



Standard Test Methods for Rubber—Evaluation of NBR (Acrylonitrile-Butadiene Rubber)¹

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1. Scope

1.1 These test methods specify the standard materials, test formulas, mixing procedures and test methods for the evaluation of various types of acrylonitrile-butadiene rubber (NBR).

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 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 3896 Practice for Rubber from Synthetic Sources—Sampling²
- D 4483 Practice for Determining Precision for Test Method Standards in the Rubber and Carbon Black Industries²
- D 5289 Test Method for Rubber Property – Vulcanization using Rotorless Cure Meters²

3. Significance and Use

3.1 These test methods are intended mainly 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.

¹ These test methods are under the jurisdiction of ASTM Committee D11 on Rubber and are the direct responsibility of Subcommittee D11.23 on Synthetic Rubbers.

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

3.2 These test methods may be used to obtain values for customer control acceptance of rubber.

4. Standard Test Formula

4.1 Standard Formula:

Material	NIST SRM/IRM No.	Quantity, Parts by Mass
NBR	...	100.00
Zinc oxide	^A	3.00
Sulfur, coated ^B	...	1.50
Stearic acid	^A	1.00
Oil furnace black	SRB-B4	40.00
TBBS ^C	^A	0.70
Total		146.20
Batch factor for mill mix ^D		4.0
Batch factor for MIM mix (Cam Head ^E)		0.50
Batch factor for MIM mix (Banbury Head) ^E		0.43

^AUse current IRM/SRM.

^BThe use of 2 % MgCO₃ coated sulfur is recommended. Standard 2 % MgCO₃ coated sulfur (Lot No. M-266573-P) is available from the C. P. Hall Co., 4460 Hudson Drive, Stow, OH 44224.

^C*N-tert-butyl-2-benzothiozolesulfenamide.*

^DFor mill and lab BB 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.

^EFor MIM batches, weigh the rubber and material, blend to the nearest 0.1 g. If individual compounding materials are used, blend to the nearest 0.001 g. For the MIM procedure, it is recommended that a blend of compounding materials, excluding black, be prepared to improve accuracy in the weighing of these materials. The material blend is prepared by blending a proportional mass of each material in a dry powder blender 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 test samples in accordance with Practice D 3896.

6. Mixing Procedures

6.1 The compound may be prepared either on a mill, in a miniature internal mixer, or a lab internal mixer, although slightly different results may be obtained.

6.2 Mill Procedure:

6.2.1 For general mixing procedure refer to Practice D 3182.

6.2.1.1 Mix with the mill roll temperature maintained at 50 ± 5°C (122 ± 9°F). The indicated mill openings are desired and should be maintained in so far as possible to provide uniformity in the breakdown of the rubber due to milling. Necessary adjustments may be made to maintain a good working bank.