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Standard Test Methods for Rubber from Natural Sources—Sampling and Sample Preparation[1]

This standard is issued under the fixed designation D 1485; 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 These test methods cover a uniform procedure for sampling lots of solid natural rubber. Raw natural rubber generally is marketed in bales ranging in mass from 24 to 115 kg.

1.2 A procedure for determining the acceptability of lots of natural rubber is given. This procedure is based on a variable sampling plan.

1.3 The sample size is based on the assumption of a visually homogeneous material. If obvious heterogeneity exists, the number of samples shall be increased.

1.4 The values stated in SI units are to be regarded as the standard.

1.5 *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 1278 Test Methods for Rubber from Natural Sources—Chemical Analysis[2]

D 3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets[2]

D 3184 Test Methods for Rubber—Evaluation of NR (Natural Rubber)[2]

2.2 *ANSI Standard:*

Z1.9 Sampling Procedures and Tables for Inspection by Variables for Percent Defective[3]

3. Significance and Use

3.1 These test methods outline a procedure for sampling and sample preparation of natural rubber. A statistical method for determining a quality index and lot acceptability is given. The sampling plan is optional for quality control or production, but must be used when needed for referee purposes.

4. Sampling

4.1 *Sample Size*—The number of samples to be selected to represent the lot shall be determined by the size of the lot as indicated in Table 1. A sample bale is selected randomly from the lot for each sample required.

NOTE 1—The sampling plan is more efficient for large lots. The risk for the producer and consumer decreases as the sample size increases.

4.2 *Removal of Test Portion*:

4.2.1 From each sample bale selected, cut one 600 to 1500-g test portion of rubber, depending on the tests to be made. Each test portion is tested separately. Cut the test portion through the entire bale, normal to the bale surfaces of the largest area, without the use of lubricant. Remove outer wrapping sheets, polyethylene film, bale coating, or other extraneous surface material from the test portion. Unless the test portion is to be tested immediately, place it in an airtight container of not more than twice the volume of the test portion, or wrap it tightly in two layers of aluminum foil until tested.

NOTE 2—In testing for volatile matter only, a sample weighing approximately 150 g may be taken as a continuous piece from any part of the bale.

5. Lot Acceptability

5.1 Each property of the lot is evaluated separately. The requirements of these tests are of two types: (*1*) those having a single limit such as a minimum or maximum and (*2*) those having double limits, that is, a minimum and a maximum. A quality index is calculated for each property tested, and from this index, an estimate is made of the percent of the lot that is defective. If this percentage does not exceed the allowable values shown in Table 1, the lot is considered acceptable.

5.2 *Quality Index Calculations*:

5.2.1 For a requirement having a maximum limit, calculate the quality index as follows:

[1] These test methods are under the jurisdiction of ASTM Committee D11 on Rubber and are the direct responsibility of Subcommittee D11.22 on Natural Rubber.

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[2] *Annual Book of ASTM Standards*, Vol 09.01.

[3] Available from American National Standards Institute, 25 W. 43rd St., 4th Floor, New York, NY 10036.

TABLE 1 Sampling Plan

NOTE 1—The sampling plan is based on Inspection Level III, ANSI Z1.9, and an Acceptable Quality Level of 2.5 %.

Lot Size, kg (lb)	Sample Size	*Q* Value, min[A]	Allowable Percent Defective, max[B]
300 to 4 000 (600 to 8 800)	3	1.12	7.6
4 001 to 6 500 (8 801 to 14 300)	4	1.17	10.9
6 501 to 11 000 (14 301 to 24 200)	5	1.24	9.8
11 001 to 18 000 (24 201 to 39 700)	7	1.33	8.4
18 001 to 30 000 (39 701 to 66 100)	10	1.41	7.3
30 001 to 50 000 (66 101 to 110 200)	15	1.47	6.6
50 001 to 80 000 (110 201 to 176 400)	20	1.51	6.2

[A]Minimum value of *Q* for quality characteristics having single specification limit.
[B]Maximum allowable percent defective for quality characteristics having both upper and lower specification limit.

$$Q = (U - \bar{X})/S \quad (1)$$

where:
Q = quality index,
U = maximum value permitted by the specification,
$\bar{X}$ = mean of all sample values obtained, and
S = standard deviation of the sample values.

5.2.2 For a requirement having a minimum limit, calculate the quality index as follows:

$$Q = (\bar{X} - L)/S \quad (2)$$

where:
Q, $\bar{X}$, and S = same as those for maximum value and
L = minimum value permitted by the specification.

5.3 *Acceptability*:

5.3.1 For a quality characteristic having a single specification limit, a lot is acceptable if the quality index equals or exceeds the minimum quality index shown in Table 1 for the applicable lot and sample size.

5.3.2 For a quality characteristic having both an upper and lower specification limit, estimate the percentages of the lot above the upper limit and below the lower limit from Table 2 using the appropriate sample size and quality index values calculated in 5.2. A lot is acceptable if the sum of the two percentages does not exceed the maximum allowable percent defective shown in Table 1 for the lot size being evaluated.

6. Preparation of Rubber for Test

6.1 *Homogenization*—Weigh the test portion to the nearest 0.1 g and then homogenize by passing it ten times between the rolls of a standard laboratory mill which is in accordance with Practice D 3182. Set the clearance between the rolls at 1.30 ± 0.15 mm and maintain the temperature of the roll surfaces at 70 ± 5°C. Roll the rubber after each pass and insert the roll endwise on the next pass. Return any particles separating during homogenization to the rubber. On the tenth pass, sheet the rubber and weigh it to the nearest 0.1 g. Use the initial and final masses in the calculation of volatile matter in accordance with Methods D 1278. Place the homogenized rubber in an airtight container of not more than twice the volume of the rubber or wrap tightly in two layers of aluminum foil until required for test.

6.2 *Chemical Tests*—Cut specimens from the homogenized rubber in such amounts as are required for the specific chemical tests made in accordance with Methods D 1278.

6.3 *Standard Compound*—Cut a portion of 400 g from the homogenized rubber for the preparation of a standard compound for physical tests in accordance with Test Methods D 3184.

TABLE 2 Estimate of Lot Percent Defective

Sample Size	3	4	5	7	10	15	20
	Q Value Estimated Percent of Lot Above or Below Limit						
0.95	19.3	18.3	17.9	17.5	17.3	17.2	17.2
1.00	16.7	16.7	16.4	16.1	16.0	15.9	15.9
1.05	13.7	15.0	14.9	14.8	14.7	14.7	14.7
1.10	9.8	13.3	13.5	13.5	13.5	13.5	13.5
1.15	0.3	11.7	12.1	12.3	12.3	12.4	12.4
1.20	...	10.0	10.8	11.1	11.2	11.3	11.4
1.25	...	8.7	9.7	10.2	10.4	10.5	10.6
1.30	...	6.7	8.2	8.9	9.2	9.4	9.5
1.35	...	5.0	7.0	7.9	8.3	8.5	8.6
1.40	...	3.3	5.9	7.0	7.4	7.7	7.8
1.45	...	1.7	4.8	6.1	6.6	6.9	7.0
1.50	...	...	3.8	5.3	5.9	6.2	6.3
1.55	...	...	2.9	4.5	5.2	5.5	5.7
1.60	...	...	2.0	3.8	4.5	4.9	5.1
1.65	...	...	1.3	3.2	4.0	4.4	4.5
1.70	...	...	0.7	2.6	3.4	3.8	4.0
1.75	...	...	0.2	2.1	2.9	3.4	3.6
1.80	...	...	...	1.7	2.5	2.9	3.1
1.85	...	...	...	1.3	2.1	2.6	2.8
1.90	...	...	...	0.9	1.8	2.2	2.4
1.95	...	...	...	0.6	1.4	1.9	2.1
2.00	...	...	...	0.4	1.2	1.6	1.8
2.10	...	...	...	0.1	0.7	1.2	1.3
2.20	...	...	...	...	0.4	0.8	1.0
2.30	...	...	...	...	0.2	0.5	0.7
2.40	...	...	...	...	0.1	0.3	0.5
2.50	...	...	...	...	...	0.2	0.3
2.60	...	...	...	...	...	0.1	0.2
2.70	...	...	...	...	...	0.1	0.1
2.80	...	...	...	...	...	...	0.1
2.90	...	...	...	...	...	...	...

7. Precision and Bias

7.1 Precision and bias statements are not directly applicable to these sampling methods, but they are pertinent to individual test methods that will use these sampling methods.

8. Keywords

8.1 natural rubber; sample preperation; sampling