VIKING®

DESIGN DATA

AIR SUPPLIES FOR DRY SYSTEMS

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com

1. DESCRIPTION

Dry and Preaction Systems require a dependable source of clean dry air under the proper pressure. The air supply must be adequate to restore normal air pressure within a time specified by the authority having jurisdiction (NFPA requires 30 minutes for dry pipe systems). Proper air regulation should be provided for all dry systems and is extremely important. If pressure is too low, the dry valve may accidentally trip when subjected to surges in water supply pressure. If pressure is too high, the time between the opening of a sprinkler and the flow of the water from the sprinkler may be unacceptably long. Very high pressure also can damage the dry valve. Design air pressure is specified by the dry valve manufacturer. Air supplies may be provided by plant air systems, individual air compressors with or without tanks, and a compressed gas (nitrogen or dry air) in cylinders. Where the plant air system is manually operated and may be shut down over weekends or holidays, an automatic maintenance air compressor may be used to maintain the required pressure. A maintenance air compressor may be used as a primary source on small dry systems. It is often desirable to provide a low air pressure alarm activated by an air pressure switch. The switch is set below the lowest design air pressure and above the expected tripping point of the dry valve in order to provide time to take corrective action in the event of low air pressure alarm.

2. DESIGN CONSIDERATIONS

Manual Filling

A dry system using manual filling employs a piping system as shown in Figure 1. The relief valve should be set at 5 PSI (0.35 bar) in excess of the design air pressure. The small drain cock is closed when filling and left open when shut off valves are closed. This is to prevent any air pressure build-up in system in case of valve leakage. To automatically maintain the design air pressure, a maintenance air compressor may be installed. See Figure 2. It is installed on the riser above the dry valve and piped directly to the system. The switch is adjusted to turn the compressor off when the design air pressure is reached.

Automatic Filling

The dry system is filled from a constant source of air such as an automatic air compressor and uses components as shown in Figure 3. The air compressor pressure switch is set at high and low pressures above design pressure. The air pressure in the system is maintained by the air pressure maintenance device which is set at design pressure. The air maintenance device contains a 1/16 inch (0.16 mm) orifice which restricts the flow of air into the system so that when a sprinkler opens, air pressure will not build up faster than it will discharge through a sprinkler. The bypass valve is kept closed and opened only to speed up the filling of the system piping to the required pressure in the required time.

Capacity of Air Compressor

The capacity of the system must be calculated in order to furnish the correct size air compressor. Determine the total length of the different pipe sizes and use the following table to calculate the capacity:

Pipe Diameter		Capacity			
US	International	Schedule 40 (1” to 6”) Schedule 30 (8”)		Schedule 10	
		Gal / Ft	L / m	Gal / Ft	L / m
1”	DN25	0.045	0.559	0.049	0.608
1-1/4”	DN32	0.078	0.969	0.085	1.043
1-1/2”	DN40	0.106	1.316	0.115	1.428
2”	DN50	0.174	2.161	0.190	2.360
2-1/2”	DN65	0.248	3.080	0.283	3.515
3”	DN80	0.383	4.756	0.434	5.390
3-1/2”	DN90	0.513	6.370	0.577	7.165
4”	DN100	0.660	8.196	0.740	9.190
5”	DN125	1.040	12.915	1.144	14.206
6”	DN150	1.501	18.640	1.649	20.477
8”	DN200	2.660	33.032	2.776	30.472
For Metric Units 1 Ft. = 0.3048 M, 1 Gal. = 3.785L					

The approximate free air capacity of a compressor suitable for pressurizing a system to 40 PSI (2.8 bar) in 30 minutes can be found by multiplying the system capacity as determined above by 0.012 for CFM (or by 0.0898 for L/M).

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Nitrogen Generator and Cylinder Gas Supply (See Figure 4 and 5)

Nitrogen cylinders may be used in place of air compressors. Nitorgen generators are used with air compressors. Nitrogen is supplied by nitrogen generators or in pressurized cylinders in various sizes and pressures. Some of the most common cylinder sizes are 122 Cu. Ft. at 1900 PSI (3455 Ltrs. at 131 bar), 225 Cu. Ft. at 2100 PSI (6372 Ltrs. at 145 bar), and 280 Cu. Ft. at 2300 PSI (7930 Ltrs. at 159 bar).

The cylinders may be connected to system the same as described for manual or for automatic filling. When nitrogen cylinders are used as a primary air supply, spare cylinders should be furnished and located at dry valve location.

For US Units:	For Metric Units:
$Vc = \frac{PV}{100}$	$Vc = \frac{PV}{108}$
Where:	Where:
Vc = Volume of Cylinder (ft.^{3})	Vc = Volume of Cylinder (L)
P = Pressure of System (PSIG)	P = Pressure of System (kPa)
V = Volume of System (Gallons)	V = Volume of System (L)

To determine the approximate amount of nitrogen to be furnished, the following formula may be used:

Special attention must be given to systems employing a bottled-gas supply. Because only a limited amount of gas is available, small leaks which normally would go unnoticed in systems being supplied by mechanical compressors, can become critical to the system's overall performance. If the system is to function at temperatures as low as -40 °F (-40 °C), and, if bottled nitrogen is the gas supply, the system is particularly susceptible to leakage, and special care should be taken to ensure against leaks throughout the entire system.

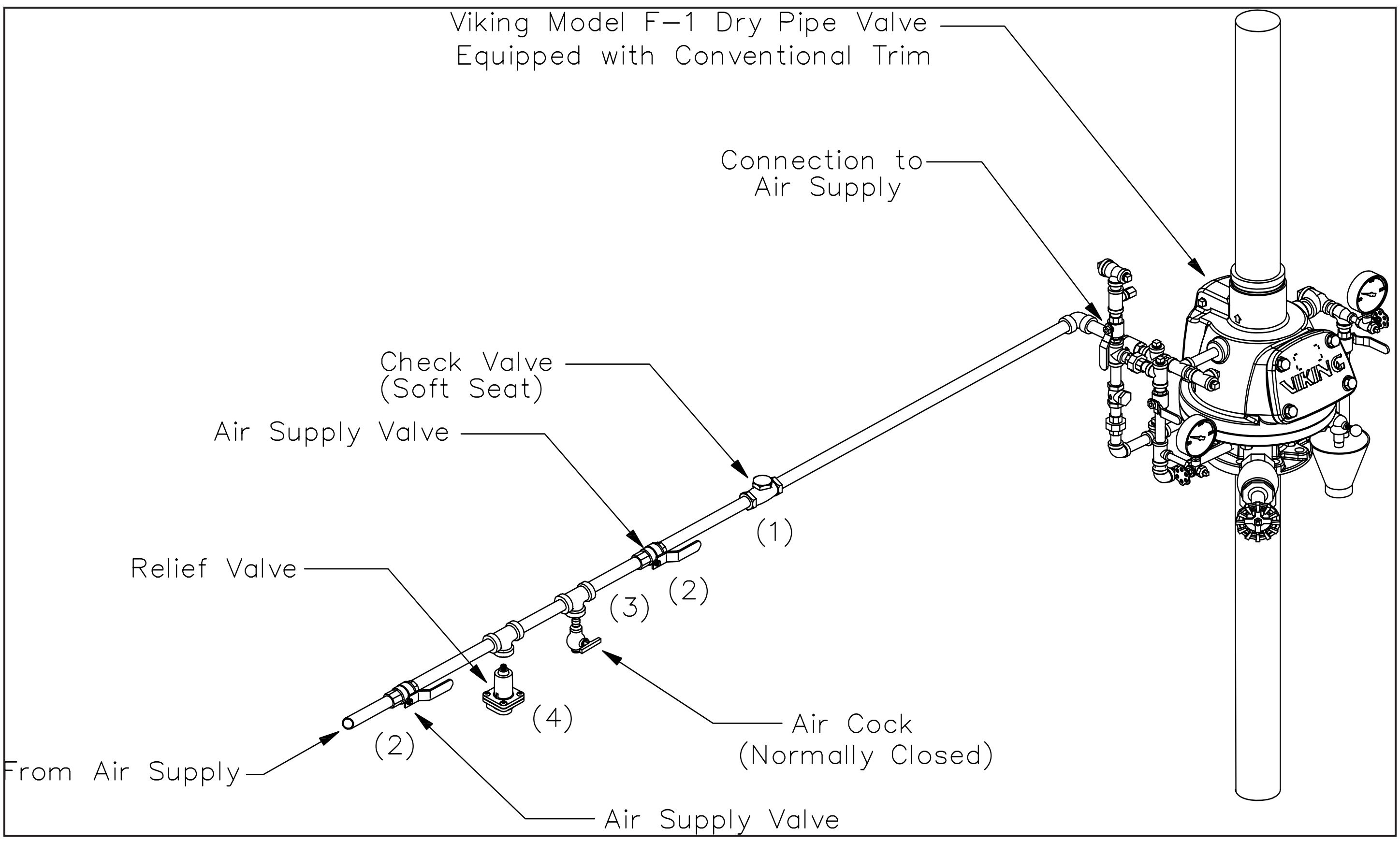

Figure 1

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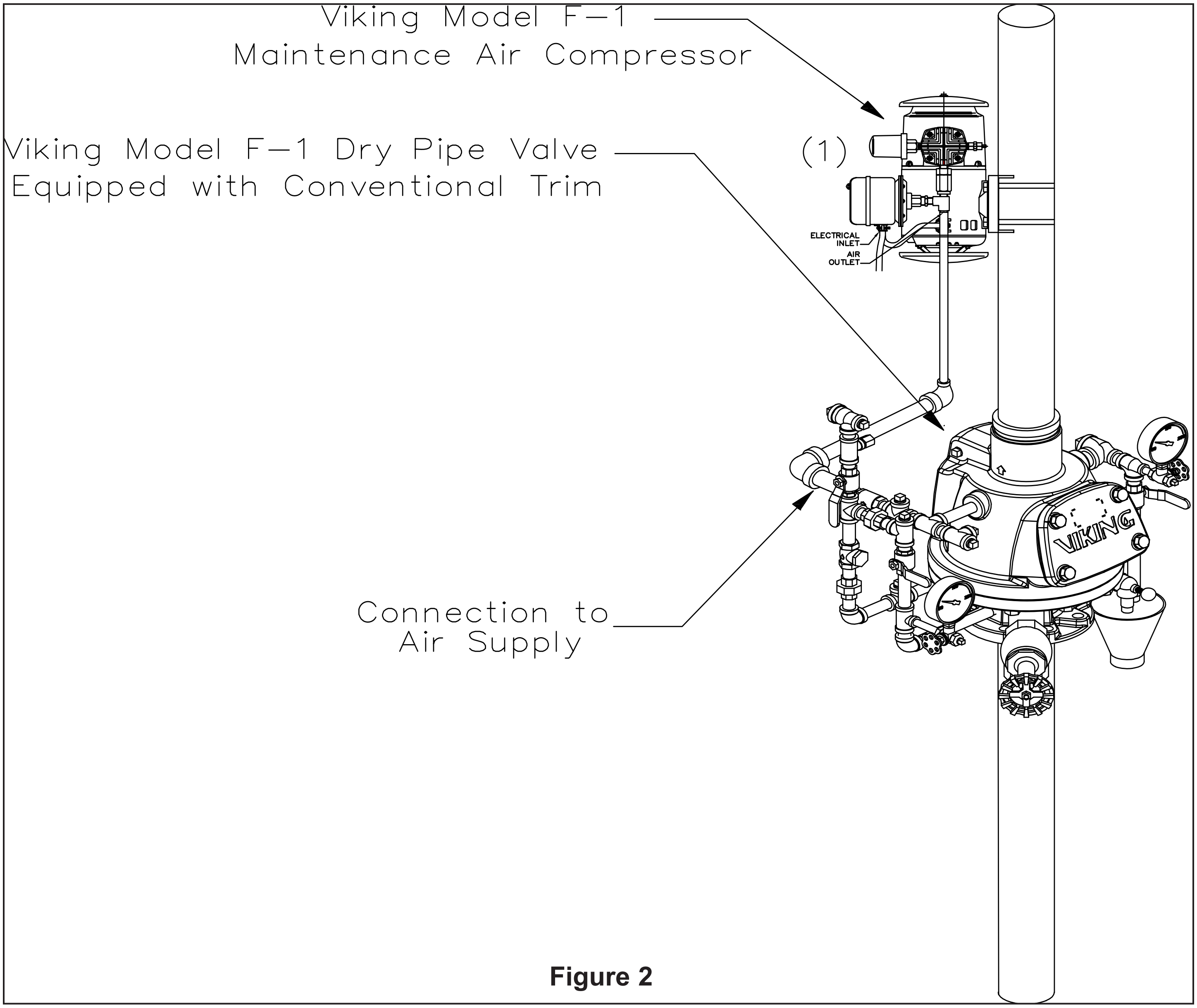

Figure 2

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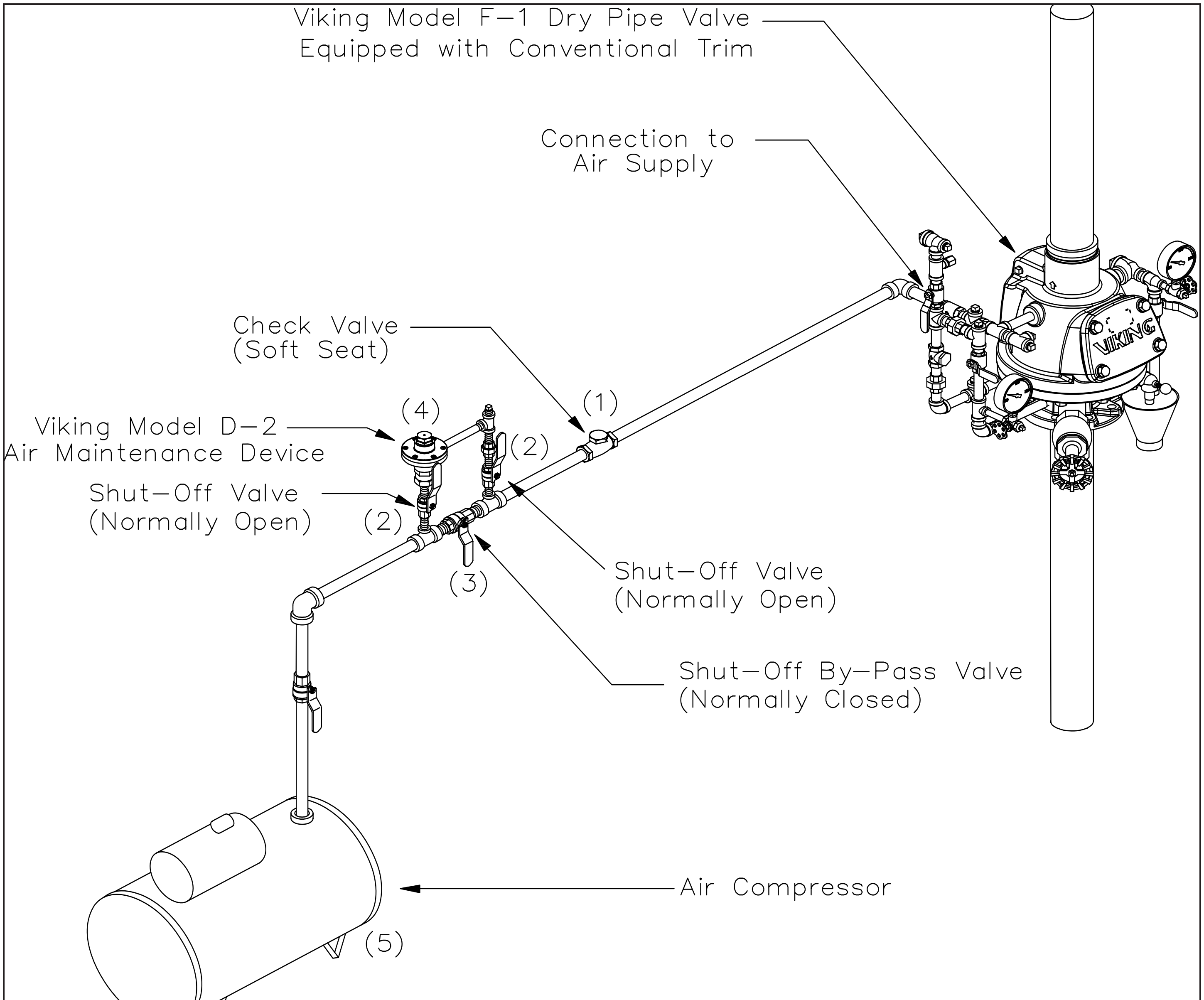

Figure 3

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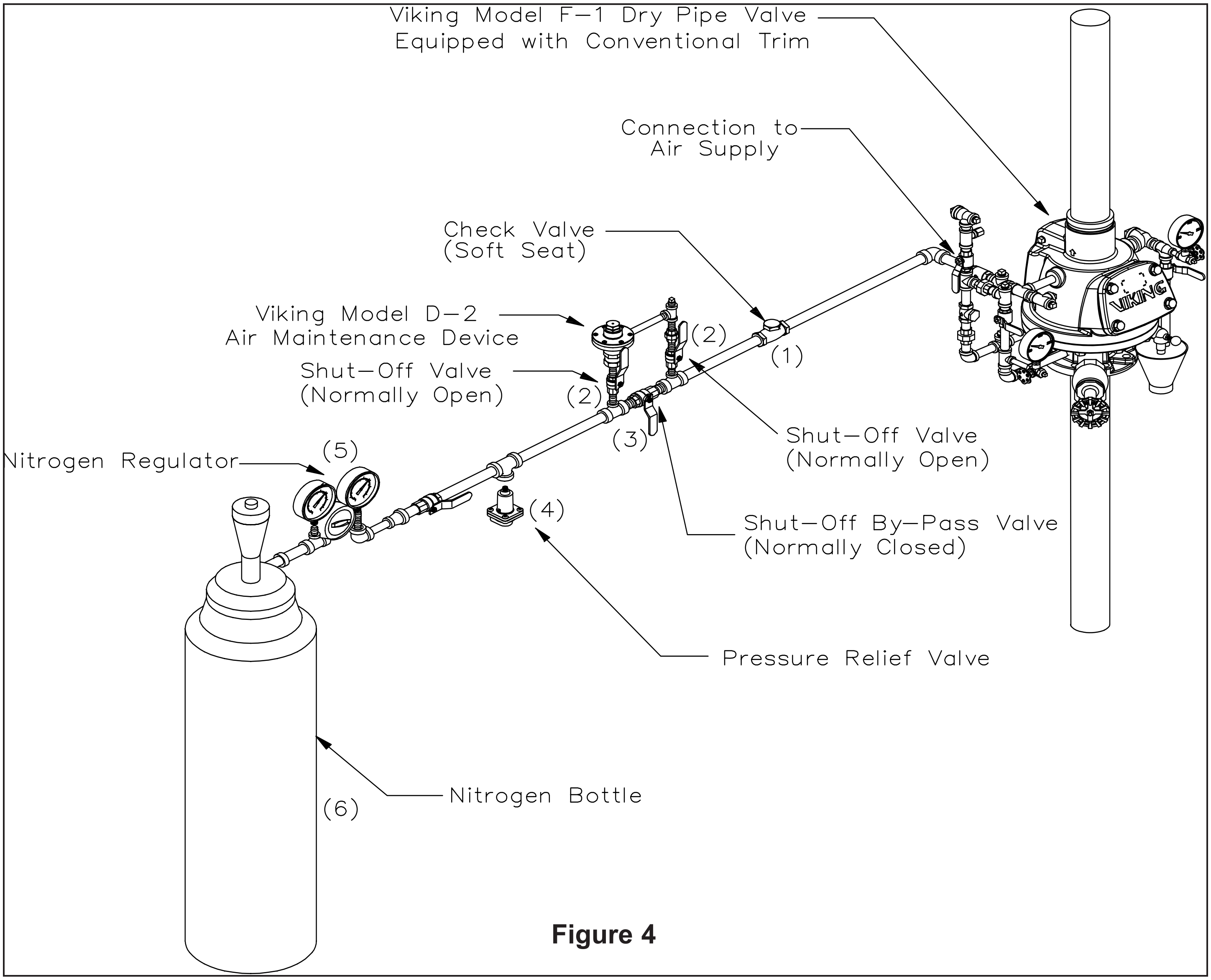

Figure 4

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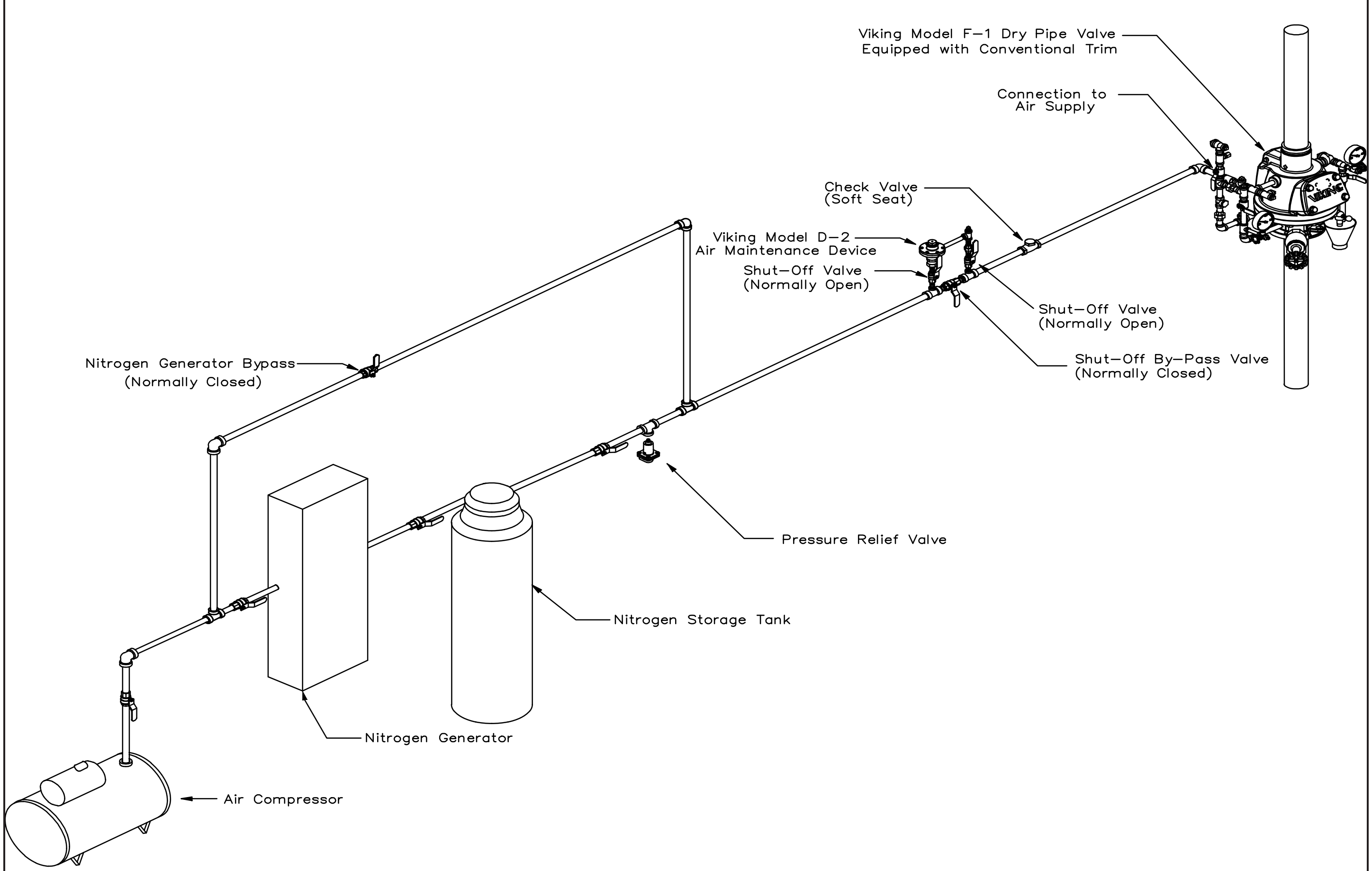

Figure 5

(Added Figure 5)