

(iii) The MRHT (see §178.338-18(b)(9) of this subchapter) may not exceed the RHT.

[Amdt. 178-77, 48 FR 27704, June 16, 1983; 48 FR 50442, Nov. 1, 1983, as amended at 49 FR 24316, June 12, 1984; 49 FR 43965, Nov. 1, 1984; 59FR 55173, Nov. 3, 1994; Amdt. 178-118, 61 FR 51340, Oct. 1, 1996]

**§ 178.338-10 Collision damage protection.**

(a) All valves, fittings, pressure relief devices and other accessories to the tank proper, which are not isolated from the tank by closed intervening shut-off valves or check valves, must be installed within the motor vehicle framework or within a suitable collision resistant guard or housing, and appropriate ventilation must be provided. Each pressure relief device must be protected so that in the event of the upset of the vehicle onto a hard surface, the device's opening will not be prevented and its discharge will not be restricted.

(b) Each protective device or housing, and its attachment to the vehicle structure, must be designed to withstand static loading in any direction that it may be loaded as a result of front, rear, side, or sideswipe collision, or the overturn of the vehicle. The static loading shall equal twice the loaded weight of the tank and attachments. A safety factor of four, based on the tensile strength of the material, shall be used. The protective device or the housing must be made of steel at least  $\frac{3}{16}$ -inch thick, or other material of equivalent strength.

(c) Each tank motor vehicle must be provided with at least one rear bumper designed to protect the cargo tank and piping in the event of a rear end collision. The bumper design must transmit the force of the collision directly to the chassis of the vehicle. The rear bumper and its attachments to the chassis must be designed to withstand a load equal to twice the weight of the loaded cargo tank and attachments, using a safety factor of four based on the tensile strength of the materials used, with such load being applied horizontally and parallel to the major axis of the cargo tank, or within 30 horizontal degrees thereof. The rear bumper dimensions must meet the require-

ments of §393.86 of this title and extend vertically to a height adequate to protect all valves and fittings located at the rear of the cargo tank from damage that could result in loss of lading.

(d) Every part of the loaded cargo tank, and any associated valve, pipe, enclosure, or protective device or structure (exclusive of wheel assemblies), must be at least 14 inches above level ground.

[Amdt. 178-77, 48 FR 27705, June 16, 1983, as amended at 49 FR 24316, June 12, 1984; Amdt. 178-99, 58 FR 51534, Oct. 1, 1993]

**§ 178.338-11 Discharge control devices.**

(a) Excess-flow valves are not required.

(b) Each liquid filling and liquid discharge line must be provided with a shut-off valve located as close to the tank as practicable. Unless this valve is manually operable at the valve, the line must also have a manual shut-off valve.

(c) Except for a cargo tank used to transport the following refrigerated liquids: argon, carbon dioxide, helium, krypton, neon, nitrogen, and xenon; each liquid filling and liquid discharge line must be provided with a remotely controlled self-closing shut-off valve. This requirement does not apply to a cargo tank motor vehicle certified before January 1, 1995, unless intended for use to transport flammable ladings. If pressure from a reservoir or from an engine driven pump or compressor is used to open this valve, the control must be of fail-safe design, spring-biased to stop the admission of such pressure. If the jacket is not evacuated, the seat of the valve must be inside the tank, in the opening nozzle or flange, or in a companion flange bolted to the nozzle. If the jacket is evacuated, the remotely controlled valve must be located as close to the tank as practicable.

(1) On a cargo tank with a capacity in excess of 3,500 gallons of water, each remotely controlled shut-off valve must be provided with remote means of automatic closure, both mechanical and thermal, installed at the ends of the cargo tank in at least two diagonally opposite locations. The thermal means shall consist of fusible elements

actuated at a temperature not exceeding 250 °F., or equivalent devices. One means may be used to close more than one remotely controlled valve.

(2) On a cargo tank with a capacity of 3,500 gallons of water or less, each remotely controlled shut-off valve must be provided with at least one remote control station on the end of the cargo tank opposite the main control station. The remote control station must contain a manual means of closure. In addition, it may contain fusible elements actuated at a temperature not exceeding 250 °F., or equivalent devices. One means may be used to close more than one remotely controlled valve.

[Amdt. 178-77, 48 FR 27705, June 16, 1983, as amended by Amdt. 178-105, 59 FR 55173, Nov. 3, 1994; 60 FR 17402, Apr. 5, 1995]

**§ 178.338-12 Shear section.**

Unless the valve is located in a rear cabinet forward of and protected by the bumper (see § 178.338-10(c)), the design and installation of each valve, damage to which could result in loss of liquid or vapor, must incorporate a shear section or breakage groove adjacent to, and outboard of, the valve. The shear section or breakage groove must yield or break under strain without damage to the valve that would allow the loss of liquid or vapor. The protection specified in § 178.338-10 is not a substitute for a shear section or breakage groove.

[Amdt. 178-77, 49 FR 24316, June 12, 1984]

**§ 178.338-13 Supports and anchoring.**

(a) All attachments of supports and bumpers to tanks and to load-bearing jackets must be made by means of pads of material similar to that of the tank or jacket, by load rings, or by bosses designed or gusseted to distribute the load. The pad must be at least ¼-inch thick, or as thick as the tank or jacket material, if less, but shall in no case be thicker than the tank or jacket material. Each pad must extend at least four times its thickness, in each direction, beyond the weld attaching the support or bumper. Each pad must be preformed to an inside radius no greater than the outside radius of the tank or jacket at the place of attachment. Each pad corner must be rounded to a radius at least one-fourth the width of

the pad and no greater than one-half the width of the pad. If weep holes or telltale holes are used, they must be drilled or punched before the pads are attached. Each pad must be attached to the tank or jacket by continuous fillet welding using filler material having properties conforming to the recommendations of the manufacturer of the tank or jacket material. Any fillet weld discontinuity may only be for the purpose of preventing an intersection between the fillet weld and a tank or jacket seam weld.

(b) A tank motor vehicle constructed so that the cargo tank constitutes in whole or in part the structural member used in place of a motor vehicle frame must have the tank or the jacket supported by external cradles or by load rings. A cargo tank mounted on a motor vehicle frame must have the tank or jacket supported by external cradles, load rings, or longitudinal members. If cradles are used, they must subtend at least 120 degrees of the cargo tank circumference. The design calculations for the supports and load bearing tank or jacket, and the support attachments must include beam stress, shear stress, torsion stress, bending moment, and acceleration stress for the loaded vehicle as a unit, using a safety factor of four, based on the tensile strength of the material, and static loadings that take into consideration the weight of the cargo tank and its attachments when filled to the design weight of the lading (see appendix G of the ASME Code). The effects of fatigue must also be considered in the calculations. Minimum static loadings must be as follows:

(1) For a vacuum-insulated cargo tank—

- (i) Vertically downward of 2;
- (ii) Vertically upward of 2;
- (iii) Longitudinally of 2; and
- (iv) Laterally of 2.

(2) For a nonvacuum-insulated cargo tank—

- (i) Vertically downward of 3;
- (ii) Vertically upward of 2;
- (iii) Longitudinally of 2; and
- (iv) Laterally of 2.

(c) When a loaded tank is supported within the vacuum jacket by structural members, the design calculations