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

[49 CFR Parts 173, 177, 178]

[Docket No. HM-86; Notice No. 71-15]

TRANSPORTATION OF HAZARDOUS MATERIALS

Cargo Tank Use and Testing, Compressed Gases in Portable and Cargo Tanks, and Specification MC 331

The Hazardous Materials Regulations Board is considering amending §§ 173.33, 173.315, 177.824, 177.840, and 178.337 of the Department's Hazardous Materials Regulations. The proposed changes involve: (1) Editing to update the requirements of §§ 173.33 and 173.315 by using the more recently developed text from § 178.337; (2) removing duplicate text by replacement with references; (3) providing for a 5-year retest requirement for MC 331 cargo tanks; (4) canceling obsolete one-time test requirements for MC 330 and MC 331 cargo tanks; and (5) modifying some requirements for safety relief devices and remotely controlled internal valves.

The proposal is based, in part, on a petition by the Compressed Gas Association regarding a 5-year retest cycle for MC 331 cargo tanks and improved safety relief device criteria for use and installation on cargo and portable tanks.

The proposed changes to the following sections are intended to be editorial:

Sec.
173.33(g), introductory text;
173.315(a)(1), Note 2 and Note 4;
173.315(h), introductory text;
173.315(i) (12) and (13);
178.337-1(e);
178.337-2(c);
178.337-9 (a) and (b);
178.337-11 (a) (2), (4), and (b);
178.337-14 (a) and (b);
178.337-15(a).

The proposed changes to the following sections would consist generally of transferring text from § 178.337 to §§ 173.33 and 173.315: § 173.33(g) (1), (2), (9), § 173.33(i) (1), (3), § 173.315(h)(2), and § 173.315(i) (1) through (11).

It is proposed to amend § 173.33(e) to cover cargo tanks on the basis of design rather than use. Section 173.33(e)(1) would require a 5-year retest cycle for MC 331 cargo tanks for which there are currently no periodic retest requirements; paragraph (e)(5) is proposed to be deleted, because in the Board's opinion, this provision is now obsolete. Testing of non-specification cargo tanks is covered by special permit and § 177.824 (c)(4). Section 173.315(h) (3) and (4) and § 178.337-11(a)(3) would be changed to require orifice sizes based on a dimensional measurement of the opening. Section 173.315(i) would be amended by deleting the present table in paragraph (i)(2) by replacing it with general criteria equally applicable to all gases (see proposed § 173.315(i)(3) herein). Section 177.824 would be amended by the deletion of obsolete testing requirements in paragraphs (a), (e), (f), and (h). However, some of the present reporting requirements would be retained. Section 17.824 would be amended to correct a reference in paragraph (i) and to reduce the retention time for certain records. Section 177.840 would be amended by adding a new paragraph (g), to require that remotely controlled internal valves be in a closed position during transportation. Section 178.337-11(c) would be amended to apply to vapor discharge openings as well as liquid openings in tanks, consistent with conditions prescribed for cargo tanks authorized by special permits. Section 178.337-11(c)(5) would be revised to raise the melting point maximum of fusible elements to 250° F., and to more clearly specify the location of heat actuated elements on emergency control devices. Section 178.337-15(c) would be amended by addition of a cross reference to § 173.315(h) (3) and (4) and would no longer contain an exemption for carbon dioxide and nitrous oxide. The Board is proposing this latter change because it is unable to establish any basis for continuation of this exemption.

The changes proposed by the Board are intended to improve regulatory language and standardize containment requirements for gases in MC 330 and MC 331 cargo tanks. The Board believes that the changes proposed have merit and that safety in transportation of gases will be enhanced by their adoption.

Several petitions were received requesting other changes that are not included in this notice:

(1) A request was made to change § 178.337-2(a)(4), stating that the current requirement that the final rolling of shell material be in the circumferential orientation of the tank shell was for use only with quenched and tempered steel (QT). The Board is of the opinion that the rule provides safety and is not unnecessarily burdensome. Ordinarily, flat steel is rolled lengthwise of the piece, and for practical reasons, the length of the piece is made the circumferential orientation of the tank. However, if material is cross-rolled (a practice not necessarily limited to QT steel), then the rule becomes important.

(2) A change was requested in § 178.337-9(b)(1). The petitioner contends the present rule implies that threaded fittings are not acceptable, but in the opinion of the petitioner, should be acceptable. The rule requires use of welded fittings wherever possible. Threaded fittings are not to be used if connection by a welded joint is possible. The petitioner suggests stronger piping be used for threaded fittings to offset any strength loss caused by the cutting of threads. This would, of course, be satisfactory for the bursting strength of pipe. But the pipe failures that have come to our attention have been cracks or breakage at threads, generally attributable to fatigue induced by jarring, vibration, or flexing, and not due to lack of strength to resist bursting. The Board believes that welded fittings are more desirable under continued, constant use.

(3) A change in § 178.337-9(b)(6) was also requested, to provide for any number of groupings of pipes, fittings, and openings on a cargo tank. The present rule requires openings to be grouped in one location. It is the Board's opinion that a rule permitting several openings in a tank shell in a variety of locations would not provide as adequate a safeguard as is now the case. The principle in such matters should be to reduce the number of openings, and to gather those necessary into one protected area.

(4) An amendment to § 178.337-11(c) was requested to discontinue requiring use of remotely controlled internal valves in openings under 2 inches in diameter. Presumably such openings would be protected by excess flow valves. Before full consideration can be given to this request, specific data must be presented as to why such remotely controlled valves are not necessary in smaller lines, and

as to the degree to which excess flow valves in smaller size vapor and liquid openings may be expected to assure the necessary protection.

(5) A petition was made to include valves operated by electromechanical means in § 178.337–11(c)(4). This proposal has not been included in this document. The Board will give full consideration to such a proposal if it can be shown that such valves incorporate a fail-safe mechanism that would result in a valve being closed in the event of loss of electrical power.

(6) A change was requested in § 178.337–14(a) to permit location of a rotary gage on the rear head of cargo tanks of 3,500 gallon capacity or less. The current requirement for a midpoint location, longitudinally and laterally, is to insure against overfilling. Location of the inner end of a rotary gage tube near the rear of a vehicle frequently could result in overfilling. The petitioner presented no data and did not suggest any means whereby overfilling would be prevented. The Board believes that to change the rule as proposed could lead to a serious reduction in safety in transportation of compressed gases.

In consideration of the foregoing, it is proposed to amend 49 CFR Parts 173, 177, and 178 as follows:

I. In Part 173:

(A) In § 173.33, the introductory text of paragraph (e) and paragraphs (e)(1), (g)(1), (2), (9), (i)(1) and (3) would be amended; the note following paragraph (i)(3) and paragraphs (e)(5) and (g)(5) would be canceled as follows:

§ 173.33 Cargo tank use authorization.

* * * * *

(e) A cargo tank designed for a service pressure of 100 p.s.i.g. or higher must not be used unless it has successfully passed the following tests, as applicable:

(1) Each DOT Specification MC 330 or MC 331 (§ 178.337 of this chapter) cargo tank must be tested at least once every 5 years in accordance with subparagraphs (2), (3), and (4) of this paragraph. Tanks and safety valves of cargo tanks used for the transportation of chlorine must be retested at least once every 2 years.

* * * * *

(5) [Canceled.]

* * * * *

(g) On tanks used for compressed gases except chlorine, the bursting strength of all piping, pipe fittings, hose, and other pressure parts except safety relief devices must be at least four times the design pressure of the tank. In addition, the bursting strength may not be less than four times any higher pressure to which each pipe, pipe fittings, hose, and other pressure part may be subjected in service by the action of a pump or other device. For tanks used in transporting chlorine, see subparagraphs (9) through (11) of this paragraph.

(1) Welded pipe joints must be used wherever possible. Where copper tubing is permitted, joints must be brazed or be of equally strong metal union type. The melting point of brazing material must be no lower than 1,000° F. The method of joining must not decrease the strength of tubing and pipe, such as by the cutting of threads. Fittings must be extra heavy. Nonmalleable metals must not be used in the construction of valves or fittings.

(2) Each hose coupling must be designed for a pressure at least 20 percent in excess of hose design pressure and so there will be no leakage when connected.

* * * * *

(5) [Canceled]

* * * * *

(9) No piping, hose, or other means of loading or unloading may be attached to the valves of a cargo tank containing chlorine except at the time of loading or unloading. No hose, piping, or tubing used for loading or unloading may be mounted or carried on the motor vehicle. Except at the time of loading or unloading, the pipe connections of the angle valves must be closed with screw plugs which are chained or otherwise fastened to prevent misplacement.

* * * * *

(i) * * *

(1) Excess-flow valves must close automatically at the rated flow of gas or liquid as specified by the valve manufacturer. The flow rating of the piping, fittings, valves, and hose on both sides of the excess-flow valve must be greater than that of the excess-flow valve. If branching or other necessary restrictions are incorporated in the system so that flow ratings are less than that of the excess-flow valve at the tank, additional excess-flow valves must be located where the flow rates are reduced.

* * * * *

(3) Filling and discharge lines must be provided with manual shutoff valves located as close to the tank as practicable. However, when a self-closing internal shutoff valve is used, a manual shutoff valve must be located in the line ahead of the hose connection. The use of back flow check valves or excess-flow valves to satisfy the requirements of this rule and of paragraph (i) of this section with one valve is prohibited.

NOTE: [Canceled]

* * * * *

(B) In § 173.315(a)(1) Table Notes 2 and 4 would be amended; the introductory text of paragraph (h) and subparagraphs (h)(2), (3), (4) would be amended; paragraph (i) would be amended.

§ 173.315 Compressed gases in cargo tanks and portable tank containers.

(a) * * *

(1) * * *

Table * * *

NOTE 2: See § 173.32 for authority to use other portable tanks.

* * * * *

NOTE 4: In the design of tanks for sulfur dioxide and chlorine a corrosion factor must be applied as required by §§ 178.245–3(a) and 178.337–3(a) of this chapter.

* * * * *

(h) Each cargo tank and portable tank, except tanks filled by weight, must be equipped with one or more of the following gaging devices which indicate accurately the maximum permitted liquid level. Additional gaging devices may be installed but may not be used as primary controls for filling of cargo tanks and portable tanks. Gage glasses are not permitted on any cargo tank or portable tank.

* * * * *

(2) If the primary gaging device is adjustable, it must be capable of adjustment so that the end of the tube will be in the location specified in subparagraph (3) of this paragraph for at least one of the ladings to be transported, at a filling level corresponding to an average loading temperature. Exterior means must be provided to indicate this adjustment. The gaging device should be legibly and permanently marked in increments not exceeding 20° F. (or not exceeding 25 p.s.i.g. on tanks for carbon dioxide or nitrous oxide), to indicate the maximum levels to which the tank may be filled with liquid at temperatures above 20° F. If it is not practicable to mark the gaging device, this information must be legibly and permanently marked on a plate affixed to the tank adjacent to the gaging device. (Table remains the same.)

(3) A dip tube gaging device consists of a pipe or tube with a valve at its outer end, with its intake limited by an orifice not larger than 0.060 inch in diameter. If a fixed length dip tube is used the intake must be located midway of the tank both longitudinally and laterally and at maximum permitted filling level. In tanks for liquefied petroleum gases, the intake must be located at the level reached by the lading when the tank is loaded to maximum filling density at 40° F.

(4) Openings for pressure gages must be restricted at or inside the tank by orifices no larger than 0.060 inch in diameter.

(i) *Safety relief devices.* Each tank must be provided with one or more safety devices which, unless otherwise specified, must be safety relief valves of the spring-loaded type. Each device must be arranged to discharge upward and without obstruction to the outside of the protective housing to prevent any impingement of escaping gas upon the tank. For chlorine tanks, see special protective housing requirements as set forth in the applicable specification.

(1) Safety relief valves on any tank must have a total relieving capacity as determined by the flow formulae contained in the CGA Pamphlet S–1.2. As an alternative, total relieving capacity may be determined by the Fetterly's formula [1] for Specification MC 330 cargo

[1] Copies of Fetterly's formula dated Nov. 27, 1928, may be obtained from the Bureau of Explosives.

tanks. Safety relief valves must have a total relieving capacity sufficient to prevent a maximum pressure in the tank of more than 120 percent of the design pressure. For an insulated tank the required relieving capacity of the relief valves must be the same as for an uninsulated tank, unless the insulation will remain in place and will be effective under fire conditions. In this case, the insulated tank must be covered by a sheet metal jacket of not less than 16 gage nominal thickness.

(2) Each safety relief valve must be arranged to minimize the possibility of tampering. If the pressure setting or adjustment is external to the valve, the safety relief valve must be provided with means for sealing the adjustment and must be sealed.

(3) Safety relief valves on each tank must be set to start-to-discharge at a pressure no higher than 110 percent of the tank design pressure and no lower than the pressure specified in subparagraph (a)(1) of this section for the gas transported.

(4) Each safety relief valve must be plainly and permanently marked with the pressure in p.s.i.g. at which it is set to discharge, with the actual rate of discharge of the device in cubic feet per minute of the gas or of air at 60° F. and atmospheric pressure, and with the manufacturer's name or trade name and catalog number. The start-to-discharge value must be visible after the valve is installed. The rated discharge capacity of the device must be determined at a pressure of 120 percent of the design pressure of the tank.

(5) Each safety relief valve must have direct communication with vapor space in the tank.

(6) Connections to safety relief valves must be of sufficient size to provide the required rate of discharge through the safety relief valves.

(7) No shutoff valve may be installed between a safety relief valve and the tank, except in cases where two or more safety relief valves are installed on the same tank, and one or more safety shutoff valves are arranged to always provide the required relief capacity through at least one of the safety relief valves.

(8) Each safety relief valve outlet must be provided with a protective device to prevent the entrance and accumulation of dirt and water. This device must not impede flow through the valve.

(9) On tanks for carbon dioxide or nitrous oxide, each safety relief device must be installed and located so that the cooling effect of the contents will not prevent the effective operation of the device. In addition to the required safety relief valves, these tanks may be equipped with one or more pressure controlling devices.

(10) Each tank for carbon dioxide also may be equipped with one or more frangible disc devices set to function at a pressure not over two times nor less than 1.3 times the design pressure of the tank.

(11) Each portion of connected liquid piping or hose that can be closed at both ends must be provided with a safety relief valve without an intervening shutoff valve.

(12) Subject to conditions of subparagraph (a)(1) of this section for the methyl chloride and sulfur dioxide optional portable tanks, one or more fusible plugs approved by the Bureau of Explosives may be used in place of safety relief valves of the spring-loaded type. The fusible plug or plugs must be in accordance with CGA Pamphlet S-1.2, to prevent a pressure rise in the tank of more than 120 percent of the design pressure. If the tank is over 30 inches long, each end must have the total specified safety discharge area.

(13) Safety relief valves on chlorine tank motor vehicles must conform with the standard of The Chlorine Institute, Inc., Type 1½ JQ225 Dwg. H51970 dated October 7, 1968.

II. In Part 177.

(A) In § 177.824, paragraph (a)(1) and paragraphs (e), (f), (h), and (i) would be amended to read as follows:

§ 177.824 Retesting and inspection of cargo tanks.

(a) * * *

(1) Every cargo tank, except specifications MC 330 and MC 331 cargo tanks, must comply with the testing requirements prescribed in paragraphs (a), (b), (c), and (d) of this section. Every cargo tank must be marked in accordance with the marking requirements of paragraph (h) of this section.

* * * * *

(e) *Compressed gas cargo tanks, specifications MC 330 and MC 331.* Every cargo tank constructed in compliance with specification MC 330 or MC 331 (§ 178.337 of this chapter) must be inspected and tested in accordance with § 173.33 of this chapter.

(f) *Reporting requirements.* Each motor carrier shall file a complete listing of MC 330 and MC 331 cargo tanks he has in service, with the Director, Bureau of Motor Carrier Safety, Federal Highway Administration, Department of Transportation, Washington, D.C. 20591. Each motor carrier, when he acquires or places in service any MC 330 or MC 331 cargo tank (other than cargo tanks used in interchange service which are reported by another carrier), shall file a supplemental report with that Bureau.

(1) The initial listing and each subsequent report must include the following information:

(i) The carrier's name, address, and telephone number.

(ii) Each cargo tank identified as follows:

(a) Carrier's equipment number;
(b) Manufacturer's name;
(c) Manufacturer's serial number;
(d) Specification MC 330 or MC 331;
(e) "QT" (Quenched and tempered) or "NQT" (Not quenched and tempered).

(2) A copy of each report required by this paragraph must be retained by the carrier during the period the tank is in the carrier's service and for 1 year thereafter.

* * * * *

(h) *Test date markings.* The month and year of the last test must be durably and legibly marked on the tank in letters not less than 1¼ inches high, near the metal certification plate.

(i) *Withdrawal of certification.* If, as the result of an accident or for any other reason a cargo tank no longer meets the applicable specification, the carrier shall remove the metal certification plate or make it illegible (see § 173.24(c)(1)(v) of this chapter). The details of the conditions necessitating withdrawal of the certification must be recorded and signed on the written certificate for that cargo tank. The vehicle owner shall retain the certificate for at least 1 year after withdrawal of the certification.

(B) In § 177.840, paragraph (g) would be added to read as follows:

§ 177.840 Compressed gases.

* * * * *

(g) Each liquid discharge valve on a cargo tank must be closed during transportation except during loading and unloading.

III. In Part 178:

In § 178.337-1 paragraph (e) would be amended; in § 178.337-2 paragraph (c) would be amended; in § 178.337-4 paragraph (b) would be amended; in § 178.337-8 paragraph (b) would be amended; in § 178.337-9 paragraphs (a) and (b) would be amended, paragraphs (c) and (d) would be redesignated (d) and (e) respectively, a new paragraph (c) would be added; in § 178.337-11 paragraph (a)(2), (3) would be amended, subparagraph (a)(4) and Note 1 following paragraph (b) would be canceled, paragraph (b), the introductory text of paragraph (c) and paragraph (c)(5) would be amended, paragraph (c)(6) would be added; in § 178.337-13 paragraphs (a) and (b) would be amended; in § 178.337-14 paragraphs (a), (b), (c) would be amended; in § 178.337-15 paragraph (a) would be amended to read as follows:

§ 178.337 Specification MC 331; cargo tanks constructed of steel, primarily for transportation of compressed gases as defined in the Compressed Gas Section.

§ 178.337-1 General requirements.

* * * * *

(e) *Insulation for carbon dioxide, chlorine, and nitrous oxide tanks.* See § 173.33(j) of this chapter.

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§ 178.337-2 Material.

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(c) *For anhydrous ammonia.* See § 173.33(h)(1) of this chapter.

* * * * *

§ 178.337-4 Joints.

* * * * *

(b) Welding procedure and welder performance tests must be made annu-

ally in accordance with section IX of the ASME Code. In addition to the essential variables named therein, the following must be considered as essential variables: Number of passes; thickness of plate; heat input per pass; and manufacturer's identification of rod and flux. When fabrication is done in accordance with Part UHT of the ASME Code, filler material containing more than 0.08 percent vanadium must not be used. The number of passes, thickness of plate, and heat input per pass may not vary more than 25 percent from the procedure or welder qualifications. Records of the qualifications must be retained for at least 5 years by the tank manufacturer and must be made available to duly identified representatives of the Department of Transportation and the owner of the tank.

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§ 178.337–8 Outlets.

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(b) *Chlorine tank valves.* See §§ 173.33 (g) (10) and (i) (4) of this chapter. Regarding chlorine tank outlets, see also § 178.337–1(c) (2).

* * * * *

§ 178.337–9 Safety relief devices, valves and connections.

(a) See §§ 173.33(g), 173.301(d), and 173.315(i) of this chapter.

(b) Each valve must be designed, constructed, and marked for a rated pressure not less than the tank design pressure at the temperature expected to be encountered.

(c) Piping and fittings must be grouped in the smallest practicable space and protected from damage as required by § 178.337–10.

* * * * *

§ 178.337–11 Emergency discharge control.

(a) * * *

(2) Excess-flow valve design and operation. See § 173.33(i) of this chapter.

(3) *Chlorine tanks.* See § 173.33(i) (4) of this chapter.

(4) [Canceled]

(b) Shutoff valves. See § 173.33(i) (3) of this chapter.

NOTE 1: [Canceled]

(c) Every vapor and liquid discharge opening in tanks for flammable liquids, flammable compressed gases, and for anhydrous ammonia must be fitted with a remotely controlled internal shutoff valve. Each valve must conform to the following requirements:

* * * * *

(5) On a tank over 3,500 gallons water capacity, each internal shutoff valve must be provided with remote means of automatic closure, both mechanical and thermal, that are installed at the ends of the tank in at least two, diagonally opposite, locations. If the discharge connection at the tank is not in the general vicinity of one of the two locations specified above, one additional fusible element must be installed so that heat from a fire in that area will activate the emergency control system. Fusible elements used may not have a melting point exceeding 250° F.

(6) On a tank of 3,500 gallons water capacity or less, each internal shutoff valve must be provided with at least one remote control station, and the actuating means may be mechanical. This station must be at one end of the tank, away from the discharge connection area.

§ 178.337–13 Supporting and anchoring.

* * * * *

(a) A cargo tank that is not permanently attached to or integral with a vehicle chassis must be secured by turnbuckles or equally efficient securing devices for drawing the tank down tight on the frame. Means must be provided to present relative motion between the tank and the vehicle chassis when the vehicle is in operation.

(b) Any tank motor vehicle designed and constructed so that the cargo tank constitutes in whole or in part the stress member used in place of a frame must have the tank supported by external cradles. Cargo tanks mounted on frames must be supported by external cradles or longitudinal members. The cradles, where used, must subtend at least 120 degrees of the shell circumference. The design calculations for the supports must include beam stress, shear stress, torsion stress, bending moment and acceleration stress for the loaded vehicle as a whole, using a factor of safety of four, based in the ultimate strength of the material and on two "g" of longitudinal and lateral loading and three times static weight in vertical loading (see Appendix G of the ASME Code).

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§ 178.337–14 Gaging devices.

(a) *Level gaging devices.* See § 173.315 (h) of this chapter.

(b) *Pressure gages.* See § 173.33(g) (8) of this chapter.

(c) *Orifices.* See § 173.315(h) (3) and (4) of this chapter.

§ 178.337–15 Pumps and compressors.

(a) See § 173.33(g) (7) and (11) of this chapter.

* * * * *

Interested persons are invited to give their views on the proposal. Communications should identify the docket number and be submitted in duplicate to the Secretary, Hazardous Materials Regulations Board, Department of Transportation, 400 Sixth Street SW., Washington, DC 20590. Communications received on or before August 10, 1971, will be considered before final action is taken on the proposal. All comments received will be available for examination by interested persons at the Office of the Secretary, Hazardous Materials Regulations Board, both before and after the closing date for comments.

This proposal is made under the authority of sections 831–835 of title 18, United States Code, section 9 of the Department of Transportation Act (49 U.S.C. 1657)

Issued in Washington, D.C. on May 28, 1971.

W. F. REA III,
Rear Admiral, U.S. Coast Guard, By direction of Commandant U.S. Coast Guard.

KENNETH L. PIERSON,
Acting Director, Bureau of Motor Carrier Safety, Federal Highway Administration.

[FR Doc.71-7769 Filed 6-3-71;8:49 am]