

Australian Standard®

Methods of test for textiles

Method 2.4: Physical tests—Determination of bursting pressure of textile fabrics—Hydraulic diaphragm method

PREFACE

This Standard was prepared by the Standards Australia Committee on Testing of Textiles to supersede AS 2001.2.4, *Determination of bursting pressure of textile fabrics*.

In the preparation of this Standard, the committee has recognized the need to revise certain aspects of the previous Standard relating to the specification of the clamping aperture, type of diaphragm, and fluid flow rate. Guidelines on calibration and verification procedures of the unit using aluminium foil sheet are also incorporated.

A separate Standard for determining the bursting force of textile fabrics (ball burst method) has been published AS 2001.2.19.

In preparing this Standard, cognizance was taken of the following Standards:

ISO 2960	<i>Textiles—Determination of bursting strength and bursting distention—Diaphragm method</i>
BS 4768	<i>Method for the determination of the bursting strength and bursting distention of fabrics</i>
ASTM D 3786	<i>Hydraulic bursting strength of knitted goods and non-woven fabrics: Diaphragm bursting strength tester method</i>

METHOD

1 SCOPE. This Standard sets out two methods for determining the bursting pressure of both wet and dry fabrics.

Method A—Constant flow rate.

Method B—Constant time to rupture.

NOTE: The results obtained by the two methods may not be comparable.

The methods are applicable to all textile fabrics. They are particularly applicable to knitted and other fabrics for which breaking or tearing force determinations are not suitable.

A method for the preparation of fabrics with an extensibility greater than that of the thin flexible diaphragm is given in Appendix A.

2 REFERENCED DOCUMENTS. The following documents are referred to in this Standard:

AS	
1199	Sampling procedures and tables for inspection by attributes
1349	Bourdon tube pressure and vacuum gauges
2001	Methods of test for textiles
2001.1	Method 1: Conditioning procedures
BS	
4294	Stretch and recovery properties of fabrics
TAPPI*	T403 Method of test for bursting strength of paper

* Issued by the Technical Association of the Pulp and Paper Industry, USA.

3 PRINCIPLE. A test specimen of fabric is clamped between two similar surfaces over a thin flexible diaphragm in a bursting tester, and distended by applying fluid pressure until it ruptures. The difference between the total pressure required to rupture the specimen and the (tare) pressure required to inflate the diaphragm is reported as the bursting pressure.

4 DEFINITIONS. For the purpose of this Standard, the definitions below apply.

4.1 Bursting pressure—the difference between the maximum pressure recorded during the rupture of a test specimen and the diaphragm tare pressure.

NOTE: The bursting pressure is expressed in kilopascals.

4.2 Tare pressure—pressure required to distend the diaphragm in the absence of the test fabric, to a height achieved immediately prior to rupture of the test fabric when in position.

4.3 Bursting distention—the distention of a test specimen at bursting pressure. It is the height, of the centre of the upper surface of the specimen above the plane in which the clamped upper edge of the specimen lies, immediately prior to rupture.

NOTE: The bursting distention is measured in millimetres.

5 REAGENTS.

5.1 Water—filtered tap water at $20 \pm 5^\circ\text{C}$ for wetting and rinsing specimens prior to wet testing.

5.2 Wetting agent—ethoxylated derivative of a synthetic alcohol (non-ionic) wetting agent*.

6 APPARATUS.

6.1 Conditioning facility—a means of providing and maintaining a standard atmosphere as described in AS 2001.1.

6.2 Hydraulic diaphragm bursting tester—a testing machine calibrated in accordance with Appendix B and having the following characteristics:

- (a) The machine shall be constructed so that a test specimen can be clamped between two annular plane surfaces, allowing a controlled increasing hydraulic pressure to be applied to the underside of the specimen, until rupture, by means of a thin flexible diaphragm clamped over a pressure chamber. This pressure is developed by a piston forcing fluid† into the pressure chamber at a rate of $95 \pm 10 \text{ mL/min}$ (Method A), or at a variable flow rate to produce a rupture in $20 \pm 5 \text{ s}$ (Method B).
- (b) The upper and lower clamping surfaces shall have external diameters of at least 75 mm, with coaxial circular apertures of diameter $31.00 \pm 0.75 \text{ mm}$. The lower surface shall be fixed, and the upper surface shall be attached to a clamping device so that, when the two surfaces are closed together, they will meet under evenly distributed pressure sufficient to prevent specimen slippage during a test. The test specimen shall not be capable of being damaged by the action of the clamping mechanism.
- (c) Means shall be provided to indicate or record the maximum pressure under the diaphragm at any point in the range in which the machine is used to an accuracy of ± 1 percent. The indicator or recorder shall be such that individual readings shall be not less than 20 percent nor more than 80 percent of its total capacity.
- (d) For Method A, means shall be provided for measuring the distention of the diaphragm at test specimen rupture to an accuracy of $\pm 0.5 \text{ mm}$. Alternatively where distention cannot be measured accurately, determine the diaphragm tare pressure either—
 - (i) in accordance with Clause 8(a)(iv)A to (a)(iv)E, or
 - (ii) in accordance with Clause 8(a)(iv)F and 8(a)(iv)G.
- (e) A diaphragm‡ of thin flexible synthetic or natural rubber, $1.0 \pm 0.1 \text{ mm}$ in thickness, shall be clamped between the lower clamping plate and the base of the machine so that, before the diaphragm is stretched by pressure under it, the centre of its upper surface is below the plane of the lower clamping surface. The diaphragm should be inspected frequently for permanent distortion and renewed if necessary.

6.3 Aluminium foil—pieces of aluminium sheet having a bursting pressure in the range of 70 kPa to 790 kPa used for verifying the overall performance of the tester (see Appendix B).

NOTE: It is recommended practice that laboratories hold sufficient stock of aluminium foil to conduct regular tests. Initial testing of the aluminium foil should be conducted after external calibration of the machine.

* Teric BL 8 produced by ICI Australia Ltd. is a suitable wetting agent.

† The recommended fluid is glycerol.

‡ A typical diaphragm complying with the above requirements is available from James Heal and Co., United Kingdom.

6.4 Timing device—a device capable of measuring elapsed time to an accuracy of 1 s.

6.5 Water bath—a container in which specimens can be immersed in water at a temperature of $20 \pm 5^\circ\text{C}$ prior to wet testing.

7 SAMPLE AND TEST SPECIMENS.

7.1 General. Care should be taken to ensure that the operator's hands are dry. Excessive handling of the sample and test specimens should be avoided.

7.2 Sample.

7.2.1 Lot sampling. A lot sample shall be selected in accordance with the relevant material specification.

Where there is no material specification, the sample shall be selected using a sampling plan developed in accordance with AS 1199.

NOTE: To provide a sampling plan with a meaningful producer's risk and consumer's risk, an adequate specification needs to take into account the variability between rolls of fabric, and between specimens from a sample taken from a roll of fabric.

7.2.2 Laboratory sample. A sample shall be taken from the outside of each roll of fabric in the lot sample, after first discarding all fabric that contains creases, fold marks, delamination or disturbed weave.

7.3 Conditioning. The fabric sample is conditioned in accordance with AS 2001.1. Test specimens are prepared from the sample and subsequent tests are conducted without removal from the standard atmosphere.

7.4 Test specimen. The test specimen shall be selected so as to be representative of the sample under test. Ten test specimens shall be taken from the sample. Each test specimen shall be at least $125 \text{ mm} \times 125 \text{ mm}$, or at least 125 mm in diameter.

NOTES:

1. For woven fabrics, a specimen should not be taken nearer to the selvage than one tenth of the fabric width.
2. No two test specimens should contain the same wale or course yarns from a knitted fabric, or the same warp or weft yarns from a woven fabric.

7.5 Wet test specimen. When a test specimen is to be tested in the wet state, place the test specimen, prepared in accordance with Clause 7.4, in the water bath containing water (Clause 5.1) and a wetting agent (see Clause 5.2) at a concentration of 0.2 g/L. Allow the test specimen to sink under its own weight, or forcibly immerse it, for an immersion period of 1 h.

7.6 Highly extensible test specimen. Ten test specimens shall be prepared according to the procedure outlined in Appendix A.

8 PROCEDURE. Testing shall be carried out in the standard atmosphere (see Clause 6.1).

To ensure consistent results all air shall be excluded from the pressure chamber.

The procedure for each test specimen shall be as follows, according to whether Method A or Method B is being used:

(a) Method A—Test at constant flow rate.

- (i) Clamp a test specimen, which is free from tension or wrinkles, securely in the machine. If the test specimen is wet insert it in the clamping device within 1 min of removal from the water.
- (ii) Apply pressure to the diaphragm at a flow rate of $95 \pm 10 \text{ mL/min}$ until the test specimen ruptures.
- (iii) Record the maximum pressure registered by the gauge at which test specimen rupture occurred and proceed as follows:
- (iv) Either—
 - (A) record the bursting distention to the nearest 0.5 mm as the distention of the diaphragm above the upper clamping surface at the point when test specimen rupture occurred;
 - (B) release the pressure on the diaphragm and remove the ruptured test specimen from the clamping surface;
 - (C) retighten the upper clamping surface without a test specimen in the machine;
 - (D) activate a lower capacity pressure indicator (recorder) and apply pressure to the diaphragm until the distention is equivalent to that recorded in item A above; and
 - (E) record the pressure exerted on the diaphragm as the tare pressure to the nearest 5 kPa.