



Designation: D2812 – 07 (Reapproved 2021)

Standard Test Method for Non-Lint Content of Cotton¹

This standard is issued under the fixed designation D2812; 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 determination of the non-lint content of cotton using the Shirley Analyzer. The cotton may be in the form of (1) raw stock, that is, cotton fiber that has been separated from the seed by ginning; (2) partially processed cotton, such as picker lap or sliver; or (3) ginning or processing waste, such as obtained from ginning, opening and cleaning, picking, carding, or combing machines.

1.2 This test method is especially adapted for determining non-lint content of cotton by use of the Shirley Analyser.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* For specific hazard statements, see Section 7.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[D123 Terminology Relating to Textiles](#)

[D1441 Practice for Sampling Cotton Fibers for Testing](#)

[D7139 Terminology for Cotton Fibers](#)

3. Terminology

3.1 For all terminology relating to D13.11, Cotton Fibers, refer to Terminology [D7139](#).

¹ This test method is under the jurisdiction of ASTM Committee [D13](#) on Textiles and is the direct responsibility of Subcommittee [D13.11](#) on Cotton Fibers.

Current edition approved Jan. 1, 2021. Published January 2021. Originally approved in 1969. Last previous edition approved in 2012 as D2812 – 07(2012). DOI: 10.1520/D2812-07R21.

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.

3.1.1 The following terms are relevant to this standard: foreign matter, invisible waste, lint, lint content, non-lint content, visible waste.

3.2 For all other terminology related to textiles, refer to Terminology [D123](#).

4. Summary of Test Method

4.1 A known mass of raw cotton, partially processed cotton, or waste is fed into the machine. The machine, operating on mechanical-pneumatic principles, separates the foreign matter from the cotton and discharges the non-lint particles and lint into separate chambers.

4.2 The amounts of lint and non-lint recovered are calculated as a percentage of the original specimen mass.

5. Significance and Use

5.1 This test method for testing cotton for non-lint content is considered satisfactory for acceptance testing of commercial shipments since it is the best available procedure for obtaining objective data.

5.1.1 If there are differences of practical significance between reported test results for two laboratories (or more), comparative tests should be performed to determine if there is a statistical bias between them, using competent statistical assistance. As a minimum, ensure the test samples to be used are as homogeneous as possible, are drawn from the material from which the disparate test results were obtained, and are randomly assigned in equal numbers to each laboratory for testing. The test results from the two laboratories should be compared using a statistical test for unpaired data, at a probability level chosen prior to the testing series. If a bias is found, either its cause must be found and corrected, or future test results for that material must be adjusted in consideration of the known bias.

5.2 This test method gives data on the non-lint content of raw cotton which can be used as a basis for: (1) estimating the net amount of manufactured textile product obtainable from raw cotton; (2) predicting the quality of cotton textile products, particularly their aesthetic properties; (3) assembling and blending bales in a mix on a non-lint content basis; (4)

adjusting ginning and textile processing machines for maximum efficiency in cleaning lint; and (5) relating non-lint content of cotton to end-product quality and processing efficiency.

6. Apparatus

6.1 *Testing Instrument*—Shirley Analyzer, commercially available non-lint testing machine operating on mechanical-pneumatic principles, described in [Annex A1](#).

6.2 *Laboratory Balance*, with a capacity of 200 g, a sensitivity of 0.01 g, and a pan large enough to weigh a 100-g specimen of cotton.

7. Hazards

7.1 Use care in running the specimen through the machine. Spread the specimen uniformly on the feed plate so that fingers do not have to come into contact with the feed roll.

7.2 In conducting tests, the machine should be completely stopped before cleaning any clumps of fiber or trash which have adhered to the upper parts of the delivery box or trash tray.

8. Sampling, Selection, and Number of Specimens

8.1 *Lot Sample*—For acceptance testing, take as directed in Practice [D1441](#).

8.2 *Laboratory Sample*:

8.2.1 *Unprocessed or Processed Cotton*—Take the laboratory sample and the test specimen as directed in Practice [D1441](#). Do not blend the laboratory sample. Handle it in such a way as to prevent loss of foreign matter. Take a laboratory sample large enough to provide two 100 ± 5 -g test specimens.

8.2.2 *Ginning or Processing Waste*—Take as a laboratory sample all the waste accumulated during the test run which should last long enough to provide one specimen weighing not less than 45 g (1 lb).³

8.3 *Test Specimens*—Test two 100 ± 5 -g specimens from each laboratory sampling unit.

9. Preparation of Specimens

9.1 No special preparation is required, but handle the laboratory sample and the specimens carefully, particularly specimens accumulated from ginning and processing waste products to avoid any loss of leaf, dust, or other foreign matter.

10. Conditioning

10.1 Do not precondition the test specimens.

10.2 Bring the laboratory sample from the prevailing atmosphere to approximate moisture equilibrium with the air of the room in which the test will be performed by exposing the samples at least 24 h.

NOTE 1—Changes in relative humidity during the test will seriously affect test results. Although tests may be made in the standard atmosphere

³ Cotton Branch, PMA, U.S. Dept. of Agriculture, "Effect of Atmospheric Conditions on Processing and Testing of Carded Cotton Yarn," Washington, DC, July, 1953.

for testing textiles as defined in Terminology [D123](#), studies have shown that the most efficient separation of lint and foreign matter occurs at a relative humidity of 60 % or less.³ Temperature variations up to $\pm 1.1^\circ\text{C}$ (2°F) or variations up to ± 2 % relative humidity during the conditioning period do not introduce any significant errors, but atmospheric conditions should be constant between the times of weighing the specimen and weighing the clean lint or waste, or both.

11. Procedure

11.1 Clean the delivery box, trash tray, and settling chamber. If the machine has not been operated previously during the day, start the motor and run the machine for 2 to 3 min with the clutch disengaged and the feed roller inoperative.

11.2 Weigh the specimen (see [8.2.1](#) and [8.2.2](#)) to the nearest 0.1 g. Record the mass, *W*.

11.3 *Placement of the Specimen on the Feed Table*:

11.3.1 For testing raw cotton or picker laps, arrange about one third of the specimen in a uniform layer of small tufts on the feed table, tearing apart hard lumps where necessary.

11.3.2 For testing slivers, spread short lengths on the feed table perpendicular to the feed roller.

11.3.3 For testing ginning and processing waste, arrange about one fourth of the specimen uniformly on the feed table.

11.4 Open the air control valve, engage the feed roller clutch and start feeding the specimen through the machine. Observe the character of the trash as it begins to fall into the tray. Only small amounts of unopened lint should be falling with the trash during the first passage. If there are hard tufts in the specimen, it may be necessary to tighten the loading springs on the feed rollers.

11.5 As the specimen is fed into the machine, continue placing portions of it on the feed table to maintain a uniform feed rate until the whole specimen has been processed as indicated by the absence of fibers under the streamer plate.

11.6 When all of the specimen has passed under the feed roller, collect all lint-bearing trash from the settling chamber and trash tray. Spread it over a small central area of the feed plate and pass it through the analyser.

11.7 Disengage the clutch and close the air control valve momentarily to allow the cleaned lint to be collected from the delivery box.

11.8 Pass the cleaned lint through the machine a second time.

11.9 Remove the lint-bearing trash from the settling chamber and trash tray and pass it through the machine again.

11.10 Disengage the feed roller clutch and close the valve momentarily and remove the cleaned lint from the delivery box. Weigh it to the nearest 0.1 g. This is the mass of the lint, *L*.

11.11 Collect the trash from the trash tray, taking care to recover all of the fine particles of trash from the walls of the settling chamber and the surface of the feed table. Weigh the trash to the nearest 0.1 g. This is the mass of the visible waste, *V*.

12. Calculation

12.1 Calculate to the nearest 0.10 % the lint content, visible waste, invisible waste, and total non-lint content using Eq 1-4.

$$\text{Lint content, \%} = (L/W) \times 100 \quad (1)$$

$$\text{Visible waste, \%} = (V/W) \times 100 \quad (2)$$

$$\text{Invisible waste, \%} = [(W - (V+L))/W] \times 100 \quad (3)$$

$$\text{Total non - lint content, \%} = 100 - \text{lint content, \%} \quad (4)$$

where:

W = mass of specimen, 11.2 or 12.1,

L = mass of lint recovered, 11.10, 12.2.3 or 12.3.4, and

V = mass of visible waste, 11.11.

13. Report

13.1 State that the tests were made as directed in this test method. Describe the material or product sampled and the method of sampling.

13.2 Report the following information:

13.2.1 Lint content, and visible and invisible waste, each.

13.2.2 Temperature and relative humidity prevailing during the test.

14. Precision and Bias

14.1 *Interlaboratory Test Data*⁴—An interlaboratory test with the Shirley Analyser was run in 1974 in which nine laboratories each tested five specimens from a low and a high foreign matter bale of lint cotton. All 45 specimens for low and for high foreign matter content came from as nearly the same portion of each bale as possible. The components of variance for the foreign matter content results expressed as standard deviation were calculated to be as follows:

<i>For Low Foreign Matter Cotton:</i>	
Within-laboratory component	0.179 %
Between-laboratory component	0.273 %
<i>For High Foreign Matter Cotton:</i>	
Within-laboratory component	0.329 %
Between-laboratory component	0.706 %

14.2 *Precision*—For the components of variance reported in 14.1, two averages of observed values should be considered significantly different at the 95 % probability level if the difference equals or exceeds the critical differences listed in Table 1 and Table 2.

TABLE 1 Confidence Limits in Percentage Points at the 95 % Probability Level

Number of Specimens	Confidence Limits
	Shirley Analyzer
2	± 0.7
3	± 0.5
9	± 0.3

TABLE 2 Critical Differences, Foreign Matter (Total Visible and Invisible Loss), %, for the Condition Noted^A

Number of Observations in Each Average	Within Laboratories	Between Laboratories
	<i>Low foreign matter:</i>	
1	0.50	0.91
2	0.35	0.84
3	0.29	0.81
4	0.25	0.80
5	0.22	0.79
<i>High foreign matter:</i>		
1	0.91	2.16
2	0.64	2.06
3	0.53	2.03
4	0.46	2.01
5	0.41	2.00

^A The critical differences were calculated using $t = 1.96$, which is based on infinite degrees of freedom.

14.3 *Bias*—The procedure in this test method for measuring the non-lint content of cotton has no bias because the value of that property can be defined only in terms of this test method.

15. Keywords

15.1 content; cotton; non-lint

⁴ Supporting data have been filed at ASTM Headquarters and may be obtained by requesting RR:D13-1043.