Designation: D 3896 – 85 (Reapproved 2001)

Standard Practice for Rubber From Synthetic Sources—Sampling[1]

This standard is issued under the fixed designation D 3896; 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 practice covers a uniform procedure for sampling lots of solid synthetic rubbers. Raw synthetic rubber generally is marketed in bales or packages of various sizes.

1.2 A procedure for determining the acceptability of lots of synthetic rubber is given. This procedure is based on a variables 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 *ANSI Standard:*

Z1.9 Sampling Procedures and Tables for Inspection by Variables for Percent Defective[2]

3. Significance and Use

3.1 The sampling plan is intended for referee purposes only in establishing the properties or quality of a lot or shipment of synthetic rubber.

4. Sampling

4.1 *Number of Samples*—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 or package 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 Portions*:

4.2.1 *Bales*—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 polyethylene film, paper, talc, or other extraneous surface material prior to testing. 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.

4.2.2 *Packages*—From each sample package selected, remove between 600 and 1500 g of rubber depending on the tests to be made. The rubber should be selected randomly from the package and should be as free of surface material as practical. Unless the sample is to be tested immediately, place it in an airtight container.

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)	Number of Samples	*Q* Value, min[A]	Allowable Percent Defective, max[B]
300 to 4000 (660 to 8800)	3	1.12	7.6
4001 to 6500 (8801 to 14 300)	4	1.17	10.9
6501 to 10 100 (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.

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:

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

[1] This practice is under the jurisdiction of ASTM Committee D11 on Rubber and is the direct responsibility of Subcommittee D11.23 on Synthetic Rubbers.

Current edition approved April 26, 1985. Published June 1985. Originally published as D 3896 – 80. Last previous edition D 3896 – 80.

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

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

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.

TABLE 2 Estimate of Lot Percent Defective

Number of Samples:	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	...	...	...	...	...	...	...

6. Precision and Bias

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

7. Keywords

7.1 sampling; synthetic rubber