Australian Standard™

AS 3706.5

Geotextiles—Methods of test

Method 5: Determination of puncture resistance—Drop cone method

FOREWORD

The determination of the puncture resistance with the drop cone makes use of the modified CBR mould. Evaluating the resistance to tear initiation, this test is particularly relevant in situations where coarse aggregates or riprap is dropped or pushed against the fabric. It is a simple test and requires a minimum of equipment.

METHOD

1 SCOPE

This Standard sets out the method for determining the puncture resistance of geotextiles by the drop cone method for both atmospheric and wet-conditioned specimens.

2 APPLICATION

This method is applicable to both woven and non-woven geotextiles, and may also be used for geomembranes and composites. It is a useful index test for quality acceptance under field conditions.

3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS	
1289	Methods of testing soils for engineering purposes
1289.6.1.1	Method 6.1.1: Soil strength and consolidation tests—Determination of the California bearing ratio of a soil—Standard laboratory method for a remoulded specimen
3704	Geotextiles—Glossary of terms
3706	Geotextiles—Method of test
3706.1	Method 1: General requirements, sampling, conditioning, basic physical properties, and statistical analysis

4 PRINCIPLE

A circular specimen is gripped around its entire circumference by clamps. A cone of specified mass is dropped onto the surface of the specimen. The diameter of the punctured hole, in combination with the drop height, gives a measure of the puncture resistance.

The puncture resistance can be expressed as either—

(a) diameter of the hole at a standard drop height of 500 mm; or

(b) drop height that will produce a hole of diameter 50 mm.

The relationship between the drop height and the diameter of the hole has been found, from testing a wide range of geotextiles, to be—

$$d_2 = d_1 \left(\frac{h_2}{h_1} \right)^{0.68} \quad \ldots 4(1)$$

or

$$h_2 = h_1 \left(\frac{d_2}{d_1} \right)^{1.47} \quad \ldots 4(2)$$

where

h_1 = drop height (first value), in millimetres

h_2 = drop height (second value), in millimetres

d_1 = diameter of hole corresponding to a drop height h_1, in millimetres

d_2 = diameter of hole corresponding to a drop height h_2, in millimetres

NOTES:

1 The exponent applying to Equation 4(1) was found to be generally in the range between 0.55 and 0.7. The value of 0.68 was established as the best approximation.

2 The actual diameter of the hole for a given drop height is an inverse measure of the resistance against penetration—the smaller the hole, the greater the resistance.

3 The above formulas are valid only where the diameter of the hole produced experimentally by this Standard exceeds 15 mm.

4 The purpose of this method is to determine a value for h_{50}. This may be derived from the equations given in 4(1) and 4(2) or from direct determination of the actual height to cause a hole diameter of 50 mm.

5 DEFINITIONS

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

5.1 Standard puncture diameter (d_{500})

The puncture diameter, in millimetres, corresponding to the standard test drop height of 500 mm.

5.2 Puncture resistance (h_{50})

The drop height, in millimetres, determined from this test method, required to obtain a puncture diameter of 50 mm.

6 SELECTION OF DROP HEIGHT

The standard test drop height is 500 ±1 mm measured as the distance from the point of the cone to the surface of the geotextile.

A drop height is selected such that a hole diameter of greater than 15 mm is achieved.

For weaker materials, a drop height of less than 500 mm is used if there is a possibility of the cone totally puncturing the geotextile at the 500 mm test height.

Table 1 may be used as a guide to the selection of a drop height.

The diameter of the puncture holes at these preferred drop heights can be related to the standard puncture diameter by the following equations:

