Australian Standard®

Methods of test for textiles

Method 2.26: Physical tests—Determination of flat abrasion resistance of textile fabrics (flexing and abrasion method)

PREFACE

This standard was prepared by the Standards Australia Committee on Testing of Textiles under the direction of the Textile Standards Board.

In the preparation of this Standard, cognizance was taken of the following Standard:

ASTMD D 3885 *Abrasion resistance of textile fabrics (flexing and abrasion method)*

The method is based upon the development described by R.G.Stoll in *Improved multipurpose abrasion test and its application for the wear resistance of textiles*, Textile Research Journal, July 1949, p. 394.

FOREWORD

The measurement of the resistance to abrasion of textile and other materials is very complex. The resistance to abrasion is affected by many factors, such as: inherent mechanical properties of the fibres; the dimensions of the fibres; the structure of the yarns; the construction of the fabrics; and the type, kind and amount of finishing material added to the fibres, yarn or fabrics.

The resistance to abrasion is also greatly affected by the conditions of the tests, such as the nature of the abradant, variable action of the abradant over the area of the specimen abraded, the pressure between the specimens, and the dimensional changes in the specimens.

Abrasion tests are all subject to variation due to changes in the abradant during specific tests. The abradant is accordingly discarded at frequent intervals, or checked periodically against a standard. With disposable abradants, the abradant is used once only or discarded after limited use. With permanent abradants that use hardened metal or equivalent surfaces, it is assumed that the abradant will not change appreciably during a specific series of tests. Similar abradants used in different laboratories will not change at the same rate, due to differences in usage. Permanent abradants may also change due to pick up of finishing or other material from test fabrics, and accordingly are cleaned at frequent intervals. The measurement of the relative amount of abrasion may also be affected by the method of evaluation, and may be influenced by the judgement of the operator.

The resistance of textile materials to abrasion, as measured on a testing machine in the laboratory, is generally only one of several factors contributing to wear performance or durability as experienced in actual use of the material. While ‘abrasion resistance’ (often stated in terms of the number of cycles on a specified machine, using a specified technique to produce a specified degree or amount of abrasion) and ‘durability’ (defined as the ability to withstand deterioration or wearing out in use, including the effects of abrasion) are frequently related, the relationship varies with different end uses, and different factors may be necessary in any calculation of predicted durability from specific abrasion data. Laboratory tests may be reliable as an indication of relative end use performance in cases where the difference in abrasion resistance of various materials is large, but they should not be relied upon where differences in laboratory test findings are small. In general, they should not be relied upon for prediction of actual wear-life in specific end uses unless there are data showing the specific relationship between laboratory abrasion tests and actual wear in the intended end use.

These general observations apply to all types of fabrics, including woven, non-woven, and knit apparel fabrics, household fabrics, industrial fabrics, and floor coverings. It is not surprising, therefore, to find that there are many different types of abrasion testing machines, abradants, testing conditions, methods of evaluation of abrasion resistance, and interpretations of results.

All the test methods and instruments so far developed for measuring abrasion resistance may show a high degree of variability in results obtained by different operators and in different laboratories; however they represent the methods now most widely in use.

Since there is a definite need for measuring the relative resistance to abrasion, standardized test methods are desirable and useful, and may clarify the problem and lessen the confusion.

Because of the conditions mentioned above, technicians frequently fail to get good agreement between results obtained on the same type of testing instrument, both within and between laboratories, and the precision of these methods is uncertain. Accordingly this Standard is not recommended for acceptance testing in contractual agreements between purchaser and seller because of the poor between-laboratory precision of the method.

METHOD

1 SCOPE. This Standard sets out a method for the determination of the resistance to abrasion of textile fabrics using the flexing and abrasion tester. The method is applicable to woven textile fabrics. It is not applicable to floor coverings.

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

AS
1199 Sampling procedures and tables for inspection by attributes

2001 Methods of test for textiles
2001.1 Method 1: Conditioning procedures

3 DEFINITIONS. For the purpose of this Standard, the definition below applies.

Abrasion—the wearing away of any part of a material by rubbing against another surface.

4 PRINCIPLE. The resistance to abrasion of a test specimen is evaluated by subjecting it to unidirectional reciprocal rubbing over a bar having specified characteristics, under known conditions of pressure and tension.

5 REAGENTS.

5.1 Water—filtered tap water shall be used.

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

6 APPARATUS.

6.1 A flex abrasion tester† (see Figure 1). A flex abrasion tester, having the essential following parts, shall be used:

(a) *Balanced head and flex block assembly*. A balanced head and flex block assembly comprising two parallel smooth plates shall be provided. One of the plates shall make a reciprocating motion of 115 ± 15 double strokes per minute of 25 mm stroke length. The other plate shall be rigidly supported by a double-lever assembly to provide free movement in a direction perpendicular to the plane of the reciprocating plate. This plate shall be stationary during the test, and well balanced so that a vertical load can be maintained by means of dead weights. The plates shall be equipped with clamps to permit the test specimen, after it has been folded around the bar, to be aligned with its long dimension parallel to the axis of the reciprocal motion and equidistant from the edges of the plates. The clamps shall have gripping surfaces adequate to prevent slipping of the test specimen during the test.

* Teric BL8, produced by ICI Australia Ltd, is a suitable wetting agent.

† The Stoll-Quartermaster has been found suitable, and is available from Custom Scientific Instrument Inc., 13 Wing Drive, Whippany, N.J. 07981, U.S.A.

(b) *Flexing bar or blade*. A bar or blade shall be provided (see Appendix A for requirements for calibration and maintenance of this apparatus). The material specifications should indicate whether the bar or blade is to be used.

The flexing bar shall be 1.6 ± 0.4 mm by 11.2 ± 1.6 mm in cross-section. It shall be made of tool steel tipped with an edge of cemented carbide or other highly resistant material. The portions of the top, bottom and edge of the bar, that will be in contact with the test specimen, shall be finely finished by grinding and polishing, in a manner that levels off the microscopic projections without breaking the edges of the bar.

The flexing blade shall be made of well polished tool steel 0.3 ± 0.13 mm by 25.4 ± 1.6 mm in cross-section, having a radius of curvature of 0.13 ± 0.02 mm. The bar or blade shall be of such length as to properly fit the yoke (tension device) employed.

(c) *Tension device or yoke*. A tension device or yoke with a means for applying force to the folding bar or blade shall be provided: the force shall act parallel to the surface of the two plates and perpendicular to the fold of the test specimen, to produce a tension evenly distributed across the fold of the test specimen. The bar or blade shall be prevented from tilting or rotating around its principal axis by the provision of means for rigidly clamping the bar to the yoke. The bar yoke used for applying tension shall be sufficiently rigid to prevent its distortion, with consequent impairment of bar position, during handling and test specimen loading.

(d) *Yoke-positioning device*. A yoke-positioning device shall be provided to position the bar and yoke properly while loading the test specimen, in order to maintain the proper bar alignment. The positioning device shall be removed from contact with the yoke after the test specimen has been loaded and before the start of the test. Proper bar alignment is a critical factor in this test, and is regulated by the length of the cables attaching the yoke to the loading platform. The proper alignment shall be checked by abrading a strip of fabric and noting whether the bar shifts laterally to either side of normal rest position during the course of abrasion. Such shifting is indicative of improper bar alignment, and shall be adjusted by shortening or lengthening the proper cable until shifting is no longer observable. After the proper cable length has been achieved, the cables shall be clamped securely, by means of locknuts, to prevent subsequent change in length.

(e) *Machine stopping mechanism*. A machine stopping mechanism, comprising a microswitch actuated by the weight rack, shall be provided in order to stop the machine when the test specimen ruptures.

(f) *Indicator*. An indicator shall be provided for indicating the number of abrasion cycles (1 cycle = 1 double stroke).

6.2 Water bath. Where wet specimens are to be tested, a shallow water bath which completely immerses the mounted wet specimen, shall be used.

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 specimen 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 and disturbed weave.

7.3 Conditioning. Except where testing wet test specimens, the sample shall be conditioned in accordance with AS 2001.1.

7.4 Test specimens. When selecting test specimens, the following requirements shall be observed:

(a) Warp direction test specimens shall be selected so that their longitudinal dimensions are parallel to the warp yarns. No two warp test specimens shall contain the same warp yarn.