

(iii) The metal can must be securely closed. For liquids that are in Division 4.2 or 4.3, the metal can must be hermetically sealed. For Division 4.2 materials in Packing Group I, the metal can must be tested in accordance with part 178 of this subchapter at the Packing Group I performance level.

(iv) The metal can must be placed in a fiberboard box that is placed in a hermetically-sealed barrier bag which is impervious to the lading.

(v) The intermediate packaging must be placed inside a securely closed, outer packaging conforming to §173.201.

(vi) Not more than four intermediate packagings are permitted in an outer packaging.

(2) For solids:

(i) The hazardous material must be placed in a tightly closed glass, plastic or metal inner packaging. The net quantity of material in any inner packaging may not exceed 2.85 kg (6.25 pounds).

(ii) The inner packaging must be placed in a hermetically-sealed barrier bag which is impervious to the lading.

(iii) The barrier bag and its contents must be placed in a fiberboard box that is placed in a hermetically-sealed barrier bag which is impervious to the lading.

(iv) The intermediate packaging must be placed inside an outer packaging conforming to §173.211.

(v) Not more than four intermediate packagings are permitted in an outer packaging.

(d) The outside of the package must be marked, in association with the proper shipping name, with the statement: "This package conforms to 49 CFR 173.13."

## Subpart B — Preparation of Hazardous Materials for Transportation

### §173.21 Forbidden materials and packages.

Unless otherwise provided in this subchapter, the offering for transportation or transportation of the following is forbidden:

(a) Materials that are designated "Forbidden" in Column 3 of the §172.101 Table.

(b) Forbidden explosives as defined in §173.54 of this part.

(c) Electrical devices which are likely to create sparks or generate a dangerous quantity of heat, unless packaged in a manner which precludes such an occurrence.

(d) For carriage by aircraft, any package which has a magnetic field of more than 0.00525 gauss measured at 4.5 m (15 feet) from any surface of the package.

(e) A material in the same packaging, freight container, or overpack with another material, the mixing of which is likely to cause a dangerous evolution of heat, or flammable or poisonous gases or vapors, or to produce corrosive materials.

(f) A package containing a material which is likely to decompose with a self-accelerated decomposition temperature (SADT) of 50°C (122°F) or less, or polymerize at a temperature of 54°C (130°F) or less with an evolution of a dangerous quantity of heat or gas when decomposing or polymerizing, unless the material is stabilized or inhibited in a manner to preclude such evolution. The SADT may be determined by any of the test methods described in Part II of the UN Manual of Tests and Criteria.

(1) A package meeting the criteria of paragraph (f) of this section may be required to be shipped under controlled temperature conditions. The control temperature and emergency temperature for a package shall be as specified in the table in this paragraph based upon the SADT of the material. The control temperature is the temperature above which a package of the material may not be offered for transportation or transported. The emergency temperature is the temperature at which, due to imminent danger, emergency measures must be initiated.

#### Method of Determining Control and Emergency Temperature

SADT <sup>1</sup>	Control temperatures	Emergency temperature
SADT < 20°C (68°F)	20°C (36°F) below SADT	10°C (18°F) below SADT
20°C (68°F) < SADT < 35°C (95°F)	15°C (27°F) below SADT	10°C (18°F) below SADT
35°C (95°F) < SADT < 50°C (122°F)	10°C (18°F) below SADT	5°C (9°F) below SADT
50°C (122°F) < SADT	<sup>2</sup>	<sup>2</sup>

<sup>1</sup> Self-accelerating decomposition temperature.

<sup>2</sup> Temperature control not required.

(2) For self-reactive materials listed in §173.224(b) Table control and emergency temperatures, where required are shown in Columns 5 and 6, respectively. For organic peroxides listed in The Organic Peroxides Table in §173.225 control and emergency temperatures, where required, are shown in Columns 7a and 7b, respectively.

(3) Refrigeration may be used as a means of stabilization only when approved by the Associate Administrator for Hazardous Materials Safety. For status of approvals previously issued by the Bureau of Explosives, see §171.19 of this subchapter. Methods of stabilization approved by the Associate Administrator for Hazardous Materials Safety are as follows:

(i) For highway transportation:

(A) A material meeting the criteria of this paragraph (f) may be transported only in a transport vehicle, freight container, or motor vehicle equipped with a mechanical refrigeration unit, or loaded with a consumable refrigerant, capable of maintaining the inside temperature of the hazardous material at or below the control temperature required for the material during transportation.

(B) Each package containing a material meeting the criteria of this paragraph (f) must be loaded and maintained at or below the control temperature required for the material. The temperature of the material must be determined by appropriate means and entered on a written record at the time the packaging is loaded.

(C) The vehicle operator shall monitor the inside temperature of the transport vehicle, freight container, or motor vehicle and enter that temperature on a written record at the time the package is loaded and thereafter at intervals not exceeding two hours. Alternatively, a transport vehicle, freight container, or motor vehicle may be equipped with a visible or audible warning device that activates when the inside temperature of the transport vehicle, freight container, or motor vehicle exceeds the control temperature required for the material. The warning device must be readily visible or audible, as appropriate, from the vehicle operator's seat in the vehicle.

(D) The carrier shall advise the vehicle operator of the emergency temperature for the material, and provide the vehicle operator with written procedures that must be followed to assure maintenance of the control temperature inside the transport vehicle, freight container, or motor vehicle. The written procedures must include instructions for the vehicle operator on actions to take if the inside temperature exceeds the control temperature and approaches or reaches the emergency temperature for the material. In addition, the written temperature-control procedures must identify enroute points where the consumable refrigerant may be procured, or where repairs to, or replacement of, the mechanical refrigeration unit may be accomplished.

(E) The vehicle operator shall maintain the written temperature-control procedures, and the written record of temperature measurements specified in paragraph (f)(3)(i)(C) of this section, if applicable, in the same manner as specified in §177.817 of this subchapter for shipping papers.

(F) If the control temperature is maintained by use of a consumable refrigerant (e.g., dry ice or liquid nitrogen), the quantity of consumable refrigerant must be sufficient to maintain the control temperature for twice the average transit time under normal conditions of transportation.

(G) A material that has a control temperature of 40°C (104°F) or higher may be transported by common carrier. A material that has a control temperature below 40°C (104°F) must be transported by a private or contract carrier.

(ii) For transportation by vessel, shipments are authorized in accordance with the control-temperature requirements of Section 21 of the General Introduction of the International Maritime Dangerous Goods Code (IMDG Code).

(g) Packages which give off a flammable gas or vapor, released from a material not otherwise subject to this subchapter, likely to create a flammable mixture with air in a transport vehicle.

(h) Packages containing materials (other than those classed as explosive) which will detonate in a fire.

(1) For purposes of this paragraph, "detonate" means an explosion in which the shock wave travels through the material at a speed greater than the speed of sound.

(2) When tests are required to evaluate the performance of a package under the provisions of this paragraph, the testing must be done or approved by one of the agencies specified in §173.56.

(i) A package containing a cigarette lighter, or other similar device, equipped with an ignition element and containing fuel; except that a cigarette lighter or similar device subject to this paragraph may be shipped if the design of the device and its inner packaging has been examined by the Bureau of Explosives and specifically approved by the Associate Administrator for Hazardous Materials Safety. The examination of cigarette lighters and similar devices containing gaseous fuel will include scrutiny for compliance with §173.308 of this part.

For the status of approvals previously issued by the Bureau of Explosives, see §171.19 of this subchapter.

- (j) An organic peroxide of the “ketone peroxide” category which contains more than 9 percent available oxygen as calculated using the equation in §173.128(a)(4)(ii). The category, ketone peroxide, includes, but is not limited to:
- Acetyl acetone peroxide
  - Cyclohexanone peroxide(s)
  - Diacetone alcohol peroxides
  - Methylcyclohexanone peroxide(s)
  - Methyl ethyl ketone peroxide(s)
  - Methyl isobutyl ketone peroxide(s)

(k) Notwithstanding any other provision of this subchapter, including §§171.11 and 175.10(a)(2) of this subchapter, an oxygen generator (chemical) as cargo on a passenger-carrying aircraft. This prohibition does not apply to an oxygen generator for medical or personal use of a passenger that meets the requirements of §175.10(a)(7) or §175.10(a)(24) of this subchapter.

#### **§173.22 Shipper’s responsibility.**

(a) Except as otherwise provided in this part, a person may offer a hazardous material for transportation in a packaging or container required by this part only in accordance with the following:

(1) The person shall class and describe the hazardous material in accordance with Parts 172 and 173 of this subchapter, and

(2) The person shall determine that the packaging or container is an authorized packaging, including Part 173 requirements, and that it has been manufactured, assembled, and marked in accordance with:

- (i) Section 173.7(a) and Parts 173, 178, or 179 of this subchapter;
- (ii) A specification of the Department in effect at the date of manufacture of the packaging or container;
- (iii) National or international regulations based on the UN Recommendations on the Transport of Dangerous Goods, as authorized in §173.24(d)(2);
- (iv) An approval issued under this subchapter; or
- (v) An exemption issued under Subchapter B of this chapter.

(3) In making the determination under paragraph (a)(2) of this section, the person may accept:

(i) Except for the marking on the bottom of a metal or plastic drum with a capacity over 100 liters which has been reconditioned, remanufactured or otherwise converted, the manufacturer’s certification, specification, approval, or exemption marking (see §§178.2 and 179.1 of this subchapter); or

(ii) With respect to cargo tanks provided by a carrier, the manufacturer’s identification plate or a written certification of specification or exemption provided by the carrier.

(4) For a DOT specification or UN standard packaging subject to the requirements of part 178 of this subchapter, a person shall perform all functions necessary to bring that package into compliance with part 178 of this subchapter, as identified by the packaging manufacturer or subsequent distributor, in accordance with §178.2 of this subchapter.

(b) [Reserved]

(c) Prior to each shipment of fissile radioactive materials, and Type B or highway route controlled quantity packages of radioactive materials (see §173.403), the shipper shall notify the consignee of the dates of shipment and expected arrival. The shipper shall also notify each consignee of any special loading/unloading instructions prior to his first shipment. For any shipment of irradiated reactor fuel, the shipper shall provide physical protection in compliance with a plan established under:

- (1) Requirements prescribed by the U.S. Nuclear Regulatory Commission, or
- (2) Equivalent requirements approved by the Associate Administrator for Hazardous Materials Safety.

#### **§173.22a Use of packagings authorized under exemptions.**

(a) Except as provided in paragraph (b) of this section, no person may offer a hazardous material for transportation in a packaging the use of which is dependent upon an exemption issued under Subpart B of Part 107 of this title, unless that person is the holder of or a party to the exemption.

(b) If an exemption authorizes the use of a packaging for the shipment or transportation of a hazardous material by any person or class of persons other than or in addition to the holder of the exemption, that person or a member of that class of persons may use the packaging for the purposes authorized in the exemption subject to the terms specified therein. However, no person may use a packaging under the authority of this paragraph unless he maintains a copy of the exemption at each facility where the packaging is being used

in connection with the shipment or transportation of the hazardous material concerned. Copies of exemptions may be obtained from the Associate Administrator for Hazardous Materials Safety, U.S. Department of Transportation, Washington, DC 20590-0001, Attention: Docket Section.

(c) When an exemption issued to a person who offers a hazardous material contains requirements that apply to a carrier of the hazardous material, the offeror shall furnish a copy of the exemption to the carrier before or at the time a shipment is tendered.

#### **§173.23 Previously authorized packaging.**

(a) When the regulations specify a packaging with a specification marking prefix of “DOT,” a packaging marked prior to January 1, 1970, with the prefix of “ICC” may be used in its place if the packaging otherwise conforms to applicable specification requirements.

(b) [Reserved]

(c) After July 2, 1982, a seamless aluminum cylinder manufactured in conformance with and for use under DOT special permit (SP) or exemption (E) 6498, 7042, 8107, 8364 or 8422 may be continued in use if marked before or at the time of the next retest with either the specification identification “3AL” immediately above the special permit or exemption number, or the DOT mark (e.g., DOT 3AL 1800) in proximity to the special permit or exemption marking.

(d) Cylinders (spheres) manufactured and marked under DOT special permit (SP) or exemption (E) 6616 prior to January 1, 1983, may be continued in use if marked before or at the time of the next retest with the specification identification “4BA” near the special permit or exemption marking.

(e) After October 1, 1984, cylinders manufactured for use under special permit (SP) or exemption (E) 6668 or 8404 may be continued in use, and must be marked “DOT-4LXXXXYY” (XXX to be replaced by the service pressure, YY to be replaced by the letters “AL”, if applicable) in compliance with Specification 4L (§178.57 of this subchapter) on or before January 1, 1986. The “DOT-4LXXXXYY” must appear in proximity to other required special permit or exemption markings.

(f) An MC 331 cargo tank motor vehicle must conform to structural integrity requirements in §178.337-3 or to corresponding requirements in effect at the time of manufacture.

(g) A non-bulk packaging manufactured, tested, marked, and certified on or before September 30, 1996, in accordance with the applicable provisions of subparts L and M of part 178 of this subchapter in effect on September 30, 1995, may be used as authorized by this subchapter if the packaging conforms to all requirements applicable at the time of manufacture. In addition, such a packaging may be reused as authorized by §173.28 without a nominal thickness marking, if it conforms to the minimum thickness criteria prescribed in §173.28(b)(4).

#### **§173.24 General requirements for packaging and packages.**

(a) *Applicability.* Except as otherwise provided in this subchapter, the provisions of this section apply to —

- (1) Bulk and non-bulk packagings;
- (2) New packagings and packagings which are reused; and
- (3) Specification and non-specification packagings.

(b) Each package used for the shipment of hazardous materials under this subchapter shall be designed, constructed, maintained, filled, its contents so limited, and closed, so that under conditions normally incident to transportation —

(1) Except as otherwise provided in this subchapter, there will be no identifiable (without the use of instruments) release of hazardous materials to the environment;

(2) The effectiveness of the packaging will not be significantly reduced; for example, impact resistance, strength, packaging compatibility, etc. must be maintained for the minimum and maximum temperatures encountered during transportation.

(3) There will be no mixture of gases or vapors in the package which could, through any credible spontaneous increase of heat or pressure, significantly reduce the effectiveness of the packaging.

(c) *Authorized packagings.* A packaging is authorized for a hazardous material only if —

(1) The packaging is prescribed or permitted for the hazardous material in a packaging section specified for that material in Column 8 of the §172.101

Table and conforms to applicable requirements in the special provisions of Column 7 of the §172.101 Table and, for specification packagings (but not including UN standard packagings manufactured outside the United States), the specification requirements in Parts 178 and 179 of this subchapter; or

(2) The packaging is permitted under, and conforms to, provisions contained in §§171.11, 171.12, 171.12a, 173.3, 173.4, 173.5, 173.7, 173.27, or 176.11 of this subchapter.

(d) *Specification packagings and UN standard packagings manufactured outside the U.S.* —

(1) *Specification packagings.* A specification packaging, including a UN standard packaging manufactured in the United States, must conform in all details to the applicable specification or standard in part 178 or part 179 of this subchapter.

(2) *UN standard packagings manufactured outside the United States.* A UN standard packaging manufactured outside the United States, in accordance with national or international regulations based on the UN Recommendations on the Transport of Dangerous Goods, may be imported and used and is considered to be an authorized packaging under the provisions of paragraph (c)(1) of this section, subject to the following conditions and limitations:

(i) The packaging fully conforms to applicable provisions in the UN Recommendations on the Transport of Dangerous Goods and the requirements of this subpart, including reuse provisions;

(ii) The packaging is capable of passing the prescribed tests in part 178 of this subchapter applicable to that standard; and

(iii) The competent authority of the country of manufacture provides reciprocal treatment for UN standard packagings manufactured in the U.S.

(e) *Compatibility.*

(1) Even though certain packagings are specified in this part, it is, nevertheless, the responsibility of the person offering a hazardous material for transportation to ensure that such packagings are compatible with their lading. This particularly applies to corrosivity, permeability, softening, premature aging and embrittlement.

(2) Packaging materials and contents must be such that there will be no significant chemical or galvanic reaction between the materials and contents of the package.

(3) *Plastic packagings and receptacles.*

(i) Plastic used in packagings and receptacles must be of type compatible with the lading and may not be permeable to an extent that a hazardous condition is likely to occur during transportation, handling or refilling.

(ii) Each plastic packaging or receptacle which is used for liquid hazardous materials must be capable of withstanding without failure the procedure specified in Appendix B of this part ("Procedure for Testing Chemical Compatibility and Rate of Permeation in Plastic Packagings and Receptacles"). The procedure specified in appendix B of this part must be performed on each plastic packaging or receptacle used for Packing Group I materials. The maximum rate of permeation of hazardous lading through or into the plastic packaging or receptacles may not exceed 0.5 percent for materials meeting the definition of Division 6.1 material according to §173.132 and 2.0 percent for other hazardous materials, when subjected to a temperature no lower than —

(A) 18°C (64°F) for 180 days in accordance with Test Method 1 in Appendix B of this part;

(B) 50°C (122°F) for 28 days in accordance with Test Method 2 in Appendix B of this part; or

(C) 60°C (140°F) for 14 days in accordance with Test Method 3 in Appendix B of this part.

(iii) Alternative procedures or rates of permeation are permitted if they yield a level of safety equivalent to or greater than that provided by paragraph (e)(3)(ii) of this section and are specifically approved by the Associate Administrator for Hazardous Materials Safety.

(4) *Mixed contents.* Hazardous materials may not be packed or mixed together in the same outer packagings with other hazardous or nonhazardous materials if such materials are capable of reacting dangerously with each other and causing —

(i) Combustion or dangerous evolution of heat;

(ii) Evolution of flammable, poisonous, or asphyxiant gases; or

(iii) Formation of unstable or corrosive materials.

(5) Packagings used for solids, which may become liquid at temperatures likely to be encountered during transportation, must be capable of containing the hazardous material in the liquid state.

(f) *Closures.*

(1) Closures on packagings shall be so designed and closed that under conditions (including the effects of temperature and vibration) normally incident to transportation —

(i) Except as provided in paragraph (g) this section, there is no identifiable release of hazardous materials to the environment from the opening to which the closure is applied; and

(ii) The closure is secure and leakproof.

(2) Except as otherwise provided in this subchapter, a closure (including gaskets or other closure components, if any) used on a specification packaging must conform to all applicable requirements of the specification.

(g) *Venting.* Venting of packagings, to reduce internal pressure which may develop by the evolution of gas from the contents, is permitted only when —

(1) Transportation by aircraft is not involved;

(2) Except as otherwise provided in this subchapter, the evolved gases are not poisonous, likely to create a flammable mixture with air or be an asphyxiant under normal conditions of transportation;

(3) The packaging is designed so as to preclude an unintentional release of hazardous materials from the receptacle; and

(4) For shipments in bulk packagings, venting is authorized for the specific hazardous material by a special provision in the §172.101 Table or by the applicable bulk packaging specification in Part 178 of this subchapter.

(h) *Outage and filling limits—*

(1) *General.* When filling packagings and receptacles for liquids, sufficient ullage (outage) must be left to ensure that leakage nor permanent distortion of the packaging or receptacle will occur as a result of an expansion of the liquid caused by temperatures likely to be encountered during transportation. Requirements for outage and filling limits for non-bulk and bulk packagings are specified in §§173.24a(d) and 173.24b(a), respectively.

(2) *Compressed gases and cryogenic liquids.* Filling limits for compressed gases and cryogenic liquids are specified in §§173.301 through 173.306 for cylinders and §§173.314 through 173.319 for bulk packagings.

(i) *Air transportation.* Packages offered or intended for transportation by aircraft must conform to the general requirements for transportation by aircraft in §173.27, except as provided in §171.11 of this subchapter.

#### **§173.24a Additional general requirements for non-bulk packagings and packages.**

(a) *Packaging design.* Except as provided in §172.312 of this subchapter:

(1) *Inner packaging closures.* A combination packaging containing liquid hazardous materials must be packed so that closures on inner packagings are upright.

(2) *Friction.* The nature and thickness of the outer packaging must be such that friction during transportation is not likely to generate an amount of heat sufficient to alter dangerously the chemical stability of the contents.

(3) *Securing and cushioning.* Inner packagings of combination packagings must be so packed, secured and cushioned to prevent their breakage or leakage and to control their movement within the outer packaging under conditions normally incident to transportation. Cushioning material must not be capable of reacting dangerously with the contents of the inner packagings or having its protective properties significantly weakened in the event of leakage.

(4) *Metallic devices.* Nails, staples and other metallic devices shall not protrude into the interior of the outer packaging in such a manner as to be likely to damage inner packagings or receptacles.

(5) *Vibration.* Each non-bulk package must be capable of withstanding, without rupture or leakage, the vibration test procedure specified in §178.608 of this subchapter.

(b) *Non-bulk packaging filling limits.*

(1) A single or composite non-bulk packaging may be filled with a liquid hazardous material only when the specific gravity of the material does not exceed that marked on the packaging, or a specific gravity of 1.2 if not marked, except as follows:

(i) A Packing Group I packaging may be used for a Packing Group II material with a specific gravity not exceeding the greater of 1.8, or 1.5 times the specific gravity marked on the packaging, provided all the performance criteria can still be met with the higher specific gravity material;

(ii) A Packing Group I packaging may be used for a Packing Group III material with a specific gravity not exceeding the greater of 2.7, or 2.25 times the specific gravity marked on the packaging, provided all the performance criteria can still be met with the higher specific gravity material; and

(iii) A Packing Group II packaging may be used for a Packing Group III material with a specific gravity not exceeding the greater of 1.8, or 1.5 times the specific gravity marked on the packaging, provided all the performance criteria can still be met with the higher specific gravity material.

(2) Except as otherwise provided in this section, a non-bulk packaging may not be filled with a hazardous material to a gross mass greater than the maximum gross mass marked on the packaging.

(3) A single or composite non-bulk packaging which is tested and marked for liquid hazardous materials may be filled with a solid hazardous material to a gross mass, in kilograms, not exceeding the rated capacity of the packaging in liters, multiplied by the specific gravity marked on the packaging, or 1.2 if not marked. In addition:

(i) A single or composite non-bulk packaging which is tested and marked for Packing Group I liquid hazardous materials may be filled with a solid Packing Group II hazardous material to a gross mass, in kilograms, not exceeding the rated capacity of the packaging in liters, multiplied by 1.5, multiplied by the specific gravity marked on the packaging, or 1.2 if not marked.

(ii) A single or composite non-bulk packaging which is tested and marked for Packing Group I liquid hazardous materials may be filled with a solid Packing Group III hazardous material to a gross mass, in kilograms, not exceeding the rated capacity of the packaging in liters, multiplied by 2.25, multiplied by the specific gravity marked on the packaging, or 1.2 if not marked.

(iii) A single or composite non-bulk packaging which is tested and marked for Packing Group II liquid hazardous materials may be filled with a solid Packing Group III hazardous material to a gross mass, in kilograms, not exceeding the rated capacity of the packaging in liters, multiplied by 1.5, multiplied by the specific gravity marked on the packaging, or 1.2 if not marked.

(4) Packagings tested as prescribed in §178.605 of this subchapter and marked with the hydrostatic test pressure as prescribed in §178.503(a)(5) of this subchapter may be used for liquids only when the vapor pressure of the liquid conforms to one of the following:

(i) The vapor pressure must be such that the total pressure in the packaging (i.e., the vapor pressure of the liquid plus the partial pressure of air or other inert gases, less 100 kPa (15 psi) at 55°C (131°F), determined on the basis of a maximum degree of filling in accordance with paragraph (d) of this section and a filling temperature of 15°C (59°F)), will not exceed two-thirds of the marked test pressure;

(ii) The vapor pressure at 50°C (122°F) must be less than four-sevenths of the sum of the marked test pressure plus 100 kPa (15 psi); or

(iii) The vapor pressure at 55°C (131°F) must be less than two-thirds of the sum of the marked test pressure plus 100 kPa (15 psi).

(5) No hazardous material may remain on the outside of a package after filling.

**(c) Mixed contents.**

(1) An outer non-bulk packaging may contain more than one hazardous material only when —

(i) The inner and outer packagings used for each hazardous material conform to the relevant packaging sections of this part applicable to that hazardous material;

(ii) The package as prepared for shipment meets the performance tests prescribed in Part 178 of this subchapter for the packing group indicating the highest order of hazard for the hazardous materials contained in the package;

(iii) Corrosive materials (except ORM-D) in bottles are further packed in securely closed inner receptacles before packing in outer packagings; and

(iv) For transportation by aircraft, the total net quantity does not exceed the lowest permitted maximum net quantity per package as shown in Column 9a or 9b, as appropriate, of the §172.101 Table. The permitted maximum net quantity must be calculated in kilograms if a package contains both a liquid and a solid.

(2) A packaging containing inner packagings of Division 6.2 materials may not contain other hazardous materials, except dry ice.

(d) Liquids must not completely fill a receptacle at a temperature of 55°C (131°F) or less.

**§173.24b Additional general requirements for bulk packagings.**

**(a) Outage and filling limits.**

(1) Except as otherwise provided in this subchapter, liquids and liquefied gases must be so loaded that the outage is at least five percent for materials poisonous by inhalation, or at least one percent for all other materials, of the total capacity of a cargo tank, portable tank, tank car (including dome capacity), multi-unit tank car tank, or any compartment thereof, at the following reference temperatures —

(i) 46°C (115°F) for a noninsulated tank;

(ii) 43°C (110°F) for a tank car having a thermal protection system, incorporating a metal jacket that provides an overall thermal conductance at 15.5°C (60°F) of no more than 10.22 kilojoules per hour per square meter per degree Celsius (0.5 Btu per hour per square foot per degree F) temperature differential; or

(iii) 41°C (105°F) for an insulated tank.

(2) Hazardous materials may not be loaded into the dome of a tank car. If the dome of the tank car does not provide sufficient outage, vacant space must be left in the shell to provide the required outage.

(b) *Equivalent steel.* For the purposes of this section, the reference stainless steel is stainless steel with a guaranteed minimum tensile strength of 51.7 deka newtons per square millimeter (75,000 psi) and a guaranteed elongation of 40 percent or greater. Where the regulations permit steel other than stainless steel to be used in place of a specified stainless steel (for example, as in §172.102 of this subchapter, special provision B30), the minimum thickness for the steel must be obtained from one of the following formulas, as appropriate:

*Formula for metric units:*

$$e_1 = (12.74e_0) / (Rm_1 A_1)^{1/3}$$

*Formula for non-metric units:*

$$e_1 = (144.2e_0) / (Rm_1 A_1)^{1/3}$$

where:

$e_0$  = Required thickness of the reference stainless steel in millimeters or inches respectively;

$e_1$  = Equivalent thickness of the steel used in millimeters or inches respectively;

$Rm_1$  = Specified minimum tensile strength of the steel used in deka-newtons per square millimeter or pounds per square inch respectively; and

$A_1$  = Specified minimum percentage elongation of the steel used multiplied by 100 (for example, 20 percent times 100 equals 20). Elongation values used must be determined from a 50 mm or 2 inch test specimen.

(c) Air pressure in excess of ambient atmospheric pressure may not be used to load or unload any lading which may create an air-enriched mixture within the flammability range of the lading in the vapor space of the tank.

(d) A bulk packaging may not be loaded with a hazardous material that:

(1) Is at a temperature outside of the packaging's design temperature range; or

(2) Except as otherwise provided in this subchapter, exceeds the maximum weight of lading marked on the specification plate.

**§173.25 Authorized packages and overpacks.**

(a) Authorized packages containing hazardous materials may be offered for transportation in an overpack as defined in §171.8 of this subchapter, if all of the following conditions are met:

(1) The package meets the requirements of §§173.21 and 173.24 of this subchapter.

(2) The overpack is marked with the proper shipping name and identification number, and labeled as required by this subchapter for each hazardous material contained therein unless markings and labels representative of each hazardous material in the overpack are visible.

(3) Each package subject to the orientation marking requirements of §172.312 of this subchapter is packed in the overpack with its filling holes up and the overpack is marked with package orientation marking arrows on two opposite vertical sides of the overpack with the arrows pointing in the correct direction of orientation.

(4) The overpack is marked with a statement indicating that the inside (inner) packages comply with prescribed specifications when specification packagings are required, unless specification markings on the inside packages are visible.

(5) Packages containing Class 8 (corrosive) materials in Packing Group I or Division 5.1 (oxidizing) materials in Packing Group I may not be overpacked with any other materials.

(b) Shrink-wrapped or stretch-wrapped trays may be used as outer packagings for inner packagings prepared in accordance with the limited quantity provisions or consumer commodity provisions of this subchapter, provided that the complete package is capable of meeting performance standards at the Packing Group III performance level. Each package may not exceed 20 kg (44 lbs) gross weight.

(c) Hazardous materials which are required to be labeled POISON may be transported in the same motor vehicle with material that is marked or known to be foodstuffs, feed or any edible material intended for consumption by humans or animals provided the hazardous material is marked, labeled, and packaged in accordance with this subchapter, conforms to the requirements of paragraph (a) of this section and is overpacked as specified in §177.841(e) of this subchapter or in an overpack which is a UN 1A2, 1B2, or 1N2 drum tested and marked for a Packing Group II or higher performance level.

### §173.26 Quantity limitations.

When quantity limitations do not appear in the packaging requirements of this subchapter, the permitted gross weight or capacity authorized for a packaging is as shown in the packaging specification or standard in Part 178 or 179, as applicable, of this subchapter.

### §173.27 General requirements for transportation by aircraft.

(a) The requirements of this section are in addition to the requirements in §173.24 and apply to packages offered or intended for transportation aboard aircraft. Notwithstanding any Packing Group III performance level specified in Column 5 of the §172.101 Table, the required performance level for packages containing Class 4, 5, or 8 materials, when offered or intended for transportation aboard aircraft, is at the Packing Group II performance level, unless otherwise excepted from performance requirements in Subpart E of this part.

#### (b) Packages authorized on board aircraft.

(1) When Column 9a of the §172.101 Table indicates that a material is “Forbidden”, that material may not be offered for transportation or transported aboard passenger-carrying aircraft.

(2) When Column 9b of the §172.101 Table indicates that a material is “Forbidden”, that material may not be offered for transportation or transported aboard aircraft.

(3) The maximum quantity of hazardous material in a package that may be offered for transportation or transported aboard a passenger-carrying aircraft or cargo aircraft may not exceed that quantity prescribed for the material in Column 9a or 9b, respectively, of the §172.101 Table.

(4) A package containing a hazardous material which is authorized aboard cargo aircraft but not aboard passenger aircraft must be labeled with the CARGO AIRCRAFT ONLY label required by §172.402(b) of this subchapter and may not be offered for transportation or transported aboard passenger-carrying aircraft.

#### (c) Pressure requirements.

(1) Packagings must be designed and constructed to prevent leakage that may be caused by changes in altitude and temperature during transportation aboard aircraft.

(2) Packagings for which retention of liquid is a basic function must be capable of withstanding without leakage the greater of —

(i) An internal pressure which produces a gauge pressure of not less than 75 kPa (11 psi) for liquids in Packing Group III of Class 3 or Division 6.1. or 95 kPa (14 psi) for other liquids; or

(ii) A pressure related to the vapor pressure of the liquid to be conveyed, determined by one of the following:

(A) The total gauge pressure measured in the receptacle (i.e., the vapor pressure of the material and the partial pressure of air or other inert gases, less 100 kPa (15 psi)) at 55°C (131°F), multiplied by a safety factor of 1.5; determined on the basis of a filling temperature of 15°C (59°F) and a degree of filling such that the receptacle is not completely liquid full at a temperature of 55°C (131°F) or less;

(B) 1.75 times the vapor pressure at 50°C (122°F) less 100 kPa (15 psi); or

(C) 1.5 times the vapor pressure at 55°C (131°F) less 100 kPa (15 psi).

(3) Notwithstanding the provisions of paragraph (c)(2) of this section —

(i) Hazardous materials may be contained in an inner packaging which does not itself meet the pressure requirement provided that the inner packaging is packed within a supplementary packaging which does meet the pressure requirement and other applicable packaging requirements of this subchapter.

(ii) Packagings which are subject to the hydrostatic pressure test and parking requirements of §§178.605 and 178.503(a)(5), respectively, of this subchapter must have a marked test pressure of not less than 250 kPa (36 psi) for liquids in Packing Group I, 80 kPa (12 psi) for liquids in Packing Group III of Class 3 or Division 6.1, and 100 kPa (15 psi) for other liquids.

(d) *Closures.* Stoppers, corks or other such friction-type closures must be held securely, tightly and effectively in place by positive means. Each screw-type closure on any packaging must be secured to prevent closure from loosening due to vibration or substantial change in temperature.

(e) *Absorbent materials.* Except as otherwise provided in this subchapter, liquids in Packing Group I or II of Class 3, 4, 5, 6, or 8, when in glass or earthenware inner packagings, must be packaged using material capable of absorbing and not likely to react dangerously with the liquid. Absorbent material is not required if the inner packagings are so protected that breakage of them and leakage of their contents from the outer packaging is not likely to occur under normal conditions of transportation and is not required for packagings containing liquids in Packing Group II for transport aboard cargo aircraft only. Where absorbent material is required and an outer packaging is not liquid-tight, a means of containing the liquid in the event of leakage must be used in the

form of a leakproof liner, plastic bag or other equally efficient means of containment. Where absorbent material is required, the quantity and disposition of it in each outer packaging must be as follows:

(1) For packagings containing liquids in Packing Group I offered for transportation or transported aboard passenger-carrying aircraft, each packaging must contain sufficient absorbent material to absorb the contents of all inner packagings containing such liquids;

(2) For packagings containing liquids in Packing Group I offered for transportation or transported aboard cargo aircraft only and packagings containing liquids in Packing Group II offered for transportation or transported aboard passenger aircraft, each package must contain sufficient absorbent material to absorb the contents of any one of the inner packagings containing such liquids and, where they are of different sizes and quantities, sufficient absorbent material to absorb the contents of the inner packaging containing the greatest quantity of liquid.

(f) *Combination packagings.* Unless otherwise specified in this part, or in §171.11 of this subchapter, when combination packagings are offered for transportation aboard aircraft, inner packagings must conform to the quantity limitations set forth in Table 1 of this paragraph for transport aboard passenger-carrying aircraft and Table 2 of this paragraph for transport aboard cargo aircraft only, as follows:

**Table 1—Maximum Net Capacity of Inner Packaging for Transportation on Passenger-Carrying Aircraft**

Maximum net quantity per package from Column 9a of the §172.101 Table	Maximum authorized net capacity of each inner packaging	
	Glass, earthenware or fiber inner packagings	Metal or plastic inner packagings
Liquids:		
Not greater than 0.5L	0.5L	0.5L
Greater than 0.5L, not greater than 1L	0.5L	1L
Greater than 1L, not greater than 5L	1L	5L
Greater than 5L, not greater than 60L	2.5L	10L
Greater than 60L, not greater than 220L	5L	25L
Greater than 220L	No limit	No limit
Solids:		
Not greater than 5 kg	0.5 kg	1 kg
Greater than 5 kg, not greater than 25 kg	1 kg	2.5 kg
Greater than 25 kg, not greater than 200 kg	5 kg	10 kg
Greater than 200 kg	No limit	No limit

**Table 2 — Maximum Net Capacity of Inner Packaging for Transportation on Cargo Aircraft**

Maximum net quantity per package from Column 9a of the §172.101 Table	Maximum authorized net capacity of each inner packaging	
	Glass, earthenware or fiber inner packagings	Metal or plastic inner packagings
Liquids:		
Not greater than 2.5L	1L	1L
Greater than 2.5L, not greater than 30L	2.5L	2.5L
Greater than 30L, not greater than 60L	5L	10L
Greater than 60L, not greater than 220L	5L	25L
Greater than 220L	No limit	No limit
Solids:		
Not greater than 15 kg	1 kg	2.5 kg
Greater than 15 kg, not greater than 50 kg	2.5 kg	5 kg
Greater than 50 kg, not greater than 200 kg	5 kg	10 kg
Greater than 200 kg	No limit	No limit

(g) *Cylinders*. For any cylinder containing hazardous materials and incorporating valves, sufficient protection must be provided to prevent operation of, and damage to, the valves during transportation, by one of the following methods:

- (1) By equipping each cylinder with securely attached valve caps or protective headrings; or
- (2) By boxing or crating the cylinder.

(h) *Tank cars and cargo tanks*. Any tank car or cargo tank containing a hazardous material may not be transported aboard aircraft.

#### §173.28 Reuse, reconditioning and remanufacture of packagings.

(a) *General*. Packagings and receptacles used more than once must be in such condition, including closure devices and cushioning materials, that they conform in all respects to the prescribed requirements of this subchapter. Before reuse, each packaging must be inspected and may not be reused unless free from incompatible residue, rupture, or other damage which reduces its structural integrity.

(b) *Reuse of non-bulk packaging*. A non-bulk packaging used more than once must conform to the following provisions and limitations:

(1) A non-bulk packaging which, upon inspection, shows evidence of a reduction in integrity may not be reused unless it is reconditioned in accordance with paragraph (c) of this section.

(2) Before reuse, packagings subject to the leakproofness test with air prescribed in §178.604 of this subchapter shall be —

(i) Retested without failure in accordance with §178.604 of this subchapter using an internal air pressure (gauge) of at least 48 kPa (7.0 psi) for Packing Group I and 20 kPa (3.0 psi) for Packing Group II and Packing Group III; and

(ii) Marked with the letter “L”, with the name and address or symbol of the person conducting the test, and the last two digits of the year the test was conducted. Symbols, if used, must be registered with the Associate Administrator for Hazardous Materials Safety.

(3) Packagings made of paper, plastic film, or textile are not authorized for reuse;

(4) Metal and plastic drums and jerricans used as single packagings or the outer packagings of composite packagings are authorized for reuse only when they are marked in a permanent manner (e.g., embossed) in millimeters with the nominal (for metal packagings) or minimum (for plastic packagings) thickness of the packaging material, as required by §178.503(a)(9) of this subchapter, and —

(i) Except as provided in paragraph (b)(4)(ii) of this section, conform to the following minimum thickness criteria:

Maximum capacity not over	Minimum thickness of packaging material	
	Metal drum or jerrican	Plastic drum or jerrican
20 L	0.63 mm (0.025 inch)	1.1 mm (0.043 inch)
30 L	0.73 mm (0.029 inch)	1.1 mm (0.043 inch)
40 L	0.73 mm (0.029 inch)	1.8 mm (0.071 inch)
60 L	0.92 mm (0.036 inch)	1.8 mm (0.071 inch)
120 L	0.92 mm (0.036 inch)	2.2 mm (0.087 inch)
220 L	0.92 mm (0.036 inch) <sup>1</sup>	2.2 mm (0.087 inch)
450 L	1.77 mm (0.070 inch)	5.0 mm (0.197 inch)

<sup>1</sup> Metal drums or jerricans with a minimum thickness of 0.82 mm body and 1.09 mm heads which are manufactured and marked prior to January 1, 1997 may be reused. Metal drums or jerricans manufactured and marked on or after January 1, 1997, and intended for reuse, must be constructed with a minimum thickness of 0.82 mm body and 1.11 mm heads.

(ii) For stainless steel drums and jerricans, conform to a minimum wall thickness as determined by the following equivalence formula:

*Formula for Metric Units*

$$e_1 = \frac{21.4 \times e_0}{\sqrt[3]{Rm_1 \times A_1}}$$

*Formula for U.S. Standard Units*

$$e_1 = \frac{21.4 \times e_0}{\sqrt[3]{(Rm_1 \times A_1) / 145}}$$

where:

$e_1$  = required equivalent wall thickness of the metal to be used (in mm or, for U.S. Standard units, use inches).

$e_0$  = required minimum wall thickness for the reference steel (in mm or, for U.S. Standard units, use inches).

$Rm_1$  = guaranteed minimum tensile strength of the metal to be used (in N/mm<sup>2</sup> or for U.S. Standard units, use pounds per square inch).

$A_1$  = guaranteed minimum elongation (as a percentage) of the metal to be used on fracture under tensile stress (see paragraph (c)(1) of this section).

(5) Plastic inner receptacles of composite packagings must have a minimum thickness of 1.0 mm (0.039 inch).

(6) A previously used non-bulk packaging may be reused for the shipment of hazardous waste, not subject to the reconditioning and reuse provisions of this section, in accordance with §173.12(c).

(7) Notwithstanding the provisions of paragraph (b)(2) of this section, a packaging otherwise authorized for reuse may be reused without being leak-proofness tested with air provided the packaging —

- (i) Is refilled with a material which is compatible with the previous lading;
- (ii) Is refilled and offered for transportation by the original filler;
- (iii) Is transported in a transport vehicle or freight container under the exclusive use of the refiller of the packaging; and
- (iv) Is constructed of —

(A) stainless steel, monel or nickel with a thickness not less than one and one-half times the minimum thickness prescribed in paragraph (b)(4) of this section;

(B) plastic, provided the packaging is not refilled for reuse on a date more than five years from the date of manufacture marked on the packaging in accordance with §178.503(a)(6) of this subchapter; or

(C) another material or thickness when approved under the conditions established by the Associate Administrator for Hazardous Materials Safety for reuse without retesting.

(c) *Reconditioning of non-bulk packaging*.

(1) For the purpose of this subchapter, reconditioning of metal drums is:

(i) Cleaning to base material of construction, with all former contents, internal and external corrosion, and any external coating and labels removed;

(ii) Restoring to original shape and contour, with chimes (if any) straightened and sealed, and all non-integral gaskets replaced; and

(iii) Inspecting after cleaning but before painting, packagings that have visible pitting, significant reduction in material thickness, metal fatigue, damaged threads or closures, or other significant defects, must be rejected.

(2) For the purpose of this subchapter, reconditioning of a non-bulk packaging other than a metal drum or a UN 1H1 plastic drum is restoring the packaging by repair, or replacement of non-integral packaging components (such as removable gaskets, closure devices, cushioning material, etc.) to a condition such that it conforms in all respects with the prescribed requirements of this subchapter. For a UN 1H1 plastic drum, replacing a removable gasket or closure device with a replacement of the same design and material which provides equivalent performance does not constitute reconditioning. Packagings which have significant defects which cannot be repaired may not be reused.

(3) A person who reconditions a packaging manufactured and marked under the provisions of Subpart L of Part 178 of this subchapter, shall mark that packaging as required by §178.503(c) and (d) of this subchapter. The marking is the certification of the reconditioner that the packaging conforms to the standard for which it is marked and that all functions performed by the reconditioner which are prescribed by this subchapter have been performed in compliance with this subchapter.

(4) The markings applied by the reconditioner may be different from those applied by the manufacturer at the time of original manufacture, but may not identify a greater performance capability than that for which the original design type had been tested (for example, the reconditioner may mark a drum which was originally marked as 1A1/Y1.8 as 1A1/Y1.2 or 1A1/Z2.0).

(d) *Remanufacture of non-bulk packagings*. For the purpose of this subchapter, remanufacture is the conversion of a non-specification, non-bulk packaging to a DOT specification or U.N. standard, the conversion of a packaging meeting one specification or standard to another specification or standard (for example, conversion of 1A1 non-removable head drums to 1A2 removable head drums) or the replacement of integral structural packaging components (such as non-removable heads on drums). A person who remanufactures a non-bulk packaging to conform to a specification or standard in Part 178 of this subchapter is subject to the requirements of Part 178 of this subchapter as a manufacturer.

(e) *Non-reusable containers*. A packaging marked as NRC according to the DOT specification or UN standard requirements of part 178 of this subchapter may be reused for the shipment of any material not required by this subchapter to be shipped in a DOT specification or UN standard packaging.

### §173.29 Empty packagings.

(a) *General.* Except as otherwise provided in this section, an empty packaging containing only the residue of a hazardous material shall be offered for transportation and transported in the same manner as when it previously contained a greater quantity of that hazardous material.

(b) Notwithstanding the requirements of paragraph (a) of this section, an empty packaging is not subject to any other requirements of this subchapter if it conforms to the following provisions:

(1) Any hazardous material shipping name and identification number markings, any hazard warning labels or placards, and any other markings indicating that the material is hazardous (e.g., RQ, INHALATION HAZARD) are removed, obliterated, or securely covered in transportation. This provision does not apply to transportation in a transport vehicle or a freight container if the packaging is not visible in transportation and the packaging is loaded by the shipper and unloaded by the shipper or consignee;

(2) The packaging —

(i) Is unused;

(ii) Is sufficiently cleaned of residue and purged of vapors to remove any potential hazard;

(iii) Is refilled with a material which is not hazardous to such an extent that any residue remaining in the packaging no longer poses a hazard; or

(iv) Contains only the residue of —

(A) An ORM-D material; or

(B) A non-flammable gas with no subsidiary hazard at an absolute pressure less than 276 kPa (40 psia); at 21°C (70°F); and

(3) Any material contained in the packaging does not meet the definitions in §171.8 of this subchapter for a hazardous substance, a hazardous waste, or a marine pollutant.

(c) A non-bulk packaging containing only the residue of a hazardous material covered by Table 2 of §172.504 of this subchapter —

(1) Does not have to be included in determining the applicability of the placarding requirements of Subpart F of Part 172 of this subchapter; and

(2) Is not subject to the shipping paper requirements of this subchapter when collected and transported by a contract or private carrier for reconditioning, remanufacture or reuse.

(d) Notwithstanding the stowage requirements in Column 10a of the §172.101 Table for transportation by vessel, an empty drum or cylinder may be stowed on deck or under deck.

(e) Specific provisions for describing an empty packaging on a shipping paper appear in §172.203(e) of this subchapter.

(f) [Reserved]

(g) A package which contains a residue of an elevated temperature material may remain marked in the same manner as when it contained a greater quantity of the material even though it no longer meets the definition in §171.8 of this subchapter for an elevated temperature material.

### §173.30 Loading and unloading of transport vehicles.

A person who loads or unloads hazardous materials into or from a transport vehicle or vessel shall comply with the applicable loading and unloading requirements of Parts 174, 175, 176, and 177 of this subchapter.

### §173.31 Use of tank cars.

(a) *General.*

(1) No person may offer a hazardous material for transportation in a tank car unless the tank car meets the applicable specification and packaging requirements of this subchapter or, when this subchapter authorizes the use of a non-DOT specification tank car, the applicable specification to which the tank was constructed.

(2) Tank cars and appurtenances may be used for the transportation of any commodity for which they are authorized in this part and specified on the certificate of construction (AAR Form 4-2 or by addendum on Form R-1). See §179.5 of this subchapter. Transfer of a tank car from one specified service on its certificate of construction to another may be made only by the owner or with the owner's authorization. A tank car proposed for a commodity service other than specified on its certificate of construction must be approved for such service by the AAR's Tank Car Committee.

(3) No person may fill a tank car overdue for periodic inspection with a hazardous material and then offer it for transportation. Any tank car marked as meeting a DOT specification and any non-specification tank car transporting a hazardous material must have a periodic inspection and test conforming to Subpart F of Part 180 of this subchapter.

(4) No railroad tank car, regardless of its construction date, may be used for the transportation in commerce of any hazardous material unless the air brake equipment support attachments of such tank car conform to the standards for attachments set forth in §§179.100-16 and 179.200-19 of this subchapter.

(5) No railroad tank car, regardless of its construction date, may be used for the transportation in commerce of any hazardous material with a self-energized manway located below the liquid level of the lading.

(6) Unless otherwise specifically provided in this part:

(i) When the tank car delimiter is an "A," offerors may also use tank cars with a delimiter "S," "J" or "T".

(ii) When the tank car delimiter is an "S," offerors may also use tank cars with a delimiter "J" or "T".

(iii) When a tank car delimiter is a "T" offerors may also use tank cars with a delimiter of "J".

(iv) When a tank car delimiter is a "J", offerors may not use a tank car with any other delimiter.

(b) *Safety systems —*

(1) *Coupler vertical restraint.* Each tank car conforming to a DOT specification and any other tank car used for transportation of a hazardous material must be equipped with a coupler vertical restraint system that meets the requirements of §179.14 of this subchapter.

(2) *Pressure relief devices.*

(i) Pressure relief devices on tank cars must conform to Part 179 of this subchapter.

(ii) Except for shipments of chloroprene, inhibited, in class DOT 115 tank cars, single-unit tank cars used for materials meeting the definition for Division 6.1 liquid, Packing Group I or II, Class 2 materials, or Class 3 or 4 liquids, must have self-closing pressure relief devices. However, a tank car built before January 1, 1991, and equipped with a non-closing pressure relief device may be used to transport a Division 6.1 or Class 4 liquid if the liquid is not poisonous by inhalation. Unless otherwise specifically provided in this subchapter, frangible discs may not have breather holes.

(3) *Tank-head puncture-resistance requirements.* The following tank cars must have a tank-head puncture-resistance system that conforms to the requirements in §179.16 of this subchapter, or to the corresponding requirements in effect at the time of installation:

(i) Tank cars transporting a Class 2 material.

(ii) Tank cars constructed from aluminum or nickel plate that are used to transport hazardous material.

(iii) Except as provided in paragraph (b)(3)(iv) of this section, those tank cars specified in paragraphs (b)(3)(i) and (ii) of this section not requiring a tank-head puncture resistance system prior to July 1, 1996, must have a tank-head puncture resistance system installed no later than July 1, 2006.

(iv) Class DOT 105A tank cars built prior to September 1, 1981, having a tank capacity less than 70 kl (18,500 gallons), and used to transport a Division 2.1 (flammable gas) material, must have a tank-head puncture-resistant system installed no later than July 1, 2001.

(4) *Thermal protection requirements.* The following tank cars must have thermal protection that conforms to the requirements of §179.18 of this subchapter:

(i) Tank cars transporting a Class 2 material, except for a class 106, 107A, 110, and 113 tank car. A tank car equipped with a thermal protection system conforming to §179.18 of this subchapter, or that has an insulation system having an overall thermal conductance of no more than 0.613 kilojoules per hour, per square meter, per degree Celsius temperature differential (0.03 B.t.u. per square foot, per hour, per degree Fahrenheit temperature differential), conforms to this requirement.

(ii) A tank car transporting a Class 2 material that was not required to have thermal protection prior to July 1, 1996, must be equipped with thermal protection no later than July 1, 2006.

(5) *Bottom-discontinuity protection requirements.* No person may offer for transportation a hazardous material in a tank car with bottom discontinuity protection unless the tank car has bottom-discontinuity protection that conforms to the requirements of E9.00 and E10.00 of the AAR Specifications for Tank Cars. Tank cars not requiring bottom-discontinuity protection under the terms of Appendix Y of the AAR Specifications for Tank Cars as of July 1, 1996, must conform to these requirements no later than July 1, 2006. Tank cars modified before July 1, 1996, may conform to the bottom-discontinuity protection requirements of Appendix Y of the 1992 edition of the AAR Specifications for Tank Cars.

(6) *Scheduling of modifications and progress reporting.* The date of conformance for the continued use of tank cars subject to paragraphs (b)(3), (b)(4), (b)(5), (e)(2), and (f) of this section and §§173.314(j) and 173.323(c)(1) is subject to the following conditions and limitations.

(i) Each tank car owner shall modify, reassign, retire, or remove at least 50 percent of their in-service tank car fleet within the first half of the compliance period and the remainder of their in-service tank car fleet during the second half of the compliance period.

(ii) By October 1 of each year, each owner of a tank car subject to this paragraph (b)(6) shall submit to the Hazardous Materials Division (RRS-12), Office of Safety Assurance and Compliance, Federal Railroad Administration, 400 7th Street, SW., Washington, DC 20590-0001, a progress report that shows the total number of in-service tank cars that need head protection, thermal protection, or bottom-discontinuity protection; the number of new or different tank cars acquired to replace those tank cars required to be upgraded to a higher service pressure; and the total number of tank cars modified, reassigned, acquired, retired, or removed from service the previous year.

(c) *Tank car test pressure.* A tank car used for the transportation of a hazardous material must have a tank test pressure equal to or greater than the greatest of the following:

(1) Except for shipments of carbon dioxide, anhydrous hydrogen chloride, vinyl fluoride, ethylene, or hydrogen, 133 percent of the sum of lading vapor pressure at the reference temperature of 46°C (115°F) for non-insulated tank cars or 41°C (105°F) for insulated tank cars plus static head, plus gas padding pressure in the vacant space of a tank car;

(2) 133 percent of the maximum loading or unloading pressure, whichever is greater;

(3) 20.7 Bar (300 psi) for materials that are poisonous by inhalation (see §173.31(e)(2)(ii) for compliance dates);

(4) The minimum pressure prescribed by the specification in Part 179 of this subchapter; or

(5) The minimum test pressure prescribed for the specific hazardous material in the applicable packaging section in Subpart F or G of this Part.

(d) *Examination before shipping.*

(1) No person may offer for transportation a tank car containing a hazardous material or a residue of a hazardous material unless that person determines that the tank car is in proper condition and safe for transportation. As a minimum, each person offering a tank car for transportation must perform an external visual inspection that includes:

(i) Except where insulation or a thermal protection system precludes an inspection, the tank shell and heads for abrasion, corrosion, cracks, dents, distortions, defects in welds, or any other condition that makes the tank car unsafe for transportation;

(ii) The piping, valves, fittings, and gaskets for corrosion, damage, or any other condition that makes the tank car unsafe for transportation;

(iii) For missing or loose bolts, nuts, or elements that make the tank car unsafe for transportation; (iv) All closures on tank cars and determine that the closures and all fastenings securing them are properly tightened in place by the use of a bar, wrench, or other suitable tool;

(v) Protective housings for proper securement;

(vi) The pressure relief device, including a careful inspection of the frangible disc in non-closing pressure relief devices, for corrosion or damage that may alter the intended operation of the device;

(vii) Each tell-tale indicator after filling and prior to transportation to ensure the integrity of the rupture disc;

(viii) The external thermal protection system, tank-head puncture resistance system, coupler vertical restraint system, and bottom discontinuity protection for conditions that make the tank car unsafe for transportation.

(ix) The required markings on the tank car for legibility; and

(x) The periodic inspection date markings to ensure that the inspection and test intervals are within the prescribed intervals.

(2) Closures on tank cars are required, in accordance with this subchapter, to be designed and closed so that under conditions normally incident to transportation, including the effects of temperature and vibration, there will be no identifiable release of a hazardous material to the environment. In any action brought to enforce this section, the lack of securement of any closure to a tool-tight condition, detected at any point, will establish a rebuttable presumption that a proper inspection was not performed by the offeror of the car. That presumption may be rebutted by any evidence indicating that the lack of securement resulted from a specific cause not within the control of the offeror.

(e) *Special requirements for materials poisonous by inhalation —*

(1) *Interior heater coils.* Tank cars used for materials poisonous by inhalation may not have interior heater coils.

(2) *Tank car specifications.* A tank car used for a material poisonous by inhalation must have a tank test pressure of 20.7 Bar (300 psi) or greater, head protection, and a metal jacket (e.g., DOT 105S300W), except that —

(i) A higher test pressure is required if otherwise specified in this subchapter; and

(ii) Other than as provided in paragraph (b)(6) of this section, a tank car which does not conform to the requirements of this paragraph (e)(2), and was authorized for the material poisonous by inhalation under the regulations in effect on June 30, 1996, may continue in use until July 1, 2006.

(f) *Special requirements for hazardous substances.*

(1) A tank car used for a hazardous substance listed in paragraph (f)(2) of this section must have a tank test pressure of at least 13.8 Bar (200 psi), head protection and a metal jacket, except that —

(i) No metal jacket is required if —

(A) The tank test pressure is 23.4 Bar (340 psi) or higher; or

(B) The tank shell and heads are manufactured from AAR steel specification TC-128, normalized;

(ii) A higher test pressure is required if otherwise specified in this subchapter; and

(iii) Other than as provided in paragraph (b)(6) of this section, a tank car which does not conform to the requirements of this paragraph (f)(1), and was authorized for a hazardous substance under the regulations in effect on June 30, 1996, may continue in use until July 1, 2006.

(2) *List of hazardous substances.* Hazardous substances for which the provisions of this paragraph (f) apply are as follows:

Aldrin  
Allyl chloride  
alpha-BHC  
beta-BHC  
delta-BHC  
gamma-BHC  
Bis(2-chloroethyl) ether  
Bromoform  
Carbon tetrachloride  
Chlordane  
p-Chloroaniline  
Chlorobenzene  
Chlorobenzilate  
p-Chloro-m-cresol  
2-Chloroethyl vinyl ether  
Chloroform  
2-Chloronaphthalene  
o-Chlorophenol  
3-Chloropropionitrile  
DDE  
DDT  
1,2-Dibromo-3-chloropropane  
m-Dichlorobenzene  
o-Dichlorobenzene  
p-Dichlorobenzene  
3,3'-Dichlorobenzidine  
1,4-Dichloro-2-butene  
1,1-Dichloroethane  
1,2-Dichloroethane  
1,1-Dichloroethylene  
Dichloroisopropyl ether  
Dichloromethane  
2,4-Dichlorophenol  
2,6-Dichlorophenol  
1,2-Dichloropropane  
1,3-Dichloropropene  
Dieldrin  
alpha-Endosulfan  
beta-Endosulfan  
Endrin  
Endrin aldehyde  
Heptachlor  
Heptachlor epoxide  
Hexachlorobenzene  
Hexachlorobutadiene  
Hexachloroethane  
Hexachlorophene  
Hexachloropropene  
Isodrin  
Kepone  
Methoxychlor  
4,4'-Methylenebis(2-chloroaniline)  
Methylene bromide  
Pentachlorobenzene  
Pentachloroethane



Pentachloronitrobenzene (PCNB)  
 Pentachlorophenol  
 Polychlorinated biphenyls (PCBs)  
 Pronamide  
 Silvex (2,4,5-TP)  
 2,4,5-T  
 TDE  
 1,2,4,5-Tetrachlorobenzene  
 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)  
 Tetrachloroethane  
 Tetrachloroethylene  
 2,3,4,6-Tetrachlorophenol  
 Toxaphene  
 1,2,4-Trichlorobenzene  
 1,1,1-Trichloroethane  
 1,1,2-Trichloroethane  
 Trichloroethylene  
 2,4,5-Trichlorophenol  
 2,4,6-Trichlorophenol  
 Tris(2,3-dibromopropyl) phosphate

### §173.32 Qualification, maintenance and use of portable tanks other than Specification IM portable tanks.

(a) Except as otherwise provided in this section, each portable tank used for the transportation of hazardous materials must conform to the requirements of the specification and regulations for the transportation of the particular commodity. Except for Specification 56 and 57 portable tanks, a manufacturer's data report of the portable tank must be procured and retained in the files of the owner during the time that such portable tank is used for such service.

(1) When a portable tank container is used as a cargo tank container, it shall conform to all the requirements prescribed for cargo tank containers. (See §173.33)

(2) [Reserved]

(3) Each uninsulated portable tank used for the transportation of compressed gases, as defined in §173.115, must have an exterior surface finish conforming to §178.245-1(c) of this subchapter.

(4) No portable tank or specification 106A or 110A tank containing a hazardous material may be offered for transportation aboard a passenger vessel unless:

(i) The vessel is operating under a change to its character of vessel certification as defined in §171.8 of this subchapter; and

(ii) The material is permitted to be transported aboard a passenger vessel in §172.101 of this subchapter.

(5) Where IM-101 and IM-102 portable tanks are prescribed, Specification 51 portable tanks otherwise conforming to the special commodity requirements of §172.102(c)(7) of this subchapter may be used.

(6) A DOT 51 portable tank may be used where DOT 56 or DOT 57 type portable tanks or DOT 30 portable tanks are authorized. A DOT 60 portable tank may be used where DOT 56 or DOT 57 type portable tanks are authorized. A higher integrity tank used instead of a specified portable tank must meet the same design profile; e.g., a DOT 51 portable tank must be lined if used instead of a lined DOT 60 portable tank.

(b) Any portable tank container constructed prior to May 15, 1950, complying with the requirements of either the A.S.M.E. Code for Unfired Pressure Vessels, 1946 Edition, or the A.P.I.-A.S.M.E. Code for Unfired Pressure Vessels, 1943 Edition, may be used for the transportation of liquefied compressed gas, provided it fulfills all the requirements of this part and specifications for the particular gas or gases to be transported therein and shall be marked "ICC Specification 51X" on the plate required by the specification, except as modified by any or all of the following:

(1) Tanks designed and constructed in accordance with Pars. U-68, U-69, or U-201 of the A.S.M.E. Code may be used. Tanks designed and constructed in accordance with Par. U-68 or U-69 may be re-rated at a working pressure 25 percent in excess of the design pressure for which the tank was originally constructed. If advantage is taken of the increased rating, the re-rated pressure shall be marked on the plate as follows:

Re-rated working pressure — psig

**Note 1:** For purposes of setting safety relief valves, pressure control valves and establishing retest pressure, and for purposes of establishing maximum and minimum design pressures, the re-rated working pressure shall be considered as the equivalent of the design pressure as defined in the specification.

(2) Loading and unloading accessories, valves, piping, fittings, safety and gauging devices, do not have to comply with the requirements for the particular location on the tank.

(3) Specification requirements as to stress-relieving and radiographing are waived.

(c) Any portable tank container of ICC Specification 50<sup>1</sup> fulfilling the requirements of that specification may be continued in service for transportation of a liquefied petroleum gas if it is retested every five years in accordance with the requirements of paragraphs (e)(3) and (4) of this section: *Provided*, That it is in and can be maintained in safe operating condition for the transportation of that gas. In this case the container may retain its original markings.

(d) *Use of Specification 52, 53, 56 and 57 portable tanks.* Continued use of an existing portable tank constructed to DOT Specification 52 or 53 is authorized only for a tank constructed before June 1, 1972. Continued use of an existing portable tank constructed to DOT Specification 56 or 57 is authorized only for a tank constructed before October 1, 1996. A stainless steel portable tank internally lined with polyethylene, which was constructed on or before October 1, 1996, and complies with all requirements of Specification 57 except that it is equipped with a polypropylene discharge ball valve and polypropylene secondary discharge opening closure, may be marked as a Specification 57 portable tank and used in accordance with the provisions of this section.

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

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

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

(ii) Specifications 52, 53, 56 and 57 portable tanks (§§178.251, 178.252, 178.253 of this subchapter): At least once every 2.5 years.

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

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

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

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

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

(iii) *Rejection criteria.* A tank fails to meet the requirements of the pressure test if, during the test, there is permanent distortion of the tank exceeding that permitted by the applicable specification, if there is any leakage, or if any deficiencies described in paragraph (e)(2)(ii) of this section are found. Any tank that fails must be rejected and may not be used again for the transportation of a hazardous material unless the tank is adequately repaired and thereafter a successful test is conducted in accordance with the requirements of this paragraph.

<sup>1</sup> Use of existing portable tanks authorized, but new construction not authorized.

(3) *Marking.* The date of the most recent periodic retest must be marked on the tank, on or near the metal certification plate. Marking must be in accordance with §178.3 of this subchapter.

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

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

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

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

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

(j) The Department may require the testing under prescribed conditions of any tank when probable cause appears for suspecting that such tank is in unsafe operating condition.

(k) The repair of tanks is authorized, provided such repairs are made under requirements prescribed in the "Code" for the original design and construction.

(1) In addition to any other provisions of the specification, no tank shall be repaired, or remodeled, as to cause leakage or cracks or likelihood of leakage or cracks, by areas of stress concentration due to shrinkage of cooling metal in welding operations, sharp fillets, reversal of stresses, or otherwise.

(2) No field welding shall be done except to non-pressure parts.

(l) The bursting strength of any piping and fittings shall be not less than four times the design pressure of the tank, and not less than four times that pressure to which, in any instance, it may be subjected in service by the action of a pump or other device (not including safety relief valves) the action of which may be to subject certain portions of the tank piping to pressures greater than the design pressure of the tank.

(1) Pipe joints shall be threaded, welded or flanged. If threaded pipe is used, the pipe and pipe fittings must not be lighter than (Schedule 80) weight. Nonmalleable metals must not be used in the construction of valves or fittings. Where copper tubing is permitted, joints must be brazed or be of equally strong metal union type. The melting point of brazing material may not be lower than 1000°F. The method of joining tubing must not decrease the strength of the tubing such as by the cutting of threads.

(2) Fittings shall be extra heavy. Non-malleable metals shall not be employed in the construction of valves or fittings.

(3) Suitable provision shall be made in every case to allow for expansion contraction, jarring and vibration of all pipe. Slip joints shall not be used for this purpose.

(4) Piping and fittings shall be grouped in the smallest practicable space and shall be protected from damage as required by the specification.

(5) All piping, valves and fittings on every tank shall be leakage tested with gas or air after installation and proved tight at not less than the design pressure of the tank on which they are used. In the event of replacement, all such piping, valves, or fittings so replaced shall be tested in accordance with the requirements of this section before the tank is returned to transportation service. The requirements of this section shall apply with equal force to all hose used on such tanks, except that such hose may be so tested either before or after installation on the tank.

(m) All materials of construction used in portable tank containers and their appurtenances shall not be subject to destructive attack by the contents of the tank.

(1) All parts of tanks and appurtenances for anhydrous ammonia shall be steel. No copper, silver, zinc, nor their alloys shall be permitted. Brazed joints shall not be permitted.

(n) Each outlet of portable tanks used for the transportation of liquefied compressed gases, except carbon dioxide, shall be provided with a suitable automatic excess-flow valve. These valves shall be located inside the tank or at a point outside the tank where the line enters or leaves the tank. The valve seat shall be located inside the tank or shall be located within a welded flange or its companion flange, or within a nozzle or within a coupling. The installation shall be made in such a manner as reasonably to assure that any undue strain which causes failure requiring functioning of the valve shall cause failure in such a manner that it will not impair the operation of the valve.

**Exception.** Safety device connections and liquid level gauging devices which are so constructed that the outward flow of tank contents shall not exceed that passed by a No. 54 drill size opening are not required to be equipped with excess-flow valves.

(1) Excess-flow valves shall close automatically at the rated flows of gas or liquid as specified by the valve manufacturer. The connections or lines on each side of the excess-flow valve, including valves, fittings, etc., shall have a greater capacity than the rated flow of the excess-flow valve.

(2) Excess-flow valves may be designed with a by-pass, not to exceed a No. 60 drill size opening, to allow equalization of pressures.

(3) Filling and discharge lines shall be provided with manually operated shut-off valves located as close to the tank as is practicable. The use of so-called "Stop-Check" valves to satisfy with one valve the requirements of this paragraph and of paragraph (n) of this section, is forbidden.

(o) Each tank for carbon dioxide and nitrous oxide shall be lagged with a suitable insulation material of such thickness that the overall thermal conductance is not more than 0.08 Btu per square foot per degree F differential in temperature per hour. The conductance shall be determined at 60°F. Insulation material used on tanks for nitrous oxide shall be noncombustible.

(p) A refrigerating and/or heating coil or coils may be installed in tanks for carbon dioxide and nitrous oxide. Such coils must be tested externally to at least the same pressure as the test pressure of the tank. The coils must also be tested internally to at least twice the working pressure of the heating or refrigerating system to be used but in no case less than the test pressure of the tank. Such coils shall be securely anchored. The refrigerant or heating medium to be circulated through the coil or coils must be such as to cause no adverse chemical reaction with the tank or tank contents in case of leakage.

(q) *Maximum Lading Pressure.* Prior to filling and offering a portable tank for transportation, the person must confirm that the portable tank conforms to the specification required for the lading and that the maximum allowable working pressure (MAWP) of the portable tank is greater than or equal to the largest pressure obtained under the following conditions:

(1) For compressed gases and certain refrigerated liquids that are not cryogenic liquids, the pressure prescribed in §173.315 of this subchapter.

(2) For liquid hazardous materials not covered in paragraph (q)(1) of this section, the sum of the vapor pressure of the lading at 46°C (115°F), plus the tank static head exerted by the lading, plus any pressure exerted by the gas padding, including air in the ullage space.

(3) The pressure prescribed in Subpart B, D, E, F, G or H of this part, as applicable.

(4) The maximum pressure used to load or unload the lading.

(r) Unless otherwise specified, where a portable tank is authorized, minimum tank design pressure is 172 kPa (25 psig) for any Packing Group I or Packing Group II liquid lading that meets more than one hazard class definition.

(s) Any DOT specification portable tank manufactured prior to January 1, 1992 that is equipped with a non-reclosable pressure relief device can continue in service for the commodities for which it is authorized. Except for DOT Specification 56 and 57 portable tanks, any DOT specification portable tank manufactured after January 1, 1992 used for materials meeting the definition for Division 6.1 liquids, Packing Group I or II, Class 2 gases, or Class 3 or 4 liquids, must be equipped with a reclosing pressure relief valve having adequately-sized venting capacity.

(t) *Exemption portable tanks based on DOT 51 portable tanks.*

(1) The owner of a portable tank constructed in accordance with and used under an exemption issued prior to August 31, 1996, that was in conformance with the requirements for Specification DOT 51 portable tanks with the exception of the location of fill and discharge outlets, shall examine the portable tank and its design to determine if it meets the new outlet requirements contained in §178.245-1(d) of this subchapter. If the owner determines that the portable tank is in compliance with all the requirements of §178.245 of this subchapter, the exemption number stenciled on the portable tank shall be removed and the specification plate (or a plate placed adjacent to the specification plate) shall be durably marked "DOT 51—E\*\*\*\*\*" (where \*\*\*\*\* is to be replaced by the exemption number).

(2) During the period the portable tank is in service, and for one year thereafter, the owner of the portable tank must retain on file at its principal place of business a copy of the last exemption in effect.

#### **§173.32a Approval of Specification IM portable tanks.**

(a) *Application for approval.*

(1) An owner or manufacturer of an IM portable tank (§§178.270 through 178.272 of this subchapter) shall apply for approval to any approval agency designated to approve that tank in accordance with the procedures in Subpart E, Part 107 of this chapter.

(2) Each application for approval must contain the following information:

(i) Three complete copies of all engineering drawings, calculations, and test data necessary to insure that the design complies with the relevant specification.

(ii) The manufacturer's serial number that will be assigned to each portable tank.

(iii) A statement as to whether the design type has been examined by any approval agency previously and judged unacceptable. Affirmative statements must be documented with the name of the approving agency, reason for nonacceptance, and the nature of modifications made to the design type.

(b) *Action by approval agency.* The approval agency shall:

(1) Review the application for approval to determine whether it is complete and conforms with the requirements of paragraph (a) of this section. If an application is incomplete, it will be returned to the applicant and the applicant will be informed in what respects the application is incomplete.

(2) Review all drawings and calculations to ensure that the design is in compliance with all requirements of the relevant specification. If the application is approved, one set of the approved drawings, calculations, and test data shall be returned to the applicant. The second and third (inspector's copy) sets of approved drawings calculations, and test data shall be retained by the approval agency.

(3) Witness all tests required in §178.270-13 of this subchapter.

(4) Ensure, through appropriate inspection that each IM portable tank is fabricated in all respects in conformance with the approved drawings, calculations, and test data, and

(5) Upon successful completion of all requirements of this subpart, the approval agency shall:

(i) Apply its name, identifying mark or identifying number, and the date upon which the approval was issued to the metal identification plate required by §178.270-14 of this subchapter.

(ii) Issue an approval certificate for each IM portable tank or, in the case of a series of identical tanks manufactured to a single design, for the series of IM portable tanks. The approval certificate must include all the information required to be displayed on the required metal identification plate.

(c) *Disposition of approval certificates.* A copy of each approval certificate must be retained by the approval agency and by the owner of each IM portable tank.

(d) *Denial of application for approval.* If an approval agency finds that an IM portable tank cannot be approved for any reason, it shall so notify the applicant in writing and shall provide the applicant with the reasons for which the approval is denied. An applicant aggrieved by a decision of an approval agency may appeal the decision in writing within 90 days of receipt to the Associate Administrator for Hazardous Materials Safety.

(e) [Reserved]

(f) *Approval of other existing IM portable tanks.* Portable tanks constructed on or before May 1, 1981, that have not operated under a DOT exemption must be approved in accordance with the provisions of paragraph (b) of this section.

(g) *Modifications to approved portable tanks.*

(1) Prior to modification of any approved portable tank which may affect conformance to §178.271 or §178.272 of this subchapter, the owner or manufacturer desiring to make such modification shall inform the approval agency that

issued the initial approval of the portable tank (or if unavailable another approval agency) of the nature of the modification and request approval of the modification. The owner or manufacturer shall supply the approval agency with three sets of all revised drawings, calculations, and test data relative to the intended modification.

(2) A statement as to whether the intended modification has been examined by any approval agency previously and judged unacceptable. An affirmative statement must be documented with the name of the approving agency, the reason for nonacceptance, and the nature of changes made to the modification since its original rejection.

(3) The approval agency shall review the request for modification, and if it is determined that the proposed modification is in full compliance with the relevant DOT specification the request shall be approved and the approval agency shall:

(i) Return one set of the approved revised drawings, calculations, and test data to the applicant. The second and third sets of the approved revised drawings, calculations, and test data shall be retained by the approval agency as required in §107.404(a)(3) of this chapter.

(ii) Ensure through appropriate inspection, that all modifications conform to the revised drawings, calculations, and test data.

(iii) Determine the extent to which retesting of the modified tank is necessary based on the nature of the proposed modification, and ensure that all required retests are performed in accordance with §178.270-13 of this subchapter.

(iv) If modification to an approved tank alters any information on the approval certificate, issue a new approval certificate for the modified tank and ensure that any necessary changes are made to the metal identification plate. A copy of each newly issued approval certificate shall be retained by the approval agency and by the owner of each portable tank.

(4) If it determined that the proposed modification is not in compliance with the relevant DOT specification, the request shall be denied. The procedures of paragraph (d) of this section apply to such denial.

(h) *Termination of Approval Certificate.*

(1) The Associate Administrator for Hazardous Materials Safety may terminate an approval issued under this section if he determines that:

(i) Information upon which the approval was based is fraudulent or substantially erroneous; or

(ii) Termination of the approval is necessary to adequately protect against risks to life and property.

(iii) The approval was not issued by the approval agency in good faith.

(2) Before an approval is withdrawn, the Associate Administrator for Hazardous Materials Safety gives the owner or manufacturer and the approval agency:

(i) Written notice of the facts or conduct believed to warrant the withdrawal;

(ii) Opportunity to submit oral and written evidence, and

(iii) Opportunity to demonstrate or achieve compliance with the application requirement.

(3) If the Associate Administrator for Hazardous Materials Safety determines that a certificate of approval must be withdrawn to preclude a significant and imminent adverse affect on public safety, he shall withdraw the certificate of approval issued by a designated approval agency. In such circumstances, the procedures of paragraphs (h)(2)(ii) and (iii) of this section need not be provided prior to withdrawal of the approval, but shall be provided as soon as practicable thereafter.

#### **§173.32b Periodic testing and inspection of Specification IM portable tanks.**

(a) *Periodic testing —*

(1) *Hydrostatic test.* Each Specification IM portable tank (§§178.270, 178.271 and 178.272 of this subchapter) and all piping valves and accessories, except pressure-relief devices, shall be hydrostatically tested with water, or other liquid of similar density and viscosity, to a pressure not less than 150 percent of its maximum allowable working pressure. Testing shall be at intervals of not more than five years. While under pressure the tank shall be inspected, for leakage, distortion, or any other condition which might render the tank unsafe for service. The hydrostatic test shall be witnessed by an approval agency. Any damage or deficiency which might render the portable tank unsafe for service shall be repaired to the satisfaction of the witnessing approval agency and the tank hydrostatically retested. Upon successful completion of the hydrostatic test the witnessing approval agency shall apply its name, identifying mark or identifying number and the date of the test on the tank as described in paragraph (d) of this section.

(2) *Pressure relief valves.* Spring loaded pressure relief valves must be removed from the tank and tested at intervals of not more than two and one-half years.

(b) *Visual inspection.* Each portable tank and all piping, valves and accessories shall be visually inspected at intervals not exceeding two and one-half years. The inspection shall be conducted by an owner or his agent or by an approval agency, except that it must be conducted by an approval agency coincident with each hydrostatic test required by paragraph (a) of this section. In the case of insulated tanks, insulation need not be removed if, in the opinion of the person performing the visual inspection, external corrosion is likely to be negligible. If evidence of any unsafe condition is discovered, the portable tank may not be returned to service until such condition has been corrected to the satisfaction of the person performing the inspection. The inspection shall include the following:

(1) The tank shall be carefully inspected internally for corroded areas, dents, distortions, defects in welds, and other conditions that might render the tank unsafe for service;

(2) The piping, valves, and gaskets shall be carefully inspected for corroded areas, defects in welds, and other conditions, including leakage, that might render the tank unsafe for service;

(3) Devices for tightening manhole covers must be operative and there must be no leakage at manhole covers or gaskets.

(4) Missing or loose bolts or nuts on any flanged connection or blank flange must be replaced or tightened.

(5) All emergency devices and valves must be free from corrosion, distortion and any damage or defect that could prevent their normal operation.

(6) Required markings on the tank must be legible.

(7) Upon successful completion of the visual reinspection, the inspector shall mark the date of the visual reinspection on the tank as described in paragraph (d) of this section.

(c) *International shipments.* A portable tank that meets the definition of "container" in §450.3(a)(3) of this title may not be offered for international transport unless the frame work, tank supports and lifting attachments fully comply with all applicable requirements of Parts 450-453 of this title.

(d) *Test date marking.* The month and year of the last hydrostatic test the identification markings of the approval agency witnessing the test, and the date of the last visual inspection must be durably and legibly marked on or near the metal identification plate in letters not less than 3 mm (0.118 inches) high when on the metal identification plate and 32 mm (1.25 inches) high when on the tank.

(e) *Damaged or deteriorated portable tanks.* Without regard to any other test requirement, any tank that shows evidence at any time of damaged or corroded areas, leakage, or other deterioration that indicates a weakness that could render the tank unsafe for service, must be inspected and tested in accordance with the requirements paragraphs (a) and (b) of this section prior to reuse. Pressure relief devices need not be tested or replaced unless there is reason to believe the relief devices have been affected by e damage or deterioration.

(f) *Record retention.* The owner of each portable tank or his authorized agent shall retain a written record of the date and results of all required tests, (including visual inspections) and the name and address of the person performing the test, until the next retest has been satisfactorily completed and recorded.

#### **§173.32c Use of Specification IM portable tanks.**

(a) No person may offer a hazardous material for transportation in an IM portable tank except as authorized by this subchapter.

(b) Except as otherwise provided in this subpart, an IM portable tank may not be used for the transportation of a hazardous material unless it meets the requirements of this subchapter.

(c) An IM portable tank for which the prescribed periodic retest or reinspection under §173.32b of this subchapter has become due may not be filled and offered for shipment until the retest or reinspection has been successfully completed. This paragraph does not apply to any tank filled prior to the test due date.

(d) Prior to filling, each IM portable tank shall be given a complete external inspection. Any unsafe condition must be corrected prior to its use. The external inspection shall include:

(1) A visual inspection of:

(i) The shell, piping, valves and other appurtenances for corroded areas, dents, defects in welds and other defects such as missing, damaged, or leaking gaskets;

(ii) All flanged connections or blank flanges for missing or loose nuts and bolts;

(iii) All emergency devices for corrosion, distortion, or any damage or defect that could prevent their normal operation; and

(iv) All required markings on the tank for legibility.

(2) An inspection to determine that any device for tightening manhole covers is operative and adequate to prevent leakage at the manhole cover.

(e) A hazardous material may not be loaded in an IM portable tank if the part of the tank or any of its appurtenances having contact with the material during transportation would be subject to destructive attack by or a dangerous reaction with the material.

(f) A hazardous material may not be loaded in an IM portable tank unless it has pressure relief devices providing total relieving capacity meeting the requirements of §178.270-11(d) of this subchapter.

(g) A hazardous material may not be loaded in an IM portable tank with filling or discharge connections located below the normal liquid level of the tank unless:

(1) Each filling or discharge connection located below the normal liquid level of the tank has at least two serially-mounted closures consisting of an internal discharge valve and a bolted blank flange or other suitable, liquid-tight closure on each filling or discharge connection; or

(2) When this paragraph (g)(2) is specified for a hazardous material through §172.102(c)(7) of this subchapter, each filling or discharge connection located below the normal liquid level of the tank, or compartment thereof, has three serially-mounted closures consisting of an internal discharge valve capable of being closed from a location remote from the valve itself, an external valve, and a bolted blank flange or other suitable, liquidtight closure on the outlet side of the external valve.

(h) Except during a hydrostatic test, an IM portable tank may not be subjected to a pressure greater than its maximum allowable working pressure.

(i) An IM portable tank may not be loaded to a gross weight greater than the maximum allowable gross weight specified on its identification plate.

(j) Except for a non-flowable solid, an IM portable tank or compartment thereof having a volume greater than 7,500 L may not be loaded to a filling density less than 80 percent by volume.

(k) The outage for an IM portable tank may not be less than 2 percent at a temperature of 122°F (50°C).

(l) Each tell-tale indicator for the space between a frangible disc and a safety relief valve mounted in series must be checked after the tank is filled and prior to transportation to ensure that the frangible disc is leak free. Any leakage through the frangible disc must be corrected prior to offering the tank for transportation. The tell-tale device must be designed to prevent the loss of any hazardous material through the device itself while the tank is in transportation.

(m) An IM portable tank containing a hazardous material may not be loaded on a highway or rail transport vehicle unless loaded entirely within the horizontal outline thereof, without overhang or projection of any part of the tank assembly. In addition, for unloading an IM portable tank, see §177.834(h) of this subchapter.

(n) Specifications IM 101 and IM 102 portable tanks used for the transportation of flammable liquids via rail may not be fitted with nonreclosing pressure relief devices except in series with spring loaded pressure relief valves.

(o) An IM 101 tank may be used whenever an IM 102 tank is authorized provided it meets the requirements for pressure relief devices, bottom outlets and any other special provisions specified for the IM 102 tank in §172.102 of this subchapter.

(p) Any IM 101 or IM 102 portable tank certified by an approval agency prior to January 1, 1992, that is equipped with a non-reclosable pressure relief device may continue in service for the commodities for which it is authorized. Any IM 101 and IM 102 portable tank certified after January 1, 1992, used for materials meeting the definition for Division 6.1 liquids, Packing Group I or II, or Class 3 or 4 liquids, must be equipped with a reclosing pressure relief valve having adequately-sized venting capacity.

(q) If the hazardous material being transported is in a molten state, the tank must be thermally insulated by completely covering it with at least 100 mm (3.94 inches) of cork or other suitable insulation material of sufficient thickness

that the overall thermal conductance is not more than 0.080 Btu per hour per square foot per degree Fahrenheit differential.

(r) Hazardous materials authorized for transport in a tank fitted with bottom outlets having two serially mounted closures are also authorized for transport in a tank fitted with three serially mounted closures and in tanks fitted with no bottom outlets. Similarly, hazardous materials authorized for transport in tanks fitted with bottom outlets having three serially mounted closures are also authorized for transport in tanks fitted with no bottom outlets.

#### **§173.32d [Removed]**

#### **§173.33 Hazardous materials in cargo tank motor vehicles.**

##### **(a) General requirements.**

(1) No person may offer or accept a hazardous material for transportation in a cargo tank motor vehicle except as authorized by this subchapter.

(2) Two or more materials may not be loaded or accepted for transportation in the same cargo tank motor vehicle if, as a result of any mixture of the materials, an unsafe condition would occur, such as an explosion, fire, excessive increase in pressure or heat or the release of toxic vapors.

(3) No person may fill and offer for transportation a specification cargo tank motor vehicle for which the prescribed periodic retest or reinspection under Subpart E of Part 180 of this subchapter is past due until the retest or inspection has been successfully completed. This requirement does not apply to a cargo tank supplied by a motor carrier who is other than the person offering the hazardous material for transportation (see §177.824 of this subchapter), or to any cargo tank filled prior to the retest or inspection due date.

##### **(b) Loading requirements.**

(1) A hazardous material may not be loaded in a cargo tank if during transportation any part of the tank in contact with the hazardous material lading would have a dangerous reaction with the hazardous material.

(2) A cargo tank may not be loaded with a hazardous material that will have an adverse effect on the tank's integrity or —

(i) May combine chemically with any residue or contaminants in the tank to produce an explosion, fire, excessive increase in pressure, release of toxic vapors or other unsafe condition.

(ii) [Reserved]

(iii) [Reserved]

(iv) May severely corrode or react with the tank material at any concentration and temperature that will exist during transportation.

(v) Is prohibited by §173.21 or §173.24 of this subchapter.

(3) Air pressure in excess of ambient atmospheric pressure may not be used to load or unload any lading which may create an air-enriched mixture within the flammability range of the lading in the vapor space of the tank.

(4) To prevent cargo tank rupture in a loading or unloading accident, the loading or unloading rate used must be less than or equal to that indicated on the cargo tank specification plate, except as specified in §173.318(b)(6). If no loading or unloading rate is marked on the specification plate, the loading or unloading rate and pressure used must be limited such that the pressure in the tank may not exceed 130% of the MAWP.

##### **(c) Maximum Lading Pressure.**

(1) Prior to loading and offering a cargo tank motor vehicle for transportation with material that requires the use of a specification cargo tank, the person must confirm that the cargo tank motor vehicle conforms to the specification required for the lading and that the MAWP of the cargo tank is greater than or equal to the largest pressure obtained under the following conditions:

(i) For compressed gases and certain refrigerated liquids that are not cryogenic liquids, the pressure prescribed in §173.315 of this subchapter.

(ii) For cryogenic liquids, the pressure prescribed in §173.318 of this subchapter.

(iii) For liquid hazardous materials loaded in DOT specification cargo tanks equipped with a 1 psig normal vent, the sum of the tank static head plus 1 psig. In addition, for hazardous materials loaded in these cargo tanks, the vapor pressure of the lading at 115°F must be not greater than 1 psig, except for gasoline transported in accordance with Special Provision B33 in §172.102(c)(3) of this subchapter.

(iv) For liquid hazardous materials not covered in paragraph (c)(1)(i), (ii), or (iii) of this section, the sum of the vapor pressure of the lading at 115°F plus the tank static head exerted by the lading, plus any pressure exerted by the gas padding, including air in the ullage space or dome.

(v) The pressure prescribed in Subpart B, D, E, F, G, or H of this part, as applicable.

(vi) The maximum pressure in the tank during loading or unloading.

(2) Any Specification MC 300, MC 301, MC 302, MC 303, MC 305, MC 306 or MC 312, cargo tank motor vehicle with no marked design pressure or

marked with a design pressure of 3 psig or less may be used for an authorized lading where the pressure derived from §173.33(c)(1) is less than or equal to 3 psig. After December 31, 1990, a cargo tank may not be loaded and offered for transportation unless marked or remarked with an MAWP or design pressure in accordance with 49 CFR 180.405(k).

(3) Any Specification MC 310 or MC 311 cargo tank motor vehicle may be used for an authorized lading where the pressure derived from §173.33(c)(1) is less than or equal to the MAWP or MWP, respectively, as marked on the specification plate.

(4) Any cargo tank marked or certified before August 31, 1995, marked with a design pressure rather than an MAWP may be used for an authorized lading where the largest pressure derived from §173.33(c)(1) is less than or equal to the design pressure marked on the cargo tank.

(5) Any material that meets the definition of a Division 6.1, Packing Group I or II (poisonous liquid) material must be loaded in a cargo tank motor vehicle having a MAWP of 25 psig or greater.

##### **(d) Relief system.**

(1) Non-reclosing pressure relief devices are not authorized in any cargo tank except when in series with a reclosing pressure relief device. However, a cargo tank marked or certified before August 31, 1995 which is fitted with non-reclosing pressure relief devices may continue to be used in any hazardous material service for which it is authorized. The requirements in this paragraph do not apply to MC 330, MC 331 and MC 338 cargo tanks.

(2) Each cargo tank motor vehicle used to transport a liquid hazardous material with a gas pad must have a pressure relief system that provides the venting capacity prescribed in §178.345-10(e) of this subchapter. The requirements in this paragraph do not apply to MC 330, MC 331 and MC 338 cargo tanks.

(3) A cargo tank motor vehicle made to a specification listed in column 1 may have pressure relief devices or outlets conforming to the applicable specification to which the tank was constructed, or the pressure relief devices or outlets may be modified to meet the applicable requirement for the specification listed in column 2 without changing the markings on the tank specification plate. The venting capacity requirements of the original DOT cargo tank specification must be met whenever a pressure relief valve is modified.

##### **Column 1**

MC 300, MC 301, MC 302, MC 303, MC 305  
MC 306  
MC 304  
MC 307  
MC 310, MC 311  
MC 312  
MC 330

##### **Column 2**

MC 306 or DOT 406  
DOT 406  
MC 307 or DOT 407  
DOT 407  
MC 312 or DOT 412  
DOT 412  
MC 331

(e) *Retention of hazardous materials in product piping during transportation.* DOT specification cargo tanks used for the transportation of any material that is a Division 6.1 (poisonous liquid) material, oxidizer liquid, liquid organic peroxide or corrosive liquid (corrosive to skin only) may not be transported with hazardous materials lading retained in the piping, unless the cargo tank motor vehicle is equipped with bottom damage protection devices meeting the requirements of §178.337-10 or §178.345-8(b) of this subchapter, or the accident damage protection requirements of the specification under which it was manufactured. This requirement does not apply to a residue which remains after the piping is drained. A sacrificial device (see §178.345-1 of this subchapter) may not be used to satisfy the accident damage protection requirements of this paragraph.

(f) An MC 331 type cargo tank may be used where MC 306, MC 307, MC 312, DOT 406, DOT 407 or DOT 412 type cargo tanks are authorized. An MC 307, MC 312, DOT 407 or DOT 412 type cargo tank may be used where MC 306 or DOT 406 type cargo tanks are authorized. A higher integrity tank used instead of a specified tank must meet the same design profile (for example, an MC 331 cargo tank must be lined if used in place of a lined MC 312 cargo tank.)

(g) Unless otherwise specified, where MC 307, MC 312, DOT 407 or DOT 412 cargo tanks are authorized, minimum tank design pressure is 172.4 kPa (25 psig) for any Packing Group I or Packing Group II liquid lading that meets more than one hazard class definition.

(h) Each liquid or vapor discharge opening in an MC 330 or MC331 cargo tank and each liquid filling and liquid discharge line in an MC 338 cargo tank must be provided with a remotely controlled internal self-closing stop valve, except when an MC 330 or 331 cargo tank is marked and used exclusively to

transport carbon dioxide, or except when an MC 338 is used to transport argon, carbon dioxide, helium, krypton, neon, nitrogen, and xenon. However, if the cargo tank motor vehicle was certified before January 1, 1995, this requirement is applicable only when an MC330 or MC331 cargo tank is used to transport a flammable liquid, flammable gas, hydrogen chloride (refrigerated liquid), or anhydrous ammonia; or when an MC 338 cargo tank is used to transport flammable ladings.

### §173.34 Qualification, maintenance and use of cylinders.

(a) *General qualification for use of cylinders.* (See §§173.1 through 173.30 for requirements applying to all shipments.)

(1) No person may charge or fill a cylinder unless it is as specified in this part and Part 178 of this subchapter. A cylinder that leaks, is bulged, has defective valves or safety devices, bears evidence of physical abuse, fire or heat damage, or detrimental rusting or corrosion, must not be used unless it is properly repaired and requalified in these regulations.

(2) When cylinders with a marked pressure limit are prescribed, other cylinders made under the same specification but with a higher marked service pressure limit are authorized. For example, cylinders marked DOT-4B500 may be used where DOT-4B300 is specified.

(b) *Grandfather clause.* A cylinder in domestic use previous to the date upon which the specification therefor was first made effective in these regulations may be used if the cylinder has been properly tested and otherwise complies with the requirements applicable for the gas with which it is charged.

(c) *Cylinder marking.* Each required marking on a cylinder must be maintained so that it is legible. Retest markings and original markings which are becoming illegible may be reproduced by stamping on a metal plate which must be permanently secured to the cylinder.

(1) Additional information not affecting the markings prescribed in the applicable cylinder specification may be placed on the cylinder. No indentation may be made in the sidewall of the cylinder unless specifically permitted in the applicable specification.

(2) When the space originally provided for dates of subsequent retests becomes filled, the stamping of additional test dates into the external surface of the footing of a cylinder is authorized.

(3) Except for marked service pressure, markings required on cylinders may not be altered or removed. The marked service pressure may be changed only upon application to the Associate Administrator for Hazardous Materials Safety and receipt of written instructions as to the procedure to be followed. A service pressure change is not authorized for a cylinder which fails to pass the prescribed periodic hydrostatic retest, unless it is reheat-treated and requalified in accordance with this section.

(d) *Pressure relief device systems.* No person may offer a cylinder charged with a compressed gas for transportation in commerce unless the cylinder is equipped with one or more pressure relief devices sized and selected as to type, location, and quantity and tested in accordance with CGA Pamphlet S-1.1 (compliance with paragraph 9.1.1.1 of CGA Pamphlet S-1.1 is not required).

(1) Except as provided in paragraphs (d)(1) (i) through (iii) of this section, a pressure relief device is not required on a cylinder 12 inches or less in length, exclusive of neck, and 4-1/2 inches or less in outside diameter.

(i) A pressure relief device is required on a specification 9, 39 (§178.65 of this subchapter), 40, or 41 cylinder. A metal pressure relief valve is required on a specification 39 cylinder used for a liquefied flammable gas. A fusible pressure relief device is not authorized on a specification 39 cylinder containing a liquefied compressed gas.

(ii) A pressure relief device is required on a cylinder charged with a liquefied gas for which this part requires a service pressure of 1800 psi or higher.

(iii) A pressure relief device is required on a cylinder charged with a nonliquefied gas to a pressure of 1,800 psi or higher at 70°F.

(2) Except for a specification 39 cylinder and a cylinder used for acetylene in solution, a pressure relief device is not required on a cylinder charged with a nonliquefied gas under pressure of 300 psi or less at 70°F.

(3) A pressure relief device is prohibited on a cylinder charged with a Division 2.3 or Division 6.1 material in Hazard Zone A.

(4) A pressure relief device is prohibited on a cylinder charged with fluorine.

(5) A pressure relief device is not required on a cylinder charged with methyl mercaptan; with mono-, di-, or trimethylamine, anhydrous; with not over 10 pounds of nitrosyl chloride; or with less than 165 pounds of anhydrous ammonia.

(6) Pressure relief devices, if used, must be in the vapor space of cylinders containing pyroforic liquids, inorganic or organic, n.o.s., covered by §173.124.

(e) *Periodic qualification and marking of cylinders.* Each cylinder that becomes due for periodic retest as specified in the following table must be retested and marked in conformance with the requirements of this paragraph (e):

Retest and Inspection of Cylinders <sup>1</sup>		
Specification under which cylinder was made <sup>2</sup>	Minimum retest pressure (psi) <sup>3</sup>	Retest period (years)
DOT-3	3,000 psi	5
DOT-3A, 3AA	5/3 times service pressure, except noncorrosive service (see §173.34(e)(13))	5, 10, or 12 (see §173.34(e)(14), (e)(12), (e)(16), and (e)(19)).
DOT-3AL	5/3 times service pressure	5 or 12 (see (e)(19)).
DOT-3AX, 3AAX	5/3 times service pressure	5
3B, 3BN	2 times service pressure (see §173.34(e)(13))	5 or 10 (see §173.34(e)(12))
3C	Retest not required	
3D	5/3 times service pressure	5
3E	Retest not required	
3HT	5/3 times service pressure	3 (see §173.34(e)(15))
3T	5/3 times service pressure	5
4	700 psi	10
4A	5/3 times service pressure (see §173.34(e)(13))	5 or 10 (see §173.34(e)(12))
4AA480	2 times service pressure (see §173.34(e)(13))	5 or 10 (see §173.34(e)(14))
4B, 4BA, 4BW, 4B-240ET	2 times service pressure, except non-corrosive service (see §173.34(e)(13))	5, 10, or 12 (see §173.34(e)(11), (e)(12) and (e)(19)).
4C	Retest not required	
4D, 4DA, 4DS	2 times service pressure	5
DOT-4E	2 times service pressure, except non-corrosive service (see §173.34(e)(13))	5
4L	Retest not required	
8, 8AL		10 or 20 (See §173.34(e)(18))
DOT-9	400 psi (maximum 600 psi)	5
25	500 psi	5
26 for filling at over 450 psi	5/3 times service pressure	5
26 for filling at 450 psi and below	2 times service pressure, except non-corrosive service (see §173.34(e)(13))	5 or 10 (see §173.34(e)(11))
33	800 psi	5
38	500 psi	5
Exemption cylinder	See current exemption	See current exemption
Foreign cylinder (see §173.301(j) for restrictions on use).	As marked on the cylinder, but not less than 5/3 of any service or working pressure marking.	5

<sup>1</sup> Any cylinder not exceeding two inches outside diameter and less than two feet in length is excepted from hydrostatic retest.  
<sup>2</sup> A cylinder in chlorine or sulfur dioxide service made before April 20, 1915, must be retested at 500 psi.  
<sup>3</sup> For cylinders not marked with a service pressure, see §173.301(e)(1).

#### (1) General requirements.

(i) Each cylinder bearing a DOT specification marking (including a cylinder remarked in conformance with §173.23) must be inspected, retested and marked in conformance with this section, at the frequency specified in the Retest and Inspection of Cylinders Table in this paragraph (e). Each cylinder bearing a DOT exemption number must be inspected, retested and marked in conformance with this section and the terms of the applicable exemption, at the frequency specified in the exemption.

(ii) No cylinder required to be retested by paragraph (e)(1)(i) of this section may be charged or filled with a hazardous material and transported in commerce unless that cylinder has been inspected and retested in accordance with this section and the retester has marked the cylinder by stamping the date of retest, the cylinder retester identification number unless excepted under this section, and any other marking required by this section. No person may mark a test date or a retester identification number on a DOT specification or exemption cylinder unless all applicable requirements of this section have been met.

#### (2) Retester authorization.

(i) No person may mark a cylinder with a test date or retester identification number, or otherwise represent that a DOT specification or exemption cylinder has been retested under this section, unless that person holds a current retester identification number issued by the Associate Administrator for Hazardous Material Safety and operates in compliance with the terms of the retester identification number issuance letter. With the exception of visual inspections,

all functions under this section must be performed or supervised by an individual named as qualified in the retester identification number application or a notification pursuant to paragraph (e)(2)(iv) of this section. A person is not required to obtain a retester identification number, if the person only performs visual inspections on DOT specification or exemption cylinders.

(ii) Any person seeking approval as a cylinder retester shall arrange for an independent inspection agency, approved by the Associate Administrator for Hazardous Materials Safety pursuant to §173.300a, to inspect its retest facility. The person seeking approval shall bear the cost of the inspection. Independent inspection agencies are not RSPA agents or representatives. A list of approved independent inspection agencies is available from the Associate Administrator for Hazardous Materials Safety, Office of Hazardous Materials Exemptions and Approvals (DHM-32), Research and Special Programs Administration, U.S. Department of Transportation, Washington, DC 20590-0001. Assistance in obtaining an approval may be requested from the same address.

(A) After the inspection, the person seeking approval must submit a letter of recommendation and inspection report from the independent inspection agency and a completed request for approval to the Associate Administrator for Hazardous Materials Safety at the address listed in this paragraph (e)(2)(ii). An applicant must include the following information: company name; facility location; mailing address (if different from location of facility); business telephone number; name of facility manager; the DOT specification/exemption cylinders that will be tested at the facility; a certification that the facility will operate in compliance with the applicable requirements of this subchapter, the date and an authorized signature.

(B) The Associate Administrator for Hazardous Materials Safety reviews the application, the inspection report and recommendation submitted by the independent inspection agency, and other available information. The Associate Administrator for Hazardous Materials Safety issues a retester identification number upon a finding that the applicant's facility and qualifications are adequate to properly inspect, test and mark cylinders under this section. Unless otherwise provided in the retester identification number issuance letter, a retester identification number expires five years from the date of issuance.

(iii) An approved retester shall apply for retester identification number renewal in a timely manner. A new inspection report and recommendation of an independent inspection agency are required for each renewal. If the Associate Administrator for Hazardous Materials Safety receives a renewal application with the accompanying inspection report and recommendation at least 50 days before expiration of the retester identification number, the retester identification number remains in effect until the Associate Administrator for Hazardous Materials Safety issues a renewal or notifies the retester that its request for renewal of the retester identification number is denied. The Associate Administrator for Hazardous Materials Safety considers renewal of a retester identification number in accordance with the standard in paragraph (e)(2)(ii)(B) of this section.

(iv) The retester identification number holder shall report in writing any change in its name, address, ownership, testing equipment, or management or personnel performing any function under this section, to the Associate Administrator for Hazardous Materials Safety (DHM-32) within 20 days of the change. A retester identification number remains valid only if the retester's facility and qualifications are maintained at or above the level observed at the time of inspection by the independent inspection agency.

(v) A retester shall maintain, at each location at which it inspects, retests or marks cylinders under this section:

(A) Current copies of those portions of this subchapter that apply to its cylinder inspection, retesting and marking activities at that location.

(B) Current copies of all exemptions governing exemption cylinders inspected, retested or marked by the retester at that location.

(C) Copies of each CGA pamphlet incorporated by reference in §171.7 of this subchapter that applies to the retester's cylinder inspection, retesting and marking activities at that location. The publication maintained must be the edition incorporated by reference in §171.7 of this subchapter.

(3) *Visual inspection.* Except as otherwise provided in this section, each time a cylinder is retested, it must be visually inspected, internally and externally, in accordance with CGA Pamphlets C-6, C-6.1, C-6.2, or C-6.3, as applicable. The cylinder must be approved, rejected or condemned according to the criteria in the applicable CGA pamphlet. Internal inspection may be omitted for cylinders of the type and in the service described under paragraph (e)(13) of this section. DOT 3BN cylinders must be inspected in accordance with CGA Pamphlet C-6.

(4) *Pressure retest.*

(i) Unless otherwise provided, each cylinder required to be retested under this section must be retested by means suitable for measuring the expansion of the cylinder under pressure. Bands and other removable attachments must be loosened or removed before testing so that the cylinder is free to expand in all directions.

(ii) The pressure-indicating device of the testing apparatus must permit reading of pressures to within 1% of the minimum prescribed test pressure of each cylinder tested, except that for an analog device, interpolation to 1/2 of the marked gauge divisions is acceptable. The expansion-indicating device of the testing apparatus must also permit incremental reading of the cylinder expansion to 1% of the total expansion of each cylinder tested or 0.1 cubic centimeter, whichever is larger. Midpoint visual interpolation is permitted.

(iii) Each day before retesting, the retester shall confirm, by using a calibrated cylinder or other method authorized in writing by the Associate Administrator for Hazardous Materials Safety that:

(A) The pressure-indicating device, as part of the retest apparatus, is accurate within  $\pm 1.0\%$  of the prescribed test pressure of any cylinder tested that day. The pressure indicating device, itself, must be certified as having an accuracy of  $\pm 0.5\%$ , or better, of its full range, and must permit readings of pressure from 90%-110% of the minimum prescribed test pressure of the cylinder to be tested. The accuracy of the pressure indicating device within the test system can be demonstrated at any point within 500 psi of the actual test pressure for test pressures at or above 3000 psi, or 10% of the actual test pressure for test pressures below 3000 psi; and

(B) The expansion-indicating device, as part of the retest apparatus, gives a stable reading of expansion and is accurate to  $\pm 1.0\%$  of the total expansion of any cylinder tested or 0.1 cubic centimeter, whichever is larger. The expansion-indicating device itself must have an accuracy of  $\pm 0.5\%$ , or better, of its full scale.

(iv) The test equipment must be verified to be accurate within  $\pm 1.0\%$  of the calibrated cylinder's pressure and corresponding expansion values. This may be accomplished by bringing the pressure to a value shown on the calibration certificate for the calibrated cylinder used and verifying that the resulting total expansion is within  $\pm 1.0\%$  of the total expansion shown on the calibration certificate. Alternatively, calibration may be demonstrated by bringing the total expansion to a known value on the calibration certificate for the calibrated cylinder used and verifying that the resulting pressure is within  $\pm 1.0\%$  of the pressure shown on the calibration certificate. The calibrated cylinder must show no permanent expansion. The retester shall demonstrate calibration in conformance with this paragraph (e)(4) to an authorized inspector on any day that it retests cylinders. A retester shall maintain calibrated cylinder certificates in conformance with paragraph (e)(8)(iii) of this section.

(v) Minimum test pressure must be maintained for at least 30 seconds, and as long as necessary for complete expansion of the cylinder. A system check may be performed at or below 90% of test pressure prior to the retest. In the case of a malfunction of the test equipment, the test may be repeated at a pressure increased by 10 percent or 100 psi, whichever is less. This paragraph (e)(4) does not authorize retest of a cylinder otherwise required to be condemned under paragraph (e)(6) of this section.

(5) *Cylinder rejection.*

(i) A retester shall reject a cylinder when on visual inspection, it meets a rejection standard in CGA Pamphlets C-6, C-6.1, C-6.2, or C-6.3, as applicable.

(ii) Except as provided in paragraph (e)(5)(iv) of this section, a cylinder that is rejected may not be marked as meeting the requirements of this section.

(iii) When a cylinder is rejected, the retester shall notify the cylinder owner, in writing, that the cylinder has been rejected and, unless requalified as provided in paragraph (e)(5)(iv) of this section, may not be filled with a hazardous material for transportation in commerce where use of a specification packaging is required.

(iv) A rejected cylinder with a service pressure of less than 900 psig may be requalified and marked if the cylinder is repaired or rebuilt and subsequently reinspected and retested in conformance with —

(A) CGA Pamphlets C-6, C-6.1, C-6.2, or C-6.3, as applicable;

(B) Parts 173 and 178 of this subchapter;

(C) Any exemption specific to that cylinder; and

(D) Any approval required under paragraphs (i) and (l) of this section.

(6) *Cylinder condemnation.*

(i) A cylinder must be condemned when —

(A) On inspection, it meets a condition for condemnation in CGA Pamphlets C-6, C-6.1, C-6.2, or C-6.3, as applicable;

(B) The cylinder leaks through its wall;

(C) Evidence of cracking exists to the extent that the cylinder is likely to be weakened appreciably;

(D) For a DOT specification cylinder other than a DOT 4E aluminum cylinder, permanent expansion exceeds 10 percent of total expansion;

(E) For a DOT 4E aluminum cylinder, permanent expansion exceeds 12 percent of total expansion;

(F) For a DOT exemption cylinder, permanent expansion exceeds the limit in the applicable exemption, or the cylinder meets another criterion for condemnation in the applicable exemption; or

(G) For a DOT specification 3HT cylinder, elastic expansion exceeds the marked rejection elastic expansion.

(ii) When a cylinder is required to be condemned, the retester shall stamp a series of X's over the DOT specification number and the marked service pressure or stamp "CONDEMNED" on the shoulder, top head, or neck using a steel stamp. Alternatively, at the direction of the owner, the retester may render the cylinder incapable of holding pressure.

(iii) When a cylinder is required to be condemned, the retester shall notify the cylinder owner, in writing, that the cylinder is condemned and may not be filled with hazardous material for transportation in commerce where use of a specification packaging is required.

(iv) A cylinder that is condemned may not be filled with hazardous material for transportation in commerce where use of a specification packaging is required and may not be marked as meeting the requirements of this section or any DOT exemption. No person may remove or obliterate the "CONDEMNED" marking.

**(7) Retester markings.**

(i) Each cylinder passing retest must be marked with the retester's identification number set in a square pattern, between the month and year of the retest date, in characters not less than 1/8-inch high. The first character of the retester identification number must appear in the upper left corner of the square pattern; the second in the upper right; the third in the lower right, and the fourth in the lower left. Example: A cylinder retested in May 1994, and approved by a person who has been issued retester identification number "A123", would be marked plainly and permanently into the metal of the cylinder in accordance with location requirements of the cylinder specification or on a metal plate permanently secured to the cylinder in accordance with paragraph (c) of this section:

A 1  
5       94  
3 2

(ii) Markings of previous tests may not be obliterated. A cylinder that is subject to the requirements of paragraph (e) (10), (11) (modified hydrostatic test only), (13) or (14) of this section is not required to be marked with a retester identification number. A cylinder requalified by the modified hydrostatic test method or external inspection must be marked after a retest or an inspection by stamping the date of retest or reinspection on the cylinder followed by the symbol "E" (external inspection) or "S" (modified hydrostatic test method) as appropriate. However, a cylinder subject to the requirements of §173.301(j) may not be marked with a retester identification number. Variation from the marking requirement may be approved on written request to the Associate Administrator for Hazardous Materials Safety.

(8) **Recordkeeping.** A retester shall maintain the following records at the retesting location, on paper or in a form from which a paper copy can be produced on request.

(i) Records of authority to inspect, retest and mark must be maintained, as follows:

(A) Current retester identification number issuance letter;

(B) If the retester identification number has expired and renewal is pending, a copy of the renewal request; and

(C) Copies of notifications to Associate Administrator for Hazardous Materials Safety required under paragraph (e)(2)(iv) of this section.

(ii) Daily records of visual inspection and hydrostatic retest must be maintained until either the expiration of the retest period or until the cylinder is again reinspected or retested, whichever occurs first. A single date may be used for each retest sheet, provided each retest on the sheet was conducted on that date. Ditto marks or a solid vertical line may be used to indicate repetition of the preceding entry for the following entries: date; actual dimensions or a symbol; if present, manufacturer's name or symbol; if present, owner's name or symbol and retest operator. Blank spaces may not be used to indicate repetition of a prior entry. Records must include —

(A) For each test to demonstrate calibration, the date; serial number of the calibrated cylinder; calibration test pressure; total, elastic and permanent expansions; and legible identification of retest operator. The retest operator must be able to demonstrate that the results of the daily calibration verification correspond to the hydrostatic retests that were performed on that day. The daily verification of calibration(s) may be recorded on the same sheets as, and with, retest records for that date;

(B) For each cylinder retested or visually inspected, records containing the date; serial number; ICC/DOT specification or exemption number; service pressure; actual dimensions or a symbol; if present, manufacturer's name or symbol; if present, owner's name or symbol; result of visual inspection; actual

test pressure; total, elastic and permanent expansions; percent permanent expansion; disposition, with reason for any repeated retest, rejection or condemnation; and legible identification of test operator. For each cylinder marked pursuant to §173.302(c)(5), the retest sheet must indicate the method by which any average or maximum wall stress was computed. Records must be kept for all completed retests, as well as unsuccessful retests under paragraph (e)(4)(v) of this section. The entry for a later retest under paragraph (e)(4)(v) of this section after a failure to hold test pressure, or retest of a cylinder requalified after rejection, must indicate the date of the earlier inspection or retest; and

(C) Calculations of average and maximum wall stress pursuant to §173.302(c)(3), if performed.

(iii) The most recent certificate of calibration must be maintained for each calibrated cylinder used by the retester.

(9) **DOT 4-series cylinders.** A DOT 4-series cylinder, except 4L cylinders, that at any time shows evidence of a leak or of internal or external corrosion, denting, bulging or rough usage to the extent that it is likely to be weakened appreciably; or that has lost five percent or more of its official tare weight must be retested before being recharged and shipped. (Refer to CGA Pamphlet C-6 or C-6.3, as applicable, regarding cylinder weakening.) After retest, the actual tare weight must be recorded as the new tare weight.

(10) **Cylinders 12 pounds or less with service pressures of 300 psi or less.** A cylinder of 12 pounds or less water capacity authorized for service pressure of 300 psi or less must be given a complete external visual inspection at the time periodic retest becomes due. External visual inspection must be in accordance with CGA Pamphlets C-6 or C-6.3. The cylinder may be hydrostatically retested without a water jacket and without determining total and permanent expansions. The retest is successful if the cylinder, when examined under test pressure, does not display a defect described in paragraph (e)(6)(i) (B) or (C) of this section.

(11) **Modified hydrostatic retest.** A cylinder made in compliance with specification DOT 4B, DOT 4BA, DOT 4BW, DOT 4E or ICC-26-300<sup>2</sup> (§§178.50, 178.51, 178.61, 178.68 of this subchapter) that is used exclusively for anhydrous dimethylamine; anhydrous methylamine; anhydrous trimethylamine; methyl chloride; liquefied petroleum gas; methylacetylene-propadiene stabilized; or dichlorodifluoromethane, difluoroethane, difluorochloroethane, chlorodifluoromethane, chlorotetrafluoroethane, trifluorochloroethylene, or mixture thereof, or mixtures of one or more with trichlorofluoromethane; and that is commercially free from corroding components and protected externally by a suitable corrosion-resistant coating (such as galvanizing or painting) may be given a hydrostatic retest every 12 years instead of every five years. Alternatively, the cylinder may be subjected to internal hydrostatic pressure of at least two times the marked service pressure without determination of expansions, but this latter type of test must be repeated every seven years after expiration of the first 12-year period. When subjected to the latter test, the cylinder must be carefully examined under test pressure and removed from service if a leak or other harmful defect exists. A cylinder requalified by the modified hydrostatic test method must be marked after a retest or an inspection by stamping the date of retest or reinspection on the cylinder followed by a "S".

(12) A cylinder made in conformance with specification DOT-3A, DOT-3AA, DOT-3B, DOT-4BA or DOT-4BW (§§178.36, 178.37, 178.38, 178.51, 178.61 of this subchapter) having a service pressure of 300 psi or less that is used exclusively for methyl bromide, liquid; mixtures of methyl bromide and ethylene dibromide, liquid; mixtures of methyl bromide and chlorpicrin, liquid; mixtures of methyl bromide and petroleum solvents, liquid; or methyl bromide and non-flammable, nonliquefied compressed gas mixtures, liquid; that is commercially free of corroding components, and that is protected externally by a suitable corrosion resistant coating (such as galvanizing or painting) and internally by a suitable corrosion resistant lining (such as galvanizing) may be tested every 10 years instead of every five years, provided that a visual internal and external examination of the cylinder is conducted every five years in accordance with CGA Pamphlet C-6. The cylinder must be examined at each filling, and rejected if a dent, corroded area, leak or other condition indicates possible weakness.

(13) A cylinder made in conformance with a specification listed in the table in this paragraph (e)(13) and used exclusively in the service indicated may, instead of a periodic hydrostatic retest, be given a complete external visual inspection at the time periodic retest becomes due. External visual inspection must be in accordance with CGA Pamphlets C-6 or C-6.3. When this inspection is used instead of hydrostatic retesting, subsequent inspections are required at five-year intervals after the first inspection. Inspections must be made only by competent persons and the results recorded and maintained in accordance with paragraph (e)(8) of this section. Records shall include: date of inspection (month and year); DOT specification number; cylinder identification (registered symbol and serial number, date of manufacture, and owner); type of cylinder protective coating (including statement as to need of refinishing or recoating); conditions

<sup>2</sup> For filling at 450 p.s.i. and below. Use of existing cylinders authorized; new construction not authorized.



checked (e.g., leakage, corrosion, gouges, dents or digs in shell or heads, broken or damaged footing or protective ring or fire damage); disposition of cylinder (returned to service, returned to cylinder manufacturer for repairs or scrapped). A cylinder that passes inspection shall be marked with the date in accordance with paragraph (e)(7) of this section. An "E" after the date indicates requalification by the external inspection method. Specification cylinders must be in exclusive service as follows:

**Cylinders made in compliance with —**  
DOT-4, DOT-3A, DOT-3AA, DOT-3A480X, DOT-4A, DOT-4AA480  
DOT-3A, DOT-3AA, DOT-3A480X, DOT-3B, DOT-4B, DOT-4BA, DOT-4BW, ICC-26-240<sup>1</sup>, ICC-26-300<sup>1</sup>

DOT-3A, DOT-3A480X, DOT-3AA, DOT-3B, DOT-4A, DOT-4AA480, DOT-4B, DOT-4BA, DOT-4BW  
DOT-3A, DOT-3AA, DOT-3A480X, DOT-4B, DOT-4BA, DOT-4BW, DOT-4E

DOT-3A, DOT-3AA, DOT-3A480X, DOT-3B, DOT-4B, DOT-4BA, DOT-4BW, DOT-4E, ICC-26-240<sup>1</sup>, ICC-26-300<sup>1</sup>

DOT-3A, DOT-3AA, DOT-3A480X, DOT-3B, DOT-4B, DOT-4BA, DOT-4BW, DOT-4E, ICC-26-240<sup>1</sup>, ICC-26-300<sup>1</sup>

DOT-3A, DOT-3AA, DOT-3B, DOT-4B, DOT-4BA, DOT-4BW, DOT-4E

DOT-3A, DOT-3AA, DOT-3B, DOT-4B, DOT-4BA, DOT-4BW

DOT-4B240, DOT-4BW240

<sup>1</sup> Use of existing cylinders authorized; new construction not authorized.

(14) *Cylinders containing anhydrous ammonia.* A cylinder made in compliance with specification DOT-3A, DOT-3A 480X, or DOT-4AA480 used exclusively for anhydrous ammonia, commercially free from corroding components, and protected externally by a suitable corrosion-resistant coating (such as painting) may be retested every 10 years instead of every five years.

(15) *3HT cylinders.*

(i) In addition to the other requirements of this section, a cylinder marked DOT-3HT must be requalified in accordance with CGA Pamphlet C-8.

(ii) The cylinder must be condemned:

(A) If elastic expansion exceeds the marked rejection elastic expansion. A cylinder made before January 17, 1978, and not marked with a rejection elastic expansion in cubic centimeters near the marked original elastic expansion must be so marked before the next retest date. The rejection elastic expansion for a cylinder is 1.05 times its original elastic expansion.

(B) If there is evidence of denting or bulging.

(C) Twenty-four years after the date of the original test or after 4,380 pressurizations, whichever occurs first. If a cylinder is recharged, on average, more than once every other day, an accurate record of the number of rechargings must be maintained by the cylinder owner or his/her agent.

(iii) The retest date and retester identification number must be applied by low-stress steel stamp to a depth no greater than that of the marking at the time of manufacture. Stamping on the sidewall is not authorized.

(16) *DOT-3A or 3AA cylinders.*

(i) A cylinder made in conformance with specification DOT-3A or 3AA with a water capacity of 125 pounds or less that is removed from any cluster, bank, group, rack or vehicle each time it is filled, may be retested every ten years instead of every five years, provided the cylinder complies with all of the following —

(A) The cylinder was manufactured after December 31, 1945;

(B) The cylinder is used exclusively for air, argon, cyclopropane, ethylene, helium, hydrogen, krypton, neon, nitrogen, nitrous oxide, oxygen, sulfur hexafluoride, xenon, permitted mixtures of these gases (see §173.301(a)) and permitted mixtures of these gases with up to 30 percent by volume of carbon

**Used exclusively for —**  
Anhydrous ammonia of at least 99.95% purity  
Butadiene, inhibited, which is commercially free from corroding components

Cyclopropane which is commercially free from corroding components  
Fluorinated hydrocarbons and mixtures thereof which are commercially free from corroding components

Liquefied hydrocarbon gas which is commercially free from corroding components  
Liquefied petroleum gas which is commercially free from corroding components

Methylacetylene-propadiene, stabilized, which is commercially free from corroding components

Anhydrous mono, di, trimethylamines which are commercially free from corroding components  
Ethyleneimine, inhibited

dioxide, provided that the gas has a dew point at or below minus 52°F at 1 atmosphere;

(C) Before each refill, the cylinder passes the hammer test specified in CGA Pamphlet C-6;

(D) The cylinder is dried immediately after hydrostatic testing to remove all traces of free water;

(E) The cylinder is not used for underwater breathing; and

(F) Each cylinder is stamped with a five-point star at least one-fourth of an inch high immediately following the test date.

(ii) If, since the last required hydrostatic retest, a cylinder has not been used exclusively as specified in paragraph (e)(16)(i)(B) of this section, but currently conforms with all other provisions of paragraph (e)(16)(i) of this section, it may be retested every 10 years instead of every five years, provided it is first retested and examined as prescribed by §173.302(c)(2), (3) and (4).

(iii) Except as specified in paragraph (e)(16)(ii) of this section, if a cylinder marked with a star is charged with a compressed gas other than as specified in this paragraph (e)(16), the star following the most recent test date must be obliterated. The cylinder must be retested five years from the marked retest date, or prior to the first charging with a compressed gas, if the required five-year retest period has passed.

(17) *Cylinders containing corrosive materials.*

(i) A cylinder that previously contained a Class 8 (corrosive) material may not be used to transport a compressed gas in commerce unless the following requirements are met —

(A) The cylinder is visually inspected, internally and externally, in accordance with CGA Pamphlet C-6;

(B) Regardless of the date of previous retest, the cylinder is subjected to and passes inspection and hydrostatic retest in accordance with this section; and

(C) The record prescribed in paragraph (e)(8) of this section includes: the month and year of inspection and test; the cylinder identification (including ICC or DOT specification number, registered symbol, serial number, date of manufacture and owner); the conditions checked (e.g., leakage, corrosion, gouges, dents, or digs in shell or heads, broken or damaged footings, fire damage) and the disposition of the cylinder (returned to service, returned to the manufacturer for repairs, or scrapped).

(ii) A cylinder requalified for compressed gas service in accordance with this paragraph (e)(17) may have its next retest and inspection scheduled from the date of the inspection and retest prescribed in this paragraph (e). If decontamination cannot remove all significant residue or impregnation by the Class 8 material, the cylinder may not be used to transport compressed gas in commerce.

(18) *DOT 8 and 8AL cylinders.*

(i) Each owner of a DOT 8 or 8AL cylinder used to transport acetylene must have the cylinder shell and the porous filler requalified in accordance with CGA Pamphlet C-13. Requalification must be performed in accordance with the following schedule:

Date of cylinder manufacture	Shell (visual inspection) requalification		Porous filler requalification	
	Initial	Subsequent	Initial	Subsequent
Before January 1, 1991	Before January 1, 2011	10 years	Before January 1, 2001	Not required
On or after January 1, 1991	10 years <sup>1</sup>	10 years	3 to 20 years <sup>2</sup>	Not required

<sup>1</sup> Years from date of cylinder manufacture.

<sup>2</sup> For cylinders manufactured on or after January 1, 1991, requalification of the porous filler must be performed no sooner than 3 years, and no later than 20 years, from the date of manufacture.

(ii) Unless requalified and marked in accordance with CGA Pamphlet C-13 before October 1, 1994, an acetylene cylinder must be requalified by a person who holds a valid retester identification number. Each cylinder successfully passing a shell or filler requalification must be marked with the retester's identification number in accordance with paragraph (e)(7) of this section. In addition, the cylinder must be marked to identify the type of requalification performed in accordance with paragraph 5.6 of CGA Pamphlet C-13. For example, the letter "S" must be used for a shell requalification and the letter "F" for a porous filler requalification.

(iii) If a cylinder valve is replaced, a cylinder valve of the same weight must be used or the tare weight of the cylinder must be adjusted to compensate for valve weight differential.

(19) Cylinders used as fire extinguishers. Only DOT specification cylinders used as fire extinguishers and meeting Special Provision 18 in §172.102(c)(1) of this subchapter may be retested in accordance with this paragraph (e)(19).

(i) A DOT specification 4B, 4BA, 4B240ET or 4BW (§§178.50, 178.51, 178.55 and 178.61 of this subchapter) cylinder may be retested as follows:

(A) For a cylinder with a water capacity of 12 pounds or less by hydrostatic test using the water jacket method or by hydrostatic test without determination of expansion (modified hydrostatic test method). A retest must be performed 12 years after the original test date and at 12-year intervals thereafter.

(B) For a cylinder having a water capacity over 12 pounds —

(1) By hydrostatic test without determination of expansion (modified hydrostatic test method). A retest must be performed 12 years after the original test date and at 7-year intervals; or

(2) By hydrostatic test using the water jacket method. A retest must be performed 12 years after the original test date and at 12-year intervals thereafter.

(ii) A DOT specification 3A, 3AA, or 3AL (§§178.36, 178.37 and 178.46 of this subchapter) cylinder may be retested by hydrostatic test using the water jacket method. A retest must be performed 12 years after the original test date and at 12-year intervals thereafter.

(f) *Cylinders subjected to the action of fire.* A cylinder which has been subjected to the action of fire must not again be placed in service until it has been properly reconditioned as follows:

(1) A cylinder made of plain carbon steel with not over 0.25 percent carbon nor over 0.90 manganese need not be reheat-treated but must pass the periodic retest requirements as specified in paragraph (e) of this section.

(2) DOT-8 and 8AL cylinders made entirely of carbon steel with 0.25 percent or less carbon and with 0.90 percent or less manganese, must be reinspected to determine the condition of the cylinder and the porous filler, as prescribed in CGA Pamphlet C-13. If the cylinder has been damaged, the porous filler must be removed and the cylinder must be heat treated and retested. The porous filler must be replaced in accordance with the specification to which the cylinder was made. A cylinder may be returned to service without reheat treatment or retest if the cylinder has no fire or mechanical damage and the porous filler is unchanged and intact.

(3) The inner cylinders made under specification DOT-4L (§178.57 of this chapter) may be used after again passing the original hydrostatic test.

(4) DOT 3AL and DOT 4E aluminum cylinders may not be reheat treated and must be removed from service.

(5) Other cylinders must be reheat treated and reconditioned as specified in paragraph (g) of this section.

(g) *Reheat treatment.*

(1) Previous to the reheat treatment procedure hereinafter prescribed, each cylinder must be subjected to a careful internal and external inspection.

(2) Cylinders must be segregated for reheat treatment in lots of 100 or less cylinders of the same general size having practically the same chemical composition.

(3) The reheat treatment operation must be carried out, supervised, and reported as prescribed for the heat treatment in the specification covering the manufacture of the cylinder in question. Data from the original reports of manufacture of the cylinders must be available.

(4) The reheat treatment must be followed by hydrostatic retest, such retest to be carried out, supervised, and reported as prescribed for the hydrostatic tests in the specification covering the manufacture of the cylinder in question. The results of the retest must meet either of the following conditions:

(i) The permanent expansion shall be from zero to 10 percent of the total expansion in the hydrostatic retest and one cylinder from each lot shall pass the requirements of the flattening and physical tests prescribed. Failure to pass the flattening or physical tests will reject the lot or;

(ii) The permanent expansion shall not be less than 3 percent nor more than 10 percent of the total expansion in the hydrostatic retest, in which case the flattening and physical tests are not required. For this alternative method the hydrostatic retest pressure may not exceed 115 percent of the minimum prescribed test pressure.

(h) *Repair by welding or brazing of specifications DOT-3A, 3AA, 3B, 3C cylinders.* Repair of specifications DOT-3A, 3AA, 3B or 3C (§§178.36, 178.37, 178.38, or 178.40 of this subchapter) cylinders by welding or brazing authorized, but only for the removal and replacement of neckrings and footings attached to cylinders originally manufactured to conform to §§178.36(e), 178.37(e), 178.38(e), and 178.40(e) of this subchapter. Removal and replacement must be done by a regular manufacturer of this type of cylinder. After removal and before replacement of such parts, cylinders must be inspected, and defective ones rejected. Cylinders, neckrings, footings, and method of replacement must conform to §§178.36(e), 178.37(e), 178.38(e), or 178.40(e) of this subchapter whichever applies. Replacement must be followed by reheat treating, testing, inspection, and supervised and reported as prescribed by the specification covering their original manufacture. Inspector's reports must conform with that required by the specification covering original manufacture with the word "repaired" substituted for "manufactured." Show original markings and the new additional markings added, and statement: "Cylinders were carefully

inspected for defects after removal of neckrings and footings and after replacement, which replacement was made by process of \_\_\_\_\_ (Welding-brazing)."

(i) *Repair by welding or brazing of DOT-4 series and DOT-8, welded or brazed cylinders.* Repairs on DOT-4 series and DOT-8 series welded or brazed cylinders are authorized to be made by welding or brazing. Such repairs must be made by a manufacturer of these types of DOT cylinders or by a repair facility approved by the Associate Administrator for Hazardous Materials Safety and by a process similar to that used in its manufacture and under the following specific requirements:

(1) Cylinders with injurious defects in welded joints in or on pressure parts must be repaired by completely removing the defect prior to rewelding.

(2) Cylinders with injurious defects in brazed joints in or on pressure parts must be repaired by rebrazing.

(3) Cylinders during welding must be free of materials in contact with the welded joint that may impair the serviceability of the metal in or adjacent to the weld. (Precautions must be taken to prevent acetylene cylinder steels from picking up carbon during repair.)

(4) Neckrings, footings, or other nonpressure attachments authorized by the specification may be replaced or repaired. Repair or replacement of footings, neckrings, or other nonpressure attachments authorized by the specification for DOT-4BA and 8AL (§§178.51 and 178.60 of this subchapter) cylinders may be made without conforming to the requirements of paragraph (i)(6) of this section provided the following requirements are met:

(i) Must be done by a manufacturer of these types of DOT cylinders or by a repair facility approved by the Associate Administrator for Hazardous Materials Safety.

(ii) The welder shall have available to him information as to the procedure equipment, and rod used during manufacture and shall use a similar method for repair.

(iii) Repairs must be by metal arc welding only. Welds shall be 3 inches maximum length and spaced at least 3 inches apart.

(iv) Welds shall not be made on or near a brazed joint (to prevent the possibility of copper penetration).

(v) After repair the welds are to be inspected visually for weld quality.

(vi) After repair the weld area is to be leak tested at the service pressure of the cylinder.

(5) After removal, and before replacement of attachments, cylinders must be inspected and defective ones rejected, repaired or rebuilt.

(6) After repair, cylinders must be reheat-treated, tested, inspected and reported when and as prescribed by the specification covering their original manufacture when welding or brazing seams in a pressure part of a cylinder; or when welding or brazing on pressure parts of cylinders of plain carbon steels with carbon over 0.25 percent or manganese over 1.00 percent or of alloy steels except as provided in §173.34(i)(7).

**Note 1:** Heat-treatment is not required after welding or brazing weldable low carbon parts to attachments of similar material which has been previously welded or brazed to the top or bottom of cylinders and properly heat-treated, provided such subsequent welding or brazing does not produce a temperature in excess of 400°F in any part of the top or bottom material.

(7) Repair of cylinders must be followed by a proof pressure leakage test at prescribed test pressure and visual examination for weld quality when welding on pressure parts of cylinders of plain carbon 0.25 percent or less and manganese 1.00 percent or less, or when repairing steel types 1315, NAX and GLX by the following procedure:

(i) Leakage through the welding metal may be repaired without subsequent reheat treatment of the cylinder.

(ii) Repair permitted only by either the metal arc or tungsten inert gas shielded arc process. E7015, 7016, or 7018 electrodes not larger than 1/8 inch diameter shall be used for the metal arc process.

(iii) Weld defects must be removed by grinding or chipping before repair by the metal arc process. The tungsten inert gas shielded arc process may be used for repair only when such repair can be made by puddling. Repair weld shall not exceed 1 inch in length nor be closer than 3 inches to the next repair area.

(iv) Repair of weld defects which have any cracking is not permitted.

(j) *Repair of non-pressure attachments.* Repair of non-pressure attachments by welding or brazing without affecting a pressure part of the cylinder must be followed by visual examination for weld quality.

(k) *Prohibited repairs.* Walls, heads or bottoms of cylinders with injurious defects or leaks in base metal shall not be repaired, but may be replaced as provided for in paragraph (1) of this section.

(l) *Rebuilding of DOT-4 series and DOT-8, welded or brazed cylinders.* Rebuilding of DOT-4 series and DOT-8 series, welded or brazed cylinders is authorized. Such rebuilding must be done by a manufacturer of these types of DOT cylinders or by a repair facility approved by the Associate Administrator for Hazardous

Materials Safety and by a process similar to that used in its original manufacture and under the following specific requirements:

(1) The replacement of a pressure part such as wall, heads, or bottoms of cylinders or the replacement of the porous filling material, shall be considered as rebuilding.

(2) Rebuilt cylinders shall be considered as new cylinders and shall conform to all the requirements of the specifications applying, including verification of material, examination, inspection, etc., and the rendering of the proper reports to the purchaser, cylinder rebuilder, and the Associate Administrator for Hazardous Materials Safety. Report must show that cylinders were rebuilt.

(3) Information in sufficient detail regarding previous serial numbers and identification symbols must be filed with the Associate Administrator for Hazardous Materials Safety.

#### **§173.35 Hazardous materials in intermediate bulk containers.**

(a) No person may offer or accept a hazardous material for transportation in an intermediate bulk container except as authorized by this subchapter. Each intermediate bulk container used for the transportation of hazardous materials must conform to the requirements of its specification and regulations for the transportation of the particular commodity. A specification intermediate bulk container, for which the prescribed periodic retest or inspection under subpart D of part 180 of this subchapter is past due, may not be filled and offered for transportation until the retest or inspection have been successfully completed. This requirement does not apply to any intermediate bulk container filled prior to the retest or inspection due date.

(b) Before being filled and offered for transportation, each intermediate bulk container and its service equipment must be visually inspected to ensure that it is free from corrosion, contamination, cracks, or other damage which would render the intermediate bulk container unsafe for transportation. No rigid plastic or composite intermediate bulk container with repaired bodies may be reused; however, plastic components, such as closures, valves, or legs, may be replaced. Fiberboard, wooden, or flexible intermediate bulk containers may not be reused.

(c) A metal intermediate bulk container, or a part thereof, subject to thinning by mechanical abrasion or corrosion due to the lading, must be protected by providing a suitable increase in thickness of material, a lining or some other suitable method of protection. Increased thickness for corrosion or abrasion protection must be added to the wall thickness specified in §178.705(c)(1)(iv) of this subchapter.

(d) Notwithstanding requirements in §173.24b of this subpart, when filling an intermediate bulk container with liquids, sufficient ullage must be left to ensure that, at the mean bulk temperature of 50°C (122°F), the intermediate bulk container is not filled to more than 8 percent of its water capacity.

(e) Where two or more closure systems are fitted in series, the system nearest to the hazardous material being carried must be closed first.

(f) During transportation —

(1) No hazardous material may remain on the outside of the intermediate bulk container; and

(2) Each intermediate bulk container must be securely fastened to or contained within the transport unit.

(g) Each intermediate bulk container used for transportation of solids which may become liquid at temperatures likely to be encountered during transportation must also be capable of containing the substance in the liquid state.

(h) Liquid hazardous materials may only be offered for transportation in a metal, rigid plastic, or composite intermediate bulk container that is appropriately resistant to an increase of internal pressure likely to develop during transportation.

(1) A rigid plastic or composite intermediate bulk container may only be filled with a liquid having a vapor pressure less than or equal to the greater of the following two values: the first value is determined from any of the methods in paragraphs (h)(1)(i), (ii) or (iii) of this section. The second value is determined by the method in paragraph (h)(1)(iv) of this section.

(i) The gauge pressure (pressure in the intermediate bulk container above ambient atmospheric pressure) measured in the intermediate bulk container at 55°C (131°F). This gauge pressure must not exceed two-thirds of the marked test pressure and must be determined after the intermediate bulk container was filled and closed at 15°C (60°F) to less than or equal to 98 percent of its capacity.

(ii) The absolute pressure (vapor pressure of the hazardous material plus atmospheric pressure) in the intermediate bulk container at 50°C (122°F). This absolute pressure must not exceed four-sevenths of the sum of the marked test pressure and 100 kPa (14.5 psi).

(iii) The absolute pressure (vapor pressure of the hazardous material plus atmospheric pressure) in the intermediate bulk container at 55°C (131°F). This absolute pressure must not exceed two-thirds of the sum of the marked test pressure and 100 kPa (14.5 psi).

(iv) Twice the static pressure of the substance, measured at the bottom of the intermediate bulk container. This value must not be less than twice the static pressure of water.

(2) Gauge pressure (pressure in the intermediate bulk container above ambient atmospheric pressure) in metal intermediate bulk containers must not exceed 110 kPa (16 psig) at 50°C (122°F) or 130 kPa (18.9 psig) at 55°C (131°F)

(i) The requirements in this section do not apply to DOT-56 or -57 portable tanks.

(j) No intermediate bulk container may be filled with a Packing Group I liquid. Rigid plastic, composite, flexible, wooden or fiberboard intermediate bulk containers used to transport Packing Group I solid materials may not exceed 1.5 cubic meters (53 cubic feet) capacity. For Packing Group I solids, a metal intermediate bulk container may not exceed 3 cubic meters (106 cubic feet) capacity.

(k) When an intermediate bulk container is used for the transportation of liquids with a flashpoint of 60.5°C (141°F) (closed cup) or lower, or powders with the potential for dust explosion, measures must be taken during product loading and unloading to prevent a dangerous electrostatic discharge.

(l) *Intermediate bulk container filling limits.*

(1) Except as provided in this section, an intermediate bulk container may not be filled with a hazardous material in excess of the maximum gross mass marked on that container.

(2) An intermediate bulk container which is tested and marked for Packing Group II liquid materials may be filled with a Packing Group III liquid material to a gross mass not exceeding 1.5 times the maximum gross mass marked on that container, if all the performance criteria can still be met at the higher gross mass.

(3) An intermediate bulk container which is tested and marked for liquid hazardous material may be filled with a solid hazardous material to a gross mass not exceeding the maximum gross mass marked on that container. In addition, an intermediate bulk container intended for the transport of liquids which is tested and marked for Packing Group II liquid materials may be filled with a Packing Group III solid hazardous material to a gross mass not exceeding the marked maximum gross mass multiplied by 1.5 if all the performance criteria can still be met at the higher gross mass.

(4) An intermediate bulk container which is tested and marked for Packing Group I solid materials may be filled with a Packing Group II solid material to a gross mass not exceeding the maximum gross mass marked on that container, multiplied by 1.5, if all the performance criteria can be met at the higher gross mass; or a Packing Group III solid material to a gross mass not exceeding the maximum gross mass marked on the intermediate bulk container, multiplied by 2.25, if all the performance criteria can be met at the higher gross mass. An intermediate bulk container which is tested and marked for Packing Group II solid materials may be filled with a Packing Group III solid material to a gross mass not exceeding the maximum gross mass marked on the intermediate bulk container, multiplied by 1.5.

#### **§173.40 General packaging requirements for poisonous materials required to be packaged in cylinders.**

When this section is referenced in the packaging section for a hazardous material elsewhere in this part, the following requirements are applicable to cylinders used for that material:

(a) *Authorized cylinders.* A cylinder must conform to one of the specifications for cylinders in Subpart C of Part 178 of this subchapter, except that Specification 8, 8AL and 39 cylinders are not authorized.

(b) *Outage and pressure requirements.* The pressure of the hazardous material at 55°C (131°F) must not exceed the service pressure of the cylinder. Sufficient outage shall be provided so that the cylinder will not be liquid full at 55°C (131°F).

(c) *Closures.* Each cylinder must be closed with a plug or valve conforming to the following:

(1) Each plug or valve must have a taper-threaded connection directly to the cylinder and be capable of withstanding the test pressure of the cylinder;

(2) Each valve must be of the packless type with non-perforated diaphragm, except that for corrosive materials, a valve may be of the packed type provided the assembly is made gas-tight by means of a seal cap with gasketed joint attached to the valve body or the cylinder to prevent loss of material through or past the packing;

(3) Each valve outlet must be sealed by a threaded cap or threaded solid plug, and

(4) Cylinder, valves, plugs, outlet caps, luting and gaskets must be compatible with each other and with the lading.

(d) *Additional protection.* Additional protection requirements for thin-walled cylinders and for cylinders equipped with valves are as follows:

(1) Each cylinder which has a wall thickness at any point of less than 2.03 mm (0.080 inch) and each cylinder which does not have fitted valve protection must be overpacked in a box. The box must conform to overpack provisions in §173.25. Box and valve protection must be of sufficient strength to protect all parts of the cylinder and valve, if any, from deformation and breakage resulting from a drop of 2.0 m (7 ft) or more onto a concrete floor, impacting at an orientation most likely to cause damage.

(2) Each cylinder equipped with a valve, if not overpacked in a box in accordance with paragraph (d)(1) of this section, must be equipped with a protective cap or other means of valve protection sufficient to protect the valve from deformation and breakage resulting from a drop of 2.0 m (7 ft) or more onto a concrete floor, impacting at an orientation most likely to cause damage.

(e) *Interconnection.* Cylinders may not be interconnected.

### Subpart C — Definitions, Classifications and Packaging for Class 1

#### §173.50 Class 1—definitions.

(a) *Explosive.* For the purpose of this subchapter, an “explosive” means any substance or article, including a device, which is designed to function by explosion (i.e., an extremely rapid release of gas and heat) or which, by chemical reaction within itself, is able to function in a similar manner even if not designed to function by explosion, unless the substance or article is otherwise classed under the provision of this subchapter.

(b) Explosives in Class 1 are divided into six divisions as follows:

(1) *Division 1.1* consists of explosives that have a mass explosion hazard. A mass explosion is one which affects almost the entire load instantaneously.

(2) *Division 1.2* consists of explosives that have a projection hazard but not a mass explosion hazard.

(3) *Division 1.3* consists of explosives that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard.

(4) *Division 1.4* consists of explosives that present a minor explosion hazard. The explosive effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package.

(5) *Division 1.5<sup>1</sup>* consists of very insensitive explosives. This division is comprised of substances which have a mass explosion hazard but are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions of transport.

(6) *Division 1.6<sup>2</sup>* consists of extremely insensitive articles which do not have a mass explosive hazard. This division is comprised of articles which contain only extremely insensitive detonating substances and which demonstrate a negligible probability of accidental initiation or propagation.

#### §173.51 Authorization to offer and transport explosives.

(a) Unless otherwise provided in this subpart, no person may offer for transportation or transport an explosive, unless it has been tested and classed and approved by the Associate Administrator for Hazardous Materials Safety (§173.56).

(b) Reports of explosives approved by the Department of Defense or the Department of Energy must be filed with, and receive acknowledgment in writing by, the Associate Administrator for Hazardous Materials Safety prior to such explosives being offered for transportation.

#### §173.52 Classification codes and compatibility groups of explosives.

(a) The classification code for an explosive, which is assigned by the Associate Administrator for Hazardous Materials Safety in accordance with this subpart, consists of the division number followed by the compatibility group letter. Compatibility group letters are used to specify the controls for the transportation, and storage related thereto, of explosives and to prevent an increase in hazard that might result if certain types of explosives were stored or transported together. Transportation compatibility requirements for carriers are prescribed in §§174.81, 175.78, 176.83 and 177.848 of this subchapter for transportation by rail, air, vessel, and public highway, respectively, and storage incidental thereto.

(b) Compatibility groups and classification codes for the various types of explosives are set forth in the following tables. Table 1 sets forth compatibility groups and classification codes for substances and articles described in the first column of Table 1. Table 2 shows the number of classification codes that are possible within each explosive division. Altogether, there are 35 possible classification codes for explosives.

Table 1—Classification Codes

Description of substances or article to be classified	Compatibility group	Classification code
Primary explosive substance.	A	1.1A
Article containing a primary explosive substance and not containing two or more effective protective features. Some articles, such as detonators for blasting, detonator assemblies for blasting and primers, cap-type, are included, even though they do not contain primary explosives.	B	1.1B 1.2B 1.4B
Propellant explosive substance or other deflagrating explosive substance or article containing such explosive substance.	C	1.1C 1.2C 1.3C 1.4C
Secondary detonating explosive substance or black powder or article containing a secondary detonating explosive substance, in each case without means of initiation and without a propelling charge, or article containing a primary explosive substance and containing two or more effective protective features.	D	1.1D 1.2D 1.4D 1.5D
Article containing a secondary detonating explosive, substance, without means of initiation, with a propelling charge (other than one containing a flammable liquid, gel or hypergolic liquid).	E	1.1E 1.2E 1.4E
Article containing a secondary detonating explosive substance with its means of initiation, with a propelling charge (other than one containing flammable liquid, gel or hypergolic liquid) or without a propelling charge.	F	1.1F 1.2F 1.3F 1.4F
Pyrotechnic substance or article containing a pyrotechnic substance, or article containing both an explosive substance and an illuminating, incendiary, tear-producing or smoke-producing substance (other than a water-activated article or one containing white phosphorus, phosphide or flammable liquid or gel or hypergolic liquid).	G	1.1G 1.2G 1.3G 1.4G
Article containing both an explosive substance and white phosphorus.	H	1.2H 1.3H
Article containing both an explosive substance and flammable liquid or gel.	J	1.1J 1.2J 1.3J
Article containing both an explosive substance and a toxic chemical agent.	K	1.2K 1.3K
Explosive substance or article containing an explosive substance and presenting a special risk (e.g., due to water-activation or presence of hypergolic liquids, phosphides or pyrophoric substances) needing isolation of each type.	L	1.1L 1.2L 1.3L
Articles containing only extremely insensitive detonating substances.	N	1.6N
Substance or article so packed or designed that any hazardous effects arising from accidental functioning are limited to the extent that they do not significantly hinder or prohibit fire fighting or other emergency response efforts in the immediate vicinity of the package.	S	1.4S

<sup>1</sup> The probability of transition from burning to detonation is greater when large quantities are transported in a vessel.

<sup>2</sup> The risk from articles of Division 1.6 is limited to the explosion of a single article.