

WAC 296-307-40025 What requirements apply to safety-relief devices?

(1) Every container used in systems covered by WAC 296-307-400 must have one or more spring-loaded safety-relief valves or the equivalent.

(2) The discharge from safety-relief valves must be vented away from the container, upward, and unobstructed to the atmosphere. All safety-relief valve discharge openings must have suitable raincaps that allow free discharge of the vapor and prevent water from entering. You must provide a method to drain condensate. The rate of discharge must be as follows:

Surface Area sq. ft.	Flow Rate CFM Air	Surface Area sq. ft.	Flow Rate CFM Air	Surface Area sq. ft.	Flow Rate CFM Air
20	258	185	1,600	900	5,850
25	310	190	1,640	950	6,120
30	360	195	1,670	1,000	6,380
35	408	200	1,710	1,050	6,640
40	455	210	1,780	1,100	6,900
45	501	220	1,850	1,150	7,160
50	547	230	1,920	1,200	7,410
55	591	240	1,980	1,250	7,660
60	635	250	2,050	1,300	7,910
65	678	260	2,120	1,350	8,160
70	720	270	2,180	1,400	8,410
75	762	280	2,250	1,450	8,650
80	804	290	2,320	1,500	8,900
85	845	300	2,380	1,550	9,140
90	885	310	2,450	1,600	9,380
95	925	320	2,510	1,650	9,620
100	965	330	2,570	1,700	9,860
105	1,010	340	2,640	1,750	10,090
110	1,050	350	2,700	1,800	10,330
115	1,090	360	2,760	1,850	10,560
120	1,120	370	2,830	1,900	10,800
125	1,160	380	2,890	1,950	11,030
130	1,200	390	2,950	2,000	11,260
135	1,240	400	3,010	2,050	11,490
140	1,280	450	3,320	2,100	11,720
145	1,310	500	3,620	2,150	11,950
150	1,350	550	3,910	2,200	12,180
155	1,390	600	4,200	2,250	12,400
160	1,420	650	4,480	2,300	12,630
165	1,460	700	4,760	2,350	12,850
170	1,500	750	5,040	2,400	13,080
175	1,530	800	5,300	2,450	13,300
180	1,570	850	5,590	2,500	13,520

Surface area = total outside surface area of container in square feet. When the surface area is not stamped on the name plate or when the marking is not legible, calculate the area with one of the following formulas:

- Hemispherical heads: Area = (Length in feet) X (outside diameter in feet) X 3.1416.
- Other than hemispherical heads: Area = (Length in feet) + (0.3 outside diameter in feet) X (outside diameter in feet) X 3.1416.

- Spherical container: $\text{Area} = (\text{outside diameter in feet})^2 \times 3.1416$.
- Flow rate: CFM air = cubic feet per minute of air required at standard conditions, 60F and atmospheric pressure (14.7 psia).

For containers with total outside surface area greater than 2,500 sq. ft., the formula is: Flow rate CFM air = 22.11 A^{0.82} where A = outside surface area of the container in square feet.

(3) Container safety-relief valves must be set for start to discharge as follows, according to the design pressure of the container.

Containers	Minimum	Maximum*
ASME U-68, U-69	110%	125%
ASME U-200, U-201	95%	100%
ASME 1952, 1956, 1959, 1962, 1965, 1968 or 1971	95%	100%
API-ASME	95%	100%
U.S. Coast Guard	As required by USCG regulations	
DOT	As required by DOT regulations	

*Note: Plus a relief valve manufacturer's tolerance of ten percent.

(4) Safety-relief devices used in systems covered by WAC 296-307-400 must be constructed to discharge at a rate equal to or greater than the rates required in subsection (2) of this section before the pressure exceeds 120% (not including the tolerance referred to in subsection (3) of this section) of the maximum permitted start-to-discharge pressure setting of the device.

(5) Safety-relief valves must be arranged to minimize tampering. If the pressure setting adjustment is external, the relief valves must have a sealable adjustment.

(6) Shut-off valves installed between the safety-relief valves and the containers or systems described in WAC 296-307-400 are prohibited.

Exception: A shut-off valve may be used where the arrangement of the valve allows the required capacity flow through the relief valves.

Exception example 1: A three-way valve installed under two safety-relief valves, each of which has the required rate of discharge and is installed to allow either of the safety-relief valves to be closed off, but does not allow both safety valves to be closed off at the same time.

Exception example 2: Two separate relief valves are installed with individual shut-off valves. The two shut-off valve stems must be mechanically interconnected to allow the full required flow of one safety-relief valve at all times.

Exception example 3: A safety-relief valve manifold that allows one valve of two, three, four or more to be closed off and the remaining valve or valves will provide not less than the rate of discharge shown on the manifold nameplate.

(7) Safety-relief valves must have direct communication with the vapor space of the container.

(8) Each safety-relief valve used with systems described in WAC 296-307-400 must be plainly and permanently marked as follows:

(a) With the letters "AA" or the symbol NH3.

(b) The pressure in pounds per square inch gauge (psig) at which the valve is set to start to discharge.

(c) The rate of discharge of the valve in cubic feet per minute of air at 60°F and atmospheric pressure (14.7 psia).

(d) The manufacturers name and catalog number.

For example: A safety-relief valve marked AA-250-4200 (air) mean the valve is suitable for use on an anhydrous ammonia container; that it is set to start to discharge at 250 psig; and that its rate of discharge is 4,200 cubic feet per minute of air.

(9) No connection to the safety-relief valve may restrict the flow capacity on either the upstream or downstream side.

(10) The manufacturer or supplier of a safety-relief valve manifold must publish complete data showing the flow rating through the combined assembly of the manifold with safety-relief valves installed. The manifold flow rating must be determined by testing the manifold with all but one valve discharging. The flow rate must be determined by the restricted opening or openings or those having the lowest flow. The valve must be marked as required in subsection (7) of this section.

(11) A hydrostatic relief valve must be installed between each pair of valves in the liquid ammonia piping or hose where liquid may be trapped to release into the atmosphere at a safe location.

(12) Discharge from safety-relief devices must not terminate in or beneath any building.

[Statutory Authority: RCW 49.17.040. WSR 98-24-096, § 296-307-40025, filed 12/1/98, effective 3/1/99. WSR 97-09-013, recodified as § 296-307-40025; filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. WSR 96-22-048, § 296-306A-40025, filed 10/31/96, effective 12/1/96.]