

T 400 sp-11

OFFICIAL STANDARD – 1926
TENTATIVE STANDARD – 1962
OFFICIAL STANDARD – 1970
REVISED – 1975
OFFICIAL TEST METHOD – 1985
REVISED – 1989
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Sampling and accepting a single lot of paper, paperboard, containerboard, or related product

1. Scope

1.1 This method describes procedures for obtaining a representative sample for testing. It should be recognized that in an ideal situation the samples selected should represent a lot of paper or paperboard, container board, or related product, including converted paper products (all hereafter referred to as “paper”). However, in some situations the sample may be as small as a single sheet of paper that has been provided to the laboratory for testing and may not represent the lot from which it is obtained.

1.1.1 Procedures are described (see Section 4) for establishing the lot of paper to be sampled.

1.1.2 The rules for selecting a representative sample for testing from this lot are described in Sections 5.1 and

5.2. Specific sampling procedures are described (5.3) for large rolls or skids.

1.1.3 Specific procedures are described (5.4) for sampling from a single roll of containerboard for basis weight and burst strength.

1.1.4 A procedure is described (5.5) for the sampling and testing of a continuous strip of paper. In evaluating the performance of a process there may be advantages in measuring the cross or along machine variation in the product. An example could be the cross machine caliper profile to determine the processing variation caused by calendar roll loadings or crown. The evaluation of machine direction strips can provide information of performance of equipment, i.e., a blocked couch roll.

1.1.5 A procedure is described (5.6) for handling a sample that may consist of a limited quantity of paper; or, may be as small as a single sheet of paper. Situations may arise where the testing laboratory has no control of the quantity of paper that is supplied for testing. An example could be the return of a piece of paper that the customer perceives to be defective and the testing laboratory has been asked to quantify its properties. It must be recognized that in these situations

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the laboratory may not have control of the sampling procedure; and, the samples supplied and tested may not represent the lot of material from which they came.

1.2 Prior to purchase, there should be agreement between buyer and seller on the size of the lot to be sampled (3.1), on details of the sampling procedure, the required physical and chemical properties, dimensional tolerances, etc., and the testing methods to be employed.

1.3 The appendices, which provide useful, statistical criteria for accepting individual lots of paper on the basis of the number of defective test units, can assist the buyer and the seller in selecting an agreed upon sampling and acceptance procedure.

2. Significance

The significance of this practice is that it provides sampling procedures for a majority of TAPPI Test Methods,

3. Definitions

3.1 *Lot*, a quantity of paper of a single type, grade, grammage, thickness, and composition, about which it is desired to make a judgment (usually as to conformance to specification) by examining or testing a small fraction called the sample.

3.2 *Sample*, a specified number of test units selected according to a prescribed procedure to represent the lot. It should also be recognized that in some situations the sample to be tested may consist of a limited quantity, or be as little as one sheet of paper.

3.3 *Sublots*, a natural subdivision of a lot consisting of discrete quantities such as carloads, pallets, rolls, etc.

3.4 *Test unit*, an area of paper sufficient to obtain a single adequate set of test results for all the properties to be measured.

3.5 *Test specimen*, a test unit, or a portion of a test unit, upon which (for a specified property) a single test determination is to be made.

3.6 *Test determination*, (1) the process of carrying out the series of operations specified in the test method whereby one or more readings (observations) are made on a test specimen and the observations combined to obtain the value of a property of the test specimen, or (2) the value obtained by the process.

3.7 *Test result*, the value obtained for one test unit of the sample by carrying out the complete protocol of the test method, the value being (as specified in the test method) either a single test determination or a specified combination of a number of test determinations.

3.8 *Test strip, cross machine strip*, continuous strip of paper that represents the width of either a roll or reel as specified by the buyer/seller. *Machine direction strip* - continuous strip of paper of a length and machine position to reflect the measurement of interest.

4. Establishing the lot

4.1 *General considerations*. Avoid grouping together different manufactures as a lot. Batches of paper are likely to differ significantly from each other in raw materials or manufacture. If the shipment is small or consists of a large number of batches, it may be uneconomical or impracticable to form lots conforming with the definition (3.1). If this is the case, divide the shipment into portions, to be designated "sublots," in which each portion conforms with the definition of lot. Before starting the sampling, obtain a complete understanding of the paper to be sampled, including the composition and size of lots and sublots, rolls, skids, etc.

4.2 *Location of sampling*.

4.2.1 *Sampling at the paper mill*. When paper is to be delivered in large rolls or skids, if agreed, have the sample taken at the paper mill and delivered to the purchaser for examination and testing. Include in the purchase agreement a definition of the number of rolls or skids constituting a lot and details of the sampling procedure to ensure compliance with the rules in selecting the sample under Section 5. Specifically indicate whether the sample was taken from mill reels or from the finished rolls or skids.

4.2.2 *Sampling in transit or warehouse*. It may be necessary to take a sample at a dock or warehouse in route between the supplier and the purchaser, especially for international shipments or in sampling for referee testing. Sampling in transit or warehouse can be quite expensive and should be avoided whenever possible, because of the problem of resealing. Arranging to inspect the shipment prior to unloading is recommended on inspection in transit. Establish the size of each lot and determine which rolls or skids will be sampled, and arrange to sample and reseal the

rolls or skids as they are loaded or unloaded to minimize additional handling. Obtain the sample in accordance with Section 5.

4.2.3 *Sampling after receipt.* This type of sampling has the obvious disadvantage of delaying evaluation of the shipment and of providing the least favorable conditions for disposal of a rejected lot. Other considerations are the same as above for sampling in transit.

4.3 *Representativeness of the sample.* The test units of the sample usually cannot be taken at random from anywhere within a large roll or skid, but must be taken near the outer layers so as not to destroy the roll or skid. If such test units are regularly taken at the paper mill (4.2.1) and a reasonably uniform quality of production is being maintained, then the test units will, in the long run, be quite representative of average production, even though not randomly selected and therefore not “representative” from a statistical viewpoint. Such test units, however, taken when the lot is in transit or warehouse (4.2.2) or after receipt (4.2.3), cannot be said with certainty to be representative of the shipment; for example, rolls shipped to a customer may have been selected because their outer layers met the customers specification, with no knowledge as to whether properties vary from the outer layers to the core of the roll. Such test units therefore may be neither random nor “representative,” but they are all that is available “to represent” the lot, which experience shows they do fairly well unless non-uniform manufacture or aging has occurred.

5. Selecting the sample

5.1 Determine the area of paper required for each test unit (see definition 3.4) and the number of test units required. Take a sample consisting of the required number of test units in accordance with a predetermined procedure, designed to eliminate deliberate selection of any particular area of paper, and, as far as practicable, conforming to the following rules:

5.1.1 *Rule 1: Take test units in proportion to the sizes of the sublots.* When a lot divides naturally into sublots consisting of discrete quantities such as carloads, pallet loads, rolls, etc., or when certain portions of the lot (3.1) differ from one another and are segregated as “sublots” (3.3), take the test units in such a way that the number of test units taken from a given subplot is proportional to the size of the subplot.

5.1.2 *Rule 2: Take the test units so that each area of paper in the lot or subplot has an equal probability of being selected.* It is recognized that difficulties of handling may not permit the taking of test units from locations scattered throughout the lot, but this should be done to the greatest practicable extent.

5.1.3 *Rule 3: Take test units indiscriminately.* Take the units without regard to their condition or quality but do not sample the outermost sheets of a roll or skid. Also do not sample from inner sheets which have been damaged by handling, abrasion, etc., unless it is evident that similarly damaged areas occur throughout the lot.

5.2 *Compliance with rules 2 and 3* may be assured by sampling according to the following plan: Divide the lot or subplot into “locations” (carloads, skids, cartons, etc.) in such a way that each location contains an equal quantity of paper. Assign a number to each location and select the locations to be sampled by drawing numbers at random from a hat or from a table of random numbers. Next assign and select the sublocations or areas within a location by the same procedure. In order to minimize handling during sampling, observe the precautions of Section 6.

5.2.1 When test units are to be taken *from small rolls, reams, bundles, cartons or shipping containers* of completed paper products, divide the lot or subplot into “locations,” etc., and proceed as described above.

5.2.2 *When test units are to be taken from large rolls or skids*, divide the lot or subplot into “locations” and “sublocations” no smaller than a roll or unopenable skid (see 5.3.2), assign and select numbers as described above, then proceed as described in 5.3 below.

NOTE 1: In ISO and British Standards, the word “reel” is used for a continuous sheet or board wound on a core and the word “roll” for the same when wound without a core. In the United States, the distinction is between the “reel” at the end of the paper machine and the “rolls” (with or without the cores) made therefrom.

5.3 Large rolls or skids.

5.3.1 When taking a test unit from a *large roll* remove all damaged layers from the outside of the roll and, in addition, discard at least three undamaged layers for sheets having a nominal grammage of less than 250 g/m² (51.2 lb/1000 ft²) or at least one undamaged layer for heavier sheets. Cut the roll across its full width and to a sufficient depth to enable the requisite number of sheets to be taken. Let the cut sheets fall to each side and remove the roll.

5.3.2 When taking a test unit from a *skid or roll that may not be opened* at the time of sampling, cut a window 300 by 450 mm (12 × 18 in.) or larger if larger test specimens are required. Cut the window with its longer side parallel to the machine direction when this is known, or if not known, cut the window at least 450 by 450 mm (18 × 18 in.) with sides parallel to those of the skid. For paper that has been sheeted simultaneously from several rolls, take a sufficient