

# T 818 cm-07

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OFFICIAL STANDARD – 1976  
OFFICIAL TEST METHOD – 1982  
REVISED – 1987  
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## Ring crush of paperboard (flexible beam method)

### 1. Scope

1.1 The ring crush test correlates with edgewise compression strength of paperboard (1).

1.2 This method is intended for paperboard between 0.28 mm (0.011 in.) and 0.51 mm (0.020 in.) thick. It may be used with less reliability for paperboard as thin as 0.18 mm (0.007 in.), and as thick as 0.76 mm (0.030 in.). The short span compression test, TAPPI T 826 “Short Span Compressive Strength of Paperboard,” measures edgewise compressive strength over a broader range of thickness.

1.3 Ring crush is also measured in TAPPI T 822 “Ring Crush of Paperboard (Rigid Support Method),” which uses a rigid platen compression machine instead of the flexing beam of this method. T 822 has a tighter precision.

### 2. Significance

The edgewise compression strength of corrugated board is a principal element in determining the dynamic compression strength of the container made from that board. Since fiberboard shipping containers are frequently subjected to loads which are resisted by compression strength, this property is an important measure of the performance characteristic of corrugated board, useful in controlling the manufacturing process and in measuring the quality of the finished product. Since edgewise compression can be estimated by a summation of the ring crush strengths of the liners and the medium, this test becomes a useful one for the corrugated boxmaker.

### 3. Summary

A compressive force is exerted on a specimen held in ring form in a special jig and placed between two platens of a compression machine, by causing the upper platen to approach the lower platen at a uniform speed until the specimen collapses.

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#### 4. Apparatus

4.1 *Compression machine*<sup>1</sup>, having upper and lower platens.

4.1.1 The lower platen rests on a beam which flexes on loading.

4.1.2 The compressive force applied is developed at a rate equivalent to  $111 \pm 22$  N/s ( $25 \pm 5$  lbf/s) when the machine is under load with the platens in contact.

4.1.3 The surfaces of the platens are smooth, flat, and parallel to each other to within one part in 2000 throughout the test. That is, for  $100 \times 100$  mm ( $4 \times 4$  in.) platens, the difference in clearance between the platens shall not exceed 0.05 mm (0.002 in.) when a simulated load is applied.

**NOTE 1:** The use of emery or crocus cloth on the platens, as in flat crush testing, is not permissible.

4.1.4 The platens are held rigidly with a maximum permissible lateral movement of 0.05 mm (0.002 in.).

4.1.5 The beam, having a capacity of either 1112 N (250 lbf) or 2224 N (500 lbf), on loading operates a scale indicating the maximum deflection (at the beam's center). This deflection is linearly related to the force applied to the beam's center via the platens, and the scale is calibrated in units of force. The beam is supported so that it can be accurately calibrated with dead weights.

**NOTE 2:** For calibrating, see Appendix A of TAPPI T 808 "Flat Crush Test of Corrugated Board."

4.2 *Specimen holder*, composed of a circular block, having an annular square cut groove,  $6.4 \pm 0.25$  mm ( $0.25 \pm 0.01$  in.) deep and  $49.3 \pm 0.025$  mm ( $1.940 \pm 0.001$  in.) outside diameter. The bottom of the annular groove is required to be parallel with the base of the block  $\pm 0.01$  mm ( $\pm 0.0004$  in.), with the sides of the groove at right angles. A branch groove tangent to the annular groove, of the same depth and extending to the edge of the block, is provided to insert the specimen and is not wider than 1.27 mm (0.050 in.) at its entrance to the annular groove. The center "island" created by the annular groove is removable and replaceable with disks of different diameters, so that the width of the groove may be adjusted to be at least 150% but not more than 175% of the nominal caliper of the specimen being tested. Each disk has a central hole to fit a receiving pin central to the annular groove and is free to turn as the specimen is inserted through the branch groove. Scribe or otherwise mark one point on the perimeter of the annular groove at some distance away from, preferably opposite, the branch groove.

4.3 *Punch and die cutting device*, capable of accurately cutting the test specimens to exact dimensions with clean, sharp, parallel edges.

#### 5. Sampling and test specimens

5.1 Obtain the sample in accordance with TAPPI T 400 "Sampling and Accepting a Single Lot of Paper, Paperboard, Fiberboard, or Related Product."

5.2 From each test unit, carefully die-cut test specimens felt side toward the male portion of the die  $12.700 + 0.000, -0.025$  mm ( $0.500 + 0.000, -0.001$  in.) wide,  $152.4 + 0.0, -0.2$  mm ( $6.00 + 0.00, -0.01$  in.) long. Cut, so that the long dimension is perpendicular to the machine direction of the board for MD specimens, and the long dimension is parallel to the machine direction of the board for CD specimens. In cutting the specimens, take care to ensure that:

5.2.1 The long edges are parallel, such that the widths at opposite ends are within 0.015 mm (0.0006 in.) of each other.

5.2.2 The long edges are parallel (or perpendicular) to the machine direction of the board.

5.2.3 The edges are cleanly cut, without tears or frays.

**NOTE 3:** Die cutting of single sheets is the proper way to cut the test specimen, meet the requirements of this section, and give test results within the precision stated.

5.3 For the purposes of this method, test a minimum of 10 specimens.

5.4 Periodically inspect a cut specimen under a low magnification to check for proper dimensions (5.2 and 5.2.1) and to insure that cuts are clean and sharp.

<sup>1</sup>Names of suppliers of testing equipment and materials for this method may be found on the Test Equipment Suppliers list in the set of TAPPI Test Methods, or may be available from the TAPPI Technical Operations Department.