



Standard Test Methods for Rubber—Evaluation of NR (Natural Rubber)¹

This standard is issued under the fixed designation D 3184; 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 specify the standard materials, test formulas, mixing procedures, and test methods for the evaluation and production control of natural rubber (NR).

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

D 412 Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension²

D 1485 Test Methods for Rubber from Natural Sources—Sampling and Sample Preparation²

D 1646 Test Methods for Rubber—Viscosity, Stress Relaxation, and Pre-Vulcanization Characteristics (Mooney Viscometer)²

D 2084 Test Method for Rubber Property—Vulcanization Using Oscillating Disk Cure Meter²

D 3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets²

D 4483 Practice for Determining Precision for Test Method Standards in the Rubber and Carbon Black Industries²

3. Significance and Use

3.1 These tests are mainly intended for referee purposes but may be used for quality control of rubber production. They may also be used in research and development work and for comparison of different rubber samples in a standard formula.

4. Standard Test Formulas

4.1 Standard Formulas:

¹ These test methods are under the jurisdiction of ASTM Committee D11 on Rubber and are the direct responsibility of Subcommittee D 11.22 on Natural Rubber.

Current edition approved March 31, 1989. Published May 1989. Originally published as D 3184 – 73. Last previous edition D 3184 – 88.

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

Quantity, Parts by Mass, and Formula No.

Material	NIST SRM			
	No.	1A Gum	2A Black Filled	3A ^A Gum
Natural rubber	...	100.00	100.00	100.00
Zinc oxide	370	6.00	5.00	6.00
Sulfur	371	3.50	2.25	3.50
Stearic acid	372	0.50	2.00	0.50
Oil furnace black ^B	378	...	35.00	...
Mercaptobenzothiazole	383	0.50	...	...
TBBS ^C	384	...	0.70	0.70
Total		110.50	144.95	110.70
Batch factor: ^D				
Mill		3.0	3.0	3.0
Miniature internal mixer: ^E				
Cam Head		0.57	0.48	0.57
Banbury Head		0.50	0.42	0.50

^A Recommended formula for Test Method D 2084 vulcanization characteristics using oscillating disk cure meter.

^B The current Industry Reference Black may be used in place of NIST 378, although slightly different results may be obtained.

^C *N-tert-butyl-2-benzothiazole sulfenamide*.

^D For mill mixes, weigh the rubber and carbon black to the nearest 1.0 g, the sulfur and accelerators to the nearest 0.02 g, and all other compounding materials to the nearest 0.1 g.

^E For MIM batches weigh the rubber carbon black to the nearest 0.1 g, the compounding material blend to the nearest 0.01 g, and individual compounding materials, if used, to the nearest 0.001 g. For the MIM procedure, it is recommended that a blend of compounding materials, including black, be prepared to improve accuracy in the weighing of these materials. This material blend is prepared by blending a proportional mass of each material in a dry powder such as a biconical blender or vee blender. A mortar and pestle may be used for blending small quantities.

5. Sample Preparation

5.1 For tests intended for referee purposes obtain and prepare the samples in accordance with Test Methods D 1485.

6. Mixing Procedures

6.1 The following three mixing procedures are offered as follows:

6.1.1 *Mill Method A*—For gum formulas 1A and 3A.

6.1.2 *Mill Method B*—For black formula 2A.

6.1.3 *MIM Method C*—For formula 1A, 2A, and 3A.

NOTE 1—It is not implied that comparable results will be obtained by these test methods.

6.2 Mill Method A:

6.2.1 For general mixing procedures, refer to Practice D 3182.

6.2.2 Mixing shall be done with the mill roll temperature maintained at 70 ± 5°C (158 ± 9°F). The indicated mill openings are desired and should be maintained insofar as