

[69 FR 76174, Dec. 20, 2004, as amended at 70 FR 34399, June 14, 2005; 78 FR 1091, Jan. 7, 2013; 87 FR 79782, Dec. 27, 2022]

§ 173.314 Compressed gases in tank cars and multi-unit tank cars.

(a) *Definitions.* For definitions of compressed gases, see §173.115.

(b) *General requirements.* (1) Tank car tanks containing compressed gases must not be shipped unless they were loaded by or with the consent of the owner thereof.

(2) Tank car tanks must not contain gases capable of combining chemically and must not be loaded with any gas which combines chemically with the gas previously loaded therein, until all residue has been removed and interior of tank thoroughly cleaned.

(3) For tanks of the DOT-106A and 110A class, the tanks must be placed in position and attached to car structure by the shipper.

(4) Wherever the word “approved” is used in this part of the regulations, it

means approval by the Association of American Railroads Committee on Tank Cars as prescribed in §179.3 of this subchapter.

(5) Each tank car used for the transportation of anhydrous ammonia or any material that meets the criteria of Division 2.1 or 2.3 must have gaskets for manway cover plates and for mounting of fittings designed (for temperature, application, media, pressure, and size) to create a positive seal so that, under conditions normally incident to transportation, there will not be an identifiable release of the material to the environment. The use of sealants to install gaskets is prohibited.

(c) *Authorized gases, filling limits for tank cars.* A compressed gas in a tank car or a multi-unit tank car must be offered for transportation in accordance with §173.31 and this section. The gases listed below must be loaded and offered for transportation in accordance with the following table:

TABLE 1 TO PARAGRAPH (c)

Proper shipping name	Outage and filling limits (see note 1)	Authorized tank car class (see note 11)	Authorized tank car specification (see note 12)
Ammonia, anhydrous, or ammonia solutions >50 percent ammonia.	Notes 2, 10	105, 112, 114, 120	105H500W, 112H500W
Ammonia solutions with >35 percent, but ≤50 percent ammonia by mass.	Note 3	106.	
Argon, compressed	Note 3	105, 109, 112, 114, 120.	
Boron trichloride	Note 4	107.	
Carbon dioxide, refrigerated liquid	Note 3	105, 106.	
Chlorine	Note 5	105.	
Chlorine trifluoride	Note 6	105	105H600W
Chlorine pentafluoride	125	106.	
Dimethyl ether	Note 3	106, 110.	
Dimethylamine, anhydrous	Note 3	106, 110.	
Dinitrogen tetroxide, inhibited	Note 3	105, 106, 110, 112, 114, 120.	
Division 2.1 materials not specifically identified in this table.	Note 3	105, 106, 110, 112, 114, 120.	105H500W
Division 2.2 materials not specifically identified in this table.	Notes 9, 10	105, 106, 109, 110, 112, 114, 120.	
Division 2.3 Zone A materials not specifically identified in this table.	Note 3	105, 106, 109, 110, 112, 114, 120.	105H600W
Division 2.3 Zone B materials not specifically identified in this table.	None	See § 173.245.	105H600W
Division 2.3 Zone C materials not specifically identified in this table.	Note 3	105, 106, 110, 112, 114, 120.	105H600W
Division 2.3 Zone D materials not specifically identified in this table.	Note 3	105, 106, 110, 112, 114, 120.	105H500W
Ethylamine	Note 3	105, 106, 109, 110, 112, 114, 120.	105H500W, 112H500H
Helium, compressed	Note 3	105, 106, 110, 112, 114, 120.	
Hydrogen	Note 3	107.	
Hydrogen chloride, refrigerated liquid	Note 4	107.	
Hydrogen sulfide	Note 7	105	105H600W, 112H600W
Hydrogen sulfide, liquefied	Note 3	105, 106, 110, 112, 114, 120.	105H600W
	68	106.	

TABLE 1 TO PARAGRAPH (c)—Continued

Proper shipping name	Outage and filling limits (see note 1)	Authorized tank car class (see note 11)	Authorized tank car specification (see note 12)
Methyl bromide	Note 3	105, 106	105H500W
Methyl chloride	Note 3	105, 106, 112.	
Methyl mercaptan	Note 3	105, 106	105H500W
Methylamine, anhydrous	Note 3	105, 106, 112.	
Nitrogen, compressed	Note 4	107.	
Nitrosyl chloride	124	105	105H500W
	110	106.	
Nitrous oxide, refrigerated liquid	Note 5	105.	
Oxygen, compressed	Note 4	107.	
Phosgene	Note 3	106.	
Sulfur dioxide, liquefied	125	105, 106, 110	105H500W
Sulfuryl fluoride	120	105.	
Vinyl fluoride, stabilized	Note 8	105.	

Notes to table 1 to paragraph (c):

1. The filling density percentage for liquefied gases is hereby defined as the percent ratio of the mass of gas in the tank to the mass of water that the tank will hold. For determining the water capacity of the tank in kilograms, the mass of 1 L of water at 15.5 °C in air is 1 kg (the mass of one gallon of water at 60 °F in air is 8.32828 pounds).
2. The liquefied gas must be loaded so that the outage is at least two percent of the total capacity of the tank at the reference temperature of 46 °C (115 °F) for a non-insulated tank; 43 °C (110 °F) for a tank having a thermal protection system incorporating a metal jacket that provides an overall thermal conductance at 15.5 °C (60 °F) of no more than 10.22 kilojoules per hour—per square meter—per degree Celsius (0.5 Btu per hour/per square foot/per degree F) temperature differential; and 41 °C (105 °F) for an insulated tank having an insulation system incorporating a metal jacket that provides an overall thermal conductance at 15.5 °C (60 °F) of no more than 1.5333 kilojoules per hour—per square meter—per degree Celsius (0.075 Btu per hour/per square foot/per degree F) temperature differential.
3. The requirements of § 173.24b(a) apply.
4. The gas pressure at 54.44 °C (130 °F) in any non-insulated tank car may not exceed 7/10 of the marked test pressure, except that a tank may be charged with helium to a pressure of 10 percent in excess of the marked maximum gas pressure at 54.44 °C (130 °F) of each tank.
5. The liquid portion of the gas at –17.77 °C (0 °F) must not completely fill the tank.
6. The maximum permitted filling density is 125 percent. The quantity of chlorine loaded into a single unit-tank car may not be loaded in excess of the normal lading weights nor in excess of 81.65 Mg (90 tons).
7. 89 percent maximum to 80.1 percent minimum at a test pressure of 6.2 bar (90 psig).
8. 59.6 percent maximum to 53.6 percent minimum at a test pressure of 7.2 bar (105 psig).
9. For a liquefied petroleum gas, the liquefied gas must be loaded so that the outage is at least one percent of the total capacity of the tank at the reference temperature of 46 °C (115 °F) for a non-insulated tank; 43 °C (110 °F) for a tank having a thermal protection system incorporating a metal jacket that provides an overall thermal conductance at 15.5 °C (60 °F) of no more than 10.22 kilojoules per hour—per square meter—per degree Celsius (0.5 Btu per hour/per square foot/per degree F) temperature differential; and 29 °C (85 °F) for an insulated tank having an insulation system incorporating a metal jacket and insulation that provides an overall thermal conductance at 15.5 °C (60 °F) of no more than 1.5333 kilojoules per hour—per square meter—per degree Celsius (0.075 Btu per hour/per square foot/per degree F) temperature differential. The winter reference temperatures may only be used for a tank car shipped directly to a consumer for unloading and not stored in transit. The offeror of the tank must inform each customer that the tank car was filled based on winter reference temperatures. The tank must be unloaded as soon as possible after March in order to retain the specified outage and to prevent a release of hazardous material, which might occur due to the tank car becoming liquid full at higher temperatures.
10. For liquefied petroleum gas and anhydrous ammonia, during the months of November through March (winter), the following reference temperatures may be used: 38 °C (100 °F) for a non-insulated tank; 32 °C (90 °F) for a tank having a thermal protection system incorporating a metal jacket that provides an overall thermal conductance at 15.5 °C (60 °F) of no more than 10.22 kilojoules per hour—per square meter—per degree Celsius (0.5 Btu per hour/per square foot/per degree F) temperature differential; and 29 °C (85 °F) for an insulated tank having an insulation system incorporating a metal jacket and insulation that provides an overall thermal conductance at 15.5 °C (60 °F) of no more than 1.5333 kilojoules per hour—per square meter—per degree Celsius (0.075 Btu per hour/per square foot/per degree F) temperature differential. The winter reference temperatures may only be used for a tank car shipped directly to a consumer for unloading and not stored in transit. The offeror of the tank must inform each customer that the tank car was filled based on winter reference temperatures. The tank must be unloaded as soon as possible after March in order to retain the specified outage and to prevent a release of hazardous material, which might occur due to the tank car becoming liquid full at higher temperatures.
11. For materials poisonous by inhalation, until December 31, 2027, the single unit tank car tanks authorized are only those cars approved by the Tank Car Committee for transportation of the specified material and built prior to March 16, 2009. After December 31, 2027, all single unit tank cars used in PIH/TIH service must meet the requirements of Note 12.
12. Except as provided in paragraph (d) of this section, for materials poisonous by inhalation, fusion-welded tank car tanks built on or after March 16, 2009, used for the transportation of the PIH materials noted, must meet the applicable authorized tank car specification and must be equipped with a head shield as prescribed in § 179.16(c)(1).

(d) *Alternative tank car tanks for materials poisonous by inhalation.* (1) As an alternative to the authorized tank car specification noted in the column 4 of the table in paragraph (c) of this section, a car of the same authorized tank car specification but of the next lower test pressure, as prescribed in column 5 of the table at §179.101–1, may be used provided both of the following conditions are met:

(i) The difference between the alternative and the required minimum plate thicknesses, based on the calculation prescribed in §179.100–6 of this subchapter, is added to the alternative tank car jacket and head shield. When the jacket and head shield are made from any authorized steel with a minimum tensile strength from 70,000 p.s.i. to 80,000 p.s.i., but the required minimum plate thickness calculation is based on steel with a minimum tensile

strength of 81,000 p.s.i., the thickness to be added to the jacket and head shield must be increased by a factor of 1.157. Forming allowances for heads are not required to be considered when calculating thickness differences as prescribed in this paragraph.

(ii) The tank car jacket and head shield must be manufactured from carbon steel plate as prescribed in § 179.100-7(a) of this subchapter.

(e) *Verification of content.* (1) The amount of liquefied gas loaded into each tank may be determined either by measurement or calculation of the weight, except that DOT specification tank car tanks authorized for the transportation of anhydrous ammonia and ammonia solution may have the amount of liquefied gas loaded into the tank car measured by a metering device in conformance with paragraph (e)(2) of this section.

(2) *Metering device.* (i) Tank cars loaded with anhydrous ammonia or ammonia solution through the use of a metering device in conformance with this section are not required to be weighed, but must have their outage measured with a magnetic gauging device to determine that the tank car is properly loaded in conformance with this paragraph. Written procedures for loading a tank car using a metering device must be developed and made available at each location where such loading takes place. Certification in writing of the inspection and completion of these loading and/or unloading procedures must be maintained for each tank car and maintained in accordance with the recordkeeping requirements in paragraph (e)(2)(iii) of this section, and all necessary records must be completed. At a minimum, these procedures will specify:

(A) The tank car must be offered for transportation in conformance with all applicable government regulations.

(B) Any defects found when the tank car is examined before shipping must be recorded, and the tank must not be loaded until the repairs to eliminate each defect are completed.

(C) The tank car must be allowed to sit undisturbed for at least 10 minutes after loading to allow material within the tank to settle. After this has occurred a final check for leaks must be

conducted prior to offering the tank car for transportation.

(ii) One out of every 10 tank cars loaded by the use of the metering device must be gauged utilizing the fixed gauging equipment on the tank car to verify by calculation the amount of anhydrous ammonia or ammonia solution contained in the tank car.

(iii) *Recordkeeping.* The following information must be maintained and be made available to any representative of the DOT upon request for each tank car loaded with the use of a metering device:

- (A) Date loaded,
- (B) Date shipped,
- (C) Tank car reporting marks,
- (D) DOT Specification,
- (E) Tank car stenciled shell capacity (gallons/liters),
- (F) Tank car stenciled tare weight (pounds/kilograms),
- (G) Outage or innage table number,
- (H) Water capacity of tank in pounds and/or kilograms,
- (I) Maximum permitted filling density (see § 173.314),
- (J) Specific gravity of anhydrous ammonia or ammonia solution at the reference temperature,
- (K) Tank car outage (inches/meters, gallons/liters),
- (L) Gallons/liters of liquid ammonia in tank car,
- (M) Quantity of vapor ammonia in tank car (gallons/liters), and
- (N) Total calculated ammonia (liquid & vapor) in tank car (pounds/kilograms).

(f) [Reserved]

(g) Special requirements for hydrogen chloride, refrigerated liquid, and vinyl fluoride, stabilized.

(1) The shipper shall notify the Federal Railroad Administration whenever a tank car is not received by the consignee within 20 days from the date of shipment. Notification to the Federal Railroad Administration may be made by e-mail to Hmassist@fra.dot.gov or telephone call to (202) 493-6229.

(2) A tank car containing hydrogen chloride, refrigerated liquid must have the auxiliary valve on the pressure relief device closed during transportation.

(3) See § 179.102-17 of this subchapter for additional requirements.

(4) Tank cars containing hydrogen chloride, refrigerated liquid, must be unloaded to such an extent that any residue remaining in the tank at a reference temperature of 32 °C (90 °F) will not actuate the reclosing pressure relief device.

(h) *Special requirements for liquefied petroleum gas*—(1) *Odorization*. All liquefied petroleum gas must be odorized as required in this paragraph to indicate positively, by a distinctive odor, the presence of gas down to a concentration in air of not over one-fifth the lower limit of combustibility; however, odorization is not required if it is harmful in the use or further processing of the liquefied petroleum gas or if it will serve no useful purpose as a warning agent in such use or further processing.

(i) The lower limits of combustibility of the more commonly used liquefied petroleum gases are: Propane, 2.15 percent; butane, 1.55 percent. These figures represent volumetric percentages of gas-air mixtures in each case.

(ii) The use of 1.0 pound of ethyl mercaptan per 10,000 gallons of liquefied petroleum gas is considered sufficient to meet the requirements of this paragraph. Use of another odorant is not prohibited so long as there is enough to meet the requirements of this paragraph (h).

(2) *Odorant fade*. In addition to paragraph (h)(1)(i) of this section, the offeror must ensure that enough odorant will remain in the tank car during the course of transportation. The offeror must have procedures in place to:

(i) Ensure quantitative testing methods are used to measure the amount of odorant in the liquefied petroleum gas;

(ii) Ensure that, when the odorization of liquefied petroleum gas is manually injected, the required amount of odorant is added;

(iii) Ensure that, when odorization of liquefied petroleum gas is automatically injected, equipment calibration checks are conducted to ensure the required amount of odorant is consistently added;

(iv) Ensure quality control measures are in place to make sure that persons who receive tank cars that have been subjected to any condition that could lead to corrosion of the tank car or re-

ceive new or recently cleaned tank cars are notified of this information and that a person filling these packagings implement quality control measures so that potential odorant fade is addressed;

(v) Inspect a tank car for signs of oxidation or corrosion; and

(vi) Take corrective action needed to ensure enough odorization remains in the tank car during the course of transportation, such as increasing the amount of odorant added to the liquefied petroleum gas.

(i) [Reserved]

(j) *Special requirements for materials having a primary or secondary Division 2.1 (flammable gas) hazard*. For single unit tank cars, interior pipes of loading and unloading valves, sampling devices, and gauging devices with an opening for the passage of the lading exceeding 1.52 mm (0.060 inch) diameter must be equipped with excess flow valves. For single unit tank cars constructed before January 1, 1972, gauging devices must conform to this paragraph by no later than July 1, 2006. The protective housing cover must be provided with an opening, with a weather-proof cover, above each pressure relief valve that is concentric with the discharge of the pressure relief valve and that has an area at least equal to the valve outlet area. Class DOT 109 tank cars and tank cars manufactured from aluminum or nickel plate are not authorized.

(k) *Special requirements for chlorine*.

(1) Tank cars built after September 30, 1991, must have an insulation system consisting of 5.08 cm (2 inches) glass fiber placed over 5.08 cm (2 inches) of ceramic fiber. Tank cars must have excess flow valves on the interior pipes of liquid discharge valves. Tank cars constructed to a DOT 105A500W specification may be marked as a DOT 105A300W specification with the size and type of reclosing pressure relief valves required by the marked specification.

(2) DOT105J500W tank cars may be used as authorized packagings, as prescribed in this subchapter for transporting “UN 1017, Chlorine, 2.3 (8), Poison Inhalation Hazard, Zone B, RQ,” if the tank cars meet all DOT specification requirements, and the tank cars are equipped with combination safety

relief valves with a start-to-discharge pressure of 360 psi, rather than the 356 psi. The start-to-discharge pressure setting must be marked on the pressure relief device in conformance with applicable provisions of the AAR Specification for Tank Cars (IBR, see § 171.7 of this subchapter).

(l) *Special requirements for hydrogen sulphide.* Each multi-unit tank car must be equipped with adequate pressure relief devices of the fusible plug type having a yield temperature not over 76.66 °C (170 °F.), and not less than 69.44 °C (157 °F.). Each device must be resistant to extrusion of the fusible alloy and leak tight at 55 °C (130 °F.). A threaded solid plug must seal each valve outlet. In addition, a metal cover must protect all valves.

(m) *Special requirements for nitrosyl chloride.* Single unit tank cars and their associated service equipment, such as venting, loading and unloading valves, and reclosing pressure relief valves, must be made of metal or clad with a material that is not subject to rapid deterioration by the lading. Multi-unit tank car tanks must be nickel-clad and have reclosing pressure relief devices incorporating a fusible plug having a yield temperature of 79.44 °C (175 °F.). Reclosing pressure relief devices must be vapor tight at 54.44 °C (130 °F.).

(n) *Special requirements for hydrogen.* Each tank car must be equipped with one or more pressure relief devices. The discharge outlet for each pressure relief device must be connected to a manifold having a non-obstructed discharge area of at least 1.5 times the total discharge area of the pressure relief devices connected to the manifold. All manifolds must be connected to a single common header having a non-obstructed discharge pointing upward and extending above the top of the car. The header and the header outlet must each have a non-obstructed discharge area at least equal to the total discharge area of the manifolds connected to the header. The header outlet must be equipped with an ignition device that will instantly ignite any hydrogen discharged through the pressure relief device.

(o) *Special requirements for carbon dioxide, refrigerated liquid and nitrous*

oxide, refrigerated liquid. Each tank car must have an insulation system so that the thermal conductance is not more than 0.613 kilojoules per hour, per square meter, per degree Celsius (0.03 B.t.u. per square foot per hour, per degree Fahrenheit) temperature differential. Each tank car must be equipped with one reclosing pressure relief valve having a start-to-discharge pressure not to exceed 75 percent of the tank test pressure and one non-reclosing pressure relief valve having a rupture disc design to burst at a pressure less than the tank test pressure. The discharge capacity of each pressure relief device must be sufficient to prevent building up of pressure in the tank in excess of 82.5 percent of the test pressure of the tank. Tanks must be equipped with two regulating valves set to open at a pressure not to exceed 24.1 Bar (350 psi) on DOT 105A500W tanks and at a pressure not to exceed 27.6 Bar (400 psi) on DOT 105A600W tanks. Each regulating valve and pressure relief device must have its final discharge piped to the outside of the protective housing.

[Amtd. 173-224, 55 FR 52665, Dec. 21, 1990]

EDITORIAL NOTE: For FEDERAL REGISTER citations affecting § 173.314, see the List of CFR Sections Affected, which appears in the Finding Aids section of the printed volume and at www.govinfo.gov.

§ 173.315 Compressed gases in cargo tanks and portable tanks.

(a) Liquefied compressed gases that are transported in UN portable tanks, DOT specification portable tanks, or cargo tanks must be prepared in accordance with this section, § 173.32, § 173.33 and subpart E or subpart G of part 180 of this subchapter, as applicable. For cryogenic liquid in cargo tanks, see § 173.318. For marking requirements for portable tanks and cargo tanks, see § 172.326 and § 172.328 of this subchapter, as applicable.

(1) *UN portable tanks:* UN portable tanks must be loaded and offered for transportation in accordance with portable tank provision T50 in § 172.102 of this subchapter.

(2) *Cargo tanks and DOT specification portable tanks:* Cargo tanks and DOT specification portable tanks must be loaded and offered for transportation in