

Aeraiton Tanks

Sanitaire #12-7851S

August 20, 2012

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Sanitaire Aeration Design Inputs for: Harold D. thompson RWRF (Lower Fountain MSDD), Sanit

Tank Geometry

3 Trains each Consisting of:

Parameter	Units	Pass 1
Parallel Reactors		1
Pass Process		Aerobic
SWD	ft	23.6
Submergence	ft	22.7
Volume	ft^3	235,946.5
Reactor Geometry:		Rect
Length	ft	158.0
Width	ft	63.3

Oxygen/Air Distribution

	Zone	1
	Pass	1
Default		100.0%

Oxygenation

Parameter	Units	Summer	Winter
No. Trains Operating		3	3
Air Rate	scfm	4,762.0	4,571.0

Standard Oxygen Correction Factor Parameters

Parameter	Units	Summer	Winter
Site Elevation	FASL	5413	5413
Ambient Pressure	PSIA	12.11	12.11
Water Temperature	°C	***20***	***20***

Notes:

Bold, Italicized text indicate assumptions made by Sanitaire

A - Indicates Actual (AOR) Requirement.

S - Indicates Standard Condition (SOR) Oxygen requirement.

If the AOR/SOR parameter is not given, then its value will be evaluated later if suitable alpha, beta, D.O., theta, pressure, and temperature data is supplied.

Round tanks are evaluated as rectangular tanks diameter equal to length and equal surface area.

Annular tanks are evaluated as rectangular tanks of width equal to the annular width and equal surface area.

Sanitaire Project Name: Harold D. thompson RWRF (Lower Fountain MSDD)
Sanitaire Project #12-7851S
Design Summary

		Operating Point & O2 Distribution	
	Units	Summer Default	Winter Default
No. Trains in Operation		3	3
No. Grids in Operation		12	12
No. Operating Diffusers		2,640	2,640
SOR	lb/day	46,323	44,654
SOTE	%	38.8	39.0
Total Air Rate	scfm	4,762	4,571
Min.Diffuser Air Rate	scfm/diff.	1.8	1.73
Max. Diffuser Air Rate	scfm/diff.	1.8	1.73
Static Pressure	psig	9.84	9.84
Diffuser DWP @ Min Air	psig	0.54	0.54
Diffuser DWP @ Max Air	psig	0.54	0.54
Pressure @ Top of Dropleg	psig	10.45	10.44
Est. Blower Efficiency		70%	70%
Est. Motor Efficiency		90%	90%
Shaft Power	Bhp	302.8	290.4
Est. Motor Electrical Load	kW	251.0	240.7
Est. Standard Aeration Efficiency	#SOR/BHP-hr	6.37	6.41

Notes:

(1) Design air is the maximum of process air or mixing air

(2) Delivered oxygen based on design air

(3) Brake Horsepower based on adiabatic compression, 70% mechanical efficiency and 0.30 psi lineloss

(4) Performance based on diffuser density (At/Ad), submergence, and diffuser unit air flow.

(5) Diffuser Air Flow based on Active Valve Modulation

(6) Blower Pressure Capability also requires consideration of:

A. The Air Main headloss (piping, fittings, valves, instrumentation, etc.) between the blower and the aeration assembly dropleg connections.

B. Potential for increased headloss resulting from diffuser fouling and/or aging. Please refer to the US EPA Fine Pore Design Manual (EPA/625/1-89/023), WEF Manual of Practice FD-13, and other

technical publications for a detailed discussion on this subject. Note that this headloss consideration relates to all Fine Pore systems regardless of supplier or type of diffuser element.

C. Increased diffuser submergence during Peak Flow conditions.

(7) Air Flow defined at 20°C

(8) Fine Mixing air based on MOP/8 0.12 scfm/ft²

Sanitaire Project Name: Harold D. thompson RWRF (Lower Fountain MSDD)
Sanitaire Project #12-7851S
Consulting Engineer:
Operating Condition: Summer
Oxygen Distribution: Default

Aeration System Design

Parameter	Units	Zone 1	Totals/Overall
Pass		1	
SWD	ft	23.61	
Subm	ft	22.72	
Volume	ft^3	235,946.5	707,839.6
No. Parallel Tanks		1	
No. Trains in Operation		3	
Grid Count		4	12
Dropleg Diameter	inches	6	
At/Ad		27.70	
Diffuser Density	% Floor	3.61%	
Diffusers/Grid		220	2,640

Oxygen Transfer

Diffuser Type		SSII-9	
Alpha			
Beta			
Theta			
D.O.	mg/l		
Water Temp	°C	20	
AOR/SOR			
Oxygen Distribution	%/Zone	100.0%	100.0%
AOR	lb/day		
SOR	lb/day		
Air Rate (7)	scfm	4,762.0	4,762.0

Performance

Mixing Criteria	$scfm/ft^2$	0.12	
Safety Factor	%		
Mixing Air (8)	scfm	3,597.7	
Process Air (for SOR)	scfm	4,762.0	
Design Air (1,7)	scfm	4,762.0	4,762.0
Diffuser Air Rate	scfm/Diff.	1.80	1.80
Delivered SOR	lb/day	46,323.4	46,323.4
Delivered SOTE	%	38.8%	38.8%
Pressure @ Top of Dropleg	psig	10.45	10.45
Shaft Power	Bhp	302.8	302.8

Notes:

(1) Design air is the maximum of process air or mixing air

(2) Delivered oxygen based on design air

(3) Brake Horsepower based on adiabatic compression, 70% mechanical efficiency and 0.30 psi lineloss

(4) Performance based on diffuser density (At/Ad), submergence, and diffuser unit air flow.

(5) Diffuser Air Flow based on Active Valve Modulation

(6) Blower Pressure Capability also requires consideration of:

A. The Air Main headloss (piping, fittings, valves, instrumentation, etc.) between the blower and the aeration assembly dropleg connections.

B. Potential for increased headloss resulting from diffuser fouling and/or aging. Please refer to the US EPA Fine Pore Design Manual (EPA/625/1-89/023), WEF Manual of Practice FD-13, and other technical publications for a detailed discussion on this subject. Note that this headloss consideration relates to all Fine Pore systems regardless of supplier or type of diffuser element.

C. Increased diffuser submergence during Peak Flow conditions.

(7) Air Flow defined at 20°C

(8) Fine Mixing air based on MOP/8 0.12 $scfm/ft^2$

Sanitaire Project Name: Harold D. thompson RWRF (Lower Fountain MSDD)
Sanitaire Project #12-7851S
Consulting Engineer:
Operating Condition: Winter
Oxygen Distribution: Default

Aeration System Design

Parameter	Units	Zone 1	Totals/Overall
Pass		1	
SWD	ft	23.61	
Subm	ft	22.72	
Volume	ft^3	235,946.5	707,839.6
No. Parallel Tanks		1	
No. Trains in Operation		3	
Grid Count		4	12
Dropleg Diameter	inches	6	
At/Ad		27.70	
Diffuser Density	% Floor	3.61%	
Diffusers/Grid		220	2,640

Oxygen Transfer

Diffuser Type		SSII-9	
Alpha			
Beta			
Theta			
D.O.	mg/l		
Water Temp	°C	20	
AOR/SOR			
Oxygen Distribution	%/Zone	100.0%	100.0%
AOR	lb/day		
SOR	lb/day		
Air Rate (7)	scfm	4,571.0	4,571.0

Performance

Mixing Criteria	$scfm/ft^2$	0.12	
Safety Factor	%		
Mixing Air (8)	scfm	3,597.7	
Process Air (for SOR)	scfm	4,571.0	
Design Air (1,7)	scfm	4,571.0	4,571.0
Diffuser Air Rate	scfm/Diff.	1.73	1.73
Delivered SOR	lb/day	44,654.2	44,654.2
Delivered SOTE	%	39.0%	39.0%
Pressure @ Top of Dropleg	psig	10.44	10.44
Shaft Power	Bhp	290.4	290.4

Notes:

(1) Design air is the maximum of process air or mixing air

(2) Delivered oxygen based on design air

(3) Brake Horsepower based on adiabatic compression, 70% mechanical efficiency and 0.30 psi lineloss

(4) Performance based on diffuser density (At/Ad), submergence, and diffuser unit air flow.

(5) Diffuser Air Flow based on Active Valve Modulation

(6) Blower Pressure Capability also requires consideration of:

A. The Air Main headloss (piping, fittings, valves, instrumentation, etc.) between the blower and the aeration assembly dropleg connections.

B. Potential for increased headloss resulting from diffuser fouling and/or aging. Please refer to the US EPA Fine Pore Design Manual (EPA/625/1-89/023), WEF Manual of Practice FD-13, and other technical publications for a detailed discussion on this subject. Note that this headloss consideration relates to all Fine Pore systems regardless of supplier or type of diffuser element.

C. Increased diffuser submergence during Peak Flow conditions.

(7) Air Flow defined at 20°C

(8) Fine Mixing air based on MOP/8 0.12 $scfm/ft^2$

Sanitaire Project Name: Harold D. thompson RWRF (Lower Fountain MSDD)
Sanitaire Project #12-7851S
Headloss Summary by System Operating Point
Consulting Engineer:
Operating Condition: Summer
Oxygen Distribution: Default

Grid Design

	Units	Grid 1
Diffuser Count		220
Dropleg Diameter	inches	6
Line Count		10
Line Spacing	ft	3.75
Manifold Diameter	inches	6
Manifold Length	ft	33.75
Header Length	ft	58.50
Manifold Location		End
Manifold Elevation		Inline
Dropleg Location		End
Header Orientation		Width

Grid Pressure

Grid Air Flow	scfm	396.8
Diffuser Air Flow	scfm	1.80
Submergence	ft	22.72
Orifice Diameter	inches	1/4
Static Header Pressure Differential in Assembly	psig	5.60E-03
Average Header Pressure in Assembly	PSI	10.44
A: Average Headloss from Top of Dropleg To Headers	PSI	4.78E-03
B: Diffuser Orifice Headloss	psi	5.99E-02
C: Diffuser Dynamic Wet Pressure	psi	5.44E-01
D: Static Pressure	psig	9.84
Total Pressure Required at Top of Dropleg (A+B+C+D)	psig	10.45
Friction Headloss (A+B)	PSI	6.47E-02

Sanitaire Project Name: Harold D. thompson RWRF (Lower Fountain MSDD)
Sanitaire Project #12-7851S
Headloss Summary by System Operating Point
Consulting Engineer:
Operating Condition: Winter
Oxygen Distribution: Default

Grid Design

	Units	Grid 1
Diffuser Count		220
Dropleg Diameter	inches	6
Line Count		10
Line Spacing	ft	3.75
Manifold Diameter	inches	6
Manifold Length	ft	33.75
Header Length	ft	58.50
Manifold Location		End
Manifold Elevation		Inline
Dropleg Location		End
Header Orientation		Width

Grid Pressure

Grid Air Flow	scfm	380.9
Diffuser Air Flow	scfm	1.73
Submergence	ft	22.72
Orifice Diameter	inches	1/4
Static Header Pressure Differential in Assembly	psig	5.16E-03
Average Header Pressure in Assembly	PSI	10.43
A: Average Headloss from Top of Dropleg To Headers	PSI	4.40E-03
B: Diffuser Orifice Headloss	psi	5.51E-02
C: Diffuser Dynamic Wet Pressure	psi	5.38E-01
D: Static Pressure	psig	9.84
Total Pressure Required at Top of Dropleg (A+B+C+D)	psig	10.44
Friction Headloss (A+B)	PSI	5.95E-02

PROJECT: Harold D. thompson RWRF (Lower Fountain MSDD)
SANITAIRE#: 12-7851S

DIFFUSER AIR DISTRIBUTION CALCULATIONS

LOCATION: Aeraiton Tanks
OPERATING CONDITION Summer
OPERATING DISTRIBUTION Default

	Zone 1
ORIFICE DIAMETER	1/4
DIFFUSER TYPE	SSII-9
AIR RATE PER DIFFUSER (SCFM):	1.8038
ORIFICE AND DIFFUSER HEADLOSS (PSI):	0.6039
MAX HEADER PRESSURE DIFFERENTIAL:	0.0056
MEAN HEADER STATIC PRESSURE (PSI):	10.44
MAX HEADER STATIC PRESSURE (PSI):	10.4464
MAX STATIC PRESSURE ABOVE MEAN (PSI):	0.0028
MIN HEADER STATIC PRESSURE (PSI):	10.4408
MIN STATIC PRESSURE BELOW MEAN (PSI):	0.0028
MAX ORIFICE AND DIFFUSER HEADLOSS (PSI):	0.6067
MIN ORIFICE AND DIFFUSER HEADLOSS (PSI):	0.6011
MAX AIR FLOW PER DIFFUSER (SCFM):	1.8080
MIN AIR FLOW PER DIFFUSER (SCFM):	1.7996
FLOW DEVIATION @ MAX SCFMDIFF	0.23%
FLOW DEVIATION @ MIN SCFMDIFF	0.23%

PROJECT: Harold D. thompson RWRF (Lower Fountain MSDD)
SANITAIRE#: 12-7851S

DIFFUSER AIR DISTRIBUTION CALCULATIONS

LOCATION: Aeraiton Tanks
OPERATING CONDITION Winter
OPERATING DISTRIBUTION Default

	Zone 1
ORIFICE DIAMETER	1/4
DIFFUSER TYPE	SSII-9
AIR RATE PER DIFFUSER (SCFM):	1.7314
ORIFICE AND DIFFUSER HEADLOSS (PSI):	0.5931
MAX HEADER PRESSURE DIFFERENTIAL:	0.0052
MEAN HEADER STATIC PRESSURE (PSI):	10.43
MAX HEADER STATIC PRESSURE (PSI):	10.4354
MAX STATIC PRESSURE ABOVE MEAN (PSI):	0.0026
MIN HEADER STATIC PRESSURE (PSI):	10.4302
MIN STATIC PRESSURE BELOW MEAN (PSI):	0.0026
MAX ORIFICE AND DIFFUSER HEADLOSS (PSI):	0.5957
MIN ORIFICE AND DIFFUSER HEADLOSS (PSI):	0.5905
MAX AIR FLOW PER DIFFUSER (SCFM):	1.7352
MIN AIR FLOW PER DIFFUSER (SCFM):	1.7277
FLOW DEVIATION @ MAX SCFMDIFF	0.22%
FLOW DEVIATION @ MIN SCFMDIFF	0.22%

SANITAIRE CERTIFIED OTE TEST DATA

9 inch Silver Series II Membrane Disc (0.41 ft²/Disc)

TARGET: At/Ad = 27.70(+/- 25%). Submergence = 22.72 (ft.)(+/- 25%)., Water Depth = 23.61 (ft.)

TEST	RUN	Data Subm. (feet)	At/Ad	Data Air per Diff. (SCFM)	Data SOTE (%)	Subm. Corrected SOTE (%)
65	E1	17.500	20.933	**1.408**	34.08	**44.25**
65	E2	17.500	20.933	**1.404**	32.10	**41.69**
65	E3	17.500	20.933	**1.404**	32.32	**41.97**
65	F1	17.500	20.933	**3.838**	29.04	**37.70**
65	F2	17.500	20.933	**3.846**	29.23	**37.95**
65	F3	17.500	20.933	**3.850**	29.31	**38.06**
129	A2	17.770	21.843	**2.039**	32.28	**41.28**
129	A3	17.770	21.843	**2.035**	32.69	**41.81**
129	A4	17.770	21.843	**1.978**	31.90	**40.79**
131	A1	19.100	22.836	**1.236**	37.97	**45.17**
131	A2	19.100	22.836	**1.218**	37.32	**44.40**
131	A3	19.100	22.836	**1.264**	37.22	**44.28**
134	A1	21.910	29.552	**0.629**	41.17	**42.70**
134	A2	21.910	29.552	**0.600**	41.54	**43.09**
134	A3	21.910	29.552	**0.635**	41.51	**43.06**
134	B1	21.910	29.552	**1.694**	38.68	**40.12**
134	B2	21.910	29.552	**1.694**	38.18	**39.60**
134	B3	21.910	29.552	**1.706**	39.38	**40.85**
134	G1	21.910	21.843	**1.778**	38.35	**39.77**
134	G2	21.910	21.843	**1.817**	38.52	**39.95**
134	G3	21.910	21.843	**1.778**	38.51	**39.94**
134	H1	21.910	21.843	**0.752**	42.33	**43.90**
134	H2	21.910	21.843	**0.752**	42.26	**43.83**
134	H3	21.910	21.843	**0.757**	42.81	**44.40**
158	E1	18.740	33.493	**3.027**	30.91	**37.48**
158	E2	18.740	33.493	**3.100**	30.80	**37.35**
158	E3	18.740	33.493	**3.193**	30.89	**37.46**
158	J1	18.740	21.843	**3.265**	31.21	**37.84**
158	J2	18.740	21.843	**3.257**	31.28	**37.93**
158	J3	18.740	21.843	**3.265**	31.09	**37.70**
158	K1	18.740	21.843	**1.048**	36.80	**44.63**
158	K2	18.740	21.843	**1.074**	36.61	**44.39**
158	K3	18.740	21.843	**1.074**	36.82	**44.65**
182	E1	18.500	31.813	**2.335**	32.44	**39.85**
182	E2	18.500	31.813	**2.335**	32.37	**39.76**
182	E3	18.500	31.813	**2.335**	32.53	**39.96**
182	E4	18.500	31.813	**1.570**	34.56	**42.46**
182	E5	18.500	31.813	**1.570**	35.56	**43.68**
182	E6	18.500	31.813	**1.574**	35.83	**44.01**

SOTE(corr) = [SUBM(target) / SUBM(data)] x SOTE(data).
SCFM/KCF=[(SCFM/Disc)1000] / [AtAd(sqft/Disc)WaterDepth]
BOLD values indicated the data plotted on the attached graph.

SANITAIRE CERTIFIED OTE TEST DATA

9 inch Silver Series II Membrane Disc (0.41 ft²/Disc)

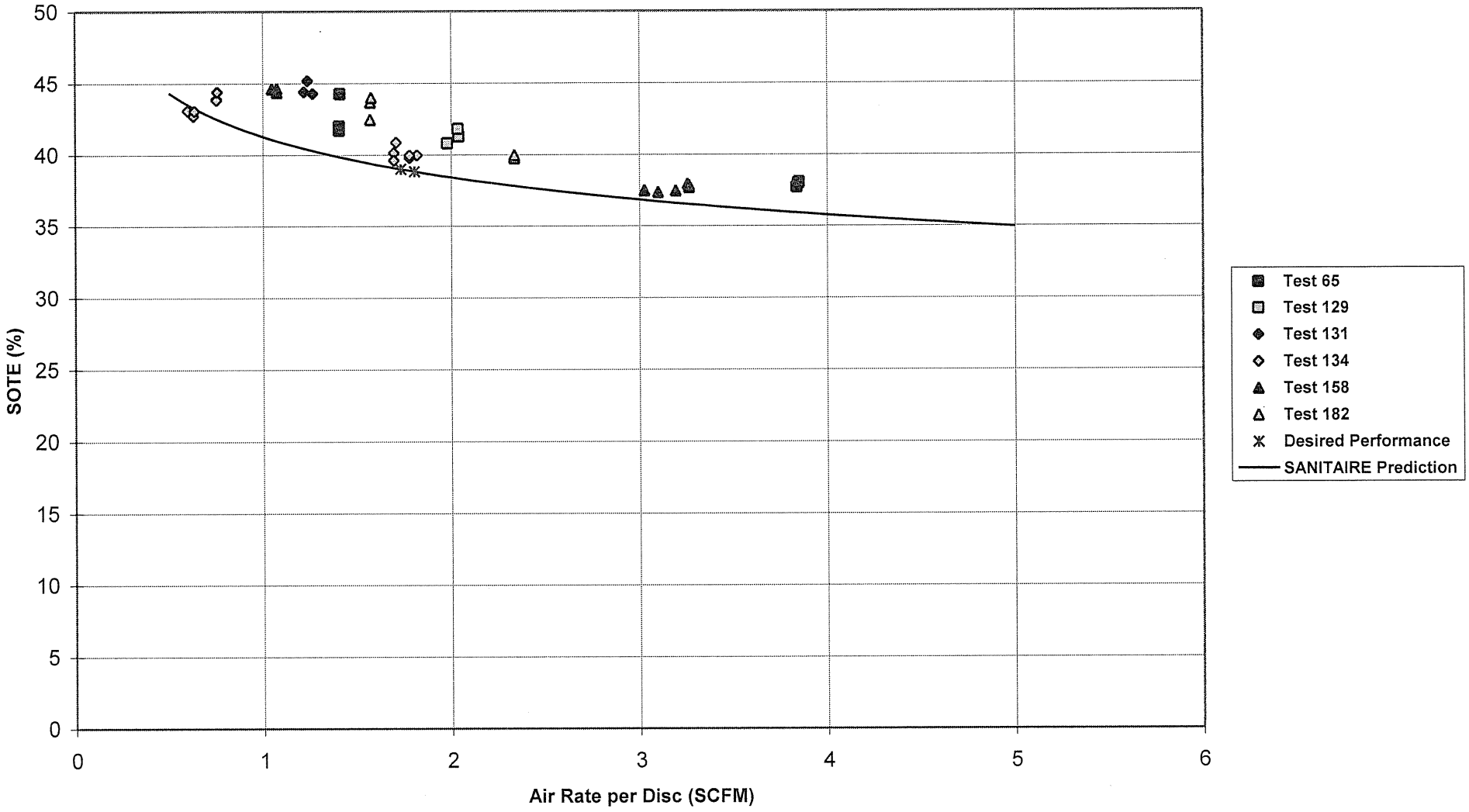
TARGET: At/Ad = 27.70(+/- 25%). Submergence = 22.72 (ft.)(+/- 25%)., Water Depth = 23.61 (ft.)

TEST	RUN	Data Subm. (feet)	At/Ad	Data Air per Diff. (SCFM)	Data SOTE (%)	Subm. Corrected SOTE (%)

INDEX OF SELECTED CERTIFIED OXYGEN TRANSFER TESTS:

Test	Date	Job #	Job Name
65	May-02	01-4869	Stillwater, OK
129	Oct-05	04-5904S	Queen Anne's County, MD WWTP
131	Oct-06	05-6123S	Harnett County Regional WWTP
134	Dec-07	07-6715S	Cleveland Southerly WWTC
158	Jun-08	07-6587S	James B. Messerly WPCP
182	May-10	09-7281S	Valdosta, GA

SANITAIRE 9 inch Silver Series II Membrane Disc Diffusers
Experimental Data vs. Factory Performance Characteristic:
At/Ad=27.7, Data Normalized to 22.72 ft. Submergence and 1000 mg/l TDS



PROJECT: LOWER FOUNTAIN, CO - WRF SANITAIRE #: 12-7851S

CERTIFICATE OF SYSTEM PERFORMANCE

SPECIFICATION SECTION 11376
FINE BUBBLE DISC AERATION SYSTEM

Xylem hereby certifies that the SANITAIRE® aeration equipment for this project as shown on the enclosed drawings and equipment data sheets will perform in compliance with the contract documents and specifications. System has been designed for long term performance of all submerged materials subject to delivered air temperature, activated sludge basin contents temperature and other ambient environmental conditions. Xylem guarantees the system will perform per the Certified Test data included with this submittal.

Jon A. Klotz
Senior Project Engineer
9333 N. 49th Street
Brown Deer, WI 53223
Direct Line: 414-365-2224
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jon.klotz@xyleminc.com

PROJECT: LOWER FOUNTAIN, CO - WRF **SANITAIRE #: 12-7851S**

AIR FILTRATION REQUIREMENTS

SPECIFICATION SECTION 11376
FINE BUBBLE DISC AERATION SYSTEM

Xylem recommends following EPA Design Manual for Fine Bubble Aeration Systems in regards to degree of air filtration required for Fine Bubble Diffused Aeration equipment.

Standard practice in designs using fine pore aeration devices is to provide blower inlet air filtration to remove 90% of all particles 1 micron and larger.

Jon A. Klotz
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9333 N. 49th Street
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xylem
Let's Solve Water

PROJECT: LOWER FOUNTAIN, CO - WRF **SANITAIRE #: 12-7851S**

SHIPPING AND SITE STORAGE

The SANITAIRE aeration equipment is shipped from the factory ready for outdoor storage.

The PVC pipe is packed in crated bundles and is not covered with plastic. **DO NOT COVER THE PVC PIPE WITH PLASTIC OF ANY TYPE.** Covering the PVC pipe with plastic may create a "greenhouse" effect, trapping heat, and causing the pipe and fittings to warp. **Covering the PVC pipe with plastic will void the factory warranty.** The bundles of pipe should be stored on a flat surface. The PVC pipe provided by Xylem contains 2% TiO2 to prevent degradation of the compound from UV rays. Pipe may be stored in the open out doors.

The diffuser components, support assemblies and other hardware is packed in box crates or on pallets covered with plastic to prevent cardboard packaging from deterioration by wind and rain. The crates and pallets should be stored on a flat surface.

- The equipment will be shipped on flat bed trailers and can be off loaded from the side will a forklift.
- Pallets of PVC air piping can be stacked 2 high on a flat surface.
- Wooden box crates can be stacked 2 high on a flat surface.
- Pallets of membrane diffusers cannot be stacked. These pallets will be wrapped in plastic for outdoor storage purposes.

After installation of aeration equipment, if start-up will be delayed for a period of time, follow long and short term storage procedures as indicated in the SANITAIRE equipment I,O&M manual.

PROJECT: LOWER FOUNTAIN, CO - WRF SANITAIRE #: 12-7851S

FINE BUBBLE AERATION SYSTEM

INSTRUCTION LESSON PLAN

NOTE: If this training session is being video taped for reference use, the following disclaimer statement will be presented at the beginning of the session.

This tape is used at Customer's own risk and is not intended as a substitute for training, safety instructions or the operating service and maintenance manuals.

XYLEM ASSUMES NO LIABILITY FOR THE COMPLETENESS OR ACCURACY OF THE TAPE. ANY CLAIM FOR INJURY OR PROPERTY DAMAGE WHICH ARRISES OUT OF OR IN CONNECTION WITH THE USE OF THE TAPE BY THE CUSTOMER, ITS EMPLOYEES, OR AGENTS IS THE SOLE RESPONSIBILITY OF THE CUSTOMER.

INTRODUCTION – (10 minutes)

Designated Instructors

Information to be discussed

- Identify equipment components, functions
- Aeration system installation and start-up procedure
- Plant operation
- Preventive Maintenance
- Yearly maintenance & diffuser cleaning
- Long term storage procedures
- Pipe repair procedures
- On tank demonstration/inspection
- Question and answer session

IDENTIFY EQUIPMENT COMPONENTS, FUNCTIONS (15 min.)

- Dropleg
- Manifold
- Distributor
- Fixed Joints
- Supports
- Diffuser
- Manual purge system

AERATION SYSTEM INSTALLATION AND START-UP PROCEDURE (10 min., page 1)

- Start-up

PLANT OPERATION (15 min., page 19)

- Principles
- Diffuser operating air flow range
- Mixing, D.O. levels
- Diffuser fouling

PREVENTIVE MAINTENANCE (15 min., page 23)

- Moisture purge
- Air bumping
- Power failure and loss of air supply
- Visual inspections
- Operating pressure and air flow
- Aeration system troubleshooting guide

YEARLY MAINTENANCE AND DIFFUSER CLEANING (10 min., page 27)

- Maintenance schedule
- Lubrication schedule
- Diffuser cleaning method

LONG TERM STORAGE PROCEDURES (10 min., page 29)

- With air available
- No air available

PIPE REPAIR PROCEDURES (15 min., page 31)

- Manifold repair
- Distributor repair

ON TANK DEMONSTRATION/INSPECTION (30 min.)

- Operating techniques
- Start-up and shut-down procedures
- Visual inspection

QUESTION AND ANSWER SESSION (AS NEEDED)

PROJECT: LOWER FOUNTAIN, CO - WRF SANITAIRE #: 12-7851S

MAINTENANCE REQUIREMENTS

DAILY

1. No routine maintenance required.

WEEKLY

1. Purge condensation from aeration grid piping. See page 23 in Section II of this I,O&M manual.

2. Air bump diffusers to blow off any settled debris. Air bumping help to reduce back pressure in aeration system and blowers. See page in Section II of this I,O&M manual.

MONTHLY

1. No routine maintenance required other than the weekly maintenance mentioned above.

BI YEARLY

1. No routine maintenance required other than the weekly maintenance mentioned above.

YEARLY

1. Drain tank.

2. Remove excess settled solids if any have accumulated.

3. Clean diffusers. See page 28 in Section II of this I,O&M manual.

4. Inspect support hardware to ensure all components are intact and tight.

5. Inspect diffuser retainer rings to be sure all rings are in place and tight. See figure 36 on page 15 in Section II of this I,O&M manual.

    - **NO LUBRICATION OF PARTS OR LUBRICATION SCHEDULE IS REQUIRED.**

    - **TROUBLESHOOTING GUIDE: SEE PAGE 25 IN SECTION II OF THIS I,O&M MANUAL.**

PROJECT: LOWER FOUNTAIN, CO - WRF SANITAIRE #: 12-7851S

PREDICTED LIFE OF PARTS / LIST OF PARTS SUBJECT TO WEAR

- All equipment provided with the SANITAIRE aeration system is suitable for twenty (20) year operation. The only parts subject to wear or deterioration are the EPDM membrane disc diffusers. No lubrication is required during routine maintenance.

- The 9"Ø SSII diffusers are manufactured from EPDM. Average predicted life of the EPDM diffuser unit is seven (7) years. Depending on the chemistry of the mixed liquor, some shrinkage of the EPDM diffuser unit may occur over time causing an increase in operating pressure. The diffuser aerating slits may become clogged over time also increasing operating pressures. Follow routine maintenance air bumping procedure to deter clogging of the diffuser units.

FINE BUBBLE AERATION SYSTEM WIRING DIAGRAMS

The Fine Bubble aeration system provided by Xylem has no electrical parts or components. No wiring is required for installation, operation or maintenance of the Sanitaire Fine Bubble Aeration system. Air blowers for process air have not been provided by Sanitaire under this contract.

FINE BUBBLE AERATION SYSTEM LUBRICATION SCHEDULE

No lubrication is required during operation or routine maintenance.

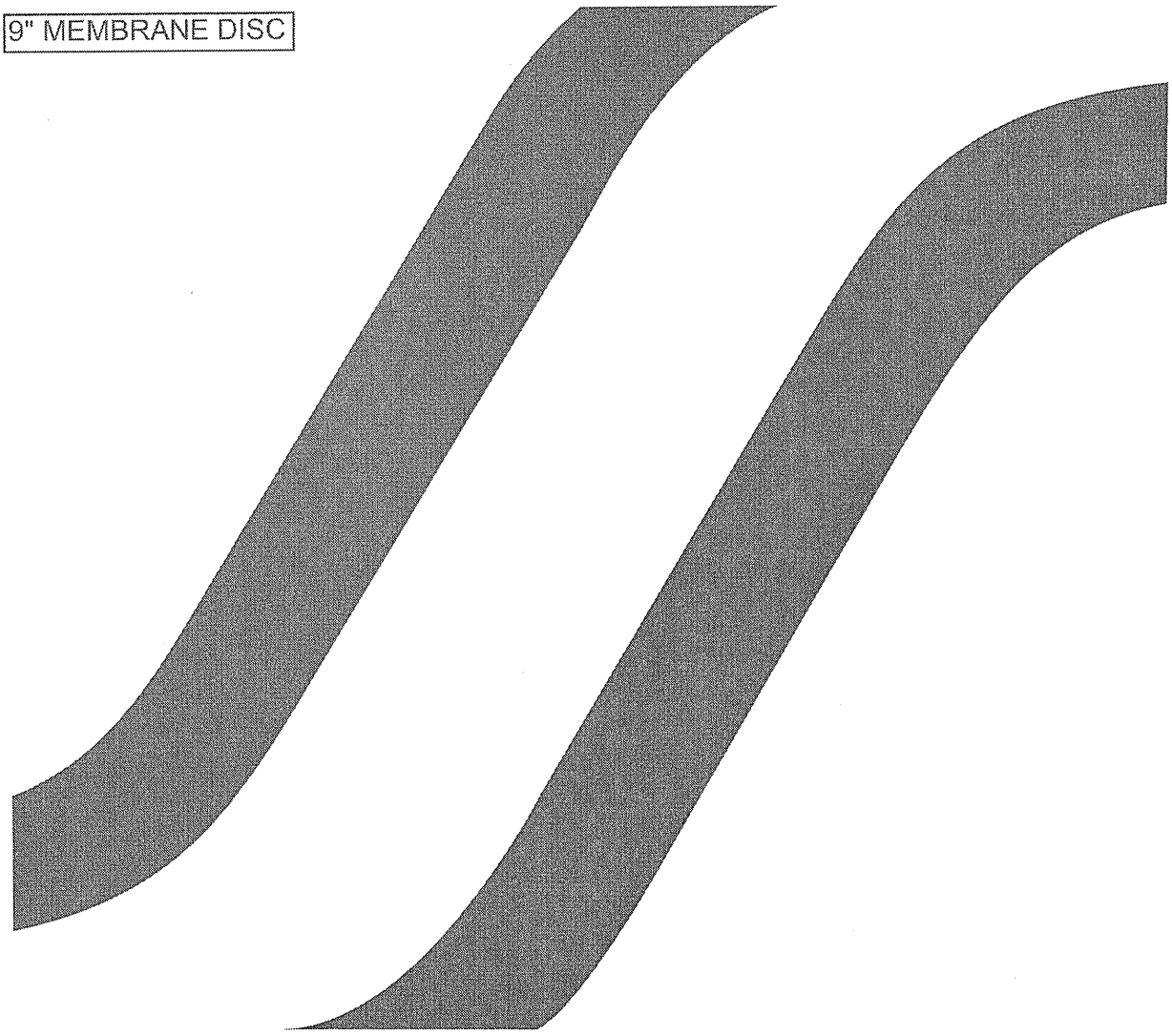
FINE BUBBLE AERATION SYSTEM EMERGENCY SHUTDOWN PROCEDURE

IN CASE OF EMERGENCY, to shut down the SANITAIRE Fine Bubble Aeration System provided by Xylem, turn off the air supply valve that allows process air to the system. See valve operation instructions. The process air valves are not included in Xylem's scope of supply for this project.

SANITAIRE®

Fine Bubble Aeration System

9" MEMBRANE DISC



INSTALLATION, OPERATION AND MAINTENANCE MANUAL

TABLE OF CONTENTS

INTRODUCTION

This manual covers the Installation, Start-up, Plant Operation, Maintenance and Repair of the SANITAIRE Fine Bubble Aeration System.

This manual is used for ~~both~~ our ~~Ceramic and~~ Membrane Fine Bubble Disc Diffusers. The format and text of this manual have ~~not~~ been edited for specific projects and specification requirements.

We do realize that most projects have either Membrane or Ceramic Disc Diffusers and rarely have both, however, all of the components involved with these systems are interchangeable and are therefore combined in this manual.

Distinct sections are offered for the Plant Operation of the different Diffuser types. The operators should follow these accordingly.

Prior to beginning the installation process, the installing contractor should make sure the erection or "E" drawings are in their possession. The "E" drawings have the required part number designation and are essential for proper installation.

The Safety Alert Symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

⚠ CAUTION

This symbol and signal word indicate a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury. This symbol MAY also be used to alert against unsafe practices.

CAUTION

This signal word indicates a situation which if not avoided, MAY result in product or property damage.

The precautions listed in this manual are not all-inclusive. If a procedure, method, tool or part is not specifically recommended, you must satisfy yourself that it is safe for you and others, and that the system will not be damaged or made unsafe as a result of your decision.

This material may not be copied or reproduced in any way without prior written approval from Sanitaire.

INSTALLATION AND START-UP

RECEIVING AND SITE STORAGE

Prior to equipment arrival a dry, level temporary storage site should be made available.

Shipments made within the USA, Canada and Mexico will be delivered on flat bed trailer trucks. Unload components with a forklift or crane.

An export shipment will arrive in export containers. On these containers, the top and one end are removable.

Palletized and banded air distributor sections and/or palletized and wrapped boxes of equipment components are placed at the bottom of the container. Loose manifold sections, droplegs or boxes are placed on the top.

Remove the loose boxes by hand. Remove the loose manifold sections and droplegs by hand or with a crane and sling device.

Palletized boxes of equipment components will be placed near the open end for removal by forklift. The palletized air distributor sections are removed by using a crane and wire slings placed through the lifting lugs as shown in Figure 0.

DO NOT stack these shipping units.

DO NOT store the units where snow removal or other heavy equipment could cause damage.

DO NOT cover the pipe components with plastic. Excessive heat build-up can damage plastic pipe and will void the equipment warranty.

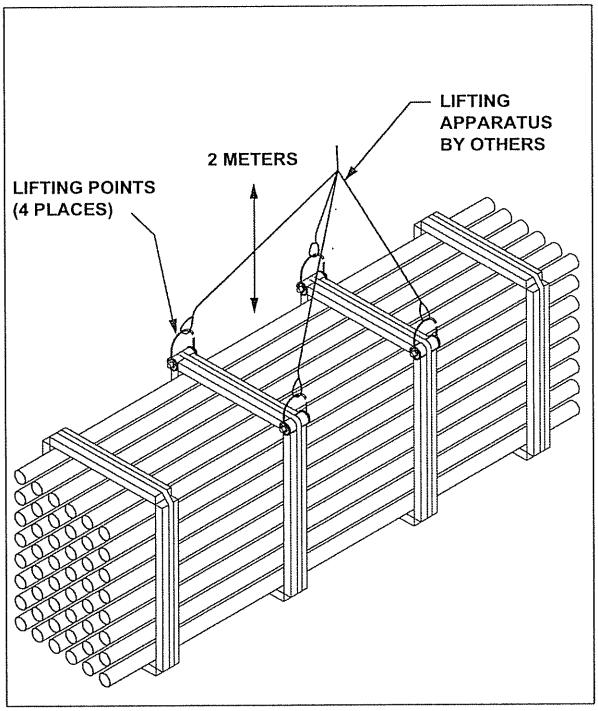


Figure 0

PHYSICAL INVENTORY

Sanitaire has provided shipping lists for all components used for the aeration system in this manual. In addition, each shipment has a packing list of all items delivered.

Before installation, take a physical inventory of all components (by comparing the shipping and packing lists) and immediately report any missing or damaged items to Sanitaire.

DROPLEG AND MANIFOLD INSTALLATION

1. Attach the upper stainless steel portion of the dropleg to the air main.

NOTE

When the upper dropleg is installed properly it should be vertical with it's centerline located as shown on the erection drawings. (See Figure 1) The droplegs are shipped with protective end plugs which require removal prior to installation.

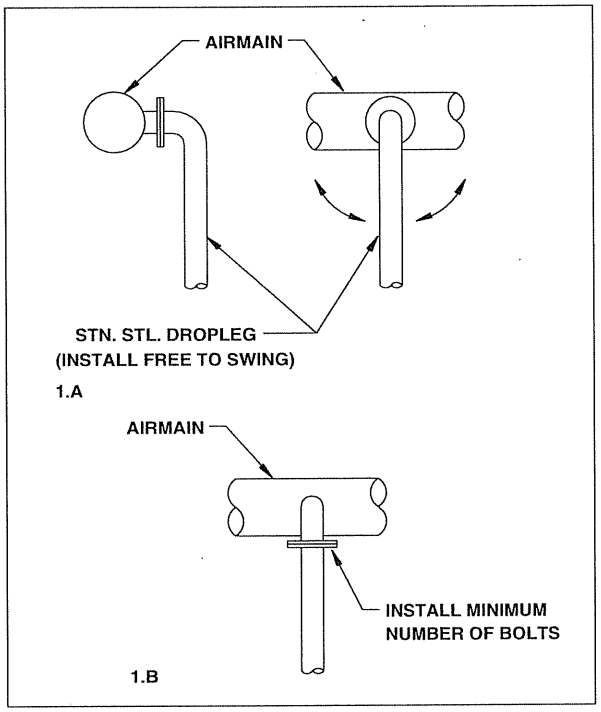


Figure 1

The air main must be capable of supporting the full weight of the upper stainless steel portion of the dropleg.

CAUTION

Before installing the upper dropleg section, all dirt and debris must be removed from the air main. The air blowers are normally used for this operation. Air filtration equipment should be installed and operating prior to blowing out air lines. Blowers may require a minimum back pressure when operating. Be sure to follow manufacturer's requirements.

NOTE

A) *Droplegs with a top connecting elbow, as shown in Figure 1.A, should be bolted and tightened to the air main connection to a point which will allow the dropleg to be swung to the side when installing the lower PVC portion of the dropleg.*

B) *Droplegs with a horizontal flange connection, as shown in Figure 1.B, should be temporarily bolted tightly to the air main connection with a minimum number of bolts. The dropleg will have to be removed to install the lower PVC portion of the dropleg.*

2. Use the installed stainless steel upper dropleg and the erection drawings to locate and layout the centerline of the aeration grid manifold.

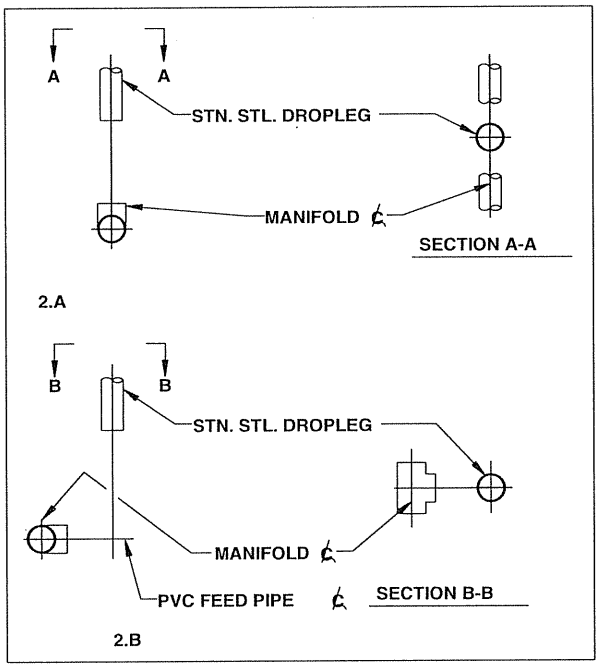


Figure 2

NOTE

The dropleg connection on the manifold is a PVC socket tee or elbow. This connection can be located directly under the dropleg as shown in Figure 2.A or offset as shown in Figure 2.B. Review the erection drawings prior to manifold layout.

3. Use the erection drawings and shipping lists to locate all manifold anchors and supports.

   Six inch (150 mm) diameter or greater manifold supports are one of two types. Figure 3 shows a manifold support used for manifolds where the centerline elevation is less than 18" (457 mm) from the floor. Figure 4 shows a support which uses a stiffening strut on manifolds where the centerline is above 18" (457 mm) off the floor.

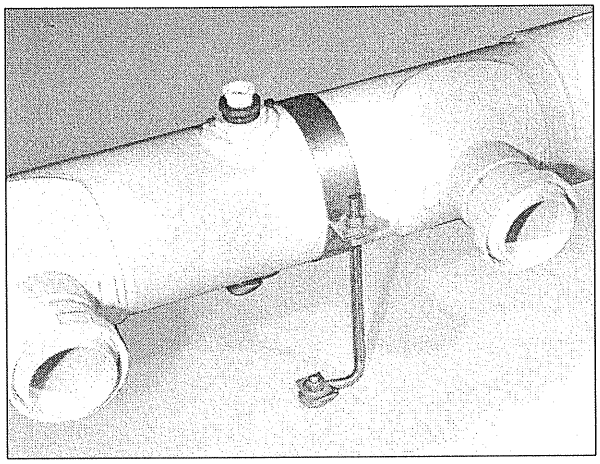


Figure 3

   Manifolds which do not use the strut support are commonly referred to as in-line manifolds. Manifolds which have the strut support are referred to as raised manifolds.

   Four inch (100 mm) diameter manifolds use a single anchor support as shown in Figure 23, these manifolds are in-line and do not require a support strut.

4. Use the erection drawings and manufacturer's installation instructions to layout and install the manifold anchors.

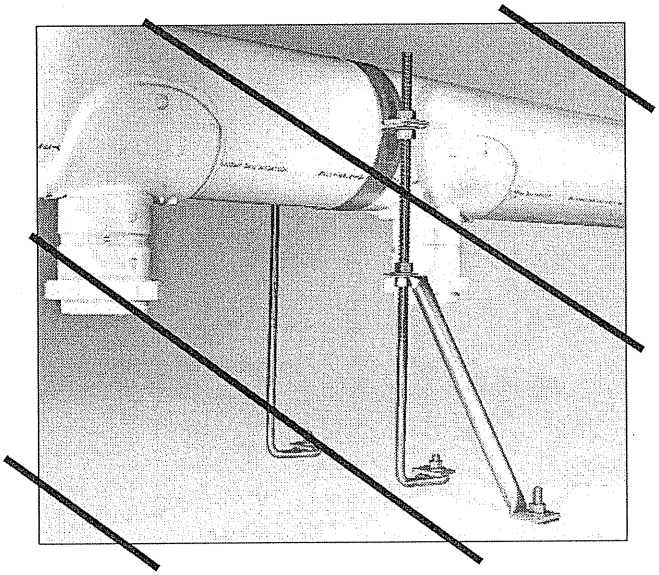


Figure 4

NOTE

A) *Before installing the anchors it is advisable to lay the manifold alongside the layout and double check for possible interference. This will require locating the correct manifold sections, lowering them into the tank, removing the dust covers off the ends and orienting the sections into the proper position. All manifold sections have a part number, shown on the erection drawings and marked on the pipe for easy identification.*

If an interference does occur the manifold supports can be repositioned as long as the maximum support spacing is held to 8'-0" (2440 mm).

B) *When installing anchors follow the tightening torque values as listed by the manufacturer in their installation instructions.*

C) *When installing anchors the threaded projection from floor level should be as shown on the erection drawing anchor table.*

5. Install the manifold support base and struts if required. All floor mounted anchor nuts, washers and plate washers need to be installed. If 4" Ø (100 mm) manifolds are used, a locating plate must be installed as shown in Figure 25.

6. Use a laser level system to bring the lower pipe clamp flange hex nuts to the proper elevation. The proper elevation will be the manifold centerline elevation as shown on the erection drawings (See Figure 6). Once the centerline elevation is set, install lower pipe clamps as shown in Figures 5, 7, and the erection drawings.

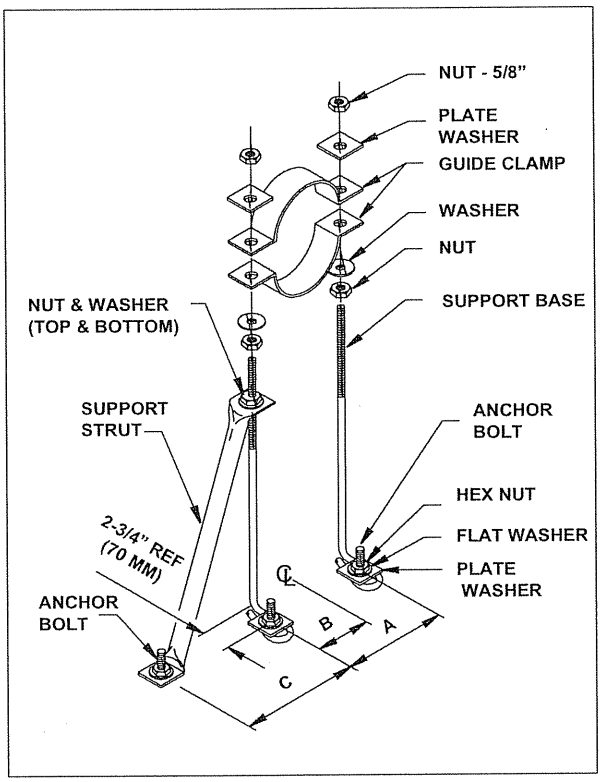


Figure 5

7. Examine the manifold pipe sections. Remove all protective dust covers from the pipe ends and 4" Ø (100 mm) air distributor connections. Dispose of the dust covers and packaging material properly.

   If pipe sections are dirty and contain debris from storage, flush with water prior to installation.

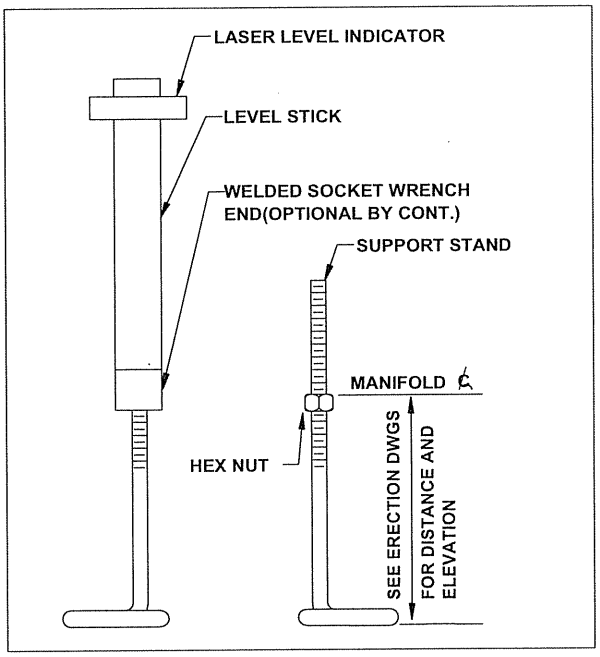


Figure 6

8. Place the manifold sections in the lower clamp cradle of the supports. The correct orientation can be determined from the erection drawings.

9. Make up any flange joints. Leave the bolts loose for now.

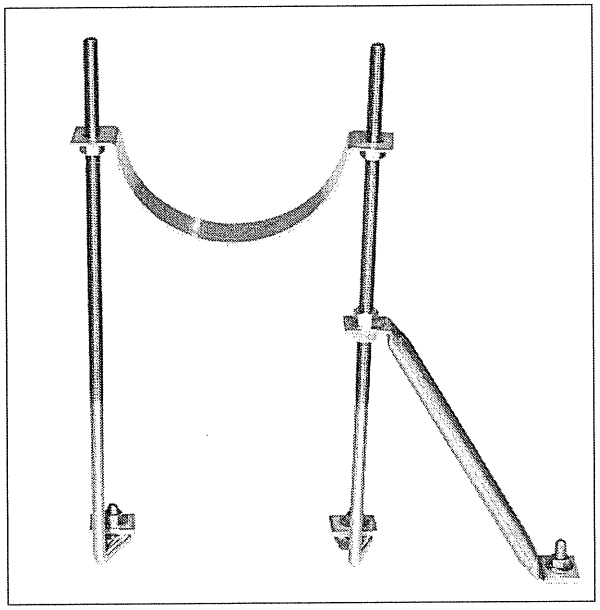


Figure 7

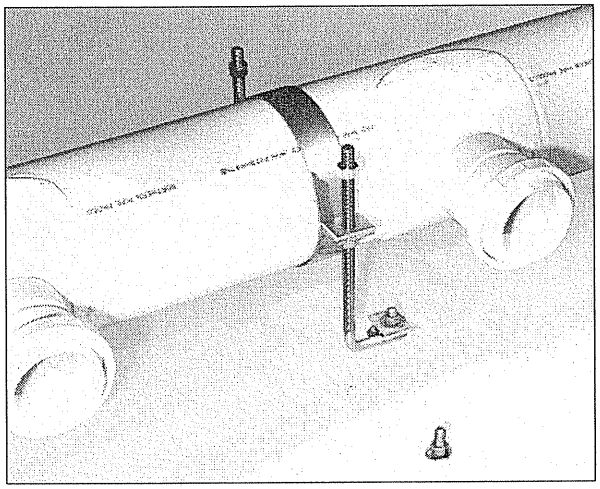
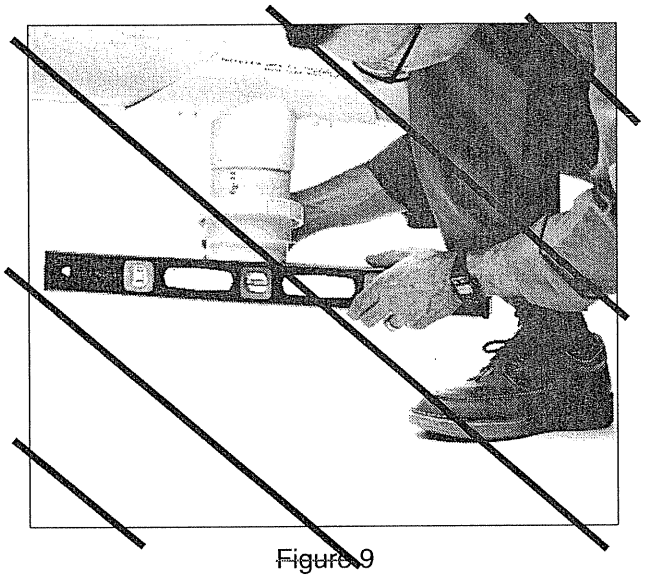


Figure 8

10. Install the upper half of the pipe clamp, plate washers and nuts. **Do not secure at this time.** See Figures 5, 8 and the erection drawings.

11. Level the manifold section which attaches to the dropleg so that the air distributor connections are plumb vertically for raised manifolds or level horizontally for in-line manifolds. See Figures ~~9 and~~ 10.

12. Secure the pipe clamps on this section by tightening down the hex nuts on the top pipe clamp. Make sure the manifold pipe is level in a horizontal line parallel to the centerline.



~~Figure 9~~

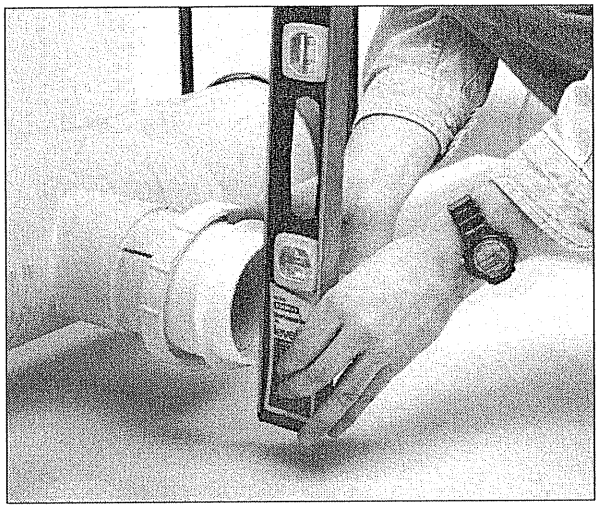


Figure 10

13. Using the following procedure, install the lower PVC portion of the dropleg:

A) With a heavy body solvent cement, field glue all required PVC feed pipe and fittings up to the last "cut to fit pipe section" which mates to the stainless steel upper dropleg section. See Figure 11 and the erection drawings. Install feed pipe supports as required and shown on the erection drawings.

NOTE

Manifolds where the upper stainless steel dropleg is positioned directly in-line with the manifold connection as shown in Figure 2.A, ***DO NOT*** *require a feed pipe, fittings and supports.*

B) Measure the distance "X" from the end of the installed stainless steel upper dropleg to the insertion depth of the PVC socket fitting. See Figure 11.

C) Remove or swing the upper stainless steel portion of the dropleg out of the work area.

D) Cut or trim the lower PVC dropleg to the measured distance.

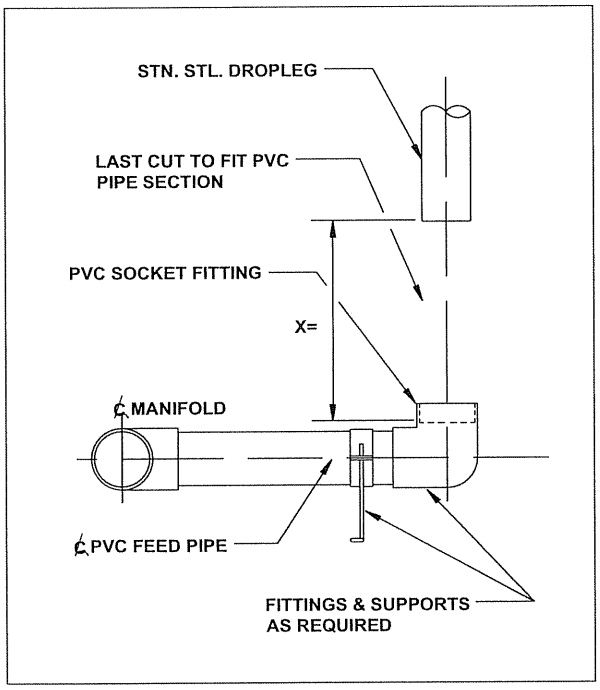


Figure 11

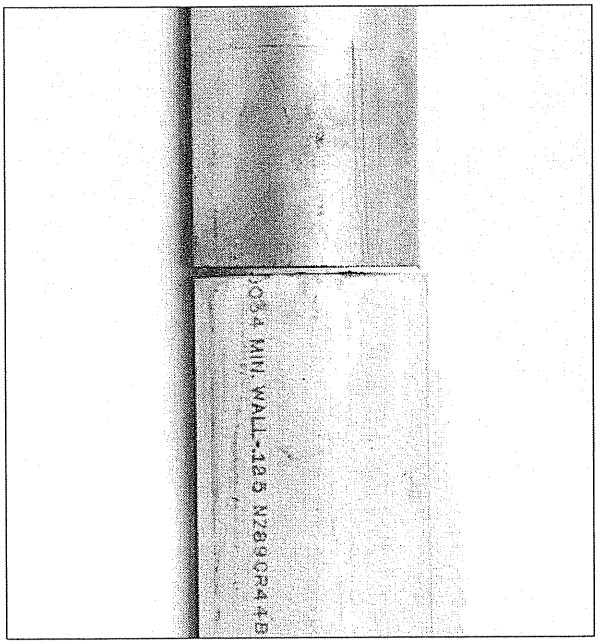


Figure 12

E) Solvent cement the lower PVC dropleg into the manifold connection fitting.

F) Reinstall and/or align the stainless steel portion of the dropleg. The gap between the stainless steel and PVC should be a maximum of 1/8" (3 mm). See Figure 12.

G) Install the clamp coupling or make the flange connection as shown in Figure 13 or 14. The clamp coupling bolts should be torqued to 50-55 ft•lbs (70-75 N•m).

NOTE

Nearly all installations have the PVC and stainless steel pipe sections mating as plain ends (Figure 12) connected with a stainless steel clamp coupling (Figure 13); however, these two sections could mate with a flange connection as shown in Figure 14. If a flange connection is used, the flange overall and socket depths must be considered when cutting the PVC dropleg section.

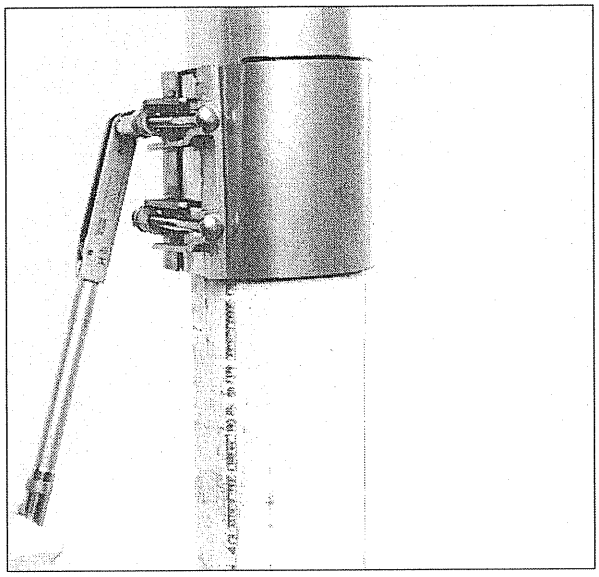


Figure 13

14. Once the complete dropleg is installed, refer back to steps 11 and 12 and secure subsequent manifold sections in the same manner. Align the air distributor saddle connections and tighten the flange joints. Level the manifold along its length and secure the pipe clamps.

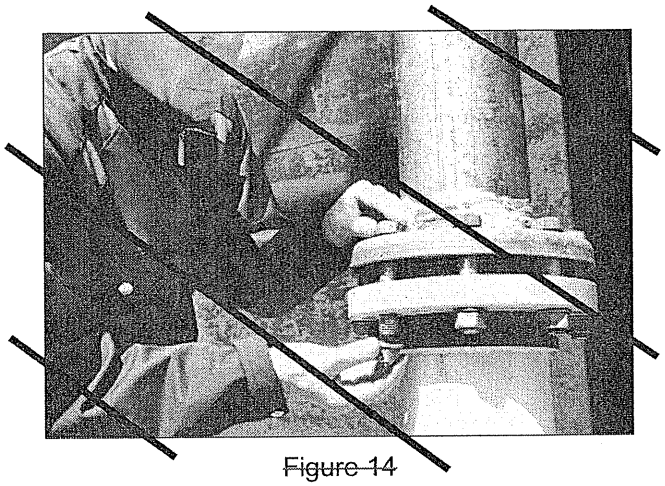


Figure 14

AIR DISTRIBUTOR AND DRAINLINE INSTALLATION

This section covers the procedure for installing the air distributors and drainlines.

NOTE

Separate drainlines are primarily used on fine bubble systems with raised manifolds. Nearly all systems with in-line manifolds will not have separate drainlines as the manifold serves as the drainline. See Figure 15 and the erection drawings.

1. Using the erection drawings and the manifold air distributor connections as a guide, layout the centerline for each air distributor and drainline if applicable. See Figure 16, Step 1.

2. Mark the air distributor support locations on one of the outside layout lines. The spacing is shown on the erection drawings. See Figure 16, Step 2.

3. Assemble one complete air distributor section from the manifold to the end cap. Include the drainline pieces if applicable. Use the distributor sections as shown and marked on the erection drawings and the pipe itself. See Figure 17.

   Remove the perforated plastic end covers prior to assembly. If the covers were previously removed or missing, check the inside of the pipe and flush out dirt and debris which may have accumulated during storage.

   The air distributors are assembled using Sanitaire fixed or expansion joints.

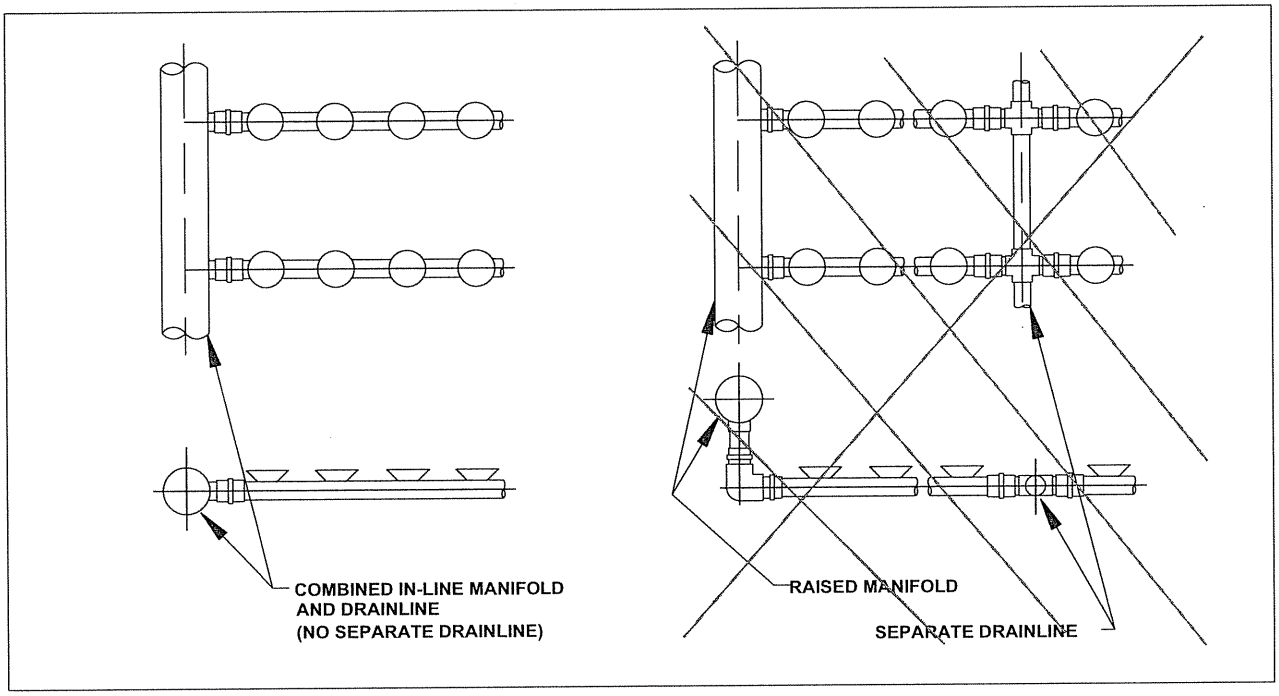


Figure 15

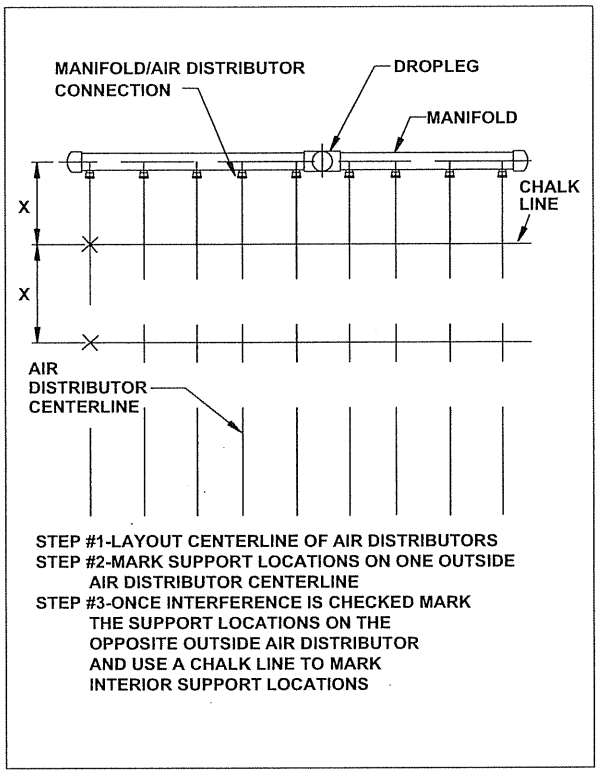


Figure 16

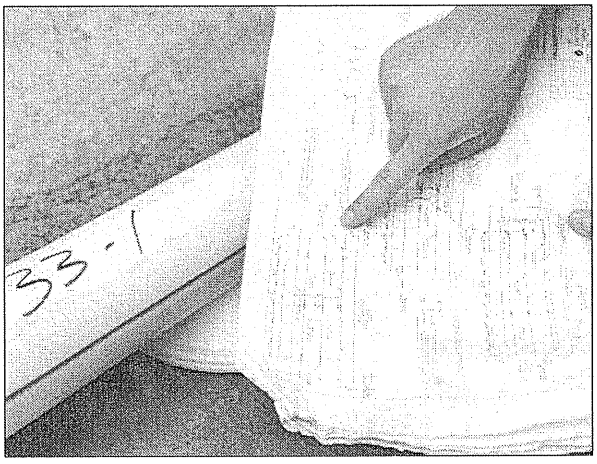


Figure 17

Assemble the fixed joint (ref. Figures 18 and 19) with a gray "O"-ring. This "O"-ring can be lubricated with a common dish soap solution for ease of installation. Place the "O"-ring on the spigot end of the fixed joint (see Figure 19). Bring together the two sections of the pipe/joint and thread the retaining ring onto the socket end of the fixed joint to a hand tight position.

NOTE

The fixed joint is a spline joint. The spline design is used to prevent air distributor section rotation. To adjust the joint after the initial installation, the joint will have to be loosened and backed off until the splines are disengaged.

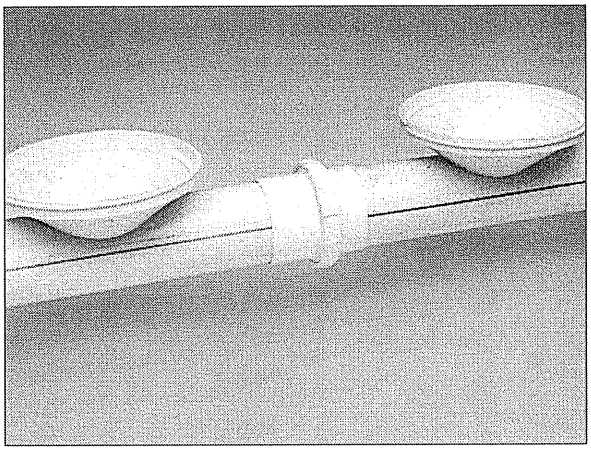


Figure 18

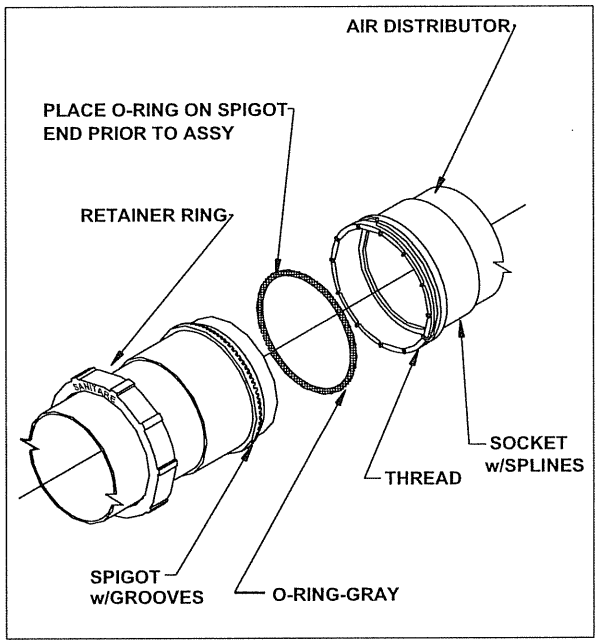


Figure 19

Assemble the expansion joint (ref. Figures 20 and 21) with a black "O"-ring. This "O"-ring must be lubricated with a small amount of the silicone lubricant provided by Sanitaire prior to installation. Place a mark 2-3/8" (60 mm) from the end of the plain end distributor section. Place the "O"-ring over the mark and insert the plain end into the expansion joint barrel until the "O"-ring seats, then tighten the retaining ring to a hand-tight position.

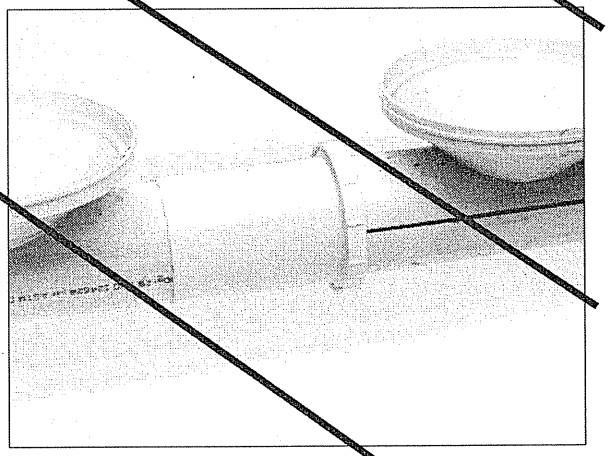


Figure 20

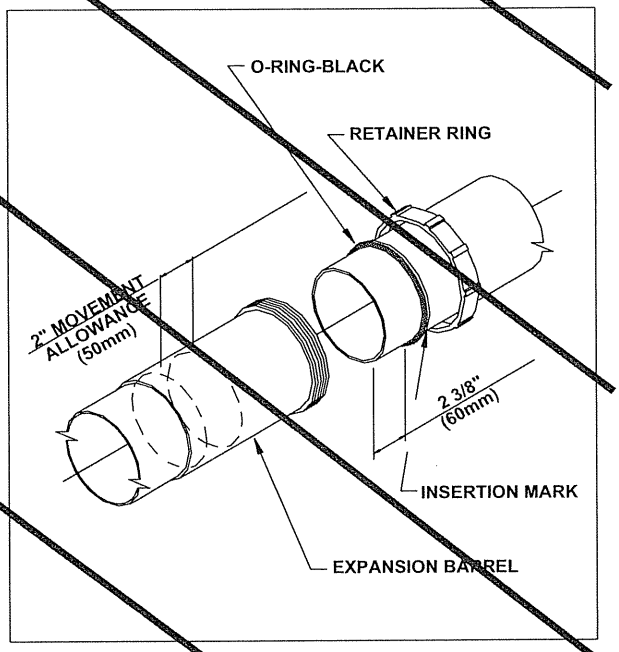


Figure 21

4. Once the first air distributor section is assembled, lay it next to the anchor bolt layout previously done and check for interference between the diffuser holders, joints and supports (see Figure 22). Support locations can be adjusted as required as long as the maximum support spacing is held to 7'-6" (2286 mm).

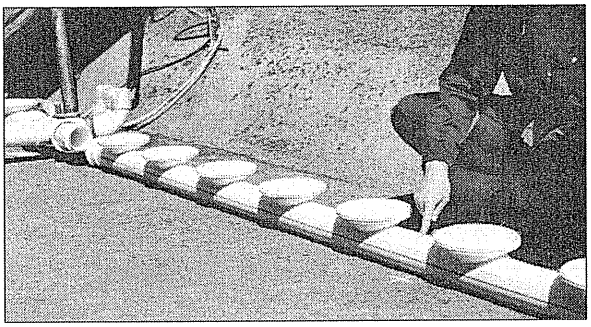


Figure 22

5. Layout the locations of all air distributor support stands. See Figure 16, Step 3.

6. Install the anchors and support base in accordance to the erection drawings and anchor manufacturer's installation instructions.

Sanitaire manufactures the following different types of air distributor supports.

Rod Type Guide Support — (see Figure 23). This is the most commonly used support. It has 5/16" Ø or 1/2" Ø rods, has a 5-3/4" (146 mm) center to center rod distance and uses light weight, oversized non-gripping pipe clamp.

The 5/16" Ø rods supports are used where the air distributor centerline does not exceed 12" (305 mm) from the floor and in areas where there are no external forces applied to the pipe sections by devices such as mixers.

The 1/2" Ø rod supports are used where the air distributor centerline exceeds 12" from the floor. This support is also used in areas where mixers may be operating.

Additional support struts maybe used on the 1/2" Ø rod supports depending on the air distributor elevation. If used, the proper location will be shown on the erection drawings.

All 4" Ø (100 mm) manifolds will use 1/2" Ø supports regardless of location.

Anchor Supports — (see Figures 24, 26A and 26B.) Anchor supports are used after expansion joints. The anchor support has 1/2" Ø rods and a 5-1/4" (133 mm) center to center rod distance. The clamps are heavy gauge stainless and will clamp down tight on the pipe. Modifications to the anchor support will be used if the air distributor centerline exceeds 5" (127 mm) from the floor and may be the pedestal type as shown in Figure 26A or have stiffening struts applied as shown in Figure 26B.

A-Frame Supports — (see Figures 27A and 27B.) A-frame supports are a formed stainless structure that could be a fixed support as shown in Figure 27A or a guide type non-gripping support as shown in Figure 27B.

The A-frame can be used in areas of high turbulence, extreme floor slope or on end looped drainlines.

General Notes on Air Distributor Support Installation

A) Use the correct support at the proper location. See erection drawings.

B) Sloped floors may require the use of several different support types and support rod diameters. See erection drawings.

C) The rod type support base locating plate must be installed as shown per Figure 25. Tighten the hex nut to the recommended torque value as listed by the anchor bolt manufacturer in their installation instructions.

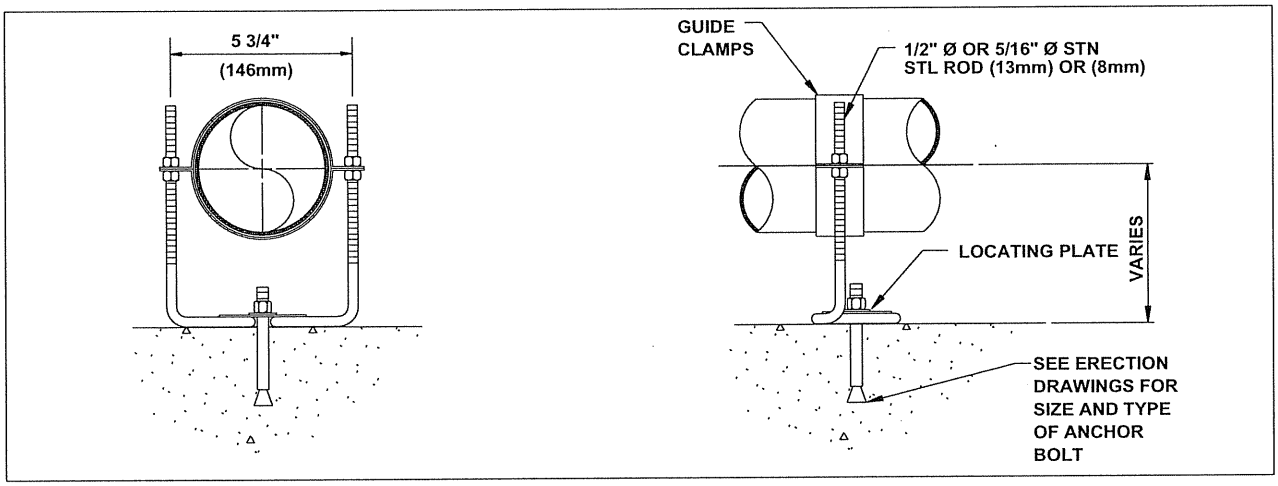


Figure 23

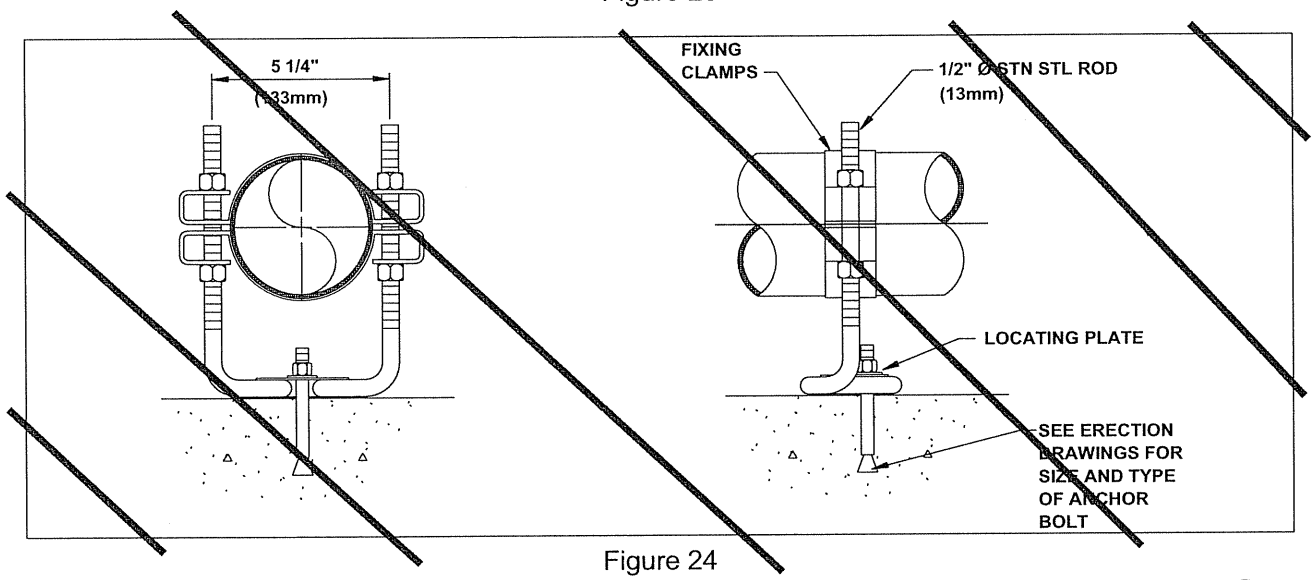


Figure 24

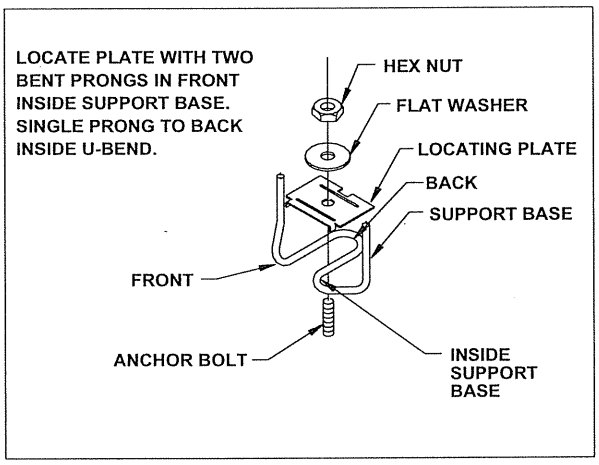


Figure 25

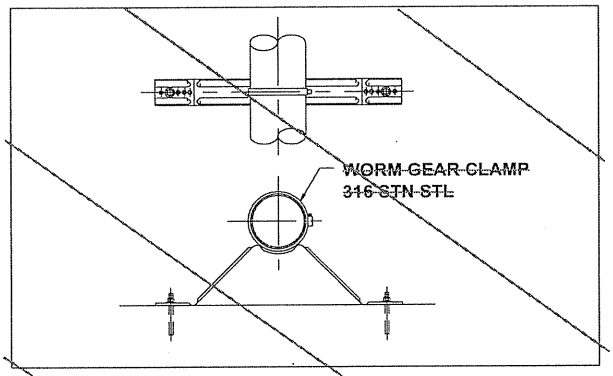


Figure 27A

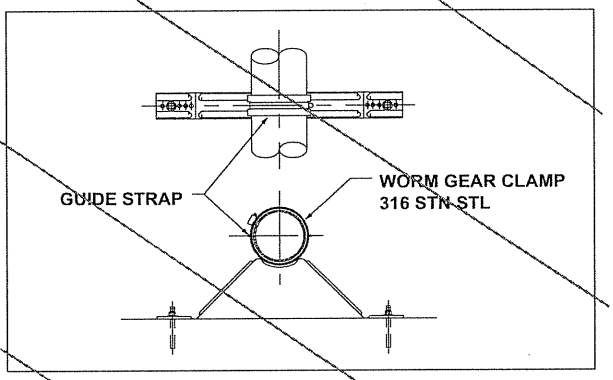


Figure 27B

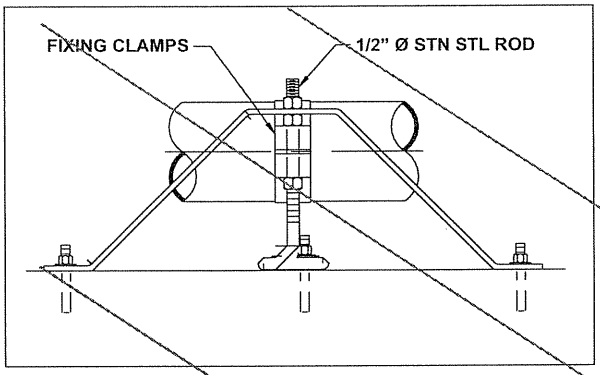


Figure 26B

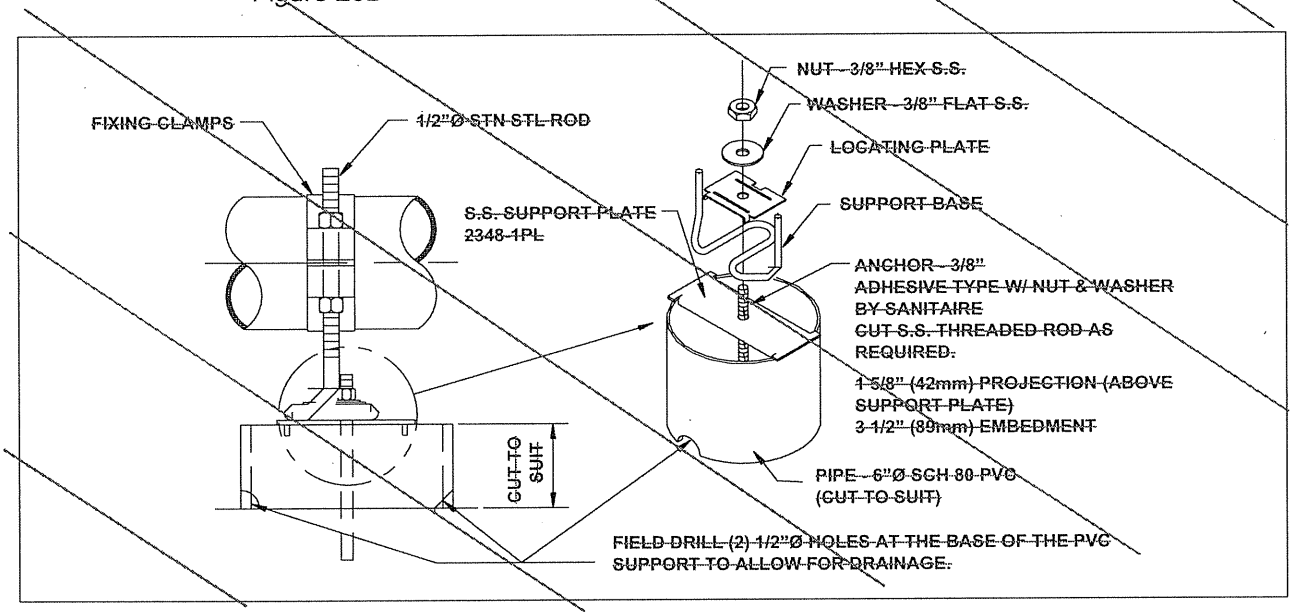


Figure 26A

7. Install the lower pipe clamp sections on all air distributor and drainline supports.

   Use the same technique as described in paragraph 6 of the dropleg and manifold installation section. The air distributor centerline elevation is shown in the erection drawings.

   The air distributor centerline elevation tolerance is ± 1/4" (6 mm).

8. Starting from the manifold, assemble the remaining air distributors in the support stands. Refer to step #3 of the air distributor and drainline installation section for joint assembly instructions.

9. Install the top half of the pipe clamp on each support and loosely install the top hex nuts.

10. Again, starting near the manifold, place a hand level on the top of diffuser holder perpendicular to the centerline of the distributor pipe. See Figure 28.

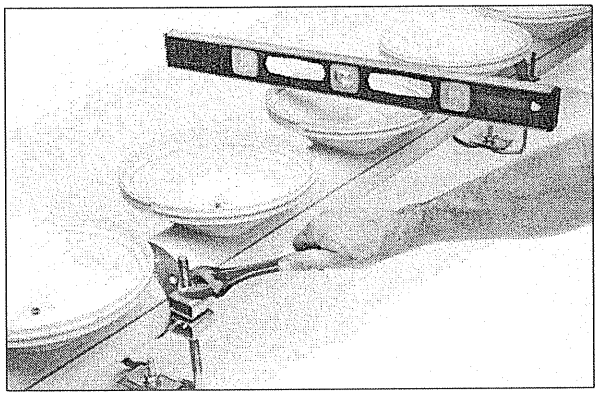


Figure 28

11. Rotate the distributor section until the pod is level.

12. Hold the pipe section level and tighten all fixed joints and/or anchor support clamps on sections which have an expansion joint.

13. After tightening, recheck for level both perpendicular and parallel to the distributor section.

14. Continue this procedure for all distributor and drainline sections.

15. Tighten all guide support nuts.

CAUTION

The guide support will be loose around the pipe – this is a design feature. Do not attempt to wrap anything around the pipe to pull the clamps tight against the pipe. See Figure 29.

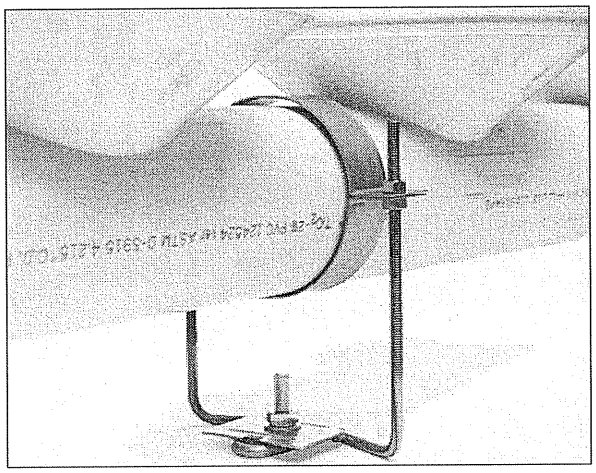


Figure 29

PURGE SYSTEM INSTALLATION

Sanitaire provides ~~two types of~~ purge system.

The ~~most commonly used~~ purge system consists of a sump and evacuation pipe.

- The sump for systems using in-line manifolds is built into the manifold pipe as shown in Figure 30A.

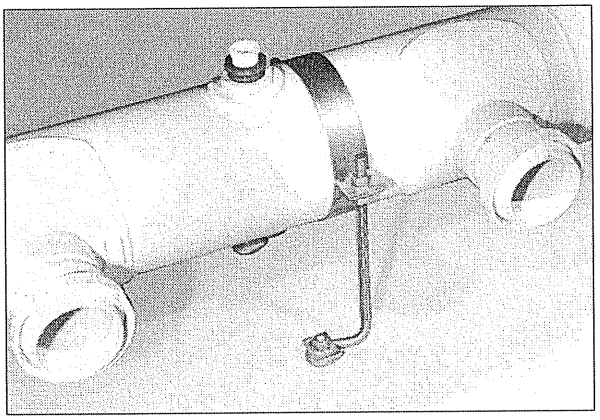


Figure 30A

- ~~The sumps for systems using the raised manifold is attached to an air distributor or drainline section as shown in Figure 30B.~~

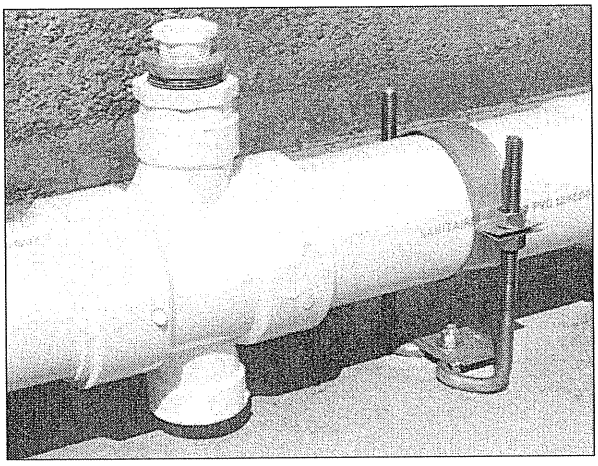


Figure 30B

- The evacuation pipe consists of 3/4" Ø (20 mm) Schedule 80 PVC pipe, fittings, and a valve mounted to the tank wall. See erection drawings for installation details.

~~The second type of purge system is the continuous purge system as shown in Figure 31. The manifold or an air distributor section is tapped at a low point and a membrane tube is attached. The membrane tube is placed at an elevation lower than the manifold or air distributor section.~~

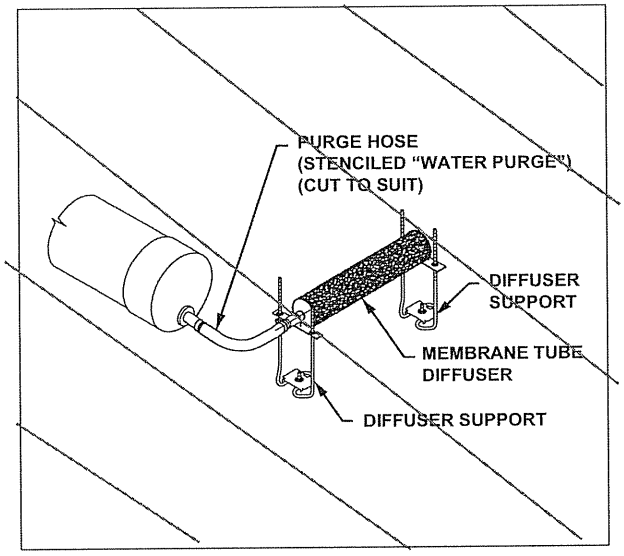


Figure 31

DIFFUSER INSTALLATION

Sanitaire manufacturers ~~two (2) types of~~ fine bubble disc diffusers. These are the ~~Ceramic Disc or the~~ Rubber Membrane Disc.

Some general installation guidelines, are as follows:

1. Install the diffusers just prior to the scheduled start-up of the aeration basin.

2. The diffuser holder must be cleaned prior to diffuser installation. See Figure 32.

3. Check the erection drawings for the location of possible blank diffuser sites and plug the orifice hole in accordance with Figure 37 and the installation instructions found on page 15.

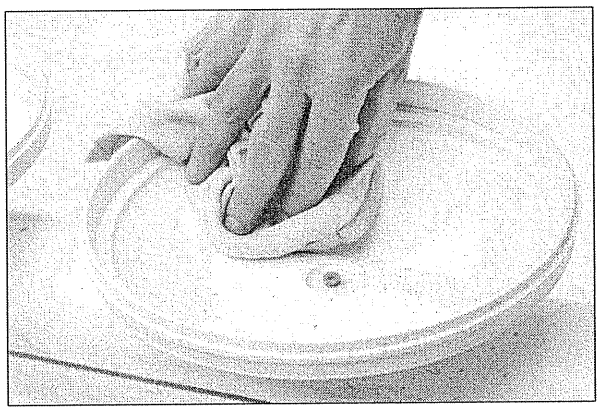


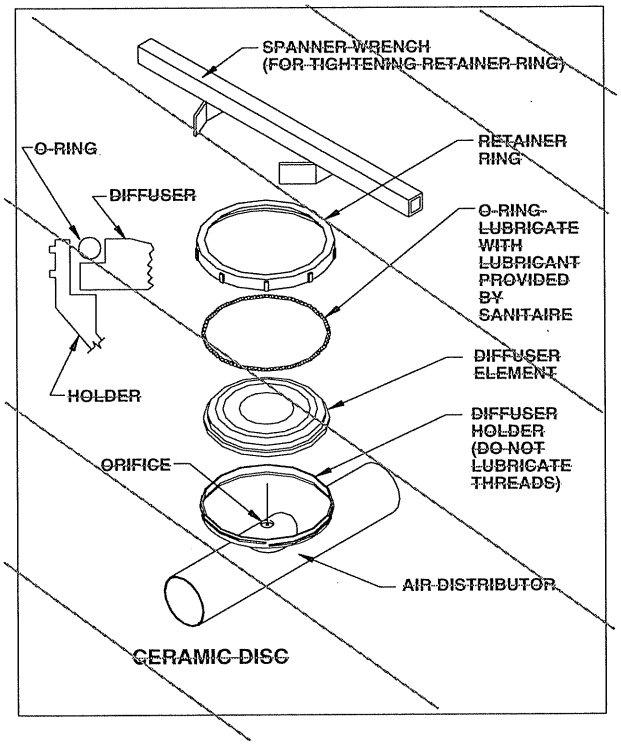
Figure 32

~~To Install CERAMIC DISC diffusers:~~

1. ~~Set the diffuser disc in the holder with the dished side and peripheral stepped edge up.~~

2. ~~Lubricate the diffuser "O" ring with a small amount of the lubricant provided by Sanitaire.~~

3. ~~Place the diffuser "O" ring in the slot or void between the diffuser holder vertical wall and the raised portion of the diffuser disc. See Figure 33.~~



~~Figure 33~~

4. ~~Turn the retaining ring to a hand tight position making sure the "O" ring stays in place.~~

5. ~~Using the retaining ring spanner wrench, turn the retaining ring an additional 1/4 turn. See Figure 34.~~

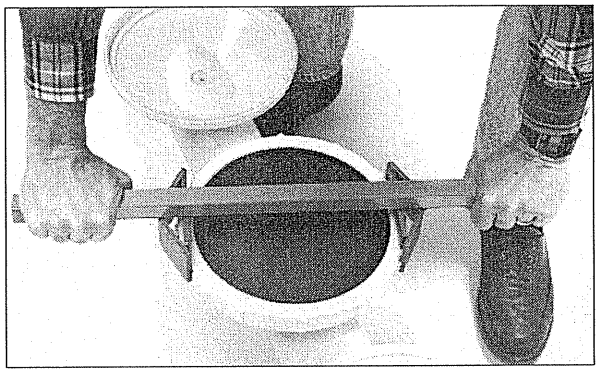


Figure 34

To Install MEMBRANE DISC diffusers:

1. Set the diffuser PVC subplate in the diffuser holder with the flat side up. See Figure 35.

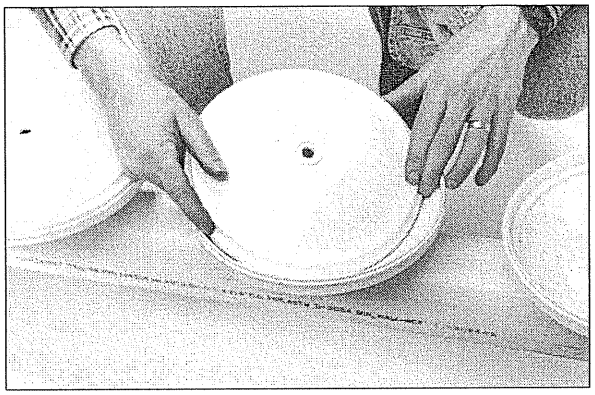


Figure 35

2. Place the membrane disc over the subplate. The integral "O"-ring should naturally fit down into the void created between the diffuser holder vertical wall and subplate.

3. Lubricate the diffuser retaining ring with a small amount of lubricant provided by Sanitaire by turning the ring upside down and swabbing the lubricant on the underside of the top surface of the retaining ring. See Figure 36.

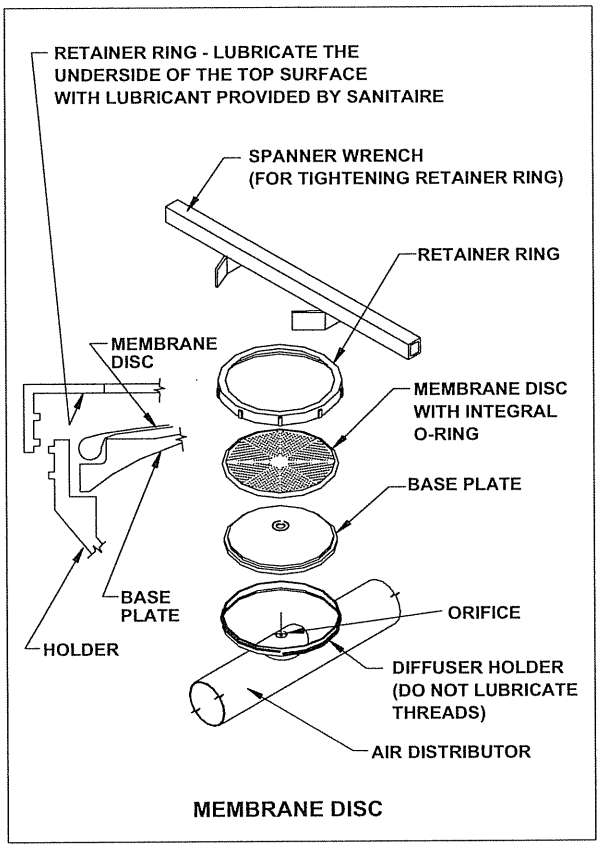


Figure 36

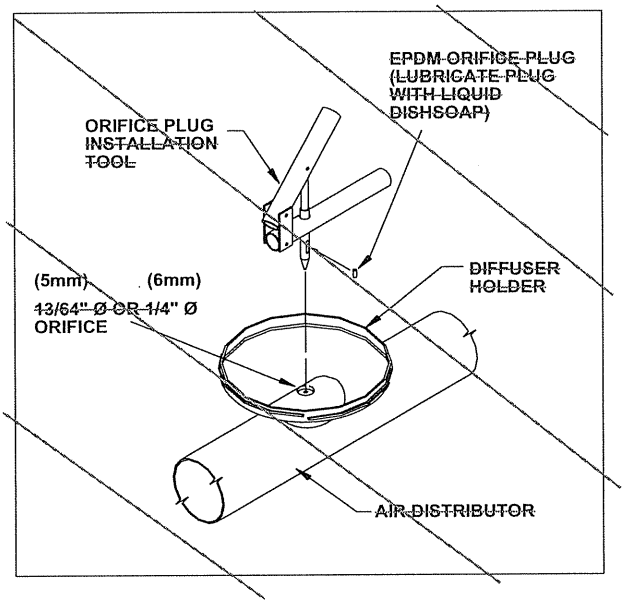
4. Turn the retaining ring to a hand-tight position.

5. Using the retaining ring spanner wrench, turn the retaining ring an additional 1/4 turn. See Figure 34.

~~BLANK DIFFUSER SITE ORIFICE PLUG INSTALLATION~~

~~Some projects will call for some of the diffusers to be initially not put into operation or left "BLANK". These diffusers may be put into operation as process demand dictates.~~

~~Locate "BLANK" diffuser sites and plug the orifice as shown in Figure 37 and described on the erection drawings.~~



~~Figure 37~~

AERATION SYSTEM START-UP PROCEDURE

Once the aeration system is installed, perform a final tank inspection and look for loose nuts, missing or improperly placed hardware, missing retaining rings, non-connected joints, etc.; and make any repairs prior to following this start-up procedure.

NOTE

The start-up procedure should be completed prior to the site visit by Sanitaire service personnel or an authorized representative. This practice will save time for all parties involved.

The start-up procedure is as follows:

1. Fill the aeration tank with clean water to a level 1" (25 mm) below the top of the diffusers. While filling, proceed with steps 2-5. Step 6 will require a visual level inspection with the water level 1" (25 mm) below the top of the diffuser.

CAUTION

Water should be introduced to the basin at a rate and direction so that no abnormal stresses are imposed on the aeration pipe network that could cause damage.

2. While filling, disconnect each of the purge hoses from the sumps (not required on continuous purge systems).

3. When the water level reaches a point just over the top of the air distributor pipe, turn the air on at a low air flow rate of approximately 0.5 scfm/diffuser (0.85 m^3/hr/diffuser).

4. Check all submerged fixed, flanged, or expansion joints for air bubbles, which indicate leaks, and repair as required.

NOTE

Leaking at fixed ~~and expansion~~ joints is generally due to one of three conditions:

- *"O"-ring pinched or out of place (most common).*
- *Joint retaining ring cross threaded on spigot.*
- *Joint not tight.*

⚠ CAUTION

When repairing pipe joints, turn off the air supply to the grid being worked on.

5. With the air ON, check each purge sump operation. Any water trapped in the pipe should be discharging from the sump assembly.

   If neither air or water is being discharged, check the sump eductor tube air orifice hole (see Figure 38). This hole may be plugged with debris or possibly glued over during manufacturing. Redrill or clean out as required and reassemble.

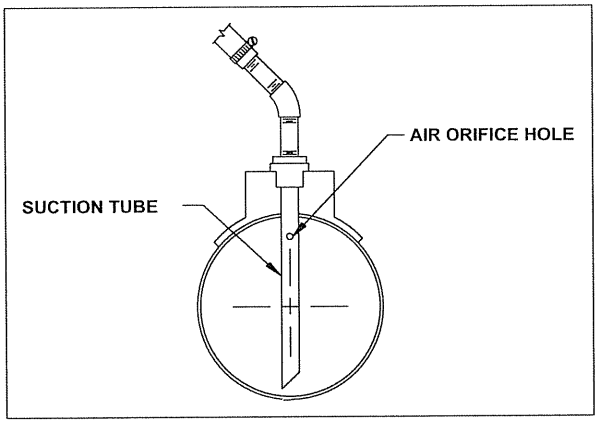


Figure 38

6. Turn the water supply OFF as it approaches a level 1" (25 mm) below the top of the diffusers. With the water OFF check the level of the aeration system. The distance from the top of the perimeter of the diffuser measured to the static water level should be relatively constant ± 1/4" (6 mm) for all diffuser heads. Raise, lower, or rotate the air distributor sections as required in order to level the aeration system.

7. Increase the air rate to about 1-1.5 scfm/diffuser (1.7 - 2.6 m^3/hr/diffuser) and turn the water supply back on.

8. Fill the basin to a maximum water level of 2" - 3" (50-75 mm) over the diffusers.

9. Check all diffuser units for uniform air distribution. Air should be discharging uniformly across the diffuser surface. See Figure 39.

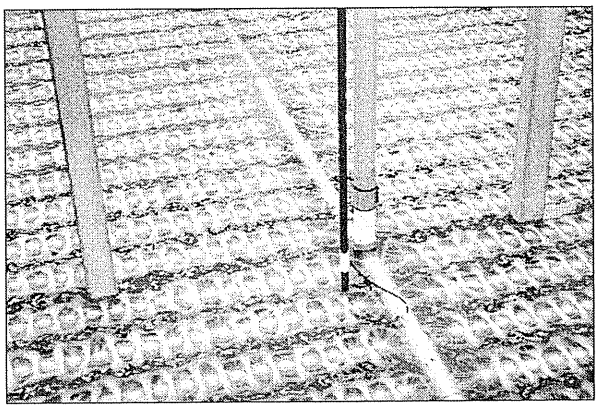


Figure 39

Excessive air discharge as indicated by large coarse bubbles around the perimeter or "halo" of the diffuser indicates a loose retaining ring or improperly seated "O"-ring (see Figure 40). To correct this situation use the retaining ring spanner wrench to back off the retaining ring. Then reseat the "O"-ring and retighten to a hand-tight plus 1/4 turn position.

If no air is discharging from the diffuser surface, the air control orifice may be plugged with debris. To correct this situation, remove the diffuser assembly, clear the orifice (a welding rod or nail works well), and reinstall the diffuser.

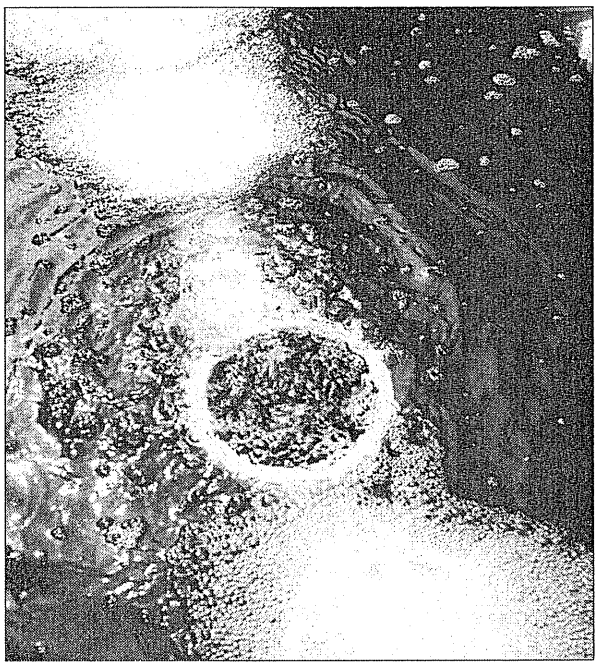


Figure 40

10. Once the system is leak free and is purged of all entrapped water, reattach the purge hoses to the purge sumps.

11. Use a soap solution to check for leaks at the clamp coupling or flange joint which joins the PVC and stainless steel portions of the drop-leg.

12. Continue filling the basin to a point 3'-4' (1 m) over the diffusers.

~~NOTE~~

~~*If your system has a raised manifold (ref. Figure 4), check for manifold flanged or fixed joint connection leaks as the water level rises and repair as required.*~~

13. Allow the system to operate 3-4 hours in this mode prior to introducing the mixed liquor.

PLANT OPERATION

PRINCIPLES

The removal of carbonaceous BOD, the coagulation of non-settable colloidal solids, and the stabilization of organic matter are accomplished biologically using a variety of microorganisms (principally bacteria) in the activated sludge process. The microorganisms convert the colloidal and dissolved carbonaceous organic matter into various gases and cell tissue through synthesis.

Aerobic systems require the presence of molecular oxygen to maximize the conversion of the organic matter through a complex series of Biochemical Oxidation and Reduction Reactions.

Oxygen needed by the microorganisms is transferred to the mixed liquor by aeration. The fine bubble aeration system takes compressed atmospheric air and passes it through the diffuser element forming millions of fine bubbles that pass through the mixed liquor. Diffusion makes the oxygen in the compressed air accessible to the microorganisms.

Typically, fine bubble aeration systems are twice as efficient as coarse bubble systems. This translates to a 50% reduction in the required air volume to treat the same waste. Fine bubble systems are more efficient due to the increase in contact surface area between the air bubble and wastewater which makes the diffusion of the oxygen quicker/unit volume.

The drawback to the increased efficiency is that overtime fine bubble aeration systems may foul and require cleaning.

DIFFUSER OPERATING AIR FLOW RANGE

~~**For CERAMIC DISC (air flow per diffuser):**~~

~~SIZE~~	~~MIN~~	~~MAX~~
~~9" (230 mm)~~	~~0.5 scfm. (0.85 m^3/hr)~~	~~3.0 scfm (5.0 m^3/hr)~~
~~7" (178 mm)~~	~~0.35 scfm (0.6 m^3/hr)~~	~~2.0 scfm (3.5 m^3/hr)~~

~~**NOTE**~~

~~*Above listed air flow rates are general design standards. Actual project design may vary.*~~

~~**Ceramic disc operating requirements:**~~

~~1. Do not operate below the minimum air flow requirements. Solids settling will occur which results in a loss in oxygen transfer efficiency and possible diffuser fouling.~~

~~2. Non-operating ceramic discs allow mixed liquor to enter the pipe network. Do not intentionally shut off the air flow to the ceramic discs in a submerged state.~~

For MEMBRANE DISC (air flow per diffuser):

SIZE	MIN	MAX
9" (230 mm)	0.5 scfm (0.85 m^3/hr)	Short term: 7 scfm (11.9 m^3/hr) Long term: 4 scfm (6.8 m^3/hr)
~~7" (178 mm)~~	~~0.35 scfm (0.6 m^3/hr)~~	~~Short term: 4.8 scfm (8.1 m^3/hr) Long term: 3.0 scfm (5.0 m^3/hr)~~

NOTE

Above listed air flow rates are general design standards. Actual project design may vary.

Membrane disc operating requirements:

1. When operating, do not reduce the air flow rate below the recommended minimums. Solids settling will occur which results in a loss of oxygen transfer efficiency and possible diffuser fouling.

2. Membrane disc systems are designed for continuous or intermittent submerged process use. Idle systems should be supplied with an alternate source of mixing.

NOTE

Solids will settle on the diffuser surface of idle systems and may promote diffuser fouling. The results of intermittent use are as follows:

- *A higher airflow and pressure may be required to lift the membrane disc off the subplate and start the grid.*
- *The diffuser may have to be cleaned if a sufficient loss in Oxygen Transfer efficiency is observed.*

General notes regarding air flow range

- The most common design average air flow range is 1 to 2 scfm/Diffuser (1.7 to 3.5 m^3/hr/Diffuser).
- Operating above this range results in a lower oxygen transfer efficiency and increased diffuser headloss.
- It may be necessary to operate at a higher airflow rate in order to meet the oxygen demand.
- Operating below this range will yield a slightly higher oxygen transfer efficiency, however, mixing requirements must be considered.

MIXING, D.O. LEVELS AND MINIMUM DIFFUSER AIR FLOW RATES

The generally accepted activated sludge plant mixing air rate standard is 0.12 scfm/$Ft.^2$ (2.2 m^3/hr/m^2) of tank surface area.

Often times conservative design will specify more diffusers with a higher minimum air flow requirement than is required by the process demand or mixing in a specific area. This is most common at the end of long plug flow reactors. The result of this is a high area D.O. level.

If the operator feels this D.O. level is not needed, the simplest solution is to take some of the diffuser units out of service by plugging the orifice as shown in the installation instructions. See Figure 37.

NOTE

Minimum mixing requirements must still be adhered to.

DIFFUSER FOULING

Operating experience shows that all fine bubble disc diffusers may foul or become clogged with continuous operation.

The rate of fouling, type of foulant, and strength of foulant depends primarily on the constituents in the wastewater.

The results of diffuser fouling include:

- loss of oxygen transfer efficiency due to bubble coalescence and coarse bubbling
- increased pressure requirements
- increased air demand.
- increased operating costs.

Diffuser fouling is divided into two categories: water side and air side. Air side fouling is very rare but does warrant some consideration. Water or mixed liquor side fouling is most common.

Causes of diffuser fouling include:

on WATER side:

- Fibrous material adhering to the edges of the diffuser units.
- Oils and greases in the wastewater.
- Precipitated deposits of iron and carbonates.
- Biological growths of slime.

on AIR side:

- Dust and dirt from unfiltered or inadequately filtered air.
- Rust and scale from air main corrosion.
- Oxidation and subsequent flaking of bituminous air main coatings.
- Construction debris
- Mixed liquor solids entering through system leaks or cracks.

Several ways of determining if the diffusers are fouled are discussed in the preventative maintenance section of this manual.

The corrective action for fouled diffusers is cleaning. This is discussed in the yearly maintenance and diffuser cleaning section of this manual.

PREVENTATIVE MAINTENANCE

MOISTURE PURGE

Moisture enters the pipe system in three ways:

- Condensate build-up inside the pipe system due to high blower discharge temperatures and moist or humid air (primary cause).
- Minor leaks in the pipe system.
- ~~Back-flow through ceramic diffusers caused by a loss of air.~~

NOTE

Membrane diffusers are designed to seal on the subplate and prevent moisture from entering the system.

The effects of entrapped moisture are:

- Increased air velocity and headloss.
- Poor air distribution.

Sanitaire manufactures ~~two types of~~ purge systems: a standard, manually operated system ~~(most common) and a continuous purge system.~~

The ~~standard~~ system uses a sump with an eductor line that extends from the grid to above the water surface and ends with a manual ball valve. To operate this system simply open the ball valve and the trapped liquid will be purged from the system. Close the valve when the water flow stops and a mist appears.

NOTE

For maximum purge results, lower the air flow to the grid. The air velocity will be reduced and more of the liquid will be forced to the sump.

The purge frequency is site determined; however, once a week is a good rule of thumb.

~~The second type of purge system is the continuous purge system which employs a diffuser unit attached to the bottom of the manifold or drain line. The entrapped moisture is continuously purged from the system.~~

~~The continuous purge systems are used on grids where it is not possible to reach a purge valve safely from a walkway.~~

AIR BUMPING

Air bumping is a technique that can be employed by operators to temporarily reduce back pressure in the system. Air bumping is the act of increasing the air flow rate per diffuser for 20-30 minutes once per week. An air rate per diffuser of 3 Scfm (5 m^3/hr) is generally used.

This practice will aid in sloughing off settled debris and may extend the period between diffuser cleanings.

POWER FAILURES AND LOSS OF AIR SUPPLY

The results of a power failure (loss of air supply) on each diffuser type are as follows:

~~**for CERAMIC DISC diffusers:**~~

- ~~Solids settle on diffuser surface.~~
- ~~Filtered mixed liquor penetrates the diffuser and enters the pipe network.~~
- ~~Short term affect: none.~~
- ~~Long term affect: fouling may occur on the surface and within the diffuser disc.~~

~~When the air supply is restored, the air pressure will build and the flow will reduce until sufficient water is pushed out of the system to allow air to be released through the diffusers.~~

~~NOTE~~

~~*It is suggested that the operator open the purge valves as soon as possible after a power outage and evacuate the system. If the liquid is left in the system the flow will be reduced and the operating pressure will be higher than normal.*~~

for MEMBRANE DISC diffusers:

- Solids settle on diffuser surface.
- Short term affect: none.
- Long term affect: the potential of surface fouling is possible and the diffusers may require a cleaning. This is generally the case for long term intermittently used membrane disc systems (i.e., Anoxic Zones, Batch Reactors).
- May require operator to shut off adjacent grids or turn on additional blowers to increase the air flow rate and force the membrane off the subplate surface. This is again generally the case for long term intermittently used membrane disc aeration systems.

VISUAL INSPECTION

Visually inspect the aeration basin surface pattern. The flow should be, for the most part, a nice quiescent pattern. Some coarse bubbling at the basin inlet may occur due to surfactants in the wastewater and is generally dispersed shortly downstream.

Excessive coarse bubbling throughout the tank indicates the diffusers may be fouling.

Large boiling in an isolated area indicates a failure in the submerged pipe system.

Visual inspection is an ongoing preventative maintenance step and can be done while taking routine samples, dissolved oxygen readings, etc.

AIR MAIN INSPECTION

Air main leaks are easily identified and usually are caused by loose joints or degraded gaskets. These types of leaks should be repaired quickly in order to prevent loss of system efficiency.

OPERATING PRESSURE AND AIRFLOW

Most blower systems are equipped with discharge pressure gauges. The operator should keep a regular log of pressure readings. A continuous increase in operating pressure indicates diffuser fouling. Likewise, a continuous increase in air demand without a change in the aeration basin loading indicates diffuser fouling.

Fine Bubble Grid Aeration System
TROUBLESHOOTING GUIDE

Problem	Cause	Action
VISUAL INSPECTION		
Poor air distribution	Diffusers not level	Level system
	Grid flooded	Operate grid purge system
	Plugged orifice	Clean orifice
	Insufficient air	Provide more air
	Solids settling	Provide more air to grid
Visible mounding of air in one location	Broken pipe	Repair (see repair procedures)
Coarse bubbling (large bubbles)	Diffuser fouling	Clean diffusers (see cleaning procedure)
Air discharge from air main	Loose joints, degraded gaskets, or degraded air main	Repair as required
OPERATIONAL PROBLEMS		
Low D.O. Concentration	Too little air	Increase air flow
High D.O. Concentration	Too much air	Decrease air flow
		Decrease quantity of diffusers in service
Increased operating pressure	Diffuser fouling	Clean diffusers (see cleaning procedure)
	Line blockage or valve closed	Check air lines and valves
Increased air requirement/ no load change	Diffuser fouling	Clean diffusers (see cleaning procedure)
	Leak in air system	Inspect and repair as required

WARNING:

Prior to draining a tank, please READ these instructions carefully to minimize the potential for heat related damage to the Aeration System.

BASIN DRAINING PROCEDURE

Before draining a basin for diffuser inspection, tank cleaning or other maintenance operations, do the following:

- Place the basin in a manual mode to override any automatic D.O./blower control systems.
- Adjust the grid(s) air control valve(s) to deliver an air flow rate equivalent to 0.5 scfm per diffuser or to a 25% open position if air flow metering is not available.
- AERATION TANK - Stop RAS flow to the basin.
- AEROBIC DIGESTER - Stop WAS flow to the basin.
- Turn off the air completely to the basin when the liquid level reaches 1 to 2 Ft. above the diffusers.
- When cleaning diffusers, the air can be turned on for short periods of time for the grid being cleaned.

NOTE: As the basin is draining, monitor the amount of air flowing to the submerged grid(s). **THE AIR FLOW SHOULD BE KEPT TO A MINIMUM. THIS WILL PREVENT EXCESS HEAT BUILD-UP FROM DAMAGING THE PVC OR CPVC PIPING SYSTEM WHILE KEEPING THE SOLIDS IN SUSPENSION.**

Refer to pages 27 and 28 for Diffuser Cleaning Procedure.

YEARLY MAINTENANCE AND DIFFUSER CLEANING

MAINTENANCE SCHEDULE

Sanitaire recommends the following maintenance schedule be observed at least once per year.

1. Drain down each tank.
2. Remove excess settled solids if any have accumulated.
3. Clean diffusers.
4. Inspect support hardware to ensure all components are intact and tight.
5. Inspect diffuser retaining rings to make sure all rings are in place and tight.
6. Inspect fixed and expansion joint retaining rings to make sure all rings are tight.

NOTE

For items 4-6, refer to the Installation Instructions.

LUBRICATION SCHEDULE

Since there are no moving parts on the SANITAIRE Fine Bubble Aeration Systems, a formal lubrication schedule is not required.

Three components require lubrication at the time of initial installation and future repairs. These components are:

- ~~Ceramic Disc Diffuser "O" Ring~~
- Membrane Disc Diffuser Retaining Ring
- ~~Expansion Barrel, 4" Ø black "O" Ring~~

Lubricate these items with the lubricants provided by Sanitaire and in accordance with the Installation Instructions.

~~CERAMIC DISC DIFFUSER CLEANING METHOD~~

~~1. Drain aeration basin (the air should remain on as basin is drained).~~

~~2. With the air left on—at approximately 1 scfm (1.7 m³/hr) per diffuser—hose off each disc for twenty seconds with clean water at a nozzle pressure of 60 psig. Turn off the air supply when completed.~~

~~3. Put on the following safety equipment: eye goggles, rubber gloves, boots, sleeves, and apron. A breathing apparatus should be available in the event it is needed.~~

⚠ CAUTION

~~Acid can be harmful if misused. Follow all manufacturers precautions and directions. Wear appropriate safety equipment. Do not breath acid vapors. Do not allow acid to make contact with eyes, skin or hair.~~

~~4. Carefully prepare a 50% by volume solution of 18° baume muriatic acid. Always add the acid to water.~~

~~5. Using an acid resistant compression sprayer, apply a uniform covering of the acid solution to all diffuser elements.~~

~~NOTE~~

~~Do not spray the acid solution on the stainless steel supports and hardware.~~

~~6. Allow the acid solution to sit on the diffusers for 30 minutes.~~

~~7. Turn the air back on at a rate of 1 scfm (1.7 m³/hr) per diffuser and repeat the hosing procedure for 10 seconds per diffuser.~~

~~8. Inspect the aeration system to determine if any hardware was loosened or broken during the cleaning.~~

9. ~~Review and follow the start-up procedure as found in the Installation and Start-up Section of this manual.~~

MEMBRANE DISC DIFFUSER CLEANING METHOD

1. Drain aeration basin (the air should remain on as basin is drained).

2. With the air left on at approximately 1 scfm (1.7 m^3/hr) per diffuser, hose off each disc for twenty seconds with a clean water source at a nozzle pressure of 60 psig.

3. Turn off the air flow to the aeration grid being cleaned.

4. If required, use a rag or soft bristle brush to scrub each diffuser to remove stubborn slime growth, chemical precipitates, or oils. Do not use acids or aggressive cleaners.

5. Turn the air back on at a rate of 1 scfm (1.7 m^3/hr) per diffuser and repeat the hosing procedure for 10 seconds per diffuser.

6. Visually inspect the aeration system to determine if any hardware was loosened or broken during cleaning.

7. Review and follow the start-up procedure as found in the Installation and Start-up Section of this manual.

LONG TERM STORAGE PROCEDURES

The following storage procedures are applicable to both fine bubble ceramic and membrane disc aeration systems.

The four options below were developed to protect the PVC pipe and diffusers from environmental damage, and are listed in order of preference.

NOTE

Prior to reading and determining a suitable long term storage method, it should be understood that Sanitaire assumes no responsibility for damage and cleaning requirements as a result of long term storage.

OPTION #1

For use when the aeration system is not in use and air is available.

For warm climate storage:

1. Fill the tank with clean water to a level three feet above the PVC portion of the dropleg. This will give the pipe and diffusers protection from UV light and heat build-up.
2. Run a small amount of air through the system to keep the pipes empty and retard the growth of algae on the diffusers.
3. Chlorinate initially and periodically as algae appears in the water.
4. Prior to bringing the system on line, drain and check all hardware. Check the diffusers and clean if fouling is evident.

For cold climate storage:

1. Follow warm climate procedures above after performing the following:
2. Prior to filling with water, install styrofoam blocks around the dropleg and carrier columns installed in the tank. These blocks will prevent crushing should ice build-up around the pipes.

NOTE

The operator may have to adjust the air flow rate to a higher level to prevent ice formation during severe cold temperatures.

OPTION #2

For use when the aeration system is not in use, air is not available, and diffusers are removed prior to storage.

For warm climate storage:

1. Remove all diffusers, "O"-rings, retaining rings, sub plates, etc.; clean as required, and store in a clean, dry environment.
2. Fill the tank with clean water to a level three feet above the PVC portion of the dropleg.
3. Chlorinate initially and periodically as algae appears in the water.
4. Prior to bringing the system on line, drain and check all hardware. Check all diffuser holders and spot check pipe internals for algae growth and fouling. Clean as required prior to installing the diffusers.

For cold climate storage:

1. Remove all diffusers, "O"-rings, retaining rings, sub plates, etc.; clean as required, and store in a clean, dry environment.
2. Install styrofoam blocks around the dropleg and carrier columns installed in the tank.

3. Fill the tank with clean water to a level three feet above the PVC portion of the dropleg.

CAUTION

*Water will freeze in the tank. **Do not** drain the water from below the ice layer. Falling ice will crush the PVC pipe system.*

4. Wait until ice is completely off the tank prior to bringing the system on line. Check all diffuser holders and spot check pipe internals for algae growth and fouling, and clean as required prior to installing the diffusers.

OPTION #3

For use when the aeration system is not in use, air is not available, and diffusers are not removed prior to storage.

The procedure here is identical to Option #2 except that the diffusers are **not removed**. This procedure applies to Idle Tanks Only. Intermittent use membrane disc systems in a flowing condition have been previously discussed in the Plant Operation and Preventative Maintenance sections of this manual.

NOTE

Be aware that the diffusers will most likely need to be cleaned prior to putting the system on line. In addition to spot checking the pipe internals, the underside of the diffuser should be spot checked to determine the extent of fouling, and if cleaning is required prior to use.

OPTION #4

For use when the aeration system is not in use, air is not available, diffusers are not removed, and flooding is undesirable.

1. Drain tanks dry.

2. Open fixed joints and loosen support band clamps as required in order to roll the air distributor sections over 180°.

NOTE

The fixed joints and floor drains should remain open to prevent water from standing in the pipe system and tank. Equipment flooded by overflows, misdirected sewage flows and excessive airborne dirt build-up will most likely require cleaning prior to being placed in service.

CAUTION

The pipe will be exposed to UV light degradation and heat build-up in the tank bottom which may cause warping and loss of some structural properties.

CAUTION

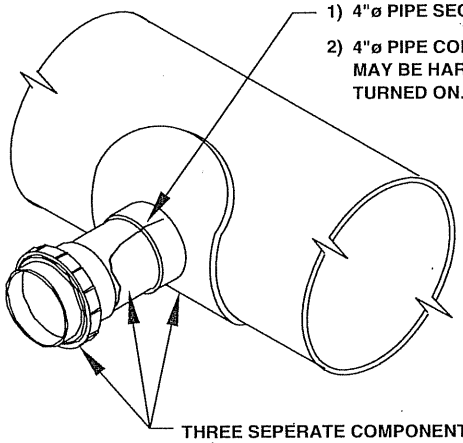
Standing water allowed to freeze around the pipe may break the pipe or may cause the diffusers (ceramic) to crack.

PIPE REPAIR PROCEDURES

PROBLEM

1) 4"ø PIPE SECTION BOKEN OFF.

2) 4"ø PIPE CONNECTION CRACKED, MAY BE HARD TO DETECT UNTIL AIR IS TURNED ON.

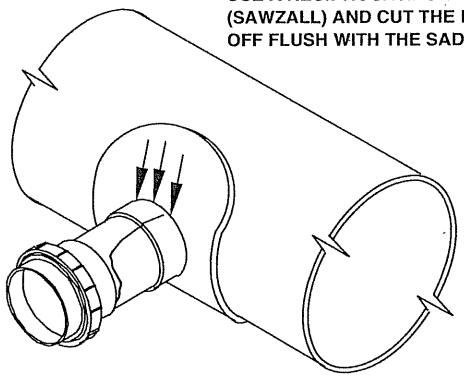


THREE SEPERATE COMPONENTS WITH SOLVENT CEMENTED JOINTS

REPAIR

STEP No. (1)

USE A RECIPROCATING TYPE SAW (SAWZALL) AND CUT THE PIPE SECTION OFF FLUSH WITH THE SADDLE AS SHOWN.



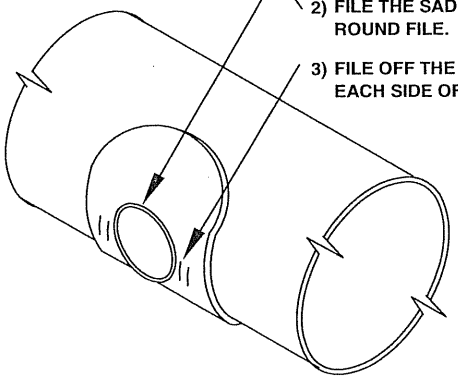
REPAIR

STEP No. (2)

1) CHAMFER THE INSIDE EDGE OF THE SADDLE OPENING TO REMOVE ANY SAW CUT PROJECTIONS.

2) FILE THE SADDLE OPENING, USE A HALF ROUND FILE.

3) FILE OFF THE SADDLE PROJECTION ON EACH SIDE OF THE OPENING.



REPAIR

STEP No. (3)

1) DETERMINE THE MANIFOLD PIPE (O.D.) AND QUANTITY OF BROKEN OR CRACKED AIR DISTRIBUTOR CONNECTIONS.

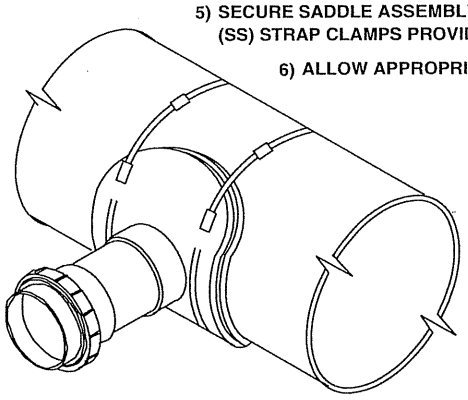
2) ORDER THE APPROPRIATE SADDLE REPAIR ASSEMBLY FROM THE SUPPLIER.

3) CLEAN AND PRIME SURFACES PRIOR TO CEMENTING.

4) SOLVENT CEMENT THE NEW SADDLE ASSEMBLY DIRECTLY OVER THE EXISTING SADDLE USING A HEAVY BODY SOLVENT CEMENT.

5) SECURE SADDLE ASSEMBLY TO MANIFOLD WITH (SS) STRAP CLAMPS PROVIDED WITH REPAIR KIT.

6) ALLOW APPROPRIATE CURE TIME.

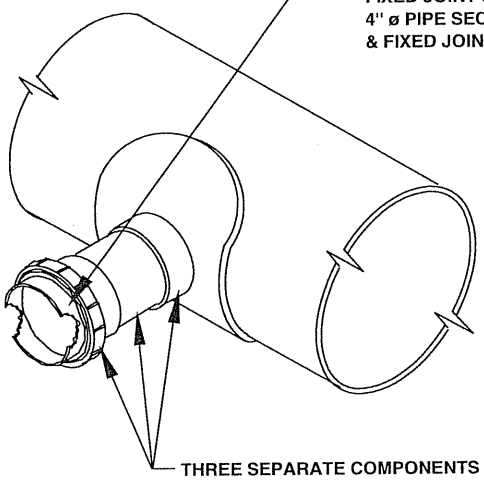


SAN A

MANIFOLD REPAIR – AIR DISTRIBUTOR CONNECTION SADDLE REPLACEMENT ON A 3-PIECE FABRICATED SADDLE ASSEMBLY

PROBLEM

1) SPIGOT & RETAINING RING END OF FIXED JOINT DAMAGED. 4" ø PIPE SECTION BETWEEN SADDLE & FIXED JOINT IS NOT DAMAGED.

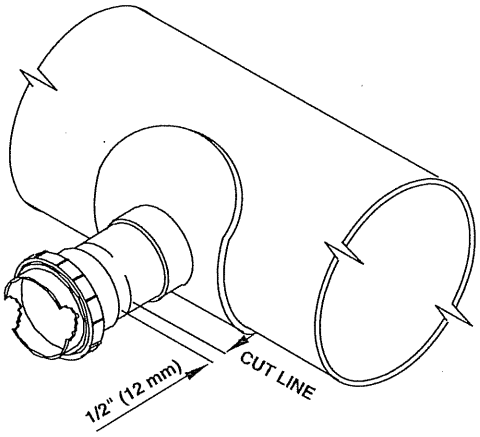


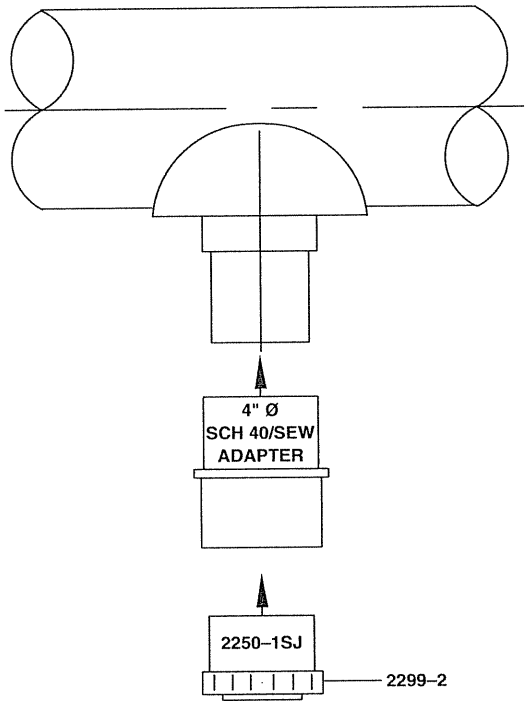
REPAIR

STEP No. (1)

1) CUT THE SPIGOT & RETAINING RING END OF THE FIXED JOINT OFF PERPENDICULAR TO THE CONNECTION AT A DISTANCE OF 1/2" (12 mm) FROM THE REAR END OF THE SOCKET FITTING.

2) DEBUR THE CUT PIPE END.





REPAIR

STEP No. (2)

1) OBTAIN THE REQUIRED QUANTITIES OF 4" ø SCH 40 TO SEWER SIZE ADAPTERS AND SPIGOT & RETAINING RING ASSEMBLIES (2250–1SJ & 2299–2) FROM THE SUPPLIER.

2) CLEAN & PRIME THE CUT PIPE END AND THE SEWER SIZE SOCKET END OF THE SCH 40/SEWER SIZE ADAPTER.

3) SOLVENT CEMENT THE SCH 40/SEWER SIZE ADAPTER TO THE CUT PIPE END.

4) CLEAN & PRIME THE OUTSIDE FACE OF THE SPIGOT & RETAINING RING AND THE SCH 40 SOCKET END OF THE SCH 40/SEWER SIZE ADAPTER.

5) CAREFULLY SOLVENT CEMENT THE SPIGOT & RETAINING RING END OF THE FIXED JOINT INTO THE SCH 40 SOCKET END OF THE SCH 40/SEWER SIZE ADAPTER. THE RETAINING RING MUST BE FREE TO ROTATE. DO NOT ALLOW EXCESS GLUE TO COME IN CONTACT WITH THE RETAINING RING.

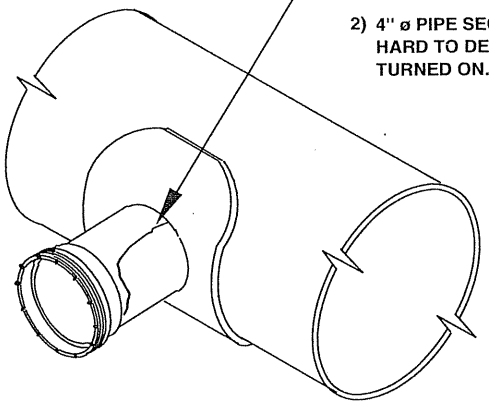
SAN B

MANIFOLD REPAIR – SPIGOT & RETAINING RING
AIR DISTRIBUTOR CONNECTION ON A 3-PIECE FABRICATED SADDLE ASSEMBLY

PROBLEM

1) 4" ø PIPE SECTION VISIBLY BROKEN OFF.

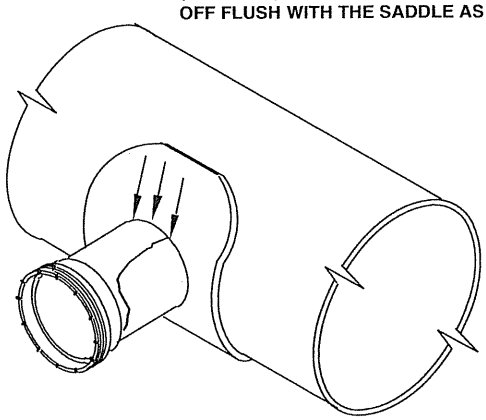
2) 4" ø PIPE SECTION CRACKED. MAY BE HARD TO DETECT UNTIL AIR IS TURNED ON.



REPAIR

STEP No. (1)

USE A RECIPROCATING TYPE SAW (SAWZALL) AND CUT THE PIPE SECTION OFF FLUSH WITH THE SADDLE AS SHOWN.

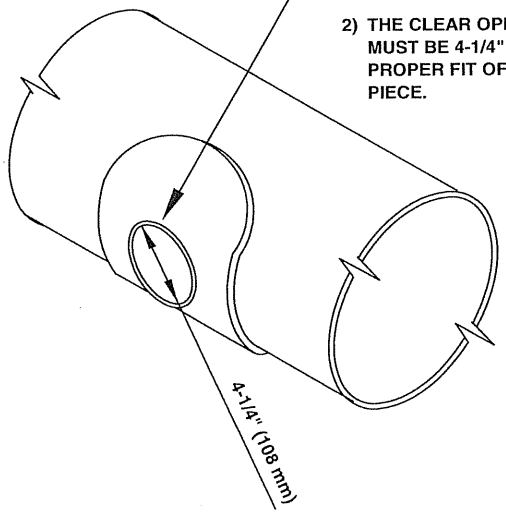


REPAIR

STEP No. (2)

1) CHAMFER THE INSIDE EDGE OF THE SADDLE OPENING TO REMOVE ANY SAW CUT PROJECTIONS.

2) THE CLEAR OPENING DIAMETER MUST BE 4-1/4" (108 mm) FOR PROPER FIT OF NEW SADDLE PIECE.



REPAIR

STEP No. (3)

1) DETERMINE THE MANIFOLD PIPE (O.D.) AND QUANTITY OF BROKEN OR CRACKED PIPE CONNECTIONS.

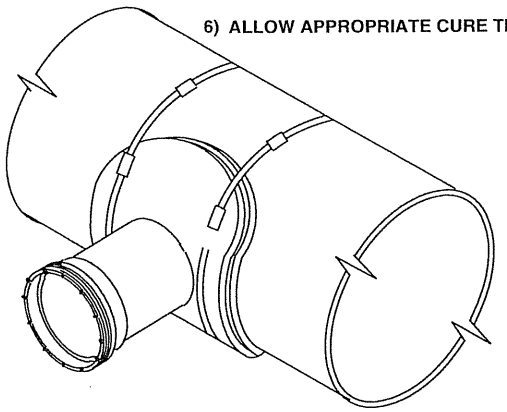
2) ORDER THE APPROPRIATE SADDLE REPAIR ASSEMBLY FROM THE SUPPLIER.

3) CLEAN AND PRIME SURFACES PRIOR TO CEMENTING.

4) SOLVENT CEMENT. THE NEW SADDLE ASSEMBLY DIRECTLY OVER THE EXISTING SADDLE USING A HEAVY BODY SOLVENT CEMENT. MAKE SURE NEW SADDLE IS LEVEL TO PROPERLY ALIGN WITH AIR DISTRIBUTOR.

5) SECURE SADDLE ASSEMBLY TO MANIFOLD WITH (SS) STRAP CLAMPS PROVIDED WITH REPAIR KIT.

6) ALLOW APPROPRIATE CURE TIME.

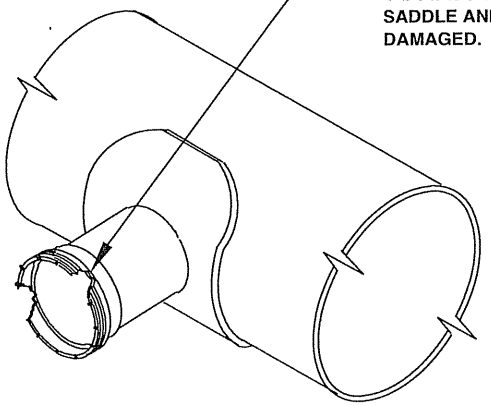


SAN C

MANIFOLD REPAIR – AIR DISTRIBUTOR CONNECTION SADDLE REPLACEMENT ON A 1–PIECE MOLDED SADDLE ASSEMBLY

PROBLEM

1) SOCKET END OF FIXED JOINT CONNECTION IS DAMAGED. 4"ø PIPE SECTION BETWEEN SADDLE AND JOINT IS NOT DAMAGED.

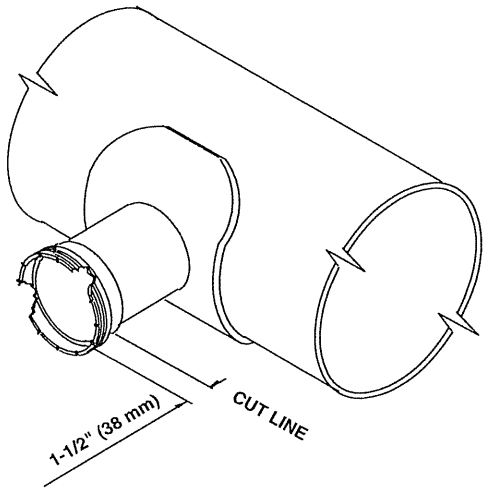


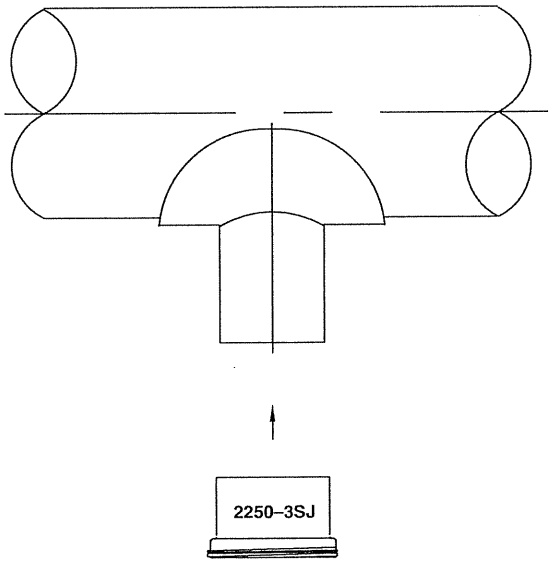
REPAIR

STEP No. (1)

1) CUT THE SOCKET END OF THE FIXED JOINT OFF PERPENDICULAR TO THE CONNECTION AT A DISTANCE OF 1-1/2" (38 mm) FROM THE FACE OF THE SOCKET END.

2) DEBUR THE CUT PIPE END.





REPAIR

STEP No. (2)

1) OBTAIN THE REQUIRED QUANTITY OF FIXED JOINT SOCKETS (2250-3SJ) FROM THE SUPPLIER.

2) CLEAN & PRIME THE CUT PIPE END AND THE INSIDE OF THE SOCKET END FITTING.

3) SOLVENT CEMENT THE SOCKET END TO THE CUT PIPE END.

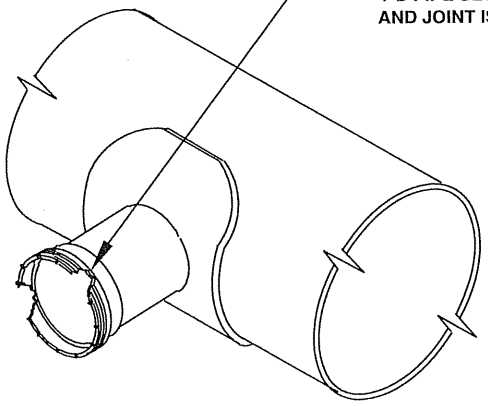
4) ALLOW ADEQUATE CURE TIME.

SAN D

MANIFOLD REPAIR – SOCKET AIR DISTRIBUTOR CONNECTION ON A 1–PIECE MOLDED SADDLE ASSEMBLY, 6" Ø – 10" Ø (150–250 mm Ø) MANIFOLDS

PROBLEM

1) SOCKET END OF FIXED JOINT CONNECTION IS DAMAGED. 4"ø PIPE SECTION BETWEEN SADDLE AND JOINT IS NOT DAMAGED.

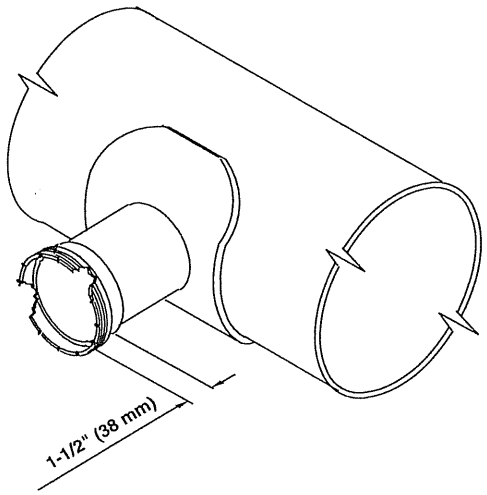


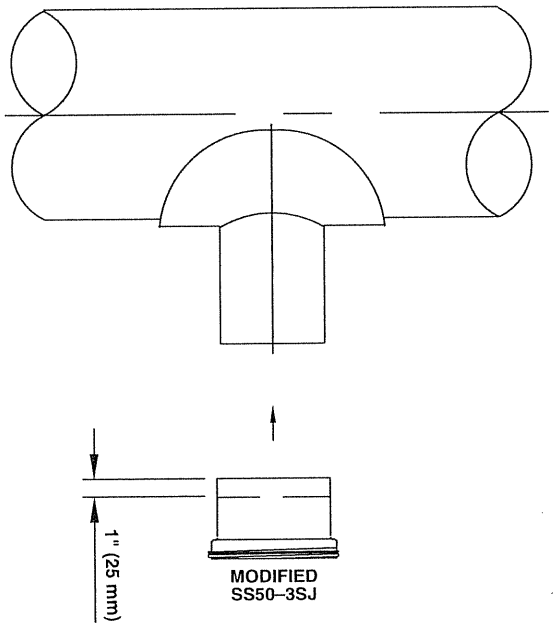
REPAIR

STEP No. (1)

1) CUT THE SOCKET END OF THE FIXED JOINT OFF PERPENDICULAR TO THE CONNECTION AT A DISTANCE OF 1-1/2" (38 mm) FROM THE FACE OF THE SOCKET END.

2) DEBUR THE CUT PIPE END.





REPAIR

STEP No. (2)

1) OBTAIN THE REQUIRED QUANTITY OF MODIFIED FIXED JOINT SOCKETS (2250–3SJ) FROM THE SUPPLIER. (1" OF SOCKET REMOVED)

2) CLEAN & PRIME THE CUT PIPE END AND THE INSIDE OF THE SOCKET END FITTING.

3) SOLVENT CEMENT THE SOCKET END TO THE CUT PIPE END.

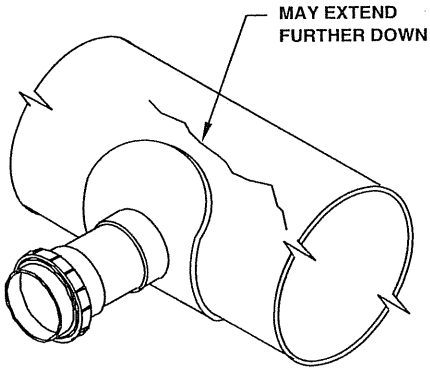
4) ALLOW ADEQUATE CURE TIME.

SAN E

MANIFOLD REPAIR – SOCKET AIR DISTRIBUTOR CONNECTION ON A 1–PIECE MOLDED SADDLE ASSEMBLY, 12" Ø (300 mm Ø) MANIFOLDS

PROBLEM

CRACKED MANIFOLD PIPE SECTION.

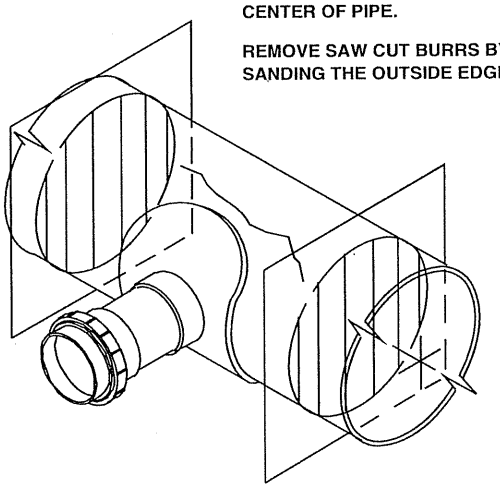


REPAIR

STEP No. (1)

CUT THE BROKEN PIPE SECTION OUT OF THE MANIFOLD BETWEEN SADDLES. THE CUT MUST BE PERPENDICULAR TO THE CENTER OF PIPE.

REMOVE SAW CUT BURRS BY FILING OR SANDING THE OUTSIDE EDGE OF THE PIPE.



REPAIR

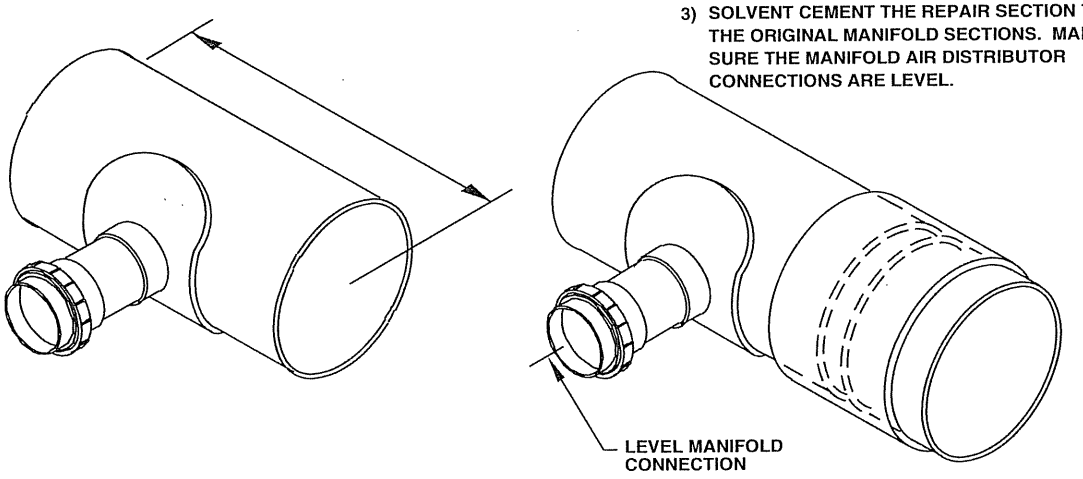
STEP No. (2)

1) DETERMINE AND ORDER THE REQUIRED REPAIR PARTS FROM THE SUPPLIER.
2) CUT A LENGTH OF REPAIR PIPE OF THE CORRECT DIAMETER AND QUANTITY OF PIPE SADDLES.
3) THE ENDS MUST BE CUT SQUARE.
4) DE-BURR THE ENDS OF THE PIPE.

REPAIR

STEP No. (3)

1) OBTAIN THE PROPER SIZE AND TYPE OF PVC COUPLINGS.
2) SOLVENT CEMENT THE REPAIR SECTION TO THE COUPLINGS AS REQUIRED. USE A HEAVY BODY SOLVENT CEMENT AND COMPATIBLE PRIMER TO MAKE GLUE JOINTS.
3) SOLVENT CEMENT THE REPAIR SECTION TO THE ORIGINAL MANIFOLD SECTIONS. MAKE SURE THE MANIFOLD AIR DISTRIBUTOR CONNECTIONS ARE LEVEL.



SAN F

MANIFOLD REPAIR – CRACKED MANIFOLD PIPE SECTION

PROBLEM

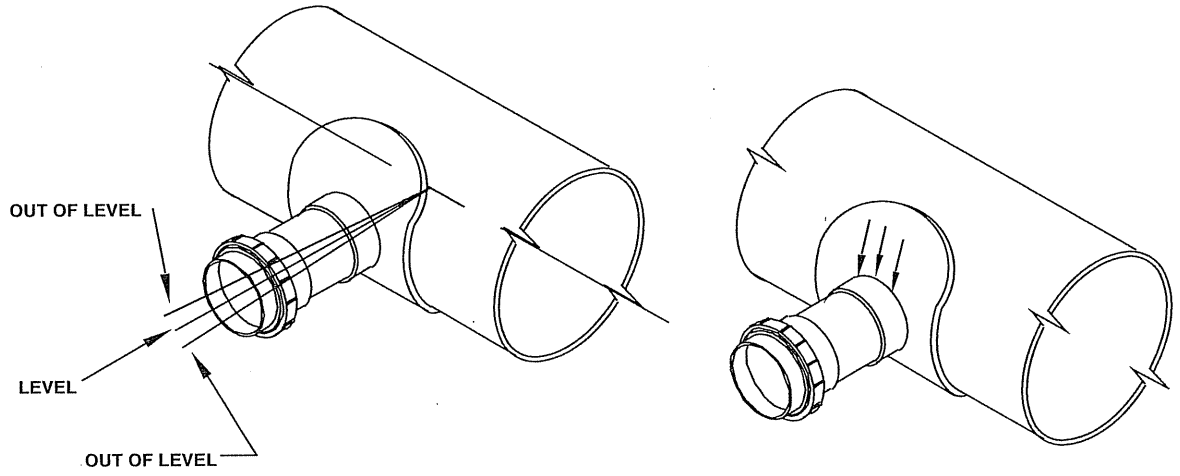
1) IN-LINE MANIFOLD AIR DISTRIBUTOR CONNECTION INSTALLED OUT OF HORIZONTAL LEVEL CAUSING AIR DISTRIBUTOR TO BE OUT OF LEVEL. (SHOWN ON SKETCH)

2) RAISED MANIFOLD AIR DISTRIBUTOR CONNECTION INSTALLED OUT OF VERTICAL PLUMB CAUSING AIR DISTRIBUTOR TO BE OUT OF LEVEL.

REPAIR

STEP No. (1)

USE A RECIPROCATING TYPE SAW (SAWZALL) AND CUT THE SPIGOT SECTION OFF FLUSH WITH THE SADDLE AS SHOWN.



REPAIR

STEP No. (2)

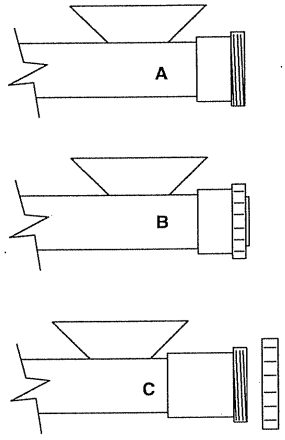
1) REFER TO DRAWING SAN A IF THE AIR DISTRIBUTOR CONNECTION IS A FABRICATED 3-PIECE SADDLE WITH A SPIGOT AND RETAINING RING.

2) REFER TO DRAWING SAN C IF THE AIR DISTRIBUTOR CONNECTION IS A MOLDED 1-PIECE SADDLE WITH A SOCKET FITTING.

SAN G

MANIFOLD REPAIR – MISALIGNED AIR DISTRIBUTOR CONNECTION

PIPE REPAIR PROCEDURES



PROBLEM

DAMAGED FIXED JOINT OR EXPANSION JOINT

A) FIXED JOINT SOCKET 2250-3SJ

B) FIXED JOINT SPIGOT 2250-1SJ
FIXED JOINT RETAINING RING 2299-2

C) EXPANSION JOINT BARREL 2306-1XS
EXPANSION JOINT RETAINING RING 2306-2XR

* 2250-3 IS A SPLINED SOCKET
* 2250-1 IS A NOTCHED SPIGOT

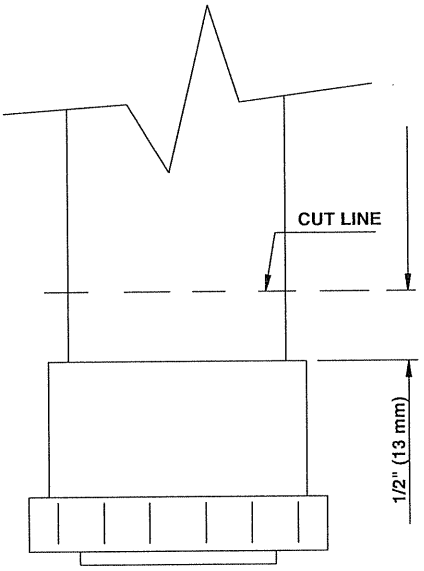
REPAIR

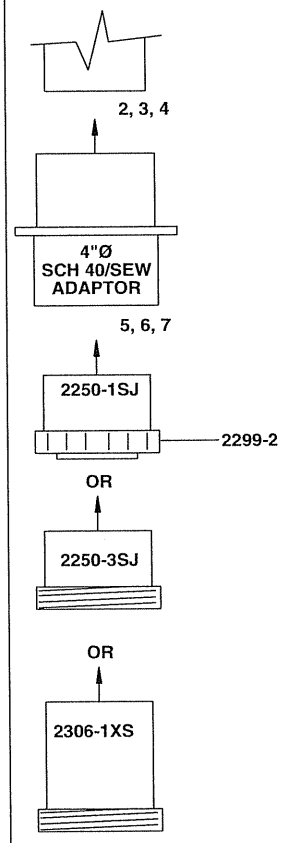
STEP No. (1)

REMOVE DAMAGED JOINT END BY CUTTING THE ATTACHED PIPE SECTION AT A DISTANCE OF (1/2") FROM THE END OF THE FITTING.

CARE SHOULD BE TAKEN TO MAKE CUT AS SQUARE AS POSSIBLE.

DE-BURR PIPE END.





REPAIR

STEP No. (2)

1) OBTAIN THE REQUIRED QUANTITY OF REPAIR PARTS FROM SUPPLIER.
2) CLEAN AND PRIME CUT PIPE END.
3) CLEAN AND PRIME THE INSIDE OF THE SMALL OR SEWER SIZE END OF A PVC SCH 40/SEWER ADAPTOR.
4) SOLVENT CEMENT THE PIPE ADAPTOR TO THE PIPE END.
5) CLEAN AND PRIME THE OPPOSITE END OF THE SCH 40/SEWER ADAPTOR.
6) CLEAN AND PRIME THE OUTSIDE FACE OF THE REQUIRED JOINT REPAIR END.
7) SOLVENT CEMENT THE JOINT END INTO SCH 40/SEWER PIPE ADAPTOR.

NOTE:
IF A SPIGOT AND RETAINING RING IS USED. DO NOT PUSH THE SPIGOT SO FAR INTO THE PIPE ADAPTOR WHERE FREE ROTATION OF THE RETAINING RING IS PROHIBITED. THE RETAINING RING MUST BE FREE TO ROTATE.

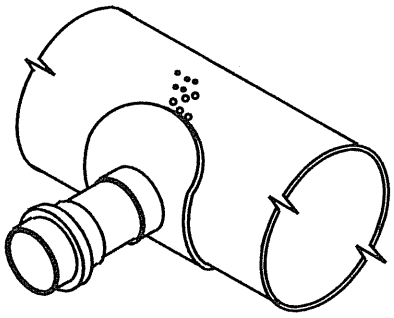
SAN H

AIR DISTRIBUTOR REPAIR – DAMAGED FIXED JOINT SPIGOT END, SOCKET END OR EXPANSION JOINT SOCKET END

SANITAIRE®

PROBLEM

PIN HOLE LEAK AROUND THE EDGE OF THE AIR DISTRIBUTOR PIPE CONNECTION SADDLE AS EVIDENT BY AIR RELEASE AT START-UP

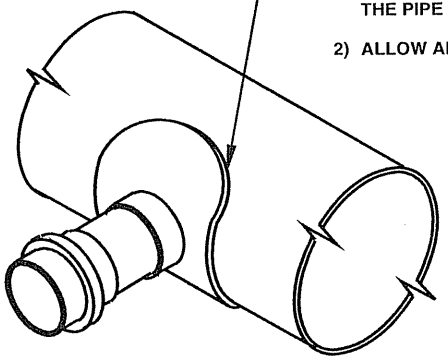


REPAIR

STEP No. (1)

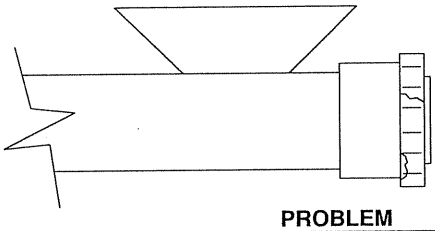
1) APPLY A BEAD OF HEAVY BODY SOLVENT CEMENT AROUND THE EDGE OF THE PIPE SADDLE.

2) ALLOW ADEQUATE CURE TIME.



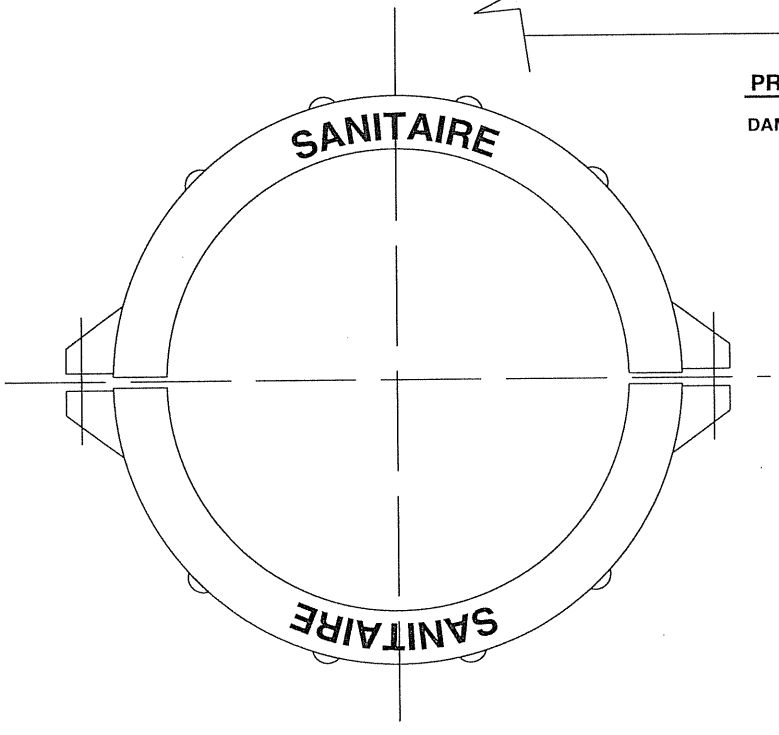
SAN I

MANIFOLD REPAIR – PIN HOLE LEAK AROUND THE EDGE OF THE AIR DISTRIBUTOR SADDLE CONNECTION



PROBLEM

DAMAGED OR BROKEN RETAINING RING(2299-2)



REPAIR

STEP No. (1)
USING A HAND HELD HACKSAW OR PVC PIPE SAW CAREFULLY CUT-OFF THE DAMAGED RETAINING RING.

STEP No. (2)
OBTAIN THE REQUIRED QUANTITY OF REPAIR RINGS FROM THE SUPPLIER. INSTALL NEW SPLIT FIXED JOINT RETAINING RING No.2299-REP

SAN J

AIR DISTRIBUTOR REPAIR – DAMAGED FIXED JOINT RETAINING RING

PROBLEMS

(A) CRACKED AIR DISTRIBUTOR PIPE.

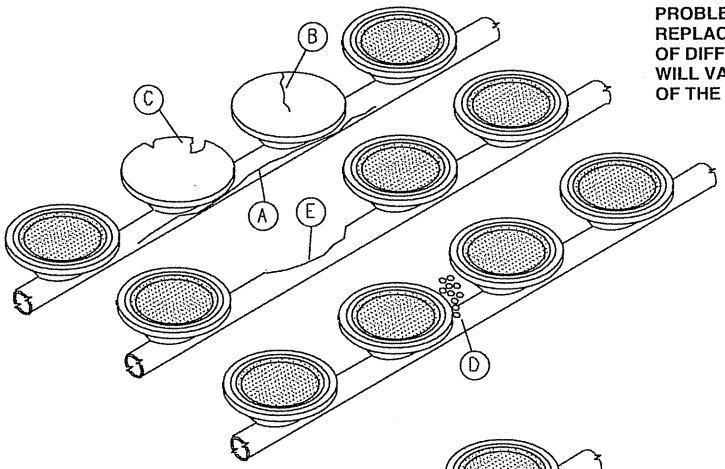
(B) CRACKED DIFFUSER HOLDER.

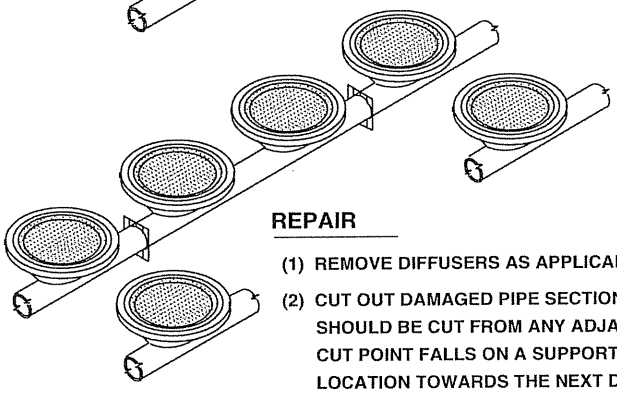
(C) CHIPPED DIFFUSER HOLDER.

(D) OUT OF ROUND DIFFUSER HOLDER (RARE) WILL NOT SEAL.

(E) DIFFUSER HOLDER BROKEN OFF.

THE REPAIR OF THE ABOVE LISTED PROBLEMS INVOLVES CUTTING OUT AND REPLACING A PIPE SECTION. THE NUMBER OF DIFFUSERS THAT REQUIRE REMOVAL WILL VARY DEPENDING ON THE EXTENT OF THE DAMAGE.

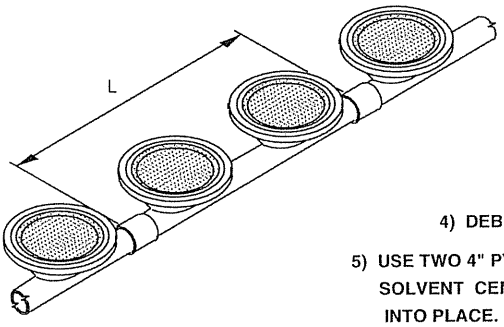




REPAIR

(1) REMOVE DIFFUSERS AS APPLICABLE FROM DAMAGED PIPE SECTION.

(2) CUT OUT DAMAGED PIPE SECTION. THE MINIMUM DISTANCE THE PIPE SHOULD BE CUT FROM ANY ADJACENT DIFFUSER IS 6" (150 mm). IF THE CUT POINT FALLS ON A SUPPORT LOCATION MOVE OFF THE SUPPORT LOCATION TOWARDS THE NEXT DIFFUSER IF SPACING ALLOWS OR MOVE DOWN TO SPACE BETWEEN NEXT DIFFUSER FOR TIGHTLY SPACED DIFFUSERS.



3) FROM A SPARE DISTRIBUTOR SECTION OR REPAIR MATERIALS SENT BY THE SUPPLIER CUT A SECTION TO THE REQUIRED LENGTH WITH THE APPROPRIATE NUMBER OF DIFFUSERS AT THE CORRECT DIFFUSER SPACING.

4) DEBUR, CLEAN AND PRIME ALL CUT ENDS.

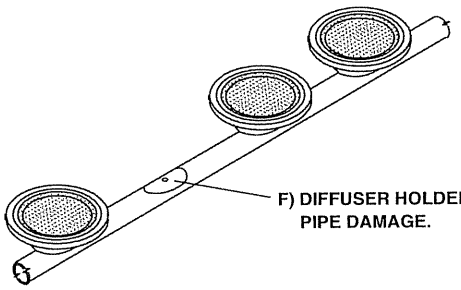
5) USE TWO 4" PVC SEWER SIZE COUPLINGS AND SOLVENT CEMENT THE REPAIR PIPE SECTION INTO PLACE.

6) ALL DIFFUSERS MUST BE KEPT ON THE SAME PLANE.

7) ALLOW APPROPRIATE CURE TIME. INSTALL THE DIFFUSERS, TIGHTEN ANY SUPPORTS THAT MAY HAVE BEEN LOOSENED, TEST AND PUT BACK IN SERVICE.

SAN K

AIR DISTRIBUTOR REPAIR – DAMAGED DIFFUSER HOLDER OR PIPE AND OBSTACLE, PIPE RE-ROUTING REQUIREMENTS



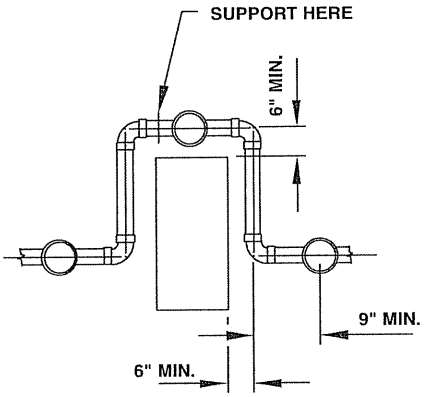
F) DIFFUSER HOLDER POPPED OFF PIPE WITH NO PIPE DAMAGE.

1) CLEAN HOLDER AREA OF ANY OLD SOLVENT CEMENT RESIDUE.

2) PRIME HOLDER AREA AND BOTTOM OF DIFFUSER HOLDER.

3) USE A HEAVY BODY SOLVENT CEMENT AND ATTACH HOLDER ON PIPE.

4) ALLOW APPROPRIATE CURE TIME.



PROBLEM

G) AIR DISTRIBUTOR INSTALLATION REQUIRES ROUTING AROUND AN OBSTACLE

REPAIR

USE 90° SEWER SIZE PVC SOCKET ELBOWS, SANITAIRE P.N. 4SEW-EL9 AND 4.215"O.D. SEWER PIPE TO MAKE NECESSARY MODIFICATIONS.

MAKE SURE THE OFFSET AIR DISTRIBUTOR RUN IS ADEQUATELY SUPPORTED.

SAN L

AIR DISTRIBUTOR REPAIR – DAMAGED DIFFUSER HOLDER OR PIPE AND OBSTACLE, PIPE RE-ROUTING REQUIREMENTS (Continued)

NOTES

Kwik Bolt 3 Expansion Anchor

1.1 Product Description

The Kwik Bolt 3 (KB3) is a torque controlled expansion anchor, which provides consistent performance for a wide range of mechanical anchor applications. This anchor series is available in carbon steel with zinc electroplated coating, carbon steel with hot dipped galvanized coating, 304 stainless steel and 316 stainless steel versions.The threaded stud version of the anchor is available in a variety of diameters ranging from 1/4" to 1" depending on the steel and coating type. Applicable base materials include normal weight concrete, structural lightweight concrete, lightweight concrete over metal deck and concrete grout filled masonry.

Guide Specifications

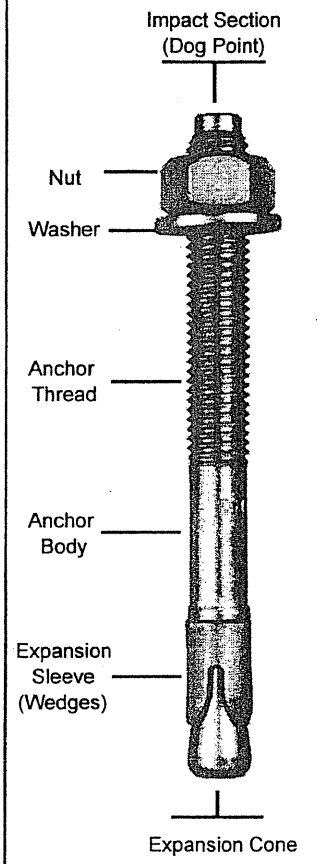
Anchor: Expansion anchors shall be Kwik Bolt 3 (KB3) supplied by Hilti, Inc. meeting the description in Federal Specification A-A 1923A, Type 4 and shall bear a length identification mark visible after installation. Anchor bodies shall be manufactured to meet one of the following conditions: 1. The carbon steel electroplated anchor coating shall conform to ASTM B633 with a minimum thickness of 5μm. 2. The carbon steel hot dipped galvanized anchor body, nut and washer coating shall conform to ASTM A 153, Class C. The expansion sleeve conforms to AISI 316. 3. Anchor body, nut and washer conform to AISI 304. The expansion sleeve conforms to AISI 316. 4. Anchor body, nut, washer and expansion sleeve conform to AISI 316.

Product Features

- Length identification code facilitates quality control and inspection after installation.
- Through fixture installation and variable thread lengths improve productivity and accommodate various base plate thicknesses.
- Raised impact section (Dog Point) prevents thread damage during installation.
- Anchor size is same as drill bit size for easy installation. For temporary applications anchors may be driven into drilled holes after usage.
- Mechanical expansion allows immediate load application.
- Consistent performance in concrete, lightweight concrete, lightweight over metal deck and grout filled concrete block base materials.
- Anchors tested to combined tension and shear load requirements as defined by ACI 318-02 Appendix-D.

Installation

Drill hole in concrete, structural lightweight concrete, or grout filled concrete block using a Hilti carbide tipped drill bit and a Hilti rotary hammer drill. Remove dust from the hole with oil free compressed air. Alternately for 1/2, 5/8, 3/4, and 1 inch diameter Kwik Bolt 3 anchors, the hole may be drilled using a matched tolerance Hilti DD-B or DD-C wet diamond core bit for anchoring applications. The slurry must be flushed from the diamond cored hole prior to anchor installation. The minimum hole depth must exceed the anchor embedment prior to torquing by one hole diameter. Drive the anchor into the hole using a hammer. A minimum of six threads must be below the surface of the fixture. Tighten the nut to the recommended installation torque.



Listings and Approvals

- International Code Council (ICC-ES) Evaluation Service Report ESR-1385
  Seismically recognized under AC01 dated April 2002
- City of Los Angeles Report (COLA) - approval pending
- UL 203, Pipe Hanger Equipment for Fire Protection Services
- FM Approval Standard Pipe Hanger Component for Automatic Sprinkler
- Metropolitan Dade Notice of Product Approval - approval pending

(Please refer to the reports to verify that the anchor type and diameter specified is included)

- Qualified under an NQA-1 Nuclear Quality Program

Visit Hilti Online
US www.us.hilti.com
Canada www.ca.hilti.com

1.2 Material Specification

Stainless Steel

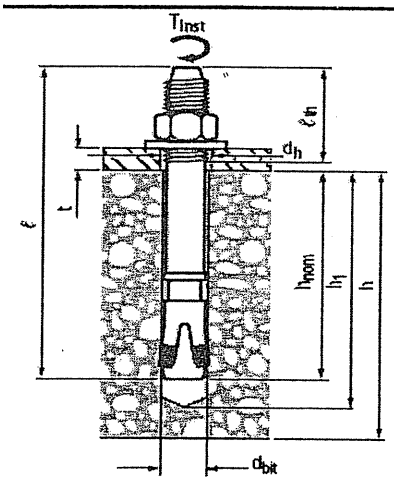
- Anchor bodies smaller than 3/4", excluding countersun Kwik Bolt Series, are produced from AISI 304 or 316 stainless steel meeting a minimum fracture load after forming:

Anchor Diameter	1/4"	3/8"	1/2"	5/8"
Fracture Load min.	2900 lbs	7200 lbs	12400 lbs	21900 lbs

- Anchor bodies 3/4" and larger and all stainless steel countersunk Kwik Bolt series are produced from AISI 304 or 316 stainless steel having minimum mechanical properties:

Anchor Diameter	< 5/8"	≥ 3/4"
Tensile Strength	90 ksi min.	76 ksi min.
Yield Strength	76 ksi min.	64 ksi min.

- Nuts meet the dimensional requirements of ASTM F 594.
- Washers meet the dimensional requirements of ANSI B18.22.1, Type A, plain.
- Expansion Sleeve for AISI 304 and 316 anchors are made from AISI 316, all nuts and washers for AISI 304 and 316 anchors are manufactured from AISI 304 and 316, respectively.



Refer to Kwik Bolt 3 Specification table under Section 1.3, for a listing and specification of anchor specific and installation variables.

See Kwik Bolt 3 anchor product line table under Section 1.5 for full list of anchor length (ℓ) and thread length (ℓ_{th}) configurations.

Combined Shear and Tension Loading

$$\left(\frac{N_d}{N_{rec}}\right)^{5/3} + \left(\frac{V_d}{V_{rec}}\right)^{5/3} \leq 1.0$$

Refer to Section 4.1.2.7 of 2005 Hilti Product Technical Guide

1.3 Technical Data

Kwik Bolt 3 Specification Tables[1]

Details			Bolt Size	in. (mm)	1/4 (6.4)			3/8 (9.5)			1/2 (12.7)		
d_{bit} nominal bit diameter[2]				in.	1/4			3/8			1/2		
h_{min} / h_{nom} / h_{deep} minimum / standard / deep embedment				in.	1 1/8	2	3	1 5/8	2 1/2	3 1/2	2 1/4	3 1/2	4 3/4
				(mm)	(29)	(51)	(76)	(41)	(64)	(89)	(57)	(89)	(121)
h_1 minimum / standard / deep hole depth				in.	1 3/8	2 1/4	3 1/4	2	2 7/8	3 7/8	2 3/4	4	5 1/4
				(mm)	(35)	(57)	(83)	(51)	(73)	(98)	(70)	(102)	(133)
d_h wedge clearance hole in plate				in. (mm)	5/16 (8)			7/16 (11)			9/16 (14)		
Recommended installation torque	T_{inst}	Normal weight and Lightweight concrete	Carbon Steel Zinc / HDG	ft-lb (Nm)	4 (5.4)			20 (27)			40 (54)		
			Stainless Steel	ft-lb (Nm)	6 (8.1)			20 (27)			40 (54)		
		Grout filled Block	Carbon Steel	ft-lb (Nm)	4 (5.4)			15 (20)			25 (34)		
h Min. base material thickness				in.	3 in. (76mm) or 1.3 h_{ef}, whichever is greater								

Details			Bolt Size	in. (mm)	5/8 (15.9)			3/4 (19.1)			1 (25.4)		
d_{bit} nominal bit diameter[2]				in.	5/8			3/4			1		
h_{min} / h_{nom} / h_{deep} minimum / standard / deep embedment				in.	2 3/4	4	5 1/2	3 1/4	4 3/4	6 1/2[3]	4 1/2	6	9
				(mm)	(70)	(102)	(140)	(83)	(121)	(165)	(114)	(152)	(229)
h_1 minimum / standard / deep hole depth				in.	3 3/8	4 5/8	6 1/8	4	5 1/2	6 4/5	5 1/2	7	10
				(mm)	(86)	(117)	(156)	(102)	(140)	(173)	(140)	(178)	(254)
d_h wedge clearance hole in plate				in. (mm)	11/16 (17)			13/16 (21)			1 1/8 (29)		
Recommended installation torque	T_{inst}	Normal weight and Lightweight concrete	Carbon Steel Zinc / HDG	ft-lb (Nm)	85 (115)			150 (203)			250 (339)		
			Stainless Steel	ft-lb (Nm)	85 (115)			150 (203)			235 (319)		
		Grout filled Block	Carbon Steel	ft-lb (Nm)	65 (88)			120 (163)			-		
h Min. base material thickness				in.	3 in. (76mm) or 1.3 h_{ef}, whichever is greater								

[1] See Kwik Bolt 3 anchor product line table under section 1.5 for full list of anchor length (l) and thread length (l_{th}) configurations.

[2] Loads for Kwik Bolt 3 are applicable for both carbide drill bits (see section 8.4.1 of 2005 Hilti Product Technical Guide) and matched tolerance Hilti DD-B or DD-C diamond core bits in sizes ranging from 1/2 inch to 1inch .

[3] Deep embedment depth for stainless steel Kwik Bolt 3 anchor is 8 inch (203 mm).

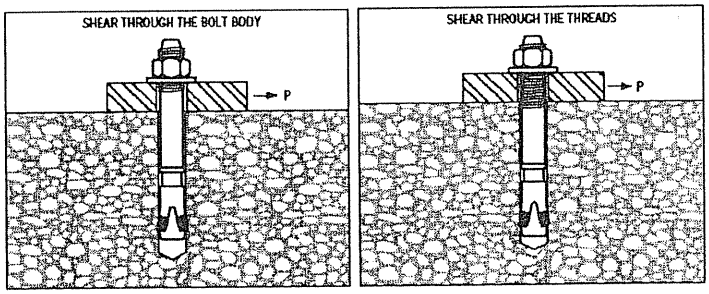
Stainless Steel Kwik Bolt 3 Allowable Loads in Concrete[1]

Anchor diameter in. (mm)	Embedment depth in. (mm)	f'_c= 2000 psi		f'_c= 3000 psi		f'_c= 4000 psi		f'_c= 6000 psi	
		Tension lb (kN)	Shear[2] lb (kN)	Tension lb (kN)	Shear[2] lb (kN)	Tension lb (kN)	Shear[2] lb (kN)	Tension lb (kN)	Shear[2] lb (kN)
1/4 (6.4)	1 1/8 (29)	260 (1.2)	595 (2.6)	320 (1.4)	675 (3)	380 (1.7)	675 (3)	470 (2.1)	675 (3)
	2 (51)	540 (2.4)	675 (3)	625 (2.8)		705 (3.1)		910 (4)	
	3 (76)	685 (3)		750 (3.3)		810 (3.6)		910 (4)	
3/8 (9.5)	1 5/8 (41)	605 (2.7)	880 (3.9)	670 (3)	1110 (4.9)	730 (3.2)	1345 (6)	950 (4.2)	1690 (7.5)
	2 1/2 (64)	1285 (5.7)	1655 (7.4)	1430 (6.4)	1655 (7.4)	1575 (7)	1870[3] (8.3)	1940 (8.6)	1870[3] (8.3)
	3 1/2 (89)	1620 (7.2)		1755 (7.8)		1885 (8.4)		2035 (9.1)	
1/2 (12.7)	2 1/4 (57)	1015 (4.5)	1875 (8.3)	1230 (5.5)	2130 (9.5)	1450 (6.4)	2380 (10.6)	1620 (7.2)	2740 (12.2)
	3 1/2 (89)	1445 (6.4)	3155 (14)	1975 (8.8)	3155 (14)	2510 (11.2)	3155 (14)	2655 (11.8)	3155 (14)
	4 3/4 (121)	1990 (8.9)		2250 (10)		2510 (11.2)		2985 (13.3)	
5/8 (15.9)	2 3/4 (70)	1650 (7.3)	2875 (12.8)	1755 (7.8)	3485 (15.5)	1860 (8.3)	4095 (18.2)	2335 (10.4)	4870 (21.7)
	4 (102)	2455 (10.9)	4870 (21.7)	2900 (12.9)	4870 (21.7)	3340 (14.9)	4870 (21.7)	4395 (19.5)	
	5 1/2 (140)	3480 (15.5)		3885 (17.3)		4290 (19.1)		6260 (27.8)	
3/4 (19.1)	3 1/4 (83)	1550 (6.9)	2880 (12.8)	1950 (8.7)	4260 (18.9)	2350 (10.5)	5645 (25.1)	2610 (11.6)	5645 (25.1)
	4 3/4 (121)	2510 (11.2)	5535 (24.6)	3250 (14.5)	5535 (24.6)	3870 (17.2)		4670 (20.8)	
	8 (203)	2930 (13)		3870 (17.2)		4530 (20.2)		5120 (22.8)	
1 (25.4)	4 1/2 (114)	3120 (13.9)	6080 (27)	3870 (17.2)	6770 (30.1)	4610 (20.5)	7470 (33.2)	4800 (21.4)	7470 (33.2)
	6 (152)	4400 (19.6)	7470 (33.2)	6400 (28.5)	7470 (33.2)	7200 (32)		7330 (32.6)	
	9 (229)	5600 (24.9)		8000 (35.6)		9390 (41.8)		9390 (41.8)	

[1] Intermediate load values for other concrete strengths and embedments can be calculated by linear interpolation.

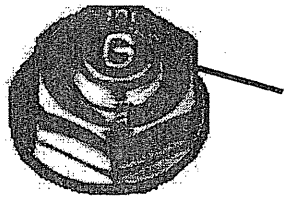
[2] Unless otherwise noted, values shown are valid for the shear plane acting through either the anchor body or the anchor threads.

[3] Values shown are for a shear plane through the anchor body. When the shear plane is acting through the anchor threads, reduce the shear value by 10%.



Length Identification System

STAMP ON ANCHOR		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Length of anchor (ℓ) (inches)	From	1	2	2 ½	3	3 ½	4	4 ½	5	5 ½	6	6 ½	7	7 ½	8	8 ½	9	9 ½	10	11	12
	Up to but not including	2	2 ½	3	3 ½	4	4 ½	5	5 ½	6	6 ½	7	7 ½	8	8 ½	9	9 ½	10	11	12	13



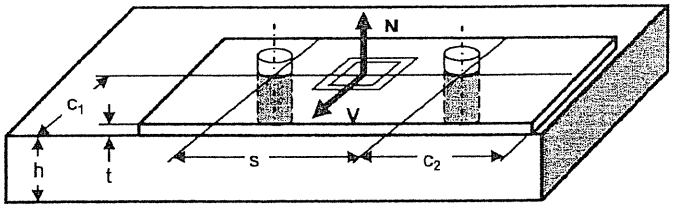
Length Identification Mark

Anchor Spacing and Edge Distance Guidelines

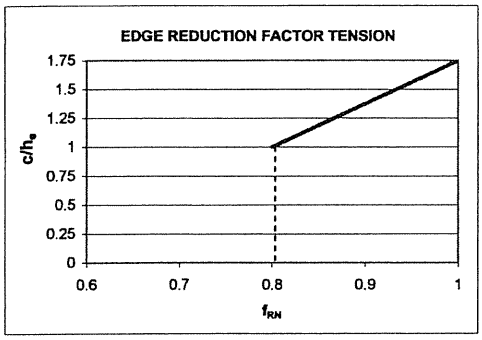
1- s = on-center fastening spacing
c = edge distance from center of bolt.

2- Apply appropriate load reduction factors for tension and shear if anchor spacing and/or edge distance is less the the critical spacing (S_{cr}) or edge distance (C_{cr}) as defined by Hilti.

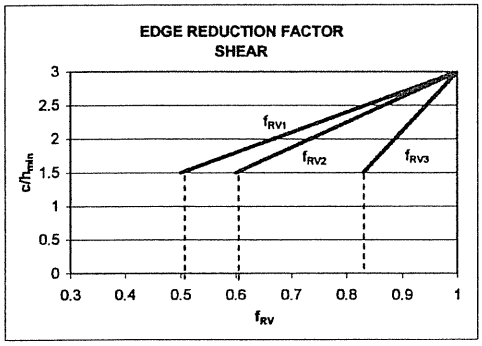
3- See section 4.1.2.3 of 2005 Hilti Product Technical guide for determinig compounded spacing and edge distance reduction as well as intermediate load values for concrete strengths and embedments.



Edge Distance Adjustment Factors



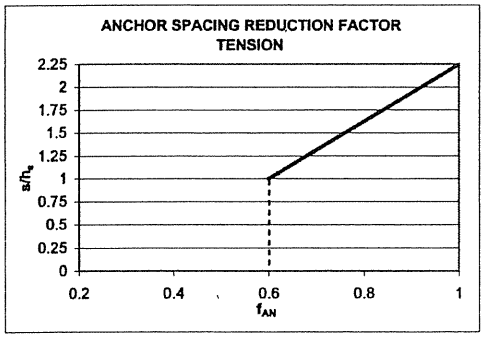
Adjustment Conditions	Critical Edge Distance	Min. Edge Distance
Emb. Ratio	$c/h_e = 1.75$	$c/h_e = 1.00$
Reduction	$f_{RN} = 1.00$	$f_{RN} = 0.80$
$h_e = h_{act}$	for the following condition	$h_{min} \le h_{act} \le h_{nom}$
$h_e = h_{nom}$	for the following condition	$h_{act} > h_{nom}$
h_{act} = Actual Embedment c = Actual Edge Distance f_{RN} = Edge Distance Reduction Factor for Tension Loading		



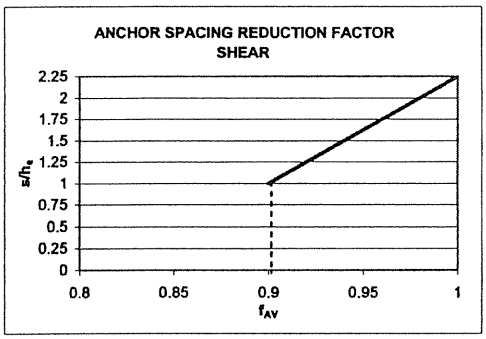
Adjustment Conditions

Shear Plane Correlation	Shear Condition	f_{RV} Reduction factor at Min. Edge Distance
f_{RV1}	shear towards edge	$f_{RV1} = 0.50$
f_{RV2}	shear parallel to edge	$f_{RV2} = 0.60$
f_{RV3}	shear away form edge	$f_{RV3} = 0.83$
embedment to edge dist ratio at critical edge dist.		$c/h_{min} = 3.00$
embedment to edge dist ratio at min edge dist.		$c/h_{min} = 1.50$
c = Actual Edge Distance h_{min} = Min Embedment for Specific Anchor Diameter		

Anchor Spacing Adjustment Factors



Adjustment Conditions	Critical Edge Distance	Min. Edge Distance
Emb. Ratio	$s/h_e = 2.25$	$s/h_e = 1.00$
Reduction	$f_{AN} = 1.00$	$f_{AN} = 0.60$
$h_e = h_{act}$	for the following condition	$h_{min} \le h_{act} \le h_{nom}$
$h_e = h_{nom}$	for the following condition	$h_{act} > h_{nom}$
h_{act} = Actual Embedment s = Actual Anchor Spacing Distance f_{AN} = Anchor Spacing Reduction Factor for Tension Loading		



Adjustment Conditions	Critical Edge Distance	Min. Edge Distance
Emb. Ratio	$s/h_e = 2.25$	$s/h_e = 1.00$
Reduction	$f_{AV} = 1.00$	$f_{AV} = 0.90$
$h_e = h_{act}$	for the following condition	$h_{min} \le h_{act} \le h_{nom}$
$h_e = h_{nom}$	for the following condition	$h_{act} > h_{nom}$
h_{act} = Actual Embedment s = Actual Anchor Spacing Distance f_{AV} = Anchor Spacing Reduction Factor for Shear Loading		

Influence of Edge Distance on Anchor Performance

Load Adjustment Factors for 1/4" Diameter Anchors

Anchor Diameter 1/4 in.	Spacing Tension f_{AN}		Edge Distance Tension f_{RN}		Spacing Shear f_{AV}		Edge Distance Shear ⊥ toward edge f_{RV1}	Edge Distance Shear ∥ to edge f_{RV2}	Edge Distance Shear ⊥ away from edge f_{RV3}
Emb. in.	1 1/8	≥ 2	1 1/8	≥ 2	1 1/8	≥ 2	≥ 1 1/8	≥ 1 1/8	≥ 1 1/8
Spacing (s) / Edge Distance (c), in. 1 1/8	0.60		0.80		0.90				
1 11/16	0.76		0.93		0.94		0.50	0.60	0.83
1 3/4	0.78		0.95		0.94		0.52	0.61	0.84
2	0.85	0.60	1.00	0.80	0.96	0.90	0.59	0.67	0.86
2 1/4	0.92	0.64		0.83	0.98	0.91	0.67	0.73	0.89
2 1/2	0.99	0.68		0.87	1.00	0.92	0.74	0.79	0.91
3	1.00	0.76		0.93		0.94	0.89	0.91	0.96
3 3/8		0.82		0.98		0.96	1.00	1.00	1.00
3 1/2		0.84		1.00		0.96			
4		0.92				0.98			
4 1/2		1.00				1.00			
4 3/4									
5									

Standard Anchor Embedments (in.)

1/4	h_{min}	1 1/8
	h_{nom}	2
	h_{deep}	3
3/8	h_{min}	1 5/8
	h_{nom}	2 1/2
	h_{deep}	3 1/2
1/2	h_{min}	2 1/4
	h_{nom}	3 1/2
	h_{deep}	4 3/4

NOTE:
Tables apply for listed embedment depths. Reduction factors for other embedment depths must be calculated using equations below.

Load Adjustment Factors for 3/8" Diameter Anchors

Anchor Diameter 3/8 in.	Spacing Tension f_{AN}		Edge Distance Tension f_{RN}		Spacing Shear f_{AV}		Edge Distance Shear ⊥ toward edge f_{RV1}	Edge Distance Shear ∥ to edge f_{RV2}	Edge Distance Shear ⊥ away from edge f_{RV3}
Emb. in.	1 5/8	≥ 2 1/2	1 5/8	≥ 2 1/2	1 5/8	≥ 2 1/2	≥ 1 5/8	≥ 1 5/8	≥ 1 5/8
Spacing (s) / Edge Distance (c), in. 1 5/8	0.60		0.80		0.90				
2	0.67		0.86		0.92				
2 1/4	0.72		0.90		0.93				
2 1/2	0.77	0.60	0.94	0.80	0.94	0.90	0.51	0.61	0.83
3	0.87	0.66	1.00	0.85	0.97	0.92	0.62	0.69	0.87
3 1/4	0.92	0.70		0.88	0.98	0.92	0.67	0.73	0.89
3 1/2	0.97	0.73		0.91	0.99	0.93	0.72	0.77	0.90
3 3/4	1.00	0.76		0.93	1.00	0.94	0.77	0.82	0.92
4		0.79		0.96		0.95	0.82	0.86	0.94
4 1/2		0.86		1.00		0.96	0.92	0.94	0.97
5		0.92				0.98	1.00	1.00	1.00
5 5/8		1.00				1.00			
5 3/4									

Spacing - Tension

$h_{min} \le h_{act} \le h_{nom}$	$h_{act} \ge h_{nom}$
$f_{AN} = \frac{c/h_{act} + 0.88}{3.13}$	$f_{AN} = \frac{c/h_{nom} + 0.88}{3.13}$

Edge Distance - Tension

$h_{min} \le h_{act} \le h_{nom}$	$h_{act} \ge h_{nom}$
$f_{RN} = \frac{c/h_{act} + 2}{3.75}$	$f_{RN} = \frac{c/h_{nom} + 2}{3.75}$

Spacing - Shear

$h_{min} \le h_{act} \le h_{nom}$	$h_{act} \ge h_{nom}$
$f_{AV} = \frac{s/h_{act} + 10.25}{12.5}$	$f_{AV} = \frac{s/h_{nom} + 10.25}{12.5}$

Edge Distance - Shear

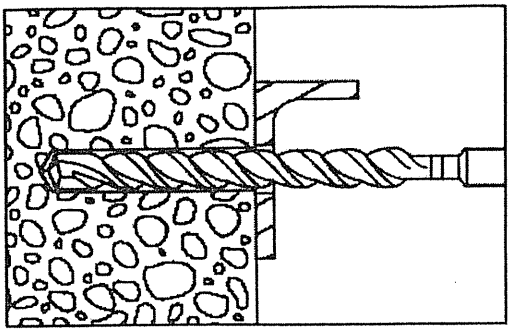
$h_{act} \ge h_{min}$	
Perpendicular Toward Edge	$f_{RV1} = \frac{c}{3h_{min}}$
Parallel to Edge	$f_{RV2} = \frac{c/h_{min} + 0.75}{3.75}$
Perpendicular Away from Edge	$f_{RV3} = \frac{c/h_{min} + 5.82}{8.82}$

Load Adjustment Factors for 1/2" Diameter Anchors

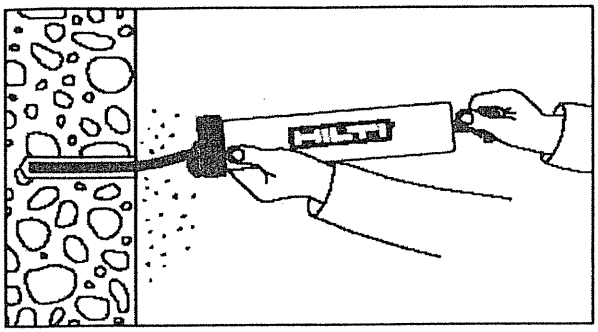
Anchor Diameter 1/2 in.	Spacing Tension f_{AN}		Edge Distance Tension f_{RN}		Spacing Shear f_{AV}		Edge Distance Shear ⊥ toward edge f_{RV1}	Edge Distance Shear ∥ to edge f_{RV2}	Edge Distance Shear ⊥ away from edge f_{RV3}
Emb. in.	2 1/4	≥ 3 1/2	2 1/4	≥ 3 1/2	2 1/4	≥ 3 1/2	≥ 2 1/4	≥ 2 1/4	≥ 2 1/4
Spacing (s) / Edge Distance (c), in. 2 1/4	0.60		0.80		0.90				
2 1/2	0.64		0.83		0.91				
3	0.71		0.89		0.93				
3 3/8	0.76		0.93		0.94		0.50	0.60	0.83
3 3/4	0.81	0.62	0.98	0.82	0.95	0.91	0.56	0.64	0.85
4 1/4	0.88	0.67	1.00	0.86	0.97	0.92	0.63	0.70	0.87
4 3/4	0.96	0.71		0.90	0.99	0.93	0.70	0.76	0.90
5	1.00	0.74		0.91	1.00	0.93	0.74	0.79	0.91
5 3/4		0.81		0.97		0.95	0.85	0.88	0.95
6		0.83		1.00		0.96	0.89	0.91	0.96
6 1/2		0.87				0.97	0.96	0.97	0.99
7 1/4		0.94				0.99	1.00	1.00	1.00
7 3/4		1.00				1.00			

1.4 Anchor Installation Instructions

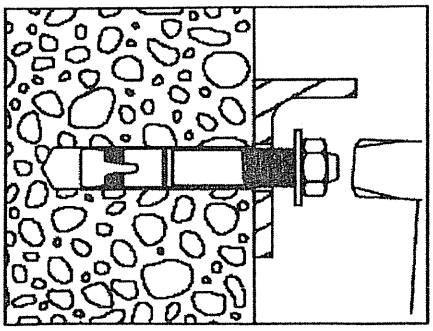
Kwik Bolt 3 Anchor Installation Instructions into normal weight and lightweight concrete



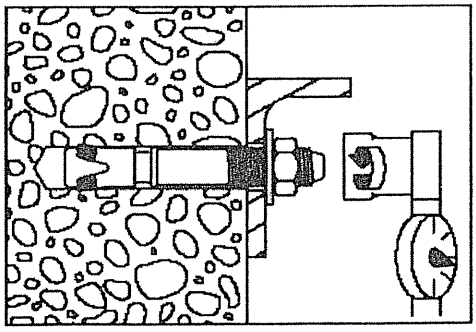
1. Hammer drill a hole to the same nominal diameter as the Kwik Bolt 3. The hole depth must exceed the anchor embedment by at least one diameter. The fixture may be used as a drilling template to ensure proper anchor location.



2. Clean hole.



3. Drive the Kwik Bolt 3 into the hole using a hammer. The anchor must be driven until at least six threads are below the surface of the fixture.



4. Tighten the nut to the recommended installation torque.

JCM Industries, Inc.
P. O. Box 1220, Nash, TX 75569-1220
Phone 800-527-8482 or 903-832-2581
Fax 800-874-9524 or 903-838-6260
www.jcmindustries.com

JCM 161 Fabricated Lug All Stainless Steel Clamps

The new JCM 161 Fabricated Lug All Stainless Steel Clamp offers an economical solution to problems such as breaks, splits, cracks, holes in all types of pipe. Available in standard sizes for cast iron, ductile iron, IPS PVC, C-900/905 PVC, steel, asbestos cement, polyethylene. The 161 is a stainless steel clamp that offers all the benefits of stainless: corrosion resistance, lightweight, flexible yet strong. The JCM 161 is especially recommended for hot soil conditions and corrosive environments.

The full circumferential gasket provides a complete repair while the molded in stainless steel bridge plate provides the full stainless steel barrier to aggressive elements.

JCM 161 Fabricated Lug All Stainless Steel Clamp Couplings - Material Specifications

BOLTING ASSEMBLY:	18-8 Type 304 Stainless Steel
BAND:	18-8 Type 304 Stainless Steel
BOLTS AND NUTS:	18-8 Type 304 Stainless Steel
GASKET:	EPDM - has excellent resistance to aging factors including ozone, oxygen, elevated temperatures and fluctuations in weather. Recommended for service in hot water, steam and dry heat. Suitable for popular chemicals - ketones, alcohols, phosphate ester hydraulic fluids, glycols, dilute acids and alkalies. Maximum temperature 300°F wet. Not suitable for petroleum.

EPDM Gasket Material

Property	**Typical Value**
Service Temperature	**275°F Operating/ 300°F Maximum**
Tensile Strength	**1450 psi**
Elongation	**200%**

Strong Stainless Steel Studs - permanently attached to eliminate loose parts and nuts are treated to speed installation and prevent seizing.

Thick Gridded Gasket - with long tapered ends and recessed bridge plate assure even gasket pressure throughout range - without wrinkling or crimping.

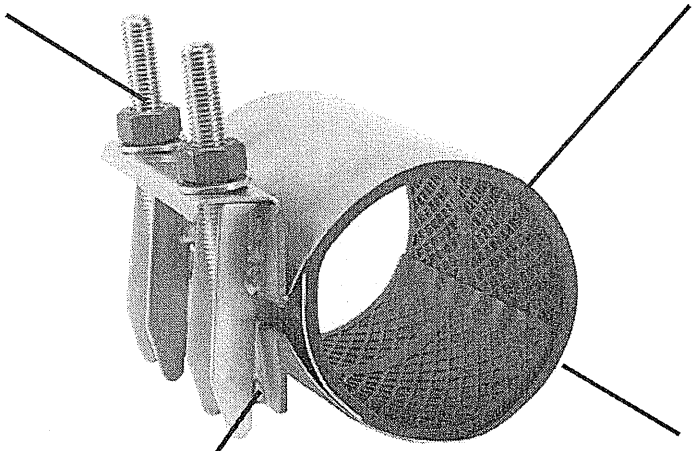


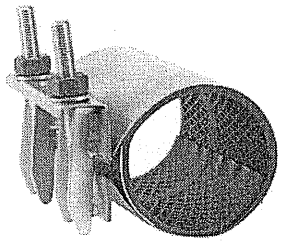
Image Reflects 7" Clamp Width

Positive Attachment of Band to Lugs - strong TIG welds eliminate mechanical weaknesses and prevents band separation. Thick stainless lifter bar plate prevents distortion or warpage during tightening.

Type 304 Stainless Steel Band - conforms to pipe irregularities, maintaining sealing pressure over the entire gasket.

NSF
Certified to NSF/ANSI 61

JCM 161 Fabricated Lug Stainless Steel Universal Clamps



The JCM 161 Fabricated Lug All Stainless Steel Clamp offers an economical solution to problems such as breaks, splits, cracks, holes in all types of pipe. Available in standard sizes, the 161 is a stainless steel clamp that offers all the benefits of stainless: corrosion resistance, lightweight, flexible yet strong.

Nom. Pipe Size (IN.)	Clamp O.D. Range (IN.)	161 Stainless Steel Universal Clamp	Clamp Width - Approximate Weight					
			7"	12"	15"	18"	24"	30"
		Clamp Number	Lbs.#	Lbs.#	Lbs.#	Lbs.#	Lbs.#	Lbs.#
2 - 2-1/2	2.35 - 2.63 2.70 - 3.13	0238 0275	• 5#	• 8#	• 10#	- 	- 	-
3	3.46 - 3.70 3.73 - 4.13	0350 0400	• 6#	• 9#	• 11#	- 	- 	-
4	4.45 - 4.75 4.74 - 5.14 4.95 - 5.35 5.22 - 5.62	0450 0480 0500 0525	• 7#	• 10#	• 12#	• 17#	• 20#	• 24#
6	~~5.95 - 6.35~~ 6.56 - 6.96 ~~6.85 - 7.25~~ ~~7.05 - 7.45~~ ~~7.45 - 7.85~~	~~0600~~ 0663 ~~0690~~ ~~0710~~ ~~0745~~	• 9#	• 13#	• 17#	• 20#	• 26#	• 34#
8	7.95 - 8.35 8.54 - 8.94 8.99 - 9.39 9.27 - 9.67 9.90 - 10.30	0800 0863 0905 0940 1000	• 11#	• 16#	• 21#	• 25#	• 32#	• 44#
10	10.60 - 11.00 11.04 - 11.44 11.34 - 11.74 11.75 - 12.15 12.00 - 12.40	1075 1110 1140 1175 1200	• 15#	• 18#	• 24#	• 30#	• 36#	• 50#
12	12.60 - 13.02 13.10 - 13.50 13.40 - 13.80 13.70 - 14.10 14.00 - 14.40	1275 1320 1340 1370 1400	• 17#	• 20#	• 27#	• 34#	• 40#	• 56#
		Number of Bolts	2	3	4	4	6	8

HOW TO ORDER

1. Determine O.D. of pipe.
2. Select proper clamp O.D. range and band width.
3. Determine Model Number.
4. Specify clamp number.
   Example: To fit Cast Iron pipe, 6.90 O.D. with 6" width, order: 161-0690-6

1. Clamp width should be equal to or greater than the pipe diameter for higher working pressures.
2. Not recommended for use for joining plain end pressure pipe.
3. Other ranges and widths available upon request.
4. Clamps do not prevent lateral movement of pipe. Applications in which the pipe may move out of the clamp, proper anchorage of the pipe must be provided.

Available Options Upon Request
Models 161-162

- Pipe sizes and ranges not listed
- Conductive Buttons
- Specialty Gaskets
- Tapped clamps, see page 14
- Other Sizes and Ranges

Certified to NSF/ANSI 61

JCM 161 Fabricated Lug Clamp Couplings
JCM 163 Fabricated Lug
Tapped Outlet All Stainless Steel
Clamp Couplings
Installation Instructions

1. Clean and scrape pipe. Remove any dirt or debris that would interfer with the complete sealing of the gasket around the pipe. Lubricate the pipe with soapy water. Do not use oil base pipe lubricant. *Trick of the Trade: Place a mark on the pipe to each side of the damaged area equal to the width of the clamp. This presents a visual mark to center the repair clamp over the damage area (1/2 of this distance is center).*

2. Inspect pipe for integrity, size and outside diameter. Confirm the proper size and range of repair clamp. Confirm proper outlet type and size.

3. Open the repair clamp by loosening (without removing) the nuts to the top of the stainless studs/bolts. Disengage the locking "C-Plate" and lift plate to open clamp. Wrap repair clamp around the pipe centering the clamp over the damaged area.

4. Tuck tapered gasket(s) in place ensuring there are no folds in the tapered edge.

5. Loosely close the clamp around the pipe by lifting the C-Plate(s) lip over the lug system stainless receiver bar, meeting the stud and fingers, and lock in place. Rotate the clamp slightly in the direction of the arrow stamped on the clamp band to ensure the tapered gasket lies flat under the clamp. **For Tapped Clamps:** Rotate tapped outlet into proper position.

6. Complete tightening of the clamp by squeezing the lugs together and tighten the nuts. Start at the center bolt and work out toward clamp ends, alternating from one side to the other for equal gap between clamp halves. Continue tightening sequence to reach the appropriate torque levels.

7. Tighten the nuts evenly with a hand wrench to the following torque values. To ensure proper torque level, wait 15 minutes and retighten to recommended torque. *Trick of the Trade: Pneumatic wrenches could cause the stainless nuts to seize on the stainless steel studs.*

5/8" Bolts/Studs tighten to 70 Foot Pounds of Torque*

8. For JCM Tapped Clamps, proceed with tapping process.

***Ensure proper torque level with a field grade torque wrench equal to the JCM 905 Torque Wrench.**

Note: Universal Clamp Couplings do not provide restraint of pipe ends. For applications in which pipe may pull out of clamp, external restraint must be provided.

INT161163-1105

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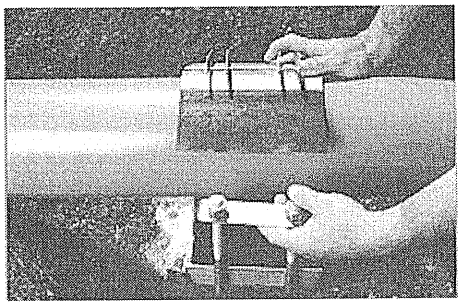
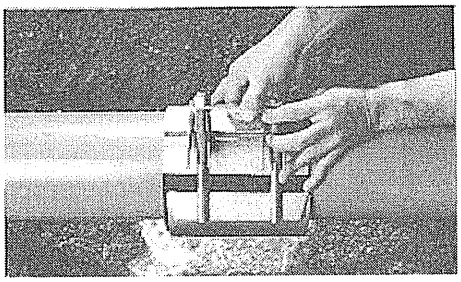
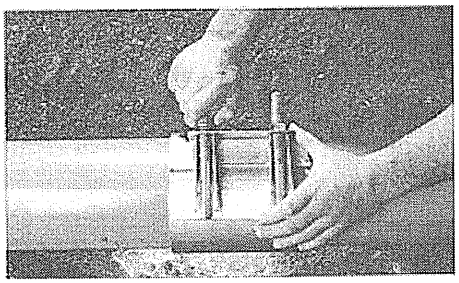


Open the repair clamp by loosening (without removing) the nuts to the top of the stainless studs/bolts. Disengage the locking "C-Plate" and lift plate to open clamp.

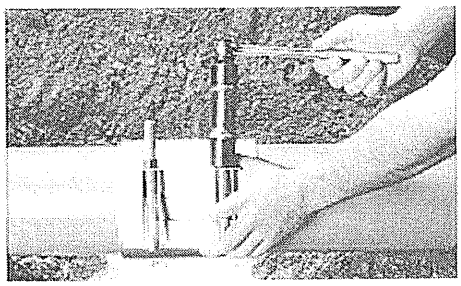
Wrap repair clamp around the pipe centering the clamp over the damaged area. Tuck tapered gasket in place ensuring there are no folds in the tapered edge.



Loosely close the clamp around the pipe by lifting the C-Plate lip over the lug system stainless receiver bar, meeting the stud and fingers, and lock in place. Rotate the clamp slightly in the direction of the arrow stamped on the clamp band to ensure the tapered gasket lies flat under the clamp.



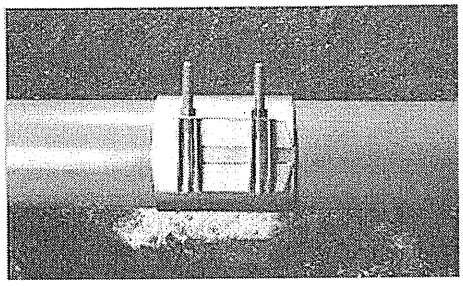
Complete tightening of the clamp by squeezing the lugs together and tighten the nuts to the appropriate torque levels.



Tighten the nuts evenly with a hand wrench to the following torque values. *Trick of the Trade: Pneumatic wrenches could cause the stainless nuts to seize on the stainless steel studs.*

5/8" Bolts/Studs tighten to 70 Foot Pounds of Torque*

***Ensure proper torque level with a field grade torque wrench equal to the JCM 905 Torque Wrench**



Completed JCM 161 Clamp Installation
For JCM 163 Tapped Clamps, proceed with tapping process.

INT161163-1105

Recommendations For Installation Of Fittings With Stainless Steel Bolts And Nuts

This JCM Quality Fitting is equipped with 18-8 stainless steel bolts and nuts for superior corrosion resistance. It is the nature of stainless steel fasteners to gall and freeze if not properly handled. This undesirable characteristic is due to the inherent properties of the stainless material. The galling and freezing action is often triggered by the presence of metal chips, burrs and grains of sand on the threads of the bolts and nuts.

Extra care has been taken by JCM prior to assembly and packing of this fitting to assure a trouble-free installation.

1. The nuts and bolts are made from material of different hardness so that they have different strengths.
2. The nuts are coated with a special (antiseize) coating.
3. Each nut is assembled by hand to be sure that it went on the bolt freely.
4. The bolts and nuts are handled carefully to avoid damage to the threads.
5. The bolts and nuts are made to exacting specifications to assure that the correct material is used and that the thread form is correct.

However, it must be pointed out that during field installation, the threads **MUST BE KEPT CLEAN AND FREE FROM NICKS.**

When a mild steel or bronze bolt is used, the low ultimate strength of the material allows the nut to tear itself free. Not so with 18-8 Stainless Steel. The ultimate strength of the material is so great, that it increases rapidly with cold work. However, once foreign matter such as a grain of sand wedges the threads, or the thread form is altered by over-torquing, the nuts cannot be removed.

The specially coated nuts supplied by JCM help to eliminate the galling caused by overtorquing, but **the bolts must be kept clean and not pitched or thrown into the tool bucket during installation. Should additional lubrication be required, a Molybdenum-Base lubricant is recommended.**

NOTE: Installation of this fitting with a pneumatic wrench may cause seizure of the nut. **A JCM 901 Master Wrench or JCM 905 Torque Wrench with Deep Socket is recommended.**

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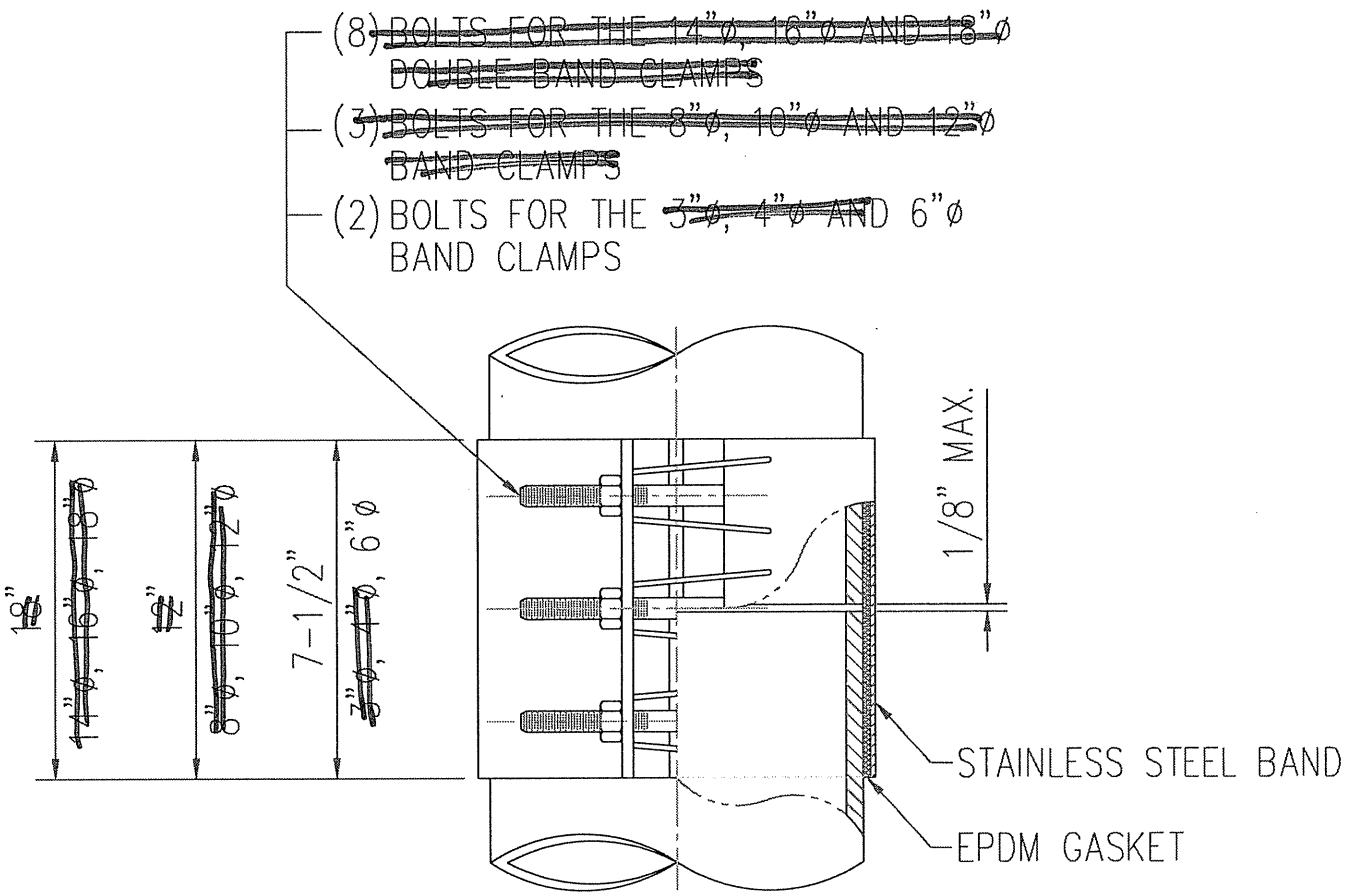

CLAMP COUPLING

SIZE ø	PART NUMBER	
	~~TUBE SIZE~~	PIPE SIZE
3"	161-0300-7	161-0350-7
4"	161-0400-7	161-0450-7
6"	~~161-0600-7~~	161-0663-7
8"	161-0800-12	161-0863-12
10"	161-1000-12	161-1075-12
12"	161-1200-12	161-1275-12

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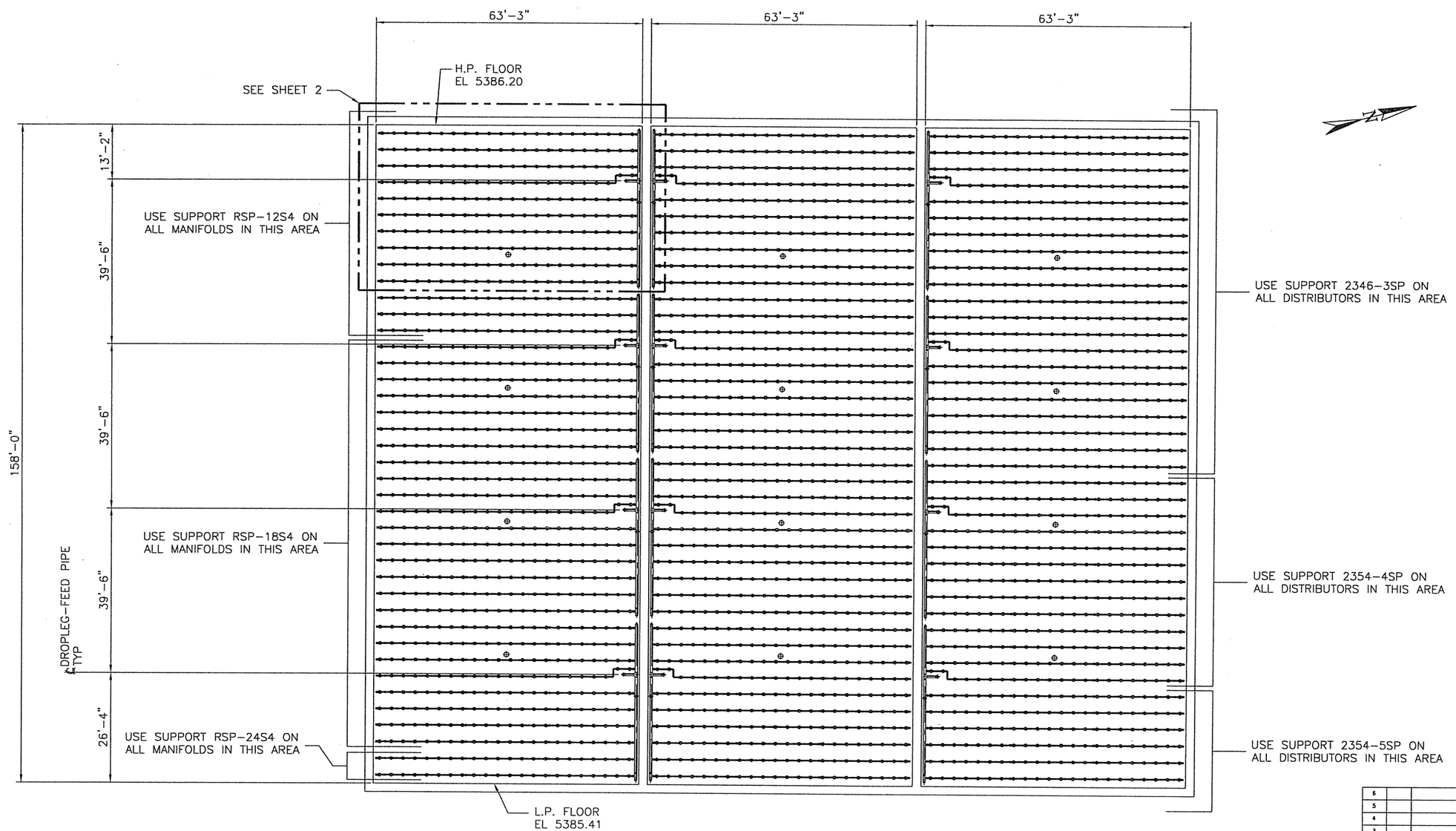
SANITAIRE
CORPORATION

DRAWN BY	CHECKED BY	APVD. BY	DWG. NO.	REV.
HPT	------	------	GEN-006009	--
DATE	NO. SHEETS	SCALE	PART NO.	
08/30/10	1 OF 1	------	--------	

8/23/2012

FOR APPROVAL ONLY – NOT FOR CONSTRUCTION



AERATION BASIN 1 AERATION BASIN 2 AERATION BASIN 3

AERATION BASINS 1, 2 & 3
KEY PLAN (1)

4/24	MEMBRANE DISC AERATION SYSTEM MATERIAL AND MANUFACTURING SPECIFICATIONS (304L, PVC)		
ITEM	MATERIAL SPECIFICATION	MANUFACTURING SPECIFICATION	NOTES
DROPLEG	304L STAINLESS STEEL ASTM A240	FITTINGS: ASTM A774 TUBULAR PRODUCTS: ASTM A778 DIMENSIONS: ASTM A554	150# DRILLING FOR TERMINATION FLANGE CONNECTION. SCH 5S PIPE (0.109") WALL THICKNESS ON DROPLEG. *SEE BELOW
SUPPORTS	304L STAINLESS STL SHEETS & PLATES PER ASTM A240 THREADED RODS PER ASTM A276	———	"L" GRADE NOT REQUIRED FOR NON-WELDED PARTS
BOLTS, NUTS, WASHERS	18-8 STAINLESS STL	———	———
FIXED JOINT O-RING	NATURAL RUBBER/SBR	———	45 ± 5 DUROMETER SHORE A COMPRESSION SET 5% MAX
LOWER DROPLEG & MANIFOLD	PVC, ASTM D1784 COMPOUND 12454-B	PIPE: ASTM D1785 FITTINGS: ASTM D2466	———
AIR DISTRIBUTORS	PVC, ASTM D3915 COMPOUND 124524	PIPE: ASTM D3034 FITTINGS: ASTM D3034	MINIMUM 2% TITANIUM DIOXIDE
DIFFUSER HOLDER SUBPLATE, RETAINING RING	PVC, ASTM D3915 COMPOUND 124524	———	MINIMUM 2% TITANIUM DIOXIDE
DIFFUSER ELEMENT	EPDM	———	———
PVC SOLVENT WELDING	ASTM D2564	ASTM D2855	———

*STAINLESS STEEL DROPLEG FABRICATION
FACTORY WELD ONLY WITH MIG, TIG, OR PLASMA-ARC WELDING INERT GAS PROCESSES, FULL PENETRATION BUTT WELDS, ER 316L FILLER WIRE. AFTER FABRICATION FINISH CLEAN ALL WELDED STAINLESS STEEL ASSEMBLIES BY FULL IMMERSION CLEANING TECHNIQUES IN ACCORDANCE TO 6.2.11 OF ASTM A380-88. THE ACID FOR USE DEFINED BY TABLE A2.1 OF ANNEX A2 OF ASTM A380. FINAL RINSE AND DRY IN ACCORDANCE TO SECTION 8.3 OF ASTM A380. ALL WELDED SURFACES TO CONFORM TO AISI NO. 2D FINISH.

2/3 — VIEW, SECTION OR DETAIL NUMBER; SHEET NUMBER ON WHICH VIEW, SECTION OR DETAIL IS FOUND

NO.	DATE	REVISION	BY
6			
5			
4			
3			
2			
1			

HAROLD D. THOMPSON REGIONAL
WATER RECLAMATION FACILITY
LOWER FOUNTAIN METROPOLITAN
SEWAGE DISPOSAL DISTRICT
COLORADO

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AERATION BASINS 1, 2 & 3

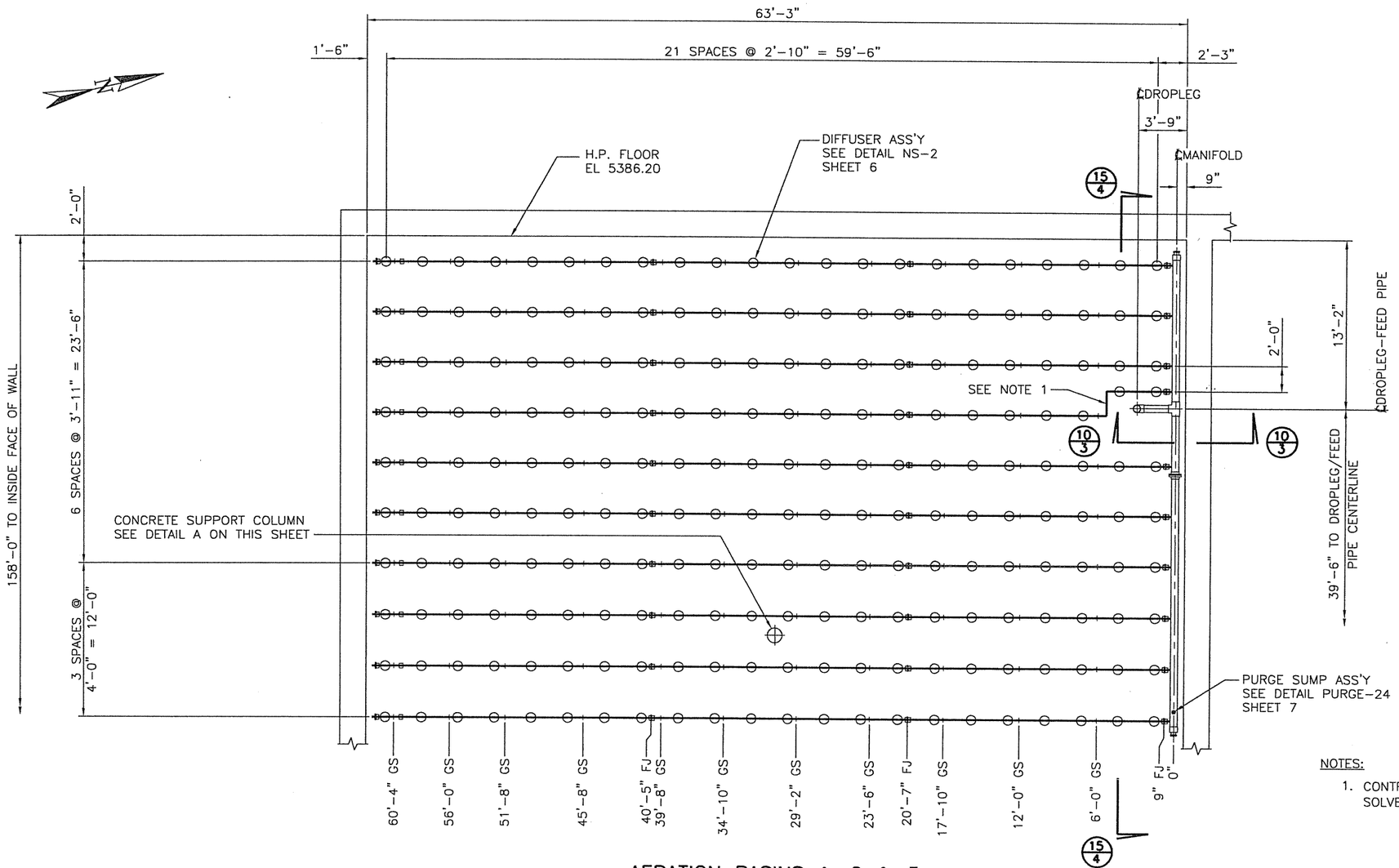
KEY PLAN

Sanitaire
a xylem brand
BROWN DEER, WISCONSIN 53223

DRWN BY BB	DATE 8-21-12	EQUIP. MEM	JOB. 12-7851S
CHKD BY JK	DATE 8-23-12	STD.	
APPVD BY JK	DATE 8-23-12	SIZE D REV. –	DWG. S-1

SHT 1 OF 7

8/23/12



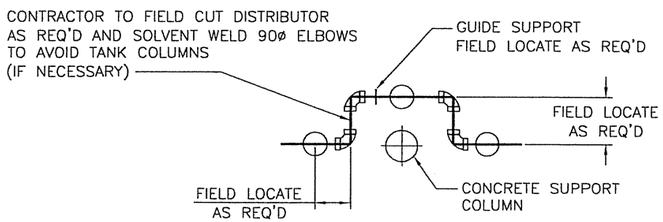
NOTES:

1. CONTRACTOR TO CUT PIPE TO SUIT AND SOLVENT WELD AS REQ'D IN THE FIELD.

AERATION BASINS 1, 2 & 3

(4) REQ'D AS SHOWN-BASIN 1
(8) MIRROR IMAGE-BASINS 2 & 3

PLAN VIEW (5)



NOTE:
PVC ELBOWS SUPPLIED LOOSE BY XYLEM.

DETAIL A

9"ø MEMBRANE DISC-SILVER SERIES II WE

GRID TYPE '1'

3 -TANK(S)
4 -GRID(S) PER TANK
10 -AIR DISTRIBUTORS PER GRID
22 -DIFFUSER HOLDERS PER AIR DISTRIBUTOR
220 -DIFFUSER ELEMENTS PER AIR DISTRIBUTOR
2640 -DIFFUSER ELEMENTS INSTALLED PER GRID
-TOTAL DIFFUSER ELEMENTS INSTALLED FOR THIS GRID TYPE

LEGEND

FJ - FIXED JOINT
SEE DETAIL FB-10A
SHEET- 5

GS - GUIDE SUPPORT (2346-3SP, 2354-4SP OR 2354-5SP)
SEE DETAIL SUP-1 OR SUP-2
SHEET- 6
SEE KEY PLAN ON SHEET 1
FOR SUPPORT TYPE & LOCATION

- FOR TYPICAL AIR DISTRIBUTOR SECTION
SEE DETAIL NS-1
SHEET- 5

NO.	DATE	REVISION	BY
6			
5			
4			
3			
2			
1			

HAROLD D. THOMPSON REGIONAL WATER RECLAMATION FACILITY
LOWER FOUNTAIN METROPOLITAN SEWAGE DISPOSAL DISTRICT
COLORADO

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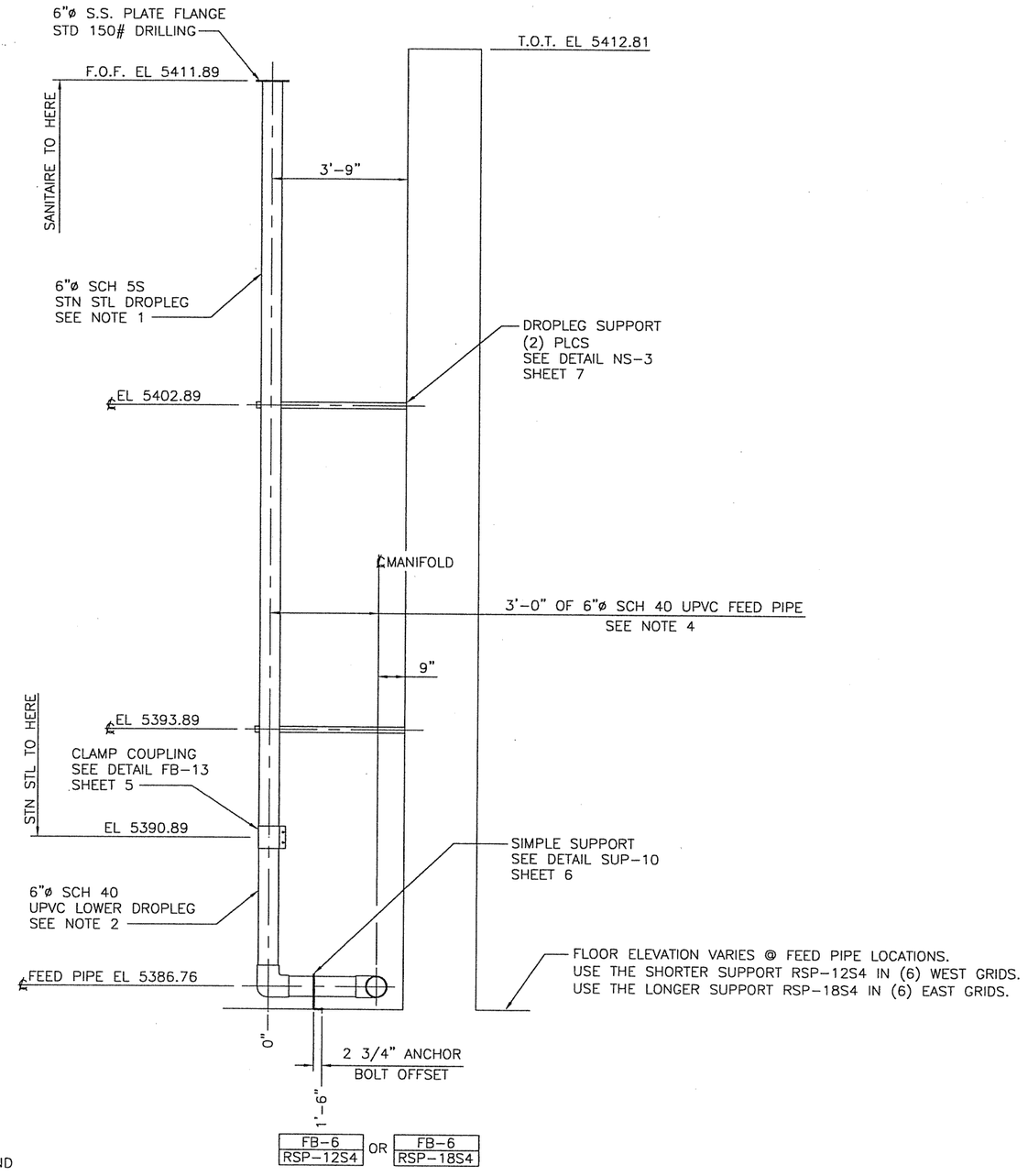
AERATION BASINS 1, 2 & 3

PLAN VIEW

Sanitaire
a xylem brand
BROWN DEER, WISCONSIN 53223

DRWN BY BB	DATE 8-21-12	EQUIP. MEM	JOB. 12-7851S
CHKD BY JK	DATE 8-23-12	STD.	DWG. S-2
APPVD BY JK	DATE 8-23-12	SIZE D REV. -	SHT. 2 OF 7



NOTES:

1. INSTALLATION OF THE DROPLEG REQUIRES A PROPERLY SUPPORTED AIR MAIN AND CONNECTION.
2. PVC DROPLEG WILL BE SHIPPED TO JOBSITE 6" LONGER THAN REQUIRED, TO ACCOUNT FOR TANK VARIANCES. CONTRACTOR TO CUT TO SUIT AND SOLVENT WELD INTO MANIFOLD TO MAINTAIN 1/8" MAXIMUM GAP BETWEEN STAINLESS STEEL AND PVC DROPLEGS.
3. FB-X / RSP-XXXX — FB-X REFERS TO THE MANIFOLD/FEED PIPE SUPPORT SIZE AND CORRESPONDS TO THE TABLE SHOWN WITH THE SUPPORT DETAIL. RSP-XXXX INDICATES THE SUPPORT STAND PART NUMBER.
4. CONTRACTOR TO CUT PIPE TO SUIT AND SOLVENT WELD AS REQ'D IN THE FIELD.

DROPLEG/FEED PIPE
AERATION BASINS 1, 2 & 3

(12) REQ'D AS SHOWN-ALL BASINS

SECTION (10)

NO.	DATE	REVISION	BY
6			
5			
4			
3			
2			
1			

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AERATION BASINS 1, 2 & 3

DROPLEG/FEED PIPE SECTION

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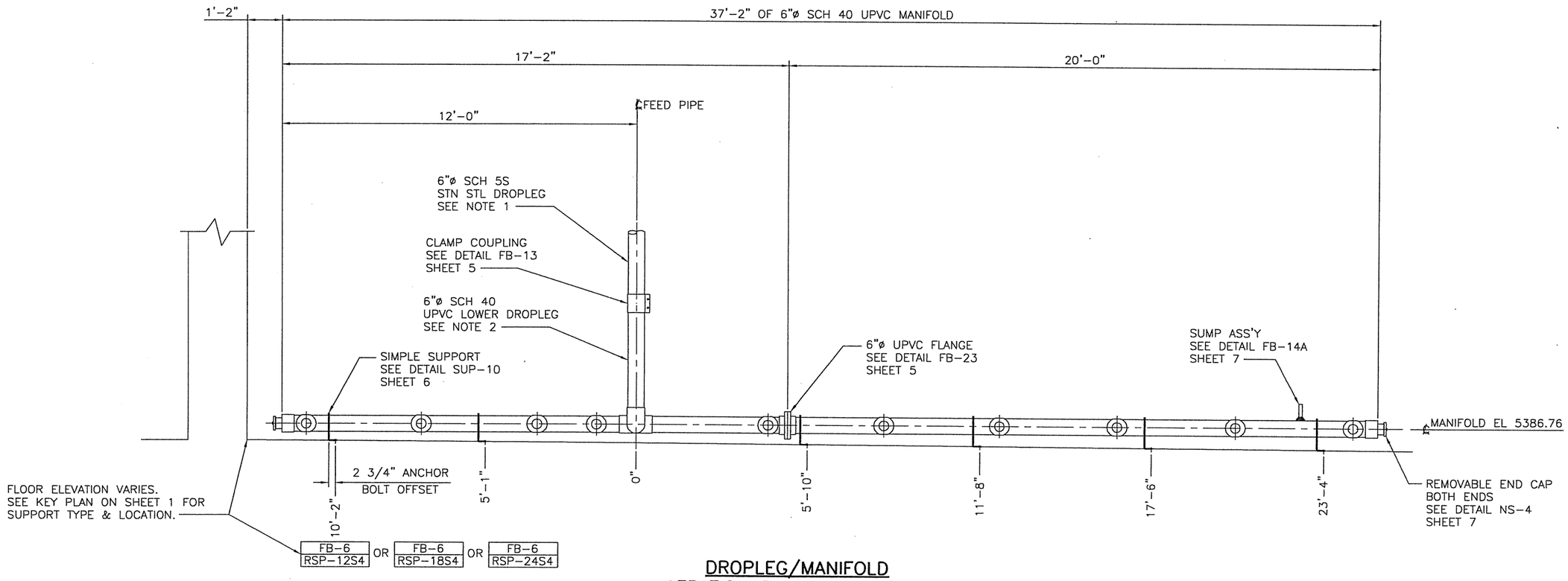
CHKD BY JK	DATE 8-23-12	STD.	DWG. S-3
APPVD BY JK	DATE 8-23-12	SIZE D REV. -	SHT. 3 OF 7



DROPLEG/MANIFOLD
AERATION BASINS 1, 2 & 3

(4) REQ'D AS SHOWN-BASIN 1
(8) MIRROR IMAGE-BASINS 2 & 3

SECTION (15)

NOTES:

1. INSTALLATION OF THE DROPLEG REQUIRES A PROPERLY SUPPORTED AIR MAIN AND CONNECTION.
2. PVC DROPLEG WILL BE SHIPPED TO JOBSITE 6" LONGER THAN REQUIRED, TO ACCOUNT FOR TANK VARIANCES. CONTRACTOR TO CUT TO SUIT AND SOLVENT WELD INTO MANIFOLD TO MAINTAIN 1/8" MAXIMUM GAP BETWEEN STAINLESS STEEL AND PVC DROPLEGS.
3. FB-X / RSP-XXXX — FB-X REFERS TO THE MANIFOLD/FEED PIPE SUPPORT SIZE AND CORRESPONDS TO THE TABLE SHOWN WITH THE SUPPORT DETAIL. RSP-XXXX INDICATES THE SUPPORT STAND PART NUMBER.

NO.	DATE	REVISION	BY
6			
5			
4			
3			
2			
1			

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AERATION BASINS 1, 2 & 3

DROPLEG/MANIFOLD SECTION

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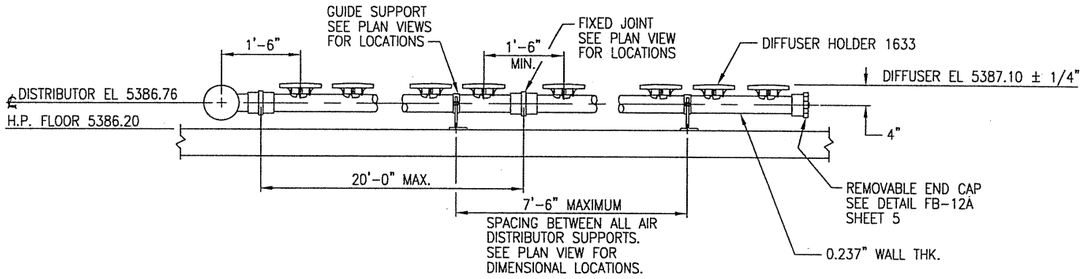
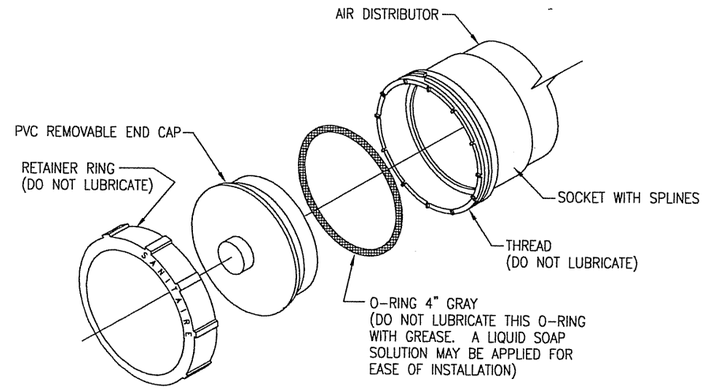
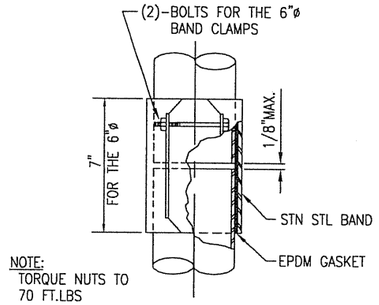
CHKD BY JK	DATE 8-23-12	STD.	DWG. S-4	
APPVD BY JK	DATE 8-23-12	SIZE D	REV. -	



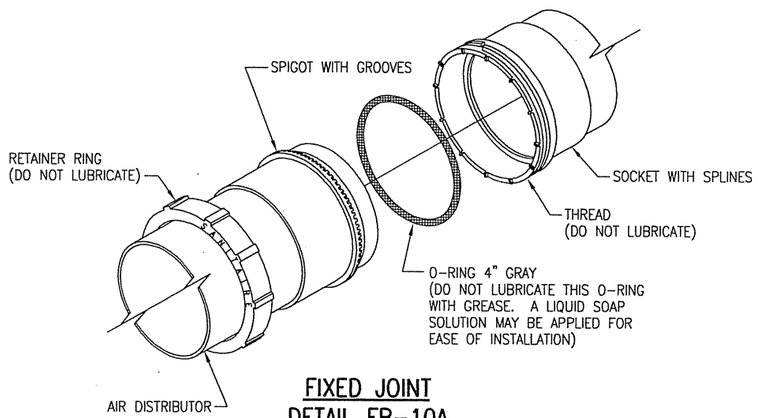
AIR DISTRIBUTOR
DETAIL NS-1



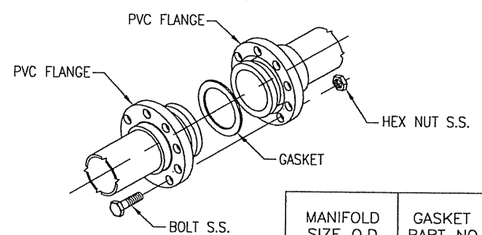
PVC REMOVABLE END CAP
DETAIL FB-12A



CLAMP COUPLING
DETAIL FB-13



FIXED JOINT
DETAIL FB-10A



MANIFOLD SIZE O.D.	GASKET PART NO.	BOLT SIZE	QUAN REQ'D PER FLANGE
6 5/8"	6-GASKET	3/4"ø X 4"	8

PVC FLANGE
DETAIL FB-23

NO.	DATE	REVISION	BY
6			
5			
4			
3			
2			
1			

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TYPICAL DISTRIBUTOR DETAIL
&
DETAILS

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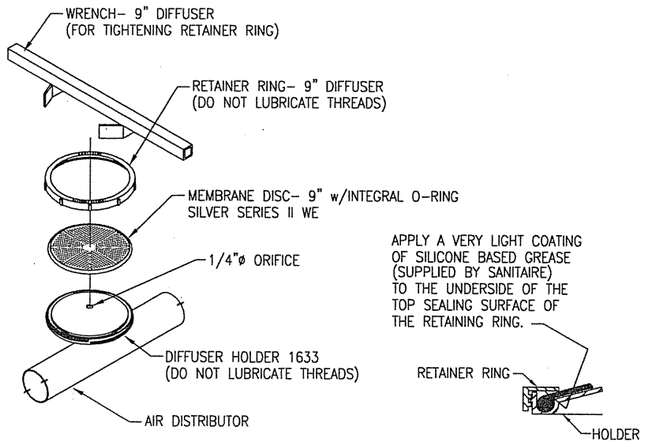
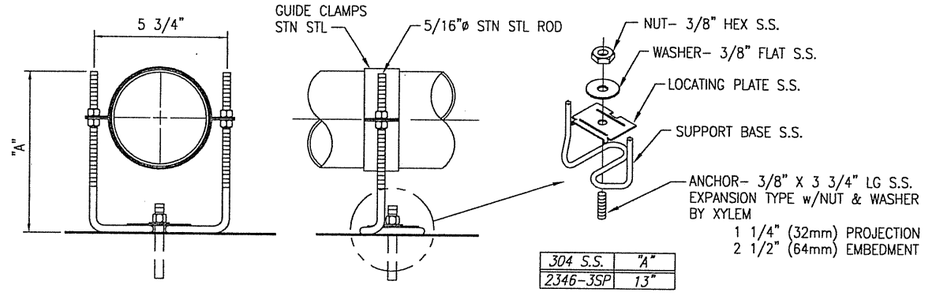
CHKD BY JK	DATE 8-23-12	STD.	
APPVD BY JK	DATE 8-23-12	SIZE D REV. -	DWG. S-5

SHT. 5 OF 7



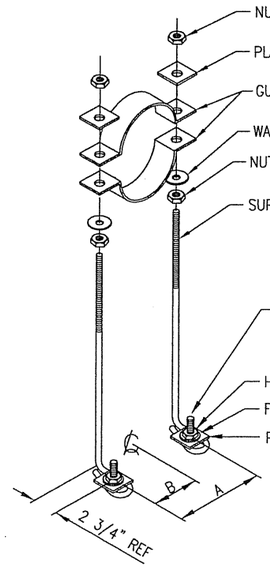
LUBRICATION DETAIL

9"ø EPDM DIFFUSER ASSEMBLY
DETAIL NS-2



304 S.S.	"A"
2346-3SP	13"

GUIDE SUPPORT
DETAIL SUP-1

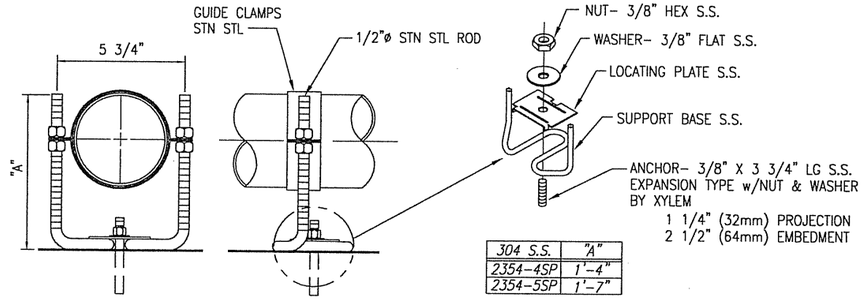


ANCHOR SPACING		
MAN. DIA.	A	B
6"ø	8 3/4"	4 3/8"

MAN. IDENT	MAN. DIA.	SUPPORT BASE	GUIDE STRAP 304	PLATE WASHER 304
FB-6	6"	SEE DRAWINGS	CG6625-4	2278-1W4

FINE BUBBLE AERATION SYSTEM EXPANSION ANCHOR CHART			
MANIFOLD DIA.	ANCHOR BOLT	PROJECTION HOLD	EMBEDMENT
6"	1/2"ø X 4 1/2"	1 3/4"	2 3/4"

SIMPLE SUPPORT
DETAIL SUP-10



304 S.S.	"A"
2354-4SP	1'-4"
2354-5SP	1'-7"

GUIDE SUPPORT
DETAIL SUP-2

NO.	DATE	REVISION	BY
6			
5			
4			
3			
2			
1			

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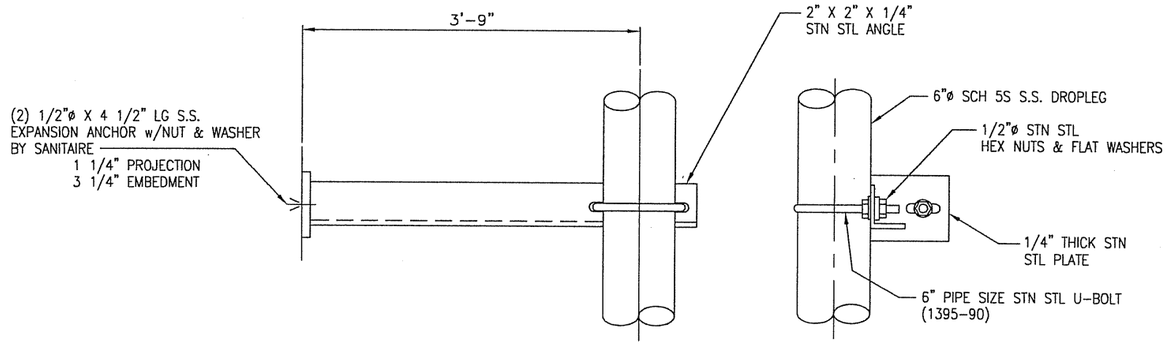
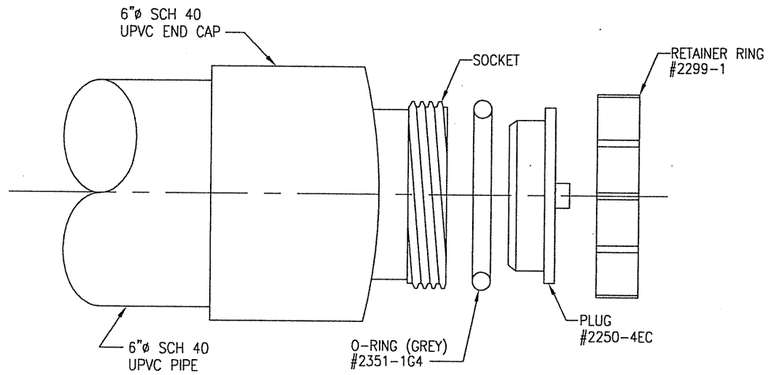
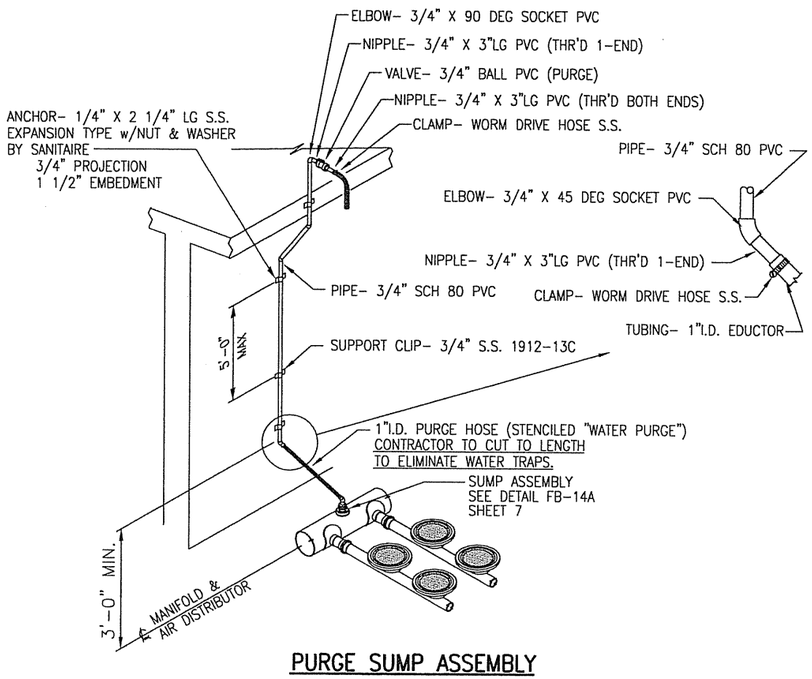
APPVD BY JK	DATE 8-23-12	SIZE D REV. -	SHT. 6 OF 7



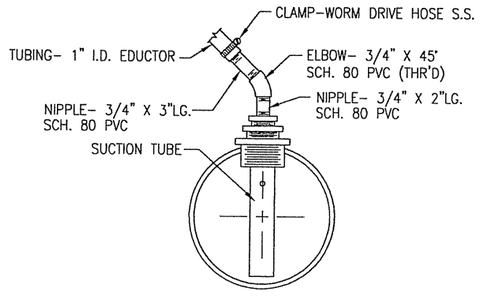
DROPLEG SUPPORT
DETAIL NS-3



REMOVABLE END CAP
DETAIL NS-4



PURGE SUMP ASSEMBLY
DETAIL PURGE-24



PURGE SUMP
DETAIL FB-14A

NO.	DATE	REVISION	BY
6			
5			
4			
3			
2			
1			

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DETAILS

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CHKD BY JK	DATE 8-23-12	STD.	
APPVD BY JK	DATE 8-23-12	SIZE D REV. -	DWG. S-7

SHT. 7 OF 7