



Standard Test Method for Grease Resistance of Paper¹

This standard is issued under the fixed designation D 722; 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 approval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers paper and paper products that have been treated or designed to resist penetration by oils or greases commonly found in foodstuffs. Such papers include but are not limited to greaseproof, glassine, and vegetable parchment papers.

1.2 This test method provides relative data regarding the degree of grease resistance for the materials tested based on time required for penetration of a test specimen by turpentine under specified laboratory conditions. For paper or paper products that are not penetrated under these conditions by the upper arbitrary time limit of the test (1800 s), no relative information is provided.

1.3 The values stated in SI units are to be regarded as the standard. The inch-pound units given in parentheses are for information only.

1.4 *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, and Related Product²

D 685 Practice for Conditioning Paper and Paper Products for Testing²

D 1968 Terminology Relating to Paper and Paper Products²

D 5039 Methods for Identification of Wire Side of Paper²

E 122 Practice for Calculating Sample Size to Estimate, with a Specified Tolerable Error, the Average for a Characteristic of a Lot or Process³

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.

Current edition approved Sept. 15, 1993. Published November 1993. Originally published as D 722 – 43T. Last previous edition D 722 – 45 (1971). Discontinued 1979 and reinstated 1993.

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

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

3. Terminology

3.1 Definitions—For definitions of terms used in this test method, refer to Terminology D 1986 or the *Dictionary of Paper*.⁴

4. Summary of Test Method

4.1 A test specimen is placed directly in contact with a piece of white book paper that is lying horizontally on a laboratory bench or similar support in an environment of specified temperature and relative humidity. Five grams of sand of a specified particle size are placed in a pile on top of the test specimen. The sand is then saturated with a known quantity of turpentine containing a dissolved red dye. The time required for the turpentine to penetrate the test specimen and stain the book paper red is measured to the nearest 10 s.

5. Significance and Use

5.1 This test method gives a relative indication of the degree to which paper and products made from paper resist penetration by oils and grease commonly found in foodstuffs. The measured penetration times are greatly accelerated under the conditions of the test, in comparison to the time that might be required for grease penetration in an actual end-use application of the tested material.

5.2 While this test method may be used as a preliminary tool to select and predict paper or paper products for an intended end use, it is not a substitute for actual use tests with the material or product of interest.

5.3 This test method may also be useful in specifications where experience has shown that paper having a particular grease resistance as measured by this test method is suitable for an intended end use.

6. Apparatus

6.1 *Tube*, of any rigid material, 25 mm (1 in.) in inside diameter and at least 25 mm (1 in.) in height, the ends of which have been smoothed.

6.2 *Buret*, or automatic pipet, calibrated to deliver 1.1 mL of liquid.

⁴ Formerly published by American Paper and Pulp Assoc. (currently API), New York, NY.



6.3 *Sand*, Ottawa cement testing sand, screened to pass a No. 20 and be retained on a No. 30 sieve.

6.4 *Paper*, white coated and calendered sheets of book paper, 104 g/m² (70 lb 25 × 38—500) of convenient size.

6.5 *Timing Device*, stopwatch or laboratory timer.

6.6 *Watch Glass*, 7.6 cm diameter.

6.7 *Scoop*, 5-g capacity; check a few weights on an analytical balance to assure the weights are 5.0 ± 0.1 g and consistent.

7. Reagents

7.1 *Turpentine*, moisture-free and colored to 100 mL of pure gum spirits turpentine, sp gr 0.860 to 0.875 at 16°C (60°F), add 5 g of anhydrous calcium chloride and 1.0 g of an oil-soluble red dye. Stopper the container, shake well, and let stand for at least 10 h, shaking occasionally. Then filter through a dry filter paper at a temperature of approximately 23°C (73°F) and store in an airtight bottle.

8. Sampling

8.1 For acceptance sampling purposes, sample in accordance with Practice D 585.

8.2 For other testing purposes, the sampling and number of test specimens depends upon the purpose of the testing. Practice E 122 is recommended.

9. Test Specimen

9.1 From each test unit prepare ten square specimens 100 mm (4 in.) in each dimension. Determine the wire side of the specimens where applicable using Methods D 5039. Otherwise, arbitrarily identify the top side of the specimen as sampled “top.” Mark each specimen prepared to identify the “wire side” or “top side.”

10. Conditioning

10.1 Condition the test specimens in accordance with Practice D 685.

11. Procedure

11.1 Perform the test in an environment complying with Practice D 685. It has been determined that temperature has a significant effect on test results.

11.2 Test not less than ten specimens that have been conditioned in accordance with Practice D 685. Make five tests on specimens with the “wire side” or “top side” facing up, and five tests with the “wire side” or “top side” facing down.

11.3 Place a sheet of book paper on a horizontal, smooth flat surface. Place a specimen directly on the book paper toward one corner, such that no portion of the specimen extends beyond the sheet of book paper. Place one end of the tube (see 6.1) directly in contact with the center of the specimen with the tube extending vertically above the specimen. Place 5 g of sand in the tube. Carefully and immediately remove the tube by lifting it straight up. The result will be a pile of sand in the center of the specimen.

11.4 To the pile of sand add exactly 1.1 mL of colored turpentine using the buret or automatic pipet. The 1.1 mL will saturate the pile of sand. Start the timing device exactly as the last of the turpentine leaves the buret or automatic pipet.

11.5 At the end of 10 s elapsed time on the timer, gently slide the specimen to a new area on the book paper, checking the area of book paper from above which the specimen was just moved for any signs of staining, indicating that the turpentine containing the red dye has penetrated through the test specimen. Continue this process after every 10 s until staining is observed. Cover the pile of turpentine saturated sand with a watch glass for specimens requiring more than 120 s for stain penetration to be observed. Discontinue the test at 1800 s even when no staining is observed.

11.6 Record the elapsed time between the addition of the turpentine and the first sign of staining of the book paper to the nearest 10 s. When the test is discontinued because it exceeds 1800 s, record the result as 1800 + .

11.7 It is advisable to make a few preliminary tests to determine the approximate elapsed time period for stain penetration if the grease-resistant properties of the sample are not known.

11.8 With experience, and depending upon the time period required for stain penetration, it may be possible to run several specimens sequentially.

12. Report

12.1 Report the following information:

12.1.1 Maximum and minimum value for the “wire side” facing up,

12.1.2 Maximum and minimum value for the “wire side” facing down,

12.1.3 Average value for the “wire side” facing up,

12.1.4 Average value for the “wire side” facing down,

12.1.5 Average value for the sample, and

12.1.6 Number of specimens tested.

12.2 For any reported average value containing a test result of 1800 + , include the value of 1800 in the average and follow the average value with the “+” sign.

13. Precision and Bias

13.1 *Precision*:

13.1.1 *Repeatability*—The critical limit between which two values obtained within the same laboratory will fall 95 % of the time is 60 % of the average value for samples having average values in the range from 30 to 300 s, 68 % of the average value for samples having average values in the range from 310 and 900 s, and is not known for samples having average values greater than 900 s.

13.1.2 *Reproducibility*—The critical limit between which two values obtained within two different laboratories will fall 95 % of the time is 84 % of the average value for samples having average values in the range from 30 to 300 s, 82 % of the average value for samples having average values in the range from 310 to 900 s, and is not known for samples having values greater than 900 s.

13.1.3 These precision values are based on an interlaboratory study conducted by the Glassine and Greaseproof Division of API. They are based on one material in each of three ranges, and involved four laboratories. For the sample having values greater than 900 s, most values were at the test limit of 1800 + s, thus no value for precision was calculated for the highest range.



13.2 *Bias*—No statement is made regarding the bias of the procedure contained in this test method because the value of grease resistance is defined only in terms of this test method.

14. Keywords

14.1 foodstuffs; glassine paper; greaseproof paper; grease resistance; paper; paper products; vegetable parchment paper

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).