

The information and data contained in this document were prepared by a technical committee of the Association. The committee and the Association assume no liability or responsibility in connection with the use of such information or data, including but not limited to any liability under patent, copyright, or trade secret laws. The user is responsible for determining that this document is the most recent edition published.

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 Material 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.

Tensile test for the manufacturer's joint of fiberboard shipping containers

1. Scope

1.1 This method is used to determine the strength of the manufacturer's joint of commercially made corrugated and solid fiberboard shipping containers.

1.2 It is applicable to taped, stitched, or glued joints and may also be used to evaluate laboratory fabricated joints similar to commercially made joints.

2. Summary

Test specimens are cut across the manufacturer's joint and stressed in a tensile tester to failure. Failure may occur wholly or partly as adhesive shear, fiber shear, tape failure, stitch or staple pullout, or tensile breaking of the linerboard.

3. Significance

3.1 When a shipping container is dropped, compressed, or vibrated, its manufacturer's joint is subjected to stresses along with all other edges. This test gives an indication of the ability of the joint to withstand rough handling without failure, to the extent that failure is related to the tensile strength of the joint itself.

3.2 In practice, if the manufacturer's joint is stronger than the tensile strength of the fiberboard, failure will occur away from the joint. However, if failure occurs within or adjacent to the adhesive area of the joint, the full potential of the box will not be realized until a stronger adhesive bond is obtained.

4. Apparatus

Tensile tester, as described in TAPPI T 494 “Tensile Breaking Properties of Paper and Paperboard (Using Constant Rate of Elongation Apparatus).”

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, Containerboard, or Related Product."

5.2 If the test sample represents a lot consisting of commercially made fiberboard shipping containers, select five random containers and test one specimen from each.

5.3 Condition the sample in accordance with TAPPI T 402 "Standard Conditioning and Testing Atmospheres for Paper, Board, Pulp Handsheets, and Related Products."

5.4 Cut five specimens at least 200 mm (8.0 in.) long, across the manufacturer's joint, with their long directions perpendicular to the long direction of the joint; and with the center of the joints offset not more than 10 mm (3/8 in.) from the centers of the specimens.

5.5 For glued and plain paper taped manufacturer's joints, cut specimens 25.0 ± 0.5 mm (1.00 ± 0.02 in.) wide with clean and parallel edges.

5.5.1 For stitched joints, cut the width of the specimen so that it contains one stitch centered between the edges with no part of it less than 6.0 mm (0.25 in.) from either edge.

5.5.2 For yarn-reinforced paper taped joints, select a sample width over 25 mm (1 in.), which will give a uniform yarn pattern over the joint gap. The specimen edges should have no cut yarn ends over the joint gap if the yarn pattern is a diamond.

6. Procedure

6.1 Perform all tests in the testing atmosphere specified in T 402.

6.2 Set the clamps to an initial test span (distance between line contacts) of 180 ± 5 mm (nominally 7.0 in.). Determine and always reset this distance within ± 0.5 mm (nominally 0.02 in.). (See Appendix A.1.3.)

6.3 Set the controls for rate of separation of the jaws to 25 ± 5 mm/min (nominally 1.0 in./min). In cases where the time required to break a single strip exceeds 30 s, a more rapid rate of jaw separation shall be used, such that the time to break a single strip will be between 15 and 30 s. In such cases, the speed of the instrument must be reported, along with the test data.

6.4 Align and clamp the specimen first in one jaw and then, after carefully removing any noticeable slack, but without straining the specimen, in the second jaw. While handling the test specimen, avoid touching the test area between the jaws with the fingers. Use a clamping pressure determine to be satisfactory (Appendix A.1.4), i.e., so that neither slippage nor damage to the specimen occurs. Automated instruments for which both jaws close simultaneously are within the context of this method.

6.5 Record each determination to at least three significant figures.

6.6 Also record the type of failure, such as: shear failure of the tape or glued joint adhesive; shear failure of the linerboard under the glued joint and the percentage of fiber failure; tensile failure of the linerboard away from the joint; breaking of the tape; bending, or unclenching of the staple; pulling of the staple through the paperboard.

6.7 Reject any readings for which the strip slips in the clamps, breaks within the clamping area, or shows evidence of uneven stress across its width.

7. Report

7.1 Report the average value of the breaking load, calculated to kN/m of width of specimen, to at least three significant figures, and if desired, to pounds per inch of width of specimen by multiplying the value in kN/m by 5.7101.

7.1.1 In the case of stitched joints, report the average value per stitch in newtons and, if desired, in pounds.

7.2 A complete report requires in addition, a statement of:

7.2.1 The width of the test specimen given in millimeters (inches), the number of strips tested, and the standard deviation or the range of individual determinations;

7.2.2 A complete description of the sample tested, including component papers, stitching wire, tape and adhesive, combined board, finished container, tab dimensions, width of tape or adhesive strip or spacing of staples, types of machinery, and conditions of manufacture;

7.2.3 Temperature and relative humidity of the conditioning and testing atmospheres;

7.2.4 Type of failure of all specimens, whether adhesive shear, fiber shear, tape failure, stitch pullout, or breaking of the linerboard.