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Standard Practice for Writing Statements on Sampling in Test Methods for Textiles[1]

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1. Scope

1.1 This practice serves as a guide for preparing statements on sampling in methods of test for textiles. Illustrative texts are included which, with suitable modification, can be used as starting points for writing statements on sampling for any of the usual forms in which textiles are shipped.

1.2 Since the primary purpose of ASTM test methods is to evaluate some characteristic of a material being transferred from a supplier to a purchaser, the procedures for sampling in this practice are directed to the acceptance testing of commercial shipments of a product. Test methods which are not recommended for use in acceptance testing of commercial shipments or which are only intended for ranking products for developmental purposes, may require modifications in the format of the appropriate illustrative text, such as the omission of any reference to lot samples.

1.3 ASTM standards are developed by a consensus process that considers the interests of producers, consumers, and the general public. Committee D-13, therefore, recommends giving preference to methods of selecting sampling plans, such as the two-point plans in the annexes in Practice D 3777, that require conscious consideration of both the producer's risk and the consumer's risk. The consumer's risk can be determined for the sampling plans in MIL-STD-105D and MIL-STD-414 but those military standards tend to focus attention on the producer's risk rather than on both the producer's and consumer's risks.

1.4 This practice makes no attempt to develop any theoretical basis for sampling. The theoretical basis for sampling is discussed in a number of standard statistical texts **(1-5)**[2] as well as in Practice E 105. Procedures for developing simple two-point single sampling plans for acceptance testing are given in Practice D 3777.

1.5 This standard includes the following sections:

2. Referenced Documents

2.1 *ASTM Standards:*

D 123 Terminology Relating to Textiles[3]

D 584 Test Method for Wool Content of Raw Wool—Laboratory Scale[3]

D 1060 Practice for Core Sampling Raw Wool in Packages for Determination of Percentage of Clean Fiber Present[3]

D 1234 Method for Sampling and Testing Staple Length of Grease Wool[3]

D 1441 Practice for Sampling Cotton Fibers for Testing[3]

D 2258 Practice for Sampling Yarn for Testing[3]

D 2525 Practice for Sampling Wool for Moisture[3]

D 2905 Practice for Statements on Number of Specimens for Textiles[3]

D 3333 Practice for Sampling Man-Made Staple Fibers, Sliver, or Tow for Testing[4]

D 3777 Practice for Writing Specifications for Textiles[4]

E 105 Practice for Probability Sampling of Materials[5]

2.2 *Military Standards:*

MIL-STD-105D Sampling Procedures and Tables for Inspection by Attributes[6]

[1] This practice is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.93 on Statistics.

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[2] The boldface numbers in parentheses refer to the list of references at the end of this practice.

[3] *Annual Book of ASTM Standards*, Vol 07.01.

[4] *Annual Book of ASTM Standards*, Vol 07.02.

[5] *Annual Book of ASTM Standards*, Vol 14.02.

[6] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

MIL-STD-414 Sampling Procedures and Tables for Inspection by Variables and Percent Defective[6]

3. Terminology

3.1 *acceptable quality level* (*AQL* or p_1), *n—in acceptance sampling*, the maximum fraction of nonconforming items at which the process average can be considered satisfactory; the process average at which the risk of rejection is called the producer's risk.

3.2 *acceptance number (c), n—in acceptance sampling*, the maximum number of nonconforming items in a sample that allows the conclusion that the lot conforms to the specification.

3.3 *acceptance sampling, n*—sampling done to provide specimens for acceptance testing.

3.4 *acceptance testing, n*—testing performed to decide if a material meets acceptance criteria.

3.5 *attribute, n*—a specific characteristic of a thing. (See *attribute data*.)

3.6 *attribute data, n*—observed values or determinations which indicate the presence or absence of specific characteristics. (See also *variate*.)

3.6.1 *Discussion*—The alternate conditions reported for an attribute are frequently described by such pairs of terms as "success" and "failure", "good" and" bad", "pass" and "fail", "go" and "no-go", and "acceptable" and "unacceptable". A discrete variate is the result of the reduction of two or more attribute data to a count of the number of successes or the number of failures or both.

3.7 *bulk sample, n—in the sampling of bulk material*, one or more portions which (*1*) are taken from material that does not consist of separately identifiable units and (*2*) can be identified after sampling as separate or composited units. (Compare *discrete sample*.)

3.7.1 *Discussion*—Since bales of staple are separately identifiable units, sampling a shipment by taking specific bales from the shipment is an example of discrete sampling. Since the fiber within a bale is not composed of separately identifiable units, sampling fiber from a bale is an example of the sampling of a bulk material.

3.8 *characteristic, n*—a property of items in a sample or population which, when measured, counted, or otherwise observed, helps to distinguish between the items.

3.9 *consumer's risk, (β), n*—the probability of accepting a lot when the process average is at the limiting quality level or LQL.

3.10 *continuous variate, n*—a variate that is a measurement based on a scale that is assumed to be continuous.

3.11 *determination value, n*—the numerical quantity calculated by means of the test method equation from the measurement values obtained as directed in a test method. (*Syn. determination*; see also *observation*.)

3.12 *discrete sample, n*—one or more units taken from a material that consists of separately identifiable units. (Compare *bulk sample*.)

3.13 *discrete variate, n*—a variate that is a measurement based on a scale that has a limited or finite number of steps; such as a count, a rating scale, or a ratio of successes to total observations.

3.14 *laboratory sample, n*—a portion of material taken to represent the lot sample, or the original material, and used in the laboratory as a source of test specimens.

3.15 *laboratory sampling unit, n*—a portion of material taken to represent one of the lot sampling units or the original material and used in the laboratory as a source of test specimens.

3.16 *limiting quality level* (*LQL* or p_2), *n—in acceptance sampling*, the fraction of nonconforming items at which the process average can be considered barely tolerable; the process average at which the risk of acceptance is called the consumer's risk.

3.17 *lot, n—in acceptance testing*, that part of a consignment or shipment consisting of material from one production lot.

3.18 *lot sample, n*—one or more shipping units taken at random to represent an acceptance sampling lot and used as a source of laboratory samples.

3.19 *lot sampling unit, n*—a portion of material taken to represent a lot and used as a source of laboratory sampling units or test specimens or both. (*Syn. primary sampling unit.*)

3.20 *nonconforming item, n*—an item that does not satisfy the requirements of the applicable specification.

3.21 *nonconformity, n*—an occurrence of failing to satisfy the requirements of the applicable specification; a condition that results in a nonconforming item.

3.22 *observation, n*—(*1*) the process of determining the presence or absence of attributes or making measurements of a variable, (*2*) a result of the process of determining the presence or absence of an attribute or making a measurement of a variable. (Compare *measurement value*, *determination value*, and *test result*.)

3.23 *parameter, n—in statistics*, an independent variable that describes a characteristic of a population or mathematical model.

3.24 *primary sampling unit, n*—the sampling unit containing all of the sources of variability which should be considered in acceptance testing; the sampling unit taken in first stage of selection in any procedure for sampling a lot or shipment.

3.24.1 *Discussion*—For textiles, the primary sampling units are generally taken as the shipping units making up a lot; such as bales of fiber, cases of yarn, rolls of fabric, or cartons of garments or other finished products. Adequate sampling for acceptance testing requires taking into account not only the variability between primary sampling units but also the variability between subunits within primary sampling units and between specimens from a single subunit in a primary sampling unit.

3.25 *process average, n—for the items produced*, the true and unknown level of (*1*) the fraction of nonconforming items or (*2*) a characteristic of the items as determined by a specific test method.

3.26 *producer's risk (α), n*—the probability of rejecting a lot when the process average is at the acceptable quality level or AQL.

3.27 *production lot, n*—that part of one manufacturer's production made from the same nominal raw material under essentially the same conditions and designed to meet the same specifications.

3.28 *random sampling, n*—the process of selecting units for a sample of size *n* in such a manner that all combinations of *n* units under consideration have an equal or ascertainable chance of being selected as the sample. (*Syn.* simple random sampling and sampling at random.)

3.28.1 *Discussion*—See standard texts on statistics and quality control for the use of random numbers to achieve proper randomization. In addition to random number tables, some computer generated numbers are acceptable. Equal probabilities are not necessary for proper random sampling so long as the probability of selection is ascertainable.

3.29 *rejection number, n—in acceptance sampling*, the minimum number of nonconforming items in a sample that requires the conclusion that the lot does not conform to specification.

3.30 *sample, n*—(*1*) a portion of material which is taken for testing or for record purposes. (See also *lot sample*; *laboratory sample*; *and specimen*.) (*2*) a group of specimens used, or of observations made, which provide information that can be used for making statistical inferences about the population(s) from which the specimens are drawn.

3.31 *sampling unit, n*—an identifiable, discrete unit or subunit of material that could be taken as part of a sample.

3.31.1 *Discussion*—Since there are two or more stages in most sampling schemes, the sampling units in each stage must be clearly identified to avoid confusion. The number of stages in sampling schemes is not limited, but may be as few or as many as required by the nature of the material being sampled. The illustrative texts in this practice frequently identify three stages of sampling: (*1*) taking primary sampling units from a lot of material as a lot sample, (*2*) taking laboratory samples from each of the primary sampling units in the lot sample, and (*3*) taking test specimens from each of the units in the laboratory sample. (See also *primary sampling unit; laboratory sample*; and *specimen*.)

3.32 *specimen, n*—a specific portion of a material or laboratory sample upon which a test is performed or which is taken for that purpose. (*Syn.* test specimen.)

3.33 *state of statistical control, n*—a condition in which a process, including a measurement process, is subject only to random variation.

3.34 *systematic sampling, n*—the process of selecting units in a sample in accordance with a specific order or location in time or space or both.

3.35 *test result, n*—a value obtained by applying a given test method, expressed either as a single observation or a specified combination of a number of observations.

3.35.1 *Discussion*—A test result is the value reported for a single subunit of the laboratory sample. For different test methods a test result might be (*1*) the value of a single observation (such as a measurement of a property, a count of defects, or a grading or rating) on a single specimen from a single subunit of the laboratory sample; (*2*) the average or some other function of the values for single observations on each of *n* specimens from a single subunit of the laboratory sample; or (*3*) a ratio of successes to total observations for *n* specimens from a single subunit of the laboratory sample.

3.36 *variable, n*—a quantity to which any of the values in a given set may be assigned. (See *parameter* and *variate*.)

3.36.1 *Discussion*—The term "variable" is sometimes used loosely as a synonym for "variate".

3.37 *variate, n*—a measured value that includes a random error of measurement, a variable with which a probability distribution is associated. (See also *variable* and *attribute data*.)

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

4. Uses and Significance

4.1 This practice provides advice on the preparation of statements on sampling in test methods for textiles. It should be used whenever a new test method is written or when an existing test method needs a revised statement on sampling.

4.2 The objective of sampling may vary with the purpose for which the test method is used. The objective of sampling for acceptance testing is to obtain material which will estimate without bias a property of the lot being evaluated and which allows making a decision on whether to accept or reject a lot with reasonable producer's and consumer's risks when the acceptable quality level and the limiting quality level are at realistic levels.

4.3 There are normally many ways to estimate the property of interest to a specified degree of precision. The most economical way to do so will depend on the relative size of the sources of variability associated with sampling and the relative cost of sampling the primary sampling units, subunits from within a primary sampling unit, and specimens from within a subunit of a primary sampling unit.

4.3.1 The sources of variability associated with the test method that are estimated by an interlaboratory testing program may be useful in writing statements on the precision of the test method but may not be useful in planning a sampling program. For planning effective sampling procedures, it is necessary to know the sources of variability associated with sampling material of the type that is to be submitted for testing. Estimating such sources of variability normally is done by a nested analysis of variance within the laboratory of the purchaser or supplier or both **(2).**

4.4 When a test method is used in acceptance sampling, the information in the statement of sampling in the test method itself should be supplemented by more specific instructions either in a material specification or in an agreement between the purchaser and the supplier. See Practice D 3777.

4.5 Annex A1 gives an explanation and a schematic diagram of the nomenclature used in sampling and testing procedures.

5. General Considerations

5.1 *Attributes vs. Variates*—Avoid any tendency to require the use of attribute data when the use of variates may be a better choice. If there is a choice, use economics as the basis of a decision on whether the result of a test is to be reported as attribute data or as a variate. To achieve comparable powers of discrimination, decisions can usually be based on a smaller sample size when measuring a variate rather than observing an attribute. Generally, however, it costs more to measure a variate than to observe an attribute. Attribute data should be used only if the total cost of collecting and using the larger

number of attribute data is less than the cost of collecting and using the smaller number of variate data.

5.2 *Random Sampling*—When practical, the section on sampling should require that the sampling units be drawn randomly to enhance the probability of getting an unbiased sample. Random sampling is usually practical when taking the primary sampling units which will constitute the lot sample. For primary sampling units that contain discrete subunits such as garments or packages of yarn, it is practical and advisable to draw individual subunits randomly from within the primary sampling units of the lot sample to form the laboratory sample.

5.3 *Systematic Sampling*—At times random sampling may be impractical for economic or other reasons. When sampling carpet for example, it would not be realistic to spoil a roll of carpet by taking a one yard full-width swatch as a laboratory sample from any place other than the end of a roll. Instead, the swatch should be taken from near the end of the roll after taking precautions that the swatch is far enough from the end of the roll to be acceptable as typical of the roll. The cutting of fabric into rolls is a rather arbitrary operation that may be regarded as random with respect to the manufacturing of the yarns from which the fabrics are made. To a lesser extent, the cutting of fabric into rolls is essentially independent of the characteristics of the equipment on which the fabric is made. Such generalizations are usually, but not always, true about many other forms of textiles such as packages of yarn.

5.3.1 The location of the test specimens in or on the units of the laboratory sample may need to be systematic to utilize information about known sources of variability. For example, it is sometimes advisable to require that woven fabric specimens be spaced along a diagonal line on each swatch in the laboratory sample so each specimen will contain different warp ends and filling picks. If it is thought advisable, the task group may include a diagram showing the location of the specimens in or on each unit of the laboratory sample.

6. General Format of Sampling Statements

6.1 *Independent Test Methods*—Most ASTM test methods are printed separately and are not an integral part of a specific ASTM specification. For such test methods, the sampling instructions should have the following format.

6.1.1 *Sampling Instructions in Specification(s)*—Test methods that are not an integral part of a specific ASTM specification may be referenced in a number of such specifications involving different end uses for the material being tested. Since the requirements for fitness for use may vary from one end use to another, the sampling instructions in the different specifications may well vary. Within each specification in which the test method is referenced, the following sampling information should be included as directed in Practice D 3777: (*1*) a description of an acceptance testing lot; (*2*) the basis for obtaining the required number of primary sampling units in the lot sample; and (*3*) if the test method does not specify a fixed number of subunits in the laboratory sample from each primary sampling unit in the lot sample, the basis for determining the required number of subunits in the laboratory sample from each primary sampling unit in the lot sample.

6.1.2 *Lot Sample*—In the test method, this paragraph should identify the primary sampling units and state that for acceptance testing, the number of primary sampling units to be randomly drawn in the lot sample will be as directed in an applicable material specification or other agreement between the purchaser and the supplier. When appropriate, the paragraph may add that the two parties may agree to use an existing ASTM practice on sampling or to conform to governmental regulations on sampling or both. A reference to governmental regulations should be considered when safety may be involved. If the primary sampling units will serve as the laboratory sample or as both the laboratory sample and test specimens, this paragraph should say so and the appropriate later paragraph(s) should be omitted.

6.1.3 *Note on Sampling Plans*—At this point in the test method, a note is recommended outlining the factors that should be considered if the purchaser and the supplier prepare a sampling plan of their own rather than using an ASTM specification.

6.1.4 *Laboratory Sample*—In the test method, this paragraph should state (*1*) whether the laboratory sample is to consist of discrete units or portions of bulk materials; (*2*) whether sampling is to be random or systematic, and if systematic, how subunits are to be drawn or in what ASTM practice on sampling a specific material the directions can be found; and (*3*) either that a specified number of subunits is to be taken from each primary sampling unit in the lot sample or that the number of subunits per primary sampling unit in the lot sample will be based on an applicable material specification or other agreement between the purchaser and the supplier. It is good practice to take the same number of subunits from each primary sampling unit in the lot sample. If the sampling instructions could result in unequal numbers of subunits per primary sampling unit, the paragraph should give instructions to assign randomly the primary sampling units in the lot sample from which each number of subunits is to be taken. If the subunits in the laboratory sample will serve as test specimens, the paragraph should say so and the section on test specimens should be omitted.

6.1.5 *Test Specimens*—In the test method, this paragraph should state (*1*) how many test specimens are to be tested from each subunit of the laboratory sample; (*2*) whether the specimens are to be located randomly or systematically, and if systematically, exactly how they are to be located within a subunit of the laboratory sample; (*3*) the dimensions of the test specimens, with tolerances if appropriate; and (*4*) handling precautions to ensure that the property of interest is not changed by handling or exposure to the environment. If the number of specimens per subunit of the laboratory sample is to be calculated, say so. Base the instructions for calculating the number of specimens per subunit of the laboratory sample on Practice D 2905, and give the instructions in a new section with a one-part number and the title “Number of Specimens” which immediately follows the section on sampling. The number of specimens per subunit of the laboratory sample should be the same for all such subunits. The paragraph should inform the user how to obtain the specimens, but instructions on preparing the specimens for testing should be part of the test procedure and instructions for combining the results from all the specimens from a single subunit of the laboratory sample into a test

result should be part of the section on calculations.

6.2 *Test Methods Included in Specifications*—Some ASTM test methods are written for use in a specific ASTM specification and are printed as an integral part of that specification. In this case, the test method and the specification are a single document and all information about sampling should be in that document. There can be no other "applicable material specification". It is not correct to speak of "or other agreement between the purchaser and the supplier" since such an agreement would not be part of the specification of which the test method is a part, even though such agreements are still possible. The sampling instructions should have the following format.

6.2.1 *Sampling Instructions in Specification*—The information specified in 6.1.1 should be provided in another section of the specification as directed in Practice D 3777.

6.2.2 *Lot Sample*—Within the specification document, the test method should (*1*) state that for acceptance testing, a lot sample will be taken as directed in the sections specified in 6.2.1 above and (*2*) identify the primary sampling units. Since a recommended sampling plan should exist elsewhere in the specification document, there is no use for a note such as that described in 6.1.3.

6.2.3 *Laboratory Sample*—Within the specification document, the test method should comply with 6.1.4 if the number of subunits to be taken from each primary sampling unit in the lot sample is to be specified at this point. If not, the section should state where, within the specification document, the number of subunits in the laboratory sample from each primary sampling unit in the lot sample is given.

6.2.4 *Test Specimens*—Within the specification document, the test method should include a section on test specimens that complies with 6.1.5.

SAMPLING FIBERS (ATTRIBUTES)

7. Sampling Fibers to Observe Attributes

7.1 *Reference Standards*—Although they do not specifically refer to sampling materials for properties to be evaluated as attributes, a number of individual standards give specialized instructions for sampling specific fibers. See 8.1.

7.2 *Independent Test Methods*—The illustrative text in 20.1 through 20.3 shows a sampling procedure for use in a test method that is not an integral part of an ASTM specification. The method evaluates fiber whiteness as an attribute by comparing tufts of staple to physical standards and determining if the specimens are as white as physical standards. Before writing a section on sampling based on this illustrative text, review 6.1-6.1.5.

NOTE 1—In illustrative texts, the numbers of sections and notes are for illustrative purposes and are not intended to conform to the numbers in other parts of this practice. In correspondence, illustrative texts are best referenced by such phrases as "the illustrative text Section 20 that follows 7.2 of Practice D 4271".

20. Sampling

20.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of bales of fiber directed in an applicable material specification or other agreement between the purchaser and the supplier, such as an agreement to use Practice D 3333. Consider bales of fiber as the primary sampling units.

NOTE 2—An adequate specification or other agreement between the purchaser and the supplier requires taking into account the variability between bales of fiber and between systematic samples from a single bale to provide a sampling plan with a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

20.2 *Laboratory Sample*—As a laboratory sample for acceptance testing, take from each bale in the lot sample the number of systematic sampling units directed in an applicable material specification or other agreement between the purchaser and the supplier. Except for the number of systematic samples, take them as directed in Practice D 3333.

20.3 *Test Specimens*—From each unit in the laboratory sample, prepare one small batt or hand sliver having a mass of 5 g (75 grains) by pulling tufts or pinches from the laboratory sample with a drafting motion of the fingers, laying successive tufts parallel to each other and compressing the assemblage gently to form a batt.

7.3 *Test Methods Included in Specifications*—When a test method like that in 7.2 is an integral part of an ASTM specification, the specification itself is the only agreement between the purchaser and the supplier that can apply to the test method. Under these circumstances, the specification should contain specific sampling instructions as directed in 6.1.1 and the illustrative text following 7.2 should be modified as directed in 6.2-6.2.4.

SAMPLING FIBERS (VARIATES)

8. Sampling Fibers to Make Measurements

8.1 *Reference Standards*—A number of individual ASTM standards give specialized instructions for sampling specific fibers. Practice D 1441 and Practice D 3333 respectively discuss sampling cotton and man-made fibers in bales. The sampling of fibers in yarns is covered by Pratice D 2258. Various aspects of sampling wool are discussed in Test Method D 584, Practice D 1060, Method D 1234, and Practice D 2525.

8.2 *Independent Test Methods*—The illustrative text in 25.1 through 25.3 (Note 1) shows the sampling instructions in a test method that is not an integral part of an ASTM specification. The method evaluates man-made fibers for a property such as breaking strength of single fibers when the fibers may be shipped in several forms. Before writing a section on sampling based on this illustrative text, review 6.1-6.1.5.

25. Sampling

25.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of shipping containers directed in an applicable material specification or other agreement between the purchaser and the supplier, such as an agreement to use Practice D 3333 for bales of staple fiber and containers of tow, sliver, or top or to use Practice D 2258 for cases of beams of yarn. Consider shipping containers to be the primary sampling units.

NOTE 3—An adequate specification or other agreement between the purchaser and the supplier requires taking into account the variability between shipping containers, between laboratory samples within a shipping container, and between specimens within a laboratory sample to provide a sampling plan with a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

25.2 *Laboratory Sample*—As a laboratory sample for acceptance testing, proceed as follows:

25.2.1 For staple fiber, systematically take five laboratory sample units from each bale in the lot sample as directed in Practice D 3333.

25.2.2 For tow, sliver, or top, take from each shipping container in the lot sample the first metre (yard) of material from the lead end of the strand that has a clean, uniform appearance. If the shipping containers in the lot sample contain multiple packages, take a laboratory sample unit from only one package drawn randomly from each container.

25.2.3 For yarn on packages, take one package at random from each case in the lot sample, remove enough traverses of yarn to obtain a surface free of visible damage or soil, and take about a 1 m (1 yd) length as the laboratory sample from that case.

25.2.4 For yarn on beams, sample as agreed upon by the purchaser and the supplier.

25.3 *Test Specimens*—As directed in Section 26, determine the number of specimens to be tested for each subunit of the laboratory sample. Individual fibers serve as test specimens. Remove twist from twisted strands before taking specimens. Using tweezers, gently remove the required number of specimens from each unit of the laboratory sample and lay them on a short pile or plush covered surface for storage until they are tested.

(*Editorial Comment*—This illustrative text must be followed by "26. Number of Specimens" written as directed in Practice D 2906.)

8.3 *Test Methods Included in Specifications*—When a test method like that in 8.2 is an integral part of an ASTM specification, the specification itself is the only agreement between the purchaser and the supplier that can apply to the test method. Under these circumstances the specification should contain specific sampling instructions as directed in 6.1.1 and the illustrative text following 8.2 should be modified as directed in 6.2-6.2.4.

SAMPLING TEXTILE STRANDS (ATTRIBUTES)

9. Sampling Textile Strands to Observe Attributes

9.1 *Reference Standards*—Although Practice D 2258 does not refer specifically to sampling properties evaluated as attributes, the practice refers to the sampling of yarns and can be used as the basis of sampling other textile strands.

9.2 *Independent Test Methods*—The illustrative text in 30.1 through 30.2 (Note 1) shows the sampling instructions for a test method that is not an integral part of an ASTM specification. The method evaluates textile strands for a property that is an attribute. The text assumes that individual packages of yarn are to be visually inspected against selected criteria, rated "pass" or "fail", and the lot accepted or rejected on the basis of the number of packages that fail out of a sample of specified size. Before writing a section on sampling based on this illustrative text, review 6.1-6.1.5.

30. Sampling

30.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of cartons directed in an applicable material specification or other agreement between the purchaser and the supplier, such as an agreement to use Practice D 2258. Consider cartons to be the primary sampling units.

NOTE 4—An adequate specification or other agreement between the purchaser and the supplier requires taking into account the variability between cartons and between packages within a carton to provide a sampling plan with a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

30.2 *Laboratory Sample*—As a laboratory sample for acceptance testing, take at random the number of packages from each carton in the lot sample directed in an applicable material specification or other agreement between the purchaser and the supplier, such as an agreement to use Practice D 2258. If differing numbers of packages are to be taken from the cartons in the lost sample, determine at random which cartons are to have each number of packages removed. Each package in the laboratory sample will serve as a test specimen.

9.3 *Test Methods Included in Specifications*—When a test method like that in 9.2 is an integral part of an ASTM specification, the specification itself is the only agreement between the purchaser and the supplier that can apply to the test method. Under these circumstances the specification should contain specific sampling instructions as directed in 6.1.1 and the illustrative text following 9.2 should be modified as directed in 6.2-6.2.4.

SAMPLING STRANDS (VARIATES)

10. Sampling Strands to Make Measurements

10.1 *Reference Standards*—Practice D 2258 discusses the sampling of yarns. Other textile strands may be sampled in the same general way.

10.2 *Independent Test Methods*—The illustrative text in 35.1 through 35.3 (Note 1) shows sampling instructions for use in a test method that is not an integral part of an ASTM specification. The method evaluates a yarn for a property such as breaking strength. If the test method were also applicable to other textile strands, it might be necessary to give more detailed instructions somewhat along the lines of the illustrative text in Section 8. Before writing a section on sampling based on this illustrative text, review 6.1-6.1.5.

35. Sampling

35.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of shipping cases directed in an applicable material specification or other agreement between the purchaser and the supplier, such as an agreement to use Practice D 2258. Consider shipping cases to be the primary sampling units.

NOTE 5—An adequate specification or other agreement between the purchaser and the supplier requires taking into account the variability between shipping cases, between packages within a shipping case, and between specimens from a single package to provide a sampling plan with a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

35.2 *Laboratory Sample*—As a laboratory sample for acceptance testing, take at random from each shipping case in the lot sample the number of packages directed in an applicable material specification or other agreement between the purchaser and supplier, such as an agreement to use Practice D 2258. Preferably the same number of packages should be

taken from each shipping case in the lot sample. If differing numbers of packages are to be taken from shipping cases in the lot sample, determine at random which shipping cases are to have each number of packages drawn.

35.3 *Test Specimens*—From each package in the laboratory sample, take the number of specimens directed in Section 36. Inspect each package after withdrawing at least five layers of yarn from the outside of the package. If there is visual evidence of damage, continue to withdraw units of five layers and reinspect. Take specimens of about 1 m (1 yd) long. Discard specimen lengths that are damaged. Discard at least 2 m (2 yd) of strand between specimens from a single package.

(*Editorial Comment*—(*1*) This text requires that the next section be "36. Number of Specimens" and that Section 36 be written as directed in Practice D 2905. (*2*) For some properties, the task group may decide to specify a fixed number of specimens per package as permitted in Practice D 2905.)

10.3 *Test Methods Included in Specifications*—When a test method like that in 10.2 is an integral part of an ASTM specification, the specification itself is the only agreement between the purchaser and the supplier that can apply to the test method. Under these circumstances the specification should contain specific sampling instructions as directed in 6.1.1 and the illustrative text following 10.2 should be modified as directed in 6.2-6.2.4.

SAMPLING FABRICS (ATTRIBUTES)

11. Sampling Fabrics to Observe Attributes

11.1 *Reference Standards*—There are no ASTM standards that give specific instructions on the sampling of fabrics for attributes.

11.2 *Independent Test Methods*—The illustrative text in 40.1 through 40.3 (Note 1) shows sampling instructions for use in a test method that is not an integral part of an ASTM specification for a property such as fabric flammability that is treated as an attribute and is subject to governmental regulation. Before writing a section on sampling based on this illustrative text, review 6.1-6.1.5.

40. Sampling

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

NOTE 6—An adequate specification or other agreement between the purchaser and the supplier requires taking into account the variability between rolls of fabric and between specimens from a swatch from a roll of fabric to provide a sampling plan with a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

40.2 *Laboratory Sample*—As a laboratory sample for acceptance testing, take a full-width swatch 1 m (1 yd) long from the outside of each roll of fabric in the lot sample, after first discarding all fabric from the outside of the rolls that contains creases, fold marks, delamination, or disturbed weave.

40.3 *Test Specimens*—Cut eight test specimens from each swatch in the laboratory sample with each specimen 230± 3 mm (9.0 ± 0.1 in.) square and with one side of each specimen parallel to the warp ends of the swatch.

11.3 *Test Methods Included in Specifications*—When a test method like that in 11.2 is an integral part of an ASTM specification, the specification itself is the only agreement between the purchaser and the supplier that can apply to the test method. Under these circumstances, the specification should contain specific sampling instructions as directed in 6.1.1 and the illustrative text following 11.2 should be modified as directed in 6.2-6.2.4.

SAMPLING FABRICS (VARIATES)

12. Sampling Fabrics to Make Measurements

12.1 *Reference Standards*—There are no ASTM standards that give specific instructions on the sampling of fabrics for properties evaluated as variates.

12.2 *Independent Test Methods*—The illustrative text in 45.1 through 45.3 shows sampling instructions for a test method that is not an integral part of an ASTM specification for a property of a fabric evaluated as a variate, such as the bending moment of a fabric. Before writing a section on sampling based on this illustrative text, review 6.1-6.1.5.

45. Sampling

45.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of rolls of fabric 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.

NOTE 7—An adequate specification or other agreement between the purchaser and the supplier requires taking into account the variability between rolls of fabric and between specimens from a swatch from a roll of fabric to provide a sampling plan with a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

45.2 *Laboratory Sample*—As a laboratory sample for acceptance testing, take a full width swatch 2 m (2 yd) long from the end of each roll of fabric in the lot sample, after first discarding a minimum of 1 m (1 yd) of fabric from the very outside of the roll.

45.3 *Test Specimens*—Cut five test specimens from each swatch in the laboratory sample with each specimen being 102 by 204 ± 2 mm (4 by 8 ± 1/16 in.) in size, with the long side of each specimen parallel to the warp ends in the swatch, and with the specimens from a single swatch spaced along a diagonal line on the swatch so each specimen will contain different warp ends and filling picks.

(*Editorial Comment*—For properties such as fabric length for which a roll of fabric serves as a test specimen, an additional sentence in 45.1 might read: "Each roll of fabric in the lot sample serves as a unit in the laboratory sample and as a test specimen." With this wording, 45.2 and 45.3 should be omitted and the note altered.)

12.3 *Test Methods Included in Specifications*—When a test method like that in 12.2 is an integral part of an ASTM specification, the specification itself is the only agreement between the purchaser and the supplier that can apply to the test method. Under these circumstances, the specification should contain specific sampling instructions as directed in 6.1.1 and the illustrative text following 12.2 should be modified as directed in 6.2-6.2.4.

SAMPLING FINISHED PRODUCTS (ATTRIBUTES)

13. Sampling Finished Products to Observe Attributes

13.1 *Reference Standards*—There are no ASTM standards that give specific instructions on the sampling of finished products for properties evaluated as attributes.

13.2 *Independent Test Methods*—The illustrative text in 50.1 through 50.2 (Note 1) shows sampling instructions for use in a test method that is not an integral part of an ASTM specification. The method evaluates a property such as the visual appearance of garments treated as an attribute. Before writing a section on sampling based on this illustrative text, review 6.1-6.1.5.

50. Sampling

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

NOTE 8—An adequate specification or other agreement between the purchaser and the supplier requires taking into account the variability between shipping cartons and between garments within a carton to provide a sampling plan with a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

50.2 *Laboratory Sample*—As a laboratory sample for acceptance testing, take at random the number of garments from each shipping carton in the lot sample directed in an applicable material specification or other agreement between the purchaser and the supplier. If differing numbers of garments are to be taken from shipping cartons in the lot sample, determine at random which shipping cartons are to have each number of garments taken. Each garment in the laboratory sample will serve as a test specimen.

13.3 *Test Methods Included in Specifications*—When a test method like that in 13.2 is an integral part of an ASTM specification, the specification itself is the only agreement between the purchaser and the supplier that can apply to the test method. Under these circumstances the specification should contain specific sampling instructions as directed in 6.1.1 and the illustrative text following 13.2 should be modified as directed in 6.2-6.2.4.

SAMPLING FINISHED PRODUCTS (VARIATES)

14. Sampling Finished Products to Make Measurements

14.1 *Reference Standards*—There are no ASTM standards that give specific instructions on the sampling of finished products for properties evaluated as variates.

14.2 *Independent Test Methods*—The illustrative text in 55.1 through 55.3 shows sampling instructions for use in a test method that is not an integral part of an ASTM specification. The method evaluates a property of a garment such as seam strength treated as a variate. Before writing a section on sampling based on this illustrative text, review 6.1-6.1.5.

55. Sampling

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

NOTE 9—An adequate specification or other agreement between the purchaser and the supplier requires taking into account the variability between cartons, garments within a carton, and specimens within a garment to provide a sampling plan with a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

55.2 *Laboratory Sample*—As a laboratory sample for acceptance testing, take two garments at random from each carton in the lot sample.

55.3 *Test Specimens*—From the longest straight seam in each garment in the laboratory sample, cut a specimen 100 ± 2 mm (4.0 ± 0.1 in.) wide parallel to the seam and with the seam centered in the specimen. Cut the specimen at least 150 mm (6 in.) long. If shorter specimens are tested, include that fact in the report of the test results.

14.3 *Test Methods Included in Specifications*—When a test method like that in 14.2 is an integral part of an ASTM specification, the specification itself is the only agreement between the purchaser and the supplier that can apply to the test method. Under these circumstances, the specification should contain specific sampling instructions as directed in 6.1.1 and the illustrative text following 14.2 should be modified as directed in 6.2-6.2.4.

15. Keywords

15.1 sampling; statistics; writing statements

ANNEX

(Mandatory Information)

A1. NOMENCLATURE FOR SAMPLING AND TESTING

A1.1 Fig. A1.1 schematically illustrates the nomenclature used (*1*) in the sampling procedure for the names of the materials taken as samples or specimens, and (*2*) in the testing procedure for the names of the information obtained by testing. Fig. A1.1 illustrates a sampling plan with three stages, but the sampling and testing nomenclature for sampling plans with fewer stages can be readily inferred from Fig. A1.1

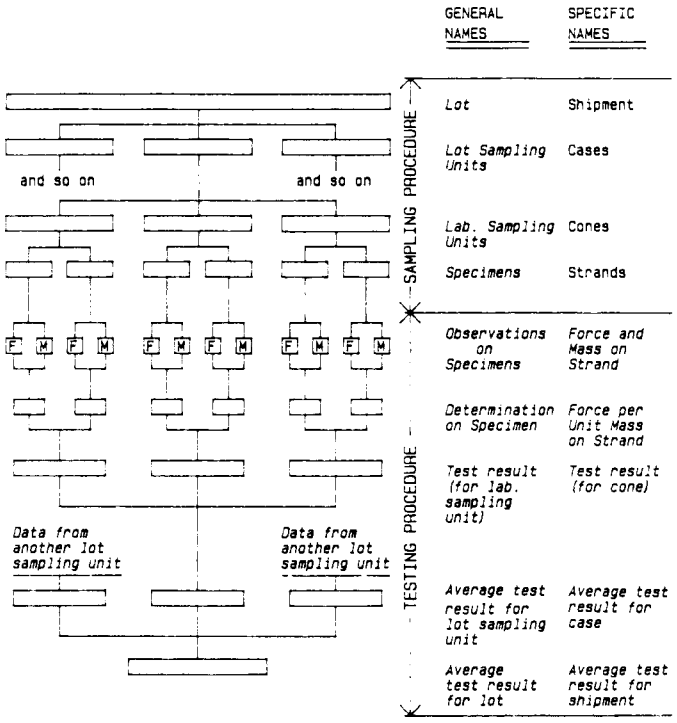

FIG. A1.1 Schematic of a Sampling and Testing Plan

A1.2 Fig. A1.1 is based on the following example:

A1.2.1 The lot to be tested is a shipment of yarn in cases. The property of interest is force per unit mass which requires two measurements or observations on each specimen: one for force and another for mass.

A1.2.2 Sampling is done by taking:

A1.2.2.1 Three lot sampling units (cases) from the lot (shipment).

A1.2.2.2 Three laboratory sampling units per lot sampling unit (cones per case).

A1.2.2.3 Two specimens per laboratory sampling unit (strands per cone).

A1.2.3 Testing is done by:

A1.2.3.1 Making one observation for force and one observation for mass on each specimen (strand).

A1.2.3.2 Using the appropriate equation, combining the observations for force and mass to get one determination for force per unit mass for each specimen (strand).

A1.2.3.3 Getting one test result per laboratory sampling unit (test result per cone) by averaging the determinations for the specimens from that laboratory sampling unit (strands from a cone).

A1.2.3.4 Getting an average test result for each lot sampling unit (average test result for each case) by averaging the test results for all the laboratory sampling units (cones) tested from that lot sampling unit (case).

A1.2.3.5 Getting one average test result for the lot (average test result for the shipment) by getting the grand average of the average test results for all the lot sampling units (average test results for cases) tested from that lot (shipment).

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