

the whole IBC, including the base pallet, unsafe for transportation.

(3) For flexible IBCs, there may be no deterioration which renders the IBC unsafe for transportation and no loss of contents.

[Amdt. 178-103, 59 FR 38074, July 26, 1994, as amended by Amdt. 178-119, 62 FR 24743, May 6, 1997; 65 FR 50462, 50463, Aug. 18, 2000; 66 FR 45386, Aug. 28, 2001]

#### § 178.816 Topples test.

(a) *General.* The topple test must be conducted for the qualification of all flexible IBC design types.

(b) *Special preparation for the topple test.* The flexible IBC must be filled to not less than 95 percent of its capacity and to its maximum net mass, with the load being evenly distributed.

(c) *Test method.* A flexible IBC must be toppled onto any part of its top upon a rigid, non-resilient, smooth, flat, and horizontal surface.

(d) *Topple height.* For all flexible IBCs, the topple height is specified as follows:

- (1) Packing Group I: 1.8 m (5.9 feet).
- (2) Packing Group II: 1.2 m (3.9 feet).
- (3) Packing Group III: 0.8 m (2.6 feet).

(e) *Criteria for passing the test.* For all flexible IBCs, there may be no loss of contents. A slight discharge (e.g., from closures or stitch holes) upon impact is not considered to be a failure, provided no further leakage occurs.

[Amdt. 178-103, 59 FR 38074, July 26, 1994, as amended at 66 FR 45386, Aug. 28, 2001]

#### § 178.817 Righting test.

(a) *General.* The righting test must be conducted for the qualification of all flexible IBCs designed to be lifted from the top or side.

(b) *Special preparation for the righting test.* The flexible IBC must be filled to not less than 95 percent of its capacity and to its maximum net mass, with the load being evenly distributed.

(c) *Test method.* The flexible IBC, lying on its side, must be lifted at a speed of at least 0.1 m/second (0.33 ft/s) to an upright position, clear of the floor, by one lifting device, or by two lifting devices when four are provided.

(d) *Criterion for passing the test.* For all flexible IBCs, there may be no damage to the IBC or its lifting devices

which renders the IBC unsafe for transportation or handling.

[Amdt. 178-103, 59 FR 38074, July 26, 1994, as amended at 66 FR 45386, Aug. 28, 2001]

#### § 178.818 Tear test.

(a) *General.* The tear test must be conducted for the qualification of all flexible IBC design types.

(b) *Special preparation for the tear test.* The flexible IBC must be filled to not less than 95 percent of its capacity and to its maximum net mass, the load being evenly distributed.

(c) *Test method.* Once the IBC is placed on the ground, a 100-mm (4-inch) knife score, completely penetrating the wall of a wide face, is made at a 45° angle to the principal axis of the IBC, halfway between the bottom surface and the top level of the contents. The IBC must then be subjected to a uniformly distributed superimposed load equivalent to twice the maximum net mass. The load must be applied for at least five minutes. An IBC which is designed to be lifted from the top or the side must, after removal of the superimposed load, be lifted clear of the floor and maintained in that position for a period of five minutes.

(d) *Criterion for passing the test.* The IBC passes the tear test if the cut does not propagate more than 25 percent of its original length.

[Amdt. 178-103, 59 FR 38074, July 26, 1994, as amended at 66 FR 45386, Aug. 28, 2001]

#### § 178.819 Vibration test.

(a) *General.* The vibration test must be conducted for the qualification of all rigid IBC design types. Flexible IBC design types must be capable of withstanding the vibration test.

(b) *Test method.* (1) A sample IBC, selected at random, must be filled and closed as for shipment.

(2) The sample IBC must be placed on a vibrating platform that has a vertical double-amplitude (peak-to-peak displacement) of one inch. The IBC must be constrained horizontally to prevent it from falling off the platform, but must be left free to move vertically and bounce.

(3) The test must be performed for one hour at a frequency that causes the package to be raised from the vibrating

platform to such a degree that a piece of material of approximately 1.6-mm (0.063-inch) thickness (such as steel strapping or paperboard) can be passed between the bottom of the IBC and the platform. Other methods at least equally effective may be used (see § 178.801(i)).

(c) *Criteria for passing the test.* An IBC passes the vibration test if there is no rupture or leakage.

[Amdt. 178–103, 59 FR 38074, July 26, 1994, as amended by Amdt. 178–108, 60 FR 40038, Aug. 4, 1995; Amdt. 178–110, 60 FR 49111, Sept. 21, 1995; 66 FR 45386, Aug. 28, 2001]

APPENDIX A TO PART 178—SPECIFICATIONS FOR STEEL

TABLE 1

[Open-hearth, basic oxygen, or electric steel of uniform quality. The following chemical composition limits are based on ladle analysis:]

Designation	Chemical composition, percent-ladle analysis		
	Grade 1 <sup>1</sup>	Grade 2 <sup>1 2</sup>	Grade 3 <sup>2 4 5</sup>
Carbon .....	0.10/0.20 .....	0.24 maximum .....	0.22 maximum.
Manganese .....	1.10/1.60 .....	0.50/1.00 .....	1.25 maximum.
Phosphorus, maximum .....	0.04 .....	0.04 .....	0.045. <sup>6</sup>
Sulfur, maximum .....	0.05 .....	0.05 .....	0.05.
Silicon .....	0.15/0.30 .....	0.30 maximum .....	
Copper, maximum .....	0.40 .....		
Columbium .....		0.01/0.04 .....	
Heat treatment authorized .....	( <sup>3</sup> ) .....	( <sup>3</sup> ) .....	( <sup>3</sup> ).
Maximum stress (p.s.i.) .....	35,000 .....	35,000 .....	35,000.

<sup>1</sup> Addition of other elements to obtain alloying effect is not authorized.  
<sup>2</sup> Ferritic grain size 6 or finer according to ASTM E112–63.  
<sup>3</sup> Any suitable heat treatment in excess of 1,100 °F., except that liquid quenching is not permitted.  
<sup>4</sup> Other alloying elements may be added and shall be reported.  
<sup>5</sup> For compositions with a maximum carbon content of 0.15 percent of ladle analysis, the maximum limit for manganese on ladle analysis may be 1.40 percent.  
<sup>6</sup> Rephosphorized Grade 3 steels containing no more than 0.15 percent phosphorus are permitted if carbon content does not exceed 0.15 percent and manganese does not exceed 1 percent.

CHECK ANALYSIS TOLERANCES

[A heat of steel made under any of the above grades, the ladle analysis of which is slightly out of the specified range is acceptable if the check analysis is within the following variations:]

Element	Limit or maximum specified (percent)	Tolerance (percent) over the maximum limit or under the minimum limit	
		Under minimum limit	Over maximum limit
Carbon .....	To 0.15 inclusive .....	0.02	0.03
	Over 0.15 to 0.40 inclusive .....	0.03	0.04
Manganese .....	To 0.60 inclusive .....	0.03	0.03
	Over 0.60 to 1.15 inclusive .....	0.04	0.04
Phosphorus <sup>7</sup> .....	Over 1.15 to 2.50 inclusive .....	0.05	0.05
	All ranges .....		0.01
Sulfur .....	All ranges .....		0.01
	To 0.30 inclusive .....	0.02	0.03
Silicon .....	Over 0.30 to 1.00 inclusive .....	0.05	0.05
	To 1.00 inclusive .....	0.03	0.03
Copper .....	Over 1.00 to 2.00 inclusive .....	0.05	0.05
	To 1.00 inclusive .....	0.03	0.03
Nickel .....	Over 1.00 to 2.00 inclusive .....	0.05	0.05
	To 0.90 inclusive .....	0.03	0.03
Chromium .....	Over 0.90 to 2.10 inclusive .....	0.05	0.05
	To 0.20 inclusive .....	0.01	0.01
Molybdenum .....	Over 0.20 to 0.40 inclusive .....	0.02	0.02
	All ranges .....	0.01	0.05
Zirconium .....	To 0.04 inclusive .....	0.005	0.01
Columbium .....	Over 0.10 to 0.20 inclusive .....	0.04	0.04
	Over 0.20 to 0.30 inclusive .....	0.05	0.05

<sup>7</sup> Rephosphorized steels not subject to check analysis for phosphorus.

[Amdt. 178–3, 34 FR 12283, July 25, 1969; 34 FR 12593, Aug. 1, 1969, as amended by Amdt. 178–64, 45 FR 81573, Dec. 11, 1980; Amdt. 178–97, 55 FR 52728, Dec. 21, 1990]

APPENDIX B TO PART 178—ALTERNATIVE LEAKPROOFNESS TEST METHODS

In addition to the method prescribed in §178.604 of this subchapter, the following leakproofness test methods are authorized:

(1) *Helium test.* The packaging must be filled with at least 1 L inert helium gas, air tight closed, and placed in a testing chamber. The testing chamber must be evacuated down to a pressure of 5 kPa which equals an over-pressure inside the packaging of 95 kPa. The air in the testing chamber must be analyzed for traces of helium gas by means of a mass spectrograph. The test must be conducted for a period of time sufficient to evacuate the chamber and to determine if there is leakage into or out of the packaging. If helium gas is detected, the leaking packaging must be automatically separated from non-leaking drums and the leaking area determined according to the method prescribed in §178.604(d) of this subchapter. A packaging passes the test if there is no leakage of helium.

(2) *Pressure differential test.* The packaging shall be restrained while either pressure or a vacuum is applied internally. The packaging must be pressurized to the pressure required by §178.604(e) of this subchapter for the appropriate packing group. The method of restraint must not affect the results of the test. The test must be conducted for a period of time sufficient to appropriately pressurize or evacuate the interior of the packaging and to determine if there is leakage into or out of the packaging. A packaging passes the pressure differential test if there is no change in measured internal pressure.

(3) *Solution over seams.* The packaging must be restrained while an internal air pressure is applied; the method of restraint may not affect the results of the test. The exterior surface of all seams and welds must be coated with a solution of soap suds or a water and oil mixture. The test must be conducted for a period of time sufficient to pressurize the interior of the packaging to the specified air pressure and to determine if there is leakage of air from the packaging. A packaging passes the test if there is no leakage of air from the packaging.

(4) *Solution over partial seams test.* For other than design qualification testing, the following test may be used for metal drums: The packaging must be restrained while an internal air pressure of 48 kPa (7.0 psig) is applied; the method of restraint may not affect the results of the test. The packaging must be coated with a soap solution over the entire side seam and a distance of not less than eight inches on each side of the side seam along the chime seam(s). The test must be conducted for a period of time sufficient to pressurize the interior of the packaging to the specified air pressure and to determine if there is leakage of air from the packaging. A

packaging passes the test if there is no leakage of air from the packaging. Chime cuts must be made on the initial drum at the beginning of each production run and on the initial drum after any adjustment to the chime seamer. Chime cuts must be maintained on file in date order for not less than six months and be made available to a representative of the Department of Transportation on request.

[Amdt. 178-97, 55 FR 52728, Dec. 21, 1990, as amended at 56 FR 66287, Dec. 20, 1991; 57 FR 45466, Oct. 1, 1992]

APPENDIX C TO PART 178—NOMINAL AND MINIMUM THICKNESSES OF STEEL DRUMS AND JERRICANS

For each listed packaging capacity, the following table compares the ISO Standard 3574 nominal thickness with the corresponding ISO Standard 3574 minimum thickness.

Maximum capacity (L)	ISO nominal (mm)	Corresponding ISO minimum (mm)
20 .....	0.7	0.63
30 .....	0.8	0.73
40 .....	0.8	0.73
60 .....	1.0	0.92
120 .....	1.0	0.92
220 .....	1.0	0.92
450 .....	1.9	1.77

[Amdt. 178-106, 59 FR 67522, Dec. 29, 1994]

**PART 179—SPECIFICATIONS FOR TANK CARS**

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