INTERNATIONAL STANDARD

ISO 3035

Third edition
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Corrugated fibreboard — Determination of flat crush resistance

Carton ondulé — Détermination de la résistance à la compression à plat

Reference number
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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 3035 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 2, *Test methods and quality specifications for paper and board*.

This third edition cancels and replaces the second edition (ISO 3035:1982), which has been technically revised. In this revision, the instrument is clarified according to ISO 13820, relevant terms are defined, a precision statement is added, and other minor text corrections have been made.

Introduction

Fibreboard shipping containers can be subjected to compressive forces in the thickness direction as part of the manufacturing process, as well as during shipment or storage. These forces can compress the flute structure and reduce the structural integrity (stacking strength) of the corrugated material. Resistance to this type of crushing is an important measure of the performance characteristics of the container.

Corrugated fibreboard — Determination of flat crush resistance

1 Scope

This International Standard specifies a method for the determination of the flat crush resistance of corrugated fibreboard used in the manufacture of shipping containers.

This International Standard is applicable to single-faced and single-wall (double-faced) corrugated fibreboard.

This International Standard is not applicable to double-wall (double-double-faced) corrugated fibreboard and to microflute corrugated fibreboard, since the end-point of the test is not clearly defined or observable.

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.

ISO 186, *Paper and board — Sampling to determine average quality*

ISO 187, *Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples*

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
flat crush
maximum crushing force, applied perpendicular to the surface of the fluting structure, sustained before complete collapse of the structure

3.2
collapse
point where the sidewalls of the flutes are no longer able to support load because they have suffered compression damage

NOTE At this point, the fluting profile appears similar to that of a mushroom (see Figure 2).

3.3
flat crush resistance
flat crush divided by the area of the test piece under the condition of test

NOTE The flat crush resistance is expressed in kilopascals.

4 Principle

A test piece of corrugated fibreboard is subjected to an increasing force applied perpendicularly to the surface by a compression tester having two flat and parallel platens, until the fluting collapses.

The maximum force sustained by the test piece is divided by the test piece area.

5 Apparatus

5.1 Flat crush tester, a motor-driven, platen-type compression testing machine in accordance with ISO 13820, and also calibrated in accordance with ISO 13820.

NOTE The results can be significantly lower when a beam-deflection compression tester is used in comparison with testing using a platen-type compression tester, particularly in the case where flutes might lean due to lateral movement. In fixed platen equipment, the platens are restrained against horizontal movement with the sample faces, leading to possible differences in the failure dynamics picked up by the crush tester.

5.2 Cutting instrument, with a circularly guided knife to cut test pieces with the cut edges clean and perpendicular to the facings of the corrugated fibreboard. Commonly used test piece areas include 5 000 mm^2 (79,8 mm ± 0,5 mm in diameter), 6 450 mm^2 (90,6 mm ± 0,5 mm in diameter) and 10 000 mm^2 (112,8 mm ± 0,5 mm in diameter). When the flat crush resistance is expected to exceed the capacity of the crush tester on a 5 000 mm^2 sample, a smaller test piece area (commonly 3 220 mm^2, 64,0 mm ± 0,5 mm in diameter) may be used.

Test pieces of other uniform shapes may be used, as long as the test area specifications are complied with, crushing of the edges is avoided when the samples are cut, and fractional flute counts are avoided.

6 Sampling

Sampling shall be carried out in accordance with ISO 186. If the test specimens are to be taken from corrugated shipping containers, they should be taken from areas away from score lines, joints and closures, but may include printed areas that reflect the overall state of the samples.

If the tests are made on another type of sample, make sure that the test specimens taken are representative of the sample received.

7 Conditioning

The sample shall be conditioned in accordance with ISO 187.

8 Preparation of test pieces

Using the cutting instrument (5.2), in the same standard atmosphere as that used for conditioning the sample, cut a sufficient number of test pieces to enable at least ten valid tests to be made.

9 Procedure

Carry out the tests in the same standard atmosphere as used for conditioning the sample. Test at least ten test pieces.

Place a test piece (see Figure 1) centrally on the lower platen and operate the flat crush tester (5.1) until the fluting collapses (see Figure 2). The rate at which the platens approach each other shall be 12,5 mm/min ± 0,25 mm/min. Record the maximum force sustained by the test piece before collapse of the fluting, to the nearest 10 N.

In the event of the flutes leaning sideways during the test (see Figure 3), ignore this test result, and make further tests on fresh test pieces as needed to obtain ten valid tests.

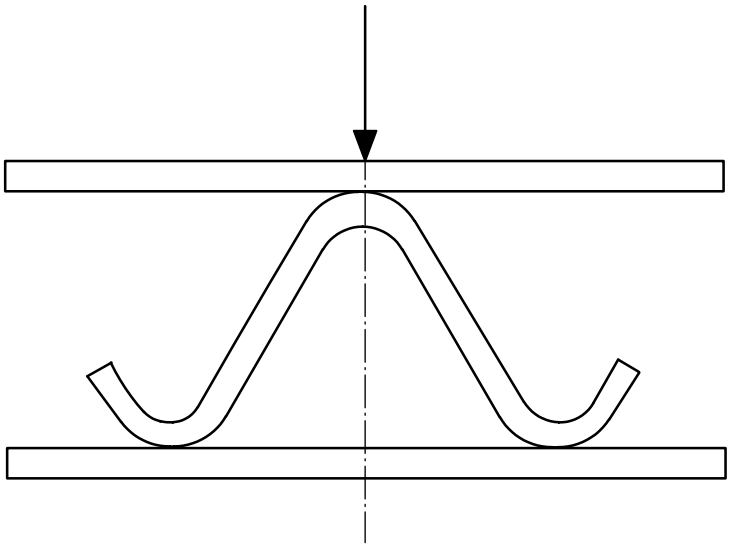

Figure 1 — Test piece before being subjected to pressure

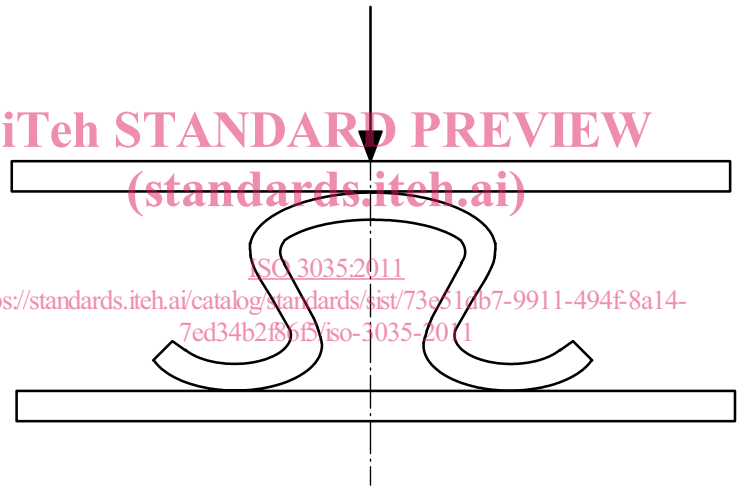

Figure 2 — Test piece after crushing