

STANDARDS AUSTRALIA

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**RECONFIRMATION**

**OF**

**AS 2001.6.1—1980**

**Methods of test for textiles**

**Part 6.1: Miscellaneous tests—Determination of the resistance of textiles to certain insect pests**

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**RECONFIRMATION NOTICE**

Technical Committee TX-020 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

Certain documents referenced in the publication may have been amended since the original date of publication. Users are advised to ensure that they are using the latest versions of such documents as appropriate, unless advised otherwise in this Reconfirmation Notice.

Approved for reconfirmation in accordance with Standards Australia procedures for reconfirmation on 6 July 2016.

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Ag Research  
Australian Wool Processors Council  
AWTA Textile Testing  
Council of Textile and Fashion Industries of Australia  
Drycleaning Institute of Australia  
National Association of Testing Authorities Australia  
RMIT University  
The Textile Institute

## NOTES

STANDARDS ASSOCIATION OF AUSTRALIA

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**Australian Standard**  
**METHODS OF TEST FOR TEXTILES**

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PART 6—MISCELLANEOUS TESTS

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**AS 2001.6.1**  
**DETERMINATION OF THE RESISTANCE OF**  
**TEXTILES TO CERTAIN INSECT PESTS**

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## PREFACE

This standard method was prepared by the Association's Committee on Testing the Resistance of Textiles to Insects under the direction of the Textile Standards Board in response to a request by wool textile manufacturing and research interests. It is based on ISO 3998 Textiles, Determination of Resistance to Certain Insect Pests.

The standard is applicable to textile fibres derived from animals. It describes a method for assessing the susceptibility of the test insects by comparing their feeding habits with insects of a wild strain. In so doing it recommends replacing the test insects if there is a significant disparity in the susceptibility. In assessing proofness against insect attack, loss of mass of test specimen and assessment of visual damage are taken into account.

The breeding of insects for test purposes is a complex operation in order to preserve and maintain them with consistent voracity. Some details for breeding them are given in Appendix A. Test insects and more complete information about breeding them are available from:

CSIRO, Division of Textile Industry  
Wool Research Laboratories  
PO Box 21  
BELMONT VIC 3216

The standard requires reference to the following Australian standards:

AS 1152	Test Sieves
AS 1587	Methods for Measurement of Textile Fabrics — Length, Width, Thickness, Mass per Unit Length and Mass per Unit Area
AS 2001.1	Methods of Test for Textiles — Conditioning Procedures*
AS 2001.3.1	Methods of Test for Textiles Part 3—Chemical Tests—Determination of pH of Aqueous Extract

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\* Revision of AS 1090 in course of preparation.

## FOREWORD

Some previous methods for testing resistance of textiles to insect pests have relied on the loss of mass of the test specimens exposed to larvae as the sole criterion of damage. However, if the larvae cut the roots of the pile or nap of pile fabrics, significant loss of pile can be caused before the larvae die. In this case, the loss of mass of the test specimen may be above the generally acceptable limit although no damage is visible to the naked eye, and the fabric may be acceptable as adequately proofed. Conversely, fabrics with a smooth milled surface, and fine knitwear, may have a loss of mass below the acceptable limit, but still show enough damage for them to be assessed as insufficiently proofed. Thus the determination of loss of mass and the visual observation on the condition of the fabric and larvae play an equal part in the assessment. In most cases, the determination of loss of mass will reinforce the visual observation owing to the fact that loose fibre cannot easily be separated from the insect debris.

Preliminary cleaning of test samples may be desirable to determine the durability of the protection during conditions of service. The cleaning procedure used is subject to mutual agreement between the parties involved with the sample to be tested.

The choice of test insects in this method has been deliberately limited to two species to provide the most realistic test conditions. Of the common textile pests, particularly those encountered in Australia, *Tinea* (moth) and *Anthrenus* (beetle) species are the most difficult to control with currently available mothproofing agents and are considered the most appropriate species for this test method.

Although other standards for determining the resistance of textiles to insects, such as ISO 3998 and IWTO-14\*, may use other insect species, the level of treatments required for the species named in this standard is more than adequate to control those otherwise specified.

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\* IWTO-14, Method of Test and Assessment for Proofness of Wool Fabrics Against the Black Carpet Beetle.

## METHOD

**1 SCOPE.** This standard sets out a method for the determination of the resistance of textiles to certain insects or their larvae. It is applicable to all textiles containing animal fibre in any proportion. Information on the breeding of the larvae is given in Appendix A.

**2 PRINCIPLE.** Conditioned test control specimens and test specimens of known mass are placed with selected larvae for 14 days. The loss in mass of all test specimens and the extent of the attack on test specimens are ascertained to assess the resistance of the test specimens.

**3 APPARATUS AND MATERIAL.** The following apparatus and material are required:

- (a) Metal containers, well ventilated, shallow, large enough to permit the test larvae to remain in contact with, or to move away from, the test specimens. A suitable size is 45 mm in diameter and 10 mm in height. The containers for any single test shall be the same shape and size.
- (b) Pointed forceps and camelhair brush with pesticide-free bristles.
- (c) Glass or suitable plastics weighing bottles, with stoppers.
- (d) Balance capable of determining mass to an accuracy of 0.1 mg.
- (e) Cutting die of diameter  $40.0 \pm 2.0$  mm for punching circular test specimens.

- (f) Standard wool test fabric consisting of scoured undyed wool cloth, free from mothproofing agent or other deleterious finishes, and having —
  - (i) a mass of 125 g/m<sup>2</sup> to 175 g/m<sup>2</sup> when determined in accordance with AS 1587; and
  - (ii) pH in the range of 4.0 to 7.0 when determined in accordance with AS 2001.3.1.

NOTE: Care should be taken to ensure that the equipment and materials used for testing do not become contaminated with substances which will adversely affect insects. All equipment must be thoroughly cleaned before use.

### 4 REARING AND FEEDING ATMOSPHERE.

The atmosphere for rearing and feeding insects shall have a temperature of  $24 \pm 2^\circ\text{C}$  and a relative humidity of  $60 \pm 5$  percent.

NOTE: This temperature has been specified because a lower temperature lengthens the life of the insects and slows down the development of the larvae.

### 5 SELECTION, PREPARATION AND CONDITIONING OF SPECIMENS.

#### 5.1 Number of Specimens.

**5.1.1 Test specimens.** Select at random eight test specimens from the sample of material to be tested, at widely spaced intervals. Use four test specimens for testing and four for moisture regain control specimens.

**5.1.2 Voracity control specimens.** For the purpose of providing a control on the larval voracity, select eight test specimens of standard wool test fabric (Clause 3(f)), undyed untreated yarn or untreated textile material corresponding to the sample to be tested. Use four of the eight specimens for voracity control testing and four for moisture regain control testing.

NOTE: A voracity control specimen should be known to support insect growth and should preferably, but not necessarily, be of the same type of material as the test specimen. A voracity control specimen is used to check that the test has been carried out correctly and that the test larvae are viable.

**5.2 Form and Size.** The specimens shall be of the appropriate form and size as specified in Table 1.

**TABLE 1  
FORM AND SIZE OF SPECIMENS**

Material*	Form and size
Woven or knitted fabrics, felts and furs	Discs, 40 mm in diameter
Carpets	Squares approximately 30 mm × 30 mm, with tufts and/or loops along the edges intact
Carpet pile alone	200 mg specimens
Yarn	200 mg specimens, wound into a loose hank in the container

\* Loose fibre must be converted to and tested in a form shown in this table.

**5.3 Conditioning Test Specimens.** All test specimens, voracity control specimens and moisture regain control specimens shall be conditioned in accordance with AS 2001.1 prior to and after exposure to larval attack.

## 6 TEST INSECTS.

**6.1 Insect Species.** One of the following test insect species shall be used:

- Anthrenus flavipes*, Le conte (beetle).
- Tinea mentonella*, Pierce and Metcalfe (moth larvae) (also known as *T. translucens*, Meyrick).

NOTE: Which of the two insect species is used is a matter for agreement between the parties interested in the test result.

**6.2 Breeding of Larvae.** The breeding of the larvae shall be carried out in accordance with the procedure described in Appendix A.

**6.3 Susceptibility of Test Insect Colony.** At intervals of not more than 3 years, the susceptibility of the test insect colony to wool cloth treated with a series of concentrations of at least two chemically dissimilar but commonly used industrial mothproofing agents, shall be compared with that of a recently captured wild strain of the same species. The method to be used for comparing the susceptibility is described in Paragraph A7 of Appendix A.

If an increase of 30 percent or more of any of these mothproofing agents is required to give a satisfactory result with the wild strain, then the test insect colony shall be replaced with this more resistant wild strain.

NOTE: Variations may occur in the lifecycle of some strains of the same species of insects due to temperature and humidity conditions and type of rearing medium used. It may be necessary, therefore, for some deviation in the age of the larvae used in the test.

**7 PROCEDURE.** The procedure shall be as follows:

- Condition the eight test specimens (including the four to be used as moisture regain control specimens) and the eight voracity control specimens (including the four to be used as moisture regain control specimens) as specified in Clause 5.3.
- Determine the mass of each separately in a stoppered weighing bottle to an accuracy of 0.1 mg.
- Place each of the 15 specimens of known mass in a separate container. Place fifteen larvae of the selected insect species onto each of four test specimens and onto each of four voracity control specimens. (Paragraphs A6.2.1, A6.2.2 (a) and A6.2.2(b) of Appendix A.)

NOTE: All containers must be the same size and shape.

- Keep the sixteen containers in the dark, in the rearing and feeding atmosphere described in Clause 4, for a period of 14 days.
- After 14 days, remove all larvae, cast skins, excrement and loose fibres from the test specimens and voracity control specimens by means of pointed forceps and camelhair brush. Transfer the test specimens, the voracity control specimens and the moisture regain control specimens to separate tared weighing bottles. With stoppers removed, condition all specimens as specified in Clause 5.3.
- Determine the mass of each of the test specimens, the voracity control specimens and the moisture regain control specimens.
- If the mean loss of mass of the four voracity control specimens (see Clause 8.1) is less than 35 mg, or if any single value is less than 25 mg, declare the test invalid.

## 8 EXPRESSION OF RESULTS.

**8.1 Method of Calculation.** Determine the loss in mass,  $L$ , of each test specimen and of each voracity control specimen, due to insect feeding, using the following formula:

$$L = (m_0 - m_1) - (m_2 - m_3)$$

where

- $L$  = loss in mass, in milligrams
- $m_0$  = the mass of the test specimen or voracity control specimen before exposure to larvae, in milligrams
- $m_1$  = the mass of the test specimen or voracity control specimen after exposure to larvae, in milligrams
- $m_2$  = the mean initial mass of appropriate moisture regain control specimens, in milligrams
- $m_3$  = the mean final mass of appropriate moisture regain control specimens, in milligrams.

**8.2 Visual Assessment.** Examine each test specimen, assess the visible damage, and classify in accordance with Tables 2 and 3.