

## AUSTRALIAN STANDARD

*Prepared by the Appita Testing Committee. Endorsed as Part of AS 1301 by Standards Australia—August 1989. Endorsed as suitable for use in New Zealand by the Standards Council of New Zealand.*

**AS 1301.445s — 89**

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# HARDNESS OF CORRUGATED BOARD

Corrugated board can be damaged by flat crushing loads when passing between rollers or belts during the container-making process, and the flat crush test is generally regarded as indicating the extent of this damage. However, it can often be observed that processing causes board to lose thickness and to feel softer, although the flat crush resistance is not reduced.

In flat crush testing the load deflection curve shows an initial straight line portion, followed by several distinct points. Examination of load deflection curves of a wide range of 'A', 'B' and 'C' flute boards has shown that the first yield point occurs within the first 250  $\mu\text{m}$  deflection (Reference 7.1). This is used as a basis for a simplified test in which the maximum load applied at this yield point, which occurs at or before 250  $\mu\text{m}$  deflection, is measured. This measure is termed hardness.

This test is usually performed at the same time as the flat crush test (AS 1301.429).

## 1. APPARATUS

**1.1 Motor-driven crush testing machine**, as described in AS 1301.449.

**1.2 Test piece cutter**, as described in AS 1301.429.

**1.3 Test piece holder**, as described in AS 1301.429, modified to include a device to indicate when the test piece has decreased in thickness by 250  $\mu\text{m}$ . Such a device and its mode of use are described in Reference 7.1.

## 2. PREPARATION OF TEST PIECES

**2.1** Condition the sample in accordance with AS 1301.414 in the standard atmosphere prescribed in AS 1301.415.

**2.2** From the sample cut at least 10 test pieces which are free of flaws or abnormalities which may affect the test result, provided that such defects are not typical of the board under test. The test piece shall have an area of  $50.0 \pm 0.1 \text{ cm}^2$  corresponding to a diameter of  $79.8 \pm 0.1 \text{ mm}$  (Note 6.1).

Do not include in any test piece any part of the board which is within 25 mm of a score line or cut edge. If the board sample is printed and comparative values are required, cut 10 test pieces from areas free of and at least 25 mm from any printed area, and 10 further test pieces directly from printed areas. If the only printing on the sample is the manufacturer's seal, the test pieces shall be taken only from the unprinted area.

## 3. PROCEDURE

**3.1** Place the test piece centrally on the emery cloth on the bottom of the sleeve of the holder.

**3.2** Place the holder in the compression tester and adjust the digital display or dial gauge to zero. Carefully slide the piston into the sleeve until it is supported by the test piece. Apply an initial load of  $40 \pm 10 \text{ N}$  to the test piece (i.e. a dial reading of  $0.125 \pm 0.040 \text{ mm}$  on a beam deflection crush testing machine) (Note 6.2). Adjust the thickness measuring device so that it will indicate when the thickness of the test piece has decreased by 250  $\mu\text{m}$ .

**3.3** Apply load to the rod of the piston by means of the upper platen of the tester. When the test piece has deflected 250  $\mu\text{m}$ , as indicated by the thickness measuring device, record the maximum load indicated

by the display or gauge to the nearest 5 N or 0.02 mm respectively (Note 6.3).

**3.4** Test at least 10 test pieces by this procedure and calculate the average force or deflection to the nearest 2.5 N or 0.01 mm respectively.

**3.5** If the beam deflection measured in millimetres is used, calculate the hardness in kilopascals from:

$$\text{Hardness (kPa)} = \text{average deflection (mm)} \times 60$$

**3.6** If the load is measured in newtons, calculate the hardness in kilopascals from:

$$\text{Hardness (kPa)} = \text{load (N)} \times 0.2$$