

STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
METHODS OF TEST FOR TEXTILES

PART 2—PHYSICAL TESTS

AS 2001.2.10
DETERMINATION OF THE TEAR RESISTANCE OF WOVEN
TEXTILE FABRICS BY THE WING-RIP METHOD

PREFACE

This edition of this standard was prepared by the Association's Committee on Testing of Textiles. It supersedes AS 1091—1973.

It is one of a series of methods which takes cognizance of the work of the International Organization for Standardization (ISO/TC 38, Textiles) and is being adapted to suit Australian conditions.

METHOD

1 SCOPE. This standard sets out a procedure for determining the tear resistance of woven textile fabrics by the wing-rip method. Two test interpretations are involved—

- (a) mean of the highest peak forces;
- (b) tearing energy.

2 APPLICATION. This method is applicable to woven fabrics provided that the yarns in the fabric do not withdraw from the specimen during the test.

3 REFERENCED DOCUMENT. The following standards are referred to in this standard:

AS 2001.1 Methods of Test for Textiles—Conditioning Procedures.

AS 2193 Methods for Calibration and Grading of Force—Measuring Systems of Testing Machines.

4 DEFINITIONS. For the purpose of this standard the following definitions apply:

4.1 Warp tests—tests in which the warp yarns are torn.

4.2 Weft tests—tests in which the weft yarns are torn.

4.3 Tearing energy—the work done in tearing the specimen for a constant jaw separation.

5 PRINCIPLE. A test specimen is cut part way along its length so as to form two wings. The wings are gripped in the jaws of a testing machine. The force required to propagate the tear is measured.

6 APPARATUS. The following apparatus is required: A testing machine complying with the following requirements:

- (a) The machine shall comply with the requirements of Grade B machines as specified in AS 2193, except that the error in the measurement of length shall not exceed 1.0 mm.
 - (b) The machine shall be equipped with an autographic recorder for measuring a force-extension diagram.
 - (c) The capacity of the machine or the range selected shall be such that the force required to break the test specimens shall be not less than 10 percent of the machine capacity.
 - (d) The machine shall be capable of extending the specimen at a constant rate.
 - (e) The force measuring mechanism of the machine shall allow little or no movement of the fixed jaws in the direction of the applied force.
 - (f) The fixed and moving jaws of the machine shall be in the same plane, parallel to one another and at right angles to the direction of application of the force.
 - (g) The jaws of the machine shall be constructed so that they do not damage the test specimen.
- NOTE: Suitable packing materials or embedding techniques may be used whenever necessary to prevent test specimens slipping in the jaws.
- (h) The jaws of the machine shall be not less than 75 mm in width.
 - (j) If tearing energy is required to be determined, an integrator shall be provided.

7 TEST SAMPLE AND TEST SPECIMEN.

7.1 Selection. The test sample shall be representative of the piece under test and shall be 1 m in length and preferably full width.



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7.2 Specimens. Test specimens shall be selected so as to be representative of the sample under test. Two series of not less than five test specimens shall be cut, each 130 mm × 200 mm. One series, for warp tests, shall have the longer dimension parallel to the weft yarns; the other series for weft tests shall have the longer dimension parallel to the warp yarns.

Each specimen shall be cut so that no two specimens will involve tearing of the same yarns. Test specimens shall be prepared in accordance with Fig. 1.

8 PROCEDURE. The procedure shall be as follows:

- Condition and test all test specimens in the standard atmosphere in accordance with AS 2001.1.
- Adjust the testing machine to operate at a rate of jaw separation of 100 ± 10 mm per minute with the jaw separation distance at the commencement of test set at 150 ± 5 mm.
- Separate the two wings of the specimen so that the lines marked on it are facing the operator and are in the same plane.
- Clamp one wing of the specimen in each of the jaws of the testing machine with the lines on the specimen placed centrally along the inner edges of the jaws.
- Set the testing machine in motion and record the force-extension diagram on the autographic recorder for a minimum length of 75 mm jaw separation after the first peak force is obtained. Observe any irregular tearing behaviour of the specimen such as changing of the tear to crosswise direction or withdrawal of crosswise yarns. If irregular tearing behaviour occurs, discard the specimen and discount the test result.

NOTES:

- The autographic record will consist of a series of peaks corresponding to the forces required to break successive yarns or groups of yarns.
- It may be necessary to adjust the drive rate of the autographic recorder in order to produce a clearly defined recording.

- If tearing energy is required, start the integrator 20 ± 2 mm of jaw separation after the first tearing force peak is recorded and allow it to continue integrating for 30 ± 1 s.

9 CALCULATION AND EXPRESSION OF RESULTS.

9.1 Mean of five highest peaks. Ignore that part of the record corresponding to the first 20 mm of jaw separation after the first peak force, note the highest peak value for the load recorded for each of five successive 10 mm intervals of jaw separation. Calculate the mean of these five highest values for each specimen. Calculate the mean value for the five warp test specimens, and also for the five weft test specimens.

9.2 Tearing energy. If the tearing energy is to be assessed, calculate the tearing energy in joules from the integrator reading for each specimen and the mean for the five specimens tested for each direction.

$$\text{NOTE: } J = \frac{xLS}{k}$$

where

J = tearing energy (Joules)

x = Integrator reading

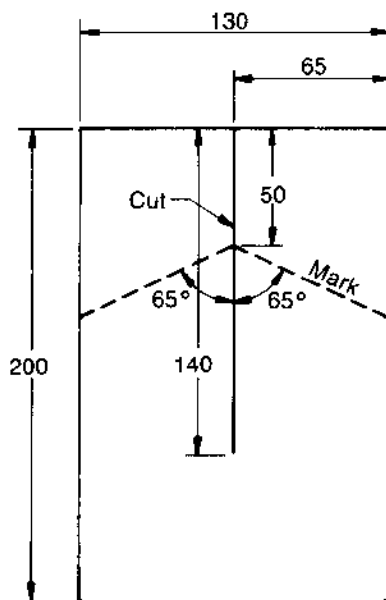
L = full-scale force, N

S = rate of specimen extension, mm/min.

k = integrator constant (for the 'Instron' machine, $k = 500\,000$).

10 REPORT. The following information shall be reported:

- The mean tearing force of the five warp test specimens, the mean tearing force of the five weft test specimens, and, if required, the individual tearing force of each warp test and weft test specimen.
- Irregular tearing behaviour, such as changing of the tear to crosswise direction of the specimen or withdrawal of crosswise yarns from either wing.
- The tearing energy, if required.



DIMENSIONS IN MILLIMETRES

Fig. 1. PREPARATION OF TEST SPECIMENS

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