

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) *Rear-end tank protection.* Rear-end tank protection devices must:

(1) Consist of at least one rear bumper designed to protect the cargo tank and piping in the event of a rear-end collision. The rear-end tank protection device design must transmit the force of the collision directly to the chassis of the vehicle. The rear-end tank protection device 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. The rear-end tank protection device dimensions must meet the requirements 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; or

(2) Conform to the requirements of § 178.345-8(d).

(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; 68 FR 19282, Apr. 18, 2003; 68 FR 52371, Sept. 3, 2003; 85 FR 83402, Dec. 21, 2020; 87 FR 79784, Dec. 27, 2022]

§ 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 that is used to transport argon, carbon dioxide, helium, krypton, neon, nitrogen, xenon, or mixtures thereof, each liquid filling and liquid discharge line must be provided with an on-vehicle remotely controlled self-closing shut-off valve.

(1) 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 and spring-biased to stop the admission of such pressure into the cargo tank. 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.

(2) Each remotely controlled shut off valve must be provided with on-vehicle remote means of automatic closure, both mechanical and thermal. One means may be used to close more than one remotely controlled valve. Cable linkage between closures and remote operators must be corrosion resistant and effective in all types of environment and weather. The thermal means must consist of fusible elements actuated at a temperature not exceeding 121 °C (250 °F), or equivalent devices. The loading/unloading connection area is where hoses are connected to the permanent metal piping. The number and location of remote operators and thermal devices shall be as follows:

(i) On a cargo tank motor vehicle over 3,500 gallons water capacity, remote means of automatic closure must be installed at the ends of the cargo tank in at least two diagonally opposite locations. If the loading/unloading connection at the cargo tank is not in the general vicinity of one of these locations, at least one additional thermal device must be installed so that heat from a fire in the loading/unloading connection area will activate the emergency control system.

(ii) On a cargo tank motor vehicle of 3,500 gallons water capacity or less, at least one remote means of automatic

closure must be installed on the end of the cargo tank farthest away from the loading/unloading connection area. At least one thermal device must be installed so that heat from a fire in the loading/unloading connection area will activate the emergency control system.

[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; 68 FR 19282, Apr. 18, 2003]

§ 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 Supporting and anchoring.

(a) On a cargo tank motor vehicle designed and constructed so that the cargo tank constitutes in whole or in part the structural member used in place of a motor vehicle frame, the cargo tank or the jacket must be supported by external cradles or by load rings. For a cargo tank mounted on a motor vehicle frame, the tank or jacket must be 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 loading that uses the weight of the cargo tank and its attachments when filled to the design weight of the lading (see appendix G in Section VIII of the ASME Code) (IBR, see §171.7 of this

subchapter), multiplied by the following factors. 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 any other insulated cargo tank—

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

(b) When a loaded tank is supported within the vacuum jacket by structural members, the design calculations for the tank and its structural members must be based on a safety factor of four and the tensile strength of the material at ambient temperature. The enhanced tensile strength of the material at actual operating temperature may be substituted for the tensile strength at ambient temperature to the extent recognized in the ASME Code for static loadings. Static loadings must take into consideration the weight of the tank and the structural members when the tank is filled to the design weight of lading (see Appendix G of Section VIII, Division 1 of the ASME Code), multiplied by the following factors. Static loadings must take into consideration the weight of the tank and the structural members when the tank is filled to the design weight of lading (see appendix G in Section VIII of the ASME Code), multiplied by the following factors. When load rings in the jacket are used for supporting the tank, they must be designed to carry the fully loaded tank at the specified static loadings, plus external pressure. Minimum static loadings must be as follows:

- (1) Vertically downward of 2;
- (2) Vertically upward of 1½;
- (3) Longitudinally of 1½; and, (4) Laterally of 1½.

[68 FR 19282, Apr. 18, 2003, as amended at 68 FR 75754, Dec. 31, 2003]

§ 178.338-14 Gauging devices.

(a) *Liquid level gauging devices.* (1) Unless a cargo tank is intended to be