

Pipeline and Hazardous Materials Safety Administration, DOT Pt. 178, App. A

types there may be no loss of the filling substance. However a slight discharge (e.g., from closures or stitch holes) upon impact is not considered a failure of the Flexible Bulk Container.

§ 178.1065 Righting test.

(a) *General.* The righting test must be conducted for the qualification of all Flexible Bulk Containers design types designed to be lifted from the top or side.

(b) *Special preparation for the righting test.* Flexible Bulk Container design types must be filled to not less than 95% of their capacity and to their maximum permissible gross mass, the load being evenly distributed.

(c) *Test method.* A sample Flexible Bulk Container design type must be tested; the Flexible Bulk Container should start lying on its side and then must be lifted at a speed of at least 0.1m/s (0.328 ft/s) to an upright position clear of the floor, by no more than half of the lifting devices.

(d) *Criterion for passing the test.* For all Flexible Bulk Container design types there must be no damage that renders the Flexible Bulk Container unsafe for transport or handling.

§ 178.1070 Tear test.

(a) *General.* The tear test must be conducted for the qualification of all of Flexible Bulk Containers design types.

(b) *Special preparation for the tear test.* Flexible Bulk Container design types must be filled its maximum permissible gross mass, the load being evenly distributed.

(c) *Test method.* (1) A Flexible Bulk Container design type must be placed on the ground and a 300 mm (11.9 in) cut shall be made. This 300 mm (11.9 in) cut must:

(i) Completely penetrate all layers of the Flexible Bulk Container on a wall with a wide face.

(ii) Be made at a 45° angle to the principal axis of the Flexible Bulk Container, halfway between the bottom surface and the top level of the contents.

(2) The Flexible Bulk Container after being cut according to the provisions of §178.1070(c)(1), must be subjected to a uniformly distributed superimposed load equivalent to twice the maximum gross mass of the package. This load must be applied for at least fifteen minutes. Flexible Bulk Containers that are 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 fifteen minutes.

(d) *Criterion for passing the test.* For all Flexible Bulk Container design types, the cut must not spread more than an additional 25% of its original length.

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 ¹	Grade 2 ^{1,2}	Grade 3 ^{2,4,5}
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, ⁶
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	(³)	(³)	(³).
Maximum stress (p.s.i.)	35,000	35,000	35,000.

¹ Addition of other elements to obtain alloying effect is not authorized.
² Ferritic grain size 6 or finer according to ASTM E 112-96 (IBR, see § 171.7 of this subchapter).
³ Any suitable heat treatment in excess of 1,100 °F., except that liquid quenching is not permitted.
⁴ Other alloying elements may be added and shall be reported.
⁵ 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.
⁶ 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
	Over 1.15 to 2.50 inclusive	0.05	0.05
Phosphorus ⁷	All ranges		0.01
Sulfur	All ranges		0.01
Silicon	To 0.30 inclusive	0.02	0.03
	Over 0.30 to 1.00 inclusive	0.05	0.05
Copper	To 1.00 inclusive	0.03	0.03
	Over 1.00 to 2.00 inclusive	0.05	0.05
Nickel	To 1.00 inclusive	0.03	0.03
	Over 1.00 to 2.00 inclusive	0.05	0.05
Chromium	To 0.90 inclusive	0.03	0.03
	Over 0.90 to 2.10 inclusive	0.05	0.05
Molybdenum	To 0.20 inclusive	0.01	0.01
	Over 0.20 to 0.40 inclusive	0.02	0.02
Zirconium	All ranges	0.01	0.05
Columbium	To 0.04 inclusive	0.005	0.01
Aluminum	Over 0.10 to 0.20 inclusive	0.04	0.04
	Over 0.20 to 0.30 inclusive	0.05	0.05

⁷ 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; 68 FR 75758, Dec. 31, 2003]

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