

Australian Standard®

AS 3706.3—2012

Geotextiles—Methods of test

Method 3: Determination of tearing strength—Trapezoidal method

FOREWORD

Failure of a geotextile by tear propagation after initial ripping or puncturing is thought to be a possible failure mode in many geotextile applications.

The pattern of failure in tear is different in non-woven fabrics from that in woven fabrics. Failure of woven fabric occurs essentially through the sequential rupture of yarns in tension, whereas, the failure of a non-woven fabric is significantly affected by inter-fibre friction forces.

METHOD

1 SCOPE

This Standard sets out a method for determining the tearing strength of geotextiles under in-plane loading, using the trapezoidal method.*

NOTE: The trapezoidal method is a tearing force tension test in which the strength is determined primarily by the individual fibres of the fabric structure, and their bonding or interlocking where applicable.

2 APPLICATION

This method is applicable to all types of geotextiles, but has limitations for high-strength materials (i.e. those having a wide-strip tensile strength in excess of approximately 80 kN/m) due to specimens slipping in the jaws.

3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS	
2193	Calibration and classification of force-measuring systems
3704	Geotextiles—Glossary of terms
3706	Geotextiles—Methods of test
3706.1	Method 1: General requirements, sampling, conditioning, basic physical properties and statistical analysis

* This method is based on ASTM D4533, *Test method for trapezoidal tearing strength of geotextiles*.

4 PRINCIPLE

A trapezoidal outline is marked centrally on a rectangular test specimen. The specimen is gripped along the two non-parallel sides of the trapezoid in the jaws of a tensile testing machine. A continuously increasing force is applied in such a way that the tear propagates across the specimen. The value of the tearing strength of the specimen is obtained from the force/extension curve, and is taken as the maximum force thus recorded.

5 DEFINITIONS

For the purpose of this Standard, the definitions given in AS 3704 apply.

6 APPARATUS

The following apparatus is required:

- (a) Constant rate of extension (CRE) tensile testing machine complying with the requirements for a Grade B machine in accordance with AS 2193, and having an extension rate of 300 mm/min, and an autographic recorder with adequate pen response or an interfaced computer to properly record the force/extension curve.

For machines with no autographic recorder, appropriate measuring instruments shall be used to allow readings of the applied force and the corresponding extension at a number of points, up to failure.

- (b) Jaws, with faces measuring 50 mm by 75 mm with the longer dimension perpendicular to the direction of application of the force, and gripping surfaces being parallel, flat, and capable of preventing the specimen from slipping or crushing during a test.
- (c) Measuring, marking and cutting equipment.
- (d) A template having the dimensions shown in Figure 1.

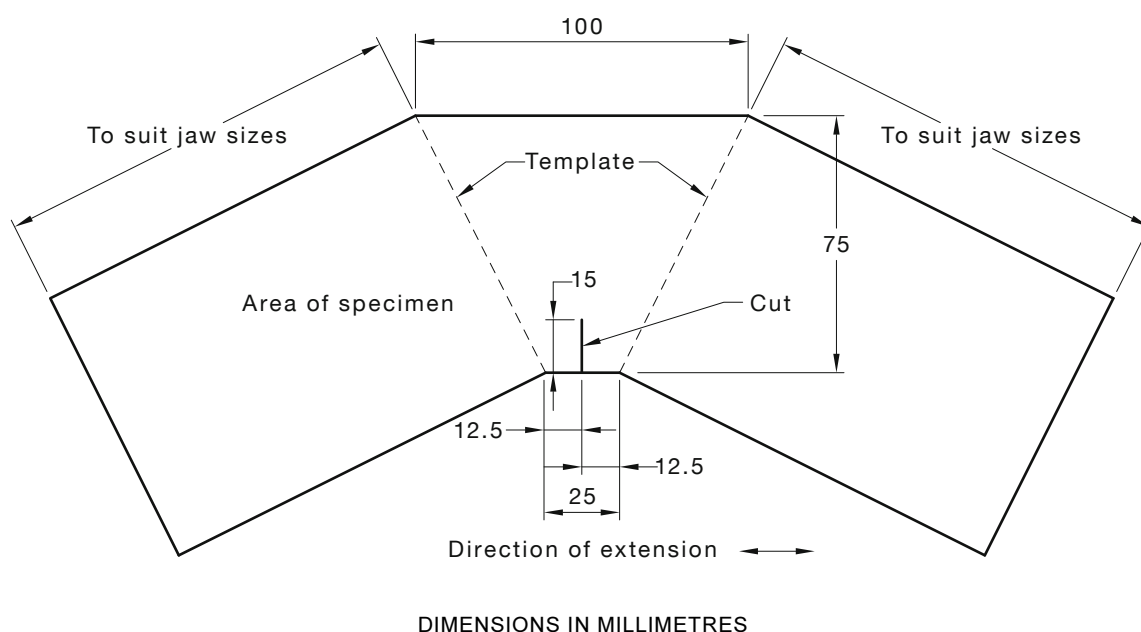


FIGURE 1 METHOD OF MARKING SPECIMEN

7 PREPARATION OF TEST SPECIMENS

7.1 Sampling

A minimum of 10 specimens shall be sampled in accordance with AS 3706.1.

7.2 Conditioning

The specimens shall be conditioned either atmospheric or wet, as required, in accordance with AS 3706.1.

8 TEST CONDITIONS

The test atmosphere shall be in accordance with AS 3706.1.

Wet-conditioned specimens shall be tested in the apparatus within 20 min of their removal from the water.

9 PROCEDURE

The procedure shall be as follows:

- (a) Using the template and a water-based marker or pencil, mark a trapezoid centrally on each specimen, as shown in Figure 1.
- (b) Cut the specimen, from the centre of the shortest side of the trapezoid, for a distance of 15 mm as shown in Figure 1.
- (c) Set up the tensile testing machine as follows:
 - (i) Adjust the distance between the jaws to 25 ± 1 mm. Measure and record the gauge length.
 - (ii) Select the force range of the machine so that tearing occurs between 10% and 90% of full scale force.
 - (iii) Set the machine to operate at an extension rate of 300 mm/min.
- (d) Secure the test specimen in the machine, noting whether it is a machine direction or cross-machine direction specimen. Clamp it along the non-parallel sides of the trapezoid with the cut halfway between the jaws, holding the short edge taut and letting the long edge lie in folds (see Figure 2).