DeZURIK

APCO | HILTON

APCO AIR/VACUUM VALVES

Series 140
.5" (15 mm) - 3" (80 mm)

Series 150
4" (100 mm) - 30" (750 mm)

Air/Vacuum Valves

Guaranteed Protection

1. Protection for pipelines

2. Eliminating risk of collapsing the line due to vacuum

3. Exhausts air when the line is filled

4. Allows air to re-enter immediately when the line drains

Plus these exclusive features at no extra cost:

5. Stainless steel floats - Guaranteed individually tested

6. ASTM quality materials guaranteed throughout

7. Every valve hydrostatically factory tested

Why and Where to Use Air/Vacuum Valves

An Air/Vacuum Valve has a large venting orifice and is used to exhaust large quantities of air from a pipeline when being filled or a deep well pump column when the pump is started.* Once the line is filled, the Air/Vacuum Valve closes and remains closed until the liquid is drained and pressure returns to atmospheric. The Air/ Vacuum Valve will then immediately open to allow air to re-enter the line and prevent a vacuum from developing.

Air/Vacuum Valves do not open to exhaust the small pockets of air which collect in the line while it is operating under pressure. We highly recommend Automatic Air Release Valves (AARV) be used in conjunction with Air/Vacuum Valves for maximum pipeline flow and pump efficiency. The AARV will eliminate constricting air pockets from forming at the high points of the pipeline.

The minimal cost for the Automatic Air Release Valves will quickly pay for itself in minimizing head loss through the pipeline. The result: energy cost savings!
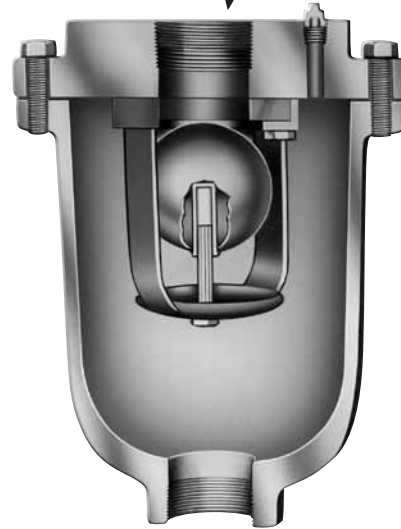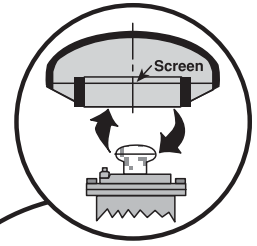
Series 140H available for high pressure service specify operating pressure if below 20 psi (138 kpa).

*See bulletin 586 - Air Valves for Vertical Turbine Pumps

Manufactured to AWWA C-512

ISO flange connections available

Optional: Mushroom Cap with built-in bug screen

Screen

Series 140
½" (15 mm) through 3" (80 mm) outlets are NPT thread. It is good practice to install a mushroom cap into the threaded outlet for discharge protection.
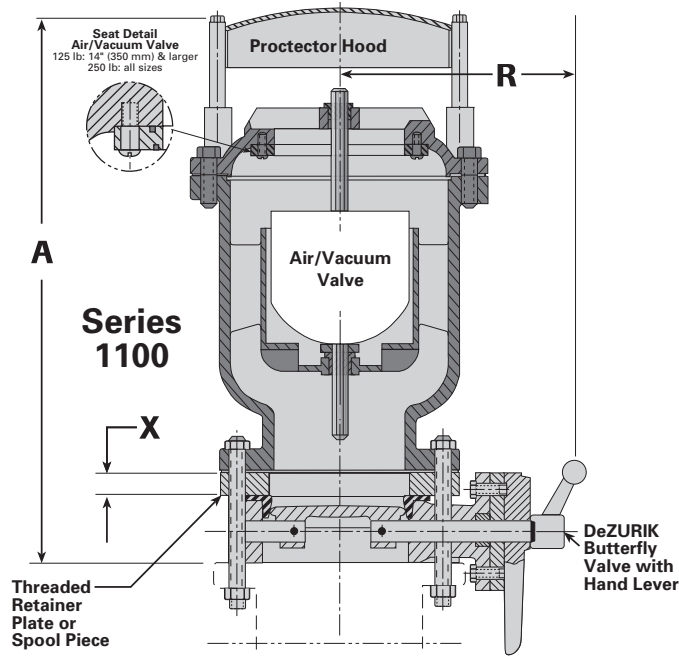

Series 150
4" (100 mm) through 30" (750 mm) standard outlets are plain with a steel protector hood.

Optional threaded or flanged outlets available.

Physical Dimensions

Series 1100

Seat Detail
Air/Vacuum Valve
125 lb: 14" (350 mm) & larger
250 lb: all sizes

Proctector Hood

R

Air/Vacuum Valve

A

X

Threaded Retainer Plate or Spool Piece

DeZURIK Butterfly Valve with Hand Lever

Model	Size	Height	Max. Dia.	Inlet	Outlet	Weight Lbs/Kg
141	.5" 15	7.063" 179	5.125" 130	.5" NPT 13	.5" NPT 13	10 5
142	1" 25	9" 229	7" 178	1" NPT 25	1" NPT 25	22 10
144	2" 50	12" 305	9" 229	2" NPT 51	2" NPT 51	55 25
146	3" 80	13.625" 346	9.438" 240	3" NPT or Flanged 76	3" NPT 76	60 27
152	4" 100	18.875" 479	12" 305	4" NPT or Flanged 102	4" Plain 102	100 45
153	6" 150	21.75" 552	16" 406	6" Flanged 152	6" Plain 152	150 68
154	8" 200	25" 635	18" 457	8" Flanged 203	8" Plain 203	200 91
155	10" 250	27.375" 695	20" 508	10" Flanged 254	10" Plain 254	350 159
156	12" 300	30.375" 772	25" 635	12" Flanged 305	12" Plain 305	500 227
157	14" 350	30.75" 781	29" 737	14" Flanged 356	14" Plain 356	625 283
158	16" 400	31.75" 806	32" 813	16" Flanged 406	16" Plain 406	830 376
159	18" 450	43.5" 1105	34" 864	18" Flanged 457	18" Plain 457	1100 499
160	20" 500	48" 1219	40" 1016	20" Flanged 508	20" Plain 508	1650 748
162	24" 600	58" 1473	48" 1219	24" Flanged 610	24" Plain 610	2600 1179

Inch
Millimeter

Replace Shut-Off Valves with DeZURIK Butterfly Valves

Costs to excavate pipeline trenches can be greatly reduced by using DeZURIK Butterfly Valves for isolation instead of gate valves. DeZURIK Butterfly Valves are economical, reliable and much shorter, permitting a reduction in depth of trench. See Below.

On sizes 4" (102 mm) and larger, the plain outlet comes with a protector hood, as illustrated. However, threaded or flanged outlets are available and recommended when valves are used inside the pump house.

Size	Model	Combination	A	R	X	No. Required & Size			
						Studs		Nuts	
						UNC	ISO	UNC	ISO
4" 100	1104	152/904	21.5" 546	9.5" 241	.938" 24	8 - .625-11 x 6.5	8 - 16-2 x 165mm	16 - .625-11	16 - 16-2
6" 150	1106	153/906	25.25" 641	10.75" 273	1" 25	8 - .75-10 x 8	8 - 20-2.5 x 203mm	16 - .75-10	16 - 18-2.5
8" 200	1108	154/908	29" 737	14.25" 362	1.5" 38	8 - .75-10 x 9	8 - 20-2.5 x 229mm	16 - .75-10	16 - 18-2.5
10" 250	1110	155/910	32" 813	14.5" 368	2" 51	12 - .875-9 x 10	12 - 20-2.5 x 254mm	24 - .875-9	24 - 20-2.5
* 12" 300	1112	156/912	39.75" 1010	15" 381	5" 127	12 - .875-9 x 8.5	12 - 20-2.5 x 216mm	24 - .875-9	24 - 20-2.5
* 14" 350	1114	157/914	40" 1016	16.75" 425	5" 127	12 - 1.0-8 x 9	12 - 24-3 x 229mm	24 - 1-8	24 - 24-3
16" 400	1116	158/916	42.75" 1086	17.75" 451	1.438" 37	16 - 1.0-8 x 11	16 - 24-3 x 279mm	32 - 1-8	32 - 24-3

Inch
Millimeter

* Uses spool piece

Additional Air Valve Information	Bulletin
Which Air Valve Should I Use?	**610**
Combination Air Valves	**623**
Air Valves for Vertical Turbine Pumps	**586**
Slow Closing Air and Vacuum Valves	**613**
Hydraulically Controlled Air/Vacuum Valves	**7000**

Where to Install

Typical Pipeline Showing its Hydraulic Gradient and the Position of Necessary APCO Air Valves.

APCO Combination Air Valve at peaks and sharp change in gradient due to possibility of column separation and vacuum **or** **APCO Hydraulically Controlled Air/Vacuum Valve** where secondary surges due to rejoining of previously separated water column could occur

APCO Air Release Valve on long ascending stretch at 1/4 to 1/2 mile intervals

APCO Hydraulically Controlled Air/Vacuum Valve where secondary surges due to rejoining of previously separated water column could occur **or** **APCO Combination Air Valve** at peaks and sharp change in gradient due to possibility of column separation and vacuum

APCO Air Release Valve on long horizontal and descending stretch at 1/4 to 1/2 mile intervals

APCO Air/Vacuum Valve at peaks and sharp change in gradient near end of line where no significant amount of air is anticipated

Datum

Reservoir or Discharge

Hydraulic Gradient

Pump

- ● Air/Vacuum Valve
- ■ Air Release Valve
- ◉ Combination Air Valve
- Ⓗ Hydraulically Controlled Air/Vacuum Valve

APCO Air/Vacuum Valve on pump discharge before check valve (not necessary for pumps with positive suction head).
APCO Hydraulically Controlled Air/Vacuum Valve where a discharge gate valve is normally closed during pump start-up to develop head.

Performance Graphs For Air/Vacuum Valve
Air inflow/outflow thru valve in standard cubic feet of free air per second, (SCFS)

Inflow
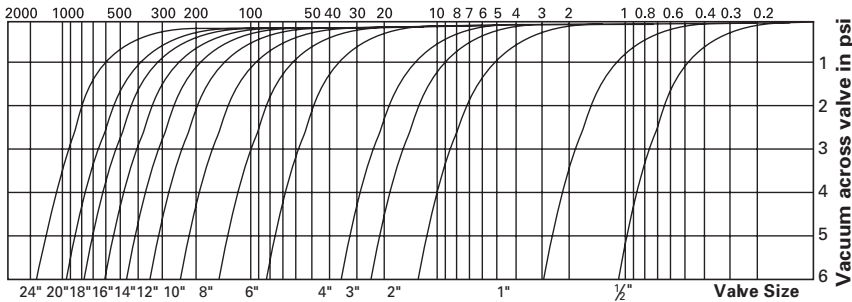
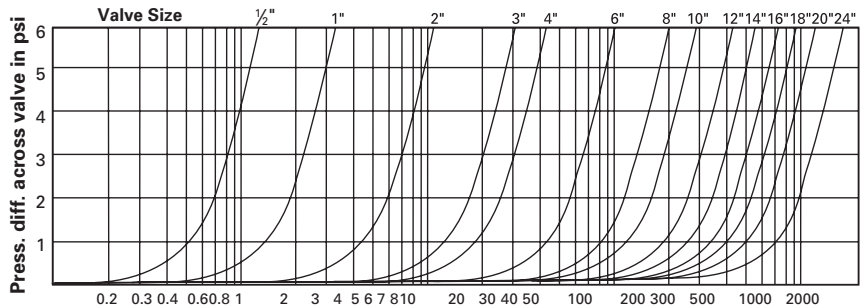

Test conducted by:
Phillips Petroleum Company
Engineering Department - Test Division
Edmond Plant February 2, 1961

Southern Research Institute
Birmingham, Alabama May 8, 1959

Outflow

Curves shown are actual flow capacities at 14.7 psi barometric pressure and 70°F temperature based on actual test. These figures are not merely flow capacities across the orifice, but flow capacities across the entire valve. In the test set-up, air approach velocity is negligible, therefore actual flow capacity exceeds the values shown on chart.

Sizing Air/Vacuum Valves for Pipelines
General Explanation of Criteria Used

1. Calculate necessary valves independently for each high point on the line.

2. Consider the more severe of the two gradients adjacent to each high point.

3. Determine maximum rate of flow in cubic feet per second which can occur in this gradient during both the filling and draining of the line. Always be sure to take the highest possible rate of flow under either circumstance, draining or filling the pipeline.

   To calculate rate of flow:

   If line is being filled by a pump

   $$\text{Rate of flow CFS} = \frac{\text{GPM of pump}}{449}$$

   If the line is being drained by gravity

   Rate of flow in CFS $=$ $0.08666\,(SD^5)^{\frac{1}{2}}$

   Where S $=$ Slope (in feet per foot of length)

   D $=$ Diameter of pipe (inches)

   Use DeZURIK/ APCO slide rule air valve computer or APCO Apslide Software

4. Valve to be installed at this high point must release or re-enter the amount of air in CFS equal to the maximum possible flow of water in CFS immediately adjacent to this high point.

5. To economize in size of valves selected, final step is to determine the maximum pressure differential which can be tolerated across the orifice consistent with the required flow of air in CFS already determined.

6. To determine this maximum tolerable differential pressure, it is necessary to calculate if there is risk of line collapse from vacuum. This condition usually is present in thin-walled steel lines above 24". To calculate collapsing pressure for thin-walled-cylindrical pipe:

   $$P = 12500000 \left(\frac{T}{D}\right)^3$$

   Where P $=$ Collapsing pressure (PSI)

   T $=$ Thickness of pipe (inches)
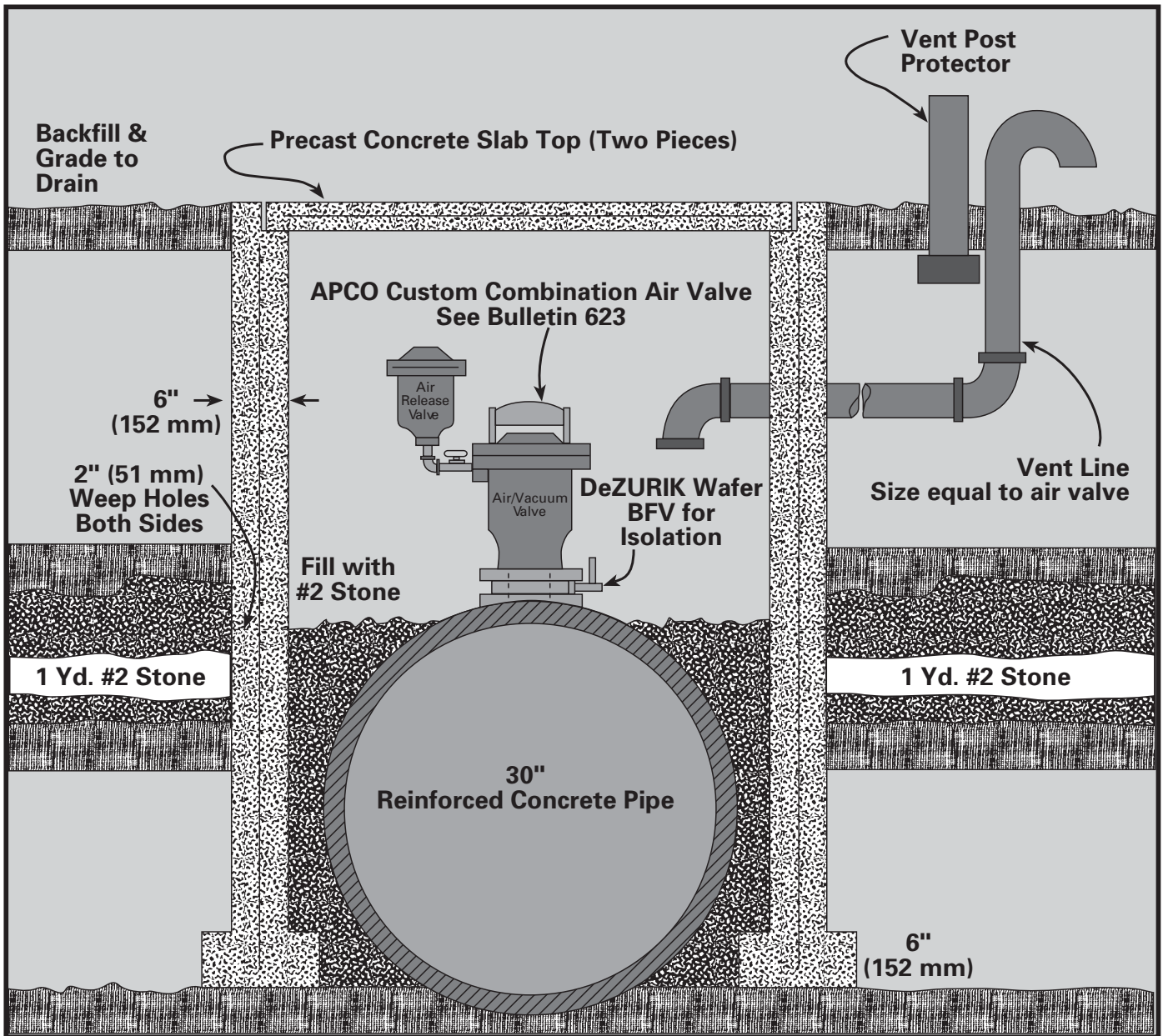
   D $=$ Diameter of pipe (inches)

   This includes a Safety Factor of 4

7. For air flow in, use the maximum pressure differential thus calculated or 5 psi whichever is lower. Enter the graph with this differential (never greater than 5 psi) and the flow found during draining to select the appropriate valve to protect your line from collapse and water column separation due to vacuum.

8. Next enter the graph with the maximum rate at which the line can be filled and use a 2 psi differential pressure. This valve size is sufficient to vent all air from the line before valve closure. This ensures maximum performance from the line.

9. Compare the sizes calculated in steps 7 & 8. The larger size is correct for the protection of your system.

10. These valves should be installed on the high point with a shut-off valve below them.

11. The same procedure should be followed for each individual high point.

12. If the line lacks clearly defined high points or they are separated by long stretches of uniform gradient, it is recommended that the proper valves be selected as explained above and duplicate installations be made at regular intervals of ¼ to ½ mile at the engineer's discretion.

To Ensure Maximum Capacity From The Pipeline:

When a line is in operation, air pockets collect both at the high point and for a distance down stream from the high point. To release the air, install the APCO Air/Vacuum Valves along with a 2" (50 mm) APCO No. 200 Air Release Valve at the high point and a second Air Release Valve a short distance down stream.

Typical Air Valve Manhole Installation

Vent Post Protector

Backfill & Grade to Drain

Precast Concrete Slab Top (Two Pieces)

APCO Custom Combination Air Valve See Bulletin 623

Air Release Valve

6" (152 mm)

2" (51 mm) Weep Holes Both Sides

Air/Vacuum Valve

DeZURIK Wafer BFV for Isolation

Vent Line Size equal to air valve

Fill with #2 Stone

1 Yd. #2 Stone

1 Yd. #2 Stone

30" Reinforced Concrete Pipe

6" (152 mm)

6

Specifications

The Air/Vacuum Valve shall be designed to allow large quantities of air to escape out the orifice when filling a pipeline and to close water tight when the liquid enters the valve. The Air/Vacuum Valve shall also permit large quantities of air to enter through the orifice when the pipeline is being drained to break the vacuum. The discharge orifice area shall be equal or greater than the inlet of the valve.

The valve shall consist of a body, cover, baffle, float and seat. The baffle will be designed to protect the float from direct contact of the rushing air and water to prevent the float from closing prematurely. The seat shall be fastened into the valve cover without distortion and shall be easily removed, if necessary. The float shall be stainless steel, and shall be center guided into the seat.

Air/Vacuum Valves shall be sizes $\frac{1}{2}$" (15mm) through 3" (80mm) and shall have NPT threaded outlets for installation of street elbow or mushroom cap. Sizes 4" (100mm) through 30" (750mm) shall have plain outlet with steel protector hood.

All materials of construction shall be certified in writing to conform to ASTM specifications as follows:

Body and cover	Cast Iron	ASTM A126 Gr.B
	Ductile Iron	ASTM A536 GR 65-45-12
Float	Stainless Steel	ASTM A240
Seat	Buna-N	
Exterior paint	Universal Metal Primer	FDA approved for potable water contact
Protector hood	Steel	

Valve to be APCO Series 140/150 Air/Vacuum Valve.

Larger diameter valves may have alternate float designs.

Sales and Service

For information about our worldwide locations, approvals, certifications and local representative:
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