Peerless Pump Company

HVAC & Hydronics Equipment

Triple Duty Valves & Suction Diffusers
Diaphragm Type Hydro-pneumatic Tanks
Air Separators
Automatic Air Eliminators
Grundfos Inline Circulator Pumps

Peerless Pump Company
P O Box 7026
Indianapolis IN 46206-7026
Phone: 317-925-9661
Fax: 317-924-7388

Brochure B-2100

Design Features & Typical Installations

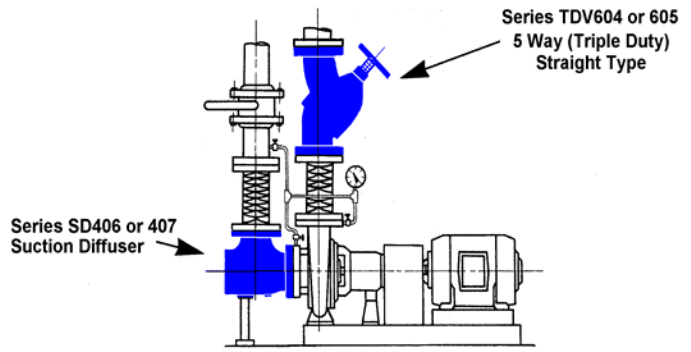
Triple Duty Valves Series TDV604 & 605:

- Non-slam spring closure type check valve
- O. S. & Y type shut off valve
- Flow Throttling
- Balancing valve
- By pass function
- Re-positional inlet body for angle connection
- Series TDV604 Cast iron body 125 Lb. ANSI flanged 150 psi maximum Working Pressure
- Series TDV605 Ductile iron body 250 Lb. ANSI 250 psi maximum working pressure
- NPT Taps on inlet and outlet side
- Bronze seat and 400 Series SS Disc
- Overall system pressure drop is reduced since less pipe and fittings are required for installed pump
- 175° F. Maximum Temperature

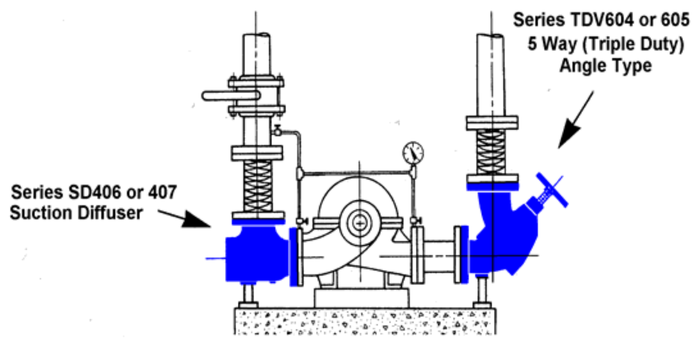
Suction Diffuser Series SD406 & 407

- Angle design for direct connection to pump suction flange
- Removable 304 SS fine mesh screen for preliminary start up of system for removal of extraneous material from system to prevent mechanical seal failures and instrumentation damage during initial running period.
- Permanent 304 SS screen for free flow minimizing pressure drop
- Guide vanes for reducing turbulence while providing proper flow conditions.
- Available with inlet and outlet of equal size or with reduced outlet size eliminating need for reducing fitting
- Overall system pressure drop is reduced since less pipe and fittings are required for installed pump
- Series SD406 Cast iron body 125 Lb. ANSI flanged 150 psi maximum Working Pressure
- Series SD407 Ductile iron body 250 Lb. ANSI 250 psi maximum working pressure
- 175° F. Maximum Temperature

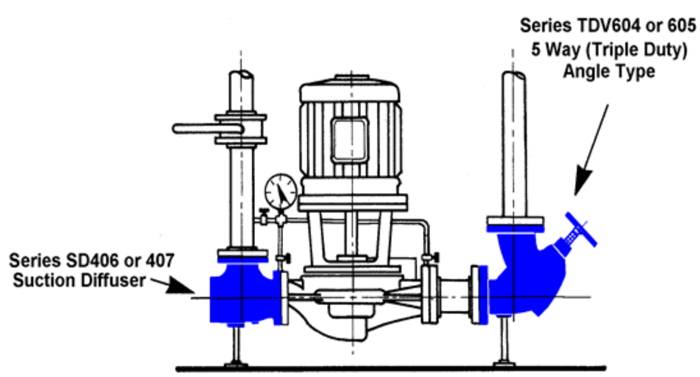
Typical Installations



Base Mounted F Series
Radially Split Case Pumps



Base Mounted Series BT, AE, TU, TUT Horizontal Split Case Pumps



In-Line Mounted PV Series
Radially Split Case Pumps

Triple Duty Valve Selection and Typical Specification

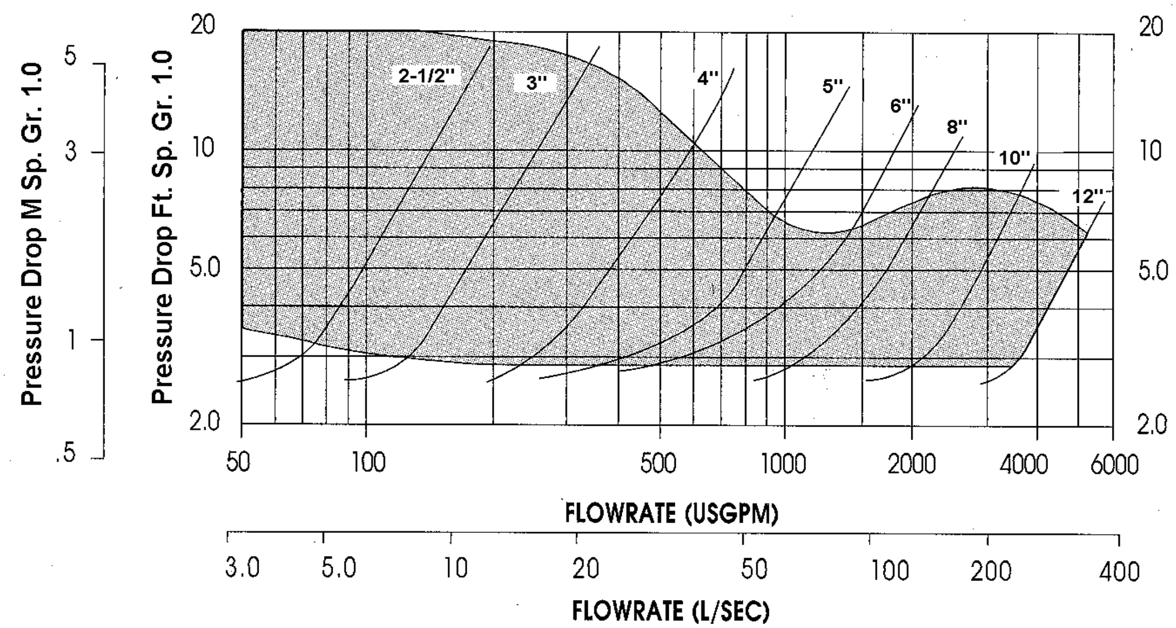


Figure 1

VALVE SELECTION CRITERIA

1 Minimum Flow Rate - To ensure sufficient flow to hold disc in full open position during operation, size valves in shaded area only of TDV Performance Curve Figure 1.

2 Maximum Flow Rate - Select valve in shaded area only. However, consideration should be given to selecting the valve with the lowest pressure drop and velocity in accordance with ASHRAE practice. This will ensure a quiet, energy-efficient system and maximum valve life.

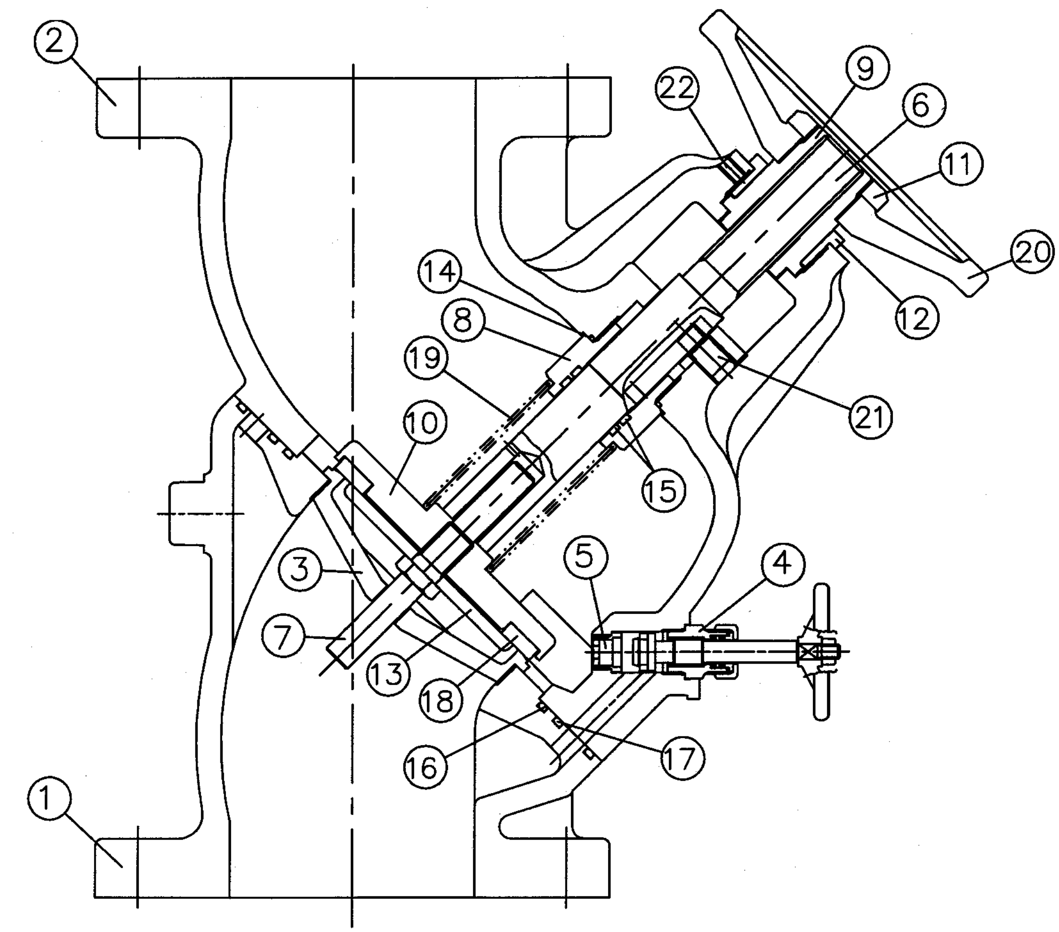
Typical Specifications Series TDV604 & 605 Triple Duty Valves

Furnish and install on the discharge side of each pump a Peerless Pump Triple Duty Valve incorporating three functions in one body: tight shut-off valve, spring-closure type silent non-slam check, flow throttling. Additional features shall include balancing valve with by-pass function and re-positional inlet body for angle mounting configuration.

Valve body shall be (cast iron with 125 x125 Lb ANSI flanges Series TDV604)(ductile iron with 250 x250 Lb. ANSI flanges - Series TDV605) ends. The body shall have two NPT connections on each side of the valve seat.

The valve disc shall be bronze plug disc type with high impact engineered seat to ensure tight shut-off and silent check valve operation.

PEERLESS PUMP®

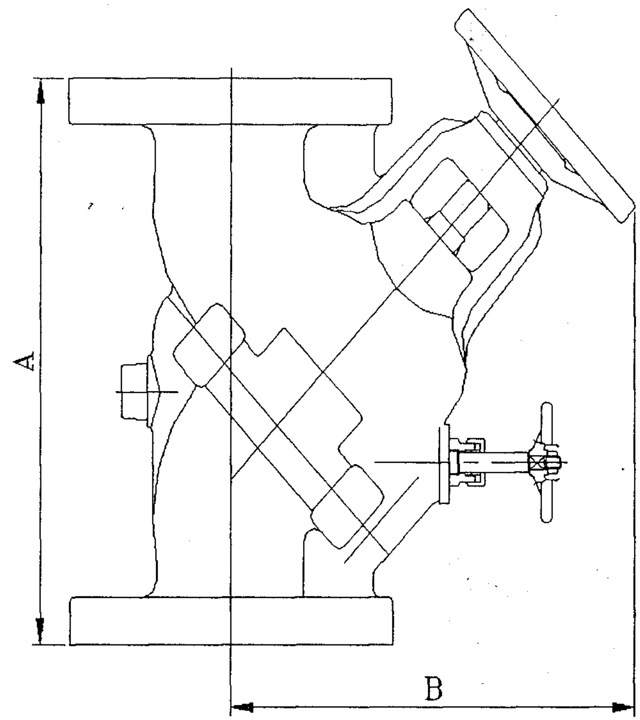


Triple Duty Valve

No	Part Name	Material	Quantity	Remark
24	Plug	FBsBe	3	
23	Bolt	STS304	4 ~	
22	Socket set screw	SCM	1	
21	Socket set screw	SCM	1	
20	Hand wheel	GCD450	1	
19	Spring	STS304	1	
18	Disc packing	NBR	1	
17	O-Ring	NBR	2	
16	O-Ring	NBR	1	
15	O-Ring	NBR	2	
14	O-Ring	NBR	1	
13	Packing plate	SS400	1	
12	Yoke nut	S45C	1	
11	Hand wheel nut	S45C	1	
10	Disc	S45C,GCD450	1	
9	Sleeve	GCD450	1	
8	Bush	C3771	1	
7	Guide pin	C3771	1	
6	Stem	C3771	1	
5	Seat(B/P)	FBsBe	1	
4	Bonnet Set	C3771	1set	
3	Seat	Bc6	1	
2	High Body	GC200	1	
1	2	3	4	5

Scale	Designed By	Checked By	Approved By	TITLE	6
9	J.P		B.C	Size	7
Date	8/14		8/14	DrawingDate	8

PEERLESS PUMP®



ANSI 125Lb

unit : inch

SIZE	2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"
A	8.98	9.29	11.61	13.19	17.28	17.28	20.39	23.70	26.65	29.88	34.02	36.34	39.61
B	7.99	8.62	9.37	10.16	14.41	14.41	16.50	20.20	22.48	26.38	28.07	32.13	33.78

ANSI 250Lb

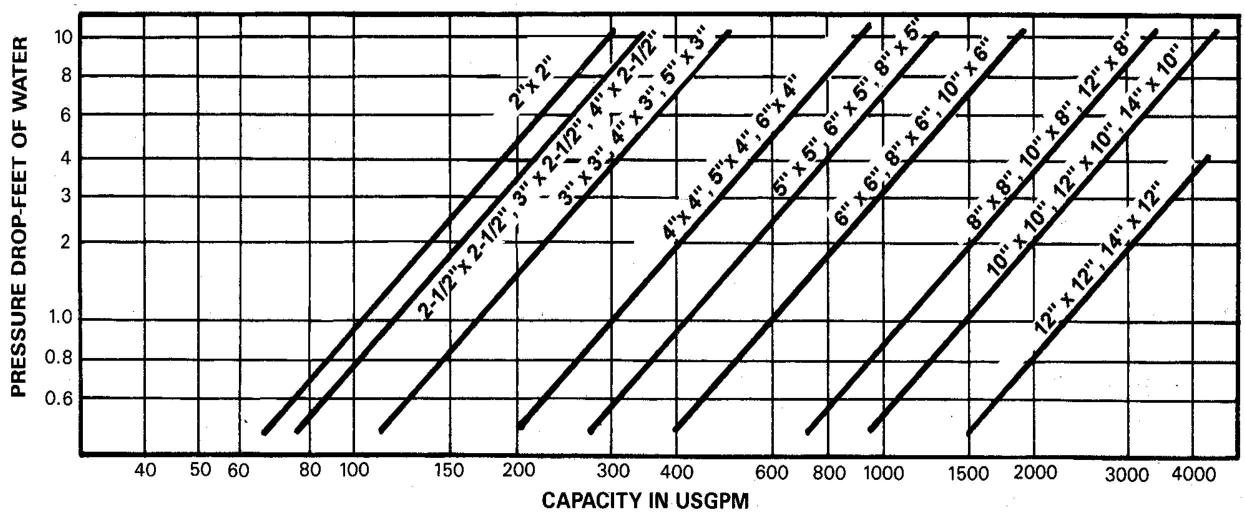
unit : inch

SIZE	2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"
A	9.13	9.53	11.77	13.82	14.49	18.15	21.34	25.12	28.15	30.59	35.59	37.91	41.22
B	7.99	8.62	9.37	10.16	11.65	14.41	16.50	20.20	22.48	26.38	28.07	32.13	33.78

Drwg. No. 4854054

Suction Diffuser Selection and Typical Specification

Suction Diffuser Pressure Drop Curves

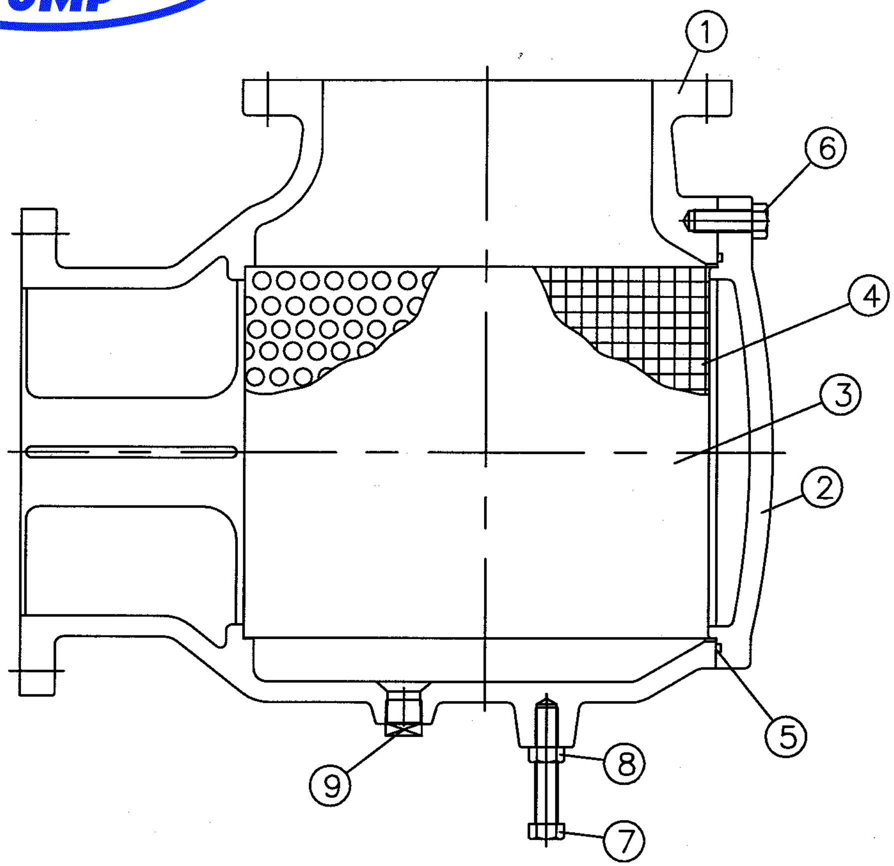


Typical Specification Series SD406 & 407 Suction Diffusers

Furnish and install on the suction of each pump, a Peerless Pump Suction Diffuser. with (Cast Iron Body with 125 x125 Lb. ANSI Flanges -Series SD406)(Ductile Iron Body with 250 x 250 Lb ANSI flanges -Series SD407), with Integrally Cast Outlet Guide Vanes, Removable Stainless Steel Strainer and Fine Mesh Start-up Strainer. The mechanical contractor shall inspect the Strainer prior to start-up of pump and shall remove the Fine Mesh Brass Strainer after a short running period. Space shall be provided for removal of Strainer and connection of blow down valve.

Page 7

PEERLESS PUMP ®

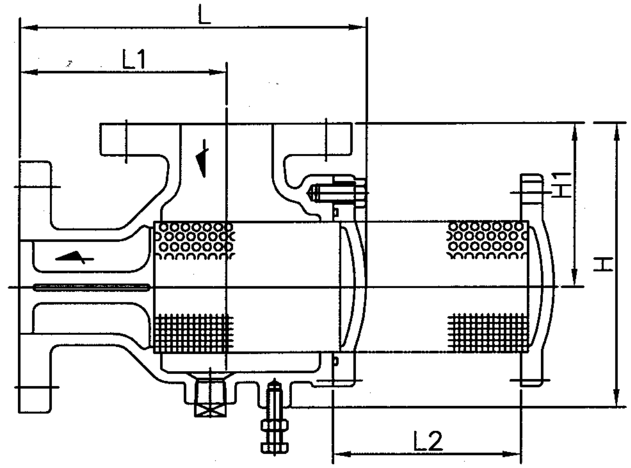


Suction Diffuser

No	Part Name	Material	Quantity	Remark
9	Plug	FBsBe	2~	
8	Nut	SS400	1	
7	Bolt	SS400	1	
6	Bolt	SS400	4	
5	O-ring	NBR	1	
4	Screen(mash)	STS304	1	
3	Screen	STS304	1	
2	Cover	GC200	1	
1	Body	GC200	1	

Scale	Designed By	Checked By	Approved By		
	J.P		B.C	Size	50A~450A (2"~18")
Date	8/14		8/14	DrawingDate	

Drwg. No. 4854056



ANSI 125Lb

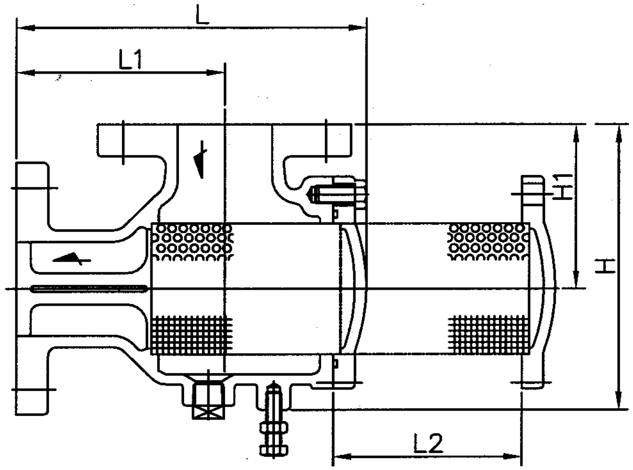
Suspension Diffusers

unit : inch

SIZE IN	2"	21/2"	21/2"	3"	3"	4"	4"	4"	5"	5"	5"	6"	6"	6"	8"	8"	8"
SIZE OUT	2"	2"	21/2"	21/2"	3"	21/2"	3"	4"	3"	4"	5"	4"	5"	6"	5"	6"	8"
L	8.43	9.49	9.57	10.47	10.55	11.97	11.93	12.13	14.45	14.45	14.09	16.10	16.10	15.83	20.43	19.69	19.33
L1	5.12	5.83	5.91	6.46	6.54	7.40	7.36	7.56	9.17	9.17	8.82	9.88	9.88	9.61	12.76	12.05	11.69
L2	4.06	4.96	4.96	5.79	5.79	6.69	6.69	6.69	7.99	7.99	7.99	8.98	8.98	8.98	11.26	11.26	11.26
H	7.32	4.49	8.11	9.21	9.21	10.79	10.79	10.79	12.09	12.09	12.09	13.86	13.86	13.86	16.89	16.89	16.89
H1	4.13	8.11	4.49	5.20	5.20	4.13	4.13	4.13	6.85	6.85	6.85	7.95	7.95	7.95	9.72	9.72	9.72

SIZE IN	10"	10"	10"	12"	12"	12"	14'	14"	14"	14"	16"	16"	16"	18"	18"	18"	
SIZE OUT	6"	8"	10"	8"	10"	12"	8"	10"	12"	14"	12"	14"	16"	14"	16"	18"	
L	23.23	23.39	22.99	28.07	27.44	26.97	30.75	30.16	29.29	29.53	32.13	32.17	32.20	36.30	36.34	36.46	
L1	14.13	14.29	13.90	17.80	17.17	16.69	19.45	18.86	17.99	18.23	19.21	19.25	19.29	21.73	21.77	21.89	
L2	14.17	14.17	14.17	16.93	16.93	16.93	18.98	18.98	18.98	18.98	20.67	20.67	20.67	24.21	24.21	24.21	
H	19.96	19.96	19.96	24.02	24.02	24.02	26.54	26.54	26.54	26.54	29.09	29.09	29.09	31.26	31.26	31.26	
H1	11.42	11.42	11.42	13.39	13.39	13.39	14.88	14.88	14.88	14.88	15.79	15.79	15.79	16.85	16.85	16.85	

PEERLESS PUMP ®



ANSI 250Lb

Suction Diffusers

unit : inch

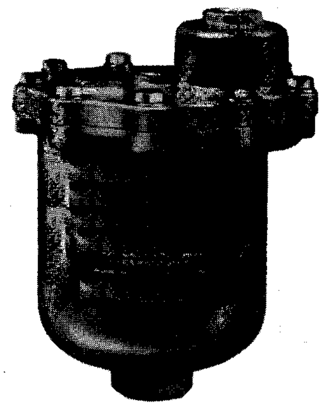
SIZE IN	2”	21/2”	21/2”	3”	3”	4”	4”	4”	5”	5”	5”	6”	6”	6”	8”	8”	8”
SIZE OUT	2”	2”	21/2”	21/2”	3”	21/2”	3”	4”	3”	4”	5”	4”	5”	6”	5”	6”	8”
L	8.50	9.57	9.69	10.55	10.55	12.09	11.93	12.44	14.45	14.69	14.53	16.42	16.77	16.26	20.87	20.12	19.80
L1	5.20	5.91	6.02	6.54	6.54	7.52	7.36	7.87	9.17	9.41	9.25	10.20	10.55	10.04	13.19	12.48	12.17
L2	4.06	4.96	4.96	5.79	5.79	6.69	6.69	6.69	7.99	7.99	7.99	8.98	8.98	8.98	11.26	11.26	11.26
H	7.40	8.23	8.23	5.20	9.21	11.10	11.10	11.10	12.52	12.52	12.52	14.45	14.45	14.45	17.36	17.36	17.36
H1	4.21	4.61	4.61	9.21	5.20	6.22	6.22	6.22	7.28	7.28	7.28	8.54	8.54	8.54	10.20	10.20	10.20

SIZE IN	10”	10”	10”	12”	12”	12”	14’	14”	14”	14”	16”	16”	16”	18”	18”	18”
SIZE OUT	6”	8”	10”	8”	10”	12”	8”	10”	12”	14”	12”	14”	16”	14”	16”	18”
L	23.66	23.90	23.70	28.54	28.15	27.72	31.26	30.87	30.04	30.28	32.87	32.91	32.95	37.05	37.13	37.24
L1	14.57	14.80	14.61	18.27	17.87	17.44	19.96	19.57	18.74	18.98	19.96	20.00	20.04	22.48	22.56	22.68
L2	14.17	14.17	14.17	16.93	16.93	16.93	18.98	18.98	18.98	18.98	20.67	20.67	20.67	24.21	24.21	24.21
H	20.67	20.67	20.67	24.76	24.76	24.76	27.28	27.28	27.28	27.28	29.69	29.69	29.69	32.05	32.05	32.05
H1	12.13	12.13	12.13	14.13	14.13	14.13	15.63	15.63	15.63	15.63	16.46	16.46	16.46	17.64	17.64	17.64

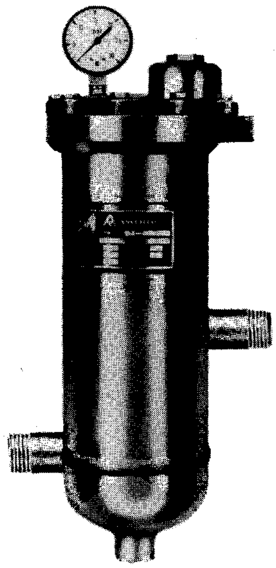
Drwg. No. 4854056

The pressurization and air elimination system accommodates the expanded water generated by the increase in temperature in a water heating or chilled water system. It maintains the necessary minimum operating pressure and ensures that all "system air" will be eliminated. It controls the increase in pressure at all critical components in the system to the maximum allowable for those components.

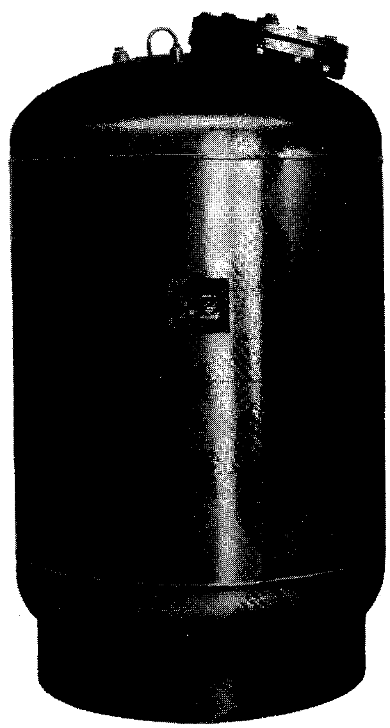
SYSTEM COMPONENTS



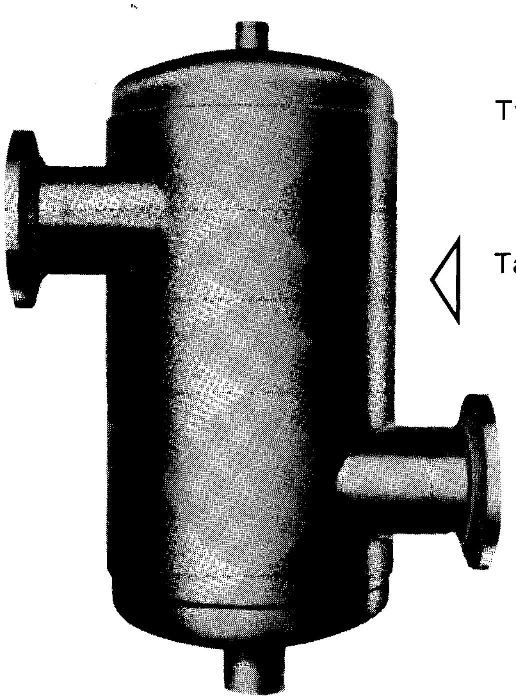
Air Elimination Valve (Model 720)



Air Separator/ Eliminator (Model 721)



Diaphragm-Type Expansion Tank



Tangential-Type Air Separator

APPLICATION OF THE PRESSURIZATION AND AIR ELIMINATION SYSTEM

COMPONENTS

1. Pressurization Controller

The pressurization controller is a diaphragm-type expansion tank with a permanent sealed-in air cushion, pre-charged to the minimum operating pressure at the location in the system where it is installed.

The minimum operating pressure consists of the static pressure plus adequate positive pressure required at the top of the system to eliminate air bubbles.

2. Air Separating and Elimination Components

The air separating and elimination component is normally installed at the point of lowest solubility of air in water, typically at a high point in the system. It consists of:

a. A tangential type air separator which separates entrained air from flowing system water by the creation of a vortex allowing free air bubbles to rise in the center, the point of lowest velocity, to an air collection chamber.

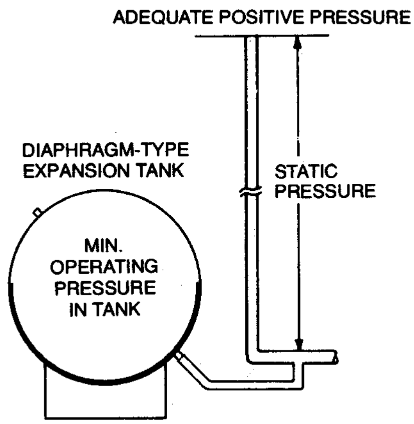
b. A unique, pilot-operated, air elimination valve, capable of eliminating air to the atmosphere as fast as it is separated from system water, through a full open orifice. In the closed position, the exit ports are sealed tight by the positive sealing force created by system pressure exerted upon surfaces of dissimilar areas.
NOTE: For detailed description, see page 9.

APPLICATION

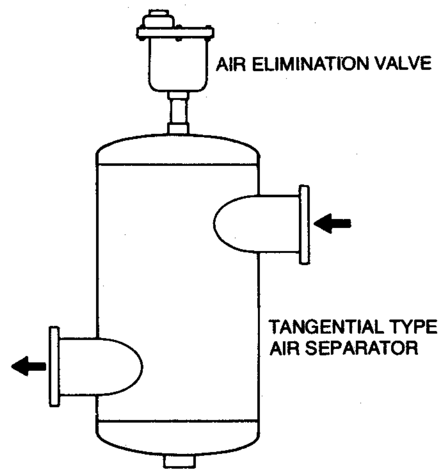
The pressurization and air elimination system is reliable, simple, and saves valuable space in the building as well as labor to install.

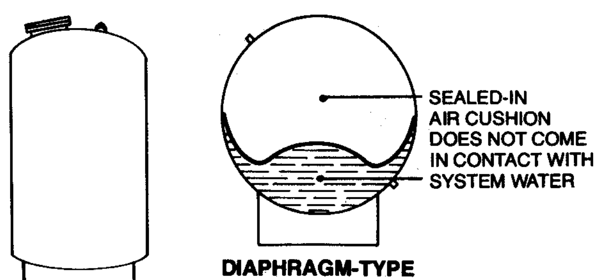
The problem of "system air" can be avoided by proper system design, exercising care to ensure a reasonably leak-proof system, and by following air elimination procedure.

The only air in the system will be the sealed-in air cushion in the diaphragm-type tank protected against contact with system water. Chemical treatment to counteract potential corrosion due to oxygen is unnecessary.

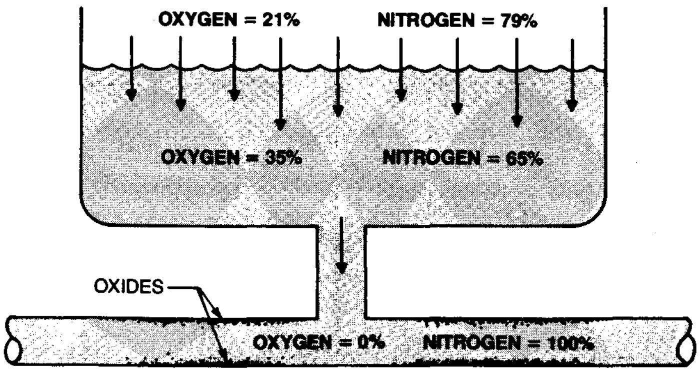


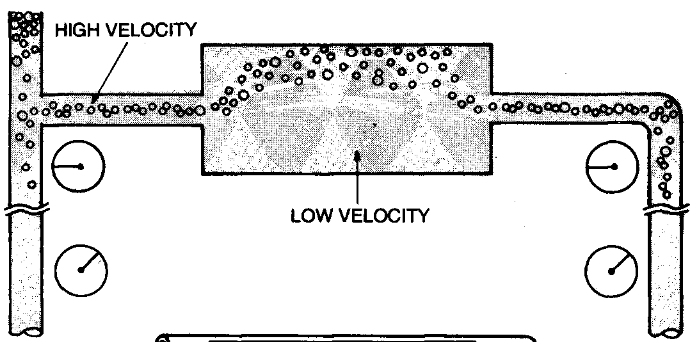
STATIC PRESSURE + ADEQUATE POSITIVE PRESSURE = MINIMUM OPERATING PRESSURE IN TANK

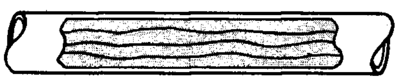




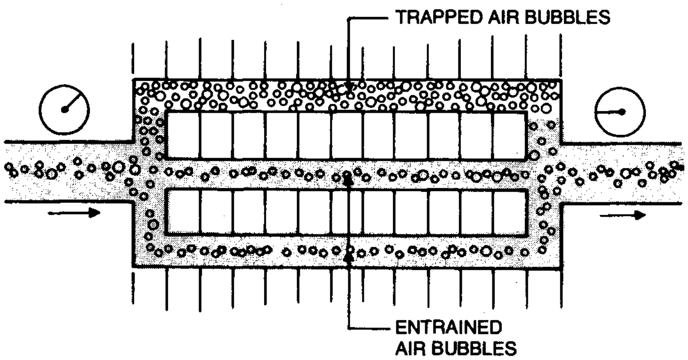
DIAPHRAGM-TYPE EXPANSION TANK



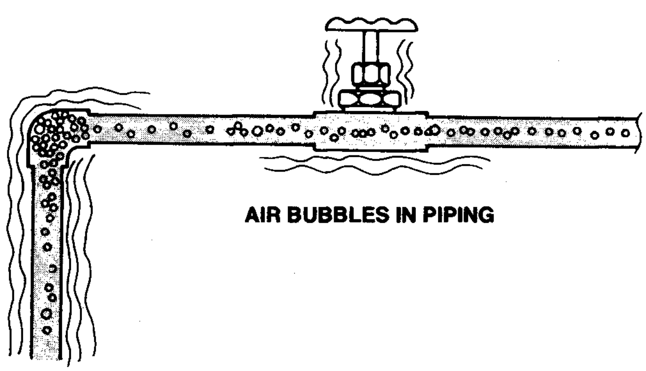




AIR IN SOLUTION



AIR BINDING OF TERMINAL UNITS



AIR BUBBLES IN PIPING

"SYSTEM AIR"

To approach the problem of "system air" we must understand its source and its effect on the system:

1. Changes in Chemical Composition

Initially, air in the system is 79% nitrogen by volume (including a small mixture of other gases) and 21% oxygen. Oxygen is absorbed more readily than nitrogen, is carried through the system in a dissolved state (in solution), and combines with metallic surfaces to form oxides.

Eventually "system air" consists only of nitrogen — unless more air enters the system, either in gaseous form, or in solution in make-up water.

2. Changes in Physical Form

a. Free Air Bubbles

Free air bubbles collect at the top of vertical or horizontal pipes and system components.

b. Entrained Air Bubbles

When system water flows at a velocity of 1.5 to 2 feet per second or more, the free air bubbles are not allowed to rise, but are carried throughout the piping system.

c. Air in Solution

Air in direct contact with water is absorbed and carried through the system in a dissolved state (in solution).

The amount of air which will be absorbed depends upon temperature and pressure. Water at higher temperature is capable of holding less air in solution. Water at lower pressures is capable of holding less air in solution.

Because pressure and temperature in a system are constantly changing, depending on location and the operating cycle, the capability of system water to hold air in solution is constantly changing.

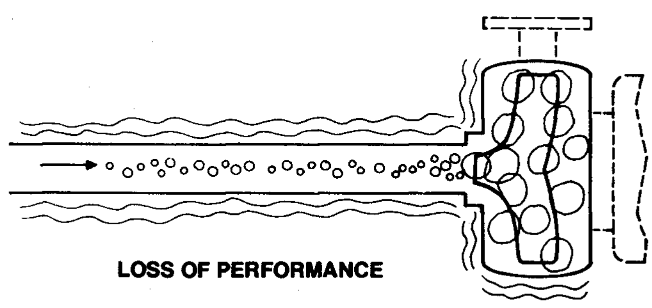
To solve the problem of system air, it is necessary to evaluate the effect of these changes.

SYMPTOMS OF SYSTEM AIR

Air binding of terminal units and accumulation of air bubbles in piping causes noise and inefficient operation.

Loss of performance in pumps and serious damage to equipment because of corrosion create expensive maintenance and replacement problems.

The energy wasted due to the presence of system air is substantial and seldom appreciated by maintenance personnel.



LOSS OF PERFORMANCE

THE SOURCES OF SYSTEM AIR

1. Initial Fill

Ideally, air should be removed at high points in the piping system and components during initial fill.

However, air pockets many times occur in horizontal piping. When system water velocity exceeds 1.5 to 2 feet per second, the air bubbles become entrained. Because of the increase in pressure at lower elevations in the piping, most, or all, of these bubbles will be absorbed and become air in solution.

2. Make-up Water

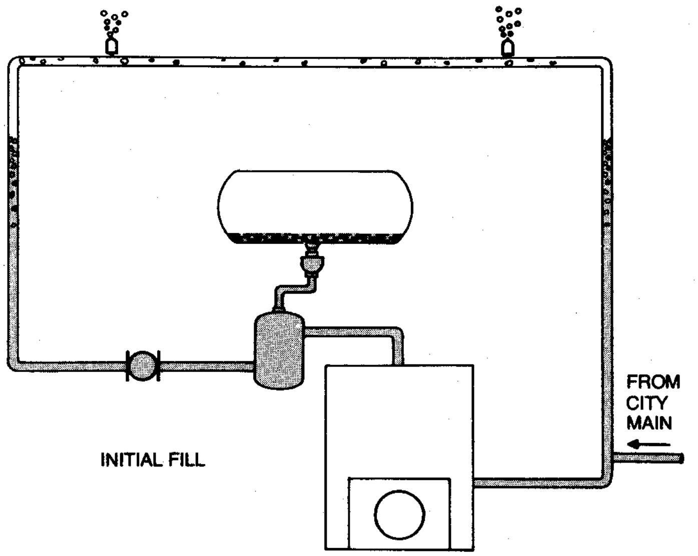
The closed hydronic system should be a tight system with as little fresh make-up water added as possible. Any air introduced to the system with make-up water should be eliminated immediately.

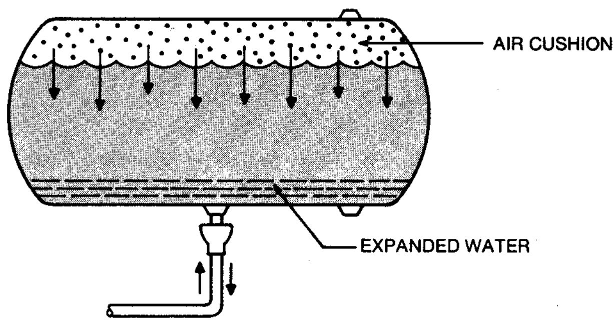
3. The Plain Steel Expansion Tank

The plain steel expansion tank (with no diaphragm) is a constant source of air. It is the one place in the system where water is in constant direct contact with air.

a. In a heating system, during each operating cycle, expanded water enters the tank, absorbs air from the air cushion (at conditions of relatively high pressure and low temperature) and re-enters the system piping.

b. In a chilled water system, the plain steel expansion tank is a prime source of air. At lower temperatures, water can hold much higher concentrations of air in solution. Air will migrate from the tank until either the system has reached its full capability to hold air in solution or until the tank is water-logged.





FORMATION OF BUBBLES

The table, Solubility of Air in Water (enlarged on page 14), shows the maximum amount of air which can be held in solution in system water at varying pressures and temperatures. When the amount of air present in the water is equal to or less than its capability to hold air in solution, absorbed air will stay in solution. When the amount of air present is greater than its capability, bubbles of released air must form.

SOLUBILITY OF AIR IN WATER
RATIO OF ABSORBED AIR VOLUME TO WATER VOLUME
EXPRESSED AS A DECIMAL

TEMP. (t) °F	PRESSURE, PSIG												
	0	10	20	30	40	50	60	70	80	90	100	110	120
40°	0.0258	0.0435	0.0613	0.0790	0.0967	0.1144	0.1321	0.1499	0.1676	0.1853	0.2030	0.2207	0.2384
50°	0.0223	0.0376	0.0529	0.0683	0.0836	0.0989	0.1143	0.1296	0.1449	0.1603	0.1756	0.1909	0.2063
60°	0.0197	0.0333	0.0469	0.0605	0.0742	0.0878	0.1014	0.1150	0.1296	0.1423	0.1559	0.1695	0.1831
70°	0.0177	0.0300	0.0423	0.0546	0.0669	0.0792	0.0916	0.1039	0.1162	0.1285	0.1408	0.1531	0.1654
80°	0.0161	0.0274	0.0387	0.0501	0.0614	0.0727	0.0840	0.0954	0.1067	0.1180	0.1293	0.1407	0.1520
90°	0.0147	0.0253	0.0358	0.0464	0.0569	0.0674	0.0750	0.0885	0.0990	0.1090	0.1201	0.1306	0.1412
100°	0.0136	0.0235	0.0334	0.0433	0.0532	0.0631	0.0730	0.0829	0.0928	0.1027	0.1126	0.1225	0.1324
110°	0.0126	0.0220	0.0314	0.0408	0.0501	0.0595	0.0689	0.0753	0.0877	0.0971	0.1065	0.1158	0.1252
120°	0.0117	0.0206	0.0296	0.0385	0.0475	0.0564	0.0654	0.0744	0.0833	0.0923	0.1012	0.1102	0.1191
130°	0.0107	0.0193	0.0280	0.0366	0.0452	0.0538	0.0624	0.0710	0.0796	0.0882	0.0968	0.1054	0.1140
140°	0.0098	0.0182	0.0265	0.0348	0.0432	0.0515	0.0598	0.0681	0.0765	0.0848	0.0931	0.1015	0.1098
150°	0.0089	0.0170	0.0251	0.0332	0.0413	0.0494	0.0574	0.0655	0.0736	0.0817	0.0898	0.0979	0.1060
160°	0.0079	0.0158	0.0237	0.0316	0.0395	0.0474	0.0553	0.0632	0.0711	0.0790	0.0869	0.0945	0.1027
170°	0.0068	0.0145	0.0223	0.0301	0.0378	0.0456	0.0534	0.0611	0.0689	0.0767	0.0844	0.0922	0.1000
180°	0.0055	0.0132	0.0208	0.0285	0.0361	0.0438	0.0514	0.0591	0.0667	0.0744	0.0820	0.0879	0.0973
190°	0.0041	0.0116	0.0192	0.0268	0.0344	0.0420	0.0496	0.0571	0.0647	0.0723	0.0799	0.0875	0.0950
200°	0.0024	0.0099	0.0175	0.0250	0.0326	0.0401	0.0477	0.0552	0.0628	0.0703	0.0779	0.0854	0.0930
210°	0.0004	0.0080	0.0155	0.0230	0.0306	0.0381	0.0457	0.0532	0.0607	0.0683	0.0758	0.0833	0.0909

Based on derivation by Professor Ferdinand Votta, Jr.,
Department of Chemical Engineering, University of Rhode Island

1. The Plain Steel Tank in a Heating System

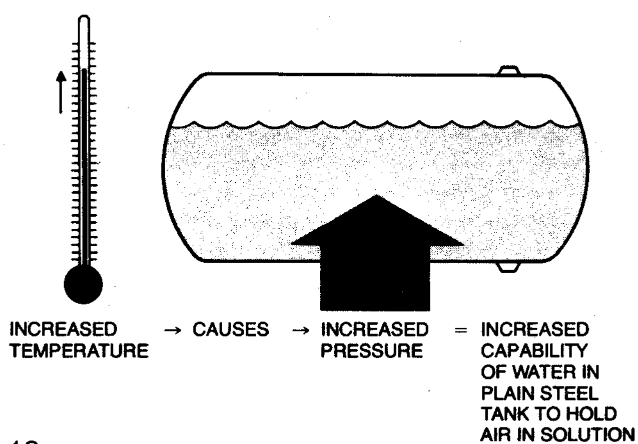
As system temperature increases, system pressure increases and the capability of the water in the plain steel expansion tank to hold air in solution increases. During each operating cycle, expanded water is forced into the tank, and then re-enters the system piping carrying its full capability, air in solution, absorbed from the air cushion in the tank.

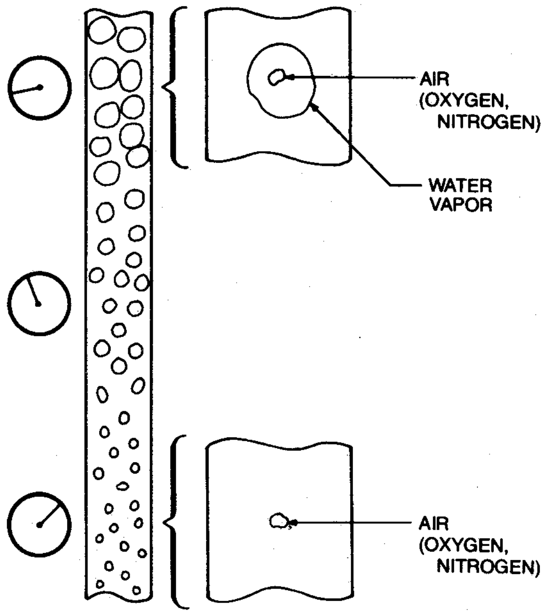
At higher elevations in the piping system, the decrease in static pressure will normally cause the capability to drop below the equilibrium point and bubbles will form.

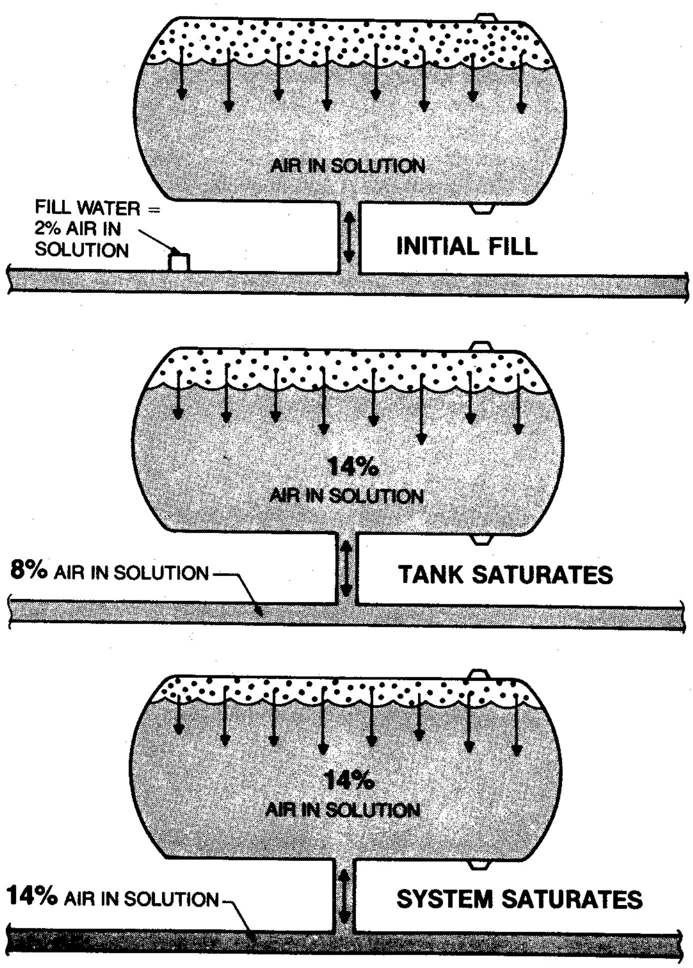
The bubbles will not only contain air released from solution, but water vapor. As the bubbles are carried to the top of the system, their size increases rapidly. There are three reasons for this:

a. The law of perfect gases (Boyle-Mariott) will result in the volume of a given amount of gas increasing as the pressure decreases.

b. As the pressure decreases, the amount of air released from solution will increase.







c. The amount of water vapor in the bubbles is proportional to increasing temperature, decreasing pressure and increase in bubble size. The vapor pressure is a function of the water temperature. At the top of the system, with no static pressure, the total pressure on the bubble will be much closer to the vapor pressure. As a result, the amount of water vapor in the bubble may be many times greater than the amount of air in the bubbles.

Under the most ideal conditions, we could hope that the entrained gas bubbles would be carried back down to the bottom of the system, where the air would be re-absorbed in the system water and the water vapor would condense.

Experience has proven otherwise. Pervasive problems exist — noise in the piping, accumulation of bubbles in terminal units, blockage of circuit and inefficient operation.

Temporary relief can be achieved by the use of manual air vents, or by automatic air vents. However, as air is removed from the system, water-logging of the plain steel tank is accelerated.

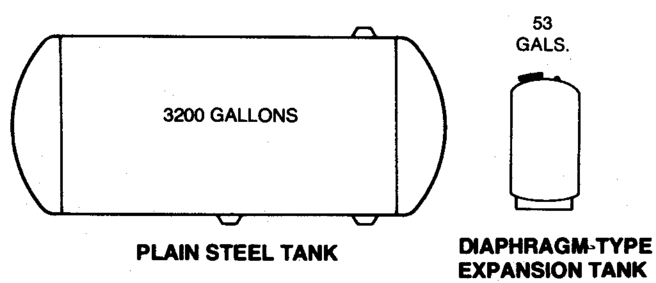
2. The Plain Steel Tank in the Chilled Water System

In the chilled water system, because of lower operating temperatures, system water can hold a much higher percentage of its volume, air in solution. As a result, the air charge in a plain steel tank is transferred as absorbed air in solution to system water in a relatively short period of time.

As a result, designers historically have used tank sizes much larger than that necessary to accommodate the expanded water in the system, in order to postpone water-logging as long as possible.

After the tank has been re-charged with air a number of times, system water will become saturated to its full capability — carrying entrained air bubbles at the top of the system, which are re-absorbed at the bottom.

A DIAPHRAGM-TYPE TANK WITH A SEALED-IN AIR CUSHION CAN BE SIZED ACCURATELY TO ACCOMMODATE THE AMOUNT OF EXPANDED WATER IN THE SYSTEM; WITHOUT OVERSIZING WHICH IS NECESSARY ONLY WITH THE PLAIN STEEL TANK.



AIR ELIMINATION SOLVES THE PROBLEM OF AIR BUBBLES

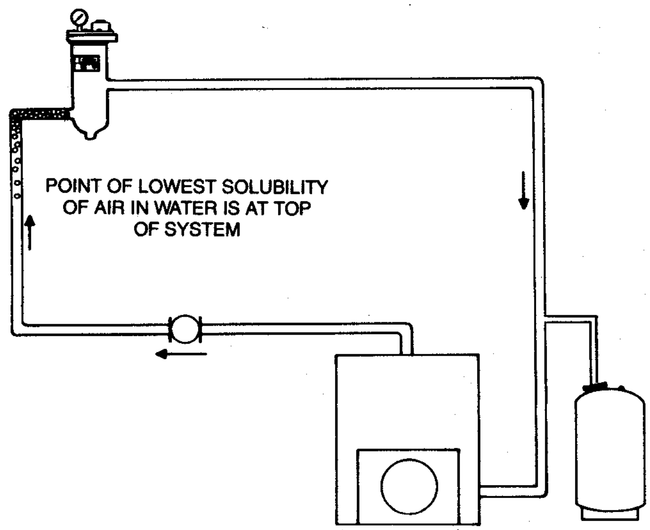
The installation of a diaphragm-type tank with a properly sized sealed-in air cushion allows the designer to eliminate "system air" and solve the problems of bubble formation.

Air separation must be accomplished at the location in the piping system where entrained air bubbles form — the point of lowest solubility of air in water, usually at the top of the system.

An air separating and elimination component at the top of the system, will allow flowing system water to enter terminal units in a deaerated condition.

The expansion tank should be placed in the system at a location where it can best perform its function in the system — usually on the suction side of the pump at the bottom of the system.

The air separation and elimination component should be placed in the system at a location where it can best perform its function — usually at the top of the system.



PUMP PERFORMANCE IN A HYDRONIC SYSTEM

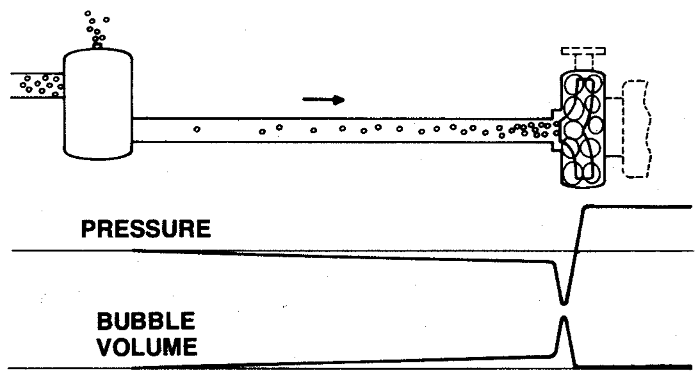
A key pump characteristic is the phenomenon of pressure reduction in the impeller eye — usually described as "required net positive suction head" ($NPSH_R$). It is generally understood that the net positive suction head available must exceed the net positive suction head requirement of a specific pump in order that the pressure at the eye of the impeller will not be less than the vapor pressure of the water at the pumping temperature.

1. Cavitation Dynamics

Cavitation occurs when vapor bubbles form in the pump impeller. As system water flows from the eye of the impeller outward to the periphery of the pump, the regained velocity head at the impeller tip increases static pressure causing any bubbles to collapse, implosion occurs.

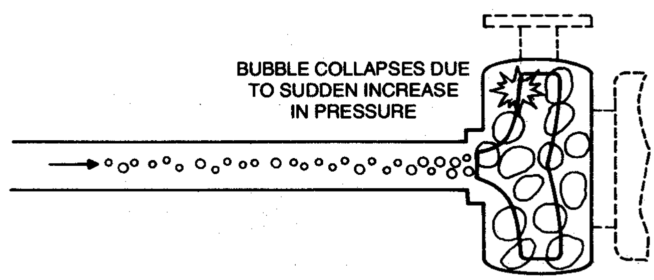
If the magnitude of the implosion is severe, particles of water are propelled with tremendous force against the surface of the impeller. The impingement of these particles can cause pitting of the surface, noise, vibration, and damage to seals and bearings.

When no air in solution is present, the bubbles are pure vapor. When there is air in solution, the bubbles consist of both air and water vapor.

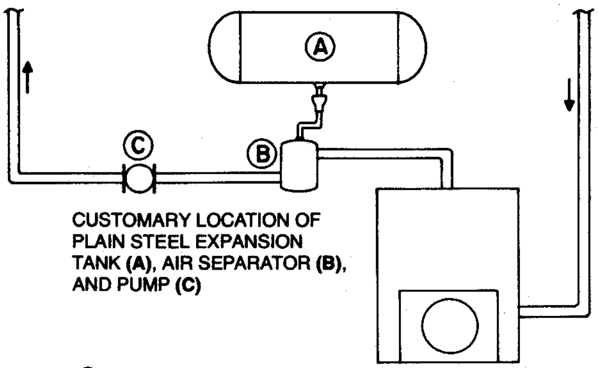


2. Formation of "Air" Bubbles at the Pump Interior

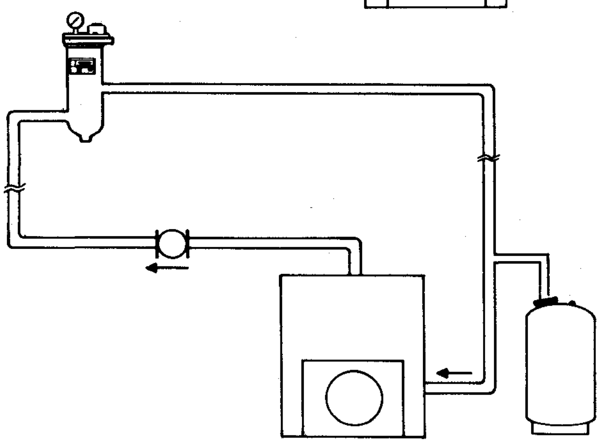
When water flowing to the pump suction is not deaerated but is at the equilibrium point, containing air in solution, bubbles will form at pressures far higher than the vapor pressure. Just as the decrease in static pressure at higher elevations in the system causes bubbles to form, the decrease in pressure which occurs as water flows to the interior of the pump causes bubbles to form. Similarly, the bubbles will not only contain air released from solution, but also water vapor, and the bubbles will grow rapidly in size as the pressure decreases.

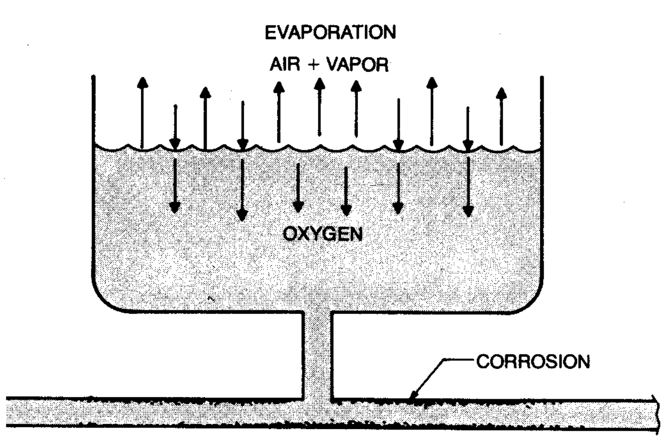


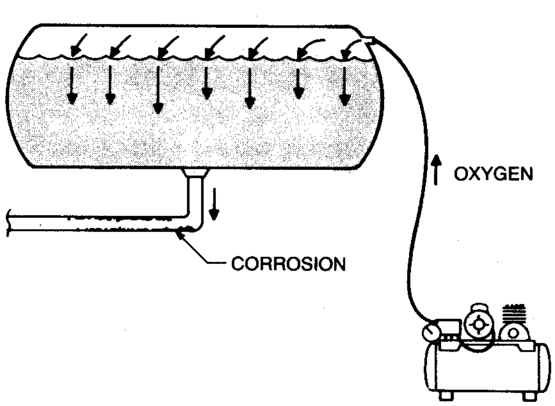
With a plain steel expansion tank and air separation device installed at the customary location adjacent to the pump suction, it can be assumed that any time during the operating



CUSTOMARY LOCATION OF PLAIN STEEL EXPANSION TANK **(A)**, AIR SEPARATOR **(B)**, AND PUMP **(C)**







cycle that entrained air bubbles are separated, the system water entering the pump will be at the saturation point. Since bubbles must form with any pressure decrease, the net positive suction pressure available should be increased to minimize the effect of these bubbles. The effects of these bubbles may be a reduction in pump performance, and in some cases a complete loss of head.

AIR ELIMINATION SOLVES THE PROBLEM OF BUBBLE FORMATION ABOVE THE VAPOR PRESSURE INSIDE THE PUMP

The diaphragm-type tank installed at the best location for proper system operation (normally at the pump suction at the bottom of the system) combined with the air separation and elimination component installed at the best location for this device (normally at the top of the system) will allow the problem of bubble formation to be solved (as shown at left).

Reference to the Table, Solubility of Air in Water, page 14, the operating temperature and pressure at the location of the air separation and elimination component will show the amount of air remaining in solution in the system water after elimination has taken place. If this amount is lower than the capability of water to hold air in solution at the pressure and temperature at the eye of the pump impeller, no bubbles will form unless the actual vapor pressure is reached.

CORROSION

1. Open System

The expansion tank installed at the top of the system, open to the atmosphere, is a souce of continuous oxygen contamination.

At the exposed surface of the water, oxygen is absorbed and transferred to system piping — an "open system".

Water vapor forms at the surface and escapes to the atmosphere. The water lost through evaporation must be replaced by make-up water carrying more oxygen.

Dust carried in the atmosphere is accumulated in system water. Suspended solids cause erosion in piping and equipment. In spite of chemical treatment, deposits of dirt at the bottom of horizontal piping cause localized pitting.

2. Closed Systems

The plain steel expansion tank (no diaphragm) contains, in theory, a trapped air cushion; and the system is referred to as a "closed system". Actually the "trapped air" eventually escapes into the system water and the tank becomes waterlogged — recharging with new air is necessary.

The use of a compressor to maintain the air cushion has become quite common, particularly on larger jobs.

In a sense, the system is no longer a closed system, but has become an open system. Oxygen is absorbed readily by water in the system; and combines with metal to form oxides. An efficient "oxygen pump" is created.

In a chilled water system, the corrosion rate is slower than in a heating system, but because of the lower temperature, the water can hold a relatively high percentage of its volume, oxygen in solution. Eventually, all the oxygen in the system will unite with metal. Corrosion is potentially very serious in the chilled water system.

CHEMICAL TREATMENT

Because a "closed system" so often becomes an "open system", chemical treatment has become more common. But this solution to the problem of corrosion is, in some ways, as troublesome as the original problem.

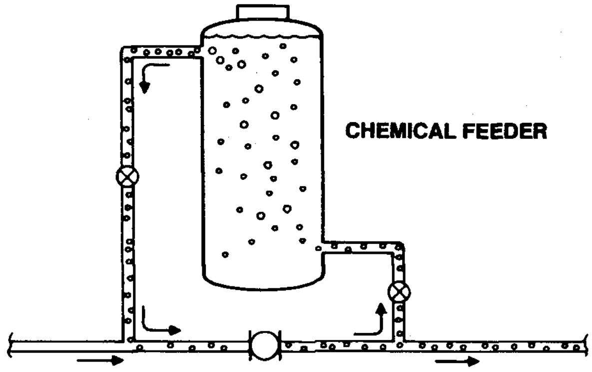
Too small an amount of one chemical could cause pitting. Excessive amounts added intermittently cause problems which could be avoided by constant feeding based on monitored results. The method of feeding can result in more oxygen being introduced to the system. Standard materials used for pump seals fail when exposed to high concentrations of certain chemicals. Special costly materials may have to be substituted.

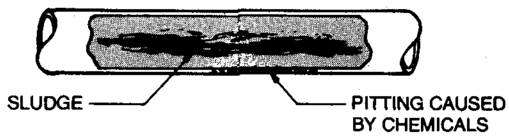
Accumulation of sludge causes inefficient operation. Frequent boiler blowdown is expensive.

Continued dumping of pervasive toxic waste into public sewer systems or streams is a questionable procedure in view of public concern over safety hazards.

The technology of applying chemicals seemingly requires highly trained specialists following careful, consistent, monitoring procedures which appear rather mystical to many engineers involved in maintenance.

In all of these different areas of concern, the role of the specifying engineer, contractor, owner or chemical specialist is difficult to define. Either overlapping responsibility or lack of responsibility is the result of this confusion.

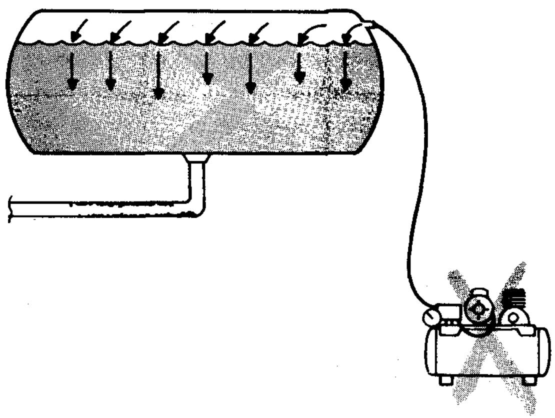


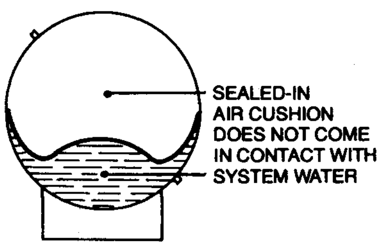


AIR ELIMINATION SOLVES THE PROBLEM OF OXYGEN CORROSION

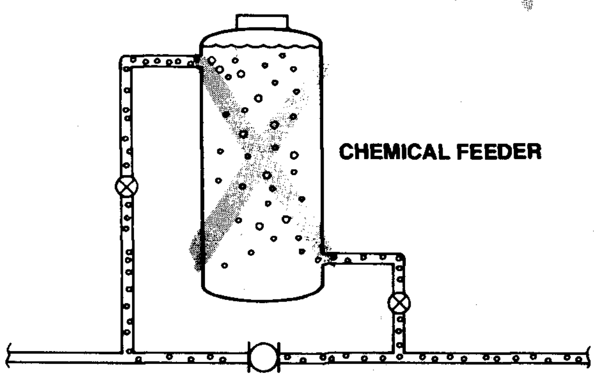
The diaphragm-type tank offers a better solution to the problem of corrosion caused by oxygen. Because the required size air cushion is permanently sealed in, all other air in the system can be eliminated. The oxygen in system water at initial fill can be eliminated before system corrosion takes place.

With reasonable care, the addition of make-up water can be minimized. No air need be added to re-charge a water-logged plain steel tank. The "oxygen pump" can be replaced. With proper PH control and, except in areas with abnormal water conditions, no chemicals to combat oxygen corrosion need be added to the water heating and chilled water system.





DIAPHRAGM-TYPE EXPANSION TANK



Diaphragm Hydro-Pneumatic Tank Design

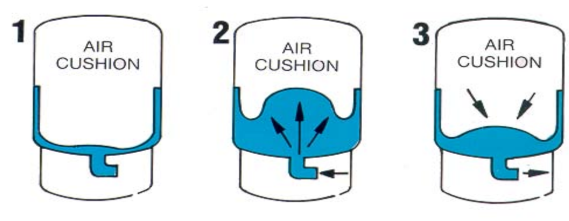
A specially compounded flexible diaphragm securely sealed into a sturdy tank separates the system air cushion from system water and maintains design expansion capacity.

1 No system water will enter the tank until the system pressure exceeds the air charge pressure. A small diaphragm tank provides the equivalent expansion capacity of a much larger conventional type compression tank.

2. When the heated water expands and enters the tank, the rugged diaphragm flexes... it doesn't stretch, as the permanent air cushion is compressed.

3. As system pressure decreases the air charge returns the expanded water to the system.

Water logged expansion tank and discharging relief valve are eliminated, and system corrosion is drastically reduced by systems removing the principal source of air found in hydronic systems



The Solution

Prevents Water logging

The plain steel expansion tank (with no diaphragm) is a constant source of air. It is the one place in the system where water is in constant direct contact with air.

In a heating system, during each operating cycle, expanded water enters the tank, absorbs air from the air cushion (at conditions of relatively high pressure and low temperature) and re-enters the system piping

In a chilled water system, the plain steel expansion tank is a prime source of air. At lower temperatures, water can hold much higher concentrations of air in solution. Air will migrate from the tank until either the system has reached its full capability to hold air in solution or until the tank is waterlogged.

With an diaphragm tank, air and water never mix and water logging is prevented.

Efficient Elimination of Air

The most serious potential problem to a heating system is oxygen corrosion. diaphragm tanks offer the best solution to this problem because the required system air cushion is sealed in and additional air in the system is eliminated minimizing oxygen corrosion.

Hydraulic Stability

Diaphragm tanks ensures maximum operating efficiency by maintaining a balance of design pressure ranges for the life of the system.

Easy Installation and Maintenance

Heavy weight plain steel tanks require additional installation costs for ceiling mounting pads, heavy duty support racks, rigging, draining and recharging. Diaphragm tanks eliminate all these costs because they are only a fraction of the size and weight of plain steel tanks. They eliminate the unnecessary heating of large quantities of system water and so save costly BTUs.

SIZING THE DIAPHRAGM-TYPE HYDRO-PNEUMATIC TANK

Critical Sizing Procedure

THINGS YOU MUST KNOW:

1. Total System Water Content……………………….(1)_______gallons

2. Minimum System Temperature……………………(2)_______°F.

3. Maximum System Temperature……………………(3)_______°F.

4. Minimum Operating Pressure at Tank…………….(4)_______PSIG

5. Maximum Operating Pressure at Tank…………..(5)_______PSIG

SELECTION OF MODEL:

6. Find and enter "Net Expansion Factor" (use TABLE 1)……(6)_________

7. Amount of Expanded Water = line (1) x line(6)……………..(7)______________gallons

8. Find and enter "Acceptance Factor" (TABLE 2……………..(8)_________

9. Minimum Total Tank Volume = line (7) - line (8) …………..(9)________gallons

10. Using TABLE 3 a, b, c, d, select a tank that is at least equal to line (9) for "Total Volume" and line (7) for Max. Expanded Water Acceptance Gallons

TABLE 1... NET EXPANSION OF WATER

Max. System Temp. °F.	Minimum System Temperature °F						
	40°F	50°F	60°F	70°F	80°F	90°F	100°F
60°F	.00050	.00490	-	-	-	-	-
70°F	.00149	.00143	.00094	-	-	-	-
80°F	.00260	.00254	.00204	.00111	-	-	-
90°F	.00405	.00399	00350	.00256	.00145	-	-
100°F	.00575	.00569	.00520	.00426	.00315	.00170	-
110°F	.00771	.00765	.00716	.00622	.00511	.00366	.00196
120°F	.01000	.00990	.00950	.00860	.00740	.00600	.00430
130°F	.01240	.01230	.01180	01090	00980	00830	00660
140°F	.01500	.01490	01450	01350	01240	01100	00930
150°F	.01790	.01780	.01730	.01640	.01530	.01330	.01210

Max. System Temp. °F.	Minimum System Temperature °F						
	40°F	50°F	60°F	70°F	80°F	90°F	100F
160°F	.0209	.0208	.0204	.0194	.0181	.0165	.0148
170°F	.0242	.0241	.0236	.0227	.0216	.0201	.0184
180°F	.0276	.0275	.0271	.0261	.0250	.0236	.0219
190°F	.0313	.0312	.0307	.0298	.0287	.0272	.0255
200°F	.0351	.0350	.0346	.0336	.0325	.0311	.0294
210°F	.0391	.0390	.0386	.0376	.0365	.0351	.0334
220°F	.0434	.0433	.0428	.0419	.0408	.0393	.0376
230°F	.0476	.0475	.0471	.0461	.0450	.0436	.0419
240°F	.0522	.0521	.0517	.0507	.0496	.0482	.0465

TABLE 2...ACCEPTANCE FACTORS

Maximum Operating Pressure at Tank (Psig)	Minimum Operating Pressure at Tank (Psig)										
	5	10	12	15	20	30	40	50	60	70	80
27	0.527	0 408	0.360	0.288	0.168	-	-	-	-	-	-
30	0.560	0.447	0.403	0.336	0.224	-	-	-	-	-	-
35	0.604	0.503	0.463	0.403	0.302	0.101	-	-	-	-	-
40	0.640	0.548	0.512	0.457	0.366	0.183	-	-	-	-	-
45	0.670	0.586	0.553	0.503	0.419	0.251	0.084	-	-	-	-
50	0.696	0.618	0.587	0.541	0.464	0.309	0.155	-	-	-	-
55	0.717	0.646	0 617	0.574	0.502	0.359	0.215	0.072	-	-	-
60	0.736	0.669	0.643	0.602	0.536	0.402	0.268	0.134	-	-	-
65	0.753	0.690	0.665	0.627	0.565	0.439	0.314	0.188	0.062	-	-
70	0.767	0.708	0.685	0.649	0.590	0.472	0.354	0.236	0.118	-	-
75	0.780	0.725	0.702	0.669	0.613	0.502	0.390	0.279	0.167	0.056	-
80	0.792	0.739	0.718	0.686	0.634	0.528	0.422	0.317	0.211	0.106	-
90	0.812	0.764	0 745	0.716	0.669	0.573	0.478	0.382	0.287	0.191	0.096
100	0 828	0 785	0 767	0.741	0 698	0.610	0.523	0 436	0 347	0.261	0.174
110	0.842	0.802	0.786	0.762	0.723	0.642	0.561	0.481	0.401	0.321	0.241

AX Series Tanks are ASME certified and come in two styles, vertical and horizontal, that can be installed in a suspended or free standing configuration. Eleven sizes are available in total tank volumes from 8 to 132 gallons. Table 3a

MAX WORKING PRESSURE: 125 psig
MAX. OPERATING TEMP: 240F

Model No.	Tank Volume (Gallons)	Max. Accept. (Gallons)	Vert. Series Height Inches	Series Length Inches	Dia. Inches
AX-15	7.8	2.40	-	19.00	12
AX-20	10.9	2.40	-	25.75	12
AX-40	21.7	4.80	-	49.00	12
AX-60	33.6	11.30	42.75	42.25	16
AX-80	44.4	22.60	56.00	55.25	16
AX-100	55.7	22.60	69.00	68.25	16
AX-120	68.0	34.00	44.25	40.25	24
AX-144	77.0	34.00	49.12	45.12	24
AX-180	90.0	34.00	56.50	52.50	24
AX-200	110.0	34.00	67.00	63.00	24
AX-240	131.7	45.20	76.25	74.25	24

TABLE 3a

L Series Tanks are ASME certified and eleven sizes are available in total tank volumes from 53 to 528 gallons. They are free standing on integral floor stands and are easily installed. Table 3b

MAX.WORKING PRESSURE: 125 psig
MAX. OPERATING TEMP: 240F

Model No.	Tank Volume (Gallons)	Max. Accept. (Gallons)	Height Inches	Dia. Inches
200-L	53	53	37.81	24
300-L	79	79	51.75	24
400-L	105	105	65.69	24
500-L	132	132	79.62	24
600-L	158	158	65.00	30
800-L	211	211	83.00	30
1000-L	264	264	73.50	36
1200-L	317	317	85.88	36
1400-L	370	370	98.25	36
1600-L	422	422	71.25	48
2000-L	528	528	85.25	48

TABLE 3b

WX-"L" Series Tanks are ASME certified and seven models are available in total tank volumes from 158 to 528 gallons. Free standing on integral floor stands for easy installation, they are designed for use with potable water. Table 3c

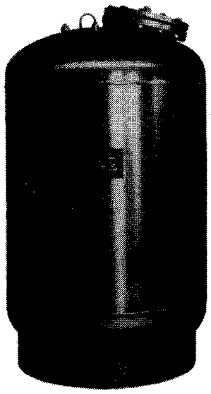
MAX. WORKING PRESSURE:125 psig
MAX. OPERATING TEMP: 240F

Model No.	Tank Volume (Gallons)	Max. Accept. (Gallons)	Height Inches	Dia. Inches
WX-600-L	158	158	72.31	30
WX-800-L	211	211	90.25	30
WX-1000-L	264	264	84.50	36
WX-1200-L	317	317	97.00	36
WX-1400-L	370	370	109.25	36
WX-1600-L	422	422	80.50	48
WX-2000-L	528	528	93.50	48

TABLE 3c

PEERLESS PUMP®

PRESSURIZATION AND AIR ELIMINATION SYSTEM COMPONENTS



DETAILED DESCRIPTION

1. Pressurization controller

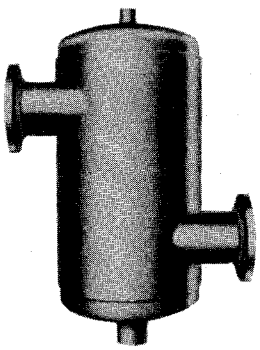
The pressurization controller, or diaphragm-type tank is available in three different models.

The L Series up to 528 gallon volume, with a replaceable diaphragm.

The AX Series, up to 131.7 gallons. Both the L Series and AX Series may be installed horizontally or vertically, free standing on an integral floor stand.

The AX300, 150 gallon volume for vertical installation only, has an integral floor stand.

All three models above are ASME designed and constructed.



2. Tangential-Type Air Separator

The tangential-type air separator, with low velocity vortex, is designed for use with the air elimination system, without a strainer and without baffling, in order to keep friction loss at a minimum. Since any pressure drop at the outlet of any air separation device immediately reduces the capability of water to hold absorbed air in solution, entrained or free air bubbles in system water can result from the installation of a strainer in the air separator — low pressure drop through the air separator is critical.

3. Model 720 Air Elimination Valve

The Model 720 Air Elimination Valve is designed to eliminate air to the atmosphere as fast as it is separated from water

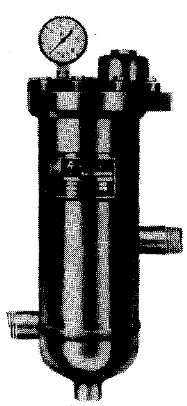
The valve consists of a body containing system water and air, a bolted-on cover into which is assembled a pilot operated elimination mechanism; and a float.

The function of the float is to position a piston moving vertically through a unique diaphragm within the elimination mechanism.

The top of the piston moves through a tight fitting hole in the top of the diaphragm.

The lower part of the piston moves through a tight fitting hole in the bottom of the diaphragm.

Between both top and bottom holes in the diaphragm, there is an intermediate chamber connected by ports to the upper surface of the diaphragm.



4. Model 721 Air Separator/Eliminator

The Model 721 Air Separator/Eliminator combines the functions of the Tangential-Type Air Separator with those of the Model 720 Air Elimination Valve into one economical, easily installed, compact, integral unit.

It features a combination vortex separator and patented remote pilot piston air elimination valve that uses the system pressure itself for tight sealing. Prevents air from entering system in vacuum conditions.

By-pass around terminal heat transfer unit ensures flow through air separator/eliminator at all times

By-pass around circulating pump creates low point of solubility at pump location

Compact size allows installation at top of system in finished space or ceiling crawl space. ASME "UM" coded.

PEERLESS PUMP®

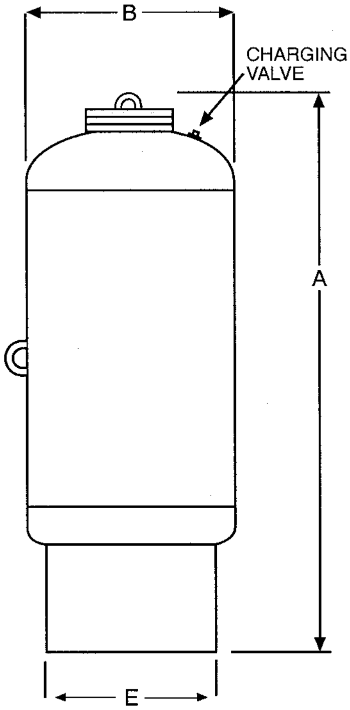
WX-440-C/450-C Series (ASME)

125 PSIG Working Pressure

ASME Models

Model No.	Tank Vol. Lit.	Tank Vol. Gal	Max. Acc. Factor	A Height mm	A Height ins.	B Diameter mm	B Diameter ins.	Sys. Conn. ins.	C ins.	D ins.	E ins.	Ship Wt. kg	Ship Wt. lbs.
WX-447-C	200	53	.65	1150	45¼	610	24	2	2	3¾	19	120	263
WX-448-C	300	80	.65	1502	59⅛	610	24	2	2	3¾	19	140	308
WX-449-C	400	106	.65	1857	73⅛	610	24	2	2	3¾	19	160	352
WX-450-C	500	132	.65	2200	86⅝	610	24	2	2	3¾	19	178	392
WX-451-C	600	158	.65	1867	73¼	762	30	2	3½	5½	24	233	513
WX-452-C	800	211	.65	2312	91	762	30	2	3½	5½	24	275	607
WX-453-C	1000	264	.65	2184	86	914	36	3	4½	7	30	367	810
WX-454-C	1200	317	.65	2489	98	914	36	3	4½	7	30	415	914
WX-455-C	1400	370	.65	2804	110⅜	914	36	3	4½	7	30	462	1018
WX-456-C	1600	422	.65	2080	81⅞	1220	48	3	7½	7⅛	42	567	1250
WX-457-C	2000	528	.65	2470	97¼	1220	48	3	7½	7⅛	42	616	1358

Note: Allow 18" (460mm) minimum clearance.



Maximum Operating Conditions

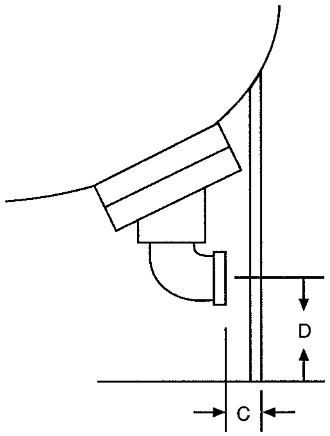
Operating Temperature	240° F (115° C)
Working Pressure	125 PSIG (8.8 kg/cm²)* ASME

* Also available with optional working pressure of 175 PSIG or 250 PSIG.

Specifications

Description	Standard Construction
Shell	Steel
Bladder	Heavy Duty Butyl
System Connection	Malleable Iron (NPTF)
Coating	Red Oxide Primer
Factory Precharge	25 PSIG (1.8 kg/cm²)

Constructed per ASME Code Section VIII.
All dimensions and weights are approximate.



CODE APPROVALS

City of Los Angeles

Job Name ____________________

Location ____________________

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Engineer ____________________

Contractor ____________________

Contractor P.O. No. ____________________

Sales Representative ____________________

Model No. Ordered ____________________

ASME CERTIFICATION REQUIRED ☐ YES ☐ NO

PEERLESS PUMP®

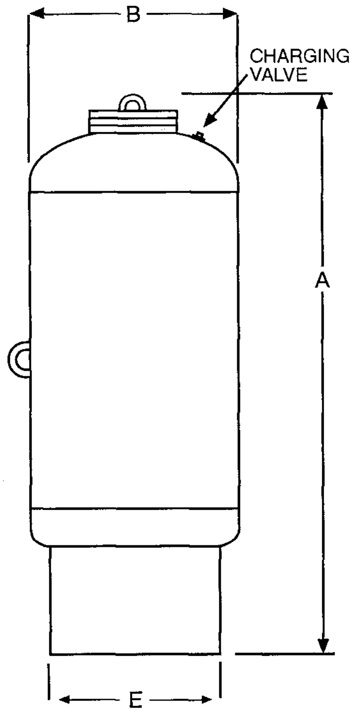
WX-440-C/450-C Series (ASME)

175 PSIG Working Pressure

ASME Models

Model No.	Tank Vol. Lit.	Tank Vol. Gal	Max. Acc. Factor	A Height mm	A Height ins.	B Diameter mm	B Diameter ins.	Sys. Conn. ins.	C ins.	D ins.	E ins.	Ship Wt. kg	Ship Wt. lbs.
WX-447-C	200	53	.65	1165	45 7/8	610	24	2	2	3 3/4	19	141	310
WX-448-C	300	80	.65	1519	59 13/16	610	24	2	2	3 3/4	19	184	404
WX-449-C	400	106	.65	1873	73 3/4	610	24	2	2	3 3/4	19	226	495
WX-450-C	500	132	.65	2226	87 5/8	610	24	2	2	3 3/4	19	267	585
WX-451-C	600	158	.65	1880	74	762	30	2	3 1/2	5 1/2	24	308	675
WX-452-C	800	211	.65	2337	92	762	30	2	3 1/2	5 1/2	24	373	817
WX-453-C	1000	264	.65	2184	86	914	36	3	4 1/2	7	30	515	1,130
WX-454-C	1200	317	.65	2489	98	914	36	3	4 1/2	7	30	588	1,290
WX-455-C	1400	370	.65	2804	110 3/8	914	36	3	4 1/2	7	30	661	1,450
WX-456-C	1600	422	.65	2080	81 7/8	1220	48	3	7 1/2	7 1/8	42	798	1,750
WX-457-C	2000	528	.65	2470	97 1/4	1220	48	3	7 1/2	7 1/8	42	926	2,030

Note: Allow 18" (460mm) minimum clearance.

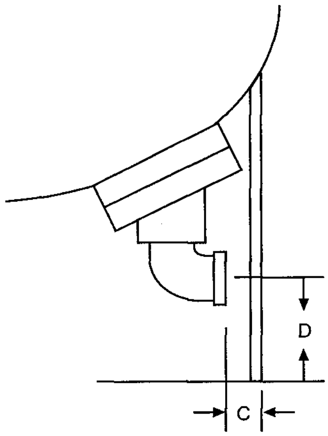


Maximum Operating Conditions

Operating Temperature	240° F (115° C)
Working Pressure	175 PSIG (12.3 kg/cm^2) ASME

Specifications

Description	Standard Construction
Shell	Steel
Bladder	Heavy Duty Butyl
System Connection	Malleable Iron (NPTF)
Coating	Red Oxide Primer
Factory Precharge	25 PSIG (1.8 kg/cm^2)



All dimensions and weights are approximate.

CODE APPROVALS

City of Los Angeles

Job Name ____________________

Location ____________________

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Engineer ____________________

Contractor ____________________

Contractor P.O. No. ____________________

Sales Representative ____________________

Model No. Ordered ____________________

ASME CERTIFICATION REQUIRED ❑ YES ❑ NO

PEERLESS PUMP®

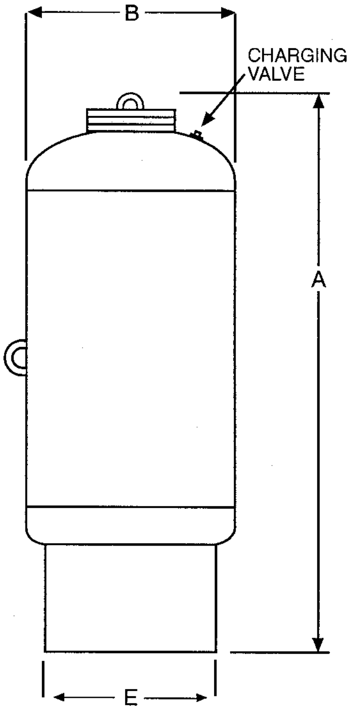
WX-440-C/450-C Series (ASME)

250 PSIG Working Pressure

ASME Models

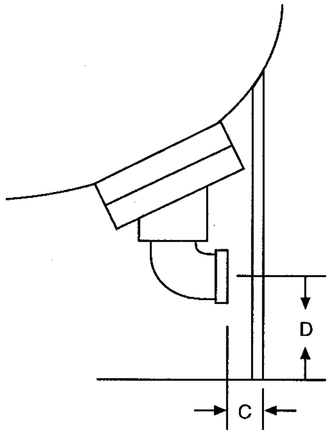
Model No.	Tank Vol. Lit.	Tank Vol. Gal	Max. Acc. Factor	A Height mm	A Height ins.	B Diameter mm	B Diameter ins.	Sys. Conn. ins.	C ins.	D ins.	E ins.	Ship Wt. kg	Ship Wt. lbs.
WX-447-C	200	53	.65	1168	46	610	24	2	2	3¾	19	178	390
WX-448-C	300	80	.65	1480	58½	610	24	2	2	3¾	19	230	505
WX-449-C	400	106	.65	1873	73¾	610	24	2	2	3¾	19	282	618
WX-450-C	500	132	.65	2194	86⅜	610	24	2	2	3¾	19	333	731
WX-451-C	600	158	.65	1892	74½	762	30	2	3¾	6	24	384	843
WX-452-C	800	211	.65	2324	91½	762	30	2	3¾	6	24	466	1021
WX-453-C	1000	264	.65	2162	85⅛	914	36	3	3⅞	6¾	30	644	1412
WX-454-C	1200	317	.65	2477	97½	914	36	3	3⅞	6¾	30	736	1613
WX-455-C	1400	370	.65	2791	109⅞	914	36	3	3⅞	6¾	30	824	1808
WX-456-C	1600	422	.65	2080	81⅞	1220	48	3	7½	6⅞	42	961	2108
WX-457-C	2000	528	.65	2432	95¾	1220	48	3	7½	6⅞	42	1160	2543

Note: Allow 18" (460mm) minimum clearance.



Maximum Operating Conditions

Operating Temperature	240° F (115° C)
Working Pressure	250 PSIG (17.6 kg/cm^2) ASME



Specifications

Description	Standard Construction
Shell	Steel
Bladder	Heavy Duty Butyl
System Connection	Malleable Iron (NPTF)
Coating	Red Oxide Primer
Factory Precharge	25 PSIG (1.8 kg/cm^2)

All dimensions and weights are approximate.

Job Name ______________________________

Location ______________________________

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Engineer ______________________________

Contractor ______________________________

Contractor P.O. No. ______________________________

Sales Representative ______________________________

Model No. Ordered ______________________________

ASME CERTIFICATION REQUIRED ❑ YES ❑ NO

PEERLESS PUMP®

WX-400-C Series (ASME)

125 PSIG Working Pressure

ASME Models

Model No.	Tank Vol. Lit.	Tank Vol. Gal	Max. Accept. Factor	A Height mm	A Height ins.	B Diameter mm	B Diameter ins.	C Conn. mm	C Inset ins.	D Conn.Centerline mm	D Conn.Centerline ins.	E ins.	Sys. Conn. ins.	Ship Wt. kg	Ship Wt. lbs.
WX-401-C	68	18	.65	794	31¼	413	16¼	124	4⅞	38	1½	12¾	1	43	95
WX-402-C	95	25	.45	1010	39¾	413	16¼	124	4⅞	38	1½	12¾	1	51	112
WX-403-C	129	34	.33	1251	49¼	413	16¼	124	4⅞	38	1½	12¾	1	56	123
WX-404-C	258	68	.50	1200	47¼	610	24	159	6¼	41	1⅝	16	1¼	95	210
WX-405-C	341	90	.39	1505	59¼	610	24	159	6¼	41	1⅝	16	1¼	127	280
WX-406-C	417	110	.31	1778	70	610	24	159	6¼	41	1⅝	16	1¼	152	335
WX-407-C	500	132	.35	1435	56½	762	30	254	10	41	1⅝	24	1¼	207	456

Code Approvals

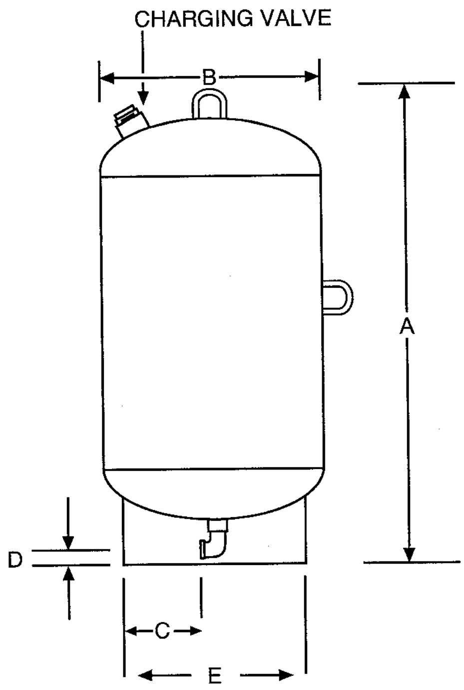
NSF ANSI/NSF 61

City of Los Angeles

Maximum Operating Conditions

Operating Temperature	200° F (93° C)
Working Pressure	125 PSIG (8.8 kg/cm²) ASME

Also available with optional working pressure of 175 PSIG or 250 PSIG.



Specifications

Description	Standard Construction
Shell	Steel
Diaphragm	Heavy Duty Butyl
System Connection	Malleable Iron (NPT)
Liner	Polypropylene
Coating	Red Oxide Primer
Factory Precharge	30 PSIG (2.2 kg/cm²)

Constructed per ASME Code Section VIII.

All dimensions and weights are approximate.

Job Name ______________________

Location ______________________

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Engineer ______________________

Contractor ______________________

Contractor P.O. No. ______________________

Sales Representative ______________________

Model No. Ordered ______________________

System Pressure Range ______________________

Pre-Charge Pressure ______________________

Pump GPM ______________________

Date Submitted ______________________

ASME CERTIFICATION REQUIRED ❑ YES ❑ NO

STERLING PEERLESS PUMP

WX-400 Series (ASME)

175 PSIG Working Pressure

ASME Models

Model No.	Tank Vol. Lit.	Tank Vol. Gal	Max. Accept. Factor	A Height mm	A Height ins.	B Diameter mm	B Diameter ins.	C Conn. mm	C Inset ins.	D Conn.Centerline mm	D Conn.Centerline ins.	E ins.	Sys. Conn. ins.	Ship Wt. kg	Ship Wt. lbs.
WX-401	68	18	.65	794	31¼	413	16¼	124	4⅞	38	1½	12¾	1	43	95
WX-402	95	25	.45	1010	39¾	413	16¼	124	4⅞	38	1½	12¾	1	51	112
WX-403	129	34	.33	1251	49¼	413	16¼	124	4⅞	38	1½	12¾	1	56	123
WX-404	258	68	.50	1200	47¼	610	24	159	6¼	41	1⅝	16	1¼	95	210
WX-405	341	90	.39	1511	59½	610	24	159	6¼	41	1⅝	16	1¼	127	280
WX-406	417	110	.31	1778	70	610	24	159	6¼	41	1⅝	16	1¼	152	335
WX-407	500	132	.35	1435	56½	762	30	254	10	41	1⅝	24	1¼	207	456

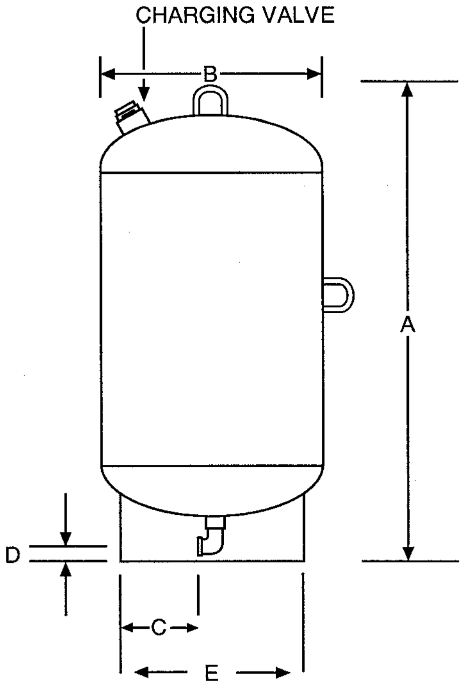
Code Approvals

NSF ANSI/NSF 61

City of Los Angeles

Maximum Operating Conditions

Operating Temperature	200° F (93° C)
Working Pressure	175 PSIG (12.3 kg/cm²) ASME



Specifications

Description	Standard Construction
Shell	Steel
Diaphragm	Heavy Duty Butyl
System Connection	Malleable Iron (NPT)
Liner	Polypropylene
Coating	Red Oxide Primer
Factory Precharge	30 PSIG (2.2 kg/cm²)

Constructed per ASME Code Section VIII

All dimensions and weights are approximate.

Job Name ______________________

Location ______________________

____

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Engineer ______________________

Contractor ______________________

Contractor P.O. No. ______________________

Sales Representative______________________

Model No. Ordered ______________________

System Pressure Range ______________________

Pre-Charge Pressure______________________

Pump GPM ______________________

Date Submitted ______________________

ASME CERTIFICATION REQUIRED ❑ YES ❑ NO

PEERLESS PUMP®

WX-400-C Series (ASME)

250 PSIG Working Pressure

ASME Models

Model	Tank Vol.		Max. Accept.	A Height		B Diameter		C Conn.	Inset	D Conn.Centerline		E	Sys. Conn.	Ship Wt.	
No.	Lit.	Gal	Factor	mm	ins.	mm	ins.	mm	ins.	mm	ins.	ins.	ins.	kg	lbs.
WX-401-C	68	18	.65	794	31¼	413	16¼	124	4⅞	38	1½	12¾	1	43	95
WX-402-C	95	25	.45	1010	39¾	413	16¼	124	4⅞	38	1½	12¾	1	51	112
WX-403-C	129	34	.33	1251	49¼	413	16¼	124	4⅞	38	1½	12¾	1	56	123
WX-404-C	258	68	.50	1200	47¼	610	24	159	6¼	41	1⅝	16	1¼	95	210
WX-405-C	341	90	.39	1511	59½	610	24	159	6¼	41	1⅝	16	1¼	127	280
WX-406-C	417	110	.31	1778	70	610	24	159	6¼	41	1⅝	16	1¼	152	335
WX-407-C	500	132	.35	1435	56½	762	30	254	10	41	1⅝	24	1¼	207	456

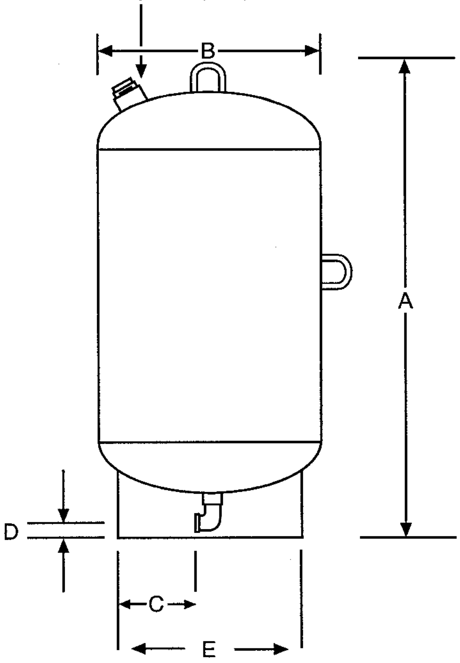
Code Approvals

NSF ANSI/NSF 61

City of Los Angeles

Maximum Operating Conditions

Operating Temperature	200° F (93° C)
Working Pressure	250 PSIG (17.6 kg/cm²) ASME



Specifications

Description	Standard Construction
Shell	Steel
Diaphragm	Heavy Duty Butyl
System Connection	Malleable Iron (NPT)
Liner	Polypropylene
Coating	Red Oxide Primer
Factory Precharge	30 PSIG (2.2 kg/cm²)

Constructed per ASME Code Section VIII.

All dimensions and weights are approximate.

Job Name ______________________

Location ______________________

Engineer ______________________

Contractor ______________________

Contractor P.O. No. ______________________

Sales Representative ______________________

Model No. Ordered ______________________

System Pressure Range ______________________

Pre-Charge Pressure ______________________

Pump GPM ______________________

Date Submitted ______________________

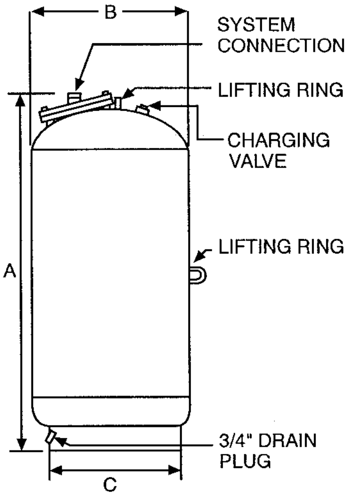
ASME CERTIFICATION REQUIRED ☐ YES ☐ NO

Expansion Tanks
"L" Series (ASME)

125 PSIG WP ASME Models

Model No.	Tank Volume		A Height		B Diameter		C Stand Dia.		Sys. Conn.[1]	Ship Weight	
	Lit.	Gal.	mm	ins.	mm	ins.	mm	ins.	ins.	kg	lbs.
200-L	200	53	936	36⅞	610	24	483	19	1	87	192
300-L	300	80	1292	50⅞	610	24	483	19	1	122	268
400-L	400	106	1644	64¾	610	24	483	19	1	140	309
500-L	500	132	1981	78	610	24	483	19	1	149	328
600-L	600	158	1619	63¾	762	30	610	24	1½	231	510
800-L	800	211	2076	81¾	762	30	610	24	1½	256	565
1000-L	1000	264	1854	73	914	36	762	30	1½	313	691
1200-L	1200	317	2169	85⅜	914	36	762	30	1½	353	779
1400-L	1400	370	2483	97¾	914	36	762	30	1½	411	905
1600-L	1600	422	1756	69⅛	1219	48	1067	42	1½	537	1183
2000-L	2000	528	2145	84	1219	48	1067	42	1½	573	1264

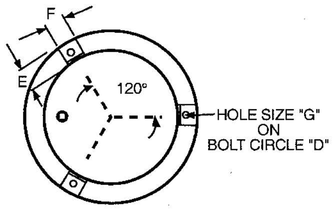
[1]System connection is NPTF



Maximum Operating Conditions

Operating Temperature	240°F (115°C)
Working Pressure	125 PSIG (8.8 kg/cm²) ASME

*Available in 175 or 250 PSIG.



BOTTOM VIEW

Specifications

Description	Standard Construction
Shell	Steel
Diaphragm	Butyl, replaceable
System Connection	Forged Steel
Factory Precharge	12 PSIG (.84 kg/cm²)

Designed & constructed per ASME Section VIII, Division 1.
Allow 18" (460 mm) minimum clearance for piping.

Sight Glass Optional

Optional Seismic Restraints

TANK Diam B	BOLT CIRCLE D	DIM. E	DIM. F	HOLE SIZE G
24	21	2	2	9/16
30	28	4	4	⅞
36	34	4	4	⅞
48	46	4	4	⅞

All dimensions and weights are approximate.

Job Name ______________________

Location ______________________

____

____

Engineer ______________________

Contractor ______________________

Contractor P.O. No. ______________________

Sales Representative ______________________

Model No. Ordered ______________________

System Operating Temp Range ______________________

System Operating Pressure Range ______________________

Tank Precharge PSIG ______________________

Date Submitted ______________________

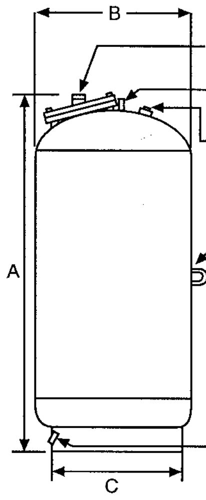
ASME CERTIFICATION REQUIRED ❑ YES ❑ NO

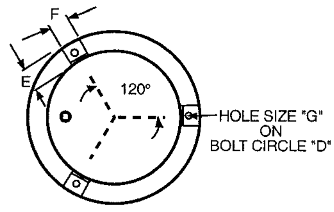
Expansion Tanks
"L" Series (ASME)

175 and 250 PSIG WP ASME Models

Model No.	Tank Volume		A Height		B Diameter		C Stand Dia.		Sys. Conn.[1]	Shipping Weight 175 PSIG		Shipping Weight 250 PSIG	
	Lit.	Gal.	mm	ins.	mm	ins.	mm	ins.	ins.	kg	lbs.	kg	lbs.
200-L	200	53	940	37	610	24	483	19	1	128	283	172	379
300-L	300	80	1302	51¼	610	24	483	19	1	162	358	224	494
400-L	400	106	1654	65⅛	610	24	483	19	1	197	435	275	607
500-L	500	132	2010	79⅛	610	24	483	19	1	231	510	327	720
600-L	600	158	1651	65	762	30	610	24	1½	277	611	386	851
800-L	800	211	2108	83	762	30	610	24	1½	331	729	467	1030
1000-L	1000	264	1867	73½	914	36	762	30	1½	413	910	643	1419
1200-L	1200	317	2181	85⅞	914	36	762	30	1½	469	1033	732	1613
1400-L	1400	370	2496	98¼	914	36	762	30	1½	530	1169	820	1808
1600-L	1600	422	1768	69⅝	1219	48	1067	42	1½	950	2094	1048	2311
2000-L	2000	528	2121	83½	1219	48	1067	42	1½	1082	2386	1214	2677

[1] System connection is NPT





BOTTOM VIEW

Maximum Operating Conditions

Operating Temperature	240°F (115°C)
Working Pressure (Indicate 175 or 250 when ordering)	175 PSIG (12.3 kg/cm^2) or 250 PSIG (17.6 kg/cm^2)

Specifications

Description	Standard Construction
Shell	Steel
Diaphragm	Butyl, replaceable
System Connection	Forged Steel
Factory Precharge	12 PSIG (.84 kg/cm^2)

Designed & constructed per ASME Section VIII, Division 1.

Allow 18" (460 mm) Minimum Clearance for Piping.

Optional Seismic Restraints

TANK Diam B	BOLT CIRCLE D	DIM. E	DIM. F	HOLE SIZE G
24	21	2	2	9/16
30	28	4	4	⅞
36	34	4	4	⅞
48	46	4	4	⅞

All dimensions and weights are approximate.

Job Name ____________________

Location ____________________

____

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Engineer ____________________

Contractor ____________________

Contractor P.O. No. ____________________

Sales Representative ____________________

Model No. Ordered ____________________

System Operating Temp Range ____________________

System Operating Pressure Range ____________________

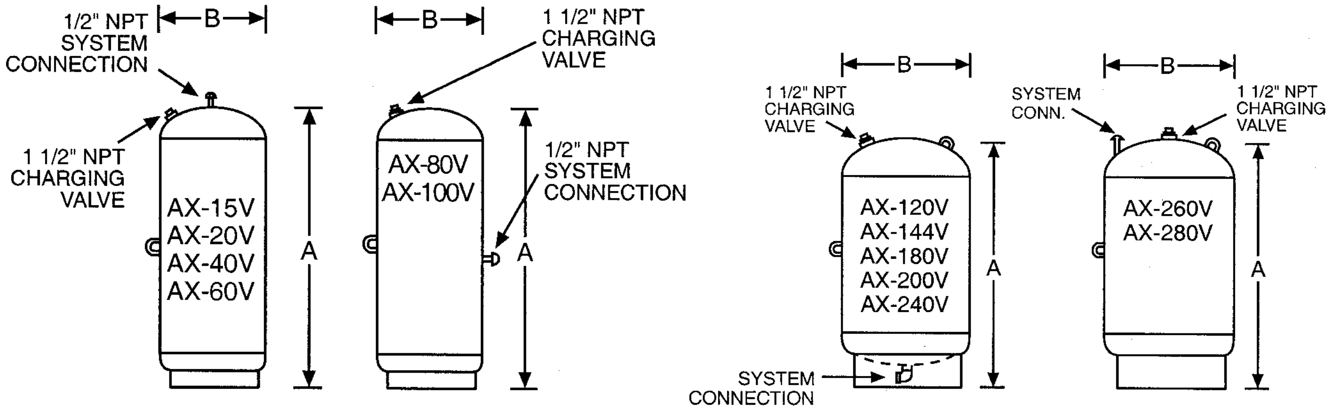
Tank Precharge PSIG ____________________

Date Submitted ____________________

ASME CERTIFICATION REQUIRED ❑ YES ❑ NO

PEERLESS PUMP®

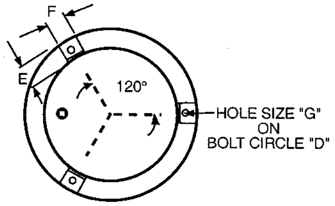
Expansion Tanks
Vertical AX Series (ASME)



Vertical ASME Models

Model No.	Tank Volume		Accept Volume		A Height		B Diameter		Sys. Conn.[1]	Ship Weight	
	Lit.	Gal.	Lit.	Gal.	mm	ins.	mm	ins.	ins.	kg	lbs.
AX-15V	29.1	7.8	9.5	2.5	489	19¼	305	12	½	20	43
AX-20V	41.5	10.9	9.5	2.5	661	26	305	12	½	21	45
AX-40V	82.2	21.7	42.8	11.3	749	29½	413	16¼	½	41	90
AX-60V	127.2	33.6	42.8	11.3	1146	45⅛	413	16¼	½	50	110
AX-80V	168.1	44.4	85.5	22.6	1422	56	413	16¼	½	66	146
AX-100V	211.8	55.7	85.5	22.6	1753	69	413	16¼	½	76	167
AX-120V	257.4	68.0	128.7	34.0	1124	44¼	610	24	1	102	224
AX-144V	291.5	77.0	128.7	34.0	1248	49⅛	610	24	1	111	244
AX-180V	340.7	90.0	128.7	34.0	1435	56½	610	24	1	121	266
AX-200V	416.4	110.0	128.7	34.0	1702	67	610	24	1	134	296
AX-240V	498.5	131.7	174.0	46.0	1369	53⅞	762	30	1	194	427
AX-260V	600.0	159.0	212.0	56.0	1537	60½	762	30	1¼	216	476
AX-280V	800.0	211.0	318.0	84.0	1989	78¼	762	30	1¼	293	645

[1]System connection is NPT



BOTTOM VIEW

Optical Seismic Restraints

TANK DIAM. B	BOLT CIRCLE D	DIM. E	DIM. F	HOLE SIZE G
12	12-¾	2	2	9/16
16-¼	14-¾	2	2	9/16
24	18	2	2	9/16
30	28	4	4	7/8

Maximum Operating Conditions

Operating Temperature	240°F (115°C)
Working Pressure	125 PSIG (862 kPa) ASME

Sight Glass Optional

Specifications

Description	Standard Construction
Shell	Steel
Diaphragm	Heavy Duty Butyl
System Connection	Forged Steel

Designed & constructed per ASME Section VIII, Division 1.

Job Name ______________________

Location ______________________

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Engineer ______________________

Contractor ______________________

Contractor P.O. No. ______________________

Sales Representative ______________________

Model No. Ordered ______________________

System Operating Temp. Range ______________________

System Operating Pressure Range ______________________

Tank Precharge Pressure ______________________

Date Submitted ______________________

ASME CERTIFICATION REQUIRED ☐ YES ☐ NO

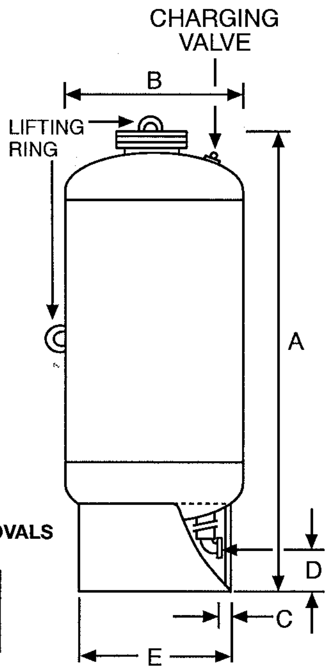
PEERLESS PUMP®

Thermal Expansion Absorbers, ST450-C Series (ASME)

Stand Models

Model No.	Tank Vol.		Max. Accept. Factor	A Height		B Diameter		C		D		E		Sys. Conn.	Ship Wt.	
	Lit.	Gal.		mm	ins.	mm	ins.	mm	ins.	mm	ins.	mm	ins.	NPTF	kg	lbs.
ST-447-C	200	53	.65	1150	45¼	610	24	51	2	95	3¾	483	19	2	120	263
ST-448-C	300	80	.65	1502	59⅛	610	24	51	2	95	3¾	483	19	2	140	308
ST-449-C	400	106	.65	1857	73⅛	610	24	51	2	95	3¾	483	19	2	161	353
ST-450-C	500	132	.65	2200	86⅝	610	24	51	2	95	3¾	483	19	2	178	391
ST-451-C	600	158	.65	1861	73¼	762	30	89	3½	140	5½	608	24	2	230	508
ST-452-C	800	211	.65	2317	91	762	30	89	3½	140	5½	608	24	2	345	760
ST-453-C	1000	264	.65	2175	85⅝	914	36	114	4½	178	7	763	30	3	368	810
ST-454-C	1200	317	.65	2489	98	914	36	114	4½	178	7	763	30	3	415	914
ST-455-C	1400	370	.65	2804	110⅜	914	36	114	4½	178	7	763	30	3	462	1018
ST-456-C	1600	422	.65	2080	81⅞	1220	48	191	7½	181	7⅛	1063	42	3	750	1655
ST-457-C	2000	528	.65	2470	97¼	1220	48	191	7½	181	7⅛	1063	42	3	873	1925

Note: Allow 18" (460mm) minimum clearance.



Maximum Operating Conditions

Operating Temperature	240°F (115°C)
Working Pressure	125 PSIG (8.8 kg/cm²) ASME

Specifications

Description	Standard Construction
Standard Factory Pre-charge	55 PSIG (3.9 kg/cm²)
System Connection	Bronze
Bladder Material	Heavy Duty Butyl
Coating	Red Oxide Primer
Shell	Steel

CODE APPROVALS

City of Los Angeles

Constructed per ASME Code Section VIII.
All dimensions and weights are approximate.

Job Name ____________________

Location ____________________

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Engineer ____________________

Contractor ____________________

Contractor P.O. No. ____________________

Sales Representative ____________________

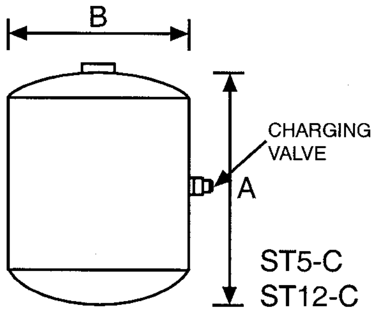
Model No. Ordered ____________________

ASME CERTIFICATION REQUIRED ❑ YES ❑ NO

PEERLESS PUMP®

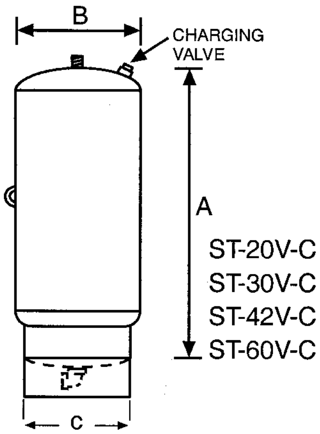
ST-C Series, Thermal Expansion Absorbers (ASME)

150 PSIG Working Pressure



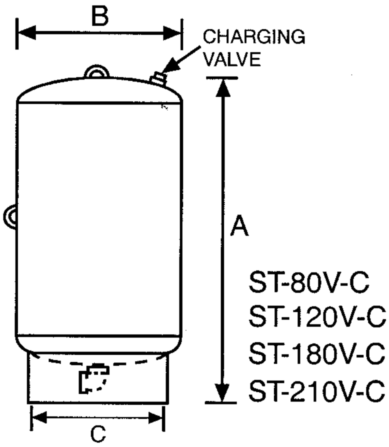
In-Line Models

Model No.	Tank Vol.		Max. Accept. Factor	A Height		B Diameter		Sys. Conn.	Ship Wt.	
	Lit.	Gal.		mm	ins.	mm	ins.	ins.	kg	lbs.
ST-5-C	8	2.1	.43	264	10⅜	254	10	¾ NPT	9.5	21
ST-12-C	24	6.4	.50	397	15⅝	305	12	¾ NPT	12	26



Stand Models

Model No.	Tank Vol.		Max. Accept. Factor	A Height		B Diameter		C Dim.		Sys. Conn.	Ship Wt.	
	Lit.	Gal.		mm	ins.	mm	ins.	mm	ins.	ins.	kg	lbs.
ST-20V-C	30	8.0	.40	495	19½	305	12	273	10¾	¾ NPTF	19	41
ST-30V-C	53	14.0	.64	486	19⅛	419	16¼	324	12¾	¾ NPTF	38.1	84
ST-42V-C	66	17.5	.65	616	24¼	419	16¼	324	12¾	¾ NPTF	41	90
ST-60V-C	95	25.0	.45	864	34	419	16¼	324	12¾	¾ NPTF	44	96
ST-80V-C	200	53.0	.65	1029	40½	610	24	406	16	1¼ NPTF	104	229
ST-120V-C	250	66	.51	1213	47¾	610	24	406	16	1¼ NPTF	117	258
ST-180V-C	292	77.0	.44	1337	52⅝	610	24	406	16	1¼ NPTF	131	288
ST-210V-C	341	90.0	.38	1524	60	610	24	406	16	1¼ NPTF	144	318



Maximum Operating Conditions

Operating Temperature	200°F (93°C)
Working Pressure	150 PSIG (10.5 kg/cm^2)ASME

Specifications

Description	Standard Construction
Standard Factory Pre-charge	55 PSIG (3.9 kg/cm^2)
System Connection	Stainless Steel
Diaphragm Material	Heavy Duty Butyl
Liner Material	Polypropylene
Shell	Steel

NSF ANSI/NSF 61

City of Los Angeles

Constructed per ASME Code Section VIII.
All dimensions and weights are approximate.

Job Name ______________________

Location ______________________

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Engineer ______________________

Contractor ______________________

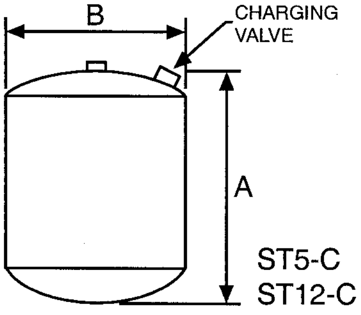
Contractor P.O. No. ______________________

Sales Representative ______________________

Model No. Ordered ______________________

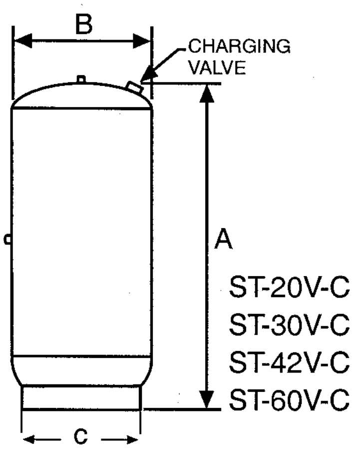
ST-C Series, Thermal Expansion Absorbers (ASME)

250 PSIG Working Pressure



In-Line Models

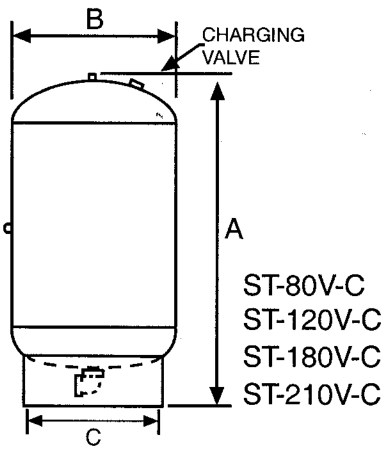
Model No.	Tank Vol. Lit.	Tank Vol. Gal.	Max. Accept. Factor	A Height mm	A Height ins.	B Diameter mm	B Diameter ins.	Sys. Conn. ins.	Ship Wt. kg	Ship Wt. lbs.
ST-5-C	8	2.1	.43	264	10⅜	254	10	¾ NPTF	9.5	21
ST-12-C	24	6.4	.50	397	15⅝	305	12	¾ NPTF	15.4	36



Stand Models

Model No.	Tank Vol. Lit.	Tank Vol. Gal.	Max. Accept. Factor	A Height mm	A Height ins.	B Diameter mm	B Diameter ins.	C Dim. mm	C Dim. ins.	Sys. Conn. ins.	Ship Wt. kg	Ship Wt. lbs.
ST-20V-C	30	8.0	.40	495	19½	305	12	273	10¾	¾ NPTF	23.6	52
ST-30V-C	53	14.0	.64	486	19⅛	419	16¼	324	12¾	¾ NPTF	44	97
ST-42V-C	66	17.5	.65	616	24¼	419	16¼	324	12¾	¾ NPTF	52.7	116
ST-60V-C	95	25.0	.45	864	34	419	16¼	324	12¾	¾ NPTF	70	154
ST-80V-C	200	53.0	.65	1029	40½	610	24	406	16	1¼ NPTF	114	251
ST-120V-C	250	66.0	.51	1213	47¾	610	24	406	16	1¼ NPTF	127.6	281
ST-180V-C	292	77.0	.44	1337	52⅝	610	24	406	16	1¼ NPTF	160.3	353
ST-210V-C	341	90.0	.38	1524	60	610	24	406	16	1¼ NPTF	173.4	382

Constructed per ASME Code Section VIII.
All dimensions and weights are approximate.



Maximum Operating Conditions

Operating Temperature	200°F (93°C)
Working Pressure	250 PSIG (17.6 kg/cm²)

Specifications

Description	Standard Construction
Standard Factory Pre-charge	55 PSIG (3.9 kg/cm²)
System Connection	Stainless Steel
Diaphragm Material	Heavy Duty Butyl
Liner Material	Polypropylene
Shell	Steel
Coating	Red Oxide Primer

NSF® ANSI/NSF 61

City of Los Angeles

Job Name ______________________

Location ______________________

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Engineer ______________________

Contractor ______________________

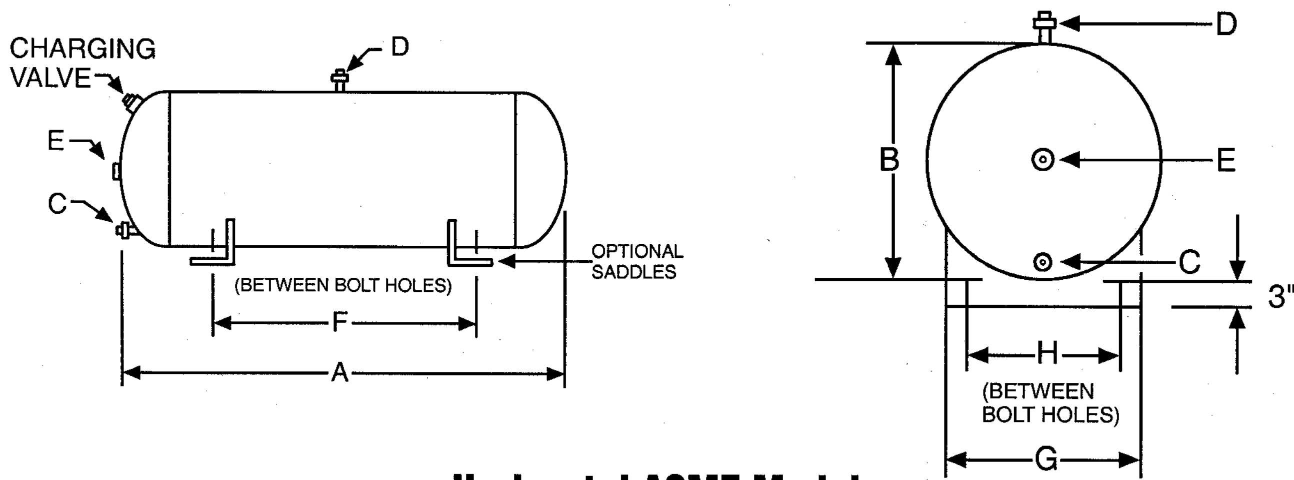
Contractor P.O. No. ______________________

Sales Representative ______________________

Model No. Ordered ______________________

PEERLESS PUMP®

Expansion Tanks
Horizontal AX Series (ASME)



Horizontal ASME Models

Model No.	Tank Volume		Accept. Volume		A Length		B Diameter		Sys. Conn.[1] ins.			Ship Wt. w/o Saddles		Saddles for Horizontal Mounting "F"		"G"		"H"		Ship Wt. w/Saddles	
	Lit.	Gal.	Lit.	Gal.	mm	ins.	mm	ins.	"C"	"D"	"E"	kg	lbs.	mm	ins.	mm	ins.	mm	ins.	kg	lbs.
AX-15	30.3	8.0	9.1	2.4	489	19¼	305	12			½	17	37	365	14⅜	254	10	203	8	22	49
AX-20	41.3	10.9	9.1	2.4	607	26¼	305	12			½	21	46	537	21⅛	254	10	203	8	25	55
AX-40	82.2	21.7	42.8	11.3	737	29	413	16¼			½	37	82	557	22	356	14	305	12	44	96
AX-60	127.2	33.6	42.8	11.3	1073	42¼	413	16¼			½	47	103	918	36⅛	356	14	305	12	53	116
AX-80	168.1	44.4	85.5	22.6	1445	56⅞	413	16¼		½		66	145	1248	49⅛	356	14	305	12	68	151
AX-100	211.8	55.7	85.5	22.6	1754	69	413	16¼		½		76	167	1578	62⅛	356	14	305	12	78	173
AX-120	257.4	68.0	128.7	34.0	1013	39⅞	610	24			1	95	210	749	29½	508	20	457	18	107	235
AX-144	291.5	77.0	128.7	34.0	1137	44¾	610	24			1	109	240	873	34⅜	508	20	457	18	111	244
AX-180	340.7	90.0	128.7	34.0	1324	52⅛	610	24			1	110	242	1060	41¾	508	20	457	18	116	255
AX-200	416.4	110.0	128.7	34.0	1591	62⅝	610	24			1	125	275	1327	52¼	508	20	457	18	139	306
AX-240	500.0	132.0	174.0	46.0	1260	49⅝	762	30			1	181	398	889	35	610	24	559	22	218	480
AX-260	600.0	159.0	212.0	56.0	1473	58	762	30	1¼			250	550	1124	44¼	610	24	559	22	277	610
AX-280	800.0	211.0	318.0	84.0	1924	75¾	762	30	1¼			318	700	1575	62	610	24	559	22	345	760

[1]System connection is NPT

Maximum Operating Conditions

Operating Temperature	240°F (115°C)
Working Pressure	125 PSIG (8.8 kg/cm²) ASME

Designed & constructed per ASME Section VIII, Division 1.

Specifications

Description	Standard Construction
Shell	Steel
Diaphragm	Heavy Duty Butyl

All dimensions and weights are approximate.

Job Name ____________________

Location ____________________

____

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Engineer ____________________

Contractor ____________________

Contractor P.O. No. ____________________

Sales Representative ____________________

Model No. Ordered ____________________

System Operating Temp. Range ____________________

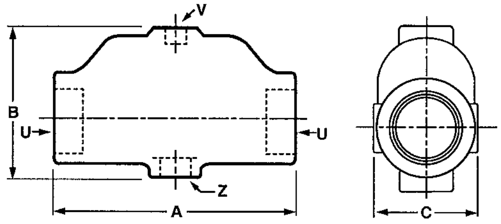
System Operating Pressure Range ____________________

Tank Precharge Pressure ____________________

Date Submitted ____________________

ASME CERTIFICATION REQUIRED ☐ YES ☐ NO

Air Elimination Equipment
1" to 3" Air Purgers



Dimensions/Specifications for 443-448

Model Number	Size Ins.	"A" Dimension Ins.	"A" Dimension mm	"B" Dimension Ins.	"B" Dimension mm	"C" Dimension Ins.	"C" Dimension mm	"U" Tappings (NPT) Ins.	"V" Tappings (NPT) Ins.	"Z" Tappings (NPT) Ins.	Ship. Wt. Lbs.	Ship. Wt. kg.
443	1	6	152	4	102	2½	64	1	⅛	½	4	1.8
444	1¼	6	152	4	102	2½	64	1¼	⅛	½	5	2.3
445	1½	8	203	5	127	3½	89	1½	⅛	½	9	4.0
446	2	8	203	5	127	3½	89	2	½	½	10	4.5
447	2½	10	254	6	152	5	127	2½	¾	½	19	8.6
448	3	10	254	6	152	5	127	3	¾	½	20	9.0

Specifications

Description	Standard Construction
Working Pressure	125 psi (862 kPa)
Materials of Construction	Cast Iron

All dimensions and weights are approximate.

Job Name ______________________

Location ______________________

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Engineer ______________________

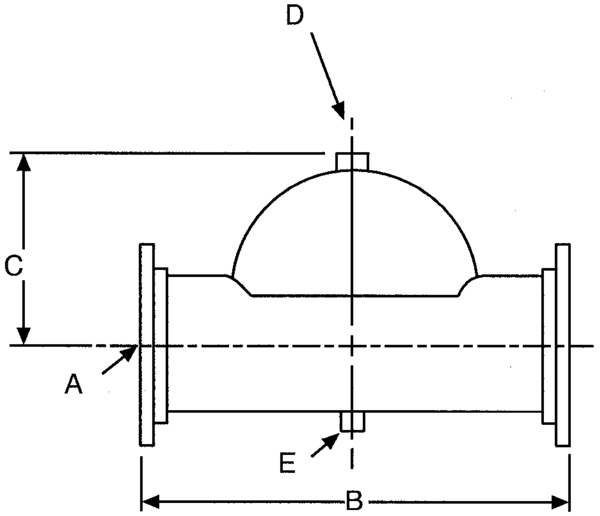
Contractor ______________________

Contractor P.O. No. ______________________

Sales Representative ______________________

Model No. Ordered ______________________

Air Elimination Equipment
4" to 18" Air Purgers



Dimensions/Specifications

Model Number	"A" Dimension* Ins.	"A" Dimension* mm	"B" Dimension Ins.	"B" Dimension mm	"C" Dimension Ins.	"C" Dimension mm	"D" Dimension (Vent Tapping) (NPT) Ins.	"E" Dimension (Drain Tapping) (NPT) Ins.	Weight Lbs.	Weight kg
449	4	102	12	305	5	127	¾	½	56	25
461	5	127	20	508	7½	191	1¼	1½	60	27
462	6	152	24	610	8½	216	1¼	1½	65	29
463	8	203	32	813	11¼	286	1¼	1½	113	51
464	10	254	40	1016	14	356	1¼	1½	174	79
465	12	305	48	1219	16¾	425	1¼	1½	330	150
466	14	356	56	1422	19⅜	492	1¼	1½	500	227
467	16	406	48	1219	20	508	1¼	1½	331	150
468	18	457	72	1829	23½	597	1¼	1½	573	260

*150 Lb. ASA Flanges

Maximum Operating Conditions

Description	Standard Construction
449	125 psi (862 kPa)
461-468	150 psi (1030 kPa)

Materials of Construction

Description	Standard Construction
No. 449	Cast Iron
No. 461-468	Steel

NOTE: Models 467 & 468 have Butt Weld Ends.

All dimensions and weights are approximate.

Job Name ______________________

Location ______________________

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Engineer ______________________

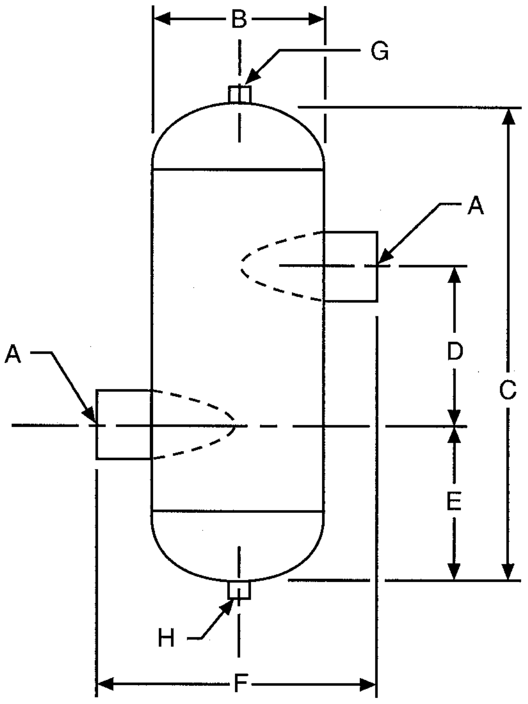
Contractor ______________________

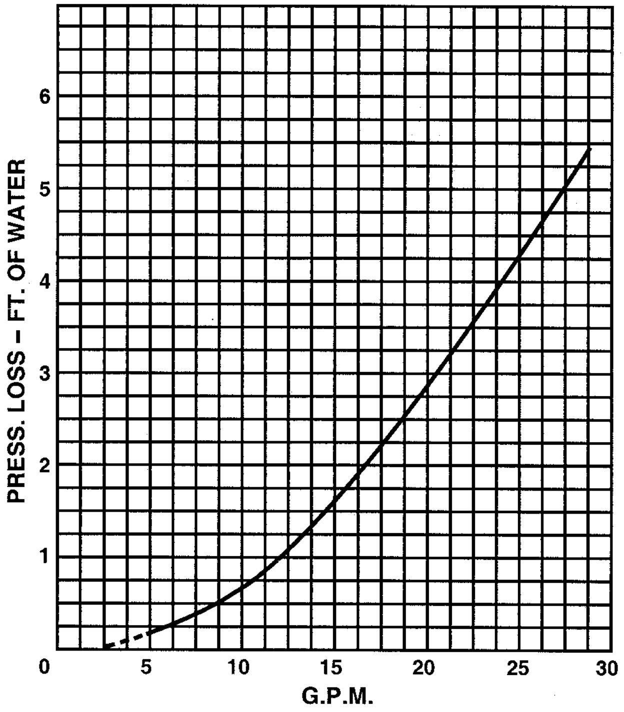
Contractor P.O. No. ______________________

Sales Representative ______________________

Model No. Ordered ______________________

Air Elimination Equipment
1" Air Separator Without Strainer





Model No.	Dimensions in Inches								Shipping Weight Lbs.
	A	B	C	D	E	F	G	H	
1-AS-L	1 NPT	4½	12	4	4	7	¾ NPT	¾ NPT	15 lbs.

Maximum Operating Conditions

Working temperature	350° F
Working pressure	125 PSI

Materials of Construction

Body	Steel
System Connection	Steel

Designed and Constructed per ASME Section VIII.

All dimensions and weights are approximate.

Job Name ______________________

Location ______________________

____

____

Engineer ______________________

Contractor ______________________

Contractor P.O. No. ______________________

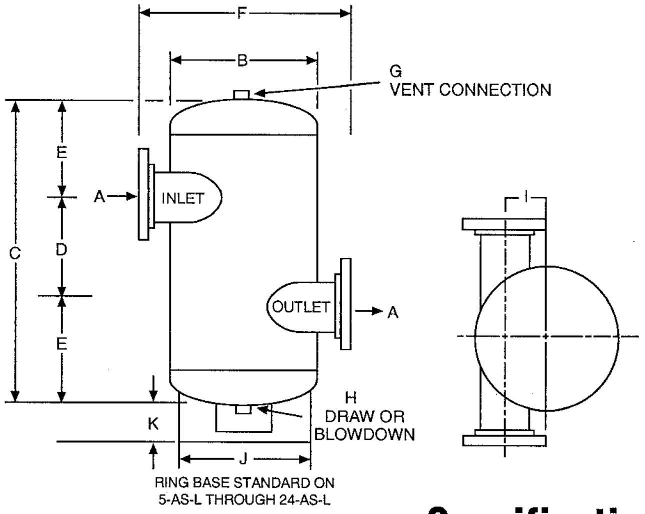
Sales Representative ______________________

Model No. Ordered ______________________

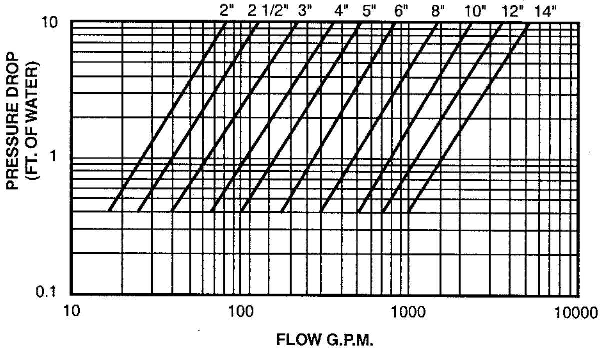
ASME CERTIFICATION REQUIRED ❑ YES ❑ NO

Air Elimination Equipment

2" – 24" Air Separators Without Strainer



AMTROL Air Separator Flow Chart



Indicates pressure drop in feet of water versus flow in gallons per minute with strainer. This is an improved method for properly computing pressure drop in AMTROL Air Separators.

Specifications/Dimensions

Model No.	Dimensions in Inches											Maximum Flow Rate			Ship Wt. lbs.
	A	B	C	D	E	F	G	H	I	J	K	Vel. 4 Ft./ Sec.	Vel. 6 Ft./ Sec.	Vel. 8 Ft./. Sec.	
2-AS-L	2	10	23	8	7½	16¼	¾	¾	3	-	-	42	63	84	65
2½-AS-L	2½	10	23	8	7½	16¼	¾	¾	3	-	-	60	90	120	65
3-AS-L	3	10	23	8	7½	17	¾	¾	3	-	-	93	140	185	70
4-AS-L	4	12	24⅜	10	7¼	20¾	¾	¾	3½	-	-	160	240	320	75
5-AS-L	5	16	34½	12	11¼	24	¾	¾	4¼	12¾	4⅝	250	375	500	145
6-AS-L	6	18	41	14	13½	26	¾	¾	4¼	14	4⅝	360	540	720	200
8-AS-L	8	24	52	18	17	32	¾	¾	5¾	16	4⅝	630	940	1250	375
10-AS-L	10	30	59½	22	18¾	40	¾	¾	7¾	24	4⅝	990	1500	1980	650
12-AS-L	12	36	70	26	22	46	¾	¾	7¾	30	12⅝	1400	2100	2800	960
14-AS-L	14	42	74	30	22	52	¾	¾	13	30	13⅜	1680	2500	3350	1950
16-AS-L	16	48	90	32	29	64	3	3	15	42	12½	2200	2800	3500	3800
18-AS-L	18	54	102	36	33¼	64	3	3	16	42	12⅜	3300	4200	5200	4300
20-AS-L	20	60	102	30	36	70	3	3	19	45	6 15/16	4500	5600	7000	4800
22-AS-L	22	60	119	48	35⅜	70	3	3	18	45	7	5000	6300	7900	5300
24-AS-L	24	72	132	43	44⅝	82	3	3	22	45	8	5500	7000	8800	6900

Maximum Operating Conditions

Working temperature	350° F
Working pressure	125 PSI

Materials of Construction

Body	Steel
Flanges	Steel - ANSI 150#

Designed and Constructed per ASME Section VIII, Division 1.

Job Name ______________________________

Location ______________________________

____

____

Engineer ______________________________

Contractor ______________________________

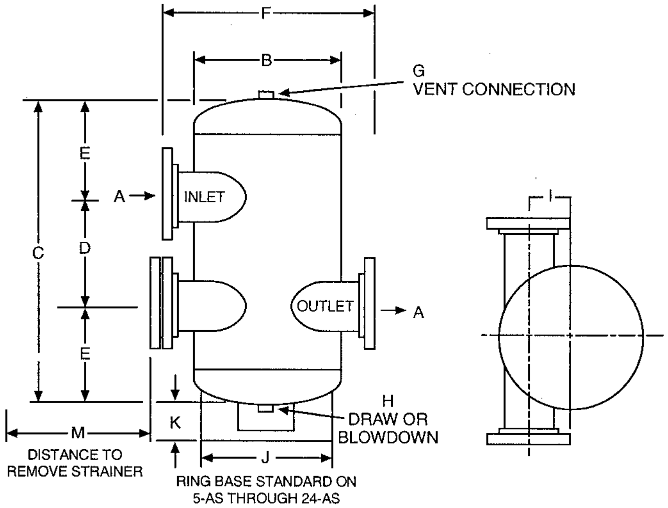
Contractor P.O. No. ______________________________

Sales Representative ______________________________

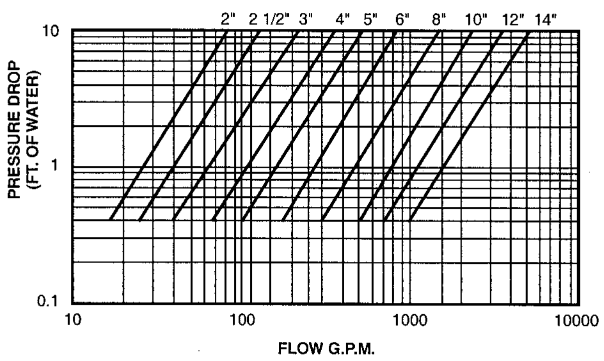
Model No. Ordered ______________________________

Air Elimination Equipment

2" – 24" Air Separators With Strainer



AMTROL Air Separator Flow Chart



Indicates pressure drop in feet of water versus flow in gallons per minute with strainer. This is an improved method for properly computing pressure drop in AMTROL Air Separators.

Specifications/Dimensions

Model No.	Dimensions in Inches												Maximum Flow Rate			Strainer Screen Free Area Sq.ins.	Ship Wt. lbs.
	A	B	C	D	E	F	G	H	I	J	K	M	Vel. 4 Ft./ Sec.	Vel. 6 Ft./ Sec.	Vel. 8 Ft./. Sec.		
2-AS	2	10	23	8	7½	16¼	¾	¾	3	-	-	14	42	63	84	33	70
2½-AS	2½	10	23	8	7½	16¼	¾	¾	3	-	-	14	60	90	120	40	70
3-AS	3	10	23	8	7½	17	¾	¾	3	-	-	14	93	140	185	45	75
4-AS	4	12	24⅜	10	7¼	20¾	¾	¾	3½	-	-	16½	160	240	320	78	80
5-AS	5	16	34½	12	11¼	24	¾	¾	4¼	12¾	4⅝	21½	250	375	500	120	180
6-AS	6	18	41	14	13½	26	¾	¾	4¼	14	4⅝	23	360	540	720	186	250
8-AS	8	24	52	18	17	32	¾	¾	5¾	16	4⅝	29	630	940	1250	313	455
10-AS	10	30	59½	22	18¾	40	¾	¾	7¾	24	4⅝	35	990	1500	1980	491	770
12-AS	12	36	70	26	22	46	¾	¾	7¾	30	12⅝	40	1400	2100	2800	644	1150
14-AS	14	42	74	30	22	52	¾	¾	13	30	13⅜	48	1680	2500	3350	810	2200
16-AS	16	48	90	32	29	64	3	3	15	42	12½	56	2200	2800	3500	969	4300
18-AS	18	54	102	36	33¼	64	3	3	16	42	12⅜	62	3300	4200	5200	1517	4900
20-AS	20	60	102	30	36	70	3	3	19	45	6 15/16	68	4500	5600	7000	1860	5600
22-AS	22	60	119	48	35⅜	70	3	3	18	45	7	68	5000	6300	7900	2073	6300
24-AS	24	72	132	43	44⅝	82	3	3	22	45	8	80	5500	7000	8800	2712	8000

Maximum Operating Conditions

Working temperature	350° F
Working pressure	125 PSI

Designed and Constructed per ASME Section VIII, Division 1.

Materials of Construction

Body	Steel
Flanges	Steel - ANSI 150#
Strainer	304 Stainless Steel

Job Name ______________________

Location ______________________

____

____

Engineer ______________________

Contractor ______________________

Contractor P.O. No. ______________________

Sales Representative ______________________

Model No. Ordered ______________________

TECHNICAL DATA

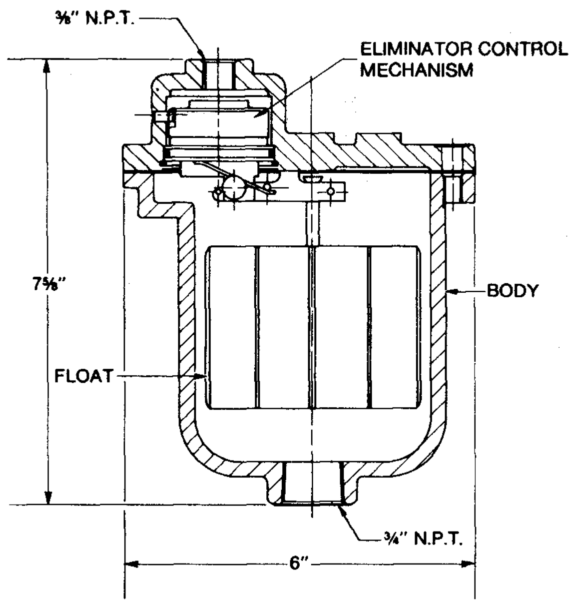
Model No. 720
AUTOMATIC AIR ELIMINATOR

An innovative approach to the problem of eliminating troublesome air from HVAC system piping.

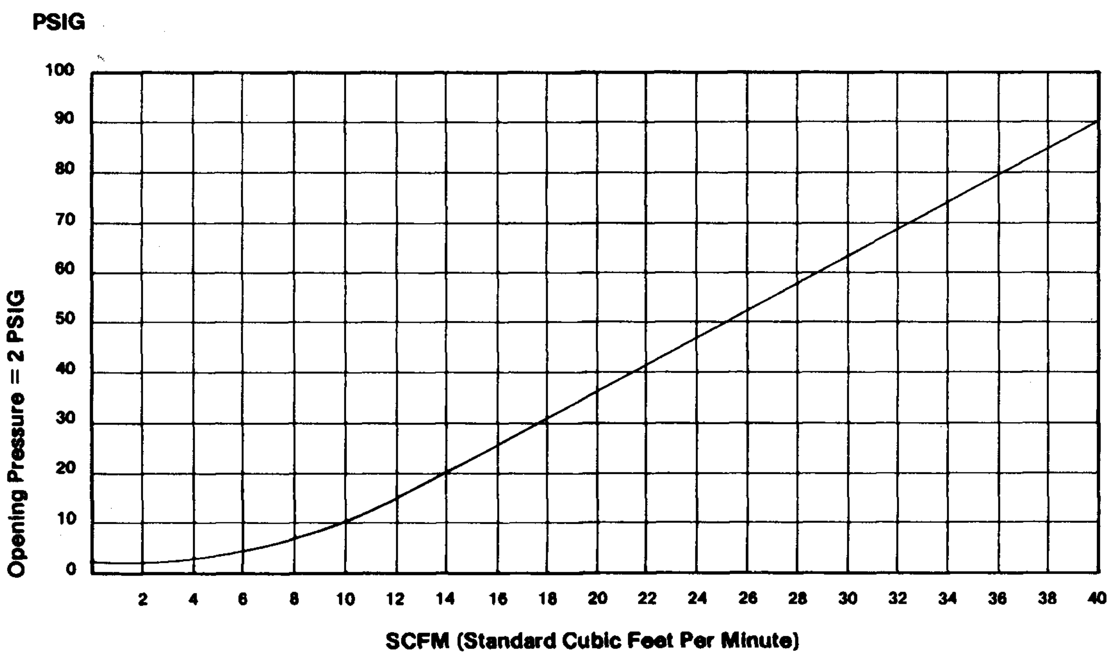
- Unique pilot-operated elimination mechanism ensures positive venting action at all operating pressures.
- Large ¼" orifice eliminates large volumes of air at low as well as high pressures.
- Designed to eliminate air as fast as it can be separated.
- Self-cleaning operating mechanism provides maintenance-free operation.
- Rapid positive seating with snap open and shut action.
- Will not open if negative pressures occur so air cannot be drawn into system.
- Ideal for use with Amtrol's air elimination and deareation procedures.

Operating Pressure Range - 2 PSIG to 150 PSIG

Max. Operating Temperature - 250°F



PSIG	2.5	5.0	7.5	10.0	20.0	30.0	50.0
SCFM	2.0	7.0	9.0	10.0	14.0	18.0	25.0



INSTALLATION INSTRUCTION
Model No. 720 AIR ELIMINATOR

The Model No. 720 Air Eliminator is a unique, pilot-operated, high capacity, air elimination valve.

A level sensing mechanism (float and lever assembly) in the air collection chamber controls the elimination mechanism which operates the valve.

In the shut position, the positive sealing action is created by system pressure — not by a float or spring — weeping is eliminated.

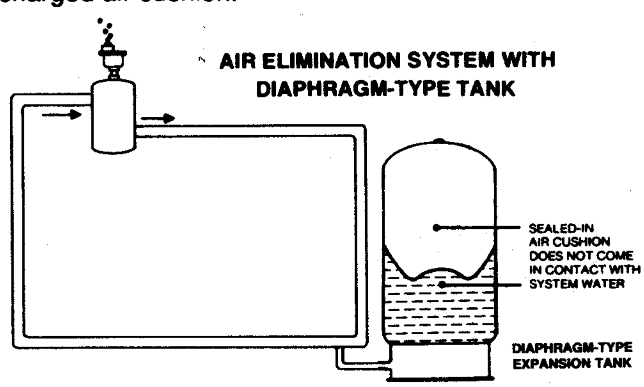
An unusually large exit orifice is possible because of this design feature and the result is a high rate of air elimination — an important factor with lower pressures at the top of the piping system (performance curves are available).

The No. 720 air elimination valve should be installed at high points in the piping system to eliminate air as the system is filled or, as part of the air separation and elimination package, at the top of risers and on the suction side of the system pump.

PRESSURIZATION AND AIR ELIMINATION SYSTEM

The valve is also an essential component in the AMTROL pressurization and air elimination system.

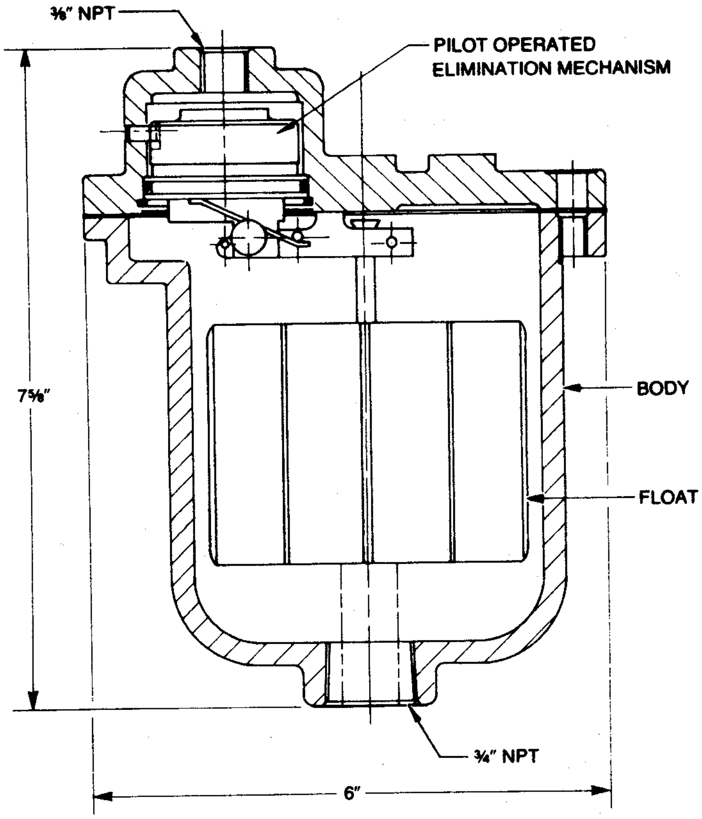
This system includes the AMTROL diaphragm-type tank which controls system pressure within a desired range. Its operation depends on a properly sized pre-charged air cushion.



AIR ELIMINATION SYSTEM WITH DIAPHRAGM-TYPE TANK

The third essential component in the air elimination system is the 490 Series tangential-type air separator which separates entrained air from flowing system water by the creation of a vortex which will allow free air to rise in the center, the point of lowest velocity, to the air collection chamber in the body of the air elimination valve.

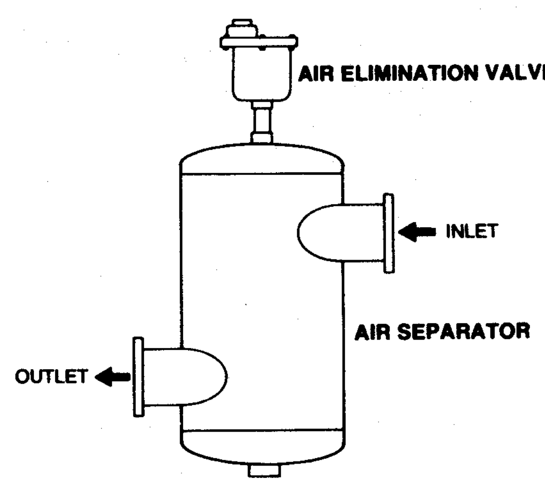
The air separator and air elimination valve can be combined and become the air separation and elimination package.



Operating pressure range – 2 psig to 150 psig
Will not open if negative pressures occur.

Maximum operating temperature – 250°F

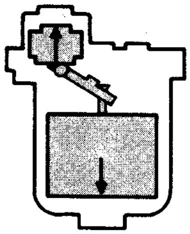
Material: Body and cover — cast iron.
Bolts and nuts — stainless steel.
Pilot mechanism — bronze.



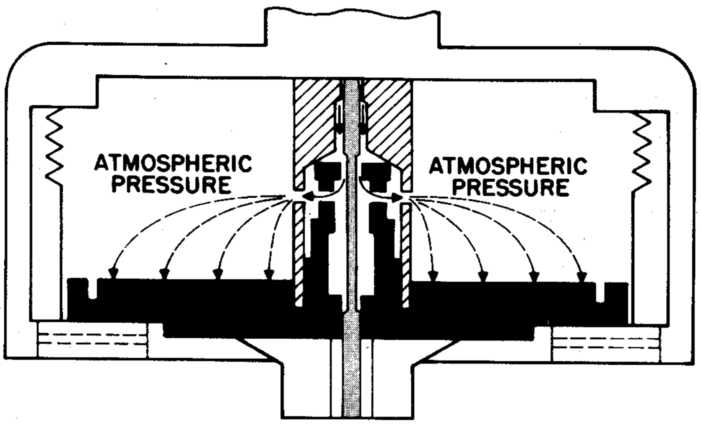
AIR ELIMINATION PACKAGE

PILOT OPERATED ELIMINATION MECHANISM
STEP-BY-STEP OPERATION

STEP 1

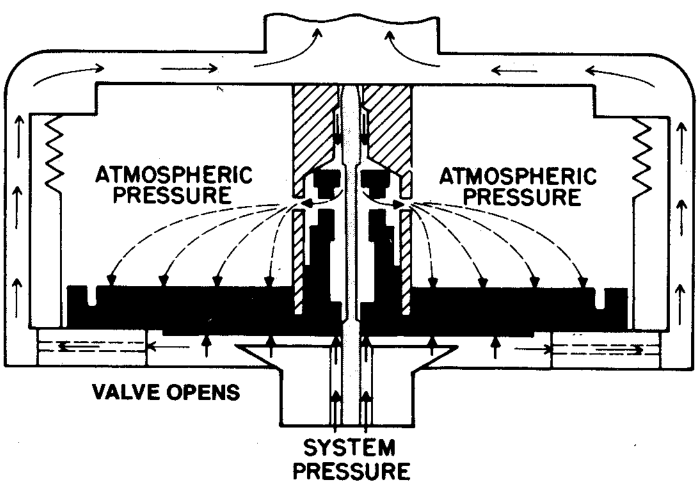


- FLOAT IN LOWEST POSITION
- PISTON IN HIGHEST POSITION
- BY-PASS CHANNEL OPEN



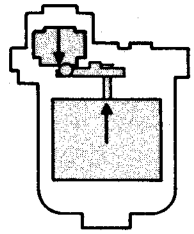
When air is accumulated in the body of the valve, the float is in the lowest position and the piston is in the highest position.

A by-pass channel in the piston exposes the intermediate chamber and the upper surface of the diaphragm to atmospheric pressure.

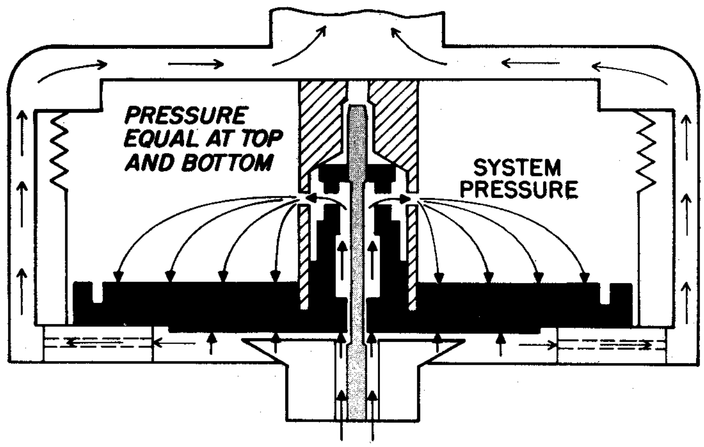


Because the system pressure of 2 psig or more exerted upon the lower surface is greater than the atmospheric pressure exerted upon the upper surface, the diaphragm is forced up, off the diaphragm seat. The valve is open, allowing system air to escape through radial ports.

STEP 2



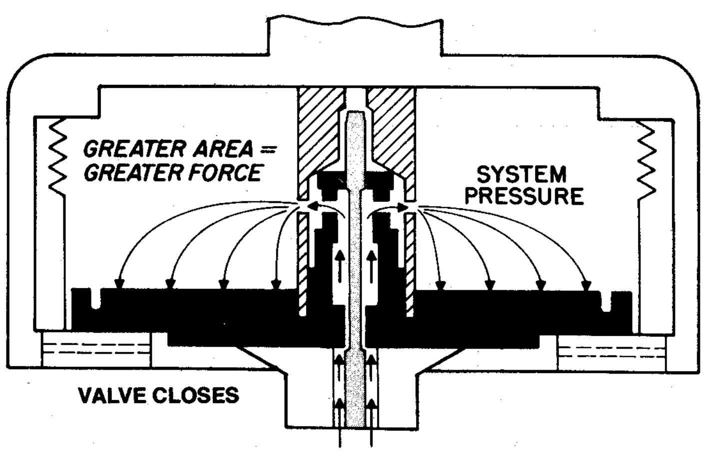
- FLOAT AT HIGHEST POSITION
- PISTON AT LOWEST POSITION
- LOWER BY-PASS CHANNEL OPEN
- UPPER BY-PASS CHANNEL SEALED



When more air is exhausted from the body of the valve, the float rises to the highest position and the piston moves to its lowest position.

The by-pass channel in the lower part of the piston now allows system air to flow into the intermediate chamber and to the upper surface of the diaphragm.

The pressure is equal on both the upper and lower surfaces of the diaphragm. However, the area of the upper surface is greater than the lower. Therefore, the total force is greater and the diaphragm is pressed down against the diaphragm seat, closing the valve.



INSTALLATION

The air separation and elimination package should be installed at the top of risers to protect the system and on the suction side of the system pump to protect the pump.

The No. 720 air elimination valve should be installed at high points in the piping and components in the system where air could accumulate. The location should be accessible for inspection and maintenance.

Shut off valves should be provided to facilitate cleaning and replacement of the float and pilot assembly if necessary.

Because vapor many times escapes with system air and can condense, good practice indicates that a line should be piped to a drain, sink or container which could be readily checked by maintenance personnel.

TYPICAL INSTALLATIONS

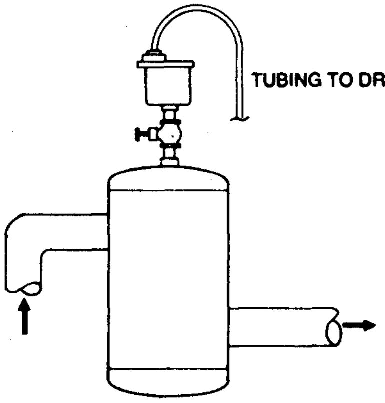


FIGURE 1

The air separator and air elimination valve installed at the top of the supply riser where most air bubbles will form.

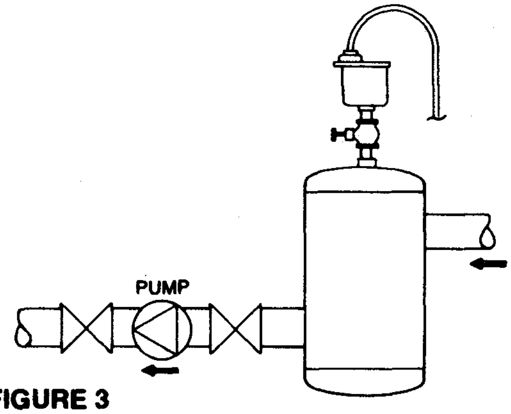


FIGURE 3

An air separator and air elimination valve should be installed on the suction side of the pump to prevent entrained air bubbles from causing cavitation.

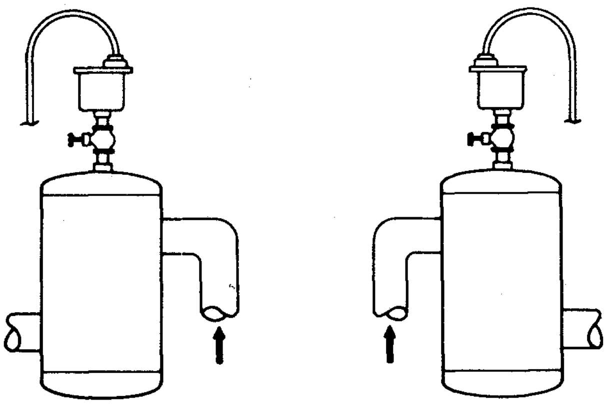


FIGURE 2

Where two or more supply risers are used, an air separator and air elimination valve should be installed at the top of each to protect lateral piping and components fed by that riser.

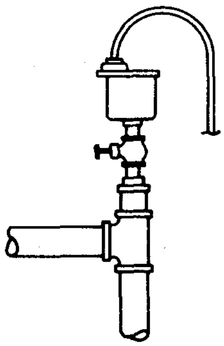
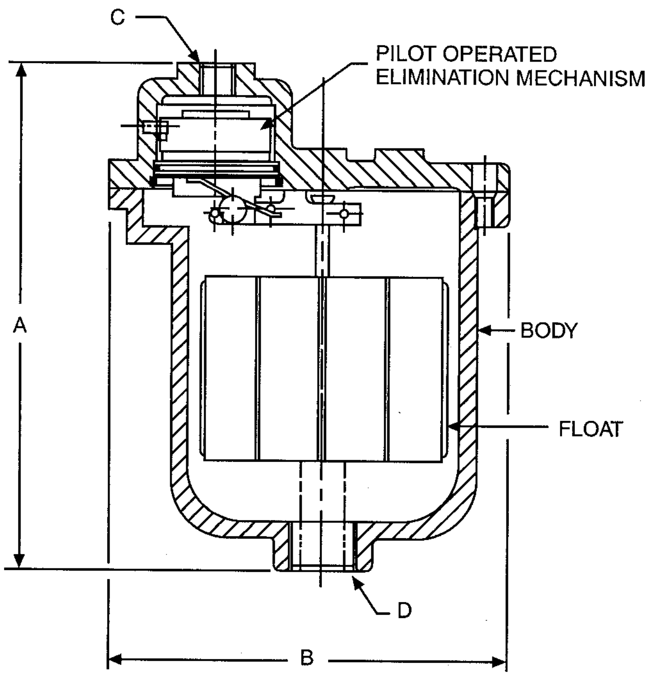


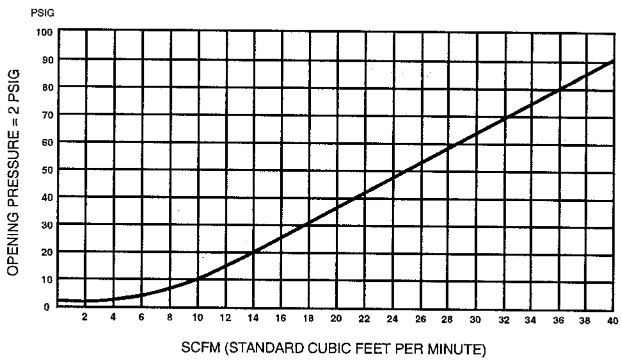
FIGURE 4

An air elimination valve should be installed at high points in piping and on all components in the system where air could accumulate.

Air Elimination Equipment

Automatic Air Eliminator Model No. 720





Specifications/Dimensions

Model	A	B	C	D	Shipping Weight
720	7⅝	6	⅜ NPTF	¾ NPTF	10 lbs.

Materials of Construction

Description	Standard Construction
Body	Cast Iron
Cover	Cast Iron
Bolts and Nuts	Stainless Steel
Pilot Mechanism	Bronze

Maximum Operating Conditions

Working temperature	250° F (120° C)
Working pressure	150 PSI (1030 kPa)

All dimensions and weights are approximate.

Job Name ____________________

Location ____________________

____

____

Engineer ____________________

Contractor ____________________

Contractor P.O. No. ____________________

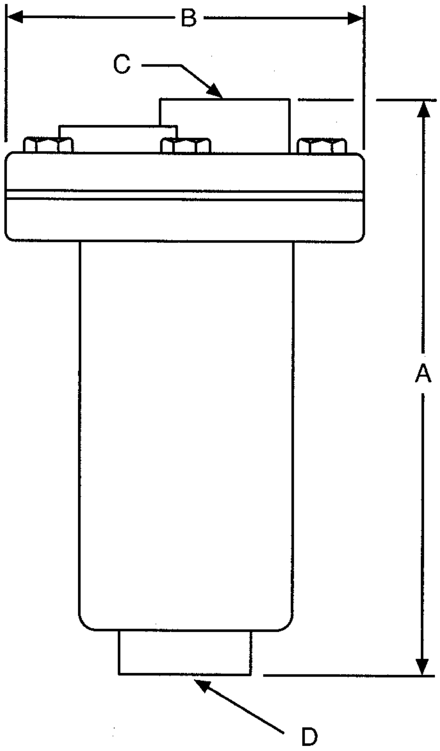
Sales Representative ____________________

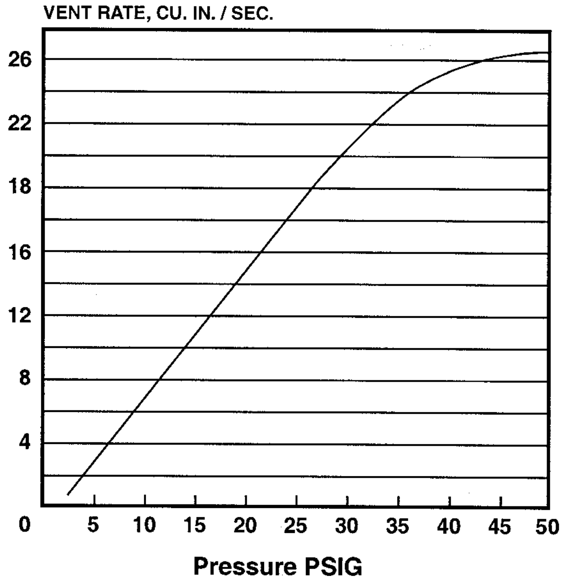
Model No. Ordered ____________________

ASME CERTIFICATION REQUIRED ❑ YES ❑ NO

Air Elimination Equipment

American Industrial Air Vent Model No. 706





Specifications/Dimensions

Model	A	B	C	D	Shipping Weight
706	5⅛	4¼	½ NPT	¾ NPT	6 lbs

Materials of Construction

Description	Standard Construction
Body	Cast Iron
Cover	Cast Iron
Internal	Brass

Maximum Operating Conditions

Working temperature	240° F (115° C)
Working pressure	150 PSI (1030 kPa)

All dimensions and weights are approximate.

Job Name ______________________________

Location ______________________________

____

____

Engineer ______________________________

Contractor ______________________________

Contractor P.O. No. ______________________________

Sales Representative ______________________________

Model No. Ordered ______________________________

ASME CERTIFICATION REQUIRED ❑ YES ❑ NO

INSTALLATION INSTRUCTIONS

AMERICAN INDUSTRIAL AIR VENT
Model No. 706

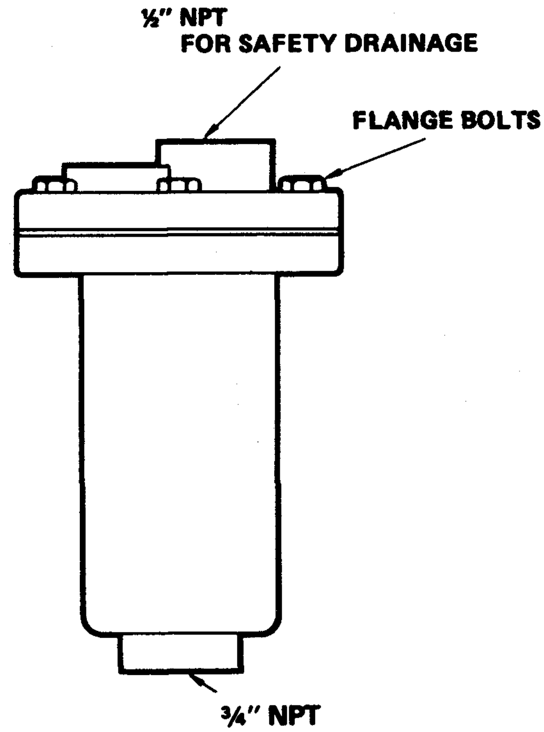
OPERATION

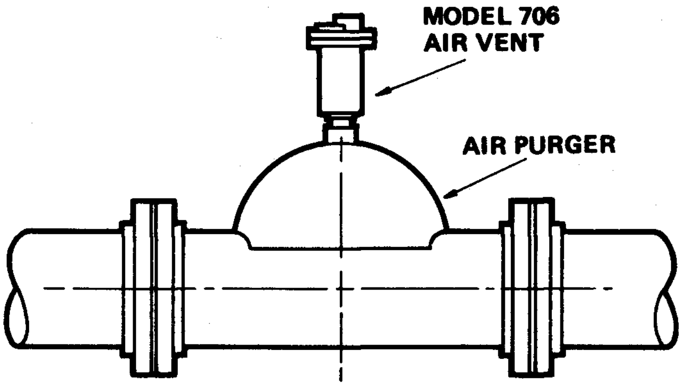
This American Automatic Air Vent has been designed for use on any hydronic or water service system where pressure does not exceed 150 PSI and temperature is no greater than 240°F. It should be installed in an accessible location at the high points of the system.

INSTALLATION

In a hydronic heating system, air removal can be accomplished most efficiently by installing a No. 706 Vent with a properly sized Air Purger or Air Separator. The purger separates the air from the water and diverts it to the Vent for quick and automatic removal. A ¾" NPT tapping is provided on the Vent for this connection.

The ½" tapping at the top of the No. 706 Vent accepts a safety drain line for discharging any moisture that may be contained in the air as it is vented.





MAINTENANCE

Since any vent may occasionally require cleaning when the system contains dirt or sludge, it is common procedure to install a gate valve to isolate the vent. The No. 706 Vent may be cleaned simply by removing the flange bolts, lifting out the inner assembly and washing off the strainer. Allow 6" clearance above the top of the No. 706 Vent for removal of this assembly.

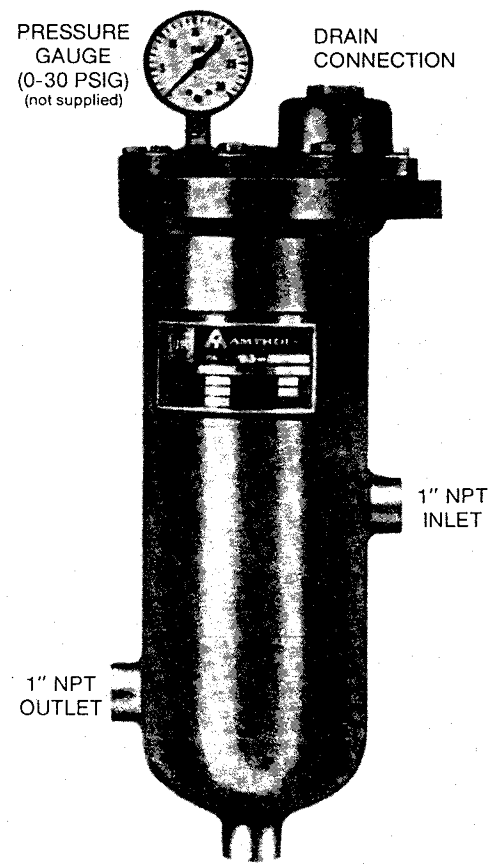
TECHNICAL DATA

Model No. 721
AUTOMATIC AIR SEPARATOR/ELIMINATOR*

ONE SIZE AIR ELIMINATION UNIT HANDLES ALL SIZE JOBS. Combines both air separation and elimination into one economical, easily installed, compact, integral unit.

Obsoletes the installation of large separators (up to 10" and 12" pipe size). Ideal for HVAC installations on upper finished runs and pump by-pass applications.

- Combination vortex separator and patented pilot piston air elimination valve uses the system pressure itself for tight sealing . . . prevents air from entering system in vacuum conditions.
- By-pass around terminal heat transfer unit ensures flow thru air separator/eliminator at all times (See Fig. 1).
- By-pass around circulating pump creates low point of solubility at pump location (See Fig. 2).
- Compact size allows installation at top of system in finished space or ceiling crawl space.
- Lower initial cost and lower installation costs . . . only two (2) fittings to pipe.
- ASME "UM" coded.



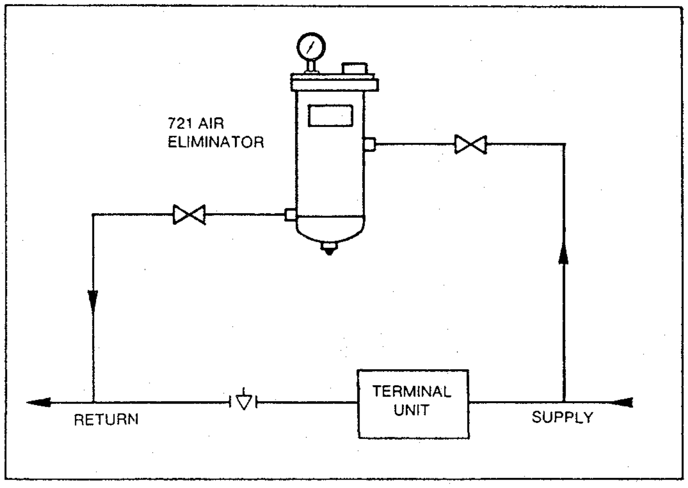


Fig. 1 — Terminal Unit By-Pass Installation

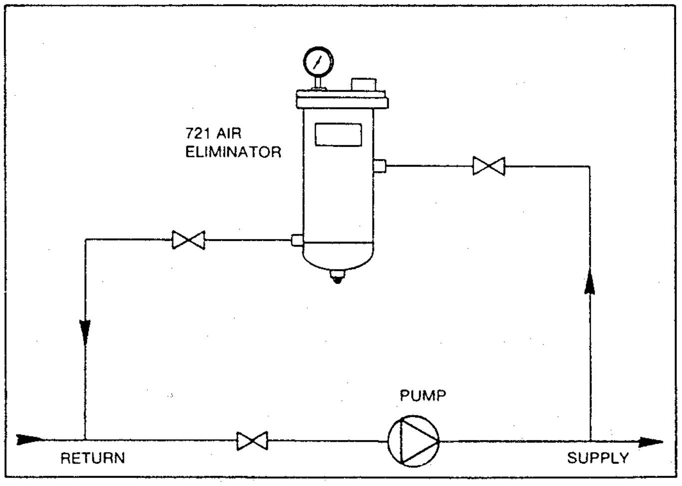
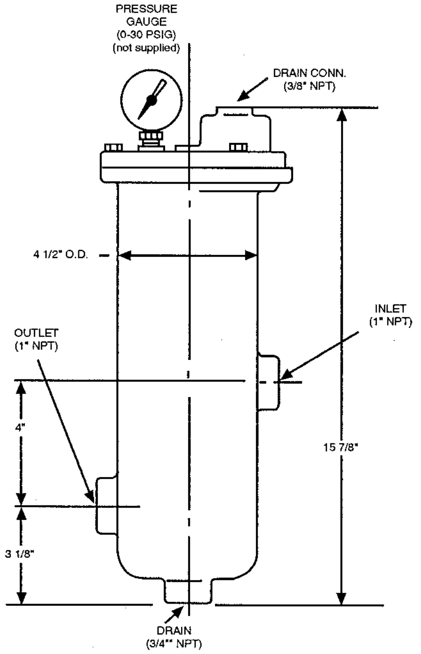


Fig. 2 — Circulating Pump By-Pass Installation

*Patent Pending

Automatic Air Separator/Eliminator Model No. 721



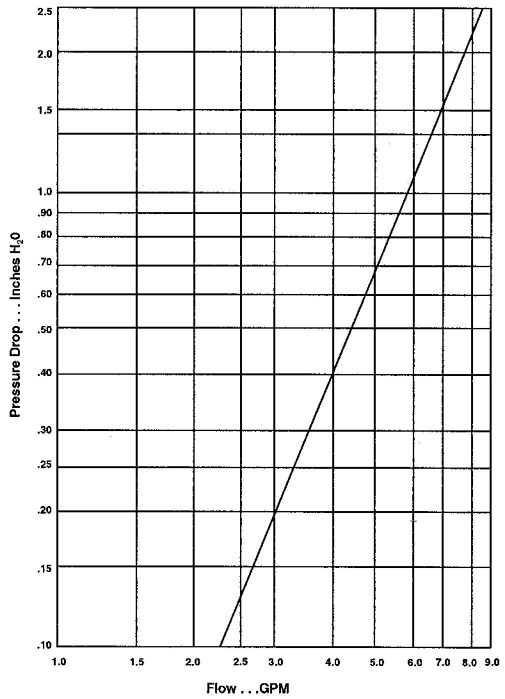


Table 1 – Flow vs. Pressure Drop (Inches H_2O)
(To obtain PSIG reading multiply inches by .0362)

PSIG	2.5	5.0	7.5	10.0	20.0	30.0	50.0
SCFM	2.0	7.0	9.0	10.0	14.0	18.0	25.0

Maximum Operating Conditions

Operating Temperature	240° F (115° C)
Working Pressure	2 PSIG to 150 PSIG
Flow Range	0 GPM to 8 GPM

Specifications

Description	Standard Construction
Body and Cover	Cast Iron

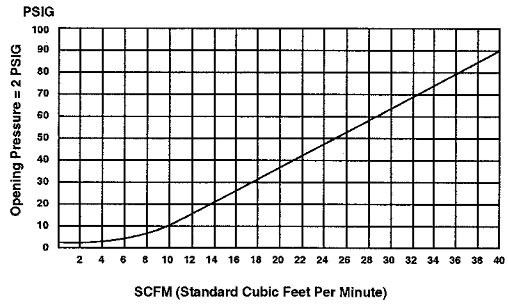


Table 2 – Air Elimination (SCFM) vs. System Pressure

Job Name ______________________

Location ______________________

____

____

Engineer ______________________

Contractor ______________________

Contractor P.O. No. ______________________

Sales Representative ______________________

Model No. Ordered ______________________

ASME CERTIFICATION REQUIRED ❑ YES ❑ NO

Drwg. No. 4854080

HVAC & Hydronics Equipment

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