Hazardous Materials Regulations Board, Transportation Requirements

[Docket No. HM-115; Notice No. 74-3]

[49 CFR Parts 172, 173, 177, 178, 179]

CRYOGENIC LIQUIDS

The Hazardous Materials Regulations Board (the "Board") is considering amending §§ 172.5, 173.29, 173.33, 173.300, 173.304, 173.314, 173.315, 173.316, 177.817, 177.840, and 179.102-4, and adding new §§ 178.338 and 179.102-18. These proposed amendments and additions provide for the transportation of cryogenic liquids in certain packagings and establish a new DOT specification MC 338, for a cargo tank constructed for use in transporting certain cryogenic liquids.

These proposals are based, in part, on a petition by the Compressed Gas Association, Inc. ("CGA"). The CGA pointed out, in its petition for rule making addressed to the Board, that large quantities of cryogenic liquids are being transported under many special permits authorizing "cryogenic" cargo tanks of various designs. The CGA submitted to the Board a proposed specification for the construction of cryogenic cargo tanks which the Board is identifying herein as "MC 338." This proposed specification is based on numerous designs for cryogenic tanks which have been utilized for several years with a reportedly satisfactory safety record. The CGA did not, however, include in its proposed specification all the requirements that the Board considers necessary for the transportation of cryogenic liquids.

Therefore, the Board is proposing to modify the CGA proposal in several respects, the major changes being as follows:

1. *Filling densities.* It is proposed that each cargo tank have no less than 2 percent outage below the inlet of any safety relief valve under conditions of incipient opening. The Board does not believe that it should permit loading which results in a pressurized condition during transportation where use of safety valves would routinely be depended upon to operate to prevent rupture of the containment vessel. In addition, a set-to-discharge pressure for relief valves on DOT-4L cylinders has been specified to make the filling density limitations meaningful.

2. *Liquid oxygen and aluminum.* The Board proposes to prohibit the use of aluminum in pumps and in inner vessels on cargo tanks which are used to transport liquefied oxygen. The Board believes that it does not presently have sufficient information to determine whether adequate safety levels are maintained when aluminum materials are used in contact with liquefied oxygen.

3. *ASME Code.* The Board proposes that the ASME Code be followed in construction of cryogenic cargo tanks. The CGA proposal limits reference to the Code only to materials used in the construction of cryogenic tanks.

4. *"G" loadings.* The Board has not agreed with the petitioner's statements regarding design calculations for external supports for tanks without frames and for supports of internal tanks. The Board believes that similar requirements for MC 331 cargo tanks are equally applicable to cryogenic tanks.

5. *Aluminum jacket.* The CGA proposed that aluminum be prohibited in the construction of a jacket for a cargo tank used to transport flammable cryogenic liquids except under restrictive conditions. The Board proposes to completely prohibit the use of aluminum jackets with cargo tanks transporting flammable cryogenic liquids and to extend this prohibition to cargo tanks transporting liquefied oxygen because of the properties of these materials in a fire situation.

6. *Manholes.* Although the CGA proposal does not include a requirement for manholes in the inner tank, the Board proposes that such manholes be required because of past experience pertaining to repairs of existing cargo tanks and the modifications that have been necessary. Providing manholes will ease access into the inner vessel and protect against degradation of the thermal integrity of the tank.

7. *Remote control shut-off valves.* The CGA recommends the use of remotely controlled shut-off valves with each filling and discharge valve for flammable cryogenic liquids. The Board agrees with this proposal but believes similar requirements are appropriate for poisonous ladings to preclude a large spill of these materials as well.

On October 16, 1971, the Board published a notice of proposed rulemaking, Docket No. HM-91 (36 FR 20166), proposing regulations governing the shipment of certain Cold Compressed Gases in Tank Cars. Several comments received raised valid objections to some of the proposals contained therein. In addition, since that time the Board has experienced difficulties with certain types of tank cars and has serious doubts concerning the validity of the assumptions upon which that notice was based. Therefore, Docket No. HM-91 is hereby withdrawn. If the Board decides to pursue these matters at a future date (other than ones related to vinyl fluoride and hydrogen chloride), a new docket will be opened. Those portions of Docket No. HM-91 relating to vinyl fluoride and hydrogen chloride are hereby reintroduced in this rulemaking proposal for further consideration.

In consideration of the foregoing, it is proposed to amend 49 CFR Parts 172, 173, 177, 178, and 179 as follows:

PART 172—LIST OF HAZARDOUS MATERIALS CONTAINING THE SHIPPING NAME OR DESCRIPTION OF ALL MATERIALS SUBJECT TO PARTS 170-189 OF THIS SUBCHAPTER

1. In § 172.5, the List of Hazardous Materials is amended as follows:

§ 172.5 List of hazardous materials.

(a) * * *

Article	Classed as—	Exemption and packing (see section)	Label required if not exempt	Maximum quantity in 1 outside container by rail express
Change				
*Argon, cryogenic liquid	Nonf. C.G.	No exemption, 173.316	Nonf. G.	300 pounds.
Hydrogen, cryogenic liquid	F.C.G.	do	F.G.	Not accepted.
*Nitrogen, cryogenic liquid	Nonf. C.G.	do	Nonf. G.	300 pounds.
*Oxygen, cryogenic liquid	do	do	do	Do.
Add				
*Carbon dioxide, cryogenic liquid	Nonf. C.G.	No exemption, 173.316	Nonf. G.	300 pounds.
Carbon monoxide, cryogenic liquid	F.C.G.	do	F.G.	Not accepted.
Ethane, cryogenic liquid	do	do	do	Do.
Ethylene, cryogenic liquid	do	do	do	Do.
*Helium, cryogenic liquid	Nonf. C.G.	do	Nonf. G.	300 pounds.
Hydrogen chloride, cryogenic liquid	do	do	do	Do.
Methane, cryogenic liquid	F.C.G.	do	F.G.	Not accepted.
Natural gas, cryogenic liquid. *See* Methane, cryogenic liquid.				
*Nitrous oxide, cryogenic liquid	Nonf. C.G.	do	Nonf. G.	300 pounds.
Vinyl fluoride, inhibited, cryogenic liquid.	F.C.G.	do	F.G.	Not accepted.

PART 173—SHIPPERS

1. In Part 173 Table of Contents, §§ 173.33 and 173.316 would be amended to read as follows:

Sec.
173.33 Cargo tank maintenance and use.
173.316 Cryogenic liquids.

2. In § 173.29, paragraph (g) would be added to read as follows:

§ 173.29 Empty containers.

* * * * *

(g) The amount of any flammable or toxic cryogenic liquid remaining in any packaging (including portable tanks, cargo tanks, and tank cars) must be such that no vapor would be discharged at a lading temperature of 130°F. This requirement does not apply to specification 4L (§ 178.57 of this subchapter) insulated cylinders.

3. In § 173.33, the heading, paragraphs (b), the introductory text of paragraph (e), (e)(2), and (e)(4) would be amended; paragraphs (e)(1)(i) and (e)(1)(ii) would be added as follows:

§ 173.33 Cargo tank maintenance and use. (See also § 177.824 of this subchapter.)

* * * * *

(b) Cargo tank qualification as an authorized packaging includes compli-

ance with the applicable specification MC 300, MC 301, MC 302, MC 303, MC 304, MC 305, MC 306, MC 307, MC 310, MC 311, MC 312, MC 330, MC 331, or MC 338, with this section, and with the inspection, retest, and marking requirements of § 177.824 of this subchapter.

(1) A cargo tank of the specification listed in Column 1 may be used when authorized in Part 173 provided manufacturing of the tank did not commence after the date in Column 2:

Column 1	*Column 2*
MC 300	Sept. 1, 1967.
MC 301	June 11, 1961.
MC 302, MC 303, MC 304, MC 305, MC 310, MC 311.	Sept. 1, 1967.
MC 330	May 14, 1967.

(2) Each holder of a special permit issued before (effective date of amendment), that authorizes him to transport any cryogenic liquid in a cargo tank, must examine the cargo tank to determine if it meets the requirements of specification MC 338 and, if practicable, must modify, re-rate, and re-mark the tank according to this specification before (date two years from date of publication of the amendment). If a cargo tank covered by a special permit cannot be modified to meet this specification, the permit holder must advise the Hazardous Materials Regulations Board before (date of 12 months from date of publication of the amendment), giving the reasons why the tank cannot be so modified.

* * * * *

(e) A specification MC 330, MC 331, or MC 338 (§§ 178.337, 178.338 of this subchapter) cargo tank must not be used unless it has successfully met the following requirements, as applicable:

(1) * * *

(i) Each cargo tank used for the transportation of a cryogenic liquid must be examined after each shipment to ascertain that the actual holding time is not significantly different from the rated time marked on the certification plate. The log required by § 177.840(h) of this subchapter may be used for this determination. If the trip log record indicates that the actual holding time is less than 90 percent of the rated holding time marked on the nameplate (§ 178.338–18(b) of this subchapter), the tank must be repaired as necessary to restore it to the marked rated holding time value before transportating any cryogenic liquid.

(ii) For distribution service, see § 177.840(h) of this subchapter.

(2) Each tank (less fittings) must be subjected to an internal pressure of at least 1½ times the design pressure (maximum allowable working pressure or rerated pressure) of the tank.

* * * * *

(4) When testing insulated tanks, the insulation and jacketing are not required to be removed unless the pressure equilibrium at test pressure cannot be maintained, the test pressure is not reached, or the vacuum integrity is not maintained in the vacuum space.

* * * * *

4. In § 173.300, paragraphs (f), (g), and (h) are redesignated paragraphs (g), (h), and (i) respectively; a new paragraph (f) is added to read as follows:

§ 173.300 Definitions.

* * * * *

(f) Cryogenic liquid means any liquid colder than —40° F. which is loaded into a packaging and thermally protected in some manner to control polymerization, vaporation, or pressure build-up under ambient temperature conditions normally incident to transportation.

(1) Until further order of the Department, a cryogenic liquid which is not flammable or poisonous and which is colder than —40° F., when loaded into a packaging constructed so that pressure in the packaging will not exceed 25.30 p.s.i.g. during transportation, is not considered a cryogenic liquid for the purpose of these regulations.

* * * * *

5. In § 173.304, paragraph (a)(2) would be amended; paragraph (b)(2) would be canceled as follows:

§ 173.304 Charging of cylinders with liquefied compressed gas.

(a) * * *

(2) The following requirements must be complied with for the gases named (For cryogenic liquids, see § 173.316):

Kind of gas	Maximum permitted filling density (see Note 1)	Containers marked as shown in this column or of the same type with higher service pressure must be used except as provided in § 173.34 (a), (b), § 173.301(j) (see notes following table).
[cancel]	*Percent*	
Argon, pressurized liquid.	115	DOT-4L200.
Nitrogen, pressurized liquid.	(3)	DOT-4L200.
Oxygen, pressurized liquid.	90	DOT-4L200.

* * * * *

(b) * * *

(2) [Canceled]

* * * * *

6. In § 173.314, paragraph (c), Table, and Note 17 following the Table would be amended; Note 23 would be added to read as follows:

§ 173.314 Requirements for compressed gases in tank cars.

* * * * *

(c) *Authorized gases, filling densities, tank cars.* Compressed gases must be loaded and transported in a tank car in accordance with the following requirements (for cryogenic liquids, see § 173.316):

* * * * *

Kind of gas	Maximum permitted filling density (see Note 1)	Containers marked as shown in this column or of the same type with higher service pressure must be used except as provided in § 173.34 (a), (b), § 173.301(j) (see notes following table).
(change)		
Vinyl fluoride, inhibited.	Note 23...	DOT-105A600W, Note 17.

* * * * *

NOTE 17: See § 179.102–4 of this subchapter. In addition to the safety relief valve required by § 179.100–15 of this subchapter, the tank must be equipped with one frangible disc of approved design (§ 179.2 of this subchapter) set to function at a pressure less than 600 p.s.i.g. but not less than 450 p.s.i.g. The discharge capacity or each of these safety relief devices must be sufficient to prevent building up of pressure in the tank in excess of 495 pounds p.s.i.g. The shipper shall notify the Bureau of Explosives whenever a car is not received by the consignee within 20 days from the date of shipment. Prior to release of an "empty" car for transportation, the pressure in the car may not exceed 70 p.s.i.g.

* * * * *

NOTE 23: Maximum permitted filling density: 59.6 percent. Minimum permitted filling density: 53.6 percent. Maximum pressure when offered for transportation: 115 p.s.i.g.

* * * * *

7. In § 173.315, paragraph (a) would be amended as follows:

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

(a) A compressed gas must be loaded and transported in a cargo tank or portable tank in accordance with the following requirements of this section (For cryogenic liquids, see § 173.316.):

* * * * *

8. § 173.316 is amended to read as follows:

§ 173.316 Cryogenic liquids.

(a) General requirements.

(1) *General requirements applicable to all packagings (including tanks).* (i) A packaging may not be loaded with the lading colder than the design temperature of the packaging.

(ii) A packaging may not be loaded with any gas which may combine chemically with the residue of a previous lading to produce an unsafe condition, until all significant residue has been removed and the interior of the packaging has been sufficiently cleaned.

(iii) The jacket covering the insulation on any packaging used to transport oxygen or any flammable lading must be made of steel.

(iv) An inner vessel used to transport oxygen may not be made of aluminum. Any piping, valve, or fitting that may come in contact with oxygen or any flammable lading may not be made of aluminum.

(v) Each safety relief device must be installed and located so that effective

operation of the device will not be prevented by the cooling effect of the contents.

(vi) When calculating "maximum permitted filling density" the total for water content of the packaging must not include any volume above the inlet to the safety relief device or pressure controlling valve.

(vii) Each packaging must be provided with one or more safety relief devices which must be installed and maintained to be in compliance with the requirements of this subchapter.

(viii) The weight of lading in any packaging must not exceed the design weight marked on the packaging or its specification plate.

(ix) When a cargo tank or tank car tank is offered for transportation, at least two percent outage must be provided below the inlet of the safety relief valve or pressure controlling valve under conditions of incipient opening, with the tank in a level attitude.

(2) *Cylinders.* The pressure must be limited by a pressure controlling valve sized and set to limit the pressure to one and one-fourth times the marked service pressure. The design and installation of each pressure-controlling valve must insure that a malfunction cannot occur as a result of frost accumulation. The liquid portion of the gas must not completely fill a cylinder. The pressure control valve on a cylinder insulated by a vacuum must be set at least 15 p.s.i. lower than one and one-fourth times the marked service pressure.

(3) *Tank cars.* (i) A tank car containing a cryogenic liquid may not be shipped unless it is loaded by or with the consent of the owner thereof.

(ii) The amount of cryogenic liquid loaded into each tank may be determined either by measurement or calculation of the weight. However, in both instances the weight must be checked after disconnection of the loading line by use of proper scales to verify that the tank has been filled to a level within the authorized limits.

(iii) Prior to release of an "empty" car for transportation, the pressure may not exceed 70 p.s.i.g.

(iv) The shipper must notify the Bureau of Explosives whenever a car containing any cryogenic lading is not received by the consignee within 20 days after shipment.

(4) *Cargo tanks.* (i) Each tank must be protected by one or more spring-loaded safety relief valves and by one or more frangible discs arranged to discharge upward and unobstructed to the outside of the protective housing in such manner as to prevent impingement of gas upon the jacket or any structural part of the vehicle.

(ii) The rated relieving capacity for each safety relief valve and frangible disc must be as determined by the flow formulas contained in CGA Pamphlet S-1.2.

(ii) The minimum total capacity of the safety relief valves and the minimum total capacity of the frangible discs, must be as prescribed in paragraph (a)(4)(ii) of this section, with the insulation space saturated with the gaseous lading at atmospheric pressure, or on a bare-tank basis unless, in the case of a tank having a non-evaculated jacket, the insulation is of a type that will remain in place and effective under accident-fire conditions. The safety relief valves must have this capacity at a tank pressure not exceeding 120 percent of the tank design pressure. The frangible discs must have this capacity at a tank pressure not exceeding 150 percent of the tank design pressure.

(iv) The safety relief valves must have a liquid flow capacity equal to or exceeding the maximum rate at which the tank is to be filled, at a tank pressure not exceeding 120 percent of the tank design pressure.

(v) 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 valve must be provided with means for sealing the adjustment and it must be sealed.

(vi) Each safety relief valve on the tank must be set to start-to-discharge at a pressure no higher than 110 percent of the tank design pressure. The frangible discs must be designed to commence functioning at a pressure no lower than 130 percent and no higher than 150 percent of the tank design pressure.

(vii) 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 air at 60° F. and 14.7 p.s.i.a., 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.

(viii) Each safety relief device must be installed to have direct communication with the vapor space of the tank, at the midlength of the top centerline.

(ix) Each connection to a safety relief device must be of sufficient size to provide the required rate of discharge through the safety relief device.

(x) No shut-off valve may be installed between a safety relief device and the tank, except in cases where two or more safety relief valves or two or more frangible discs are installed on the same tank, one or more shut-off valves may be arranged to always provide the required relief capacity through at least one safety relief valve and at least one frangible disc.

(xi) Each safety relief device must be arranged or protected to prevent the accumulation of foreign material. The arrangement or protection must not impede flow through the device.

(xii) The jacket must be protected by a suitable relief device to release internal pressure. The discharge area of this device must be at least 0.00024 square inch per pound of water capacity of the tank. This relief device must function at a pressure not exceeding the internal design pressure of the jacket calculated in accordance with the ASME Code or 25 p.s.i., whichever is less.

(xiii) Each cargo tank must be filled by weight. The weight must be checked after disconnection of the loading line by use of proper scales to verify that the tank has been filled within the authorized limits. (See paragraph (a)(1)(ix) of this section.) Tare weight must be ascertained by weighing the tank or tank vehicle empty before each filling.

(xiv) In addition to the required safety relief devices, a cargo tank also may be equipped with one or more pressure controlling devices.

(xv) In addition to the required safety relief devices, a cargo tank also may be equipped with one or more frangible discs set to function at a pressure not over 2 times nor less than 1.5 times the design pressure of the tank.

(xvi) Each portion of connected liquid piping or hose that can be closed at both ends must be provided with either a hydrostatic safety relief valve, without an intervening shut-off valve, or a check valve permitting flow from the pipe or hose into the tank. If used, the relief valve must be located to prevent its discharge from impinging on the tank, piping, or operating personnel.

(xvii) Each tank inlet and outlet, except safety relief devices, must be marked to designate whether it communicates with vapor or liquid when the tank is filled to the maximum permitted filling density.

(xviii) The minimum height of any part of the loaded cargo tank or any associated valve or pipe, enclosure, or protective device or structure must be at least 14 inches above level ground.

(xix) Any shut-off valve or device that interferes with the pressure control (road relief) valve must be designed so that the cargo tank may not be offered for transportation when the road relief valve is inoperative.

(xx) When transportation (movement) begins, a cryogenic liquid may not be at a temperature such that the lower pressure setting of the pressure control (road relief) valve or the required safety relief valve will be reached in less time than the rated holding time specified in § 178.338-9 of this subchapter.

(b) Specification 4L (§ 178.57 of this subchapter). Cylinder. The following cryogenic liquids are authorized to be shipped in this cylinder subject to the additional requirements specified.

(1) *Argon, nitrogen, and oxygen* must be loaded and shipped as follows:

Cryogenic liquid	Maximum permitted filling density (see Note 1)	Safety relief valve maximum start-to-discharge pressure	Containers marked as shown in this column or of the same type with higher service pressure must be used.
Argon, cryogenic liquid	115	145	DOT-4L200.
Nitrogen, cryogenic liquid	68	90	DOT-4L200.
Oxygen, cryogenic liquid	96	125	DOT-4L200.

NOTE 1: The "filling density" is hereby defined as the percent ratio of the weight of gas in a container to the weight of water that the container will hold at 60°F. (1 lb. of water=27.737 cubic inches at 60°F.).

(2) *Hydrogen (minimum 95 percent parahydrogen)* must be loaded and shipped as follows:

(i) Service temperature: minus 423°F. or colder.

(ii) Maximum filling density, based on cylinder capacity at minus 423°F.: 6.7 percent.

(iii) Pressure must be limited by a pressure-controlling valve set to limit pressure to not more than 17 p.s.i.

(iv) Each cylinder must be constructed, insulated, and maintained so that during transportation the total rate of venting shall not exceed 30 standard cubic feet of hydrogen per hour.

(v) In addition to the marking required by § 178.57–20 of this subchapter, the total rate of venting in standard cubic feet per hour shall be marked on the top of each head or valve protection band in letters at least one-half inch high as follows: "VENT RATE * *CFH" with the stars replaced by figures signifying the standard hydrogen venting rate for the cylinder.

(vi) Transportation is limited to private and contract motor carriers under conditions specified in § 177.840(a) of this subchapter.

(vii) Pressure in each cylinder must be reduced to 8 p.s.i.g. or lower at least once within 4 hours before the beginning of transportation.

(c) *Tank cars.* (1) Specification 113A-60W2 (§§ 179.400, 179.401 of this subchapter). Tank car. Hydrogen (minimum 95 percent parahydrogen) is authorized to be shipped in this tank car subject to the additional requirements specified:

(i) Each tank must be equipped with a pressure controlling valve set at a pressure not exceeding 17 p.s.i.g.

(ii) The maximum permitted filling density is 6.6 percent.

(2) Specification 105A600W (§§ 179.-100, 179.101 of this subchapter). Tank car. Hydrogen chloride is authorized to be shipped in this tank car subject to the following additional requirements.

(i) Hydrogen chloride. Maximum permitted filling density: 89.0 percent. Minimum permitted filling density: 80.1 percent. Maximum pressure when offerred for transportation: 80 p.s.i.g. See § 179.102–18 of this subchapter.

(d) Specification MC 338 (§ 178.338 of this subchapter). Tank motor vehicle. The following cryogenic liquids are authorized to be shipped in this cargo tank subject to the additional requirements specified:

(1) *Argon, carbon dioxide, helium, hydrogen chloride, nitrogen, nitrous oxide, oxygen, and vinyl fluoride* must be loaded and shipped as follows:

Pressure control (road relief) valve setting	Maximum permitted filling density[1] (percent by weight)							
Maximum start to discharge pressure (pounds square inch gauge)	Argon	Carbon dioxide	Helium	Hydrogen chloride	Nitrogen	Nitrous oxide	Oxygen	Vinyl fluoride
15				113		120		
18			12.5					
25				111		118		
30	129				74		105	
40				109		117		
50				108		115		78
55	129				71		102	
60				106		113		77
80		113		105		110		75
85	125						99	
100		112		103		108		74
105					67			
120		110		101		107		73
140		108		100		105		72
145	115				64		94	
180		106		98		103		69
200	110	104		97	60	102	90	68
250		102		95		100		66
275	105				56		86	
325	101				53		83	
Highest design service temperature	−320° F	(2)	−432° F	(2)	−320° F	(2)	−320° F	(2)

[1] See § 173.315(a)(1), Note 1.
[2] See § 178.338-1(b)(2) of this subchapter.

(2) *Natural gas, methane, ethylene, ethane, and carbon monoxide* must be loaded and shipped as follows:

Pressure control (road relief) valve setting	Maximum permitted filling density[1] (Percent by weight)			
Maximum start-to-discharge pressure (pounds per square inch gage)	Methane or NG	Ethylene	Ethane	Carbon monoxide
15	—	—	—	75.0
17	—	—	—	74.0
20	—	53.1	—	—
25	39.6	—	51.0	73.0
30	39.2	52.4	—	72.0
35	—	—	—	—
40	—	—	50.4	—
45	—	50.9	—	71.5
50	38.2	—	—	—
55	—	—	—	—
60	—	—	49.3	—
70	—	49.8	—	—
90	—	—	47.9	—
95	36.6	48.8	47.3	—
100	—	—	—	—
Highest design service temperature	−320° F.	−320° F.	−320° F.	−320° F.

[1] See § 173.315(a)(1), Note 1.

(3) Hydrogen (minimum 95 percent parahydrogen) must be loaded and shipped as follows:

Pressure Control (Road relief) valve setting	*Maximum Permitted Filling Density[1] (Percent by weight)*
Maximum start-to discharge pressure (psig)	*Hydrogen*
10	6.7
15	6.6
21	6.5
27	6.4
35	6.3
40	6.2
47	6.1
55	6.0
61	5.9
75	5.7
82	5.6
89	5.5
97	5.4
102	5.3
109	5.2
116	5.1
123	5.0
Highest design service temperature	−423° F.

[1] See § 173.315(a)(1), Note 1.

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

1. In Part 177 Table of Contents, § 177.840 would be amended to read as follows:

Sec.
177.840 Compressed gases including cryogenic liquids.

2. In § 177.817, paragraph (c) would be amended to read as follows:

§ 177.817 Shipping papers.

* * * * *

(c) The driver of each motor vehicle transporting hazardous materials shall have in his possession a copy of the shipping paper showing the information required in paragraphs (a) and (b) of this section. When transporting cryogenic liquids, the driver shall also have in his possession written instructions regarding general precautions, manual venting, and emergency procedures, including a telephone number and name of person to be called, in case of emergency or accident.

* * * * *

3. In § 17740, the heading would be amended; paragraphs (h), (i), (j), and (k) would be added to read as follows:

§ 177.840 Compressed gases including cryogenic liquids.

* * * * *

(h) The driver of any motor vehicle transporting cryogenic liquid shall be knowledgeable in the handling of that specific lading. He must take precautions to avoid delay en route that could cause an excessive pressure rise or other undesirable condition. If unforeseen conditions cause an excessive pressure rise, the tank must be manually vented at a remote and safe location. For each shipment, the driver must record the cargo tank pressure at the start of each trip, immediately before and after any manual venting, at least once every five hours, and at the destination point for the lading.

(i) For distribution service (peddle runs), the one-way travel time computed as prescribed in § 178.338–9(c) of this subchapter, must be reduced by one-half.

(j) Each cargo tank containing cryogenic liquids, except one in use in distribution (peddle) service, must be completely drained of liquid contents at destination and must be vented to atmospheric pressure to be considered empty and not subject to the regulations for cargo tanks transporting cryogenic liquids.

(k) The time required between the loading of a cargo tank with a cryogenic liquid and the subsequent unloading of the same tank at its final destination shall not exceed the one-way travel time as calculated under § 178.338–9(c) of this subchapter. For distribution service, this time shall not exceed the one-way travel time as calculated under § 178.338–9(c) of this subchapter and modified by paragraph (i) of this section.

PART 178—SHIPPING CONTAINER SPECIFICATIONS

1. In Part 178 Table of Contents, § 178.338 would be added to read as follows:

Sec.
178.338 Specification MC 338; insulated cargo tank.

2. Section 178.338 would be added to read as follows:

§ 178.338 Specification MC 338; insulated cargo tank.

§ 178.338–1 General requirements.

(a) Each cargo tank must consist of a welded inner vessel suitably supported within an outer shell, with insulation between the two, and having piping, valves, supports, and other appurtenances as specified in this subchapter. For the purposes of this specification, tank means inner vessel and jacket means outer shell.

(b) Each tank must be designed and constructed to meet the requirements of the ASME Code.

(1) The design pressure of the tank may not be less than 25 p.s.i.g. (see Note 1). The design pressure must include consideration of the loadings due to the static head of the lading as well as internal pressure. If the jacket is evacuated, the tank must be designed for a pressure 15 p.s.i. higher than its "design pressure," and the jacket must be designed in accordance with paragraph (d)(1) of this section.

NOTE 1: "Design pressure" in this specification means "maximum allowable working pressure" as used in the ASME Code.

(2) The design service temperature of the tank and its piping and valves must not be higher than the liquefaction temperature of the lading at atmospheric pressure (see Note 1). For specific temperatures see § 173.316 of this subchapter.

NOTE 1: "Design service temperature" in this specification means the lowest temperature of the "allowable temperature range" for which the tank is suitable, as defined in paragraph UG–116 of the ASME Code.

(3) Design and constructional detail of the tank interior must not permit collection and retention of cleaning materials or contaminants. All interior weldments must be finished to permit washing of the surface by the normal sloshing of the lading during transportation.

(c) The surface of the tank must be insulated with a material compatible with the lading.

(1) Each cargo tank must be designed so that the total heat transfer from the atmosphere at 70° F. to the lading will not exceed 0.20 Btu per hour per pound of water capacity.

(2) For a cargo tank used to transport oxygen, the insulation must not be capable of sustaining combustion when it contacts a glowing platinum wire in a

99.5 percent pure oxygen atmosphere, at a minimum pressure of 10 p.s.i.g., and a minimum temperature of 400° C. A cargo tank which is so insulated must be marked "INSULATION FOR OXYGEN SERVICE" in accordance with § 178.338–18(b) of this specification when it is used to transport oxygen.

(3) Each vacuum-insulated cargo tank must be provided with a connection for a vacuum gauge to indicate the pressure within the insulation space.

(d) The insulation must be completely covered by a metal jacket which must be constructed and sealed so that moisture can not come into contact with the insulation. Also see § 173.316(a)(1)(iii) of this subchapter. If the jacket is not evacuated, minimum metal thicknesses are required as follows: low carbon (mild) steel, 1/16 inch; stainless steel, 1/32 inch; aluminum, 3/32 inch. If the jacket is evacuated, minimum metal thicknesses are required as follows: steel, 3/32 inch; aluminum, 1/8 inch. In addition, an evacuated jacket must be in compliance with the requirements of paragraphs (d) (1) and (2) of this section.

(1) The cylindrical portion of the jacket between stiffening rings must have a critical collapsing pressure of at least 30 p.s.i. as determined by the formula:

$$P_c=\frac{2.6\,E\,(t/D)^{2.5}}{L/D-0.45\,(t/D)^{0.5}}$$

where P_c=Critical collapsing pressure;
E=Modulus of elasticity of jacket material, lbs./sq. inch;
t=Minimum thickness of jacket material, inches;
D=Outside diameter of jacket, inches; and
L=Distance between stiffening ring centers, inches. The heads are considered as stiffening rings located one-third the head depth from the head tangent line. The outer shell, head, and rings must be designed for a minimum 7.50 pounds per square inch external pressure in accordance with the requirements of the ASME Code.

(2) If stiffening rings are used in designing the cylindrical portion of the jacket for external pressure, each ring must be attached to the jacket by fillet welds on each side of the ring. Outside stiffening ring attachment welds must be continuous. Inside ring attachment welds may be intermittent. When intermittent welds are used, the total length of welds on each side of the ring must be at least one third of the jacket circumference. Where a closed section is used, it must be continuously welded on the outside of each leg. A portion of the jacket may be included when calculating the moment of inertia of the ring. The effective width of jacket plate, W, on each side of the attachment to the ring is given by the formula:

$$W=0.78\,(Rt)^{0.5}$$

where R=Outside radius of the jacket, inches, and
t=Plate thickness of the jacket, inches.

(i) Where a stiffening ring consists of a closed section having two webs attached to the jacket, the jacket plate between the webs may be included up to the limit of twice the value of W defined above. The flange of the section is subject to the same limitation, with W based on R and t of the flange. Where two separate members, such as two angles, are located less than 2W apart they may be treated as a single stiffening ring. (The maximum width of jacket plate which may be considered effective is 4W.)

(ii) Each stiffening ring must have a minimum moment of inertia as determined by either of the following formulae:

$$I=1.05\,D^2L/E$$
$$I'=1.38\,D^2L/E$$

where I=Required moment of inertia of the stiffener itself about a centroidal axis parallel to the jacket axis, inches⁴;
I'=Required moment of inertia of the combined section of stiffener and effective width of jacket plate about a centroidal axis parallel to the jacket axis, inches;
D=Outside diameter of the jacket, inches;
L=One-half the distance from the centerline of the stiffening ring to the next line of support on one side, plus one-half the distance from the centerline of the stiffening ring to the next line of support on the other side of the stiffening ring, both measured parallel to the axis of the jacket, inches (a line of support is either a stiffening ring meeting the requirements of this paragraph, or a circumferential line on a head at one-third the depth of the head from the head tangent line); and
E=Modulus of elasticity of the stiffener material, p.s.i.

(e) Each cargo tank must be constructed, insulated, and equipped as follows:

(1) *Flammable cryogenic liquids.* Each cargo tank must be equipped with a device or system such that venting gas from the pressure control (road relief) valve does not exceed 50 percent of its lower flammable limit with air. This device or system must be capable of handling twice the normal evaporation rate and must be separate from the safety relief devices required by this specification.

§ 178.338–2 Material.

(a) All material used in the construction of a tank, its appurtenances, and a jacket if designed in accordance with the ASME Code, must be suitable for use with the lading to be transported and must be in conformance with the requirements of the ASME Code and any requirements of the American Society for Testing and Materials.

(b) All tie-rods, mountings, and other appurtenances within the jacket and all piping, fittings, and valves must be of materials suitable for use at the lowest temperature to be encountered by the part.

(c) Impact tests are required on all tank material and must be performed as required by Section VIII of the ASME Code.

(d) The direction of final rolling of the shell material must be the circumferential orientation of the tank shell.

(e) Each tank constructed in accordance with Part UHT of the ASME Code must be postweld heat treated as a unit after completion of all welds to the shell and heads. Other tanks must be postweld heat treated as required by the ASME Code. The method must be as prescribed in the ASME Code. Welded attachments to pads may be made after postweld heat treatment.

(f) The fabricator shall record the heat and slab numbers and the certified Charpy impact values of each plate used in the tank on a sketch showing the location of each plate in the shell and heads of the tank. Copies of each sketch must be provided to the owner and retained for at least five years by the fabricator and made available to any duly identified representative of the Department of Transportation.

§ 178.338–3 Metal thickness.

(a) The metal thickness of the tank must be as required by the ASME Code and paragraph (b) of this section. Metal thickness less than 3/16-inch must not be used for the shell or heads of a tank unless the tank is enclosed in an evacuated or load-bearing jacket. Metal thickness less than 1/8-inch must not be used for the shell or heads of the tank under any circumstances.

(b) The minimum thickness of metal in the shell (cylindrical portion) of the tank must be such that at no point will the stress on a plane normal to the longitudinal axis exceed 25 percent of the minimum specified tensile strength of the metal (see Note 1). For purposes of this requirement, calculation must be made by the formula:

$$S=T/2+(T^2/4+S_s^2)^{0.5}$$

where, at any point under consideration and for the worst combination of loadings,

S=Effective stress as limited by this requirement;
T=The sum of the longitudinal tensile stress due to external vacuum and internal pressure and other causes including direct tensile stress due to a rearward acceleration force equal to twice the static weight, tensile stress due to the bending moment of a rearward acceleration force equal to twice the static weight applied at the road surface, and tensile flexure stress due to three times the static weight; and
S_s=The vectorial sum of the shear stresses in the plane in question, including direct vertical shear due to three times the static vertical loading, direct lateral shear due to a lateral accelerative force equal to twice the static weight, and torsional shear due to a lateral accelerative force equal to twice the static weight, applied at the road surface.

NOTE 1: The forces, loads, and stresses concerned in this requirement relate to the weight of the tank itself, its maximum weight of contents, and articles supported by the tank, not including the weight of structures supporting the tank in normal conditions. The stresses involved are not all uniform through the length of the tank.

(c) Maximum concentrated stresses which might be created at supports due to shear, bending, and torsion must also be calculated in accordance with Appendix G of the ASME Code.

(d) Where any tank support is attached to any part of a tank head, the stresses imposed on the head must be as required in paragraphs (b) and (c) of this section with respect to maximum concentrated stresses at pads and cradles.

§ 178.338–4 Joints.

(a) All joints in the tank, and in the jacket if evacuated, must be as required by the ASME Code, with all undercutting in shell and head material repaired as specified therein.

(b) Welding procedures and welder performance tests must be made annually, in accordance with Section IX of the ASME Code. In addition to the essential variables named therein, the following must also be considered essential variables: number of passes, thickness of plate, heat input per pass, and manufacturer's identification of rod and flux. The number of passes, thickness of plate, and heat input per pass must not vary more than 25 percent from the procedure or welder qualification. Records of the qualification must be retained for at least five years by the tank manufacturer and be made available to any official representative of the Department or the owner of the cargo tank.

(c) All longitudinal welds in tanks and load-bearing jackets must be so located as not to intersect supports other than load rings and stiffening rings.

(d) Substructures must be properly fitted before attachment, and the welding sequence must minimize stresses due to shrinkage of welds.

(e) Filler material containing more than 0.05 percent vanadium must not be used with quench and tempered steel.

(f) All joints must be in accordance with paragraph UW of the ASME Code except that a butt weld with one plate edge offset is not authorized.

§ 178.338–5 Stiffening rings.

(a) A tank is not required to be provided with stiffening rings except as provided in the ASME Code.

(b) If a jacket is evacuated, it must be constructed in compliance with § 178.338–1(d). Stiffening rings must be used to meet these requirements if necessary.

§ 178.338–6 Manholes.

Each tank constructed in accordance with Part UHT of the ASME Code, and any tank above 3500 gallons water capacity, must be provided with a manhole conforming to paragraph UG–46 (g)(1) and other requirements of the ASME Code. The jacket must be provided with means of entrance and exit through the manhole, or may be only marked to indicate the manway locations on the tank.

§ 178.338–7 Openings.

(a) The liquid product discharge opening of each tank must be designed for complete drainage of liquid contents.

(b) With the exception of gauging devices, thermometer wells, and safety relief, manual vent, and pressure control (road relief) valves or devices, each opening in the tank must be:

(1) Closed at or inside the jacket with a plug, cap, bolted flange, or plate; or

(2) Provided with a valve conforming to the requirements of §§ 178.338–8(b) and 178.338–11, as appropriate.

(c) If the leakage of a single valve, except safety valves and pressure control (road relief) valves, would permit loss of flammable or poisonous material, an additional closure which is leak tight at tank design pressure must be provided outboard of such valve.

§ 178.338–8 Safety relief devices, piping, valves, and fittings.

(a) *Safety relief devices.* See § 173.316(a)(4) of this subchapter.

(1) Each safety relief device must be designed, constructed, and marked for a rated pressure equal to or exceeding the tank design pressure at the temperature expected to be encountered.

(b) *Piping, valves, and fittings.* (1) All piping, valves, and fittings shall be as prescribed in §§ 173.33(g) and 173.316 (a)(1) of this subchapter.

(2) Each valve must be designed, constructed, and marked for a rated pressure equal to or exceeding the tank design pressure at the temperature expected to be encountered.

(3) All fittings providing for expansion and vibration must be rated for the maximum pressures and the lowest temperatures to which they will be subjected in actual service.

(4) All piping and fittings must be grouped and protected from damage as required by § 178.338–10.

(5) When a pressure-building coil is used on a tank designed to handle oxygen or poisonous or flammable ladings, the vapor connection to that coil must be provided with a valve, as close to the tank as practical, to prevent the loss of vapor in case of damage to that coil.

§ 178.338–9 Holding time.

(a) Holding time is the time, as determined by testing, that will elapse before the pressure of the contents, under equilibrium conditions, reaches the level of the lowest pressure control valve setting.

(b) The test to determine holding time must be performed by charging the tank with nitrogen to a filling density corresponding to 2 percent outage at the pressure level of the lowest setting on the pressure relieving devices. The tank together with its contents maintained at equilibrium conditions must then be exposed to ambient temperatures.

(c) The equilibrium pressures and ambient temperatures must be recorded at 3-hour intervals, until the pressure level of the contents reaches the pressures at which the lowest pressure relieving device is set to open. This total time lapse in hours shall be noted "measured holding time at ____°F. average temperature." The measured holding time must be adjusted to the equivalent holding time for the intended commodity as an average temperature of 85°F. to establish the rated holding time. The rated holding time (RHT) will be converted to "one-way travel time" by the formula:

$$OWTT=\frac{RHT-24}{2}$$

where OWTT=One-way travel time, and
RHT=Rated holding time.

§ 178.338–10 Collision damage protection.

(a) All valves, fittings, safety relief devices, and other accessories to the tank proper must be installed within the motor vehicle framework or within a suitable collision resistant guard or housing and, appropriate ventilation must be provided. Safety valves must be protected so that in the event of the upset of the vehicle onto a hard surface, their opening will not be prevented and their discharge will not be restricted.

(b) The protective devices or housings and their attachments to the vehicle structure must be designed to withstand static loading in any direction in which they may be loaded by front, rear, side, or sideswipe collision, or by overturn of the vehicle, equal to twice the weight of the tank and attachments, when filled with the lading, using a safety factor of not less than four, based on the ultimate strength of the material to be used, without damage to the fittings protected. A protective device or housing must be made of metal at least 3/16-inch thick.

(c) Each tank motor vehicle must be provided with at least one rear bumper designed to protect the tank and piping in the event of a rear end collision. The rear bumper design must transmit the force of a rear end collision directly to the chassis of the vehicle. The rear bumper and its attachments to the chassis must be designed to withstand a load equal to twice the weight of the loaded tank and attachments, using a safety factor of four based on the ultimate strength of the materials used, with such load being applied horizontally, and parallel to the major axis of the tank or within 30 horizontal degrees thereof. The rear bumpers dimensionally must meet 49 CFR 393.86 and must extend vertically to a height sufficient to protect all valves and fittings located at the rear of the tank, damage to which would cause loss of lading.

§ 178.338–11 Discharge control devices.

(a) Excess-flow valves are not required.

(b) *Shut-off valves.* Each filling and discharge line must be provided with a shut-off valve located as close to the tank as practicable. Unless this valve is manually operable at the valve, the line must also have a manual shut-off valve.

(c) Each filling and discharge line on a cargo tank for a flammable or poisonous lading must be provided with a remotely controlled shut-off valve normally operated by air, gas, or hydraulic pressure, or mechanical means. If pressure from a reservoir or from an engine-driven pump or compressor is used for

opening this valve, the control must be of fail-safe design, spring-biased to stop the admission of such pressure. Unless the jacket is evacuated, the seat of the valve must be inside the tank, in the opening nozzle or flange, or in a companion flange bolted to the nozzle or flangle. If the jacket is evacuated, the seat of the valve must be inside the jacket, in the jacket opening nozzle or flange, or in a companion flange bolted to the nozzle or flange.

(1) On a tank with a capacity in excess of 3500 gallons of water, each internal shut-off 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. Fusible elements shall not have a melting point exceeding 250° F. One means may be used to close more than one remotely controlled valve.

(2) On a tank with a capacity of 3500 gallons of water or less, each internal shut-off valve must be provided with at least one remote control station on the end of the tank opposite the main control station. The remote control station must contain manual means, and may also contain thermal means, for closing the remotely controlled shut-off valves. One means may be used to close more than one remotely controlled valve.

§ 178.338–12 Yield section.

The design or installation of each valve to which damage could result in loss of liquid or vapor, must incorporate a yield section adjacent to and outboard of such valve which will yield or break under strain without damage to the valve that would allow the loss of liquid or vapor. The protection specified in § 178.338–10 is not a substitute for such a section.

§ 178.338–13 Supports and anchoring.

(a) A cargo tank that is not permanently attached to or integrated with a vehicle chassis must be secured by turnbuckles or equally efficient securing devices for drawing the tank down tight on the frame without introducing undue concentration of stresses. Anchors, stops, or other means must be provided to prevent relative motion between the tank and the vehicle chassis when the vehicle is in operation, and must be installed so as to be readily accessible for inspection and maintenance.

(b) A tank motor vehicle constructed so that the cargo tank constitutes in whole or part the structural member used in place of a motor vehicle frame must have the tank or the jacket supported by external cradles or by load rings. A cargo tank with a load bearing jacket mounted on a frame must be supported by external cradles, load rings, or longitudinal members. The cradles, where used, must subtend at least 120 degrees of the cargo tank circumference. The design calculations for the supports and load bearing outer shells, and tank support attachments to an outer shell head, must include beam stress, shear stress, torsion stress, bending moment, and acceleration stress for the loaded vehicle as a unit, using a factor of safety of 4, based on the ultimate strength of the material and a 2 "g" longitudinal and lateral loading and 3 times the static weight in vertical loading (see Appendix G of the ASME Code). The effects of fatigue must be considered in the calculations.

(c) When a tank support is attached to any part of a tank or jacket head, the stresses imposed on the head must be provided for as required in paragraph (b) of this section.

(d) All attachments of supports and bumpers to tanks and to load-bearing jackets must be made by means of pads of material similar to that of the tank or jacket, by load rings, or by bosses designed or gussetted to distribute the load. The pad thickness must be no less than ¼ inch, or the thickness of the tank or jacket material if less, and no more than that of the tank or jacket material. Each pad must extend at least 4 times its thickness, in each direction, beyond the weld attaching the support or bumper. Each pad must be preformed to an inside radius no greater than the outside radius of the tank or jacket at the place of attachment. Each pad corner must be rounded to a radius at least ¼ the width of the pad and no greater than ½ the width of the pad. Weep holes and telltale holes, if used, must be drilled or punched before the pads are attached. Each pad must be attached to the tank or jacket by continuous fillet welding using filler material having properties conforming to the recommendations of the maker of the tank or jacket material.

(e) When a tank is supported within the jacket by structural members, these members must be designed to withstand minimum static loadings of one and one-half vertical upward, two lateral and longitudinal, and three vertical downward times the weight of the tank, under any condition of loading, using a safety factor of not less than four, based on the ultimate strength of the material used, at the temperature to be encountered by the members. When load rings in the jacket are used for supporting the tank, they must be designed to carry the tank and its content when filled to capacity at the static loadings above specified plus external pressure.

(f) Regarding design weight of lading used in determining the loadings, see § 178.338–18(c).

§ 178.338–14 Gauging devices.

(a) *Liquid level gauging devices.* (1) Each cargo tank which is not required to be filled by weight, must be equipped with one or more gauging devices which must indicate accurately the maximum permitted liquid level in accordance with the loading pressure at equilibrium conditions, to provide a minimum of two percent outage below the inlet of the pressure control valve or safety relief valve at the condition of incipient opening of that valve. A fixed-length dip tube, a fixed try-cock line, or a differential pressure liquid level gauge is authorized as a primary control for filling; other gauging devices, except gauge glasses, are authorized but shall not be used as a primary control for filling.

(2) The design pressure of each liquid level gauging device must be at least that of the tank.

(3) A fixed length dip tube gauging device or try-cock line, when used, must consist of a pipe or tube of small diameter equipped with a valve at or near the jacket, and extending into the tank to a specified filling height. The fixed height at which the tube ends in the tank must be such that the device will function when the liquid reaches the maximum level permitted in loading. The setting (percent outage) of each such device must be indicated in a visible location at or adjacent to the valve.

(4) The liquid level gauging device, of whatever kind, if used as a primary control for filling must be designed and installed to indicate accurately the filling level, or to function at maximum filling level, at a point midway of the tank both longitudinally and laterally. For this purpose the lower (high pressure) connection of each differential-pressure gauging device must extend outside the tank, in such a location as to assure that its content will always be vaporized, to a point at midlength of the bottom of the tank.

(b) *Pressure gauges.* Each cargo tank must be provided with a suitable pressure gauge indicating the lading pressure and located on the front of the jacket so it can be seen by the driver in the rear view mirror. Each gauge must have a reference mark at the tank design pressure or the start-to-discharge pressure of the safety relief valve or pressure control (road relief) valve, whichever is less.

(c) *Orifices.* All openings for dip tube gauging devices, try-cock lines, and pressure gauges must be restricted at or inside the jacket by orifices no larger than 0.060-inch in diameter. Any opening for dip tube gauging devices and try-cock lines must be plugged at or inside the jacket.

§ 178.338–15 Cleanliness.

(a) A tank constructed for oxygen service must be thoroughly cleaned to remove all foreign material:

(1) All loose particles from fabrication such as weld beads, dirt, grinding wheel debris, and other loose contaminants must be removed prior to final closure of the manway; and

(2) Chemical or solvent cleaning with a compatible material must be performed to remove any contaminants likely to react with the lading.

§ 178.338–16 Inspection and testing.

(a) *General.* Inspection of materials of construction of a tank, its appurtenances, and the jacket if evacuated, must be in compliance with the requirements of the ASME Code. The liquid container must be subjected to either a hydrostatic or a pneumatic test in accordance with the following:

(1) *Hydrostatic test.* The hydrostatic test pressure must be one and one-half

times the sum of the design pressure plus static head of lading plus 15 p.s.i. if subjected to external vacuum, except that for tanks constructed in accordance with Part UHT of the ASME Code the original test pressure must be at least twice the calculated test pressure.

(2) *Pneumatic test.* The pneumatic test may be used in place of the hydrostatic test, for vessels that are so designed or supported that they cannot safely be filled with water, or for vessels, not readily dried, that are to be used in services where traces of the testing liquid cannot be tolerated and the parts of which have, where possible, been previously tested by hydrostatic pressure.

(i) The pneumatic test presure must be one and one-half times the sum of the design pressure plus static head of lading plus 15 p.s.i. if subjected to external vacuum. The pneumatic test pressure in the vessel must be reached by gradually increasing the pressure to one-half of the test pressure. Thereafter, the test pressure must be increased in steps of approximately one-tenth of the test pressure until the required test pressure has been reached. Then the pressure must be reduced to a value equal to 4/5 of the test pressure and held for a sufficient time to permit inspection of the vessel.

(b) *Weld Inspection.* On each tank over 3,500 gallons water capacity, unless fully radiographed, an examination must be made of all welds in or on the shell and heads, both inside and outside, by either the wet fluorescent magnetic particle method or the fluorescent dye penetrant method, as prescribed in Appendices VI or VIII of the ASME Code, respectively, or by the ultrasonic examination method as prescribed in Appendix U of the ASME Code. Permanent magnets must not be used to perform the magnetic particle inspection.

(1) A tank which has been subjected to examination by the magnetic particle method, the liquid penetrant method, or any method involving a material deposit on the interior tank surface must not be used for oxygen service.

(c) *Repair.* All cracks and other defects found must be repaired in accordance with the repair procedures prescribed by the ASME Code. The welder and the welding must be qualified in accordance with the ASME Code. If any cutting is done by means other than mechanical, the cutter, the welder, and the combination of cutting and welding shall be so qualified. After repairing, the tanks must then again be post-weld heat-treated, if such heat treatment was previously performed, and the repaired areas must again be tested.

(d) A verification must be made of the cleanliness of a cargo tank constructed for oxygen service by means that assure that all contaminants that are likely to react with the lading have been removed by the cleaning process required in § 178.338–15.

§ 178.338–17 Pumps.

See §§ 173.33(g) and 173.316(a) (1) (iv) of this subchapter.

§ 178.338–18 Marking.

(a) Each tank must have a non-corrosive metal plate permanently affixed by brazing or welding around its perimeter, on the right side near the front. If this plate is attached by welding, it must be welded before the tank is post-weld heat treated. The plate must be plainly marked by stamping, embossing, or other means of forming letters into the metal of the plate, with the following information in addition to that required by the ASME Code appropriately completed, in characters at least 3/8-inch high to indicate the following:

Maximum density of lading for which the tank is designed;
Material specification number;
Water capacity in pounds net at 60°F., after deduction for structural members, baffles, piping, and other appurtenances inside the tank; and
Original test date. Markings may be abbreviated as follows:
Max. dens. of lading:
Mat. Spec. no.:
W. Cap.:
Orig. test date:

(b) An additional plate, as specified in paragraph (a) of this section, must be attached by welding, brazing, or riveting to the jacket in the location specified in paragraph (a) of this section or at the control station in a position to be readily legible to operating personnel. On it must be stamped the information specified in paragraph (a) of this section, and in addition, appropriately completed, the following, in characters at least 1/4-inch high:

DOT MC 338
Vehicle manufacturer_____
Manufacturer's vehicle serial no_____
Lining material (*if any*)_____
Date of manufacture_____
Certificate date_____
Design service temperature (*see § 178.338–1 (b) (2)*) _____

"INSULATION FOR OXYGEN SERVICE" (*if appropriate. See § 178.338–1(c) (2)*)
or
"NOT AUTHORIZED FOR OXYGEN SERVICE" (*if appropriate. See § 178.338–16(b)*)
Rated holding time ____ hrs. (*name of cryogenic*)
"FLAMMABLE LADINGS AUTHORIZED" (*if appropriate. See § 178.338–1(e)*)
Maximum weight of lading for which designed ____ lbs.

(c) The design weight of lading used in determining the loadings in §§ 178.338–3(b), 178.338–10(b) and (c), 178.338–13(b) and (e) must be shown as the maximum weight of lading marking required by paragraph (b) of this subsection.

(d) The jacket must be plainly marked on the right side near the front, in letters at least two inches high on a contrasting background "One-way Travel Time ___ hrs", with the blank filled in according to the results of the computation prescribed in § 178.338–9(c) or § 177.840(i) of this subchapter.

§ 178.338–19 Certification.

(a) For each tank vehicle there must be prepared, and the owner shall obtain, the tank manufacturer's data report required by the ASME Code and one or more certificates stating that the completed tank vehicle is in complete compliance in all respects with specification MC 338 including the ASME Code. The first of such certificates for one tank vehicle may if desired refer to an incomplete tank vehicle, in which case supplemental certificates as necessary must be added to the first certificate until complete compliance is indicated. The certificate or 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 a responsible official of the firm responsible for the portion of the complete tank vehicle represented thereby, such as basic tank fabrication, insulation and jacket, piping, etc.

(b) The owner shall retain the copy of the data report, certificates, and related papers in his files throughout his ownership of the tank and for at least one year thereafter; and in the event of change in ownership, retention by the prior owner of non-fading photographically reproduced copies will be deemed to satisfy this requirement. Each motor carrier using the tank vehicle, if not the owner thereof, shall obtain a copy of the data report and the certificate or certificates and retain them in his files during the time he uses the tank and for at least one year thereafter.

PART 179—SPECIFICATIONS FOR TANK CARS

1. In § 179.102, § 179.102–4 would be amended; § 179.102–18 would be added to read as follows:

§ 179.102 Special commodity requirements for pressure tank car tanks.

§ 179.102–4 Vinyl fluoride, inhibited.

(a) Tank cars used to transport vinyl fluoride, inhibited, must comply with the following special requirements:

(1) Each tank must comply with specification DOT–105A600W and must be designed for loading at or below 0 degrees F.

(2) All plates for the tank, manway nozzle, and anchor must be made of steel complying with ASTM Specification A516–70a, Grade 70, ASTM Specification A537–70, Grade B, or AAR Specification TC128–70, Grade B and further meeting the requirements of ASTM Specification A300–68, Class 1. However, impact specimens must be Type A Charpy V-notch as shown in ASTM Specification A–370–68 and must meet the impact requirements at or below minus 50° F. Production welded test plates prepared as required by W4.00 of AAR Specifications for Tank Cars, Appendix W, must include impact test specimens of weld metal and heat affected zone, prepared and tested in accordance with W9.00 of AAR Specifications for Tank Cars, Appendix W, and these must meet the same impact requirements as the plate material at or below minus 50° F.

(3) Insulation must be of approved material and must be self-extinguishing.

(4) Tank must be equipped with one safety relief valve, set for the start-to-discharge pressure listed in § 179.101, and one safety vent of approved design, set to function at a pressure less than the tank test pressure, and not less than 78 percent of the tank test pressure. The discharge capacity of each of these safety relief devices must be sufficient to prevent building up pressure in tank in excess of 82½ percent of the tank test pressure.

(5) Each safety relief device must have its discharge piped to the outside of the protective housing.

(6) Excess flow valves must be applied under all liquid and vapor valves, except safety relief valves.

(7) Thermometer well must be applied.

(8) Gauging device is not required but may be applied. Fixed length dip tubes may be used for gauging.

(9) A pressure gauge must be applied.

(10) Aluminum, copper, silver, zinc, or any alloy of any of these metals shall not be used in the tank construction, or fittings in contact with the lading.

(11) The jacket must be stenciled adjacent to the water capacity stencil "COLDEST LADING TEMPERATURE ____°F.

(12) The tank car and insulation must be designed to prevent the lading from increasing from the maximum allowable shipping pressure to the start-to-discharge pressure of the safety relief valve within 30 days at an ambient temperature of 90° F.

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§ 179.102–18 Hydrogen chloride, cryogenic liquid.

(a) Tank cars used to transport hydrogen chloride, cryogenic liquid must comply with the following special requirements:

(1) Each tank car tank must comply with Specification DOT–105A600W and be designed for loading at or below minus 50° F.

(2) All plates for the tank car tank, manway nozzle, and anchor must be made of steel complying with ASTM Specification A516–70a, Grade 70; ASTM Specification A537–70, Grade B, or AAR Specification TC128–70, Grade B and further meeting the requirements of ASTM Specification A300–68, Class I. However, impact specimens must be Type A Charpy V-notch as shown in ASTM Specification A370–68 and must meet the impact requirements at or below minus 50°F. Production welded test plates prepared as required by W4.00 of AAR Specification for Tank Cars, Appendix W, must include impact test specimens of weld metal and heat affected zone, prepared and tested in accordance with W9.00 of AAR Specifications for Tank Cars, Appendix W, and these must meet the same impact requirements as the plate material at or below minus 50°F.

(3) Tank car tanks may be equipped with exterior cooling coils on top of the tank car shell.

(4) Safety relief valves must be monel trimmed and must be equipped with frangible disc of silver, or teflon coated monel or tantalum. Discharge must be piped to outside of the protective housing.

(5) Loading and unloading valves must be Hastelloy B or C or monel trim, identified as "Vapor" or "Liquid." Excess flow valves must be applied under all liquid and vapor valves, except safety relief valves.

(6) Thermometer well must be applied.

(7) Sump in the bottom of the tank under liquid pipes must be applied.

(8) All gaskets must be teflon, teflon jacketed, or of other approved material.

(9) Gauging device is not required but may be applied. Fixed length dip tubes may be used for gauging.

(10) Insulation must be of approved material and must be self-extinguishing.

(11) The jacket must be stenciled adjacent to the water capacity stencil "COLDEST LADING TEMPERATURE ____°F."

(12) The tank car and insulation must be designed to prevent the lading from increasing from the maximum allowable shipping pressure to the start-to-discharge pressure of the safety relief valve within 30 days at an ambient temperature of 90°F.

Interested persons are invited to give their views on these proposals. Communications should identify the docket number and be submitted in duplicate to the Secretary, Hazardous Materials Regulations Board, Department of Transportation, Washington, D.C. 20590. Communications received before June 18, 1974 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, room 6215 Buzzards Point Building, Second and V Streets, S.W., Washington, D.C. both before and after closing date for comments.

(Transportation of Explosives Act (18 U.S.C. 831–835); section 6, Department of Transportation Act (49 U.S.C. 1655); Title VI and section 902(h), Federal Aviation Act of 1958 (49 U.S.C. 1421–1430, 1472(h), and 1655(c)).

Issued in Washington, D.C. on February 21, 1974.

W. J. BURNS,
Director,
Office of Hazardous Materials.

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National Highway Traffic Safety Administration

[49 CFR Part 571]

[Docket No. 74-9; Notice 1]

MOTOR VEHICLE SAFETY STANDARDS

Child Restraint Standard

This notice proposes to revise Motor Vehicle Safety Standard No. 213, "Child Seating Systems" (49 CFR 571.213). Standard No. 213 was published March 26, 1970 (35 FR 5120) and amended September 23, 1970 (35 FR 14778), April 10, 1971 (36 FR 6895), June 29, 1971 (36 FR 12224) and March 23, 1973 (38 FR 7562). The standard became effective on April 1, 1971.

The revised standard would apply to all devices manufactured for transporting children in motor vehicles. It would apply to all devices subject to the present standard and others, commonly referred to as car beds and infant carriers, that presently are not. It would also apply to Type 3 seat belt assemblies, commonly referred to as child harnesses, which are presently within the purview of Motor Vehicle Safety Standard No. 209 (49 CFR 571.209). That standard would be amended accordingly.

The proposed standard would substitute a series of requirements, including simulated dynamic crash tests, for the present static tests of Standard No. 213. Under the proposed requirements, all child restraint systems would be subject to dynamic tests, using test dummies specified in the standard, in frontal, lateral and rearward impact modes. The frontal impact would be at speeds simulating 30-mile-per-hour crashes. Lateral and rearward impacts would simulate 20-mile-per-hour crashes. When tested in this fashion, each child restraint would be required to retain the test dummy in the system and to suffer no loss of structural integrity. They would be further required to limit head motion, as determined by the use of the specified test dummies, in each directional mode.

The NHTSA recognizes that specifications for the 6-month-old dummy are not complete. Complete specifications are being developed at this time and will be issued as a proposal when they are complete. The preliminary specifications set forth in this notice are included to facilitate comments on the test procedures of the standard.

The NHTSA has tentatively determined that limitation of head motion so as to prevent impact with the vehicle interior, combined with padding requirements, is the most practicable method available for providing safety performance levels for children.

For child seats and harnesses, the dummy's head excursion would be limited to 18 inches, measured in the forward direction from the forwardmost point of the vehicle seat back. This requirement is intended to provide adequate clearance in most domestic vehicles. Purchasers would be advised on instruction sheets furnished with each restraint system to install the device in seating positions offering this amount of unobstructed space. The proposed rule would further limit head movement to 19 inches in each lateral direction and would require the head to be supported by the seat back in the rearward direction. Restraints recommended for use by children under 25 pounds would also be required to provide protection from excessive forward head motion. Recumbent position restraints would be required to limit forward head motion to within 18 inches of the forwardmost point of the vehicle seat back.