 Pipeline and Hazardous Materials Safety Admin., DOT § 178.345–10

§ 178.345–10 Pressure relief.

(a) Each cargo tank must be equipped to relieve pressure and vacuum conditions in conformance with this section and the applicable individual specification. The pressure and vacuum relief system must be designed to operate and have sufficient capacity to prevent cargo tank rupture or collapse due to over-pressurization or vacuum resulting from loading, unloading, or from heating and cooling of lading. Pressure relief systems are not required to conform to the ASME Code.

(b) Type and construction of relief systems and devices. (1) Each cargo tank must be provided with a primary pressure relief system consisting of one or more reclosing pressure relief valves. A secondary pressure relief system consisting of another pressure relief valve in parallel with the primary pressure relief system may be used to augment the total venting capacity of the cargo tank. Non-reclosing pressure relief devices are not authorized in any cargo tank except when in series with a reclosing pressure relief device. Gravity actuated reclosing valves are not authorized on any cargo tank.

(2) When provided by §173.33(c)(3)(iii) of this subchapter, cargo tanks may be equipped with a normal vent. Such vents must be set to open at not less than 1 psig and must be designed to prevent loss of lading through the device in case of vehicle overturn.

(3) Each pressure relief system must be designed to withstand dynamic pressure surges in excess of the design set pressure as specified in paragraphs (b)(3)(i) and (ii) of this section. Set pressure is a function of MAWP as set forth in paragraph (d) of this section.

(i) Each pressure relief device must be able to withstand dynamic pressure surge reaching 30 psig above the design set pressure and sustained above the set pressure for at least 60 milliseconds with a total volume of liquid released not exceeding one gallon before the relief device recloses to a leak-tight condition. This requirement must be met regardless of vehicle orientation. This capability must be demonstrated by testing. An acceptable method is outlined in TTMA RP No. 81-97 "Performance of Spring Loaded Pressure Relief Valves on MC 306, MC 307, MC 312, DOT 406, DOT 407, and DOT 412 Tanks" (incorporated by reference; see §171.7 of this subchapter).

(ii) After August 31, 1995, each pressure relief device must be able to withstand a dynamic pressure surge reaching 30 psig above the design set pressure and sustained above the set pressure for at least 60 milliseconds with a total volume of liquid released not exceeding 1 L before the relief valve recloses to a leak-tight condition. This requirement must be met regardless of vehicle orientation. This
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capability must be demonstrated by
testing. TTMA RP No. BL cited in para-
graph (b)(3)(i) of this section, is an ac-
ceptable test procedure.

(4) Each reclosing pressure relief
valve must be constructed and in-
stalled in such a manner as to prevent
unauthorized adjustment of the relief
valve setting.

(5) No shut-off valve or other device
that could prevent venting through the
pressure relief system may be installed
in a pressure relief system.

(6) The pressure relief system must
be mounted, shielded and drainable so
as to minimize the accumulation of
material that could impair the opera-
tion or discharge capability of the
system by freezing, corrosion or block-
age.

(c) Location of relief devices. Each
pressure relief device must com-
municate with the vapor space above the
lading as near as practicable to the
center of the vapor space. For example,
on a cargo tank designed to operate in
a level attitude, the device should be
positioned at the horizontal and trans-
verse center of the cargo tank; on
cargo tanks sloped to the rear, the de-
vice should be located in the forward
half of the cargo tank. The discharge
from any device must be unrestricted.
Protective devices which deflect the
flow of vapor are permissible provided
the required vent capacity is main-
tained.

(d) Settings of pressure relief system.
The set pressure of the pressure relief
system is the pressure at which it
starts to open, allowing discharge.

(1) Primary pressure relief system.
The set pressure of each primary relief
valve must be no less than 120 percent
of the MAWP, and no more than 132
percent of the MAWP. The valve must
reclose at not less than 108 percent
of the MAWP and remain closed at lower
pressures.

(2) Secondary pressure relief system.
The set pressure of each pressure relief
valve used as a secondary relief device
must be not less than 120 percent of the
MAWP.

(e) Venting capacity of pressure relief
systems. The pressure relief system (pri-
mary and secondary, including piping)
must have sufficient venting capacity
to limit the cargo tank internal pres-
sure to not more than the cargo tank
test pressure. The total venting ca-
pacity, rated at not more than the cargo
tank test pressure, must be at least
that specified in table I, except as pro-
vided in § 178.348–4.

TABLE I—MINIMUM EMERGENCY VENT CAPACITY
[In cubic feet free air/hour at 60 °F and 1 atm.]

<table>
<thead>
<tr>
<th>Exposed area in square feet</th>
<th>Cubic feet free air per hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>15,800</td>
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<tr>
<td>30</td>
<td>23,700</td>
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<td>40</td>
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<tr>
<td>1,000</td>
<td>445,000</td>
</tr>
</tbody>
</table>

NOTE 1: Interpolate for intermediate sizes.

(1) Primary pressure relief system. Un-
less otherwise specified in the appli-
cable individual specification, the pri-
mary relief system must have a min-
imum venting capacity of 12,000 SCFH
per 350 square feet of exposed cargo
tank area, but in any case at least one
fourth the required total venting ca-
pacity for the cargo tank.

(2) Secondary pressure relief system. If
the primary pressure relief system does
not provide the required total venting
capacity, additional capacity must be
provided by a secondary pressure relief
system.

(f) Certification of pressure relief de-
vices. The manufacturer of any pressure
relief device, including valves, frag-
gable (rupture) disks, vacuum vents and
combination devices must certify that
the device model was designed and
tested in accordance with this section and the appropriate cargo tank specification. The certificate must contain sufficient information to describe the device and its performance. The certificate must be signed by a responsible official of the manufacturer who approved the flow capacity certification.

(g) Rated flow capacity certification test. Each pressure relief device model must be successfully flow capacity certification tested prior to first use. Devices having one design, size and set pressure are considered to be one model. The testing requirements are as follows:

(1) At least 3 devices of each specific model must be tested for flow capacity at a pressure not greater than the test pressure of the cargo tank. For a device model to be certified, the capacities of the devices tested must fall within a range of plus or minus 5 percent of the average for the devices tested.

(2) The rated flow capacity of a device model may not be greater than 90 percent of the average value for the devices tested.

(3) The rated flow capacity derived for each device model must be certified by a responsible official of the device manufacturer.

(h) Marking of pressure relief devices. Each pressure relief device must be permanently marked with the following:

(1) Manufacturer's name;
(2) Model number;
(3) Set pressure, in psig; and
(4) Rated flow capacity, in SCFH at the rating pressure, in psig.


§ 178.345–11 Tank outlets.

(a) General. As used in this section, "loading/unloading outlet" means any opening in the cargo tank wall used for loading or unloading of lading, as distinguished from outlets such as manhole covers, vents, vapor recovery devices, and similar closures. Cargo tank outlets, closures and associated piping must be protected in accordance with §178.345-8.

(b) Each cargo tank loading/unloading outlet must be equipped with an internal self-closing stop-valve, or alternatively, with an external stop-valve located as close as practicable to the cargo tank wall. Each cargo tank loading/unloading outlet must be in accordance with the following provisions:

(1) Each loading/unloading outlet must be fitted with a self-closing system capable of closing all such outlets in an emergency within 30 seconds of actuation. During normal operations the outlets may be closed manually. The self-closing system must be designed according to the following:

(i) Each self-closing system must include a remotely actuated means of closure located more than 10 feet from the loading/unloading outlet where vehicle length allows, or on the end of the cargo tank farthest away from the loading/unloading outlet. The actuating mechanism must be corrosion-resistant and effective in all types of environment and weather.

(ii) If the actuating system is accidentally damaged or sheared off during transportation, each loading/unloading outlet must remain securely closed and capable of retaining lading.

(iii) When required by part 173 of this subchapter for materials which are flammable, pyrophoric, oxidizing, or Division 6.1 (poisonous liquid) materials, the remote means of closure must be capable of thermal activation. The means by which the self-closing system is thermally activated must be located as close as practicable to the primary loading/unloading connection and must actuate the system at a temperature not over 250 °F. In addition, outlets on these cargo tanks must be capable of being remotely closed manually or mechanically.

(2) Bottom loading outlets which discharge lading into the cargo tank through fixed internal piping above the maximum liquid level of the cargo tank need not be equipped with a self-closing system.

(c) Any loading/unloading outlet extending beyond an internal self-closing stop-valve, or beyond the innermost external stop-valve which is part of a self-closing system, must be fitted with