Designation: D 5908 – 96 (Reapproved 2004)

Standard Test Method for Resin Binder Distribution and Binder Penetration Analysis of Polyester Nonwoven Fabrics[1]

This standard is issued under the fixed designation D 5908; 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 covers the analysis of polyester highloft nonwoven fabrics for resin binder distribution and binder penetration.

1.2 The values stated in SI units are to be regarded as the standard. The inch-pound values given in parentheses are for information 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:* [2]

D 123 Terminology Relating to Textiles

2.2 *ASTM Adjuncts:*

ADJD5908 Photographic Standards[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *batting*, *n*—a textile filling material consisting of a continuous web of fibers formed by carding, garnetting, air laying or other means.

3.1.2 *highloft nonwoven fabric*, *n*—a low density fiber network structure characterized by a high ratio of thickness to mass per unit area.

3.1.3 *needle-punched batting*, *n*—a textile filling material that is stabilized by mechanically entangling the fibers.

3.1.4 *resin binder*, *n*—emulsion polymer used for bonding.

3.1.5 *resin bonded batting*, *n*—a textile filling material that is stabilized by spraying it with an acrylic, polyvinyl acetate, or other suitable resin emulsion after which the batting is dried and cured.

3.1.6 *thermal bonded batting*, *n*—a textile filling material that contains low-melting point fibers or polymer which, when heated, fuse the batting materials together.

3.1.6.1 *Discussion*—Thermal bonded batting may also contain a resin binder.

3.1.7 For definitions of other textile terms refer to Terminology D 123.

4. Summary of Test Method

4.1 A specimen of batting, either manufactured or from an end use product, is dyed with a dye that subjectively stains the resin binder. The stained specimen is examined for binder distribution on the batting surface and binder penetration through the batting by comparison to photographic rating standards.

5. Significance and Use

5.1 This test method is used in the trade for acceptance testing of commercial shipments.

5.1.1 In case of a dispute arising from differences in reported test results when using this test method, the purchaser and the supplier should conduct comparative tests to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of bias. As a minimum, the two parties should take a group of test samples that are as homogeneous as possible and are from a material lot of the type in question. The test samples should then be randomly assigned in equal numbers to each laboratory for testing. The average results from the two laboratories should be compared using a statistical test for unpaired data and an acceptable probability level chosen by the two parties before the testing is begun. If a bias is found, either its cause must be found and corrected or the purchaser and the supplier must agree to interpret future test results with consideration of the known bias.

5.2 This test method is used to assess the distribution of resin binder application. The distribution of resin binder relates to batting performance.

6. Apparatus and Materials

6.1 *Dyebath Container*, plastic or metal, of sufficient volume for dyebath.

6.2 *Dye*, C.I. Basic Red 14.

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[1] This test method is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.64 on Non-Woven Fabrics.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Two sets of five color photographic standards illustrating changes in binder distribution and penetration are available from ASTM Headquarters. Request ADJD5908.

6.3 *Rubber Gloves and Safety Glasses*.

6.4 *Stirrer*.

6.5 *Photographic Rating Standards:*[3]

6.5.1 *Binder Surface Distribution Photographic Rating Standards*, and

6.5.2 *Binder Penetration Photographic Rating Standards*.

7. Sampling and Test Specimens

7.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of rolls directed in an applicable material specification or other agreement between the purchaser and the supplier. Consider the rolls, or pieces, of highloft nonwoven material to be the primary sampling unit. In absence of such an agreement, take the number of rolls specified in Table 1.

NOTE 1—An adequate specification or other agreement between the purchaser and supplier requires taking into account the variability between rolls and within rolls to provide a sampling plan with meaningful producer's risk, consumer's risk, acceptable quality level and limiting quality level.

7.2 *Laboratory Sample*—As a laboratory sample for acceptance testing select a minimum of one 600 mm (24 in.) by full-width section of batting at random for each lot sample.

7.3 *Test Specimen*—Consider the laboratory sample the test specimen. Using indelible ink, mark the sample with machine direction (MD), edge (left or right), surface (upper or lower) and proper sample identification.

8. Procedure

8.1 Add C.I. Basic Red 14 dye to approximately 60 L (15 gal) of tap water at 49 to 60°C (120 to 140°F) to give a concentration of 0.2 % based on the total mass of the dyebath. Stir until completely dissolved.

8.2 Immerse the full-width specimen in the dyebath and allow to remain for 15 ± 1 min.

8.3 Remove specimen from dyebath, gently squeeze out excess dye. Rinse specimen until no further color bleeding is noted.

8.4 Allow specimen to dry.

8.5 Place the specimen on a dark background.

8.6 Rate the specimen using the binder distribution rating scale below or the Surface Distribution Photographic Rating Standards and record the ratings.

Binder Surface Distribution Rating Scale

Rating	Description
5	No undyed portions, uniform coverage and shade
4	Majority of web dyed, slight variation in shade
3	Small undyed areas indicative of lack of binder
2	Large undyed areas, apparent streaks
1	Majority of web undyed, narrow width streaks

TABLE 1 Number of Rolls, or Pieces, of Highloft in the Lot Sample

Number of Rolls, Pieces in Lot Inclusive	Number of Rolls or Pieces in Lot Sample
1 to 3	All
4 to 24	4
25 to 50	5
Over 50	10 % to a maximum of ten rolls or pieces

8.7 Select three positions across a width-wise edge of the specimen, the center and 25 cm (12 in.) from each machine-direction edge. For each position, rate the specimen using the Binder Penetration Rating Scale or the Binder Penetration Photographic Rating Standards and record the rating.

Binder Penetration Rating Scale

Rating	Description
5	Uniform dye shade throughout batting thickness
4	Dye penetration through the thickness, shade varies
3	Thin undyed layer in the center
2	Surface dyeing with slight penetration
1	Surface dyeing only

9. Report

9.1 State that the tests were performed as directed in this test method. Describe the products sampled or materials used and the method of sampling used when applicable.

9.2 Report the following information:

9.2.1 Binder surface distribution rating for each specimen,

9.2.2 Binder penetration rating for each specimen, and

9.2.3 Stained specimens or photographs of specimens indicating locations of observed may be included for clarity.

10. Precision and Bias

10.1 *Summary*—Calculation of components of variance and least critical differences is not appropriate due to the restricted and discontinuous rating scale for the distribution and penetration of the resin binder in polyester highloft nonwoven fabrics. An interlaboratory evaluation has been conducted and observations are summarized and reported in 10.2.

10.2 *Interlaboratory Test Data*[4]—An interlaboratory test was run in 1994 in which randomly drawn samples of three materials were tested in each of seven laboratories. Each laboratory used two operators, each of whom evaluated one specimen of each material using the same set of photographic standards for rating purposes. The materials were made by three different manufacturers and all had square metre weights in the range of 270 to 475 g and containing 15 to 20 % added resin. The following data were extracted and are reported for reference purposes.

	Range of Average Laboratory Ratings			
	Distribution		Penetration	
	min	max	min	max
Material A	3.0	5.0	2.0	4.5
Material B	2.0	5.0	3.0	4.0
Material C	3.0	4.8	2.5	4.5

	Overall Average Rating	
	Distribution	Penetration
Material A	4.2	3.0
Material B	4.4	3.4
Material C	3.8	3.9

Between operators within any given laboratory the difference in rating for either property on any material never exceeded one rating.

10.3 *Bias*—The true value of resin binder distribution and penetration can only be defined in terms of a test method. Within this limitation, this test method has no known bias.

[4] Supporting data are available from ASTM Headquarters. Request RR:D19-1052.

11. Keywords

11.1 batting; highloft batting; highloft nonwoven fabric; resin binder