

T 803 cm-10

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OFFICIAL STANDARD – 1967
OFFICIAL TEST METHOD – 1979
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Puncture test of container board

1. Scope

This tester (Fig. 1) measures the energy required to puncture container board or corrugated board with a pyramidal point affixed to a pendulum arm. Results are reported in “puncture units,” comprised of two major components: the energy to tear the material and the energy to bend it out of the way of the point.

2. Significance

- 2.1 Damage in use, similar to that occurring in this test, may result from contact with solid objects, such as the end of a piece of lumber or the corner of a wooden box.
- 2.2 The test evaluates, in a composite fashion, some fabrication factors and properties of the materials.

NOTE 1: In single and double wall corrugated board this method measures the energy to puncture the board and the energy to bend the board back to allow penetration of the point and arm through the test specimen. It is widely used as well on triple wall board. Here the clearance between the puncture point and the aperture in the loose plate 13.2 mm (0.5 in.) can be less than the thickness of the board. As a result, for some triple wall board, the total energy measured combines the energy for puncture and bending with that necessary to crush the board.

3. Apparatus

- 3.1 *Puncture test apparatus*¹ (see Fig. 1), consisting of the following:
 - 3.1.1 *Pendulum*, incorporating an arm in the form of an arc of 90°.
 - 3.1.2 *Puncture point*, affixed to the end of the arm and having the shape of a right angle triangular pyramid 25 ± 0.7 mm (1 ± 0.03 in.) high, with leading edges rounded, base edges left sharp, and the point honed to 1.57 ± 0.05 mm (0.062 ± 0.002 in.) radius. The total tearing length of the head is 107.7 mm (4.24 in.).

¹Names 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.

Approved by the Standard Specific Interest Group for this Test Method



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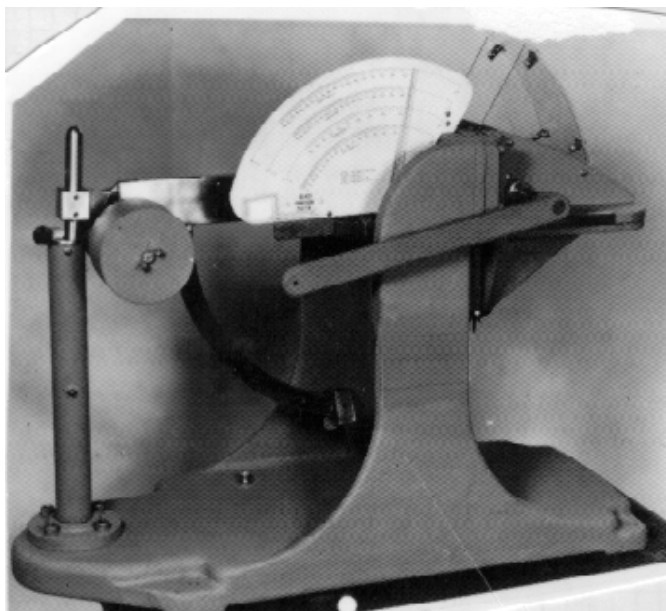


Fig. 1. Puncture tester.

3.1.3 *Puncture point collar*, loose fitting around the base of the puncture point to avoid friction that would result if the punctured material rubbed against the puncture arm.

3.1.4 *Trigger*, or latch, to hold the pendulum in a horizontal position.

3.1.5 *Clamping jaws*, spring actuated, for rigidly holding the specimen to be tested in a horizontal plane.

3.1.6 *Pointer and scale*, to indicate the arc through which the pendulum travels after passing through the specimen. Scale graduations correspond to the weights used.

3.1.7 *Augmenting weights*, which when attached result in scale values up to least 38.87 J (1300 units of energy) when the pendulum starts in the horizontal position. Addition of weights to the pendulum arm changes the scale on which the reading is taken.

3.1.8 *Loose plate*, inserted between the clamping jaws when testing material to define the test area (means should be provided for securing the plate once it has been properly positioned). The loose plate is removed before checking the zero reading of the apparatus.

3.1.9 *Adjustable screw*, bearing against the pointer assembly during the measuring of half the pendulum swing, permitting adjustment of the full-scale position of the pointer.

NOTE 2: For testing lighter materials, the apparatus can be supplied with an attachment that allows the release of the pendulum at a 45° angle. An auxiliary low scale is also supplied which when attached to the standard scale plate provides additional calibration from 0-0.90 J (0-30 units) and allows reading of half a unit. Modified machines for heavier material are also available.

4. Adjustment and calibration

4.1 Place the apparatus on a rigid, heavy foundation of convenient height, and bolt it down so that it is level in both horizontal directions. The preferred mount is a separate concrete base. Adjust the apparatus with the entire clamping assembly unbolted and, with the newer instruments, swing the hinged assembly away from the path of the pendulum. With older instruments, completely remove the assembly from the machine.

4.2 *Pendulum friction*. Remove the weights and weight-support stud, put the puncture-point collar in place on the puncture head, rotate the pointer to a position below the zero mark, and then latch and release the pendulum. The pendulum should swing for a minimum of 8 minutes before coming to rest. If it does not, clean and lubricate the bearing.

4.3 *Zero reading*. Remove the weights and stud; remove the loose plate and fix the puncture-point collar on the puncture head. Allow the pendulum to hang vertically on its pivot shaft. Then with adjusting screw, align the pointer exactly on full scale. With the pointer set to about 25 mm (1 in.) above zero on the scale, raise the pendulum until the latch engages. Release the pendulum. If the scale reading is not zero, loosen the four set screws that position the latch tongue as required. Repeat this procedure until the scale reading is zero.