



DEPARTMENT OF TRANSPORTATION
HAZARDOUS MATERIALS REGULATIONS BOARD
WASHINGTON, D.C. 20590

2885

[Docket No. HM-68; Amdts. 173-60, etc.]

PORTABLE TANK SPECIFICATIONS

The purpose of these amendments to the Department's Hazardous Materials Regulations is to provide two new specifications for portable tanks and to prescribe uses for these tanks. Existing authorization for fabrication of DOT specifications 52 and 53 portable tanks will terminate on May 31, 1972.

On December 12, 1970, the Hazardous Materials Regulations Board published a notice of proposed rule making, Docket No. HM-68; Notice No. 70-24 (35 F.R. 18919) which proposed these amendments. The Board received several comments regarding these changes.

Several comments were addressed to the material specifications for aluminum and the difficulties of expressing permitted aluminum alloys in a format that would not be unnecessarily restrictive and that would not require frequent updating to be kept current with advancing technology. Also, the Board was requested to treat aluminum in a similar manner as steel. After reviewing all the comments on this matter, the Board concluded that a table similar in principle and format to that for steel would be the most effective solution. This table is included in the amendment.

Many comments were made regarding the criteria for venting of liquids and the inadequacy of the proposal as it was written. The Board agrees with these comments and has included provisions for the use of frangible discs, adjustment of the total emergency venting capacity table, a requirement for total containment under conditions of transportation which include temperatures as high as 130° F., allowance for minimum venting capacity calculated from a tank pressure of 3 p.s.i.g. to 5 p.s.i.g., and clarification that spring-loaded devices are not mandatory.

In response to several comments regarding materials of construction, the Board has clearly noted that pressure relief devices are not required to be made of metal.

The Board received many comments on the written format of the specifications and has adopted the format for which almost all commenters expressed a preference; viz., a general requirement section for all portable tanks followed by separate specification requirements for tanks for dry and liquid products. Under this format the Board further recognized a difference between requirements for containers for liquid and containers for solids. This was in consideration of the overall difference in hazard between the liquid and solid state of a material in the event of a leak.

Several comments were made concerning the adequacy, desirability, and effect of the proposed tests and how they relate to the transportation environment.

Although the testing criteria now set forth in the Hazardous Materials Regulations may not be fully responsive, in consideration of results these criteria have produced with respect to the adequacy of present hazardous materials packaging, the Board prefers to retain the conventional drop, vibration, and pressure testing now found in the regulations. The Department has a study in progress regarding the relation of testing to the environment and will await the conclusions of this study before embarking on any extensive changes in testing philosophy. A particular concern in testing was the requirement for vibration testing, especially as it involves solids. Here also, the Board has chosen to retain existing test criteria. With respect to the tanks to be used for solids, it is the opinion of the Board that use of a fine, dry, powdered filling material in the vibration test will be helpful. It should also permit evaluation of closures located low in the tank if the dry powdered material is of sufficiently fine mesh size. However, the Board has chosen not to prescribe the actual mesh size, but will rely on the clear intent of the rule describing testing and the fact that design and testing information must be available to the shipper to assure compliance with §173.24 of the Hazardous Materials Regulations.

The retest periods remain as proposed because of the exposure these portable tanks receive. The Board believes that a longer retest period would not be responsive to the type of service these smaller portable tanks will see.

Some objection against the tie-down requirements was expressed. Most of these comments did not contain explanatory or supporting data. Consequently, the Board has made adjustments only as it considered were necessary but otherwise maintained the requirement.

Several commenters objected to the joint efficiency requirements as expressed and referred the Board to the current requirements for cargo tanks as a better form for the rule. The Board agrees with these suggestions and has added requirements similar to §178.340-5 of the Hazardous Materials Regulations.

On the basis of several comments and re-evaluation, the Board has determined that existing requirements and tests for fittings, closures, guards, and supports assure the adequacy of the specifications without the need for specific mounting pad requirements. This proposed section, therefore, is not included in this amendment.

Several comments related to the difficulty in expressing tank failure. The Board originally proposed terms such as "no stress in excess of yield strength" and other similar expressions. The difficulty in describing inadequate strength was demonstrated by several commenters. The Board has changed the rule to refer to the term "significant deformation" or similar expressions, being of the opinion that the term "significant" relating to the projected adequacy of a container to hold product is capable of being determined.

On the basis of some of the comments received, it became obvious to the Board that the purpose of the term "Maximum gross weight" in §178.251-7(a) was not fully understood. In performance oriented specifications such as these, testing must of necessity be closely allied to the packaging in the "as used" condition in transportation. The maximum gross weight limitation can refer only to a rated weight based on design and testing. The Board noted, however, that although its performance oriented philosophy was expressed in notice No. 70-24, some of the rules applying its philosophy could be clearer. Accordingly, the term "Maximum gross weight" in §178.251-7(a) has been changed to "Rated gross weight" and §§178.251-1(b), 178.252-3(a), and 178.253-5(a) incorporate language relating testing more specifically to the gross weight marking on the certification plate.

Currently, there are at least 25 outstanding permits authorizing use of modified specifications 52 or 53 portable tanks. These are commonly known in the trade as "Tote Tanks", "Tote Bins", "Liqua-Bins", etc. The Board is hereby authorizing their continued usage until April 30, 1974, under special permit, each permit subject to cancellation for cause. This authorization is only in effect for the commodities and modes of transportation specified in each permit. Each permit holder must examine the tanks in use to determine compliance with specifications 56 or 57 and if possible modify, re-rate, and re-mark the tanks according to the applicable specification. If the tank covered by a special permit cannot be brought within specification, the permit holder must advise the Board before July 1, 1973, and explain why the tank can not be brought within specification. The Board will then make individual determinations regarding additional rule making or continuance of the permit.

Those special permit holders having specification 52, 53, 56, or 57 portable tanks or similar modified tanks in services not covered by this amendment must also petition the Board for additional rule making or continuance of the permit under the same conditions.

Permits outstanding for portable tanks related to MC specifications or specifications 51 and 60 are not affected by this amendment.

In consideration of the foregoing, 49 CFR Parts 173, 174, 177, and 178 are amended as follows:

PART 173—SHIPPERS

A. In Part 173 Table of Contents, §173.32 is amended to read as follows:
Sec.
173.32 Qualification, testing, maintenance, and use of portable tanks.

B. In §173.32, the heading and paragraphs (e) through (i) are amended; paragraph (d) is added to read as follows:

§ 173.32 Qualification, testing, maintenance, and use of portable tanks.

(d) Use of specification 52 and 53 tanks. Continued use of an existing portable tank constructed to specification 52 or 53 is authorized only for a tank constructed before June 1, 1972.

(e) Retest. Each portable tank used for the transportation of a hazardous material must be successfully retested before further use in accordance with the following:

(1) Schedule. Each tank must be retested as prescribed in subparagraph (2) of this paragraph, in accordance with the following schedule:

(i) Specification 51 (§ 178.245 of this chapter): at least once every 5 years.

(ii) Specifications 52, 53, 56, and 57 (§§ 178.246, 178.247, 178.251, 178.252, 178.253 of this chapter): at least once every 2 years.

(iii) Specification 60 (§ 178.255 of this chapter): at the end of the first 4-year period after the original test; at least once every 2 years thereafter up to a total of 12 years of service; and at least once annually thereafter. Retesting is not required on a rubber-lined tank except before each relining.

(iv) Any other portable tank authorized by this part for transportation of compressed gases (including liquefied compressed gases): at least once every 5 years.

(2) Test procedures. Unless otherwise specified, each tank must be retested in accordance with the following test procedures:

(i) Pressure. Each specification 60 tank must be retested in accordance with § 178.255-12 of this chapter. A specification 57 tank must be retested in accordance with § 178.253-5(b) of this chapter. Any other tank must be tested by a minimum pressure (air or hydrostatic) of at least 2 pounds per square inch gage or at least one and one-half times the design pressure (maximum allowable working pressure, or re-rated pressure) of the tank, whichever is greater. During each air pressure test, the entire surface of all joints under pressure must be coated with or immersed in a solution of soap and water, heavy oil, or other material suitable for the purpose of detecting leaks. The pressure must be held for a period of time sufficiently long to assure detection of leaks. During the air or hydrostatic test, relief devices may be removed, but all the closure fittings must be in place and the relief device openings plugged. Lagging need not be removed from a lagged tank if it is possible to maintain the required test pressure at constant temperature with the tank disconnected from the source of pressure.

(ii) Visual. While under the test pressure, the tank must be visually inspected for leakage, defective fittings and welds, defective closures, significant dents, and other defects or abnormalities which indicate a potential or actual weakness that could render the tank unsafe for the transportation of a hazardous material.

(iii) Rejection criteria. A tank fails to meet the requirements of the pressure

test if, during the test, there is permanent distortion of the tank exceeding that permitted by the applicable specification, if there is any leakage, or if any deficiencies described in subdivision (ii) of this subparagraph are found. Any tank that fails must be rejected and may not be used again for the transportation of a hazardous material unless the tank is adequately repaired and thereafter a successful test is conducted in accordance with the requirements of this paragraph.

(3) Marking. The date of the most recent periodic retest must be marked on the tank, on or near the metal certification plate. Marking must be in accordance with § 173.24.

(4) Records. The owner of the tank or his authorized agent must retain a written record indicating the date and results of all required tests and the name and address of the tester, until the next retest has been satisfactorily completed and recorded.

(f) Special tanks. Each portable tank authorized by this Part including each special permit tank (other than a tank covered by paragraph (e) (1) (iv) of this section) which is not in compliance with one of the specifications listed in paragraph (e) of this section, must be tested in accordance with the procedures prescribed in paragraph (e) of this section for the type of portable tank most nearly equivalent in design and usage. A tank constructed in accordance with paragraph U-68 or U-69 of previous editions of the ASME Code, and which has not been re-rated, must be hydrostatically retested at twice the design pressure instead of the one and one-half times prescribed in paragraph (e) (2) (i) of this section.

(g) Deteriorated tanks. Without regard to any other retest requirements, any tank that shows evidence at any time of bad dents, corroded areas, leakage, or other conditions that indicate weakness which could render the tank unsafe for the transportation of a hazardous material, must be retested as prescribed in paragraph (e) (2) of this section.

(h) Damaged tanks. Any tank that has been in an accident and that has been damaged to an extent that may adversely affect its product retention capability, must be retested as prescribed in paragraph (e) (2) of this section.

(i) Unused tanks. Any tank that has not been used to transport a hazardous material for a period of 1 year or more may not be returned to hazardous materials service until it has been tested successfully in accordance with the requirements of paragraph (e) (2) of this section.

C. In § 173.128, paragraph (a) (3) is amended to read as follows:

§ 173.128 Paints and related materials.

(a) * * *
(3) Specification 52¹ or 57 (§§ 178.251, 178.253 of this chapter). Metal portable tank.

D. In § 173.132, paragraph (a) (2) is amended to read as follows:

§ 173.132 Cement, liquid, n.o.s., container cement, linoleum cement, pyroxylin cement, rubber cement, tile cement, wallboard cement, and coating solution.

(a) * * *
(2) Specification 52¹ or 57 (§§ 178.251, 178.253 of this chapter). Metal portable tank. Authorized for materials irrespective of flash point but only those defined as viscous liquids by § 173.115(b).

E. In § 173.239a, paragraph (a) (2) is added to read as follows:

§ 173.239a Ammonium perchlorate.

(a) * * *
(2) Specification 53¹ or 56 (§§ 178.247, 178.251, 178.252 of this chapter). Metal portable tank. Lower side or hopper-type product discharge openings are not permitted.

PART 174—CARRIERS BY RAIL FREIGHT

In § 174.532, paragraph (n) is added to read as follows:

§ 174.532 Loading other hazardous materials.

(n) Specification 56 or 57 (§§ 178.251, 178.252, 178.253 of this chapter) portable tanks containing hazardous materials may not be stacked on each other nor may any other freight be stacked on them during transportation.

PART 177—SHIPMENT MADE BY WAY OF COMMON, CONTRACT, OR PRIVATE CARRIERS BY PUBLIC HIGHWAY

In § 177.834, paragraph (n) is added to read as follows:

§ 177.834 General requirements.

(n) Specification 56 or 57 (§§ 178.251, 178.252, 178.253 of this chapter) portable tanks containing hazardous materials may not be stacked on each other nor may any other freight be stacked on them during transportation.

PART 178—SHIPPING CONTAINER SPECIFICATIONS

A. In Part 178 Table of Contents, §§ 178.246 and 178.247 are canceled; §§ 178.251, 178.252, and 178.253 are added to read as follows:

¹Use of existing tanks authorized. Construction not authorized after April 30, 1972.

- Sec.
 178.251 General design and construction requirements applicable to specifications 56 (§ 178.252) and 57 portable tanks (§ 178.253).
 178.252 Specification 56; metal portable tank.
 178.253 Specification 57; metal portable tank.

§ 178.246 [Revoked]

B. Section 178.246 is canceled.

§ 178.247 [Revoked]

C. Section 178.247 is canceled.

D. Section 178.251 is added to read as follows:

§ 178.251 General design and construction requirements applicable to specifications 56 (§ 178.252) and 57 portable tanks (§ 178.253).

§ 178.251-1 General requirements.

(a) These specifications apply to tanks of any shape (cylindrical, conical, cubical, or other).

(b) The rated gross weight of the tank must not exceed the values used during the design qualification vibration and drop tests.

(c) Each tank must be in compliance with all applicable requirements of §§ 173.24 and 173.32 of this chapter.

§ 178.251-2 Materials of construction.

(a) Except for gaskets, pressure relief devices, valve seats, liners, and linings, all construction material must be metal.

(b) Hardware for handling and securing, fitting protection, outlet piping, valves, relief devices, and closures must be made of material that is electrolytically compatible with, or suitably protected from electrolytic action when joined to the product retention components of the tank.

(c) Any material used must not be susceptible to stress corrosion cracking.

(d) Material specification: All sheet, plate, and extruded material for shell, heads, bulkheads, and baffles for portable tanks must meet the following minimum requirements:

(1) *Aluminum alloys.* Aluminum alloys must be suitable for fusion welding and must meet the following requirements:

Minimum yield strength..... 24,000 p.s.i.
 Minimum ultimate strength... 30,000 p.s.i.
 Minimum elongation of standard 2 inch gage length..... 8 percent

(2) *Steel.* Steel must meet the following requirements:

	Mild steel	Low alloy low carbon	Stainless
Minimum yield strength, p.s.i.	25,000	45,000	25,000
Minimum ultimate strength, p.s.i.	45,000	60,000	70,000
Minimum elongation of standard 2 inch gage length (percent)	20	25	30

(3) *Magnesium alloys.* Magnesium alloy must conform to ASTM B-90-69, Grade ZE-10A.

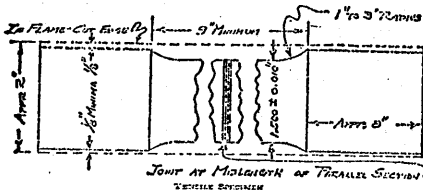
§ 178.251-3 General construction requirements.

(a) *Method of joining.* All joints between tank shells, heads, baffles (or baffle attaching rings), and bulkheads must be welded in accordance with the requirements of this section.

(b) *Strength of joints (Aluminum Alloy (AL), Magnesium Alloy (MG)).* All welded joints must be made in accordance with recognized good practice. The efficiency of a joint must not be less than 85 percent of the mechanical properties of the adjacent material. Each alloy must be joined by an inert gas arc welding process using filler metals which are consistent with material suppliers recommendations.

(c) *Strength of joints (Mild Steel (MS), High Strength Low Alloy (HSLA), Austenitic Stainless Steel (SS)).* Joints must be welded in accordance with recognized good practice. The efficiency of any joint must not be less than 85 percent of the mechanical properties of the adjacent material.

(d) *Compliance test.* Compliance with the requirements contained in paragraph (b) or (c) of this section for the welded joints must be determined by preparing two test specimens from materials representative of those to be used in each tank. Joints must be made by the same technique of fabrication and must conform to the figure below. Each specimen must be tested to failure under tension. One pair of test specimens may represent all the tanks to be made of the same combination of materials by the same technique of fabrication, and in the same shop, within 6 months after the tests on such samples have been completed. The butt welded specimens tested may be considered as qualifying other types or combinations of types of weld using the same filler material and welding process as long as parent metals are of the same types of material.



§ 178.251-4 Stacking, mounting, and tie-down provisions.

(a) *Load support devices.* Each tank designed to be stacked in storage must be provided with load support devices. There may be no significant permanent deformation of the load support devices or the tank under either of the following stress conditions:

(1) Tanks loaded to their maximum authorized gross weight and stacked at least 18 feet high.

(2) A load on the support devices at least three times the maximum authorized gross weight of the tank.

(b) *Base mounting.* Each tank must be constructed with mountings to provide a secure base during transportation. The mounting may be in the form of a skid or similar structure.

(c) *Tie-down system.* If there are tie-down devices that are a structural part of the tank, the tie-down system must be capable of withstanding the following static loading without significant deformation to the tank. The static loading applied must have, with respect to the center of gravity of the tank a vertical component of at least two times the maximum authorized gross weight of the tank.

(1) If the design of the tank necessitates specific front and side orientation when loaded on a transportation vehicle, the static loading applied must have two horizontal components at right angles to each other, one direction at a time as follows:

(i) A longitudinal component at least seven times the maximum authorized gross weight of the tank in the direction of travel of the vehicle, and

(ii) A component of five times the maximum authorized gross weight of the tank in the transverse direction, or

(2) If the design of the tank does not necessitate specific front and side orientation when loaded on a transportation vehicle, the static loading applied must have two horizontal components at right angles to each other, one direction at a time, of a least seven times the maximum authorized gross weight of the tank.

(d) If there is a structural part of the tank that could be used to tie the tank down and which is not in compliance with paragraph (c) of this section, it must be securely covered or locked during transportation to prevent its use as a tie-down.

§ 178.251-5 Testing.

(a) *Design qualification testing.* Design qualification tests prescribed in this paragraph must be made on at least one of each design and size tank, except that a set of tests, when made on a tank of one size, may serve to qualify smaller tanks made of same kind and thickness of material, by the same fabrication technique, and with identical supports, and equivalent closures, and other appurtenances. Tests must be performed sequentially on a single tank in the order listed in this section. Additional tests must be made if there is any increase in design size of the tank, any reduction in thickness of material, or any change in material, or in fabrication technique. Test samples must be retained for 1 year.

(1) *Vibration and drop tests.* See applicable specification, § 178.252-3(a) or § 178.253-5(a).

(2) *Structural integrity tests—(i) Lifting devices.* If there is a system of lifting devices that is a structural part of the tank or is permanently attached thereto or to the support structure, the system must be capable of supporting at least three times the maximum gross weight of the tank, and each individual lifting device must be capable of supporting at least the maximum gross weight of the tank, without significant permanent deformation in either the lifting device system or in any part of the tank.

(ii) *Shipment support structure.* If the tank supports are a structural part of the tank, the supports must be capable of

absorbing a force equal to the maximum gross weight of the tank or breaking without significant permanent deformation to the product retention component of the tank. The force must be applied to the supports at ground level from at least two horizontal directions at right angles to each other, one direction at a time.

(iii) *Stacking support devices.* If stacking support devices are a structural part of the tank, there must be no significant permanent deformation of any device or the tank under either of the following stress conditions:

(a) Tanks loaded to their maximum authorized gross weight and stacked at least 18 feet high.

(b) A load on the stacking support devices of at least three times the maximum authorized gross weight of the tank.

(iv) *Fittings and protective devices.* Each fitting (or its protective device) subject to this test requirement must be capable of withstanding a force at least two times the maximum authorized gross weight of the tank without resultant damage to the fitting. The force must be applied to the fitting or its protective device in at least two horizontal directions at right angles to each other, one direction at a time, and in alignment with the fitting.

(b) *Production quality control, testing and inspection.* See applicable specification, § 178.252-3(b) or § 178.253-5(b).

§ 178.251-6 Rejected tanks.

No tank which fails to pass any of the prescribed tests may be placed in service until suitable repairs have been made and satisfactory re-tests results have been obtained.

§ 178.251-7 Identification and marking.

(a) A metal certification plate must be permanently affixed to each tank and must be readily accessible for inspection. The plate must be marked in letters and numerals at least 3/16-inch high by stamping, embossing, or other means of forming letters into or on the metal plate itself. The marking must contain at least the following information:

Tank manufacturer _____
Specification identification: Spec. 56 or Spec. 57 _____
Design pressure (for specification 57 only) _____ p.s.i.g.
Test pressure (for specification 56 only) _____ p.s.i.g.
Serial number _____
Original test date _____
Tare weight _____ lbs.
Rated gross weight¹ _____ lbs.
Volumetric capacity _____ U.S. gal. (or cu. ft.)
Materials of construction² _____

¹ The rated (permitted) gross weight may not exceed that weight used during the design qualification tests involving vibration and drop.

² E.g., AL for aluminum, MG for magnesium alloy, MS for mild steel, HSLA for high strength low alloy, SS for austenitic stainless steel, including ASTM or ASME reference.

(b) Unless the tank has been designed for stacking and meets the appropriate stacking integrity requirements of this specification, it must also be marked in letters at least 2 inches high in con-

trasting colors "Do Not Stack" and "Do Not Place Other Freight On Top Of This Tank", on at least two sides of the tank. These instructions must also appear on the certification plate. Plate markings are required to meet the requirements of paragraph (a) of this section and need not be in contrasting color.

E. Section 178.252 is added to read as follows:

§ 178.252 Specification 56; metal portable tank.

§ 178.252-1 General requirements.

(a) Each tank must be in compliance with the general design and construction requirements in § 178.251 in addition to the specific requirements of this section.

(b) Each tank may not exceed a rated gross weight of 7,000 pounds.

§ 178.252-2 Openings.

(a) Each fill and discharge opening must be equipped with a closure and locking device.

(b) A drum-type locking ring closure is authorized for openings not exceeding 23 inches in diameter. A drum-type locking ring closure must be at least a 12-gage bolted ring with forged lugs having at least a 5/16-inch steel bolt tapped into one of the lugs. The locking ring must be equipped with a lock nut or equivalent device.

(c) For a tank that incorporates a hopper-type product discharge opening, the closure device must be constructed to retain product under the test conditions outline in §§ 178.251-5 and 178.252-3(a). Closures for those openings must be designed with positive mechanical locking and sealing devices to prevent leakage during normal conditions incident to transportation.

§ 178.252-3 Testing.

(a) *Design qualification testing.* In addition to the testing prescribed in § 178.251-5(a), a vibration and a drop test are also required on each design. For these tests, the tank must be filled with a fine, dry powdered material having a density that results in the tank having a gross weight not less than the rated gross weight of the tank.

(1) *Vibration test.* This test must be performed for 1 hour using a minimum double amplitude of 1 inch at a frequency that causes the test tank to be raised from the floor of the testing table so a piece of flat steel strap may be passed between the tank and the table. The tank must be restrained so that all horizontal motion is restricted and only vertical motion is permitted.

(2) *Drop test.* The tank must be capable of withstanding without leakage of contents a 2-foot free drop onto a flat unyielding horizontal surface, striking the target surface in the position and attitude from which maximum damage to the tank (including closures) is expected.

(b) *Production quality control, testing, and inspection—*(1) *Leakage test.* Each tank must be tested by a minimum air or hydrostatic pressure of at least 2 pounds per square inch gage applied to the entire tank. If the air pressure is used, the entire surface of all joints

under pressure must be coated with, or immersed in, a solution of soap and water, or other material suitable for the purpose of detecting leaks. If the hydrostatic pressure test is used it must be carried out by using water or other liquid having a similar viscosity, the temperature of which may not exceed 100° F. and all joints under pressure must be inspected for leaks. For either test, the pressure must be held for a period of time sufficiently long to assure detection of leaks. All closures must be in place during the test. Any tank that has detectable leakage or significant permanent deformation does not meet the requirements of this specification.

F. Section 178.253 is added to read as follows:

§ 178.253 Specification 57; metal portable tank.

§ 178.253-1 General requirements.

(a) Each tank must be in compliance with the general design and construction requirements in § 178.251 in addition to the specific requirements of this section.

(b) Each tank must have a capacity of at least 110 gallons but not more than 660 gallons.

§ 178.253-2 Openings.

(a) Each fill and discharge opening must be equipped with a closure device that meets the following requirements:

(1) Any closure for a fill opening in excess of 20 square inches must be equipped with a device to prevent the closure from fully opening without first relieving internal pressure.

(2) Any product discharge valve, if used, must be provided with a leak tight device, such as a cap or plug.

(3) Each closure must be vapor tight.

(b) A drum-type locking ring closure is authorized for any opening less than 23 inches in diameter. A drum-type locking ring closure must be at least a 12-gage bolted ring with forged lugs having at least a 5/16-inch steel bolt tapped into one of the lugs. The locking ring must be equipped with a lock nut or equivalent device.

§ 178.253-3 Protection of fittings.

Each fitting which could be damaged sufficiently to result in leakage of tank contents must be protected by suitable guards or protective housings. The term "fitting" includes valves, closure devices, safety relief devices, and other accessories through which contents could leak from the tank. Each fitting or fitting protection device must be capable of withstanding the fitting protection test specified in § 178.251-5.

§ 178.253-4 Vents.

(a) Each tank must be equipped with at least one pressure relief device such as a spring-loaded valve, frangible disc or fusible plug.

(b) Each pressure relief device must communicate with the vapor space of the tank when the tank is in a normal transportation attitude. Shutoff valves must not be installed between the tank opening and any pressure relief device.

Pressure relief devices must be mounted, shielded, or drained to prevent the accumulation of any material that could impair the operation or discharge capability of the device.

(c) The total emergency venting capacity (cu. ft./hr.) of each portable tank must be at least that determined from the following table.

Total surface area square feet ^{1,2} :	Cubic feet free air per hour
20	15,800
30	23,700
40	31,600
50	39,500
60	47,400
70	55,300
80	63,300
90	71,200
100	79,100
120	94,900
140	110,700
160	126,500

¹ Interpolate for intermediate sizes.
² Surface area excludes area of legs.

(1) The pressure operated relief device must open at not less than 3 pounds per square inch gage and at not over the design test pressure of the tank. The minimum venting capacity for pressure activated vents must be 6,000 cubic feet of free air per hour (measured at 14.7 p.s.i.a. and 60° F.) at not more than 5 pounds per square inch gage.

(2) If a frangible device is used for relieving pressure, the device must have a minimum area of 1.25 square inches and must be rated at less than the design test pressure of the tank.

(3) If a fusible device is used for relieving pressure, the device must have a minimum area of 1.25 square inches. The device must function at a temperature between 220° F. and 300° F. and at a pressure less than the design test pressure of the tank, unless this latter function is accomplished by a separate device.

(d) No relief device may be used which would release flammable vapors

under normal conditions of transportation (temperature up to and including 130° F.).

§ 178.253-5 Testing.

(a) *Design qualification testing.* In addition to the testing prescribed in § 178.251-5, a vibration test, a drop test, and a pressure test are also required on each design. For the vibration and drop tests, the tank must be filled with a liquid to not less than the rated gross weight.

(1) *Vibration test.* This test must be performed for 1 hour using a minimum double amplitude of 1 inch at a frequency that causes the test tank to be raised from the floor of the testing table so a piece of flat steel strap may be passed between the tank and the table. The tank must be restrained so that all horizontal motion is restricted and only vertical motion is permitted.

(2) *Drop test.* The tank must be capable of withstanding without leakage of contents a 2-foot free drop onto a flat unyielding horizontal surface, striking the target surface in the position and attitude from which maximum damage to the tank (including piping and fittings) is expected.

(3) *Pressure test.* The tank must be capable of maintaining, under hydrostatic test for at least 5 minutes, at least one and one-half times the design pressure prescribed in this paragraph, without detectable leakage or significant permanent deformation. The pressure must be measured at the top of the tank. Each closure must be in place and blocked if necessary as for shipment. Each closure must be standard, except that tapping for pressurizing and gaging is permitted. Design pressure must be determined as follows:

$$P = \frac{hd}{115} + 3$$

Where:

P=Design pressure in psig;
h=Inside height of tank in inches;
d=Maximum allowable density in pounds per gallon;

115=Number of cubic inches in 1 gallon (231) divided by a safety factor of two.

(b) *Production quality control, testing and inspection—*(1) *Leakage test.* Each tank must be leak tested by a minimum sustained air pressure of at least three pounds per square inch gage applied to the entire tank. The entire surface of all joints under pressure must be coated with or immersed in a solution of soap and water or other material suitable for the purpose of detecting leaks. The pressure must be held for a period of time sufficiently long to assure detection of leaks. All closures must be in place during the test, but safety relief devices may be removed and such openings plugged. Any tank that has detectable leakage or significant permanent deformation does not meet the requirements of this specification.

This amendment is effective March 31, 1972, however, compliance with the regulations, as amended herein, is authorized immediately.

(Secs. 831-835, title 18, United States Code, sec. 9, Department of Transportation Act, 49 U.S.C. 1657)

Issued in Washington, D.C., on February 2, 1972.

MAC. E. ROGERS,
Board Member, for the
Federal Highway Administration.

ROBERT A. KAYE,
Board Member, for the
Federal Highway Administration.

JAMES F. RUDOLPH,
Board Member, for the
Federal Highway Administration.

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