WI 240308.02

T 843

BALLOT NO. 02 -SARG

DRAFT NO. 01

DATE October 22, 2024

WORKING GROUP
CHAIR N/A

SUBJECT
CATEGORY
Fiberboard Shipping Container Testing

RELATED
METHODS See "Additional Information"

CAUTION:
This Test Method may include safety precautions which are believed to be appropriate at the time of publication of the method. The intent of these is to alert the user of the method to safety issues related to such use. The user is responsible for determining that the safety precautions are complete and are appropriate to their use of the method, and for ensuring that suitable safety practices have not changed since publication of the method. This method may require the use, disposal, or both, of chemicals which may present serious health hazards to humans. Procedures for the handling of such substances are set forth on Safety Data Sheets which must be developed by all manufacturers and importers of potentially hazardous chemicals and maintained by all distributors of potentially hazardous chemicals. Prior to the use of this method, the user must determine whether any of the chemicals to be used or disposed of are potentially hazardous and, if so, must follow strictly the procedures specified by both the manufacturer, as well as local, state, and federal authorities for safe use and disposal of these chemicals.

Fluted Edge Crush of Corrugating Medium (Rigid Support Method)

(Five-year review of Official Method T 843 om-20)

1. Scope

1.1 This test evaluates the ability of corrugating medium to contribute to the compression strength of a corrugated box. It is a procedure for measuring the edgewise compression strength of a laboratory-fluted strip of corrugating medium in a direction parallel to the fluted tips.

1.2 Fluted edge crush is also measured in TAPPI T 824 "Fluted edge crush of corrugating medium (flexible beam method)", which uses a flexible beam compression machine instead of a rigid platen machine as used in this procedure.

2. Significance

2.1 Fluted edge rigidity relates to the edgewise compressive performance contribution of corrugating medium to the short column strength of corrugated board. For this purpose, a fluted specimen of corrugating medium is tested in edge crush; hence, this test is named the corrugated fluted crush test, cross direction (CFC).

2.2 This method offers an alternative to edge rigidity measured by the ring crush test in accordance with TAPPI T 822 "Ring Crush of Paperboard (Rigid Support Method)" or the STFI test in accordance with TAPPI T 826 "Short Span Compressive Strength of Containerboard." Test values for CFC, Ring Crush and STFI are significantly different. Thus, formulas used to predict combined board edge crush (ECT) from the edge rigidity are different for each of the three measures of edge rigidity.

3. Apparatus

3.1 *Medium fluter*[1], in accordance with TAPPI T 809 "Flat Crush of Corrugating Medium (CMT Test)."

3.2 *Specimen cutter*, in accordance with TAPPI T 809.

3.3 *Compression machine*[1], in accordance with TAPPI T 811, having the following:

3.3.1 A rigidly supported platen and a driven platen, each having a working area of approximately 100 cm^2 (about 15.5 in^2). The platens are required to have not more than 0.050 mm (0.002 in.) lateral movement and the rigidly supported platen not more than 0.150 mm (0.006 in.) vertical movement within a load range of 0 to 2500 *N* (0 to 562 lbf). Within the 100 cm^2 (15.5 in^2) working area each platen shall be flat to within 0.0025 mm (0.0001 in.) of the mean platen surface and the platens shall remain parallel with each other within 1 part in 2000 0.0125 nm/25 mm, or 0.005 in./1.0 in. throughout the test.

3.3.2 A means for moving the driven platen to achieve an initial platen separation of at least 60 mm (2.36 in.). Within a range of platen separation of 0 to 60 mm (0 to 2.36 in.) and within a load range of 0 to 1112 *N* (0 to 250 lbf), the speed of the driven platen shall be controllable at 12.5 ± 0.25 mm (0.5 ± 0.01 in.) per minute.

NOTE 1: For convenience, the test machine should be capable of rapid platen return and automatic, settable positioning.

NOTE 2: The use of emery or crocus cloth on the platens, as allowed in flat crush testing (TAPPI T 809), is not permissible.

3.3.3 A capacity of at least 1112 *N* (250 lbf).

3.3.4 A means of measuring and indicating the maximum load sustained by the test specimen within 2.2 *N* (0.5 lbf).

3.3.5 An indicating mechanism that can be checked accurately with dead weight load, load cell, or proving ring. The accuracy required is 0.5% or 2.2 *N* (0.5 lbf), whichever is greater.

3.4 *Fluted crush specimen holder*. A suitable holder is shown in Fig. 1. A suitable holder consists of a pair of matched fluted jaws which are spring-loaded, and which are opened and closed by means of a hand lever. The bottom surface of the holder shall be flat. A suitable stopping surface exists so that 6.35mm (0.25 in.) width of the specimen is grasped by the holder. The spring-loaded feature allows for variations in caliper of specimens. Construction should be such to allow loading of the specimen within 3 s.

3.4.1 The fluted crush specimen holder should conform to the same parallelism requirements as the crush tester itself.

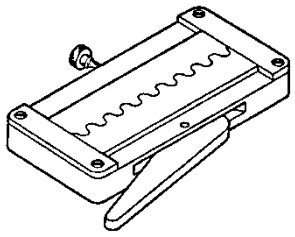

Fig. 1. Fluted crush specimen holder.

[1]Names of suppliers of testing equipment and materials for this method may be found on the Test Equipment Suppliers list, available as part of the CD or printed set of Standards, or on the TAPPI website general Standards page.

NOTE 3: The "scissors-type" holder shown as Fig. 1 in T 824 is not suitable for use in rigid platen testing machines. The "scissors-type" holder was designed specifically for use on flexible beam testers.

4. Sampling and test specimens

Sample in accordance with TAPPI T 400 "Sampling and Accepting a Single Lot of Paper, Paperboard, Containerboard, or Related Product." From each test unit of the sample, and using the specimen cutter (3.2), cut ten representative test specimens, each 152.4 × 12.7 mm (6 × 0.5 in.), with the longer dimension in the machine direction of the medium.

5. Conditioning

Precondition and condition the specimen strips prior to fluting in accordance with TAPPI T 402 "Standard Conditioning and Testing Atmospheres for Paper, Board, Pulp Handsheets, and Related Products."

6. Procedure

6.1 Perform the fluting operation as prescribed in TAPPI T 809 "Flat crush of corrugating medium (CMT test)", with the following exceptions:

6.1.1 Within as short a period as possible after the specimen emerges from the fluter, insert it into the holder, place the holder on the platen of the compression tester, and apply the load to the specimen until a maximum is reached. The time between the exit from the fluter and the onset of load should not exceed 20-25 seconds.

7. Report

Include in the report: (a) the average medium fluted edge crush (CFC) value, to the nearest 5 *N* (1 lb); (b) the standard deviation of CFC values; and (c) the number of specimens tested.

8. Precision

The following estimates of repeatability and reproducibility are based on an interlaboratory trial conducted in 2001 involving 16 different laboratories and a total of 17 rigid platen type instruments. The samples were composed of randomized, pre-conditioned sheets of 26# (2 grades) and 33# medium. The precision statements are based on 10 determinations per test result and 3 test results for each instrument, per sample. A more detailed chart of results is included below.

Repeatability (within a lab) = 5 %
Reproducibility (between laboratories) = 9 %

Repeatability and reproducibility are estimates of the maximum difference (at a 95 % confidence level) that should be expected when comparing test results for materials similar to those described above under similar test conditions. These estimates may not be valid for different materials or testing conditions.

Table of detailed CFC results

Material	*Grand mean, lb*	*Standard deviation between labs*	*Repeatability r and %r*		*Reproducibility R and %R*		*Instruments included*
26# Medium	68.1	1.7	3.0	4.4 %	5.4	7.9 %	16
26# Medium	68.7	2.1	4.1	6.0 %	6.7	9.8 %	16
33# Medium	74.7	2.5	3.6	4.8 %	7.6	10.1 %	15

9. Keywords

Corrugating medium, Edge crush resistance, Compression tests, Corrugated fluted crush test, Flutes

10. Additional information

10.1 Effective date of issue: To be assigned.

10.2 Related methods: ISO 16945; TAPPI T 824 "Fluted edge crush of corrugating medium (flexible beam method)" uses a deflecting beam tester operating under a constant loading rate of 111 *N*/s (25 lbf/s) but in other respects is similar. Test results obtained during the collaborative studies to determine precision statements for the two TAPPI methods indicated that test results for 26# medium using either method are similar. However, test results on heavier weight mediums generally yield higher test results when using the rigid-platen method. As can be seen in the precision statements for the flexible-beam and rigid-platen methods, the variability of the test results for the flexible beam method is significantly greater than for the rigid platen method.

10.3 Revision history: This method replaced UM 811 "The Concora Fluted Crush Test (cfc-o) for Corrugating Medium" and UM 805 "Stiffness Test for Fluted Corrugating Medium."

10.3.1 The 2009 revision modified the platen flatness, parallelism and speed requirements to match other procedures using rigid platen crush testers. In addition, minor wording changes were made throughout the document to provide for improved accuracy or completeness.

10.3.2 The 2013 revision made minor editorial changes and adjusted the time of the method (cited in 6.2) in line with round robin work done as part of ISO 16945.

10.3.3 The 2020 revision made minor editorial and wording changes to provide for improved accuracy and readability.

Your comments and suggestions on this procedure are earnestly requested and should be sent to the TAPPI Standards Department. ■