must be tested to a minimum test pressure of 250 kPa (36 psig).

e) **Criteria for passing the test.** A package passes the hydrostatic test if, for each test sample, there is no leakage of liquid from the package.


§ 178.606 Stacking test.

(a) **General.** All packaging design types other than bags must be subjected to a stacking test.

(b) **Number of test samples.** Three test samples are required for each different packaging. For periodic retesting of packagings constructed of stainless steel, monel, or nickel, only one test sample is required. Exceptions for the number of aluminum and steel sample packagings used in conducting the stacking test are subject to the approval of the Associate Administrator. Notwithstanding the provisions of § 178.602(a) of this subpart, combination packagings may be subjected to the stacking test without their inner packagings, except where this would invalidate the results of the test.

(c) **Test method—(1) Design qualification testing.** The test sample must be subjected to a force applied to the top surface of the test sample equivalent to the total weight of identical packages which might be stacked on it during transport; where the contents of the test sample are non-hazardous liquids with specific gravities different from that of the liquid to be transported, the force must be calculated based on the specific gravity that will be marked on the packaging. The minimum height of the stack, including the test sample, must be 3.0 m (10 feet). The duration of the test must be 24 hours, except that plastic drums, jerricans, and composite packagings 6HH intended for liquids shall be subjected to the stacking test for a period of 28 days at a temperature of not less than 40 °C (104 °F). Alternative test methods which yield equivalent results may be used if approved by the Associate Administrator. In guided load tests, stacking stability must be assessed after completion of the test by placing two filled packagings of the same type on the test sample. The stacked packages must maintain their position for one hour. Plastic packagings must be cooled to ambient temperature before this stacking stability assessment.

(2) **Periodic retesting.** The test sample must be tested in accordance with:

(i) Section 178.606(e)(1) of this subpart; or

(ii) The packaging may be tested using a dynamic compression testing machine. The test must be conducted at room temperature on an empty, unsealed packaging. The test sample must be centered on the bottom platen of the testing machine. The top platen must be lowered until it comes in contact with the test sample. Compression must be applied end to end. The speed of the compression tester must be one-half inch plus or minus one-fourth inch per minute. An initial preload of 50 pounds must be applied to ensure a definite contact between the test sample and the platens. The distance between the platens at this time must be recorded as zero deformation. The force A to then be applied must be calculated using the formula:

\[
Liquids: A = (n – 1) \times \left[ w + (s \times v \times 8.3 \times .98) \right] \times 1.5;
\]

\[
Solids: A = (n – 1) \times m \times 2.2 \times 1.5
\]

Where:

- \( A \) = applied load in pounds
- \( m \) = the certified maximum gross mass for the container in kilograms
- \( n \) = minimum number of containers that, when stacked, reach a height of 3 meters
- \( s \) = specific gravity of lading
- \( w \) = maximum weight of one empty container in pounds
- \( v \) = actual capacity of container (rated capacity + outage) in gallons.

And:

- 8.3 corresponds to the weight in pounds of 1.0 gallon of water.
- .98 corresponds to the minimum filling percentage of the maximum capacity for liquids.

1.5 is a compensation factor that converts the static load of the stacking test into a load suitable for dynamic compression testing.

2.2 is the conversion factor for kilograms to pounds.

(d) **Criteria for passing the test.** No test sample may leak. In composite packagings or combination packagings,
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§ 178.609 Test requirements for packagings for infectious substances.

(a) Samples of each packaging must be prepared for testing as described in paragraph (b) of this section and then subjected to the tests in paragraphs (d) through (i) of this section.

(b) Samples of each packaging must be prepared as for transport except that a liquid or solid infectious substance should be replaced by water or, where conditioning at $918 \degree C (0 \degree F)$ is specified, by water/antifreeze. Each primary receptacle must be filled to 98 percent capacity. Packagings for live animals should be tested with the live animal being replaced by an appropriate dummy of similar mass.

(c) Packagings prepared as for transport must be subjected to the tests in Table I of this paragraph (c), which, for test purposes, categorizes packagings according to their material characteristics. For outer packagings, the headings in Table I relate to fiberboard or similar materials whose performance may be rapidly affected by moisture; plastics that may embrittle at low temperature; and other materials, such as metal, for which performance is not significantly affected by moisture or temperature. Where a primary receptacle and a secondary packaging of an inner packaging are made of different materials, the material of the primary...