

(b) In the case of a cargo tank vehicle manufactured in two or more stages, each manufacturer who performs a manufacturing operation on the incomplete vehicle or portion thereof shall furnish to the succeeding manufacturer, at or before the time of delivery, a certificate covering the particular operation performed by that manufacturer, and any certificates received from previous manufacturers, Registered Inspectors, and Design Certifying Engineers. The certificates must include sufficient sketches, drawings, and other information to indicate the location, make, model and size of each valve and the arrangement of all piping associated with the tank. Each certificate must be signed by an official of the manufacturing firm responsible for the portion of the complete cargo tank vehicle represented thereby, such as basic tank fabrication, insulation, jacket, or piping. The final manufacturer shall furnish the owner with all certificates, as well as the documents required by paragraph (a) of this section.

(c) The owner shall retain the data report, certificates, and related papers throughout his ownership of the cargo tank. In the event of change of ownership, the prior owner shall retain non-fading photographically reproduced copies of these documents for at least one year. Each operator using the cargo tank vehicle, if not the owner thereof, shall obtain a copy of the data report and the certificate or certificates and retain them during the time he uses the cargo tank and for at least one year thereafter.

(Approved by the Office of Management and Budget under control number 2137-0017)

[Amdt. 178-77, 48 FR 27707, 27713, June 16, 1983, as amended by Amdt. 178-89, 55 FR 37058, Sept. 7, 1990; Amdt. 178-99, 58 FR 51534, Oct. 1, 1993; 62 FR 51561, Oct. 1, 1997; 68 FR 75755, Dec. 31, 2003]

§§ 178.340-178.343 [Reserved]

§ 178.345 General design and construction requirements applicable to Specification DOT 406 (§ 178.346), DOT 407 (§ 178.347), and DOT 412 (§ 178.348) cargo tank motor vehicles.

§ 178.345-1 General requirements.

(a) Specification DOT 406, DOT 407 and DOT 412 cargo tank motor vehicles must conform to the requirements of this section in addition to the requirements of the applicable specification contained in §§ 178.346, 178.347 or 178.348.

(b) All specification requirements are minimum requirements.

(c) *Definitions.* See § 178.320(a) for the definition of certain terms used in §§ 178.345, 178.346, 178.347, and 178.348. In addition, the following definitions apply to §§ 178.345, 178.346, 178.347, and 178.348:

Appurtenance means any cargo tank accessory attachment that has no lading retention or containment function and provides no structural support to the cargo tank.

Baffle means a non-liquid-tight transverse partition device that deflects, checks or regulates fluid motion in a tank.

Bulkhead means a liquid-tight transverse closure at the ends of or between cargo tanks.

Charging line means a hose, tube, pipe, or similar device used to pressurize a tank with material other than the lading.

Companion flange means one of two mating flanges where the flange faces are in contact or separated only by a thin leak sealing gasket and are secured to one another by bolts or clamps.

Connecting structure means the structure joining two cargo tanks.

Constructed and certified in conformance with the ASME Code means the cargo tank is constructed and stamped in accordance with the ASME Code, and is inspected and certified by an Authorized Inspector.

Constructed in accordance with the ASME Code means the cargo tank is constructed in accordance with the ASME Code with the authorized exceptions (see §§ 178.346, 178.347, and 178.348)

and is inspected and certified by a Registered Inspector.

External self-closing stop-valve means a self-closing stop-valve designed so that the self-stored energy source is located outside the cargo tank and the welded flange.

Extreme dynamic loading means the maximum single-acting loading a cargo tank motor vehicle may experience during its expected life, excluding accident loadings.

Flange means the structural ring for guiding or attachment of a pipe or fitting with another flange (companion flange), pipe, fitting or other attachment.

Inspection pressure means the pressure used to determine leak tightness of the cargo tank when testing with pneumatic pressure.

Internal self-closing stop-valve means a self-closing stop-valve designed so that the self-stored energy source is located inside the cargo tank or cargo tank sump, or within the welded flange, and the valve seat is located within the cargo tank or within one inch of the external face of the welded flange or sump of the cargo tank.

Lading means the hazardous material contained in a cargo tank.

Loading/unloading connection means the fitting in the loading/unloading line farthest from the loading/unloading outlet to which the loading/unloading hose or device is attached.

Loading/unloading outlet means the cargo tank outlet used for normal loading/unloading operations.

Loading/unloading stop-valve means the stop valve farthest from the cargo tank loading/unloading outlet to which the loading/unloading connection is attached.

MAWP. See § 178.320(a).

Multi-specification cargo tank motor vehicle means a cargo tank motor vehicle equipped with two or more cargo tanks fabricated to more than one cargo tank specification.

Normal operating loading means the loading a cargo tank motor vehicle may be expected to experience routinely in operation.

Nozzle means the subassembly consisting of a pipe or tubular section with or without a welded or forged flange on one end.

Outlet means any opening in the shell or head of a cargo tank, (including the means for attaching a closure), except that the following are not outlets: A threaded opening securely closed during transportation with a threaded plug or a threaded cap, a flanged opening securely closed during transportation with a bolted or welded blank flange, a manhole, or gauging devices, thermometer wells, and safety relief devices.

Outlet stop-valve means the stop-valve at the cargo tank loading/unloading outlet.

Pipe coupling means a fitting with internal threads on both ends.

Rear bumper means the structure designed to prevent a vehicle or object from under-riding the rear of a motor vehicle. See § 393.86 of this title.

Rear-end tank protection device means the structure designed to protect a cargo tank and any lading retention piping or devices in case of a rear end collision.

Sacrificial device means an element, such as a shear section, designed to fail under a load in order to prevent damage to any lading retention part or device. The device must break under strain at no more than 70 percent of the strength of the weakest piping element between the cargo tank and the *sacrificial device*. Operation of the *sacrificial device* must leave the remaining piping and its attachment to the cargo tank intact and capable of retaining lading.

Self-closing stop-valve means a stop-valve held in the closed position by means of self-stored energy, which opens only by application of an external force and which closes when the external force is removed.

Shear section means a sacrificial device fabricated in such a manner as to abruptly reduce the wall thickness of the adjacent piping or valve material by at least 30 percent.

Shell means the circumferential portion of a cargo tank defined by the basic design radius or radii excluding the closing heads.

Stop-valve means a valve that stops the flow of lading.

Sump means a protrusion from the bottom of a cargo tank shell designed

to facilitate complete loading and unloading of lading.

Tank means a container, consisting of a shell and heads, that forms a pressure tight vessel having openings designed to accept pressure tight fittings or closures, but excludes any appurtenances, reinforcements, fittings, or closures.

Test pressure means the pressure to which a tank is subjected to determine pressure integrity.

Toughness of material means the capability of a material to absorb the energy represented by the area under the stress strain curve (indicating the energy absorbed per unit volume of the material) up to the point of rupture.

Vacuum cargo tank means a cargo tank that is loaded by reducing the pressure in the cargo tank to below atmospheric pressure.

Variable specification cargo tank means a cargo tank that is constructed in accordance with one specification, but which may be altered to meet another specification by changing relief device, closures, lading discharge devices, and other lading retention devices.

Void means the space between tank heads or bulkheads and a connecting structure.

Welded flange means a flange attached to the tank by a weld joining the tank shell to the cylindrical outer surface of the flange, or by a fillet weld joining the tank shell to a flange shaped to fit the shell contour.

(d) A manufacturer of a cargo tank must hold a current ASME certificate of authorization and must be registered with the Department in accordance with part 107, subpart F of this chapter.

(e) All construction must be certified by an Authorized Inspector or by a Registered Inspector as applicable to the cargo tank.

(f) Each cargo tank must be designed and constructed in conformance with the requirements of the applicable cargo tank specification. Each DOT 412 cargo tank with a "MAWP" greater than 15 psig, and each DOT 407 cargo tank with a maximum allowable working pressure greater than 35 psig must be "constructed and certified in conformance with Section VIII of the ASME Code" (IBR, see §171.7 of this

subchapter) except as limited or modified by the applicable cargo tank specification. Other cargo tanks must be "constructed in accordance with Section VIII of the ASME Code," except as limited or modified by the applicable cargo tank specification.

(g) Requirements relating to parts and accessories on motor vehicles, which are contained in part 393 of the Federal Motor Carrier Safety Regulations of this title, are incorporated into these specifications.

(h) Any additional requirements prescribed in part 173 of this subchapter that pertain to the transportation of a specific lading are incorporated into these specifications.

(i) *Cargo tank motor vehicle composed of multiple cargo tanks.* (1) A cargo tank motor vehicle composed of more than one cargo tank may be constructed with the cargo tanks made to the same specification or to different specifications. Each cargo tank must conform in all respects with the specification for which it is certified.

(2) The strength of the connecting structure joining multiple cargo tanks in a cargo tank motor vehicle must meet the structural design requirements in §178.345-3. Any void within the connecting structure must be equipped with a drain located on the bottom centerline that is accessible and kept open at all times. For carbon steel, self-supporting cargo tanks, the drain configuration may consist of a single drain of at least 1.0 inch diameter, or two or more drains of at least 0.5 inch diameter, 6.0 inches apart, one of which is located as close to the bottom centerline as practicable. Vapors trapped in a void within the connecting structure must be allowed to escape to the atmosphere either through the drain or a separate vent.

(j) *Variable specification cargo tank.* A cargo tank that may be physically altered to conform to another cargo tank specification must have the required physical alterations to convert from

§ 178.345-2

one specification to another clearly indicated on the variable specification plate.

[Amdt. 178-89, 54 FR 25020, June 12, 1989, as amended at 55 FR 37058, Sept. 7, 1990; Amdt. 178-105, 59 FR 55173, Nov. 3, 1994; Amdt. 178-118, 61 FR 51340, Oct. 1, 1996; 66 FR 45387, 45389, Aug. 28, 2001; 68 FR 19283, Apr. 18, 2003; 68 FR 52371, Sept. 3, 2003; 68 FR 75755, Dec. 31, 2003; 70 FR 56099, Sept. 23, 2005; 76 FR 43532, July 20, 2011]

§ 178.345-2 Material and material thickness.

(a) All material for shell, heads, bulkheads, and baffles must conform to Section II of the ASME Code (IBR, see §171.7 of this subchapter) except as follows:

(1) The following steels are also authorized for cargo tanks “constructed in accordance with the ASME Code”, Section VIII.

ASTM A 569
ASTM A 570
ASTM A 572
ASTM A 622
ASTM A 656
ASTM A 715
ASTM A 1008/ A 1008M, ASTM A 1011/A 1011M

(2) Aluminum alloys suitable for fusion welding and conforming with the 0, H32 or H34 tempers of one of the following ASTM specifications may be used for cargo tanks “constructed in accordance with the ASME Code”:

ASTM B-209 Alloy 5052
ASTM B-209 Alloy 5086
ASTM B-209 Alloy 5154
ASTM B-209 Alloy 5254
ASTM B-209 Alloy 5454
ASTM B-209 Alloy 5652

All heads, bulkheads and baffles must be of 0 temper (annealed) or stronger tempers. All shell materials shall be of H 32 or H 34 tempers except that the lower ultimate strength tempers may be used if the minimum shell thicknesses in the tables are increased in inverse proportion to the lesser ultimate strength.

(b) *Minimum thickness.* The minimum thickness for the shell and heads (or baffles and bulkheads when used as tank reinforcement) must be no less than that determined under criteria for minimum thickness specified in §178.320(a).

49 CFR Ch. I (10-1-23 Edition)

(c) *Corrosion or abrasion protection.* When required by 49 CFR part 173 for a particular lading, a cargo tank or a part thereof, subject to thinning by corrosion or mechanical abrasion due to the lading, must be protected by providing the tank or part of the tank with a suitable increase in thickness of material, a lining or some other suitable method of protection.

(1) *Corrosion allowance.* Material added for corrosion allowance need not be of uniform thickness if different rates of attack can reasonably be expected for various areas of the cargo tank.

(2) *Lining.* Lining material must consist of a nonporous, homogeneous material not less elastic than the parent metal and substantially immune to attack by the lading. The lining material must be bonded or attached by other appropriate means to the cargo tank wall and must be imperforate when applied. Any joint or seam in the lining must be made by fusing the materials together, or by other satisfactory means.

[Amdt. 178-89, 54 FR 25021, June 12, 1989, as amended at 55 FR 37059, Sept. 7, 1990; 56 FR 27876, June 17, 1991; Amdt. 178-97, 57 FR 45465, Oct. 1, 1992; Amdt. 178-118, 61 FR 51341, Oct. 1, 1996; 68 FR 19283, Apr. 18, 2003; 68 FR 75755, Dec. 31, 2003; 70 FR 34076, June 13, 2005]

§ 178.345-3 Structural integrity.

(a) *General requirements and acceptance criteria.* (1) The maximum calculated design stress at any point in the cargo tank wall may not exceed the maximum allowable stress value prescribed in Section VIII of the ASME Code (IBR, see §171.7 of this subchapter), or 25 percent of the tensile strength of the material used at design conditions.

(2) The relevant physical properties of the materials used in each cargo tank may be established either by a certified test report from the material manufacturer or by testing in conformance with a recognized national standard. In either case, the ultimate tensile strength of the material used in the design may not exceed 120 percent of the minimum ultimate tensile strength specified in either the ASME Code or the ASTM standard to which the material is manufactured.