

§ 178.815 Stacking test.

- (a) *General.* The stacking test must be conducted for the qualification of all IBC design types intended to be stacked.
- (b) *Special preparation for the stacking test.* (1) All IBCs except flexible IBC design types must be loaded to their maximum permissible gross mass.
- (2) 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.* (1) All IBCs must be placed on their base on level, hard ground and subjected to a uniformly distributed superimposed test load for a period of at least five minutes (see paragraph (d) of this section).
- (2) Fiberboard, wooden, and composite IBCs with outer packagings constructed of other than plastic materials must be subjected to the test for 24 hours.
- (3) Rigid plastic IBC types and composite IBC types with plastic outer packagings (11HH1, 11HH2, 21HH1, 21HH2, 31HH1 and 31HH2) which bear the stacking load must be subjected to the test for 28 days at 40 °C (104 °F).
- (4) For all IBCs, the load must be applied by one of the following methods:
- (i) One or more IBCs of the same type loaded to their maximum permissible gross mass and stacked on the test IBC;
- (ii) The calculated superimposed test load weight loaded on either a flat plate or a reproduction of the base of the IBC, which is stacked on the test IBC; or
- (iii) 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 applicable formula:

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

or

Solids: $A = (n-1) [w + (s \times v \times 8.3 \times .95)] \times 1.5$

Where:

A = applied load in pounds.

n = minimum number of containers that, when stacked, reach a height of 3 m.

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.

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

(d) *Calculation of superimposed test load.* For all IBCs, the load to be placed on the IBC must be 1.8 times the combined maximum permissible gross mass of the number of similar IBCs that may be stacked on top of the IBC during transportation.

(e) *Criteria for passing the test.* (1) For metal, rigid plastic, and composite IBCs there may be no permanent deformation which renders the IBC unsafe for transportation and no loss of contents.

(2) For fiberboard and wooden IBCs there may be no loss of contents and no permanent deformation which renders 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]