Designation: D 5625 – 97 (Reapproved 2002)

An American National Standard

Standard Test Method for Measuring Length, Width, and Squareness of Sheeted Paper and Paper Products[1]

This standard is issued under the fixed designation D 5625; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method determines the average length, width, and squareness of sheets of paper. It may also be used to determine the difference between consecutive sheets in a lot of paper. It is especially useful with printing and writing papers which have been cut to specific sizes. The procedure is applicable to a wide range of sheet dimensions, including dimensions as small as 1.6 in. (41 mm) to as large as 60.2 in. (1530 mm). While not the subject of this test method, the equipment described may be used to determine uniformity of hole punching and various process variables related to the cutting of sheeting papers.

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

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

2. Referenced Documents

2.1 *ASTM Standards:*

D 585 Practice for Sampling and Accepting a Single Lot of Paper, Paperboard, Fiberboard, or Related Products[2]

D 685 Practice for Conditioning Paper and Paper Products for Testing[2]

D 1968 Terminology Relating to Paper and Paper Products[2]

E 122 Practice for Calculating Sample Size to Estimate, With a Specified Tolerable Error, the Average for Characteristic of a Lot or Process[3]

3. Terminology

3.1 *Definitions*—Definitions of terms in this test method may be found in Terminology D 1968. Use the *Dictionary of Paper*[4] for terms not found in Terminology D 1968.

4. Significance and Use

4.1 This test method is intended for use in measuring the two principle dimensions, length and width, of paper sheets. Accurate, reproducible sheet dimensions are required for successful passage of paper sheets through printing or copying machines.

4.2 In addition to sheet dimensions, sheet squareness measurements may also be made.

4.3 While not specifically described in this test method, the equipment and techniques described herein may be extended to other uses, such as the measurement of location and reproducibility of punched holes in sheets of paper.

4.4 This test method is intended for use in measuring conformity of sheet size as stated in standard specifications of materials, such as cut-sized papers.

5. Apparatus

5.1 The device used consists of a square or rectangular glass plate of size larger than the specimen sheet whose measurements are to be determined. The device is inscribed with dimension scales in one or both dimensions of the glass photo-engraved in 0.01-in. (0.25-mm) increments, and with one or both dimension directions beginning with values of 0.00 in. (0.00 mm) in the lower left corner of the plate as it is used by the operator. The glass plate is housed in a hardwood or other suitable rigid frame and back-illuminated by a soft uniform light source. A register bar or the stop block is attached to the frame in either the length or the width dimension from the 0.00/0.00 corner of the glass plate to assist in accurately positioning the specimen sheet for measurement.

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[1] This test method is under the jurisdiction of ASTM Committee D06 on Paper and Paper Products and is the direct responsibility of Subcommittee D06.92 on Test Methods.

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[2] *Annual Book of ASTM Standards*, Vol 15.09.

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

[4] Available from the Technical Association of the Pulp and Paper Industry, Technology Park, P.O. Box 105113, Atlanta GA 30348.

5.1.1 Accuracy of the measurement scale is of prime importance, and should be ±0.005 in. (±0.13 mm) or less. Exact construction of the rigid frame is important only to the degree that it provides support for the glass plate over the illuminant source. Light source must be uniform under the entire glass plate. Exact intensity must be such that the dimension graduations photo-imaged onto the glass plate are easily distinguished by the operator, and may require variation due to ambient lighting conditions in the work area where the device is located.

5.2 One device which has been found suitable for making the required measurements, and which complies with the requirements in 5.1, is the Quick Skan,[5] which is available in sizes to accommodate most common sheet dimensions and calibrated in either inches or millimetres. Other similar commercial devices may be available, and if they comply with the general description in 5.1, should be usable for this test method.

6. Sampling, Test Specimens, and Test Units

6.1 For acceptance sampling, follow the procedures described in Practice D 585.

6.2 When sampling for other purposes, the sampling, number of test units and test specimens depends upon the purpose of the testing. Use of Practice E 122 is recommended.

7. Conditioning

7.1 The impact of ambient humidity on sheet dimensions must not be underestimated. For example, a cross-direction expansion of 0.4 % is not unusual as a sheet goes from a relative humidity of 30 to 70 %.

7.2 The buyer and seller or other parties involved in the testing must agree, prior to the testing, to the exact conditioning that will be undertaken prior to testing.

7.3 In cases where this test method is used for routine control or problem solving, or both, as opposed to referee testing, it must be clearly understood that bringing samples from an area where the ambient relative humidity is different from that in the area of the test equipment may result in variable or non-reproducible results. On the other hand, if the desired data is the sheet dimension in a specific area of the operation, it may be most appropriate to move the measuring equipment to that particular location for the testing.

7.4 In all cases where no agreement to the contrary has been entered into by the buyer and the seller, condition the test specimens in accordance with provisions in Practice D 685.

7.5 In all cases, the exact conditioning process used must be reported in accordance with 10.1.5. Further, the exact temperature and humidity in the testing area must be measured using the equipment specified in Practice D 685.

7.6 Paper may gain or lose moisture depending upon the temperature and equilibrium moisture conditions at which it is stored or used. This gain or loss may vary as a function of paper type. This moisture variation will be accompanied by a change in paper dimensions which will frequently be greater than the measurement reproducibility in 5.1.1. It should be clear that the measurements described herein are extremely sensitive to moisture variation. In extreme cases, moisture variation may cause sheet dimension variations to exceed that permitted by various specifications. For these reasons, the buyer and the seller may choose to replace the temperature or humidity, or both, as well as the conditioning time described in Practice D 685 with ones deemed more relevant to the specific intermediate or end-use temperature and humidity conditions under which the paper will be used. In such cases, those agreed-upon conditions take precedence over Practice D 685, as noted in 7.4.

8. Procedure

8.1 *Sheet Dimensions (Length and Width)*:

8.1.1 Select a specimen (sheet) from those chosen in Section 6.

8.1.2 Place one corner of the sheet at the 0.00 corner of the glass plate and position the two edges defining that corner exactly against the length and width register bars.

8.1.3 Determine to the nearest 0.01 in. (0.25 mm), the reading where the edge of the specimen (sheet) crosses the dimension scale in each dimension (length and width).

8.2 *Sheet Squareness*:

8.2.1 Select a specimen (sheet) from those chosen in Section 6.

8.2.2 Place the short dimension of the sheet against the bottom register bar with the long dimension extending up the side of the device on the glass plate about 0.5 in. (about 13 mm) from the register bar. Slowly and gently slide the specimen (sheet) toward the side register bar until the specimen just contacts the side register bar while the short dimension remains against the bottom register bar. If the entire long dimension of the specimen (sheet) appears to contact the register bar, the sheet is square. If the entire long dimension does not contact the register bar, one end of the specimen (sheet) will contact the bar and the other will not.

8.2.3 Using the device scale, determine the distance of the end of the specimen (sheet) which does not contact the register bar from the register bar itself.

8.2.4 Record the value determined.

8.2.5 Repeat for all specimens (sheets) chosen in Section 6.

8.3 *Dimension Variation*—Where variation in dimension of consecutive sheets in a lot or sample is desired, select an agreed number of pairs of consecutive sheets and perform the procedure in accordance with 8.1 or 8.2, or both, on these consecutive sheets.

8.4 In the event a commercial device such as that in 5.2 is used for the measurement, the instructions for use of the device should be used in place of those in 8.1.2 and 8.1.3, and 8.2.2 and 8.2.3.

9. Calculation and Interpretation of Results

9.1 Determine the average value for the length and width of each sample or for the lot, or both, as agreed upon between the buyer and the seller to the nearest 0.01 units.

9.2 Determine the average value for squareness for each sample or for the lot, or both, as agreed upon between the buyer and the seller to the nearest 0.01 units.

[5] Quick Skan is available from Quick Skan Co., 826 South Fairview, Park Ridge, IL 60068.

9.2.1 It must be understood that the value for squareness, while measuring deviation from a 90° angle for the specimen (sheet) corner, is measured in units of length (inches or millimetres). For a sheet having a perfectly square corner, the reported value will be 0.00 length units. For sheet whose corner is not square, a value different than 0.00 length units results. Because of the way in which squareness is measured and defined, sheets having identical corner angles but different long dimensions will appear to have different squareness. This is consistent with the increasing negative impact of non-square sheets as sheet length increases, and must be understood and considered when this test method is used and referenced in developing specifications.

9.3 Determine the average dimension variation among an agreed-upon number of pairs of consecutive sheets by determining the variation between each of the pairs for the properties in 8.2 and 8.3. Determine the average variation for each property.

10. Report

10.1 Report the following information:

10.1.1 The average value and range for length,

10.1.2 The average value and range for width,

10.1.3 The average value and range of squareness,

10.1.4 The average difference between consecutive sheets for length, width, and squareness, and

10.1.5 The exact conditioning procedure used and the exact temperature and percent relative humidity at which the testing was done. See Section 7.

11. Precision and Bias

11.1 *Precision*—Based on limited information from a single instrument in a single laboratory, the repeatability standard deviations and the 95 % repeatability limits for measuring length, width, and squareness are approximately 0.02 in. (0.51 mm) and 0.06 in. (1.52 mm), respectively, for the properties measured in this test method. The precision for the measurement of the difference between the length, width, or squareness of consecutive sheets is approximately twice that measured for the individual sheets. The absolute magnitude of the difference between the dimensions of two consecutive sheets is dependent upon the manufacturing process. The reproducibility of this test method is being determined.

11.2 *Bias*—The procedure in this test method has no bias because the values of the properties measured are defined in terms of the definitions and procedures in this test method.