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Standard Test Method for Needle-Related Damage Due to Sewing in Woven Fabric¹

This standard is issued under the fixed designation D 1908; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method evaluates the damage caused by sewing machine needles when a specific sewn seam assembly is used for a woven fabric.

1.2 The index of needle damage as determined by this test method is significant only for the fabric and sewn seams being evaluated using this test method.

1.2.1 The index compiles the damage done by fusing, deflection, or severance of yarns in the fabric tested.

1.3 The sewn seams to be indexed should be taken from either previously sewn articles or from sewn seams prepared in accordance with a prescribed seam assembly.

1.4 The index produced by this test method can be used to determine proper needle selection for a particular fabric.

1.5 The values stated in SI units are to be regarded as standard. The values stated in inch-pound units are provided for information only.

1.6 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 123 Terminology Relating to Textiles²

D 2724 Test Methods for Bonded, Fused, and Limited Apparel Fabrics³

2.2 Federal Standard:

No. 751a Stitches, Seams and Stitchings⁴

2.3 AATCC Method:

143 Appearance of Apparel and Other Textile End Products After Repeated Home Laundering⁵

3. Terminology

3.1 Definitions:

3.1.1 *grin*, v —*in sewn seams*, to stress a seam so that the individual stitches can be seen.

3.1.2 *needle damage*, n —*in sewn fabrics*, the partial or

complete yarn severance or fiber fusing caused by a needle passing through a fabric during sewing.

3.1.3 *refurbish*, v —*as applied to textile products*, to brighten or freshen up and restore to wearability or use by cleaning such as drycleaning, laundering or steam cleaning.

3.1.4 *seam allowance*, n —*in sewn fabrics*, the distance from the edge of a fabric to the parallel stitch line furthest from that edge.

3.1.5 *seam assembly*, n —the composite structure obtained when fabric(s) are joined by means of a seam.

3.1.5.1 *Discussion*—A sewn seam assembly may be described in terms of the fabric orientation, seam direction, seam type, stitch type, seam allowance, sewing thread tex ticket number(s) and type(s), stitch density, stitch gage, and rows of stitching.

3.1.6 *seam damage*, n —*in sewn fabrics*, any change in the physical condition of one or more of the components in a seam which reduces seam efficiency.

3.1.7 *seam type*, n —*in sewn seams*, an alphanumeric designation relating to the essential characteristics of fabric positioning and rows of stitching in a specified sewn fabric seam.

3.1.7.1 *Discussion*—Seam types are described in Fed. Std. No. 751a.

3.1.8 *sewn seam*, n —*in sewn fabrics*, a juncture at which two or more planar structures such as textile fabrics, are joined by sewing, usually near the edge.

3.1.9 *stitch*, n —*in sewn seams*, the repeated unit formed by the sewing thread in the production of seams.

3.1.10 *stitch density*, n —*in sewn seams*, the number of stitches per unit length in one row of stitching in the seam.

3.1.11 *stitch gage*, n —*in sewn fabrics*, the perpendicular distance between adjacent parallel rows of stitching.

3.1.12 *stitch type*, n —*in sewn seams*, a numerical designation relating to the essential characteristics of the interlacing of sewing thread(s) in a specified stitch.

3.1.12.1 *Discussion*—Stitch types are described in Fed. Std. No. 751a.

3.1.13 For definitions of other textile terms used in this method, refer to Terminology D 123.

4. Summary of Test Method

4.1 Seams taken from manufactured items already sewn or seams prepared in accordance with a prescribed seam assembly, or an assembly agreed upon by purchaser and supplier are evaluated to determine the damage caused by sewing machine needles in the warp, filling, or bias direction.

4.1.1 This test method provides for determining a ratio, expressed as an index, of either the damaged yarns to the total number of yarns present in a seam assembly, or the damaged yarns to the total number of needle penetrations.

¹ This test method is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.54 on Consumer Product Performance.


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² Annual Book of ASTM Standards, Vols 07.01 and 07.02.

³ Annual Book of ASTM Standards, Vol 07.01.

⁴ Available from Government Printing Office, GSA, 7th & D Streets, S.W., Washington, DC 20407.

⁵ Available from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, NC 27709.

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5. Significance and Use

5.1 Needle related damage in woven fabrics which is usually manifested in mass production assembly, can be caused by a wide range of factors. These include, but are not limited to, improper needle selection or installation, deficiencies in quality control, mechanical problems or improper engineering.

5.2 Test Method D 1908 is used to determine needle-related damage due to sewing in woven fabrics and is not recommended for the acceptance testing of commercial shipments of woven fabrics since reliable data on between-laboratory precision have not yet been determined. If the method must be used to test commercial shipments for acceptance testing, comparative tests, as described in 5.2.1, are advisable.

5.2.1 In case of a dispute arising from differences in reported test results when using Test Method D 1908 for acceptance testing of commercial shipments, the purchaser and the supplier should conduct comparative tests to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of bias. As a minimum, the two parties should take a group of test specimens that are as homogeneous as possible and that are from the same lot of material of the type in question and which were manufactured at the same assembly facility. The test specimens should then be randomly assigned in equal numbers to each laboratory for testing. If a bias is found, either its cause must be found and corrected or the purchaser and the supplier must agree to interpret future test results in light of the known bias.

5.3 Fabric yarns made of both natural and synthetic fibers may be deflected or severed by the action of the sewing machine needle. When the temperature of the needle exceeds the softening or melting point of yarns made from polymeric fibers fusing can occur.

5.3.1 Severed or fused yarns can either reduce the seam breaking strength or cause objectionable appearance, or both.

5.3.2 Because this test method measures the occurrence of either yarn severance, yarn fusing or both, it can be used in selecting the needle which will minimize needle damage for any specified seam assembly.

5.4 Seams evaluated by this test method should be taken from factory assembly line production.

5.5 Proper needle selection, especially relative to point, blade, groove, land, scarf, and diameter of the needle can be determined by use of this test method. (See Figs. 1 and 2, and Table 1).

6. Apparatus

6.1 *Sewing Machine*, with necessary accessories capable of handling the test fabric and forming the required seam stitch type.

6.1.1 Proper needle selection with correct point, blade, groove, land, scarf and diameter for seam joining particular fabric selected. (See Figs. 1 and 2, and Table 1).

6.2 *Sewing Threads*, of required type, material, and tex size.

6.3 *Automatic Washing Machine*,⁶ with "normal setting" agitator speed of 1.2 ± 0.1 Hz/min (70 ± 5 cycles/min), washing time of 12 min, spin speed of 53.0 ± 0.5 rads/s (505 ± 5 r/min), final spin cycle of 4 min, and rinse temperature of $40 \pm 3^\circ\text{C}$.

6.4 *Automatic Tumble Dryer*,⁷ with controlled exhaust temperature which cycles from 60 to 71°C and a cooling period while tumbling 5 min at the end of the drying cycle.

6.5 *Drycleaning Machine*,⁸ single-unit, coin-operated type, capable of providing a complete automatic dry-to-dry cycle using perchlorethylene. It shall consist of a commercial rotating cage type, totally enclosed machine. The diameter of the rotating cage shall be not less than 600 mm (24 in.) and not more than 1080 mm (42 in.). In depth it shall be not less than 300 mm (12 in.). It shall be fitted with two to four lifters. The speed shall be such as to give a g -factor between 0.5 and 0.9 (acceleration between 5 and 9 m/s^2) for cleaning and between 35 and 120 (acceleration between 350 and 1200 m/s^2) for extraction. The machine shall be equipped with thermometers for the measurement of the solvent temperature and the air drying temperature.

NOTE 1—The g -factor is calculated using Eq 1 or Eq 2 and acceleration, a , is calculated using Eq 3:

$$g = 1.42n D/100\,000 \quad (1)$$

$$g = 5.59n d/10\,000\,000 \quad (2)$$

$$a = 0.5w d/1\,000 \quad (3)$$

where:

n = revolutions per minute (r/min),

D = cage diameter, in.,

d = cage diameter, mm, and

w = angular velocity in rads/s.

7. Sampling Manufactured Items

7.1 *Lot Sample for Manufactured Items*—As a lot sample for acceptance testing, take at random the number of shipping units of manufactured items containing previously prepared seams as directed in an applicable material specification or other agreement between the purchaser and the supplier.

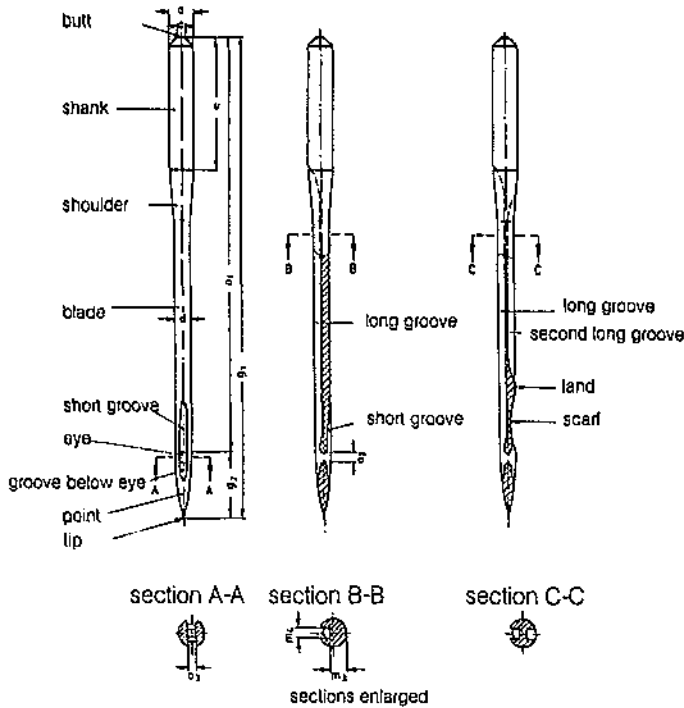
NOTE 2—An adequate specification or other agreement between the purchaser and supplier requires taking into account the variability between cartons of existing seams in previously manufactured items, and between specimens from a carton of manufactured items to produce a sampling plan with a meaningful producer's risk and consumer's risk, while at the same time providing acceptable quality and limiting quality levels.

7.2 *Laboratory Sample for Manufactured Items*—Take one previously manufactured item from each carton of a lot

⁶ A Kenmore automatic washer has been found satisfactory for this purpose. Available from Sears, Roebuck and Co. For model number and nearest Commercial Sales Department, write AATCC, P.O. Box 12215, Research Triangle Park, NC 27709. Any other washer which is known to give comparable results may be used.

⁷ A Kenmore electric dryer has been found satisfactory for this purpose. Available from Sears, Roebuck and Co. For model number and nearest Commercial Sales Department write AATCC, P.O. Box 12215, Research Triangle Park, NC 27709. Any dryer which is known to give comparable results may be used.

⁸ Sources of suitable equipment are McGraw Edison Co. Speed Queen Div., Ripon, WI 54971; Philco-Bendix Corp. Fairfield, IA 52556; American Permact, Inc., 175 Express Street, Plainview, NY 11803; and Valley Industries Productions Inc., 133 E Jericho Turnpike, Mineola, NY 11316.



Symbol	Description
a	shank diameter
d	blade diameter
c	butt diameter
e	length of shank
g ₁	length of needle
g ₂	length of point
k ₁	length of short groove
k ₂	length of groove below eye
m ₃	remaining thickness of blade
m ₄	width of long groove
o ₁	butt to eye
o ₂	length of eye
o ₃	width of eye
u ₁	remaining thickness of shank
se	eccentricity
p ₁	length of scarf

FIG. 1 Description and Measurements of Sewing Machine Needles

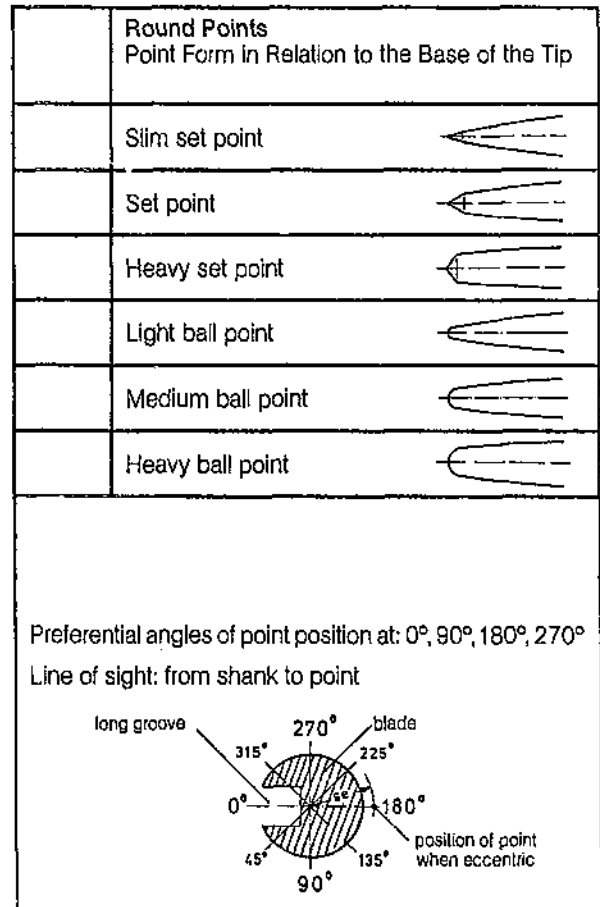
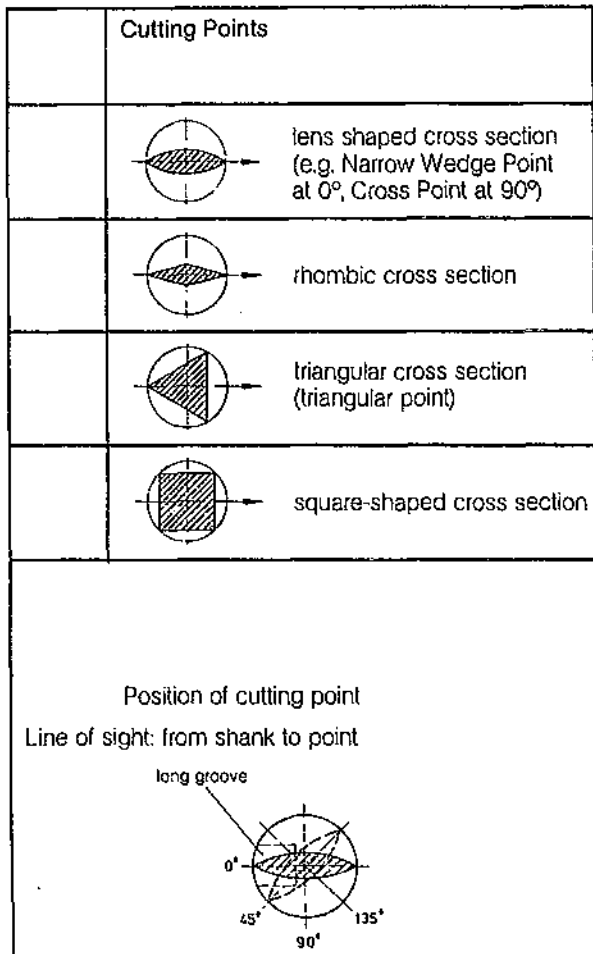


FIG. 2 Types of Needle Points