Designation: D4759 – 11

Standard Practice for Determining the Specification Conformance of Geosynthetics[1]

This standard is issued under the fixed designation D4759; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This practice covers a procedure for determining the conformance of geosynthetic properties to standard specifications.

1.2 *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]

D4354 Practice for Sampling of Geosynthetics and Rolled Erosion Control Products(RECPs) for Testing

D4439 Terminology for Geosynthetics

D4533 Test Method for Trapezoid Tearing Strength of Geotextiles

D7273 Guide for for Acceptance Testing Requirements for Geonets and Geonet Drainage Geocomposites

3. Terminology

3.1 For general definitions used in this document, refer to Terminology D4439.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *test result, n*—a value obtained by a given test method, expressed as a single determination or a specified combination of a number of determinations.

4. Significance and Use

4.1 This practice provides a means by which the purchaser can determine the conformance of geosynthetic properties as applied to the acceptance or rejection of a material in regards to a material specification.

4.2 This practice has been developed with strong emphasis on practicality and the realization that all geosynthetics are subjected to a vigorous quality control program prior to shipping.

NOTE 1—It is suggested that the user obtain the mean, standard deviation, and/or the coefficient of variation for given physical/mechanical properties of a product directly from the manufacturer. If this data is unavailable, it is suggested that users of this practice begin to accumulate data that can be used to estimate product averages and standard deviations for each product.

NOTE 2—The risk to the purchaser of buying out of specification materials is minimal when conformance requirements are detailed in the purchase specification and adequate conformance testing is performed. It is the producer's responsibility to perform thorough quality control testing for all properties requiring certification. The producer's risk of rejection is minimal with the performance of this thorough quality control testing.

5. Summary of the Test Procedure

5.1 *Procedure A*—This procedure determines the conformance of geosynthetic materials properties to acceptable specifications values.

NOTE 3—Conformance testing is done by the purchaser or designated person/organization. It is usually done as the geosynthetics are brought to the project site and justify the payment of the billing (D4354). Typically testing is performed on the final product and no components to produce or assemble the final geosynthetic material need to be conformance tested.

5.2 —This procedure determines the conformance of geocomposite geosynthetic material properties to a set of acceptable specification values. Typically multiple individual components need to be tested together with the final geocomposite product to show conformance with the acceptable material specification. Since those individual components might or might not be altered during production/ assembly, sample collection is typically executed during production/assembly at the manufacturing facility.

6. Procedure A

6.1 Divide into lots and select lot and laboratory samples as directed in Practice D4354.

[1] This practice is under the jurisdiction of ASTM Committee D35 on Geosyntheticsand is the direct responsibility of Subcommittee D35.01 on Mechanical Properties.

Current edition approved July 1, 2011. Published August 2011. Originally approved in 1988. Last previous edition approved in 2007 as D4759–02(07). DOI: 10.1520/D4759-11.

[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.

6.2 Test the number of specimens as directed in the applicable testing method.

6.3 If the average test values for the individual lot sampling unit meet all the acceptable specification values, the lot passes.

6.4 If the average test value for any individual lot sampling unit does not meet one or more of the acceptable specification values, the lot shall be resampled and tested, except as noted in 6.4.3.

6.4.1 Any individual lot sampling unit which fails initial testing shall not be included in the lot for resampling.

6.4.2 Disposition of individual lot sampling units which fail initial testing shall be agreed upon by purchaser and seller.

6.4.3 If all lot sampling units fail initial testing, reject the entire lot without further sampling and testing.

6.4.4 The resample size shall be at least that determined in 6.1.

NOTE 4—The larger the number of samples in a resample, the smaller will be the consumer's risk of accepting an undesirable product.

6.5 Pass the lot if the average test values for the individual lot sampling unit from the resample meet the acceptable specification values.

6.6 Fail the lot if the average test values for any individual lot sampling unit from the resample do not meet one or more of the acceptable specification values.

6.7 Reject any failing lot.

6.8 A numerical example of this practice is included in Appendix X1.

7. Procedure B

7.1 Divide into lots and select lot and laboratory samples as directed in Practice D4354.

NOTE 5—typically for geocomposite samples, the specification will require sampling during manufacture, select the units for the lot sample and potentially the multiple individual components at uniformly spaced time intervals throughout the production period at the production/assembly facility (Procedure C in D4354).

7.2 Test the number of specimens as directed in the applicable testing methods.

7.3 If all the average test values for the individual lot sampling units meet all the acceptable specification values, the entire lot passes.

7.4 If the average test value for any individual lot sampling unit does not meet one or more of the acceptable specification values, that particular lot sampling unit shall be catalogued as "failed" or non-conforming.

NOTE 6—Most individual ASTM standards describe within the standard procedure as of how to address "failed" or non-conforming measured values.

7.4.1 Any individual lot sampling unit which fails initial testing shall be retested for all the methods which did not meet the acceptable specification values.

7.4.2 If the average of both tests for any initially non-conforming methods, confirm that the individual lot sampling unit is non-conforming, then the individual lot sampling unit failing the acceptable specification value need to be rejected.

7.4.3 Individual lot sampling units before and after the failed individual lot sampling unit or units in the lot will be resampled and retested for all applicable testing methods ("blocking tests").

7.4.4 Finally, the sequence of non-conforming individual lot sampling units in the lot shall be bounded/delineated by passing individual lot sampling units ("blocking tests").

NOTE 7—It should be noted that if any tests on the individual components of the geocomposite are non-conforming, availability of those individual components for blocking tests could be limited to the selected individual lot sampling units prior to production/assembly.

7.4.5 Disposition of individual lot sampling units which fail conformance testing shall be agreed upon by purchaser and seller.

7.5 Reject the sequence of non-conforming individual lot sampling units in between the bounding samples in the lot, if the average test values for any individual lot sampling unit do not meet one or more of the acceptable specification values.

7.6 A numerical example of this procedure is included in Appendix X2.

APPENDIXES

(Nonmandatory Information)

X1. EXAMPLE OF DETERMINING CONFORMANCE TO SPECIFICATION IN ACCORDANCE WITH PROCEDURE A

X1.1 *Assumptions*—This example assumes the following:

X1.1.1 A geotextile is to be tested against a specification that requires a minimum of trapezoid tear strength of 356 N (80 lbf).

X1.1.2 For this example, the lot consists of 300 rolls. Practice D4354, Procedure C requires two lot sampling units per lot for lots of 201 to 500 rolls. The 300 rolls in the lot were assigned numbers and the five rolls to be used as lot sampling units were selected using a table of random numbers.

X1.1.3 Test Method D4533 specifies there will be one laboratory sampling unit taken from each lot sampling unit and requires the following number of test specimens per laboratory sampling unit in each direction:

$$n = (tv/A)^2$$

where:

n = number of test specimens per laboratory sampling unit (rounded upward to the next whole number),

v = reliable estimate of the coefficient of variation for individual observations based on similar materials in the user's laboratory under conditions of single-operator precision,

t = the value of Student's t for one side limits, a 95 % probability level, and the degrees of freedom associated with the estimate of v, and

A = 5.0 % of the average, the value of the allowable variation.

X1.1.4 Based on a value of $v = 6.3$ lbf associated with an infinite number of degrees of freedom ($t = 1.645$):

$n = [(1.645)\ (6.3)/5.0]^2 = 4.3 = 5$ specimens per laboratory sampling unit in each direction

X1.2 *Data for Sample Set 1*—The data are given in Table X1.1. Lot sampling unit 2 failed in the machine direction. Since lot sampling unit 2 does not meet the specification requirement, the lot was resampled.

X1.3 *Resampling*—The supplier and the purchaser agreed to increase the number of rolls in the second lot sample to three. The three rolls in the second sample were selected using a table of random numbers excluding the roll from which lot sampling unit 2 was taken.

X1.4 *Data for Sample Set 2*—The data are given in Table X1.2. None of the lots sampling units failed. The lot was accepted.

TABLE X1.1 Test Results for Sample Set 1

Specimen	Lot Sampling Units			
	Machine Direction		Cross-Machine Direction	
	1	2	1	2
1	84	79	84	80
2	83	78	85	81
3	82	79	84	83
4	82	80	83	84
5	83	81	82	82
Average	82.8	79.4	83.8	82.0

TABLE X1.2 Test Results for Sample Set 2

Specimen	Lot Sampling Units					
	Machine Direction			Cross-Machine Direction		
	3	4	5	3	4	5
1	86	92	78	87	93	80
2	85	94	80	87	94	81
3	83	90	82	86	95	83
4	81	91	84	84	92	85
5	82	93	83	83	91	84
Average	83.4	92.0	81.4	85.4	93.0	92.6

X2. EXAMPLE OF DETERMINING CONFORMANCE TO SPECIFICATION IN ACCORDANCE WITH PROCEDURE B

X2.1 Assumptions This example assumes the following:

X2.1.1 A geonet geocomposite is to be tested against a specification that requires all the methods as identified in D7273. Specifically the upper and lower geotextile used to manufacture the geonet geocomposite requires a minimum of trapezoid tear strength of 356 N (80 lbf) in machine and cross machine direction.

X2.1.2 For this example, the lot consists of 175 rolls. Practice D4354, Procedure C requires one lot sampling units per lot for lots of 1 to 200 rolls. However, the material specification required sampling during manufacture at a frequency of every 35 rolls; the units for the lot sample were selected at uniformly spaced time intervals throughout the production period. Each individual sample unit consisted of a 3 ft by roll width of geonet, upper and lower geotextile and laminated geonet geocomposite. The 175 geonet geocomposite rolls in the lot were assigned sequentiallylabeled numbers and the six rolls to be used as lot sampling units were roll numbers 1, 35, 70, 105, 140, and 175.

X2.1.3 Test Method D4533 specifies there will be one laboratory sampling unit taken from each lot sampling unit and requires five test specimens per laboratory sampling unit in each direction (see X1.1.3).

X2.2 *Data for Initial Sample Set*—The average test data are given in Table X2.1 per tested Lot Sampling Unit (roll) in each direction tested. Lot Sampling Unit 105 failed in the machine direction.

X2.3 *Retesting*—Since lot sampling unit 105 does not meet the specification requirement, the lot sampling unit 105 was retested.

X2.4 *Data for Retesting Lot Sampling Unit 105*–The data are given in Table X2.2. The average test data for lots sampling units 105 is 66.25 lbf. The individual lot sampling unit 105 was rejected.

X2.5 *Bounding Lot Sampling Unit 105*—Purchaser and seller check availability of samples. Lot Sampling Unit 100 is available with individual components. No individual components are available to upper bound Lot Sampling Unit 105, only Lot Unit Sample 140 was available.

X2.6 *Data for Retesting Lot Sampling Unit 100*–The data are given in Table X2.3. That individual lot sampling unit 100 was accepted since it was passing the specification requirement.

X2.7 The sequence of non-conforming individual lot sampling units in the lot was bounded/delineated by passing individual lot sampling units (“blocking tests”).

X2.8 Reject the sequence of non-conforming individual lot sampling units in the Lot Sampling Unit 101 to 139, since representative lot unit samples do not meet the acceptable specification values for trapezoidal tear in the machine direction.

TABLE X2.1 Test Results for Initial Sample Set

Lot Sampling Units (Roll numbers)	Machine Direction	Cross-Machine Direction
1	95.8	105.3
35	82.2	94.6
70	80.1	94.1
105	65.4	80.4
140	80.0	89.3
175	85.2	102.6

TABLE X2.2 Test Results for Retested Sample

Lot Sampling Units (Roll numbers)	Machine Direction	Cross-Machine Direction
105	67.1	82.0

TABLE X2.3 Test Results for Bounding Lot Sample Unit

Lot Sampling Units (Roll numbers)	Machine Direction	Cross-Machine Direction
100	87.9	87.4