WI 200308.03

T 829

DRAFT NO. 2 - SARG

DATE March 28, 2021

WORKING GROUP CHAIRMAN To be determined

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 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.

Score quality test

(Five-year review of Official Method T 829 om-15)

(suggested minor editorial changes from Draft 1 incorporated)

1. Scope

This method describes a qualitative method for evaluating the relative quality of scores in corrugated containers.

2. Significance

2.1 Set-up and case sealing of a corrugated box on production equipment will depend on various factors, one of which is the quality of both panel and flap scores found on the corrugated box.

2.2 It is the purpose of this procedure to provide a consistent means for determining the relative quality of scores in corrugated containers. This procedure determines the force required to break scored and unscored board, and by calculating an abstract ratio (in %) of the force required to break the scored board to that of unscored board, relative information on the quality of the score can be ascertained. By comparing this abstract tested ratio to an

established range of ratios based on materials that perform well, pass/fail criteria can be determined by each manufacturer.

2.3 The actual force needed to break individual scores can also be reported.

2.4 This method will not determine score spring-back force or board memory that may exist, nor does it measure forces required to bend entire flaps or panels.

2.5 This procedure provides information on score quality for a given combined board and is intended for single wall and double wall board. It may be used for triple wall, but with less reliability.

3. Apparatus[1]

3.1 A device capable not only of applying a force at a constant speed of 0.8 mm/sec (0.031 in./sec), but also allowing a minimum of 12.7 mm (0.5 in.) travel, or a sufficient amount of travel to ensure a maximum 90° bend of the test sample.

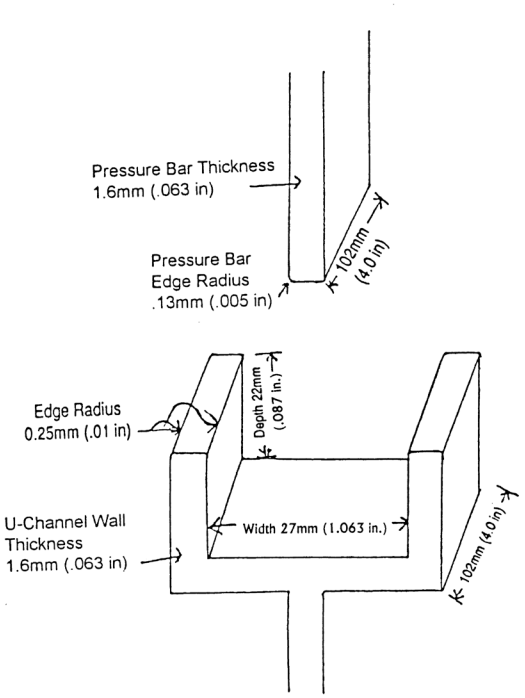

Fig. 1. Dimensions of test devices.

[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..

3.1.1 A *U-shaped channel* having an internal width of 27 mm (1.063 in.), an internal depth of 22 mm (0.87 in.), a wall thickness of 1.6 mm (0.063 in.), and an edge radius of 0.25 mm (0.01 in.), with an overall length of 102 mm (4.0 in.) (see Fig. 1).

3.1.2 A *pressure bar* having a thickness of 1.6 mm (0.063 in.), and an edge radius of 0.13 mm (0.005 in.), with an overall length of 102 mm (4.0 in.) (see Fig. 1).

3.2 *Force gauge or load cell* capable of measuring and indicating the applied force to within ± 1% or 2.5*N* (0.56 lbf) whichever is greater and must have sufficient capacity so that all readings can be maintained in the middle half of the scale.

3.2.1 Attach the force gauge or load cell to the stationary (nonmoving) member of the device.

~~4.~~ Conditioning

4.1 Precondition and condition test specimens in accordance with TAPPI T 402 “Standard Conditioning and Testing Atmospheres for Paper, Board, Pulp Handsheets, and Related Products.”

4.2 If TAPPI conditions cannot be achieved, report temperature, humidity and sample moisture content in accordance with TAPPI T 412 “Moisture in Pulp, Paper, and Paperboard.”

5. Test specimens

5.1 Obtain samples from each test unit in accordance with TAPPI T 400 “Sampling and accepting a single lot of paper, paperboard, containerboard, or related product.” Test specimens should be free of defects and will include all unbroken scores, in both the machine and cross directions.

NOTE 1: Take samples at least 12.7 mm (0.5 in.) from any cut edge to eliminate any crushing influence.

5.2 Cut samples 25.4 mm (1.00 in.) wide and 152.4 mm (5.00 in.) long of both scored and unscored board. Orient the samples according to the direction of score bend being measured (Fig. 2)

6. Test procedure

6.1 Ensure gauge or load cell is properly calibrated.

6.2 Place a scored specimen, single face upward, directly on top of the U-shaped support, so that the score and pressure bar are both centered within the U-channel (see Fig. 3). This will determine score break force (i.e., bending in direction of intended fold).

6.2.1 If measuring the score prebreak force (i.e., bending in opposite direction of intended fold), the test sample should be placed with DB (outside) liner up.

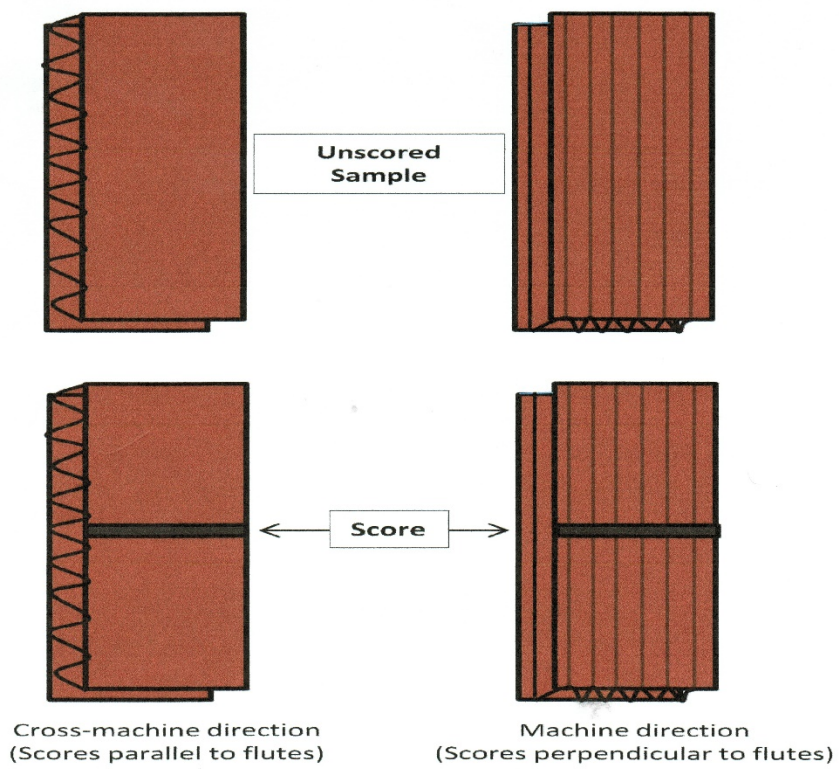

Fig. 2. Scores parallel and perpendicular to flutes.

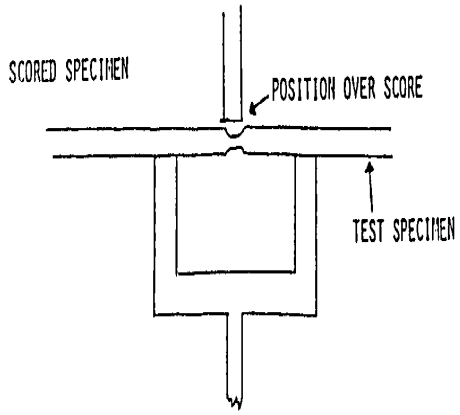

Fig. 3. Scored specimen.

6.3 Zero the force gauge.

6.4 Initiate test and record maximum load.

6.5 Repeat 6.2-6.4, this time positioning the specimen to determine the force required to bend an unscored section of corrugated board (see Fig. 4).

NOTE 2: When determining the force required to bend an unscored section of board in the cross-machine direction (scores parallel to flutes), the pressure bar should be positioned directly over a flute tip (Fig. 4).

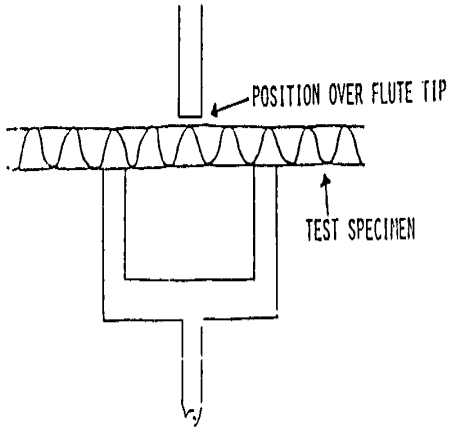

Fig. 4. Unscored specimen.

7. Interpretation of observations

7.1 The abstract score ratio is determined as follows:

$$\text{Score ratio in \%} = \frac{\textit{average force to break the score}}{\textit{average force to break unscored board}} \times 100$$

8. Report

8.1 The report shall include the number of samples tested, the average force to bend each population, and the abstract score ratio.

8.2 In the event that specimens were not preconditioned and conditioned according TAPPI T 402, report temperature, humidity, and board moisture content, as determined in accordance with TAPPI T 412.

9. Precision

9.1 The following estimates of repeatability and reproducibility are based on results from an interlaboratory study conducted in 2014. The precision estimates below are based on three samples of single-wall, combined corrugated board distributed to five laboratories.

Repeatability (within a lab) = 9 %

Reproducibility (between laboratories) = 50 %

The study used to estimate the precision involved five laboratories and three materials. The materials involved are described in the table below. Laboratories reported the maximum force to break scored and unscored boards. The precision statement is based on the calculation of the abstract score ratio. Variation within the laboratory and between laboratories across all materials was significantly lower for the unscored determinations. Ten determinations per laboratory, per sample were used in this trial.

Precision Results

	Score ratio	*Repeatability (r)*	*Repeatability % (%r)*	*Reproducibility (R)*	*Reproducibility % (%R)*
42-33-42 C	31.5	3.7	12%	7.1	23%
35-23-35 E	34.0	2.5	7%	24.5	72%
42-31-42C	30.2	2.5	8%	16.8	55%

9.2 Repeatability and reproducibility are estimates of the maximum difference (at 95%) which 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.

10. Keywords

Scores, corrugated boards, container boards, corrugated boxes.

11. Additional Information

11.1 Effective date of issue: To be assigned.

11.2 Changes in the 2015 edition included: (1) a precision statement was added; (2) the method was modified to include not only the relative comparison of scored compared to unscored but also allowing the ability to report the absolute value; and (3) instead of using the same samples for both scored and unscored testing, separate samples are to be cut and measured; (4) multiple grammatical and minor structural changes were made to improve the method overall.

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

Department.