

strength, and be firmly secured in the outer packaging.

(ii) Any part of a closure likely to come into contact with the contents of the receptacle must be resistant to those contents. Closures must be fitted so as to be leakproof and secured to prevent any loosening during transportation. Vented closures must conform to §173.24(f) of this subchapter.

(2) Protective packagings must conform to the following requirements:

(i) For receptacles with protective steel drum 6PAL, the drum must comply with §178.504(b) of this subpart. However, the removable lid required for this type of packaging may be in the form of a cap.

(ii) For receptacles with protective packaging of steel crate or steel box 6PA2, the protective packaging must conform to the following:

(A) Section 178.512(b) of this subpart.

(B) In the case of cylindrical receptacles, the protective packaging must, when upright, rise above the receptacle and its closure; and

(C) If the protective crate surrounds a pear-shaped receptacle and is of matching shape, the protective packaging must be fitted with a protective cover (cap).

(iii) For receptacles with protective aluminum drum 6PBI, the requirements of §178.505(b) of this subpart apply to the protective packaging.

(iv) For receptacles with protective aluminum box or crate 6PB2, the requirements of §178.512(b) of this subpart apply to the protective packaging.

(v) For receptacles with protective wooden box 6PC, the requirements of §178.513(b) of this subpart apply to the protective packaging.

(vi) For receptacles with protective plywood drum 6PDI, the requirements of §178.507(b) of this subpart apply to the protective packaging.

(vii) For receptacles with protective wickerwork hamper 6PD2, the wickerwork hamper must be properly made with material of good quality. The hamper must be fitted with a protective cover (cap) so as to prevent damage to the receptacle.

(viii) For receptacles with protective fiber drum 6PG1, the drum must conform to the requirements of §178.508(b) of this subpart.

(ix) For receptacles with protective fiberboard box 6PG2, the requirements of §178.516(b) of this subpart apply to the protective packaging.

(x) For receptacles with protective solid plastic or expanded plastic packaging 6PH1 or 6PH2, the requirements of §178.517(b) of this subpart apply to the protective packaging. Solid protective plastic packaging must be manufactured from high-density polyethylene from some other comparable plastic material. The removable lid required for this type of packaging may be a cap.

(3) Quantity limitations are as follows:

(i) Maximum net capacity for packaging for liquids: 60 L (16 gallons).

(ii) Maximum net mass for packagings for solids: 75 kg (165 pounds).

Subpart M—Testing of Non-bulk Packagings and Packages

SOURCE: Amdt. 178-97, 55 FR 52723, Dec. 21, 1990, unless otherwise noted.

§ 178.600 Purpose and scope.

This subpart prescribes certain testing requirements for performance-oriented packagings identified in subpart L of this part.

[Amdt. 178-97, 55 FR 52717, Dec. 21, 1990, and amended by Amdt. 178-99, 58 FR 51534, Oct. 1, 1993]

§ 178.601 General requirements.

(a) *General.* The test procedures prescribed in this subpart are intended to ensure that packages containing hazardous materials can withstand normal conditions of transportation and are considered minimum requirements. Each packaging must be manufactured and assembled so as to be capable of successfully passing the prescribed tests and of conforming to the requirements of §173.24 of this subchapter at all times while in transportation.

(b) *Responsibility.* It is the responsibility of the packaging manufacturer to assure that each package is capable of passing the prescribed tests. To the extent that a package assembly function, including final closure, is performed by the person who offers a hazardous material for transportation,

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that person is responsible for performing the function in accordance with §§ 173.22 and 178.2 of this subchapter.

(c) *Definitions.* For the purpose of this subpart:

(1) *Design qualification testing* is the performance of the tests prescribed in § 178.603, § 178.604, § 178.605, § 178.606, § 178.607, § 178.608, or § 178.609, as applicable, for each new or different packaging, at the start of production of that packaging.

(2) *Periodic retesting* is the performance of the drop, leakproofness, hydrostatic pressure, and stacking tests, as applicable, as prescribed in § 178.603, § 178.604, § 178.605, or § 178.606, respectively, at the frequency specified in paragraph (e) of this section. For infectious substances packagings required to meet the requirements of § 178.609, periodic retesting is the performance of the tests specified in § 178.609 at the frequency specified in paragraph (e) of this section.

(3) *Production testing* is the performance of the leakproofness test prescribed in § 178.604 of this subpart on each single or composite packaging intended to contain a liquid.

(4) A *different packaging* is one that differs (i.e. is not identical) from a previously produced packaging in structural design, size, material of construction, wall thickness or manner of construction but does not include:

(i) A packaging which differs only in surface treatment;

(ii) A combination packaging which differs only in that the outer packaging has been successfully tested with different inner packagings. A variety of such inner packagings may be assembled in this outer packaging without further testing;

(iii) A plastic packaging which differs only with regard to additives which conform to § 178.509(b)(3) or § 178.517(b)(4) or (5) of this part;

(iv) A combination packaging with inner packagings conforming to the provisions of paragraph (g) of this section;

(v) Packagings which differ from the design type only in their lesser design height; or

(vi) For a steel drum, variations in design elements which do not con-

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stitute a different design type under the provisions of paragraph (g)(8) of this section.

(d) *Design qualification testing.* The packaging manufacturer shall achieve successful test results for the design qualification testing at the start of production of each new or different packaging.

(e) *Periodic retesting.* The packaging manufacturer must achieve successful test results for the periodic retesting at intervals established by the manufacturer of sufficient frequency to ensure that each packaging produced by the manufacturer is capable of passing the design qualification tests. Changes in retest frequency are subject to the approval of the Associate Administrator for Hazardous Materials Safety. For single or composite packagings, the periodic retests must be conducted at least once every 12 months. For combination packagings, the periodic retests must be conducted at least once every 24 months. For infectious substances packagings, the periodic retests must be conducted at least once every 24 months.

(f) *Test samples.* The manufacturer shall conduct the design qualification and periodic tests prescribed in this subpart using random samples of packagings, in the numbers specified in the appropriate test section. In addition, the leakproofness test, when required, shall be performed on each packaging produced by the manufacturer, and each packaging prior to reuse under § 173.28 of this subchapter, by the reconditioner.

(g) *Selective testing.* The selective testing of packagings that differ only in minor respects from a tested type is permitted as described in this section. For air transport, packagings must comply with § 173.27(c)(1) and (c)(2) of this subchapter.

(1) *Selective testing of combination packagings. Variation 1.* Variations are permitted in inner packagings of a tested combination package, without further testing of the package, provided an equivalent level of performance is maintained and, when a package is altered under Variation 1 after October 1, 2010, the methodology used to determine that the inner packaging,

including closure, maintains an equivalent level of performance is documented in writing by the person certifying compliance with this paragraph and retained in accordance with paragraph (l) of this section. Permitted variations are as follows:

(i) Inner packagings of equivalent or smaller size may be used provided—

(A) The inner packagings are of similar design to the tested inner packagings (i.e. shape—round, rectangular, etc.);

(B) The material of construction of the inner packagings (glass, plastic, metal, etc.) offers resistance to impact and stacking forces equal to or greater than that of the originally tested inner packaging;

(C) The inner packagings have the same or smaller openings and the closure is of similar design (e.g., screw cap, friction lid, etc.);

(D) Sufficient additional cushioning material is used to take up void spaces and to prevent significant moving of the inner packagings;

(E) Inner packagings are oriented within the outer packaging in the same manner as in the tested package; and,

(F) The gross mass of the package does not exceed that originally tested.

(ii) A lesser number of the tested inner packagings, or of the alternative types of inner packagings identified in paragraph (g)(1)(i) of this section, may be used provided sufficient cushioning is added to fill void space(s) and to prevent significant moving of the inner packagings.

(2) *Selective testing of combination packagings. Variation 2.* Articles or inner packagings of any type, for solids or liquids, may be assembled and transported without testing in an outer packaging under the following conditions:

(i) The outer packaging must have been successfully tested in accordance with §178.603 with fragile (e.g. glass) inner packagings containing liquids at the Packing Group I drop height;

(ii) The total combined gross mass of inner packagings may not exceed one-half the gross mass of inner packagings used for the drop test;

(iii) The thickness of cushioning material between inner packagings and between inner packagings and the out-

side of the packaging may not be reduced below the corresponding thickness in the originally tested packaging; and when a single inner packaging was used in the original test, the thickness of cushioning between inner packagings may not be less than the thickness of cushioning between the outside of the packaging and the inner packaging in the original test. When either fewer or smaller inner packagings are used (as compared to the inner packagings used in the drop test), sufficient additional cushioning material must be used to take up void spaces.

(iv) The outer packaging must have successfully passed the stacking test set forth in §178.606 of this subpart when empty, i.e., without either inner packagings or cushioning materials. The total mass of identical packages must be based on the combined mass of inner packagings used for the drop test;

(v) Inner packagings containing liquids must be completely surrounded with a sufficient quantity of absorbent material to absorb the entire liquid contents of the inner packagings;

(vi) When the outer packaging is intended to contain inner packagings for liquids and is not leakproof, or is intended to contain inner packagings for solids and is not siftproof, a means of containing any liquid or solid contents in the event of leakage must be provided in the form of a leakproof liner, plastic bag, or other equally efficient means of containment. For packagings containing liquids, the absorbent material required in paragraph (g)(2)(v) of this section must be placed inside the means of containing liquid contents; and

(vii) Packagings must be marked in accordance with §178.503 of this part as having been tested to Packing Group I performance for combination packagings. The marked maximum gross mass may not exceed the sum of the mass of the outer packaging plus one half the mass of the filled inner packagings of the tested combination packaging. In addition, the marking required by §178.503(a)(2) of this part must include the letter "V".

(3) *Variation 3.* Packagings other than combination packagings which are produced with reductions in external dimensions (i.e., length, width or diameter) of up to 25 percent of the dimensions of a tested packaging may be used without further testing provided an equivalent level of performance is maintained. The packagings must, in all other respects (including wall thicknesses), be identical to the tested design-type. The marked gross mass (when required) must be reduced in proportion to the reduction in volume.

(4) *Variation 4.* Variations are permitted in outer packagings of a tested design-type combination packaging, without further testing, provided an equivalent level of performance is maintained, as follows:

(i) Each external dimension (length, width and height) is less than or equal to the corresponding dimension of the tested design-type;

(ii) The structural design of the tested outer packaging (i.e. methods of construction, materials of construction, strength characteristics of materials of construction, method of closure and material thicknesses) is maintained;

(iii) The inner packagings are identical to the inner packagings used in the tested design type except that their size and mass may be less; and they are oriented within the outer packaging in the same manner as in the tested packaging;

(iv) The same type or design of absorbent materials, cushioning materials and any other components necessary to contain and protect inner packagings, as used in the tested design type, are maintained. The thickness of cushioning material between inner packagings and between inner packagings and the outside of the packaging may not be less than the thicknesses in the tested design type packaging; and

(v) Sufficient additional cushioning material is used to take up void spaces and to prevent significant moving of the inner packagings.

An outer packaging qualifying for use in transport in accordance with all of the above conditions may also be used without testing to transport inner packagings substituted for the origi-

nally tested inner packagings in accordance with the conditions set out in Variation 1 in paragraph (g)(1) of this section.

(5) *Variation 5.* Single packagings (i.e., non-bulk packagings other than combination packagings), that differ from a tested design type only to the extent that the closure device or gasketing differs from that used in the originally tested design type, may be used without further testing, provided an equivalent level of performance is maintained, subject to the following conditions (the qualifying tests):

(i) A packaging with the replacement closure devices or gasketing must successfully pass the drop test specified in §178.603 in the orientation which most severely tests the integrity of the closure or gasket;

(ii) When intended to contain liquids, a packaging with the replacement closure devices or gasketing must successfully pass the leakproofness test specified in §178.604, the hydrostatic pressure test specified in §178.605, and the stacking test specified in §178.606.

Replacement closures and gasketings qualified under the above test requirements are authorized without additional testing for packagings described in paragraph (g)(3) of this section. Replacement closures and gasketings qualified under the above test requirements also are authorized without additional testing for different tested design types packagings of the same type as the originally tested packaging, provided the original design type tests are more severe or comparable to tests which would otherwise be conducted on the packaging with the replacement closures or gasketings. (For example: The packaging used in the qualifying tests has a lesser packaging wall thickness than the packaging with replacement closure devices or gasketing; the gross mass of the packaging used in the qualifying drop test equals or exceeds the mass for which the packaging with replacement closure devices or gasketing was tested; the packaging used in the qualifying drop test was dropped from the same or greater height than the height from which the packaging with replacement closure devices or gasketing was dropped in design type tests; and the specific gravity

of the substance used in the qualifying drop test was the same or greater than the specific gravity of the liquid used in the design type tests of the packaging with replacement closure devices or gasketing.)

(6) The provisions in Variations 1, 2, and 4 in paragraphs (g)(1), (2) and (4) of this section for combination packagings may be applied to packagings containing articles, where the provisions for inner packagings are applied analogously to the articles. In this case, inner packagings need not comply with §173.27(c)(1) and (c)(2) of this subchapter.

(7) *Approval of selective testing.* In addition to the provisions of §178.601(g)(1) through (g)(6) of this subpart, the Associate Administrator may approve the selective testing of packagings that differ only in minor respects from a tested type.

(8) For a steel drum with a capacity greater than 12 L (3 gallons) manufactured from low carbon, cold-rolled sheet steel meeting ASTM designations A 366/A 366M or A 568/A 568M, variations in elements other than the following design elements are considered minor and do not constitute a different drum design type, or “different packaging” as defined in paragraph (c) of this section for which design qualification testing and periodic retesting are required. Minor variations authorized without further testing include changes in the identity of the supplier of component material made to the same specifications, or the original manufacturer of a DOT specification or UN standard drum to be remanufactured. A change in any one or more of the following design elements constitutes a different drum design type:

(i) The packaging type and category of the original drum and the remanufactured drum, *i.e.*, 1A1 or 1A2;

(ii) The style, (*i.e.*, straight-sided or tapered);

(iii) Except as provided in paragraph (g)(3) of this section, the rated (marked) capacity and outside dimensions;

(iv) The physical state for which the packaging was originally approved (*e.g.*, tested for solids or liquids);

(v) An increase in the marked level of performance of the original drum (*i.e.*,

to a higher packing group, hydrostatic test pressure, or specific gravity to which the packaging has been tested);

(vi) Type of side seam welding;

(vii) Type of steel;

(viii) An increase greater than 10% or any decrease in the steel thickness of the head, body, or bottom;

(ix) End seam type, (*e.g.*, triple or double seam);

(x) A reduction in the number of rolling hoops (beads) which equal or exceed the diameter over the chimes;

(xi) The location, type or size, and material of closures (other than the cover of UN 1A2 drums);

(xii) The location (*e.g.*, from the head to the body), type (*e.g.*, mechanically seamed or welded flange), and materials of closure (other than the cover of UN 1A2 drums); and

(xiii) For UN 1A2 drums:

(A) Gasket material (*e.g.*, plastic), or properties affecting the performance of the gasket;

(B) Configuration or dimensions of the gasket;

(C) Closure ring style including bolt size (*e.g.*, square or round back, 0.625 inches bolt); and

(D) Closure ring thickness,

(E) Width of lugs or extensions in crimp/lug cover.

(h) *Approval of equivalent packagings.* A packaging having specifications different from those in §§178.504–178.523 of this part, or which is tested using methods or test intervals, other than those specified in subpart M of this part, may be used if approved by the Associate Administrator. Such packagings must be shown to be equally effective, and testing methods used must be equivalent.

(i) *Proof of compliance.* Notwithstanding the periodic retest intervals specified in paragraph (e) of this section, the Associate Administrator may at any time require demonstration of compliance by a manufacturer, through testing in accordance with this subpart, that packagings meet the requirements of this subpart. As required by the Associate Administrator, the manufacturer shall either—

(1) Conduct performance tests, or have tests conducted by an independent testing facility, in accordance with this subpart; or

(2) Supply packagings, in quantities sufficient to conduct tests in accordance with this subpart, to the Associate Administrator or a designated representative of the Associate Administrator.

(j) *Coatings.* If an inner treatment or coating of a packaging is required for safety reasons, the manufacturer shall design the packaging so that the treatment or coating retains its protective properties even after withstanding the tests prescribed by this subpart.

(k) *Number of test samples.* Except as provided in this section, one test sample must be used for each test performed under this subpart.

(l) *Stainless steel drums.* Provided the validity of the test results is not affected, a person may perform the design qualification testing of stainless steel drums using three (3) samples rather than the specified eighteen (18) samples under the following provisions:

(i) The packaging must be tested in accordance with this subpart by subjecting each of the three containers to the following sequence of tests:

(A) The stacking test in § 178.606,

(B) The leakproofness test in § 178.604,

(C) The hydrostatic pressure test in § 178.608, and

(D) Diagonal top chime and flat on the side drop tests in § 178.603. Both drop tests may be conducted on the same sample.

(ii) For periodic retesting of stainless steel drums, a reduced sample size of one container is authorized.

(2) *Packagings other than stainless steel drums.* Provided the validity of the test results is not affected, several tests may be performed on one sample with the approval of the Associate Administrator.

[Amdt. 178-97, 55 FR 52723, Dec. 21, 1990, as amended at 56 FR 66285, Dec. 20, 1991; 57 FR 45465, Oct. 1, 1992; Amdt. 178-102, 59 FR 28494, June 2, 1994; Amdt. 178-106, 59 FR 67521, 67522, Dec. 29, 1994; Amdt. 178-117, 61 FR 50628, Sept. 26, 1996; 66 FR 45386, Aug. 28, 2001; 67 FR 53143, Aug. 14, 2002; 68 FR 75758, Dec. 31, 2003; 68 FR 61942, Oct. 30, 2003; 75 FR 5396, Feb 2, 2010; 75 FR 60339, Sept. 30, 2010]

§ 178.602 Preparation of packagings and packages for testing.

(a) Except as otherwise provided in this subchapter, each packaging and package must be closed in preparation

for testing and tests must be carried out in the same manner as if prepared for transportation, including inner packagings in the case of combination packagings.

(b) For the drop and stacking test, inner and single-unit receptacles other than bags must be filled to not less than 95% of maximum capacity (see § 171.8 of this subchapter) in the case of solids and not less than 98% of maximum in the case of liquids. Bags containing solids shall be filled to the maximum mass at which they may be used. The material to be transported in the packagings may be replaced by a non-hazardous material, except for chemical compatibility testing or where this would invalidate the results of the tests.

(c) If the material to be transported is replaced for test purposes by a non-hazardous material, the material used must be of the same or higher specific gravity as the material to be carried, and its other physical properties (grain, size, viscosity) which might influence the results of the required tests must correspond as closely as possible to those of the hazardous material to be transported. Water may also be used for the liquid drop test under the conditions specified in § 178.603(e) of this subpart. It is permissible to use additives, such as bags of lead shot, to achieve the requisite total package mass, so long as they are placed so that the test results are not affected.

(d) Paper or fiberboard packagings must be conditioned for at least 24 hours immediately prior to testing in an atmosphere maintained—

(1) At 50 percent ± 2 percent relative humidity, and at a temperature of $23 \text{ }^{\circ}\text{C} \pm 2 \text{ }^{\circ}\text{C}$ ($73 \text{ }^{\circ}\text{F} \pm 4 \text{ }^{\circ}\text{F}$). Average values should fall within these limits. Short-term fluctuations and measurement limitations may cause individual measurements to vary by up to ± 5 percent relative humidity without significant impairment of test reproducibility;

(2) At 65 percent ± 2 percent relative humidity, and at a temperature of $20 \text{ }^{\circ}\text{C} \pm 2 \text{ }^{\circ}\text{C}$ ($68 \text{ }^{\circ}\text{F} \pm 4 \text{ }^{\circ}\text{F}$), or $27 \text{ }^{\circ}\text{C} \pm 2 \text{ }^{\circ}\text{C}$ ($81 \text{ }^{\circ}\text{F} \pm 4 \text{ }^{\circ}\text{F}$). Average values should fall within these limits. Short-term fluctuations and measurement limitations may cause individual measurements to