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Standard Practice for Sampling Yarn for Testing¹

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

1. Scope

1.1 This practice describes a procedure for the division of shipments of yarn into test lots and the sampling of such lots for testing.

1.2 This practice is applicable to single, plied, or cabled yarns, and cords, made of any fiber or mixture of fibers, and supported on any form of package, including beams.

1.3 This practice also describes procedures for the sampling of yarn(s) removed from woven or knitted fabrics, however, when thus sampled, the yarns are usually not representative of entire shipments, as referred to in 1.1. Consequently, the resultant sampling can only be used to determine the characteristics of the yarn and is usually not used for acceptance testing. Moreover, it should be recognized that the characteristics of yarns from fabrics may be different than the characteristics of the same yarn(s), prior to being entered into the fabric manufacturing process.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as the standard. Within the text, the inch-pound units are shown in parentheses. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with this practice.

1.5 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[D123 Terminology Relating to Textiles](#)

¹ This practice is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.58 on Yarns and Fibers.

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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 to the standard's Document Summary page on the ASTM website.

[D1578 Test Method for Breaking Strength of Yarn in Skein Form](#)

[D1907 Test Method for Linear Density of Yarn \(Yarn Number\) by the Skein Method](#)

[D4271 Practice for Writing Statements on Sampling in Test Methods for Textiles \(Withdrawn 2009\)](#)³

[D4849 Terminology Related to Yarns and Fibers](#)

3. Terminology

3.1 For terminology related to Yarns and Fibers, see Terminology [D4849](#).

3.2 The following terms are relevant to this standard: beam, beam set, bulk sample, case, cone, end, fabric package, laboratory sample, lot, lot sample, primary sampling unit, production lot, sample, sampling unit, sample skein, specimen, and yarn package.

3.3 For definitions of all other textile terms see Terminology [D123](#).

4. Summary of Practice

4.1 Instructions are given for dividing the yarn into lots, for determining the number of cases, beams, or fabric packages to be selected from each lot as a lot sample, and for determining the number of packages, including the number of ends, representing those packages taken from the lot sample as a laboratory sample. See Practice [D4271](#).

5. Significance and Use

5.1 Assigning a value to any property of the material in a container or in a lot, consignment, or delivery involves a measurement process that includes both sampling and testing procedures. The correctness of the value assigned depends upon the variability due to testing. Even when the variability due to testing is minimized by carefully developed procedures, correct and consistent estimates of the true value of the property are possible only when the sampling procedure avoids systematic bias, minimizes variations due to sampling, and provides a laboratory sample of adequate size.

³ The last approved version of this historical standard is referenced on www.astm.org.

5.2 Practice D2258 may not give the most efficient sampling plan that might be devised in special situations but does present a general procedure that gives satisfactory precision with an economical amount of sampling and one which does not require elaborate statistical computation based on previous knowledge of the amount of variation between primary sampling units (such as cases, beams or fabric packages), between units of the laboratory sample taken from the primary sampling units of the lot sample (such as yarn packages taken from a case) and between specimens taken from units of the laboratory sample (such as lengths of yarn taken from a yarn package or a fabric swatch taken from a roll or piece). Many plans that include stratified sampling can be found in textbooks.

5.3 The smallest number of specimens required for a given variability in the average result will usually be obtained by (1) maximizing the number of shipping containers in the lot sample, (2) taking a single package end per shipping container in the laboratory sample, and (3) taking only one specimen per package. Unfortunately, this is rarely the most economical way to test a product because it normally costs most to take a shipping container as part of the lot sample, costs an intermediate amount to take a package from a shipping container as part of a laboratory sample, and costs least to take and test a specimen from a package or yarn.

5.4 To minimize the cost of sampling a lot of material, it is necessary to agree on the required variance for the reported average for a lot of material:

5.4.1 Estimate the variance due to lot samples, the variance due to laboratory samples, and the variance due to testing specimens.

5.4.2 Calculate the total variance for average test results for several combinations of the number of lot samples, the number of laboratory samples per lot sample, and the number of specimens per laboratory sample.

5.4.3 Calculate the cost of performing each of the sampling schemes considered in 5.4.2.

5.4.4 Select the sampling scheme that (1) has the required precision and (2) is most economical to perform.

6. Procedure

6.1 *Division into Lots*—Instructions on the division of product into lots is best given in the appropriate specification. In the absence of such instructions, sample and test as a separate lot any portion of a shipment or order that differs from other portions in specifications, put-up, or physical characteristics, or that is billed or designated by the supplier as a separate lot. If portions of a larger order are shipped on different dates, from plants or warehouses, or in more than one carload or truckload, treat each such separately shipped portion as a separate lot. If the cases in a shipment do not have consecutive numbers, divide the shipment into groups of cases having consecutive numbers and treat each group as a separate lot if it is separated from an adjacent group by as many as ten case numbers. Treat each beam set as a separate lot.

6.2 *Lot Sample*—As a lot sample for acceptance testing, unless otherwise agreed upon, as when specified in an applicable material specification, proceed as follows:

NOTE 1—An adequate specification or other agreement between the purchaser and the supplier requires taking into account the variability between shipping units, between packages or ends within a shipping unit, and between specimens from a single package so as to provide a sampling plan with a meaningful producer’s risk, consumer’s risk, acceptable quality level, and limiting quality level.

6.2.1 *Cases or Fabric Packages*—For the lot sample, assign each case or fabric package with consecutive numbers and take for acceptance testing, the number of cases or fabric packages specified in Table 1. Select the cases or fabric packages by a random process using the assigned numbers by either placing these numbers on small slips or chips, placing them in a container, mixing thoroughly and drawing out the number or numbers by selection, or by using a random number table or its computer equivalent.

6.2.1.1 When fabric packages, such as bolts or pieces, are contained in cases, consider the case as the sampling unit. When fabric packages, such as rolls are self-contained, consider the individual fabric package as the sampling unit.

6.2.1.2 When known, fabric packages, such as rolls, pieces, or bolts produced from one beam set may be treated in the same manner as beams.

6.2.2 *Beams*—For the lot sample, assign each beam with consecutive numbers and take for acceptance testing, one beam from the beam set. Select the beam by a random process using the assigned numbers by either placing these numbers on small slips or chips, placing them in a container, mixing thoroughly and drawing out the number by selection, or by using a random number table or its computer equivalent.

6.3 *Laboratory Sample*—For a laboratory sample for acceptance testing, unless otherwise agreed upon, as when specified in an applicable material specification, proceed as follows:

6.3.1 *Cases*—When sampling cases, take a total of ten packages from the lot sample. When there are five cases in the lot sample, select randomly two packages from each case. When there are four cases in the lot sample, select randomly two packages from each case then randomly select two of the four cases and select randomly a third package from each of the selected cases. When there are three cases in the lot sample, select randomly three packages from each case then randomly select one of the three cases and select randomly a fourth package from the selected case. When there are two cases in the lot sample, select randomly five packages from each case. When there is one case in the lot sample, select randomly ten packages from the case.

TABLE 1 Number of Cases, Beams, or Fabric Packages^{A,B}

In Lot	In Lot Sample
1	1
2 to 4	2
5 to 9	3
10 to 19	4
20 or more	5

^A For cases containing only a few packages per case, enough cases must be taken in the lot sample so there will be at least ten packages in the lot sample. (See 6.2.2.1 and 6.2.2.2.)

^B Table 1 is an empirical practice schedule found by experience to be satisfactory for the lot sample from homogeneous lots of yarn or fabric support packages, such as rolls or boards.