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Date: 10/10/2023
Return Request: 10/16/2023
Project: ASU Mid-South RC & UC Chiller Replacement
Supplier: Fluid Solutions
Manufacturer: Various
Submittal: Air-Dirt Separator
Submittal Number: 23 00 00-03
Drawing # and Installation: Mechanical Drawings

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Notes:

CSUSA PROJECT NO.

23-1024

jon@comfortar.com

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

Operation & Maintenance Manual

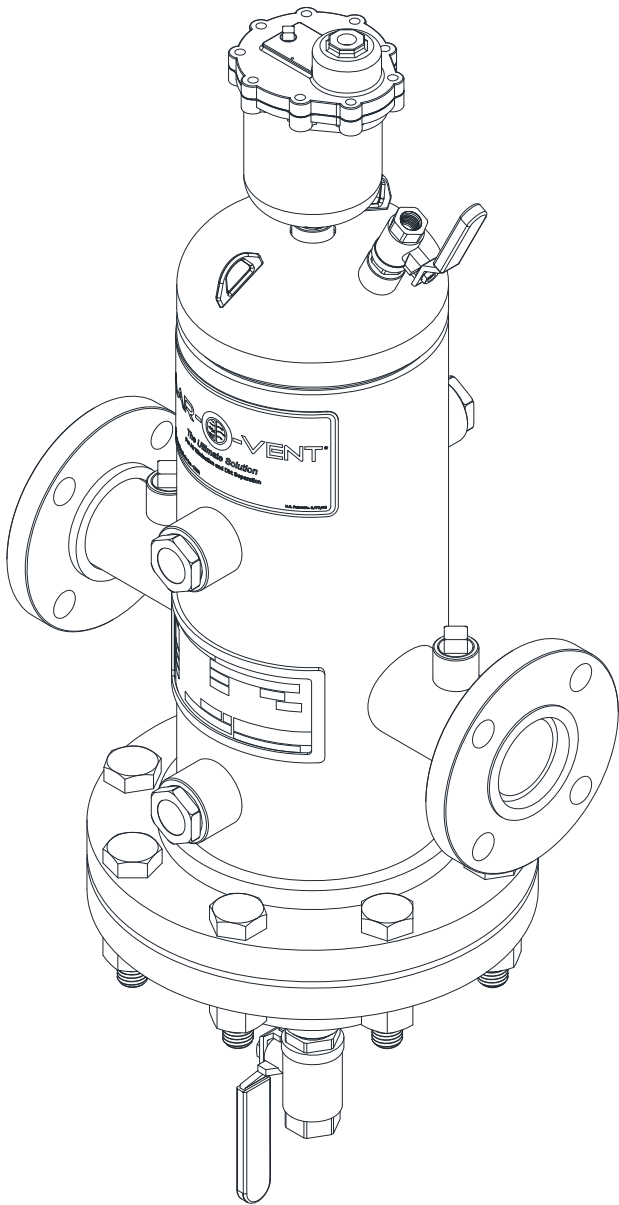


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Section 1 General Product Information

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.

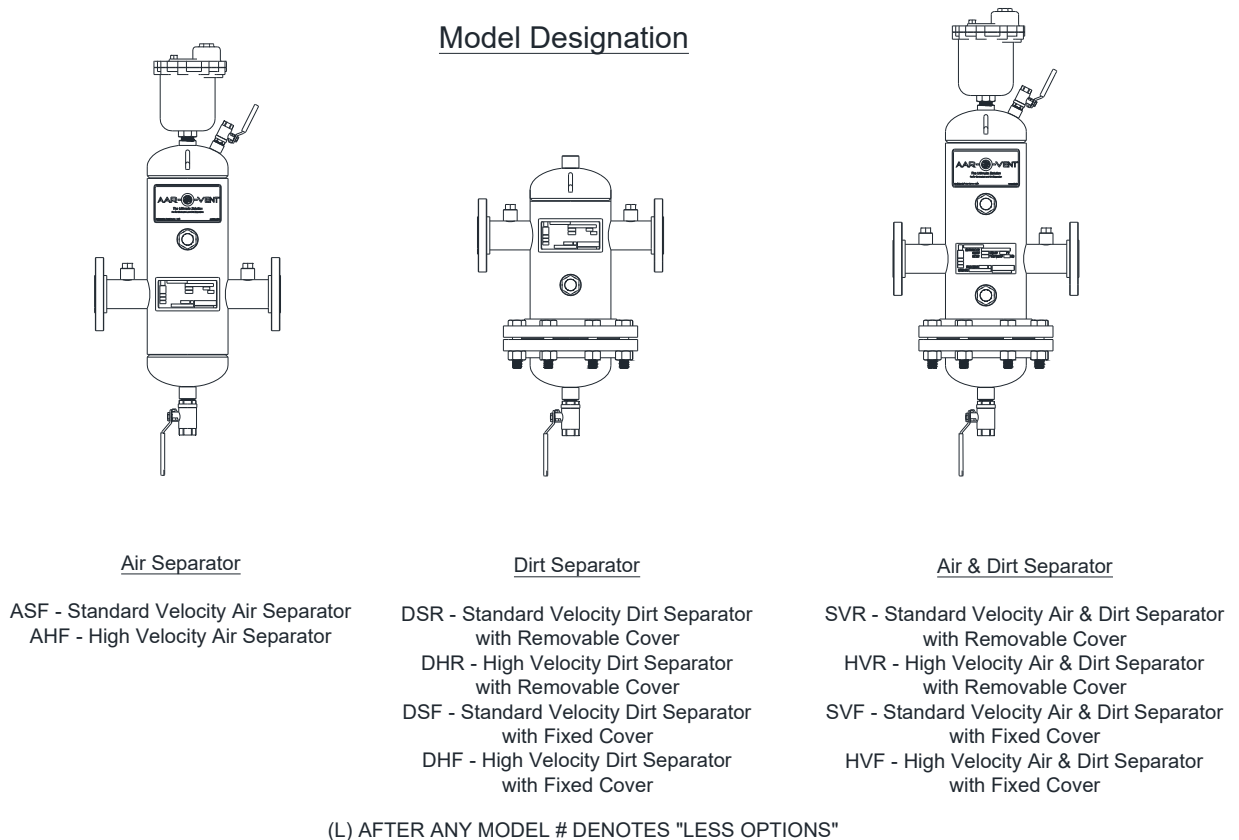


Figure 1-1 Overview

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.

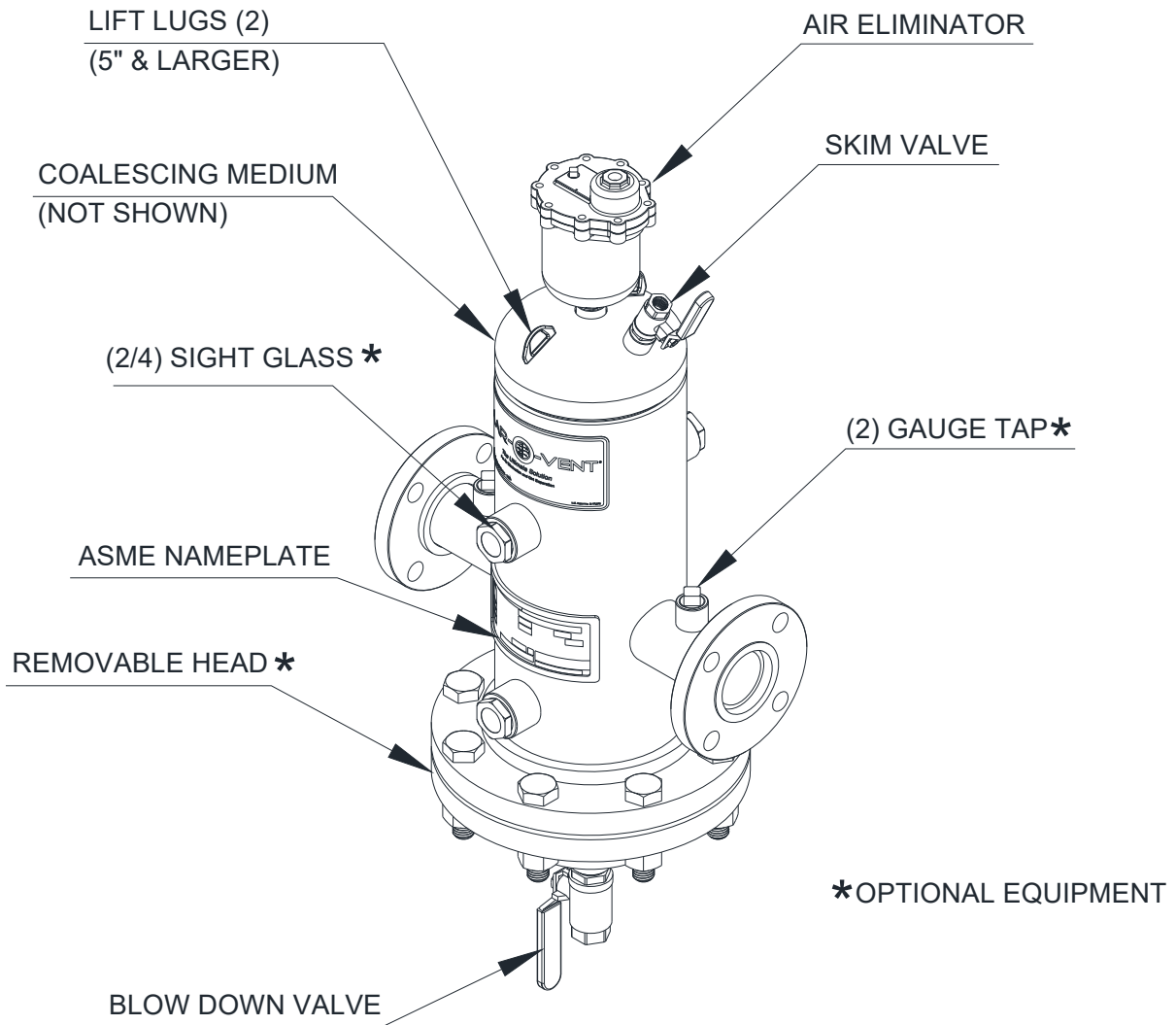


Figure 3-1 Components

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.

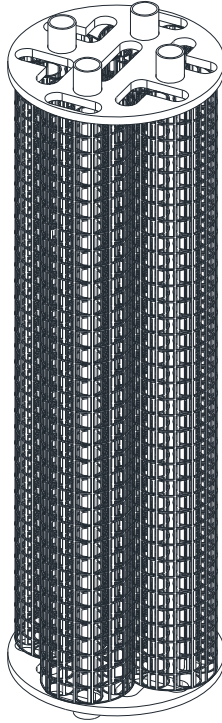


Figure 3-2 Coalescing Medium

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.

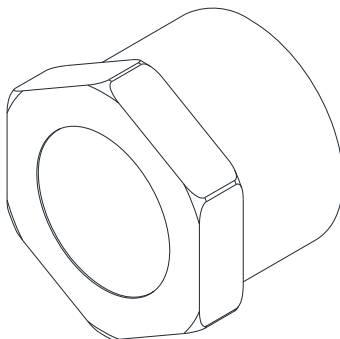


Figure 3-3 Sight Glass

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.

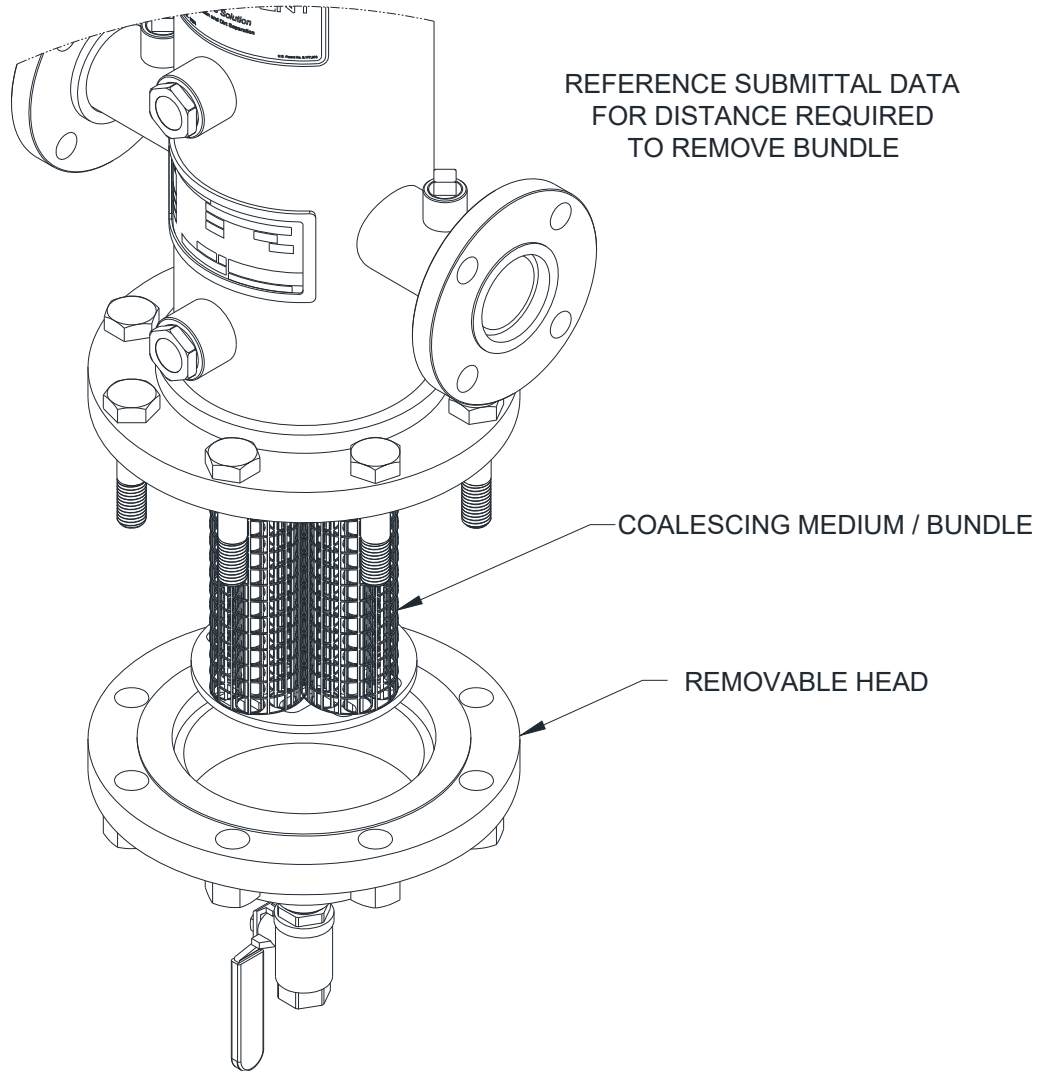


Figure 3-4 Removable Head Detail



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.

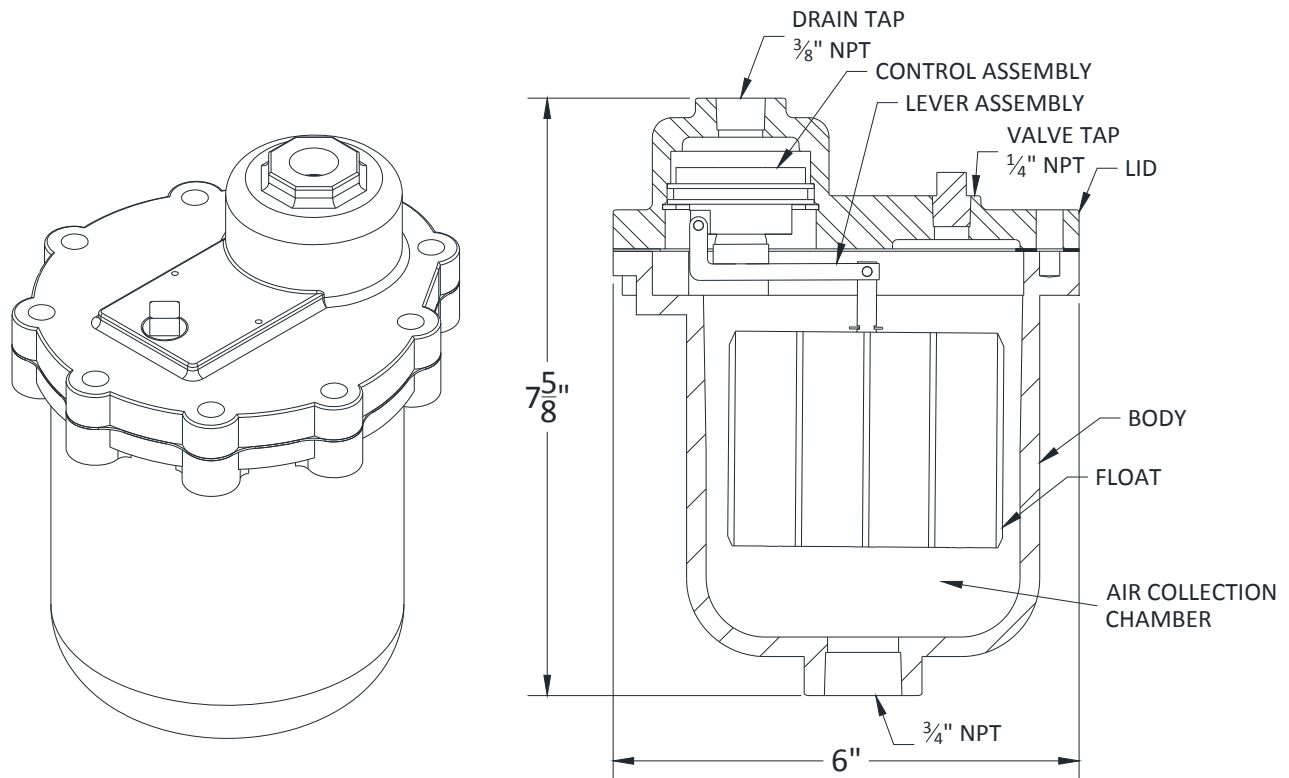


Figure 3-5 Air Vent

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).

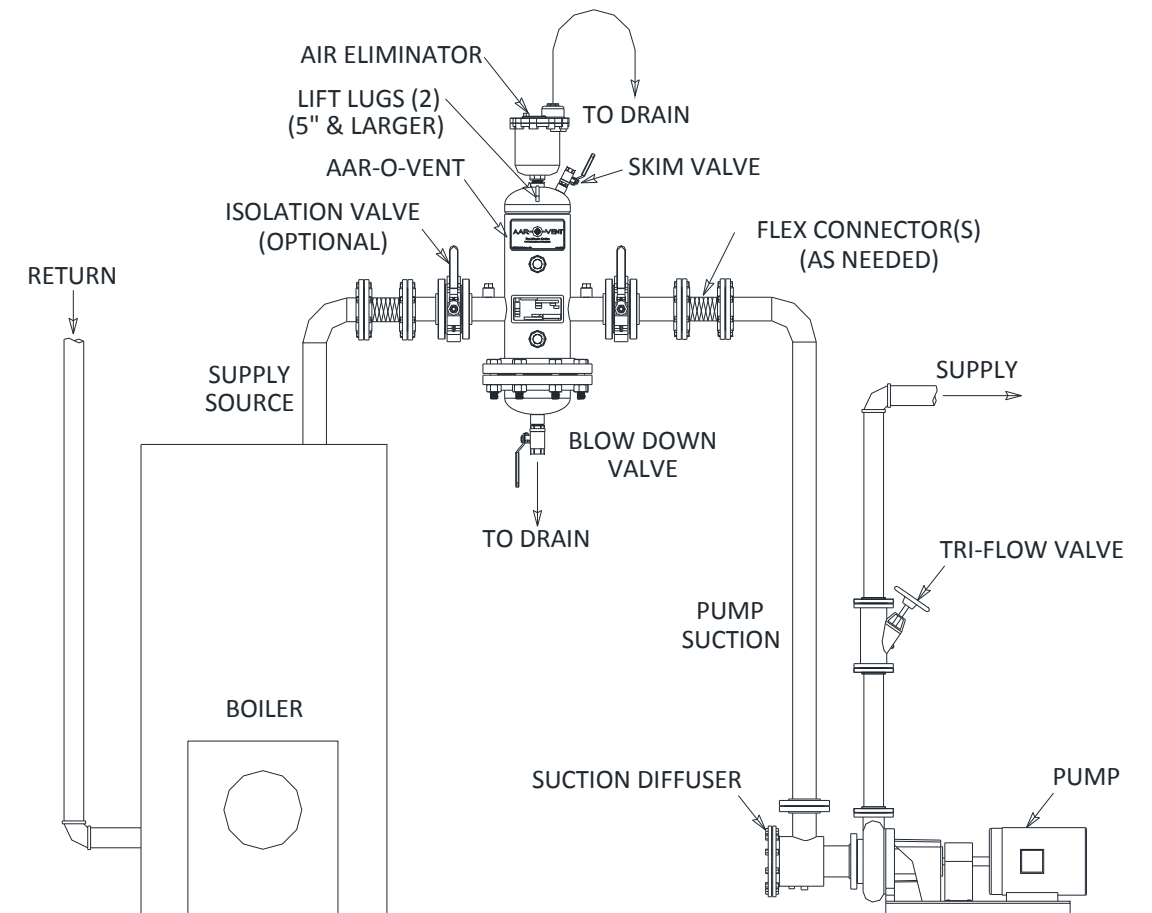


Figure 4-1 Typical Piping Diagram

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)

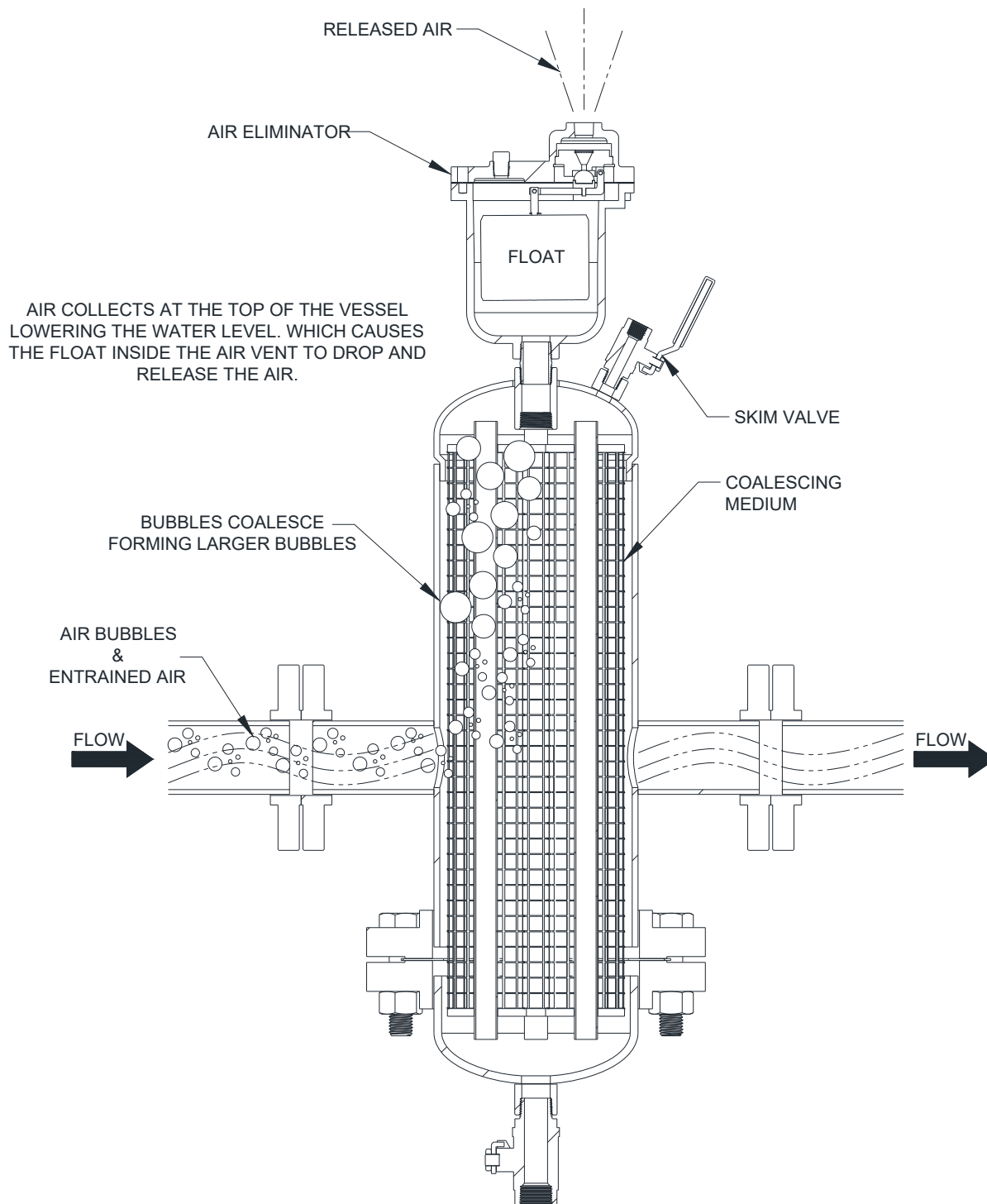


Figure 4-2 Operation (Air Elimination)

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)

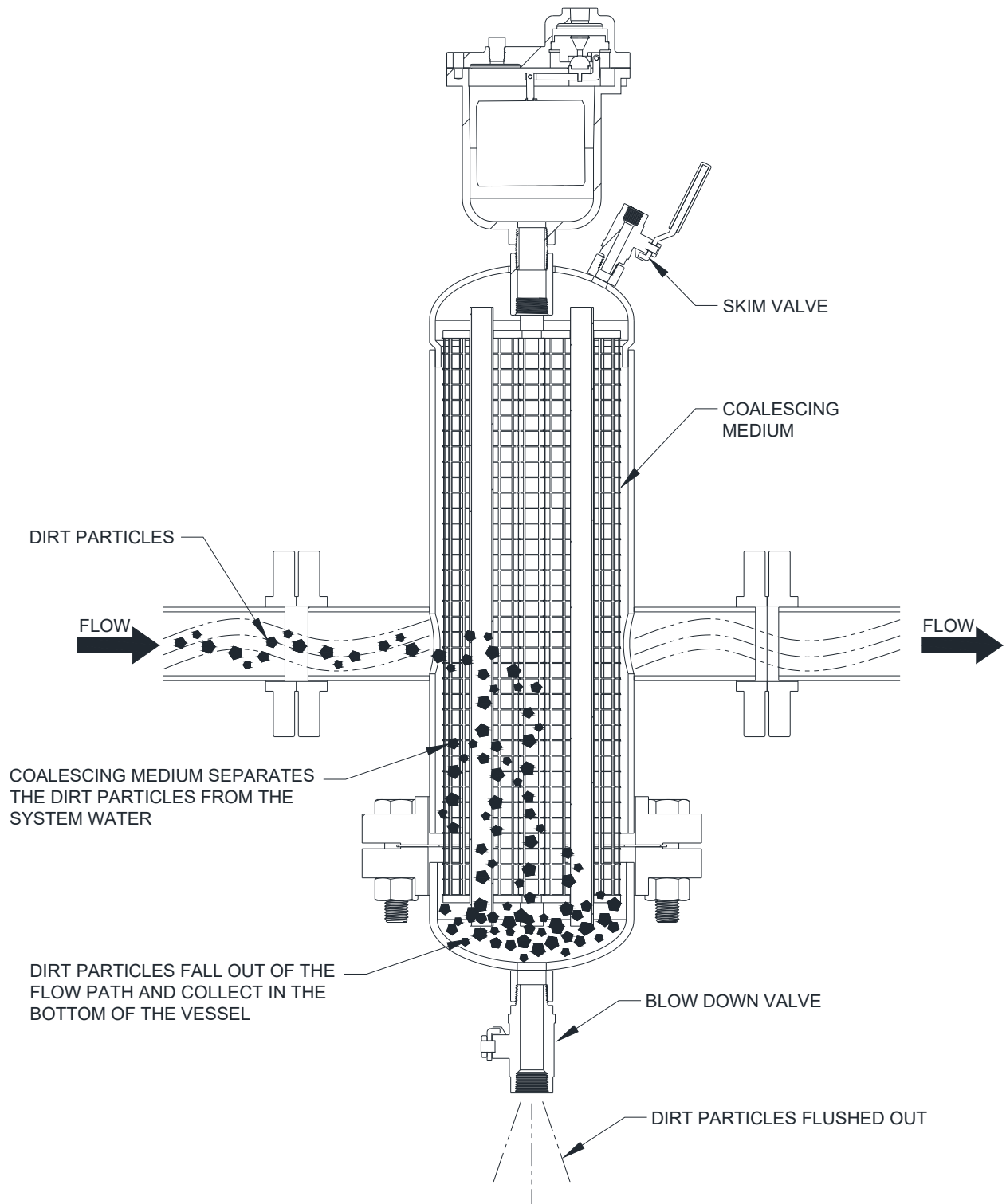


Figure 4-3 Operation (Dirt Elimination)

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.

<u>Aar-O-Vent Connection size</u>	<u>Removable Head Size</u>	<u>Bolt Size</u>	<u>Number of Bolts</u>	<u>Torque Ft/Lb (150# Flgs.)</u>
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




REVIEW OF MECHANICAL SUBMITTALS

Project: ASU Mid South Chiller Replacement
Location: West Memphis, Arkansas
Date of Receipt: Tuesday, October 24, 2023
Date of Review: Wednesday, October 25, 2023
Reviewed by: Mark Eakin
Email: meakin@pettitinc.com

P&P Job No.23-008

Signed: 

Checking is for conformance with the design concept of the Project and compliance with the information given in the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.

Item	Approval Status		Comments
Section 23 00 00 – Air-Dirt Separator	Approved		- None.



Note:



SUBMITTAL DATA

Date: August 31, 2023
Project: ASU Midsouth
Contractor: Comfort Systems
Engineer: Pettit & Pettit

GRUNDFOS AIR DIRT SEPARATOR

NEW AIR DIRT SEPARATOR Note #20, M1.01

One 6" Grundfos air dirt separator with removeable head and air vent.

6815 Dewaffelbaker Dr., Maumelle, AR 72113

Phone (501) 663-8886 • Fax (501) 663-8738

www.fluidsolutionsinc.com

Standard Features

1. Air Vent
2. Flanged Connections
3. Blow Down Valve
4. Skim Valve
5. Removable or Fixed Head
6. ASME Nameplate
7. Sight Glass (4)*
8. Gauge Tap (2)*

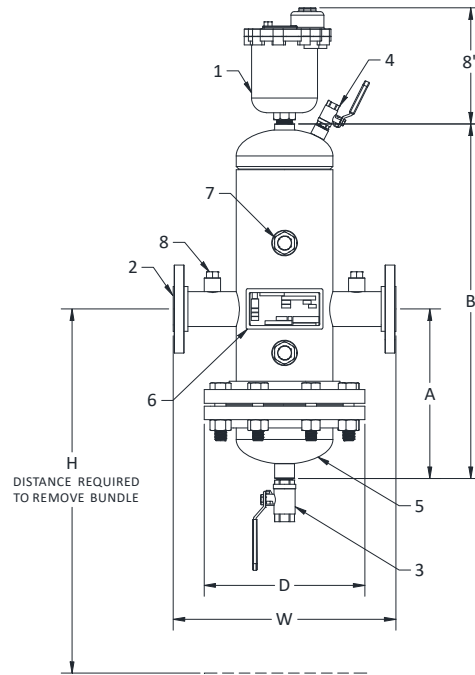
*Less Options:

- Minus Sight Glass x4
- Minus Gauge Tap x2

MATERIALS OF CONSTRUCTION

Coalescing Media	Stainless Steel
Shell	Carbon Steel
Blow Down Valve	Bronze
Skim Valve	Bronze
Air Vent	Model 720

NOTE: IF REQUIRED, THE LOWER HEAD AND COALESCING MEDIA ARE REMOVABLE FOR CLEANING ON THE 'R' TYPE HEAD.



MAXIMUM OPERATING CONDITIONS

Maximum Working Pressure (2"-12")	175 PSIG
Maximum Working Pressure (14"-24")	150 PSIG
Maximum Working Temperature	250° F

Model Designation



Grundfos **Separation Type**
A=Air Only
D=Dirt Only
B=Both Air and Dirt
4=Hydraulic Separator

Velocity
S=Standard Velocity
H=High Velocity

Head Type
R=Removable
F=Fixed

Connection Size
example: 025 = 2.5"
or 100 = 10.0"

Options
W=with options
X=less options*

DIMENSIONS

MODEL	CONNECTION SIZE**	(INCHES)					FLOW (GPM)	WEIGHT (LBS.) GBSR	WEIGHT (LBS.) GBSF
		A	B	D	W	H			
GBS*-020-*	2"	12.00	24.50	11.00	15.25	26.50	65	150	120
GBS*-025-*	2.5"	12.00	24.50	11.00	15.75	26.50	95	150	120
GBS*-030-*	3"	12.00	24.50	11.00	20.25	26.50	150	150	120
GBS*-040-*	4"	15.00	29.00	13.50	20.63	33.00	250	250	200
GBS*-050-*	5"	19.00	39.00	16.00	27.75	44.00	380	310	240
GBS*-060-*	6"	19.00	41.00	19.00	27.75	44.00	560	375	265
GBS*-080-*	8"	24.00	49.00	23.50	33.63	54.50	970	700	530
GBS*-100-*	10"	33.00	63.00	27.50	37.50	75.00	1510	1000	730
GBS*-120-*	12"	38.00	78.00	32.00	42.50	90.00	2130	1500	1110
GBS*-140-*	14"	43.00	94.00	35.00	45.00	104.00	2880	1950	1670
GBS*-160-*	16"	56.00	118.00	35.00	50.00	141.00	3760	2325	2045
GBS*-180-*	18"	55.00	121.00	41.62	56.00	138.00	4760	3250	2800
GBS*-200-*	20"	68.00	145.00	41.62	61.50	175.00	5880	4575	4125
GBS*-240-*	24"	73.00	150.00	55.00	72.00	175.00	8460	7250	6370

**ANSI B16.5 150 PSI FLANGE

DESIGNED AND CONSTRUCTED PER ASME SECTION VIII, DIV. 1

Job Name _____

Location _____

Engineer _____

Architect _____

Sales Rep. _____

Contractor _____

Model Number _____

Temperature _____

Capacity _____

Liquid _____

Notes _____