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Standard Practice for Sampling Yarn for Testing

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Foreword

This Ethiopian Standard has been prepared under the direction of Technical Committee for Textile Yarns (TC 68) and published by the Ethiopian Standards Agency (ESA).

”this standard is based on ASTM 2258, Standard Practice for Sampling Yarn for Testing pursuant to agreement with ASTM international.”

Aknowledgement is made to the ASTM international for the use of the said publication in preparing the standard.

Standard Practice for Sampling Yarn for Testing

1. Scope

1.1. This Ethiopian standard practice describes a procedure for the division of shipments of yarn in to test lots and the sampling of such lots for testing.

1.1.1. This practice can be used for lot sample testing of yarns for both pre-fabric production and post-fabric production.

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 in to the fabric manufacturing process.

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

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. Normative Reference

ES 6265 Terminology Relating to Textiles

ES ISO 6939 Test Method for Breaking Strength of Yarn in Skein Form

ES ISO 2060 Test Method for Linear Density of Yarn (Yarn Number) by the Skein Method

ES 6290 Terminology Related to Yarns and Fibers

3. Terminology

3.1. For terminology related to Yarns and Fibers see Terminology ES 6290.

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 definition of all other textile terms seesTerminology ES 6265.

4. Summary of Practice

4.1. Instructions are given for dividing the yarn in to 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.

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 up on the variability due to testing and sampling plan. 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.

5.2. Practice may not give the most efficient sampling plan that might be devised in special situations but does present ageneral procedure that gives satisfactory precision with an economical amount of sampling. Many plans that include stratify sampling can be found in text books and through the use of statistical software tools and calculators.

5.2.1. If not specifies by the purchaser, the manufacturer will define suitable production lots based on one or more of the following: supply lot, production shift/time segment, production equipment or production line, operator, designated shipment, production run, or a combination here in.

5.2.2. If not specifies by the purchaser, the manufacturer will define sampling and testing frequency based on the following: process capability or capability analysis, historical trends, level of detection rate required, confidence level requirements, known variations or special causes, or both**.** Every attempt to ensure conforming production being produced, identify potential non conforming product or proper isolation and identification will be carried out by the manufacturer.

5.2.3. Sampling count and number of specimens will be based on standard practice listed with in the document. Increase or decrease in count or frequency might be applied based on typical standard deviation, precision and confidence level, Measurement System Analysis (MSA), gauge R & R study, or gauge linearity and bias study. Higher variations would indicate reason for an increase incount, while lower variations would indicator as on for decrease in count, while lower variations would indicator as on for decrease in count.

5.2.4. When selecting asuitable sample size, several considerations needs to be made: (1) size of the lot being sampled, (2) historical trends, (3) distribution of the data, (4) level of accuracy and confidence (5) cost, and (6) practicality.

5.2.5. Minimizing and reducing measurement error will improve product testing reliability, reduce overall variation of test data accuracy, and improve confidence level of their ported values.

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 on 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 in to Lots—Instructions on the division of product in to 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 ware houses, or in more than one car load or truck load, treat each such separately shipped portion as a separate lot. If the cases in a shipment do not have consecutive numbers, divide the shipment in two 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.

NOTE1—many manufacturers have elected to test while manufacturing product (in-process testing). This method of sampling and testing provides faster information in real-time analysis of data for timely adjustments and reactions to potential shifts within a process. In either method chosen by the manufacturer (in-process or post-process),the applied practice for sampling yarn contained or its equivalency (frequency and count),may still be extracted from this standard.

6.2. Lot Sample—As a lot sample for acceptance testing, unless otherwise agreed up on, as when specifies in an applicable material specification proceed as follows:

NOTE2—An adequate specification or other agreement between the purchaser and the supplier requires taking in to 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 specifies in Table1. 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 the mina 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.

6.2.1.3. 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 the mina 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 up on, as when specifies in an applicable material specification proceed as follows:

6.3.1. Cases—when sampling cases, take a total often 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.

6.3.2. Fabric Package When sampling fabric packages, discard the outside layer of the fabric package, and then take a full widths watch, 2m [2yd.] from each selected lot sampling unit. Treat each type of yarn in the fabric, the warp and fill in yarns in woven fabrics, and the machine direction of knitted fabrics as separate sampling units. Take a total often ends from the fabrics watches. When there are fives watches in the lot sample, select randomly two ends from each watch. When there are four watches in the lot sample, select randomly two ends from each watch then randomly select two of the fours watches and select randomly a third end from each of these elected watches. When there are three watches in the lot sample, select randomly three ends from each swatch then randomly select one of the three swatches and select randomly a fourth end from the selected swatch. When there are two swatches in the lot sample, select randomly five ends from each swatch. When there is one swatch in the lot sample, select randomly ten ends from the swatch. Remove ends from the fabric swatches as directed in 6.3.4, 6.3.5, and 6.3.6, as required.

6.3.3. Beams—when sampling beams of yarn, take ten ends from the first beam in the lot sample. Randomly take the first end from among those included between 2.5 and 7.5% of the beam end

count from one beam flange Take the other in needs from positions each 10% of the beam end count from the first end toward the other beam flange When sampling yarn on beams, reel sample skeins, or reel test skeins directly from the beams using minimal tension to prevent stretching of yarns. Place the beam containing the yarn to be tested on two bearings high enough for the beam flange to clear the floor. Attach a crank arm to one end of the beam shaft. Place the reel a convenient distance from the beam to draw the yarn from the beam at less than a 20°angle. Fasten their quirked number of ends from the beams to the reel. Let one operator turn the beam slowly to unwind the yarn while a second operator turns the reel fast enough to take up the yarn as it conform the beam.

NOTE 4—In using beams after the test ends have been removed, asset of spools containing the same kind of yarn or thread as that on the beam may be placed behind the beam on a small reel to replace the ends that have been used for testing. When the ends which supply the test, skeins come up on the beam, the auxiliary spools may be broken out.

6.3.4. Sample Skeins—it is often preferable, but is not mandatory except when sampling yarn on beams, to reel sample skeins. Skeins condition more rapidly than tightly wound packages, and it is sometimes more convenient to handle the laboratory sample in skein form. From each of the yarn packages or ends selected for the laboratory sample, reels a skein containing sufficient length to provide all these specimens required. If yarn strength or yarn number is to be determined by skein methods, the test skeins specify in Test Method ES ISO 6939 and ES ISO 2060 may be reeled directly from the yarn packages or beams, and additional sample skeins may be reeled as a source of specimens for other tests. Remove the yarn from packages their by drawing over the end of bobbins, cops, cones, etc., or from the side off lange spools or beams which ever is done in normal use. When the normal means of yarn removal is not known, draw the yarn from the side of the package. Removal of yarn over-end drawing from the side results in a difference of twist of 1/π d, when red is the package diameter. When several ends are wound parallel on a single package or beam, draw each end through a separate guide and reel a skein from each selected end in the laboratory sample, drawing from the side of the package form or beam. When selecting ends directly from in process or straight from a next fusion line, obtain random ends from a cross the full width of the production line to accurately obtain affair account of the distribution.

6.3.5. Removing Yarn from Woven Fabrics—Cut the fabric parallel to the direction (warp or fill in yarns) to be tested. Ravel and discard the warp (or filling yarn sun sill full length yarn scan be removed from the fabric swatch.

NOTE5—if the fabric is tightly woven, it may be necessary to cut the fringe frequently to allow the yarns to be raveled from the fabric without stretching.

6.3.6. Removing Yarn from Weft Knit Fabrics—cut the fabric along a course line. Clean the raveling edge to obtain a free pulling yarn at least 0.2m [8in.] longer than the specimen length required for the property of interest. For double knit fabric, randomly take five ends from the short feed length courses and five ends from the long feed length courses to obtain the required ten ends.

Treat dial and cylinder yarns as the same unless there is reason to think that they are different, such as different colors.

6.3.7. Removing Yarn from Warp Knit Fabrics—Clamp one side of the fabric, face up, to an edge of a pile board. Stretch the fabric across the board to puts light tension on the loops and clamp it to the opposite side of the board. Place clamps near the raveling end of the fabric (closed wale loop). Randomly take ends from the wale direction consisting of an appropriate number of ends from each bar throughout the lot sample and at least 0.2m [8in.] longer than the specimen length required for the property of interest. When known, treat the yarns from different bars as the same unless there is reason to think that they are different. When yarns are known to be different from different bars, treat each different yarn type separately.

NOTE6—Warp knit fabrics normally use at least two bars, but may use as many as five and possibly more. With two-bark in its, the yarns may be the or different. When more than two bars reused, yarns on the different bars usually are not all the same type. Warp knit fabric scan be made with one bar, but it is unusual and rarely used.

6.3.7.1. Clean the wale loops of cut ends by inserting dissecting needle (here after, needle) below yarns which enter the loops from the space between, and at the base of, the loops (or catch these yarns with tweezers) and pull gently to free sufficient yarns to supply the required number of yarns for testing plus some spares. Maintain as compact a yarn bundle as possible, avoiding playing yarns (separated filament due to splitting yarn bundle with needle or tweezers and pulling on only part of the filament in the bundle). Continue working loops out from the back of succeeding loops, using needle or tweezers on the yarn in the spaces between loops, until sufficient yarn has been raveled to hold on to when stretched slightly. This initial starting of the raveling process is most easily accomplished using a stereomicroscope, but allow-power magnifying glass may be sufficient. The yarns may now be sand switched in tape at the end to keep them together and for ease of handling.

6.3.7.2. Continue raveling by the ladder technique of gently pulling on the yarns being removed; with slightly more stress sand angled pull on those at the edges. Gentle pressure on yarns in spaces at the sides with a needle may be necessary from time to time. Try to keep the yarns raveling such that a uniform line is maintained across the courses as the Wales are being raveled. When yarns resist raveling, check for broken or looped filament wrapped about yarn loops. These have to be worked loose (under microscope) or broken; in which case, the yarn with the broken filament can’t be used for testing. Yarn scan normally take affair amount of hand tension during the raveling process without being damaged. When too much tension has been applied, the yarn will lose memory of knit-crimp and Notre-crimp to loop form.(With greige yarns, however, moisture and heat from handling by some people may cause loss of the knit-crimp memory without yarn damage.) This phase can be done with fabric still clamped to board. Or, it can be done with fabric held on each side of the raveling area with heel of

thumb and three fingers leaving thumbs and fore finger to pull on yarns and work needle as needed. Lighted low power magnification may be helpful. Very tightly knit fabrics will ravel more slowly and may require continued use of microscope.

6.3.7.3. It is a more common practice to ravel sufficient yarn to obtain a standard length from the yarns guided by the bar which “floats over at least one needle during knitting (sometimes called “long bar” and usually, but not always, the top bar).Shorter, appropriate lengths will necessarily be taken from the other bar(s).

6.4. Test Specimens—randomly take the number of ends per unit in the laboratory sampling unit that is specified in the applicable test method.

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Ethiopian Standards Agency

Organization and Objectives

The Ethiopian Standards Agency (ESA) is the national standards body of Ethiopia established in 2010 based on regulation No. 193/2010.ESA is established due to the restructuring of Quality and Standards Authority of Ethiopia (QSAE) which was established in 1998.

ESA's objectives are:-

- ❖ Develop Ethiopian standards and establish a system that enable to check whether goods and services are in compliance with the required standards,
- ❖ Facilitat the country's technology transfer through the use of standards,
- ❖ Develop national standards for local products and services so as to make them competitive in the international market.

Ethiopian Standards

The Ethiopian Standards are developed by national technical committees which are composed of different stakeholders consisting of educational institutions, research institutes, government organizations, certification, inspection, and testing organizations, regulatory bodies, consumer association etc. The requirements and/ or recommendations contained in Ethiopian Standards are consensus based that reflects the interest of the TC representatives and also of comments received from the public and other sources. Ethiopian Standards are approved by the National Standardization Council and are kept under continuous review after publication and updated regularly to take account of latest scientific and technological changes. Orders for all Ethiopian Standards, International Standard and ASTM standards, including electronic versions, should be addressed to the Documentation and Publication Team at the Head office and Branch (Liaisons) offices. A catalogue of Ethiopian Standards is also available freely and can be accessed in from our website.

International Involvement

ESA, representing Ethiopia, is a member of the International Organization for Standardization (ISO), and Codex Alimentarius Commission (CODEX). It also maintains close working relations with the international Electro-technical Commission (IEC) and American Society for Testing and Materials (ASTM).It is a founding member of the African Regional Organization for standardization (ARSO).

More Information?
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