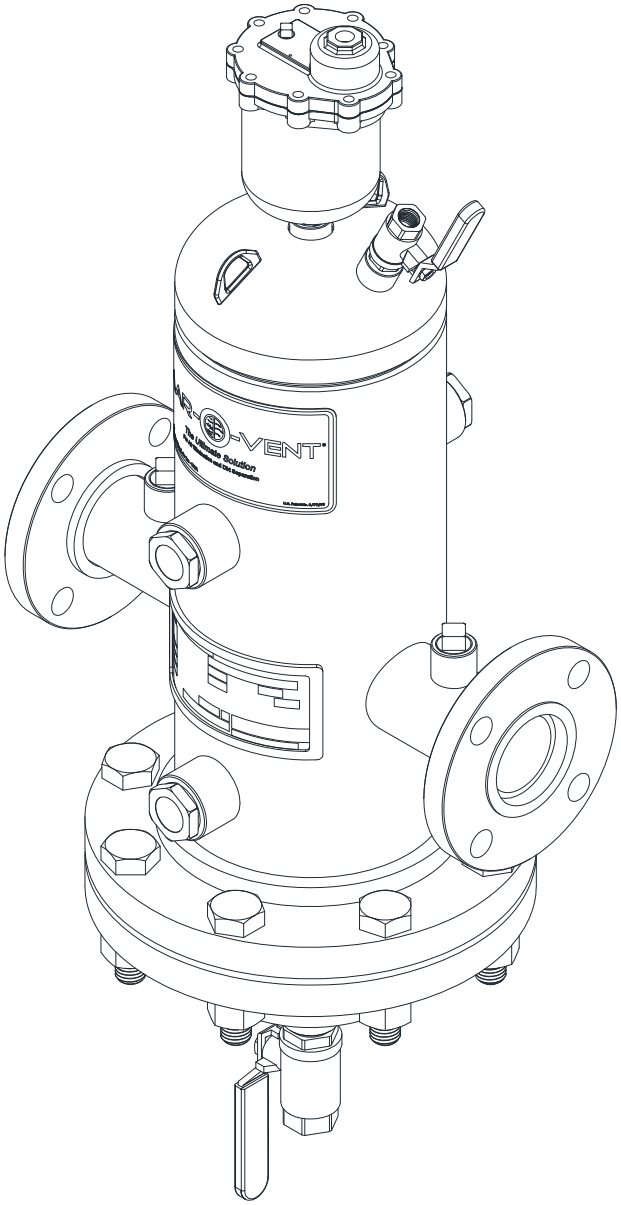
High Performance Air & Dirt Separators
Manual # 9636-1230 Rev. A

Operation & Maintenance Manual



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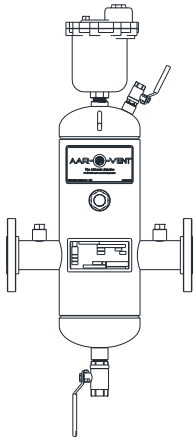
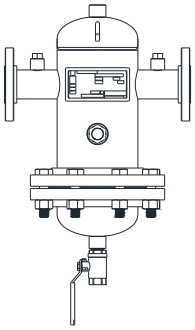
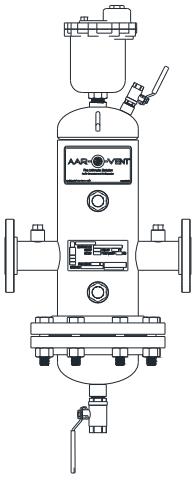
Section 1
General Product Information

1.1 Overview

The *Aar-O-Vent*® is another product in the long line of innovations. It has been carefully assembled and factory tested to provide years of trouble-free service. This manual provides information to install, operate, service and maintain the *Aar-O-Vent*. Multiple *Aar-O-Vent* models are covered (Figure 1-1). There are three main types of *Aar-O-Vent*: Air Separator (Air Only), Dirt Separator (Dirt Only), and combination Air & Dirt Separator.







Model Designation

Air Separator

ASF - Standard Velocity Air Separator
AHF - High Velocity Air Separator

Dirt Separator

DSR - Standard Velocity Dirt Separator with Removable Cover
DHR - High Velocity Dirt Separator with Removable Cover
DSF - Standard Velocity Dirt Separator with Fixed Cover
DHF - High Velocity Dirt Separator with Fixed Cover

Air & Dirt Separator

SVR - Standard Velocity Air & Dirt Separator with Removable Cover
HVR - High Velocity Air & Dirt Separator with Removable Cover
SVF - Standard Velocity Air & Dirt Separator with Fixed Cover
HVF - High Velocity Air & Dirt Separator with Fixed Cover

(L) AFTER ANY MODEL # DENOTES "LESS OPTIONS"

Figure 1-1 Overview

Section 2
Safety Information/Warnings

2.1 Safety Information and Warnings

Every practical safety feature has been incorporated into the design and manufacture of the *Aar-O-Vent*. If questions are not answered by this manual, or if specific installation, operation, and/or maintenance procedures are not clearly understood, contact your local representative before proceeding. Personnel must, at all times, observe all safety regulations while performing maintenance or repairs.

All installation, operation, and maintenance procedures should be performed by qualified, experienced and well trained personnel. The potential exists for severe personal injury if proper procedures are not followed.

Depending on the size of *Aar-O-Vent*, the bundle can be quite heavy. It is recommended that supports be used when removing the head and bundle. Once all bolts have been removed from the head, the head and bundle are free to drop. Risk of severe personal injury and/or property damage may occur if the bundle and head are not supported.

5" and larger *Aar-O-Vents* have lift lugs to aid in lifting and locating the unit. The lift lugs are not intended to be used to support the *Aar-O-Vent* during operation. Adequately sized and spaced supports/hangers should be used to prevent damage or strain on the system piping.

The *Aar-O-Vent* is not designed to be used as a make-up water inlet point. Using any of the connections for make-up water would impede proper operation and void the warranty.

System water over 100°F can be very hazardous. Keep flow away from the body when flushing the unit. Failure to do so could result in serious bodily injury or property damage.

Section 3
Component Identification and Information

3.1 Component Identification

The following paragraphs contain functional descriptions for each of the major components of *Aar-O-Vent*. This manual provides information for multiple *Aar-O-Vent* models. All the components listed have the same functional purpose in each model.

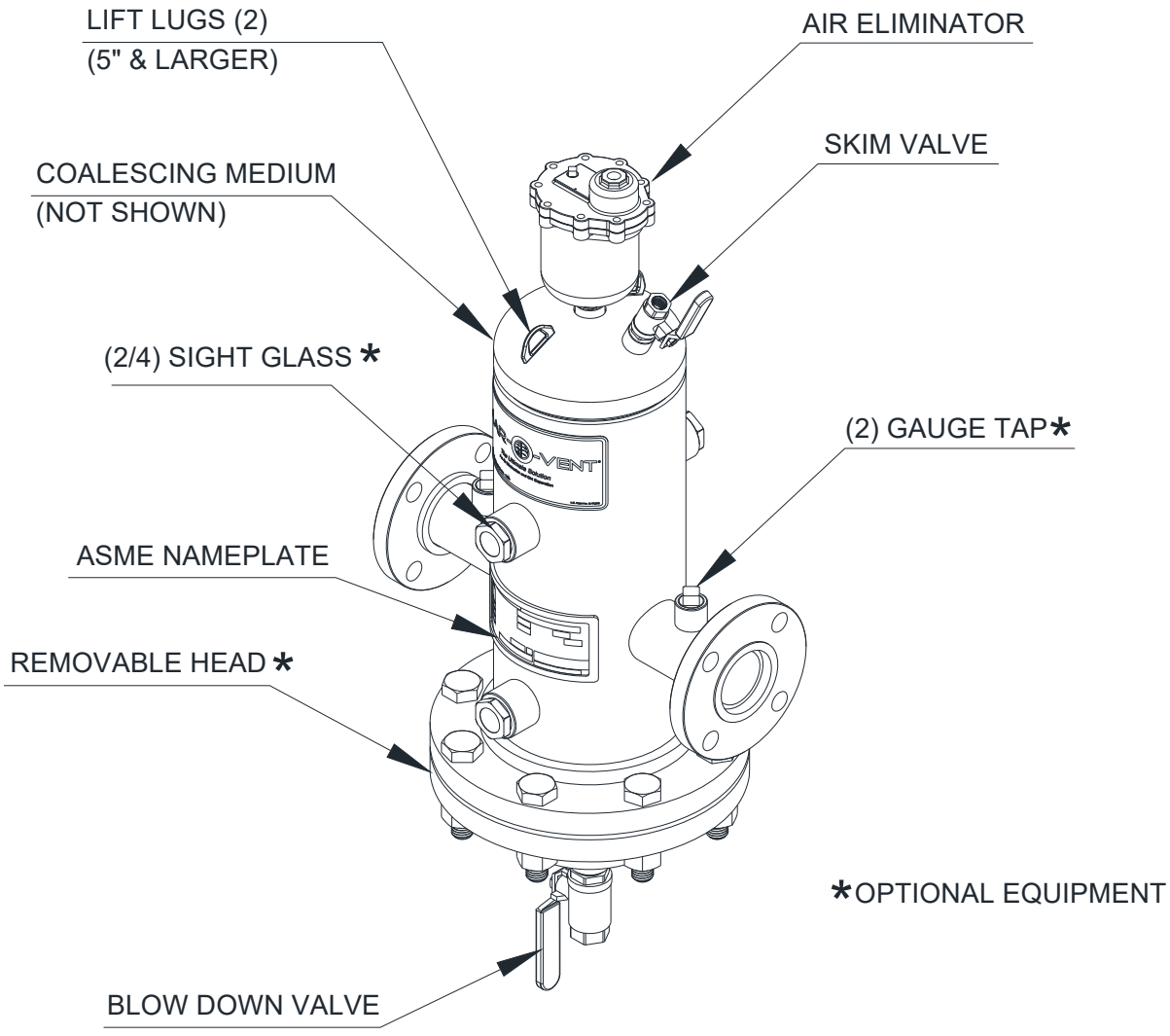


Figure 3-1 Components

3.1.1 Coalescing Medium

Each *Aar-O-Vent* model incorporates an all stainless steel coalescing medium often referred to as the bundle. This coalescing medium eliminates virtually any dirt particles, air bubbles and/or entrained air from the water by means of an air eliminator or blow down valve. This patented design resists corrosion and can be easily cleaned.

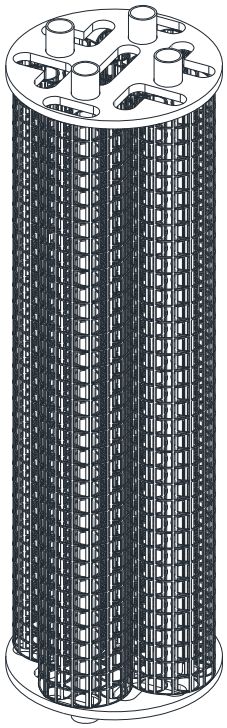


Figure 3-2 Coalescing Medium

3.1.2 Sight Glass (Optional)

One of the optional features offered with each *Aar-O-Vent* is sight glasses. Sight glasses allow the user to periodically check the coalescing medium for signs of dirt build-up.

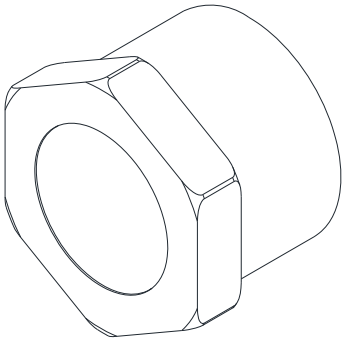


Figure 3-3 Sight Glass

3.1.3 Removable Head Option

The removable head option allows the user to easily remove the bundle for cleaning or inspection, available on all models.

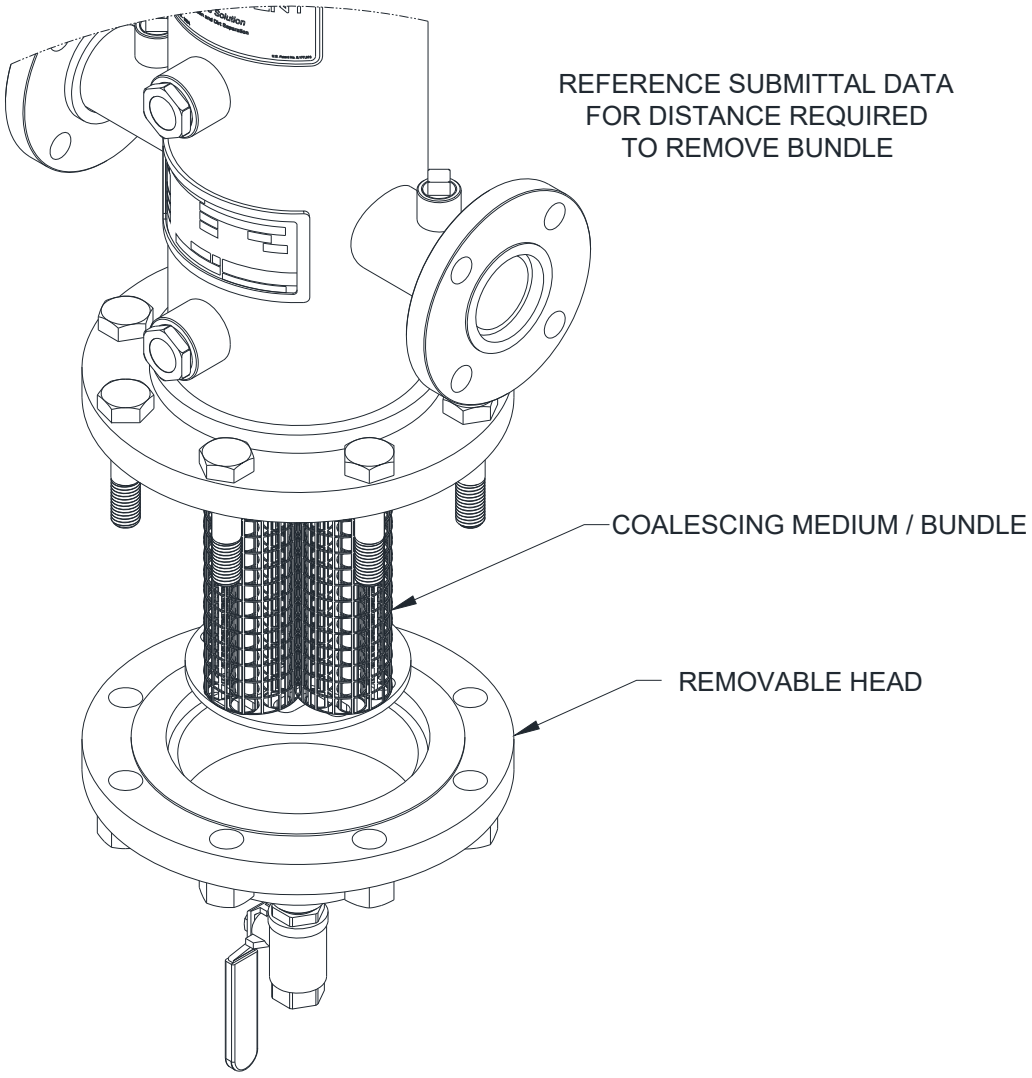


Figure 3-4 Removable Head Detail

Depending on the size of *Aar-O-Vent*, the bundle can be quite heavy. It is recommended that supports be used when removing the head and bundle. Once all bolts have been removed from the head, the head and bundle are free to drop. Risk of severe personal injury and/or property damage may occur if the bundle and head are not supported.

3.1.4 Model 720 Air Eliminator

The Model 720 Air Eliminator is a unique high capacity, air elimination device. It is designed to eliminate air as fast as it can be separated from liquid. The valve will not open if negative pressure occurs, preventing air from being drawn back into the system.

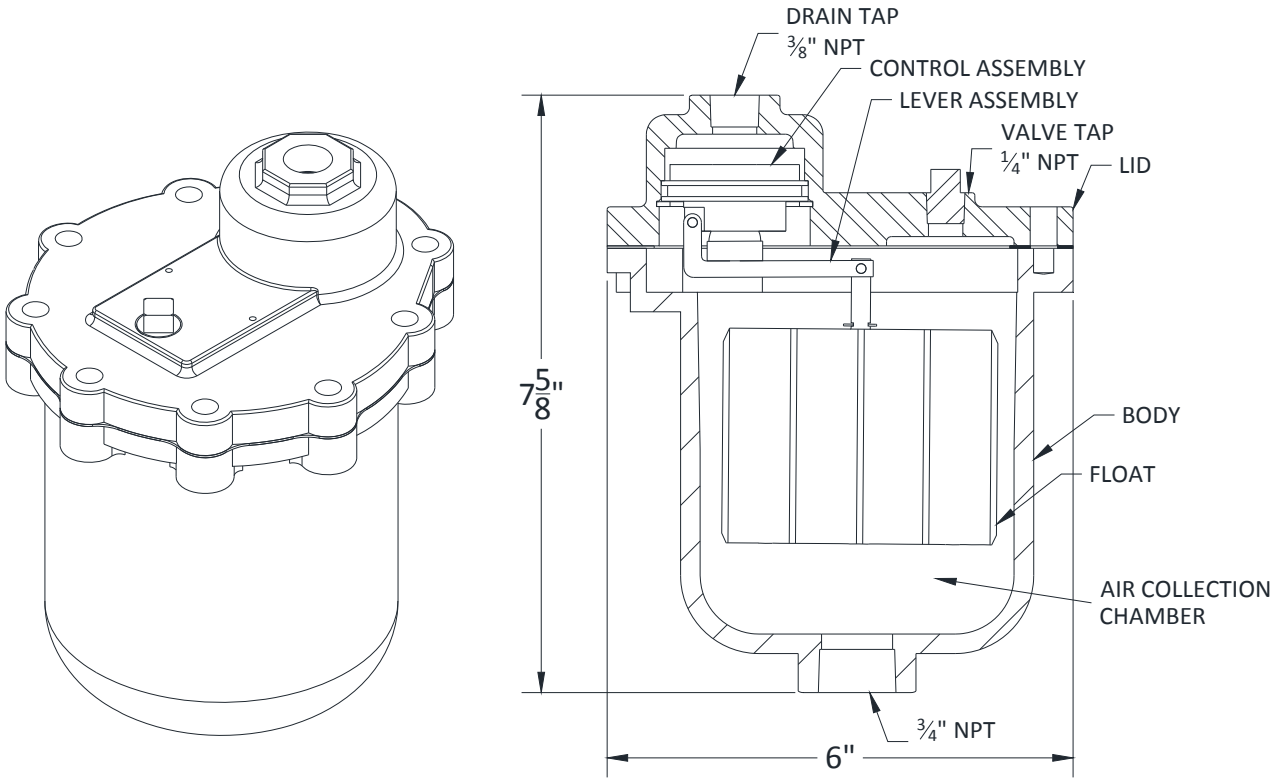


Figure 3-5 Air Vent

Air Eliminator Operation

The air eliminator is used on the *Aar-O-Vent* to remove unwanted air that could reduce system performance, increase operational cost, and support the damaging effects of corrosion.

The collection of air in the body of the air eliminator causes the float to drop allowing the air to be vented through an air eliminating orifice. As the liquid level rises in the air eliminator body, the float also rises shutting off the flow of vented air (Figure 3-5).

Section 4
Installation and Operation

4.1 Installation Tips

The following procedures are to aid the operator in installing the *Aar-O-Vent*. All procedures are to be performed by experienced, trained, and certified personnel only.

5" and larger *Aar-O-Vents* have lift lugs to aid in lifting and locating the unit. The lift lugs are not intended to be used to support the *Aar-O-Vent* during operation. Adequately sized and spaced supports/hangers should be used to prevent damage or strain on the system piping.

1. To protect the *Aar-O-Vent* during shipping, some of the components are shipped unattached in protective packaging. These components are to be installed on site. See Figure 3-1 for component locations.
2. The *Aar-O-Vent* should be located where it is easily accessible for inspection, service and repair.
3. A standard *Aar-O-Vent* should be installed in-line in the system piping, in a vertical position only. Adequately sized and spaced pipe supports/hangers should be used to prevent damage or strain on the system piping.
4. An *Aar-O-Vent* should be installed in a piping system at its lowest point of solubility. Typically the point of highest temperature and lowest pressure is the ideal location.
5. When placing the *Aar-O-Vent* with removable head in the system piping, be aware of the clearance required for bundle removal and cleaning. See Submittal Data for distance required to remove bundle.
6. When piping the unit into system piping, the pipe should be sized to allow adequate flow at a minimal head loss, and be, at minimum, the same size as the *Aar-O-Vent* connections. The use of elbows, tees or other restrictive fittings should be kept to a minimum.
7. Isolation valves are recommended to allow gasket changes and inspection of the bundle.
8. Expansion joints and or flex connectors are recommended to prevent pipe strain caused by thermal expansion or piping misalignment.
9. System by-pass piping is also recommended to better facilitate system service and maintenance.
10. The *Aar-O-Vent* will operate with flow entering the unit at either connection.

4.1 Installation Tips (Continued)

Using the figure below as reference only, note the steps outlined to install piping for the *Aar-O-Vent* (Figure 4-1).

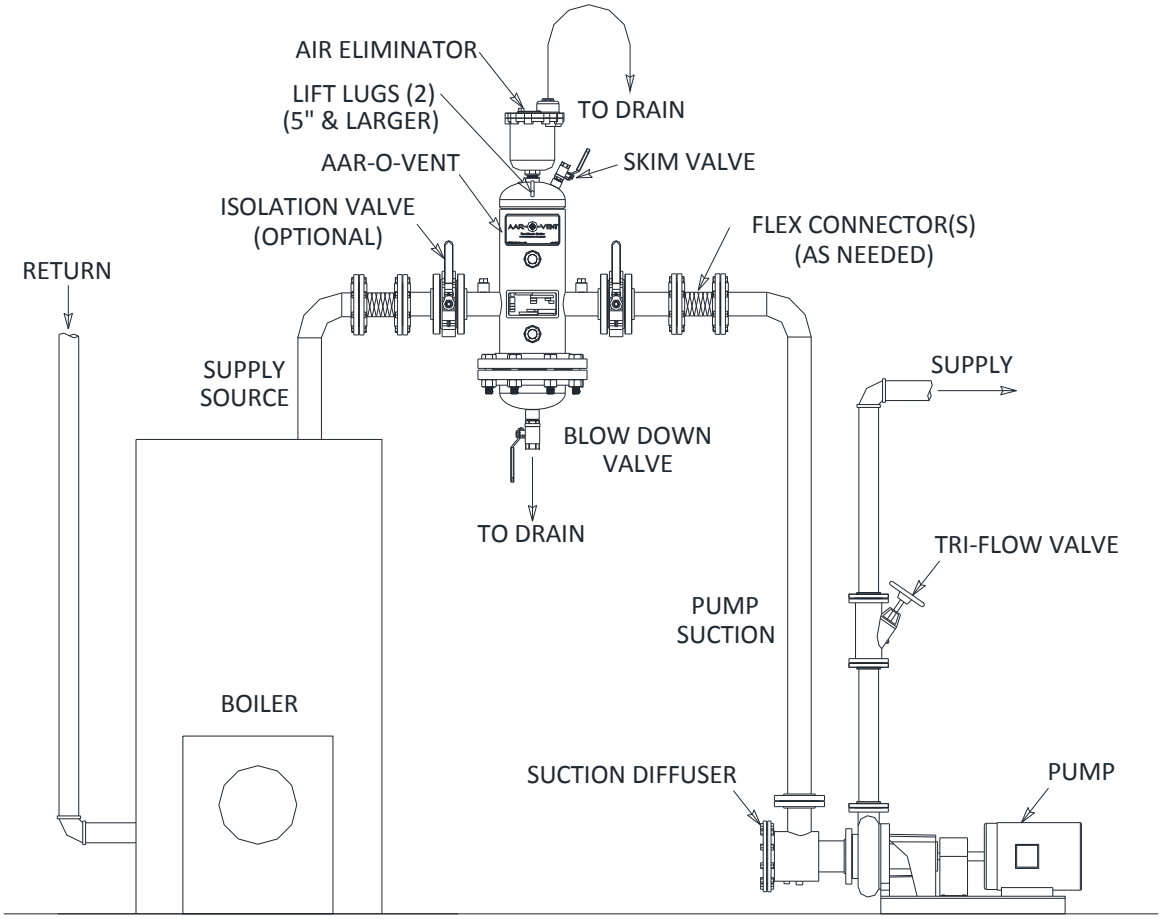


Figure 4-1 Typical Piping Diagram

1. Connect the supply source to one connection of the *Aar-O-Vent*.
2. Connect suction piping of the pump to the other connection of the *Aar-O-Vent.*
3. The air vent, the blow down valve and the skim valve should be run to an adequate drain.
4. Once all connections are made, allow the system to completely fill with water. Opening the skim valve will speed up this process.
5. After the unit is completely filled, the *Aar-O-Vent* is ready for operation.

4.2 Operation

Heating/cooling system efficiency and component life is greatly dependent on water quality. Air and dirt particles can cause pump cavitation, corrosion and increased component wear. In a closed loop system, the *Aar-O-Vent* eliminates air bubbles, entrained air and dirt particles quickly and easily.

Air Elimination:

The *Aar-O-Vent* in “Air Only”, “Dirt Only” and combination units “Air and Dirt”. The “Air Only” and “Air & Dirt” units are the only models that utilize the Model 720 air elimination device, air vent. They also have extra space in the top of the vessel for the collection of air. Outlined below is operational information on the air elimination feature of the *Aar-O-Vent*. Use Figure 4-2 for reference (“Air and Dirt” model shown).

- Large air bubbles in the system water enter the *Aar-O-Vent* and collide with the coalescing medium. They quickly rise to the top of the vessel and into the air elimination device.
- Micro bubbles coalesce and form larger bubbles. The larger bubbles then rise to the top of the vessel and into the air elimination device.
- Entrained air is pulled out of solution and forms micro bubbles. The micro bubbles coalesce forming larger bubbles. The larger bubbles rise to the top of the vessel and into the air elimination device.
- As air bubbles collect at the top of the vessel they create an air pocket. This pocket of air pushes the water level down inside the vessel. As the water level drops, the float inside of the air elimination device also drops releasing the air to atmosphere.
- The air elimination device releases air as fast as it can be separated. It will not allow air back into the system, even if a vacuum occurs.
- Once the air has been released, the water level will rise inside the vessel. This causes the float to rise and close the air elimination device.

This cycle will continue as new water is introduced into the system piping. With each pass of system water the *Aar-O-Vent* will eventually eliminate up to 99.7% of dissolved oxygen content in the system piping.

The *Aar-O-Vent* is not designed to be used as a make-up water inlet point. Using any of the connections for make-up water would impede proper operation and void the warranty.

4.2 Operation (Continued)

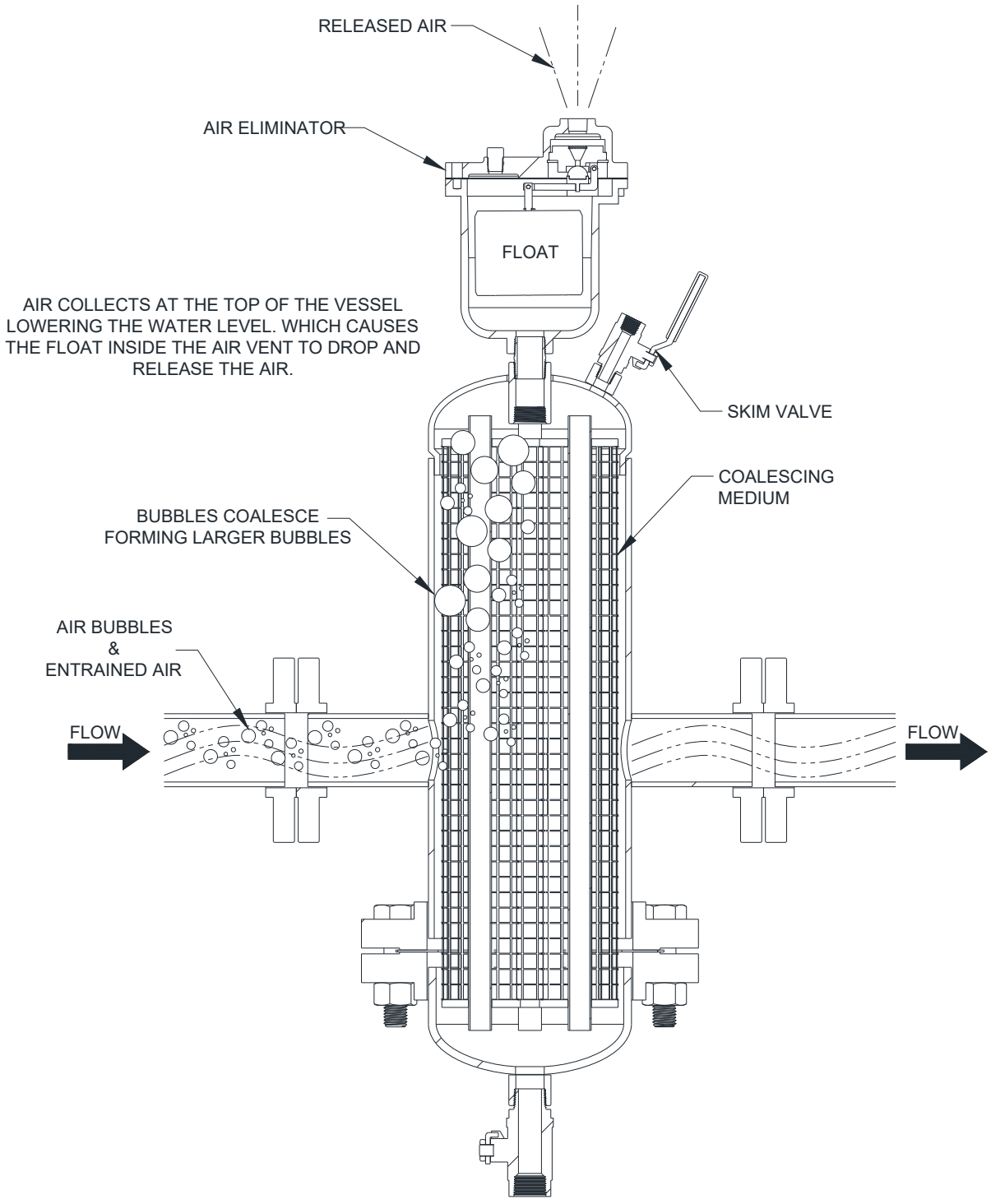


Figure 4-2 Operation (Air Elimination)

4.2 Operation (Continued)

Dirt Elimination:

The “Dirt Only” and “Air & Dirt” *Aar-O-Vent* models have extra space in the lower section of the vessel for collection of dirt particles. Outlined below is the operational information on the dirt elimination feature of the *Aar-O-Vent*. Use Figure 4-3 for reference (“Air and Dirt” model shown).

- Dirt particles in the system water enter the *Aar-O-Vent* and collide with the coalescing medium.
- The coalescing medium creates an area of less turbulence allowing the dirt particles to fall out of the flow path and to the bottom of the vessel.
- Dirt particles will continue to collect at the bottom of the vessel until they are flushed out through the blow down valve.
- Floating debris can be flushed out by opening the skim valve located on the top of the vessel.
- Should the need to clean the coalescing medium arise, the removable head provides ease of removal and cleaning.

Depending on the size of *Aar-O-Vent*, the head and bundle can be quite heavy. It is recommended that supports be used when removing the head/bundle. Once all bolts have been removed from the head, the head and bundle are free to drop. Risk of severe personal injury and/or property damage may occur if the bundle and head are not properly supported.

4.2 Operation (Continued)

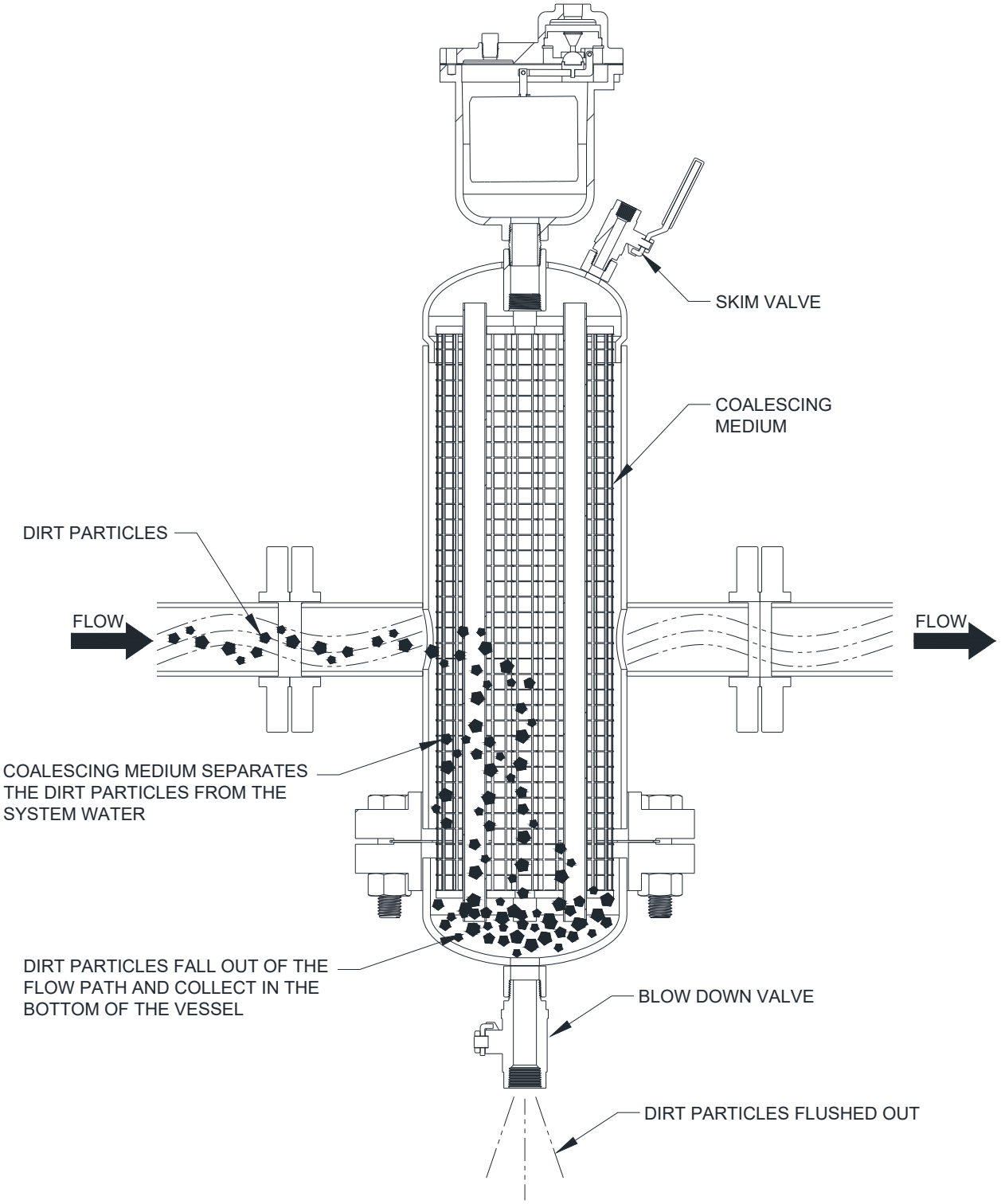


Figure 4-3 Operation (Dirt Elimination)

Section 5
Maintenance Information

5.1 Maintenance Information

The *Aar-O-Vent's* simple design allows for minimal maintenance. There are no moving parts other than the air elimination device itself.

- Routine flushing of the blow down valve and skim valve are recommended. Frequency of flushing is system specific based on water quality. A container or hose should be used to catch the sediment when flushing the valves, unless they are piped to an adequate drain.

System water over 100°F can be very hazardous. Keep flow away from the body when flushing the unit. Failure to do so could result in serious bodily injury or property damage.

- The coalescing medium (bundle) can be removed for cleaning as needed. A power washer or hose is sufficient. The stainless steel construction allows for ease of cleaning. A new gasket should be installed upon reassembly of the unit. Tighten all bolts in a criss-cross fashion, properly torqued. See chart below.

Depending on the size of *Aar-O-Vent,* the head and bundle can be quite heavy. It is recommended that supports be used when removing the head/bundle. Once all bolts have been removed from the head, the head and bundle are free to drop. Risk of severe personal injury and/or property damage may occur if the bundle and head are not properly supported.

- When replacing the gaskets and reassembling the unit, the bolts should be torqued incrementally to 30%, 60% and then 100% of the appropriate value shown in the chart below. They should also be torqued in a criss-cross pattern.

Aar-O-Vent Connection size	Removable Head Size	Bolt Size	Number of Bolts	Torque Ft/Lb (**150#** Flgs.)
2”	6”	3/4”	8	50
2.5”	6”	3/4”	8	50
3”	6”	3/4”	8	50
4”	8”	3/4”	8	50
5”	10”	7/8”	12	80
6”	12”	7/8”	12	80
8”	16”	1”	16	123
10”	20”	1 1/8”	20	195
12”	24”	1 1/4”	20	273

JAER, JAPR, JWTA Series

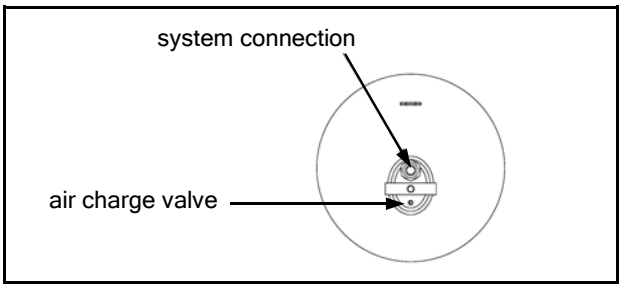
ASME Type IV Bladder Tanks For 10 to 135 Gallon Sizes

GENERAL INSTRUCTIONS

1. Type IV replaceable bladder type expansion, thermal expansion, and hydro-pneumatic tanks may be installed in a vertical or horizontal position.
2. In order to properly check or modify the air charge pressure on the tank after the system is filled with water, shut-off and drain valves must be installed in the piping connected to the tank.
3. The drain valve is used to flush the system and to drain the water out of the tank prior to changing the air charge pressure.
4. An automatic air vent must be installed in the piping to the expansion tank to vent off accumulated air.
5. A pressure gauge must be installed to properly monitor the system pressure at the tank.
6. A minimum overhead clearance of approximately 18" is required to remove and replace the bladder if necessary.

INSTALLATION INSTRUCTIONS

1. Note the location of the NPT system connection, Schrader type air charge valve, and drain plug.



2. Inspect the connections and the tank for signs of damage that may have occurred during shipping.
3. Locate the nameplate and verify that the tank is suitable for the operating conditions of the system. The marked maximum allowable working pressure (MAWP) must be greater than or equal to the maximum system operating pressure. The marked maximum design temperature must be greater than or equal to the maximum system operating temperature.

OPERATING / MAINTENANCE INSTRUCTIONS

1. All Type IV bladder tanks are shipped from the factory with a precharge air pressure of 12 PSIG. Use an accurate pressure gauge to check the air charge pressure prior to installation. Notify the factory immediately if a loss of pressure has occurred.
2. Prior to installation, set the desired air charge pressure. The air charge pressure in the tank is typically set 3 to 5 PSI below the fill pressure of the system. Note that the air charge pressure for the standard Type IV tank must not exceed 80 PSIG. If an air charge pressure of more than 80 PSIG is required, a high pressure fill tube may be required.
3. Charge the tank with nitrogen or with oil-free compressed air. Check the pressure frequently during the filling process.
4. IMPORTANT: To accurately set the air charge pressure, the tank must be charged with nitrogen or air at ambient temperature.
5. WARNING: Excessive pressure may cause the tank to fail. Failure to follow these instructions may result in serious personal injury and property damage.
6. Connect the tank to the system. Each piping connection must include a lock shield gate valve and union to allow the tank to be isolated from the system or safely removed if necessary.
7. WARNING: Do not remove the drain plug on the tank or loosen the hold down nut on the cover plate. Removing the drain plug or loosening the hold down nut will cause a loss of air charge pressure.
8. Check the air charge pressure before filling the system with water. Verify that the air charge pressure is correct for the system.
9. Leak check all connections on the tank, including the cover plate seal, with a suitable leak detector solution.
10. When filling the system with water, all valves in the piping leading to the tank must be open to ensure that the air in the bladder is displaced by the system water.
11. If the air charge pressure needs to be changed after the system is filled with water, follow these steps:
    a. Shut off the heat source and allow the system water to cool to ambient temperature.
    b. Close the lock shield valve in the system piping.

OPERATING / MAINTENANCE INSTRUCTIONS (CONT.)

c. Open the drain valve in the system piping and allow the water to drain from the tank.

d. Check the air charge pressure with an accurate pressure gauge and charge the tank to the desired set pressure.

e. Close the drain valve, open the lock shield valve, and turn on the system heat source.

12. During normal system operation, follow standard preventative maintenance procedures.
13. IMPORTANT: Periodically check the tank for signs of leakage or corrosion and monitor the air charge pressure to ensure safe and efficient operation of the tank and system.
14. Loss of the air charge pressure is typically an indication that either the Schrader air charge valve may be leaking or the bladder may be leaking.

SCHRADER VALVE INSPECTION AND REPLACEMENT

1. If the tank fails to hold the air charge pressure, the Schrader valve may need to be replaced.
2. Prepare the tank for service. Refer to items 11a through 11d in the operating instructions starting on Page 1.
3. WARNING: Do not remove the valve core stem until the pressure in the expansion tank reaches zero. Depress the valve stem and slowly vent off the air pressure. Failure to follow these instructions may result in serious personal injury and property damage.
4. Replace the Schrader valve core and follow the instructions for properly charging the tank as outlined on Page 1.
5. Leak check all connections on the tank, including the cover plate seal, with a suitable leak detector solution.

BLADDER REPLACEMENT INSTRUCTIONS

1. Depress the valve core stem on the air charge valve.
2. If a combination of water and air escapes, the bladder needs to be replaced.
3. Prepare the tank for service. Shut off the heat source and allow the system water to cool to ambient temperature.
4. Close the lock shield valve in the piping to the tank.
5. Open the drain valve and allow the water to drain from the bladder.
6. Depress the valve stem on the Schrader valve to vent off the air pressure. Remove the valve core to bleed all of the remaining air charge.
7. Remove the drain plug in the tank shell.
8. Disconnect the system connection at the top of the tank and siphon any remaining water out of the bladder.
9. Loosen the nut on top of the bar or yoke that secures the cover plate to the handhole opening.
10. While holding the stud, remove the nut, bar, and gasket.
11. Grip the cover plate and remove the stud.
12. Rotate the cover plate 90°, tilt it on an angle, and pull the cover plate with the bag attached through the handhole opening (see Figure 1).
13. Wash down the inside of the tank as necessary.
14. Dry out the inside of the tank.
15. Examine the inside of the tank. Clean out any remaining dirt and remove any rust blisters. If the cover plate area is corroded, the tank will not seal properly. Replace the cover plate if necessary.
16. Remove the clamp and fill tube from the bladder.
17. Install the fill tube, clamp, and cover plate on the new bladder. Secure the clamp tightly around the steel pipe nipple (Figure 2).
18. Fold the new bag lengthwise and insert it through the handhole opening.
19. Using water from a spray bottle, lubricate the bladder to make it easier to fit through the opening.
20. Insert the stud into the cover plate and position the new gasket between the cover plate and the tank opening.
21. While holding the stud, replace the bar and nut.
22. Tighten the nut using 60 to 70 ft-lbs. of torque. Make sure that the gasket and cover plate are centered on the handhole opening.
23. Reinstall the drain plug. Use a thread lubricant or sealant and make sure that the plug is properly tightened.
24. Install the Schrader valve core stem and charge the tank to the system fill pressure. Refer to items 2 through 8 in the operating instructions on Page 1.
25. Use a leak detector solution or soapy water to leak check the drain plug, Schrader valve, and the gasket seal around the handhole.
26. Connect the tank to the system.

Figure 1

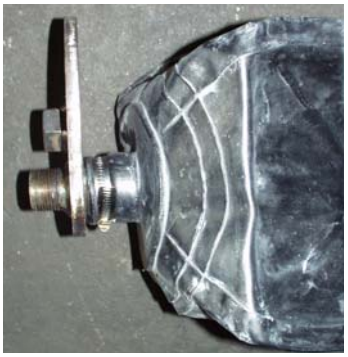


Figure 2