Designation: D3775 – 17 (Reapproved 2023)

Standard Test Method for End (Warp) and Pick (Filling) Count of Woven Fabrics[1]

This standard is issued under the fixed designation D3775; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This test method covers the measurement of end (warp) and pick (filling) count and is applicable to all types of woven fabrics.

NOTE 1—Historically, the term fabric count has been used to describe the end and pick count of woven fabrics. The terms end count and pick count are replacing the term fabric count, to provide clarity.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.2.1 Throughout this document, there will be some instances in which the units do not convert 1:1. This is to acknowledge that this is a global document and that different parts of the world use different units of measurement. Organizations using the metric system wil report the count per 1 cm. Organizations using the English system will report the count per 1 in.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

NOTE 2—For a current test method for the wale and course count of weft knitted fabrics, refer to Test Method D8007.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D123 Terminology Relating to Textiles

D1776 Practice for Conditioning and Testing Textiles

D4850 Terminology Relating to Fabrics and Fabric Test Methods

D7023 Terminology Relating to Home Furnishings

D8007 Test Method for Wale and Course Count of Weft Knitted Fabrics

2.2 *Other Standard:*

ANSI/ASQC Z1.4—Inspection by Attributes[3]

3. Terminology

3.1 For all terminology related to D13.59, Fabric Test Methods, General, refer to Terminology D4850

3.1.1 The following terms are relevant to this standard: count, end, end count, filling, pick, pick count, thread count.

3.2 For all terminology related to Home Furnishings, refer to Terminology D7023.

3.3 For all other terms related to textiles, refer to Terminology D123.

4. Summary of Test Method

4.1 The number of ends per unit distance and picks per unit distance are determined using suitable magnifying and counting devices or by raveling yarns from fabrics. See ANSI Z1.4.

5. Significance and Use

5.1 This test method is considered satisfactory for acceptance testing of commercial shipments because it has been used extensively in the trade for that purpose.

5.1.1 If there are differences of practical significance between reported test results for two laboratories (or more), comparative test should be performed to determine if there is a

[1] This test method is under the jurisdiction of ASTM Committee D13 on Fabric Physical Test Methods B

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer tot he standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

statistical bias between them, using competent statistical assistance. As a minimum, use the samples for such a comparative test that are as homogeneous as possible, drawn from the same lot of material as the samples that resulted in disparate results during initial testing and randomly assigned in equal numbers to each laboratory. The test results from the laboratories involved should be compared using a statistical test for unpaired data, a probability level chosen prior to the testing series. If bias is found, either its cause must be found and corrected, or future test results for that material must be adjusted in consideration of the known bias.

5.1.2 This test method is suitable for use with narrow fabrics when the count across the total width is measured in the narrow direction and extrapolated to the number of yarns per centimeter (inch).

6. Apparatus

6.1 Use any suitable device, such as pick glass, rule and pointer, microfilm reader, or projection equipment. The use of optical sensing equipment may be used as agreed upon by the purchaser and supplier.

6.2 Use a scale graduated in mm (1⁄16-in.) to measure the distance over which thread counts were taken.

7. Sampling

7.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of rolls of fabric as directed in an applicable material specification or other agreement between the purchaser and the supplier. Consider rolls of fabric to be the primary sampling units.

7.2 *Laboratory Sample*— As a laboratory sample, take a full width swatch at least 2 m (2 yd) long from each roll of fabric in the lot sample. Consider each designated place at which end counts and pick counts are made as a test specimen.

NOTE 3—For specimens not obtained as directed in Section 7, the results should not be used for acceptance testing of a lot.

8. Conditioning

8.1 Condition specimens as directed in Practice D1776.

8.2 Fabrics woven from yarns having a relatively low moisture regain in the standard atmosphere for testing textiles, which is 21 °C ± 2 °C (70 °F ± 4 °F) and 65 % ± 5 % relative humidity, and which are not significantly affected by minor variations in different atmospheric conditions, for example, nylons, acrylics, and polyesters, may be tested without preconditioning. Fabrics woven from yarns composed wholly or in part from wool, rayon, cotton, or acetate are more sensitive to atmospheric changes and must be conditioned prior to testing, except by agreement of all parties interested in the test results.

8.3 When full rolls or bolts of fabric cannot be properly conditioned in a reasonable time with available facilities, perform the test without conditioning and report the actual conditions prevailing at the time of the test. Such results may not correspond with the results obtained after testing in the standard atmosphere for testing textiles.

9. Procedure

9.1 *General:*

9.1.1 Count the number of ends and picks in five randomly spaced places diagonally across the width of the laboratory sampling unit. For specific distances to count, see 9.3.

9.1.2 Round all counts to the nearest whole yarn contained in the distance counted.

9.1.3 When two yarns are laid-in together and parallel, count each yarn separately, as a single unit, regardless of whether it is comprised of single or plied components.

9.2 *Specific Fabric Widths:*

9.2.1 For fabric widths of 100 cm (40 in.) or more, make no count closer than 15 cm (6 in.) from the selvage edge, or within 50 cm (20 in.) from the end of the roll or piece.

9.2.2 For fabric widths of less than 100 cm (40 in.) but greater than 12.5 cm (5 in.), make no count closer than one tenth of the width of the fabric from the selvage edge, or within 50 cm (20 in.) from the end of the roll or piece.

9.2.3 For narrow fabrics constructed with widths of 12.5 cm (5 in.) or less, use the full width of the fabric, but make no count within 50 cm (20 in.) from the end of the roll or piece.

9.3 *Specific Fabric Counts:*

9.3.1 For fabrics containing 10 yarns per cm (25 yarns per in.) or more, count the ends over 2.5 cm (1 in.) of width in five different, randomly selected places across the width of the laboratory sampling unit, and count the picks over a 2.5 cm (1 in.) length in five different, randomly selected places along the length of the laboratory sampling unit.

9.3.1.1 When the coefficient of variation for five counts is higher than 5 %, make five additional counts and average the results of the ten readings.

9.3.2 For fabrics containing less than 10 yarns per cm (25 yarns per in.), count the number of ends over a 7.5 cm (3 in.) width, in five randomly selected places across the width of the laboratory sampling unit, and count the number of picks over a 7.5 cm (3 in.) length in five randomly selected places along the length of the laboratory sampling unit.

9.3.2.1 When the coefficient of variation for five counts in a 7.5 cm (3 in.) width is higher than 5 %, discard those readings and make five fresh counts over a 12.5 cm (5 in.) width.

9.3.3 In fancy weaves, where one or more yarns do not appear at regular, short intervals, make count measurements over at least one full pattern repeat of each design in the weave. Count the number of ends over each design repeat in five different, randomly selected places across the width of the laboratory sampling unit, and count the number of picks over each design repeat in five different, randomly selected places along the length of the laboratory sampling unit. The repeat width and length shall be recorded to the nearest 0.1 cm (1⁄16 in.).

9.3.4 For narrow fabrics constructed with widths of 12.5 cm (5 in.) or less, count the number of ends in the full width of the fabric, and count the number of picks over a 2.5 cm (1 in.) length in five different, randomly selected places along the length of the laboratory sampling unit.

9.3.5 Record the distance (*W*) over which warp counts were taken to the nearest 0.1 cm (1⁄16 in.). Record the distance (*L*) over which filling counts were taken to the nearest 0.1 cm (1⁄16 in.).

9.4 *Count by Raveling Options*—When individual yarns cannot be readily distinguished visually for counting in a fabric, one of the two alternative options shown below may be used.

9.4.1 Ravel a piece of fabric parallel to the direction to be counted, obtain a straight edge, then ravel and count the yarns in a 2.5 cm (1 in.) strip. For example, cut a strip of fabric from each randomly selected place, approximately 3.5 cm (1.5 in.) wide, and of practical length parallel to the yarns to be counted. Then ravel each strip to give a testing width of 2.5 cm (1 in.) by removing an approximately equal number of yarns from each side, prior to counting.

9.4.2 Make a straight cut through the fabric across the yarns to be counted. Place a ruler along the cut edge and mark off a 2.5 cm (1 in.) length. Count the number of yarns protruding between the two marks. If possible, ravel a yarn or two, to ensure that only protruding yarns are being counted.

9.4.3 Record the distance (*W*) over which end counts were taken to the nearest 0.1 cm (1⁄16 in.). Record the distance (*L*) over which pick counts were taken to the nearest 0.1 cm (1⁄16 in.).

10. Calculation

10.1 For each place counted, calculate, to the nearest whole number, the number of yarns per centimeter (inch), using the following equations:

$$\text{Counts}_w/W = \text{yarns/cm (in.)} \quad (1)$$

$$\text{Counts}_L/W = \text{yarns/cm (in.)} \quad (2)$$

where:

Count_w = number of ends counted in the width direction,
W = Distance over which end count was taken, cm (in.),
Count_L = number of picks counted in the length direction, and
L = distance over which pick count was taken, cm (in.).

Examples:

$$20 \text{ ends}/0.6 \text{ cm} = 33 \text{ ends/cm} \quad (3)$$

$$100 \text{ picks}/2.5 \text{ cm} = 40 \text{ picks/cm} \quad (4)$$

Note that counts reported in yarns/cm and those reported in yarns/in. may not be exact conversions and may have different levels of accuracy due to rounding.

10.2 Calculate the average number of ends/cm (ends/in.) to the nearest individual yarn for each roll and for the lot.

10.3 Calculate the average number of picks/cm (picks/in.) to the nearest individual yarn for each roll and for the lot.

10.4 When requested, calculate the thread count of the fabric as the sum of the end and pick counts per cm (in.) to the nearest whole number for each roll and for the lot.

11. Report

11.1 State that the specimens were tested as directed in Test Method D3775. Describe the material or product sampled and the method of sampling used.

11.2 Report the following information:

11.2.1 Average number of ends and picks per cm (in.) calculated to the nearest individual yarn; when stating the count for the fabric, show the end count first followed by the pick count for each roll and for the lot. For example:

$$\text{Count} = 100 \times 40 \textit{ or } 100 \textit{ by } 40$$

NOTE 4—The result is to be read as "one hundred by forty" not as 4000.

11.2.2 Thread count for each roll and for the lot, when requested,

11.2.3 Distance over which each count was taken, and the total yarns in each place counted,

11.2.4 Atmospheric conditions under which the tests were conducted and whether the specimens were conditioned as directed in Practice D1776.

12. Precision and Bias

12.1 *Summary*—In comparing two averages of five observations when measuring the end or pick count of a woven fabric, the difference should not exceed about 0.42 ends or picks/in. in 95 out of 100 cases when all the observations were taken by the same well-trained operator using the same piece of equipment and specimens randomly drawn from the same sample of material. Larger differences are likely under all other circumstances.

12.2 *Interlaboratory Test Data*[4]—An interlaboratory test was run in 1981 in which randomly drawn specimens of four materials were tested in each of four laboratories. Two operators in each laboratory each tested two specimens of each material for both end count and pick count. The first fabric was a 65 % polyester and 35 % cotton seersucker type basket weave. The second fabric was a 65 % polyester and 35 % cotton gingham check. The third fabric was an 88 % cotton and 12 % polyester corduroy. The fourth fabric was a 100 % cotton denim. The fabrics used in this interlaboratory study ranged in counts from 50 to 130 ends/in., and from 50 picks/in. to 125 picks/in. The components of variance for end count and for pick count expressed as standard deviations were calculated to be as follows:

Counts	Single-Operator Component	Within-Laboratory Component	Between-Laboratory Component
Single Material Comparisons:			
End or Pick Counts	0.337	0.000	0.458

[4] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D13-1067.