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Short span compressive strength of containerboard

1. Scope

- 1.1 This method describes a procedure for determining the compressive resistance of containerboard.
- 1.2 This method is intended for containerboard having a span-to-thickness ratio of 5 or less. This is equivalent to a grammage of between approximately 100 g/m² (20 lb/1000 ft²) (1) and 440 g/m² (90 lb/1000 ft²).

2. Significance

The edgewise compressive strength of corrugated board is one of the most important properties governing the compressive strength of corrugated containers. Research has shown that the cross directional short span compressive strengths of linerboard and medium can be used to predict the compressive strength of corrugated board and, hence, the box compressive strength (1-3). For example, summations of the compressive strengths of the components correlate very well with the combined board edgewise compressive strength.

3. Summary

A test specimen, 15 mm wide (0.59 in.), is held between two clamps, 0.70 mm (0.028 in.) apart. The clamps are forced towards each other until a compressive failure occurs. The maximum force causing failure is measured.

4. Apparatus

- 4.1 *Compression tester*, having the following:
 - 4.1.1 Two clamps for holding a test specimen 15 mm (0.59 in.) wide (Fig. 1). Each clamp has a stationary and a movable jaw. The clamps shall be 30 mm (1.18 in.) deep and have a surface of high friction, for example, a sand-blasted surface. The clamps shall grip the test specimen firmly over its full width. The stationary jaws shall be on the same side of the test specimen. The clamping surfaces of the movable jaws shall be in the same plane and parallel to those of the stationary jaws (see Appendix A).

Approved by the Standard Specific Interest Group for this Test Method

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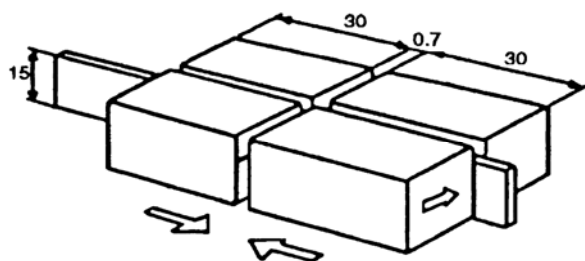


Fig. 1. Clamping arrangement all measurements in mm (4).

4.1.2 The clamps shall be able to grip the test specimen with a constant clamping force of 2300 ± 500 N (517 ± 112 lb). A means for indicating the relative force exerted by the clamps shall be available.

4.1.3 At the start of the test, the free span between the clamps shall be 0.70 ± 0.05 mm (0.028 ± 0.02 in.). After the test is started, the clamps shall move toward each other at a speed of 3 ± 1 mm/min (0.12 ± 0.04 in./min), the deformation of the load cell being considered.

4.1.4 A means for measuring and indicating the maximum load sustained by the specimen which can accurately be checked with dead weight loads or equivalent means. The accuracy required is $\pm 1\%$ of the test reading when this is within 10 - 100% of the full scale range.

4.2 *Cutting device*, capable of accurately cutting the specimen to a width of 15 ± 0.1 mm (0.59 ± 0.004 in.) and a convenient length, usually about 150 mm (6 in.). A precision die-type cutter is preferred.

5. Sampling and test specimens

5.1 From each test unit obtained in accordance with TAPPI T 400 "Sampling and Accepting a Single Lot of Paper, Paperboard, Containerboard, or Related Product." Precondition and condition in an atmosphere according to TAPPI T 402 "Standard Conditioning and Testing Atmospheres for Paper, Board, Pulp Handsheets and Related Products" and carefully cut specimens in the form of strips at least 70 mm (2.8 in.) in length and with a width of 15 ± 0.1 mm (0.59 ± 0.004 in.). Cut the specimen so that the long direction is parallel to the cross-machine direction, (CD). (Although cross direction (CD) measurements are the basis for edge crush and box compression predictive formulas, machine direction (MD) measurements can also be taken using the same method). In cutting the specimens take care to ensure that:

5.1.1 Handling the specimen in the test area with bare fingers is to be avoided because compressive strength tests are sensitive to the moisture content of the containerboard under test.

5.1.2 The long edges are parallel to each other, such that the widths at opposite ends are within 0.1 mm (0.004 in.) of each other.

5.1.3 The long edges are parallel to the cross direction and do not deviate more than 1.6 mm (0.063 in.) from the true cross direction.

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

6. Procedure

6.1 Test the specimens in an atmosphere in accordance with TAPPI T 402 "Standard Conditioning and Testing Atmospheres for Paper, Board, Pulp Handsheets, and Related Products."

6.2 Select the program for the grade to be tested if this feature is available and follow the prompts.

6.3 Insert the test specimen in the machine and actuate the clamps so that the prescribed pressure is applied and there is minimal slippage. Avoid handling the specimen in the test area with bare fingers because compressive strength tests are sensitive to the moisture content of the containerboard under test.

6.4 Operate the machine to apply a compressive load to the specimen and record the maximum compressive load.

6.5 Multiple tests can be run on each strip but do not test any area of the strip that has been compressed by the clamping jaws.

6.6 A minimum of 10 tests should be run.