

(vi) The start-to-discharge pressure of emergency-relief devices must be higher than that specified for the pressure relief devices in paragraph (e)(3)(iv) of this section. The emergency-relief devices must be sized and designed in such a way that the maximum pressure in the shell never exceeds the test pressure of the portable tank.

NOTE TO PARAGRAPH (E)(3)(VI): An example of a method to determine the size of emergency-relief devices is given in Appendix 5 of the UN Manual of Tests and Criteria (incorporated by reference, see §171.7 of this subchapter).

(vii) For insulated portable tanks, the capacity and setting of emergency-relief devices must be determined assuming a loss of insulation from 1 percent of the surface area.

(viii) Vacuum-relief devices and reclosing devices on portable tanks used for flammable hazardous materials must be provided with flame arresters. Any reduction of the relief capacity caused by the flame arrester must be taken into account and the appropriate relief capacity must be provided.

(ix) Service equipment such as devices and external piping must be designed and constructed so that no hazardous material remains in them after filling the portable tank.

(x) Portable tanks may be either insulated or protected by a sun-shield. If the SADT of the hazardous material in the portable tank is 55 °C (131 °F) or less, the portable tank must be completely insulated. The outer surface must be finished in white or bright metal.

(xi) The degree of filling must not exceed 90% at 15 °C (59 °F).

(xii) DOT 57 metal portable tanks are authorized only for tert-butyl cumyl peroxide, di-(2-tert-butylperoxyisopropyl)-benzene(s), dicumyl peroxide and mixtures of two or more of these peroxides. DOT 57 portable tanks must conform to the venting requirements of paragraph (e)(5) of this section. These portable tanks are not subject to the requirements of paragraphs (e)(3)(ii) and (e)(3)(iv) of this section.

(4) For tertiary butyl hydroperoxide (TBHP), each tank car, cargo tank or portable tank must contain 7.6 cm (3.0 inches) low density polyethylene (PE)

saddles having a melt index of at least 0.2 grams per 10 minutes (ASTM D1238, condition E) as part of the lading, with a ratio of PE to TBHP over a range of 0.008 to 0.012 by mass. Alternatively, plastic or metal containers equipped with fusible plugs having a melting point between 69 °C (156 °F) and 71 °C (160 °F) and filled with a sufficient quantity of water to dilute the TBHP to 65 percent or less by mass may be used. The PE saddles must be visually inspected after each trip and, at a minimum, once every 12 months, and replaced when discoloration, fracture, severe deformation, or other indication of change is noted.

(5) *IBCs*. IBCs are authorized subject to the conditions and limitations of this section provided the IBC type is authorized according to IB52 (see §172.102(c)(4) of this subchapter), as applicable, and the IBC conforms to the requirements in subpart O of part 178 of this subchapter at the Packing Group II performance level. The following additional requirements also apply:

(i) IBCs shall be provided with a device to allow venting during transportation. The inlet to the pressure relief device shall be sited in the vapor space of the IBC under maximum filling conditions during transportation.

(ii) To prevent explosive rupture of metal IBCs or composite IBCs with complete metal casing, the emergency-relief devices shall be designed to vent all the decomposition products and vapors evolved during self-accelerating decomposition or during a period of not less than one hour of complete fire-engulfment as calculated by the formula in paragraph (e)(3)(v) of this section. The control and emergency temperatures specified in IB52 are based on a non-insulated IBC.

[Amdt. 173–224, 55 FR 52643, Dec. 21, 1990]

EDITORIAL NOTE: For FEDERAL REGISTER citations affecting §173.225, see the List of CFR Sections Affected which appears in the Finding Aids section of the printed volume and on GPO Access.

**§ 173.226 Materials poisonous by inhalation, Division 6.1, Packing Group I, Hazard Zone A.**

Division 6.1, Packing Group I, materials that are poisonous by inhalation and that fall within the boundaries of

Hazard Zone A in the graph found in §173.133 must be packed in non-bulk packagings in accordance with the following paragraphs:

(a) In seamless specification cylinders conforming to the requirements of §173.40. However, a welded cylinder filled before October 1, 2002, may be transported for reprocessing or disposal of the cylinder's contents until April 1, 2003.

(b) In 1A1, 1B1, 1H1, 1N1, or 6HA1 drums further packed in a 1A2 or 1H2 drum. Both inner and outer drums must conform to the performance test requirements of subpart M of part 178 of this subchapter at the Packing Group I performance level. The outer drum must have a minimum thickness of 1.35 mm (0.053 inch) for a 1A2 outer drum or 6.30 mm (0.248 inch) for a 1H2 outer drum. Outer 1A2 and 1H2 drums must withstand a hydrostatic test pressure of 100 kPa (15 psig). Capacity of the inner drum may not exceed 220 L (58 gallons). In addition, the inner drum must—

(1) Be capable of satisfactorily withstanding the hydrostatic pressure test in §178.605 of this subchapter at a test pressure of 550 kPa (80 psig);

(2) Satisfactorily withstand the leakproofness test in §178.604 of this subchapter using an internal air pressure of at least twice the vapor pressure at 55 °C (131 °F) of the material to be packaged;

(3) Have screw-type closures that are—

(i) Closed and tightened to a torque prescribed by the closure manufacturer, using a device that is capable of measuring torque;

(ii) Physically held in place by any means capable of preventing back-off or loosening of the closure by impact or vibration during transportation; and

(iii) Provided with a cap seal that is properly applied in accordance with the cap seal manufacturer's recommendations and is capable of withstanding an internal pressure of at least 100 kPa (15 psig).

(4) Have a minimum thickness as follows:

(i) If the capacity of the inner drum is less than or equal to 120 L (32 gallons), the minimum thickness of the inner drum is—

(A) For a 1A1 or 1N1 drum, 1.3 mm (0.051 inch);

(B) For a 1B1 drum, 3.9 mm (0.154 inch);

(C) For a 1H1 drum, 3.16 mm (0.124 inch); and

(D) For a 6HA1 drum, the plastic inner container shall be 1.58 mm (0.0622 inch) and the outer steel drum shall be 0.96 mm (0.0378 inch).

(ii) If the capacity of the inner drum is greater than 120 L (32 gallons), the thickness of the inner drum is—

(A) For a 1A1 or 1N1 drum, 1.7 mm (0.067 inch);

(B) For a 1B1 drum, 4.7 mm (0.185 inch);

(C) For a 1H1 drum, 3.16 mm (0.124 inch); and

(D) For a 6HA1 drum, the plastic inner container shall be 1.58 mm (0.0622 inch) and the outer steel drum shall be 1.08 mm (0.043 inch); and

(5) Be isolated from the outer drum by a shock-mitigating, non-reactive material.

(c) In combination packagings, consisting of an inner packaging system and an outer packaging, as follows:

(1) *Outer packagings:*

Steel drum: 1A2  
 Aluminum drum: 1B2  
 Metal drum, other than steel or aluminum:  
 1N2  
 Plywood drum: 1D  
 Fiber drum: 1G  
 Plastic drum: 1H2  
 Wooden barrel: 2C2  
 Steel jerrican: 3A2  
 Plastic jerrican: 3H2  
 Aluminum jerrican: 3B2  
 Steel box: 4A  
 Aluminum box: 4B  
 Natural wood box: 4C1 or 4C2  
 Plywood box: 4D  
 Reconstituted wood box: 4F  
 Fiberboard box: 4G  
 Expanded plastic box: 4H2  
 Solid plastic box: 4H2

(2) *Inner packaging system.* The inner packaging system consists of two packagings: an impact-resistant receptacle of glass, earthenware, plastic or metal securely cushioned with a non-reactive, absorbent material and packed within a leak-tight packaging of metal or plastic. This combination packaging in turn is packed within the outer packaging. Capacity of each inner receptacle may not exceed 4 L (1 gallon). An inner receptacle that has a closure

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must have a closure which is physically held in place by any means capable of preventing back-off or loosening of the closure by impact or vibration during transportation. Both the inner packaging system and the outer packaging must conform to the performance test requirements of subpart M of part 178 of this subchapter, at the Packaging Group I performance level. The inner packaging system must meet these tests without the benefit of the outer packaging. The total amount of liquid contained in the outer packaging may not exceed 16 L (4 gallons).

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**§ 173.227 Materials poisonous by inhalation, Division 6.1, Packing Group I, Hazard Zone B.**

Division 6.1, Packing Group I, materials that are poisonous by inhalation and that fall within the boundaries of Hazard Zone B in the graph found in §173.133 shall be packed in non-bulk packagings which conform to the performance test requirements of subpart M of part 178 of this subchapter, at the Packing Group I performance level. The following packagings are authorized:

(a) In packagings as authorized in §173.226 and seamless and welded specification cylinders conforming to the requirements of §173.40.

(b) 1A1, 1B1, 1N1 or 1H1 drum or 6HA1 composite further packed in a 1A2 or 1H2 drum. Both the inner and outer drums must conform to the performance test requirements of subpart M of part 178 of this subchapter at the Packing Group I performance level. The outer drum must have a minimum thickness of 1.35 mm (0.053 inches) for a 1A2 outer drum or 6.30 mm (0.248 inches) for a 1H2 outer drum. Outer 1A2 and 1H2 drums must withstand a hydrostatic test pressure of 100 kPa (15 psig). In addition, the inner drum must—

(1) Satisfactorily withstand the leakproofness test in §178.604 of this subchapter using an internal air pressure of at least two times the vapor

pressure at 55 °C (131 °F) of the material to be packaged;

(2) Have screw closures that are—

(i) Closed and tightened to a torque prescribed by the closure manufacturer, using a device that is capable of measuring torque;

(ii) Physically held in place by any means capable of preventing back-off or loosening of the closure by impact or vibration during transportation; and

(iii) Provided with a cap seal that is properly applied in accordance with the cap seal manufacturer's recommendations and is capable of withstanding an internal pressure of at least 100 kPa (15 psig).

(3) Have a minimum thickness as follows:

(i) If the capacity of the inner drum is less than or equal to 30 L (7.9 gallons), the minimum thickness of the inner drum is:

(A) For a 1A1 drum, 0.69 mm (0.027 inch);

(B) For a 1B1 drum, 2.79 mm (0.110 inch);

(C) For a 1H1 drum, 1.14 mm (0.045 inch); and

(D) For a 6HA1 drum, the plastic inner container shall be 1.58 mm (0.0625 inch), the outer steel drum shall be 0.70 mm (0.027 inch).

(ii) If the capacity of the inner drum is greater than 30 L (7.9 gallons) but less than or equal to 120 L (32 gallons), the minimum thickness of the inner drum is—

(A) For a 1A1 drum, 1.08 mm (.043 inch);

(B) For a 1B1 drum, 3.9 mm (0.154 inch);

(C) For a 1H1 drum, 3.16 mm (0.124 inch); and

(D) For a 6HA1 drum, the plastic inner container shall be 1.58 mm (0.0625 inch) and the outer steel drum shall be 0.96 mm (0.0378 inches).

(iii) If the capacity of the inner drum is greater than 120 L (31.7 gallons), the thickness of the inner drum is—

(A) For a 1A1 or 1N1 drum, 1.35 mm (0.053 inches);

(B) For a 1B1 drum, 4.7 mm (0.185 inches);

(C) For a 1H1 drum, 3.16 mm (0.124 inches); and

(D) For a 6HA1 drum, the plastic inner container shall be 1.58 mm (0.0625