



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 40168-2021

**Corrugating medium - Determination of the edge crush
resistance after laboratory fluting**

Issued on: May 21, 2021

Implemented on: December 1, 2021

Issued by: SAMR; SAC

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1 Scope

This Standard specifies the method to determine the edge crush resistance of corrugating medium after laboratory fluting.

This Standard applies to all kinds of corrugating mediums used to manufacture corrugated fibreboard after fluting.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 450, Paper and Board - Sampling for Testing and Identification of Machine and Cross Direction, Wire Side and Felt Side (GB/T 450-2008, ISO 186:2002, MOD)

GB/T 451.2, Paper and board - Determination of grammage (GB/T 451.2-2002, eqv ISO 536:1995)

GB/T 10739, Paper, board and pulps - STANDARD atmosphere for conditioning and testing (GB/T 10739-2002, eqv ISO 187:1990)

ISO 13820, Paper, board and corrugated fibreboard -Description and calibration of compression-testing equipment

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 edge crush resistance; CCT

under the specified conditions, after corrugated core paper is corrugated in the laboratory, and the edge of the specimen is compressed, the maximum pressure per unit length that the specimen can withstand before crushing

NOTE: The unit is kilonewtons per meter (kN/m).

3.2 edge crush resistance index

the edge crush resistance is divided by the quantitative value

NOTE: The unit is newton meters per gram (N.m/g).

4 Principle

Pass the specimen between a pair of heated rollers and place it vertically in the holder to corrugate. Apply pressure to the specimen in a direction perpendicular to the edge of the specimen. When the specimen is crushed, the maximum force value per unit length indicates the edge crush resistance of the specimen.

5.1 Sample cutting equipment

The cut specimen shall meet the requirements of Chapter 8.

5.2 Flute meter

The flute meter consists of a pair of matched steel fluted rollers. One corrugated roller is the driving roller, and the other corrugated roller is the driven roller. Use appropriate methods to keep the temperature of the fluted roll within the range of $(175 \pm 8)^\circ\text{C}$. Check the temperature while the fluted roller is in motion.

Under the test conditions, a grooved roller is driven by a motor. The rotating speed is controlled at $(4.5 \pm 1.0)\text{r/min}$. By evenly applying a force of $(100 \pm 10)\text{ N}$ on the grooved roller, the grooved roller is kept in engagement. In some instruments, the force between the fluted rollers is applied by a spring in a stretched state. The friction within the equipment can cause the force acting on the specimen to be much smaller than the force originally required to be set on the fluted roller. In order to verify whether the instrument meets the requirements of this article, it is necessary to test the force required to prevent the driven

roller from moving to the driving roller at a distance of 200um from the driving roller.

Each roller shall meet the following necessary characteristics (see Figure 1):

- Addendum circle diameter: (228.5 ± 0.5) mm;
- Tooth thickness: (16 ± 1) mm;
- Number of teeth: 84 (see NOTE 3);

parallelism of the long side of the specimen shall be within 0.01mm. It shall be clean and free of defects.

9 Test steps

9.1 General rules The edge crush resistance test can be tested immediately after fluting (see 9.2).

It can also be tested after 30min of temperature and humidity treatment after fluting (see 9.3).

9.2 Test immediately after fluting If the compression test is performed immediately after the specimen is fluted, the time from fluting to pressure application shall be within 20s~25s.

NOTE: In the inter-laboratory comparison experiment conducted in 2012, the shortest time required from installing the specimen to applying pressure was 20s~25s.

9.3 Test after 30min of temperature and humidity treatment after fluting If the specimen is subjected to temperature and humidity treatment after fluting, the specimen shall be treated again for 30min~35min in the environment where the temperature is $(23 \pm 1)^{\circ}\text{C}$ and the relative humidity is $(50 \pm 2)\%$. If the specimen is tested after 30min of temperature and humidity treatment after fluting, all the specimens can be fluted before the test.

9.4 Fluting and testing Turn on the motor and heat the fluted roller to $(175 \pm 8)^{\circ}\text{C}$.

Insert the specimen vertically into the gap between the two fluted rollers along the long side of the specimen.

Put the fluted specimen into the holder (5.3). Then put the holder in the middle of the lower plate of the compression tester. Start the test and take a reading.

Take the maximum test value, accurate to 1N.

Whether it is tested immediately or after 30min of temperature and humidity treatment, repeat the above steps to test the remaining specimens. At least 10 valid test results have been obtained.

10 Result calculation

10.1 Edge crush resistance

Annex A (informative) Precision

A.1 In May 2012, 11 laboratories from 6 countries participated in an international inter-laboratory comparison.

A.2 This comparison experiment uses 3 different quantitative fluting samples.

CCT0 and CCT30 tests were carried out on each sample.

A.3 The data is shown in Table A.1~Table A.4.

A.4 The calculation basis is ISO/TR 24498 and TAPPI T 1200.

A.5 The reported repeatability standard deviation is the combined repeatability standard deviation, that is, the standard deviation calculated using the root mean square of the standard deviations of all participating laboratories. This is different from the traditional definition of repeatability in ISO 5725-1.

A.6 The reported repeatability limit and reproducibility limit are the maximum difference between the two sets of test results obtained from the same material under the same test conditions, and the maximum difference is not evaluated at a 95% confidence rate. This evaluation is invalid for different materials or different test conditions. The repeatability limit and the reproducibility limit are calculated by multiplying the repeatability standard deviation and the repeatability standard deviation by 2.77.

NOTE 1: The repeatability standard deviation is equivalent to the laboratory standard deviation. However, the reproducibility standard deviation is different from the inter-laboratory standard deviation. The reproducibility standard deviation includes both the inter-laboratory standard deviation and the intra-laboratory standard deviation. That is,

NOTE 2: , it is assumed that the test results are normally distributed and the standard deviation s is obtained based on a large number of tests.