



Designation: D 3186 – 97

Standard Test Methods for Rubber—Evaluation of SBR (Styrene-Butadiene Rubber) Mixed With Carbon Black or Carbon Black and Oil¹

This standard is issued under the fixed designation D 3186; 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 formula, mixing procedures, and test methods for the evaluation and production control of pigmented types of styrene-butadiene rubbers (SBR). This includes the pigmented SBR oil masterbatches.

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

3. Significance and Use

3.1 These test methods are intended mainly for referee purposes but may be used for quality control of masterbatch production. They may also be used in research and develop-

ment work and for comparison of different rubber samples in a standard formula.

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

4. Standard Test Formula

4.1 Standard Formula:

Material	NIST SRM/IRM No.	Quantity, Parts by Mass
Masterbatch	...	$100 + X^A + Y^B$
Zinc oxide ^{C,D}	IRM 91	3.00
Sulfur ^{C,D}	371	1.75
Stearic acid ^{C,D}	372	1.50
TBBS ^{D,E}	384	1.25
Total		$107.50 + X + Y$
Batch factor ^F		

^A X = parts carbon black per 100 parts base polymer.

^B Y = parts oil per 100 parts base polymer.

^CFor the MIM procedure, it is recommended that a blend of compounding materials be prepared to improve accuracy of the weighing of these materials. This 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.

^DFor mill mixes, weigh the rubber to the nearest 1.0 g, the sulfur and the accelerator to the nearest 0.02 g, and all of the other compounding materials to the nearest 0.1 g. For MIM mixes, weigh the rubber and material blend to the nearest 0.01 g and individual pigments, if used, to the nearest 0.001 g.

^ETBBS is *N-tert-butyl-2-benzothiazolesulfenamide*.

^FFor mill mixes, a batch factor should be selected to the nearest 0.5 to give as large a total mass as possible that will not exceed 525.0 g. Calculate all parts to the nearest 0.01 part. For MIM mixes, calculate a batch factor to the nearest 0.01 that will provide a 75 % loading of the mixing chamber.

5. Sample Preparation

5.1 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, miniature internal mixer, or laboratory internal mixer, although slightly different results may be obtained.

6.2 Mill Procedure:

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

6.2.1.1 Mix with the mill roll temperature maintained at $50 \pm 5^\circ\text{C}$ ($122 \pm 9^\circ\text{F}$). The indicated mill openings are desired and should be maintained as closely as possible to provide uniformity in the breakdown of the rubber due to milling.

6.2.2 Mixing Cycle:

¹ These test methods are under the jurisdiction of ASTM Committee D-11 on Rubber and are the direct responsibility of Subcommittee D11.23 on Synthetic Rubbers.

Current edition approved Nov. 10, 1997. Published April 1998. Originally published as D 3186 – 81. Last previous edition D 3186 – 95.

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