

Insect Pest Deterrents on Textiles

Developed in 1940 by AATCC Committee RA49; Jurisdiction transferred in 1994 to AATCC Committee RA31; jurisdiction returned in 2000 to AATCC Committee RA49; revised 1949, 1962; reaffirmed 1956, 1971, 1974, 1977, 1980, 1985, 1989, 1999; editorially revised 1974, 1988, 1992; editorially revised and reaffirmed 1994, 2004. Related to ISO 3998.

1. Purpose and Scope

1.1 This test method covers procedures for the evaluation of compounds or treatments designed to protect textile fabrics and yarns from damage by insect pests, such as moths or carpet beetles. They comprehend not only the initial protection furnished by the treatment, but also the permanency of the protection during conditions of ordinary service.

2. Principle

2.1 Treated and untreated specimens are subjected to the action of insect pests under controlled conditions for one exposure period and then examined for evidence of damage. Additional exposure periods are given as necessary until visual damage is evident.

3. Terminology

3.1 **insect resistance**, *n.*—*in textiles*, the capability to impede damage by insects.

4. Safety Precautions

NOTE: These safety statements are for information purposes only. The precautions are ancillary to the testing procedures and are not intended to be all inclusive. It is the user's responsibility to use safe and proper techniques in handling materials in this test method. Manufacturers MUST be consulted for specific details such as material safety data sheets and other manufacturer's recommendations. All OSHA standards and rules must be consulted and followed.

4.1 Good laboratory practices should be followed. Wear safety glasses in all laboratory areas.

4.2 All chemicals should be handled with care. Use chemical goggles or face shield, impervious gloves and an impervious apron during dispensing and mixing of the chemicals used in this test method.

4.3 Perchloroethylene is toxic by inhalation, by repeated contact with the skin and by ingestion. It must be used only in

a well vented atmosphere. Toxicology studies with laboratory animals have shown evidence of cancer in rats and mice exposed to perchloroethylene vapors at 100-400 ppm concentrations for prolonged times. Fabric saturated with this solvent must be dried in an adequately ventilated hood.

4.4 An eyewash/safety shower should be located nearby and an organic vapor respirator should be readily available for emergency use.

4.5 Exposure to chemicals used in this procedure must be controlled at or below levels set by governmental authorities (e.g., Occupational Safety and Health Administration's [OSHA] permissible exposure limits [PEL] as found in 29 CFR 1910.1000 of January 1, 1989). In addition, the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) comprised of time weighted averages (TLV-TWA), short term exposure limits (TLV-STEL) and ceiling limits (TLV-C) are recommended as a general guide for air contaminant exposure which should be met (see 18.7).

5. Apparatus and Materials

- 5.1 Flat iron
- 5.2 Moth cloth (see 18.1)
- 5.3 Perchloroethylene
- 5.4 Stoddard solvent

6. Test Specimens

6.1 Test specimens are prepared by applying the treatment or compound to be tested in the desired proportion to a piece of standard pure undyed scoured wool (see 18.1). After application, the specimen is thoroughly aired for a period of not less than 7 days for the removal of all volatile constituents. The size of the piece should be sufficient to furnish specimens for all of the service tests to which it is to be subjected.

6.2 If it is desired to determine the resistance of the treatment on a special fabric, test specimens are prepared as described in 6.1 using the special fabric instead of the standard fabric.

7. Resistance to Insect Pests

7.1 The resistance of the treated specimens to insect pests is determined in accordance with AATCC Test Method 24, Resistance of Textiles to Insects (with the exception that 28-day test periods should be employed), both immediately after the

preparation of the fabric and airing described in 6.1, and also after subjecting it to any or all of the service tests described in 8-13 (see 18.2).

8. Washing

8.1 The treated specimen is washed according to the procedure described below, and the washing is repeated up to 5 times as desired.

8.2 The tests are to be run for 5 min at $38 \pm 2^\circ\text{C}$ ($100 \pm 5^\circ\text{F}$) in a soap solution containing 0.2% neutral chip soap (see 18.3) using a bath ratio of 30 times as much water as fabric. The specimens after hand washing (squeezing suds through fabric) in this soap solution are rinsed twice in water at approximately 29°C (85°F) using the same ratio of water as in the washing, that is, 30:1.

9. Cleaning

9.1 Apparatus. The apparatus consists of a Launder-Ometer or similar machine.

9.2 Stoddard Solvent (see 18.4) Solution. The soap is made by dissolving 56 g of potassium hydroxide in 100 mL of water. This solution is poured slowly with constant stirring into a mixture of 340 g of oleic acid, 400 mL of Stoddard solvent and 100 mL of tertiary butyl alcohol or an equal quantity of Butyl Cellosolve.

9.3 Perchloroethylene Solution. Prepare the solution in accordance with the procedure described in 9.2 except that perchloroethylene is used instead of Stoddard solvent.

9.4 Drycleaning with Stoddard Solvent (see 18.5). Each specimen is placed in a 1 pt. preserving jar containing the necessary volume of cleaning solution prepared by mixing together 50 mL of Stoddard solvent and 0.6 mL of drycleaning soap solution for each gram of specimen. Place the jar in the machine and operate it for 25 min. Pour out the solution, and add 100 mL of fresh Stoddard solvent without soap to the jar. Return the jar to the machine and operate it for an additional 10 min. Remove the specimen from the jar, and without squeezing lay it out on a horizontal surface such as a muslin-covered frame or screen, and allow to dry at room temperature. The cleaning may be repeated as many as five times.

9.5 Alternative Drycleaning with Perchloroethylene. Dryclean the treated specimen in accordance with the procedure described in 9.4 using the perchloroethylene solution instead of the Stoddard

solvent solution. The cleaning may be repeated as many as five times.

9.6 Wet Cleaning (see 18.5). Place the specimen cleaned in accordance with the procedure described in either 9.4 or 9.5 on a porcelain slab, or piece of slate, and wet at 32-38°C (90-100°F), with sufficient distilled water, containing 1 g of neutral soap per liter, to keep the specimen thoroughly wet for 15 min. Rinse the specimen by immersing it in 1 L of distilled water at 32-38°C (90-100°F) for 5 min. Remove the specimen and without squeezing, lay it out on a horizontal surface, such as a muslin-covered frame or screen, and allow to dry at room temperature.

9.7 After cleaning, the resistance of the specimen to insect pests is determined.

10. Hot Pressing

10.1 Press the treated specimen by hand in accordance with the following procedure (see 18.5). Lay the specimen on a padded ironing board and cover with a damp muslin press cloth, weighing 135.6–152.55 g/m² (4.0–4.5 oz/yd²) previously saturated with water and wrung out so as to retain moisture equal to approximately 75% of its dry weight. Press until dry with a flat iron having a temperature of 135-149°C (271-300°F). Allow the specimen to lie on a smooth horizontal surface for 1 h at room temperature. The specimen may be pressed as many as five times. After pressing, the resistance of the specimen to insect pests is determined.

11. Water

11.1 Sea Water Solution. Make up a solution containing 3% of sodium chloride and 0.5% of magnesium chloride.

11.2 Procedure. Saturate the treated specimen with the sea water solution, roll fairly tightly and place it in a closed vessel to prevent evaporation. Allow to stand overnight, or for 24 h if desired. The treatment with sea water may be repeated as many as five times. After this treatment, the resistance of the specimen to insect pests is determined.

12. Perspiration

12.1 The treated specimens are subjected to AATCC Test Method 15 for Colorfastness to Perspiration, and the resistance of each specimen to insect pests is then determined.

13. Light

13.1 The treated specimen is exposed to light in the Fade-Ometer in accordance with AATCC Test Method 16, Colorfastness to Light, Option 1. The exposure may be continued for 10, 20 or 40-h periods. After the light test, the resistance of the specimen to insect pests is determined.

14. Abrasion

14.1 The treated specimen is subjected to 2,000 revolutions of the carpet wear test machine in accordance with the procedure described in the paper on Wear of Carpets (see 18.6) published by the National Bureau of Standards. After abrasion the resistance of the specimen to insect pests is determined.

15. Classification

15.1 The classification of the permanency of protection furnished by compounds designed to increase the resistance of fabrics and yarns to insect pests is based upon a comparison of the results obtained by the use of AATCC Test Method 24, Resistance of Textiles to Insects, before and after the application of the service tests prescribed in 7-13.

15.2 The classes of permanency of protection are those for the specific service test as indicated in Table I.

16. Report

16.1 The report should include a designation of classification of the treated specimen with respect to the change in its resistance to insect pests after each of the service tests described in 8-14.

17. Precision and Bias

17.1 *Precision*. Precision for this test method has not been established. Until a precision statement is generated for this test method, use standard statistical techniques in making any comparisons of test results for either *within-laboratory* or *between-laboratory* averages.

17.2 *Bias*. Insect pest deterrents on textiles can be defined only in terms of a test method. There is no independent method for determining the true value. As a means of estimating this property, the method has no known bias.

18. Notes

18.1 Available from Testfabrics Inc., P.O. Box 26, 415 Delaware St., W. Pittston PA 18643; tel: 570/603-0432; fax: 570/603-0433; e-mail: testfabric@aol.com.

18.2 The selection of the particular service tests to be applied to the specimen in question should be governed by the use to which the fabric is to be put.

18.3 Chip Soap Specification, ASTM D 496. Available as Standard Neutral Chip Soap from AATCC, P.O. Box 12215, Research Triangle Park NC 27709; tel: 919/549-8141; fax: 919/549-8933; e-mail: orders@aatcc.org.

18.4 Standard Specifications for Stoddard solvent (ASTM D 235).

18.5 These procedures are adapted from the method for drycleaning described in Paragraphs 26a and 25c of "Commercial Standard for Textiles: Testing and Reporting" (CS59-44), published by the National Institute for Standards and Technology.

18.6 Scheifer, H. F. and Cleveland, R. S., Wear of Carpets, J. Research N.B.S. Vol. 12. No. 2, 155 (1934), Research Paper RP640.

18.7 Available from Publications Office, ACGIH, Kemper Woods Center, 1330 Kemper Meadow Dr., Cincinnati OH 45240; tel: 513/742-2020.

Table I—Evaluation of Compounds for Resistance to Insect Pests

Class	No Change	Appreciable Change
1. Based on Tests Prescribed in Sections 7-12 (numbers indicate repeats of the tests)		
1	...	1
2	1	2
3	2, 3, or 4	5
5	5	...
2. Based on Light Test Prescribed in Section 13		
1	...	10 h
2	10 h	20 h
3	20 h	40 h
5	40 h	...
3. Based on Change After Abrasion Test Prescribed in Section 14		
1	...	2000 revs
5	2000 revs	...