

## Certificate

### Standard Reference Material 388d Butyl Rubber

Standard Reference Material 388d has the following characteristics when tested by procedures described in the appendix overleaf. The uncertainty limits for the values reflect both variation within the lot of rubber and error of test, and are based on a confidence coefficient of 95 percent. The Mooney viscosity of the rubber is  $74.5 \pm 1.5$  ML 1 + 8 (100 °C), the uncertainty reflects permissible variations in the viscometer.

Characteristic of Compound	Units	Procedure I	Procedure II
Viscometer cure at 150 °C.			
Minimum viscosity	ML	52.9 ± 0.5	33.8 ± 0.9
Incipient cure, $t_s$	min	6.86 ± 0.05	11.7 ± 0.06
Cure index, $\Delta t$	min	1.56 ± 0.02	2.95 ± 0.15
Stress at 400% Elongation			
Cure A	lb/in <sup>2</sup>	920 ± 40	—
Cure B	lb/in <sup>2</sup>	1290 ± 40	—
Cure C	lb/in <sup>2</sup>	1615 ± 40	—
Stress at Failure			
Cure A	lb/in <sup>2</sup>	2930 ± 50	—
Cure B	lb/in <sup>2</sup>	2980 ± 50	—
Cure C	lb/in <sup>2</sup>	2970 ± 50	—
Elongation at Failure			
Cure A	%	785 ± 15	—
Cure B	%	690 ± 15	—
Cure C	%	615 ± 15	—
Strain at 400 lb/in <sup>2</sup>			
Cure A	%	276 ± 6	—
Cure B	%	218 ± 3	—
Cure C	%	191 ± 3	—
Strain at 5 kg/cm <sup>2</sup>			
Cure A	%	—	216 ± 5
Cure B	%	—	153 ± 3
Cure C	%	—	137 ± 3
Electrical Resistivity			
Cure C	megohm-cm	0.12 ± 0.02	—

This lot of rubber was evaluated in the National Bureau of Standards, Institute for Applied Technology, by George E. Decker, George W. Bullman, and Albert M. Brown, of the Evaluation Criteria Section, Robert D. Stiehler, Chief.

WASHINGTON, D. C. 20234  
 April 17, 1967

W. WAYNE MEINKE, Chief  
 Office of Standard Reference Materials

**CAUTION: STORE THIS MATERIAL IN  
 THE DARK SINCE EXPOSURE TO LIGHT  
 AFFECTS THE PROPERTIES.**

(Over)

APPENDIX TO CERTIFICATE FOR STANDARD REFERENCE  
MATERIAL 388D

**MATERIAL:** Standard Reference Material 388d was selected from a lot of IIR Type 218, prepared from a single slurry tank of crumb. Sheets of the dried rubber weighing approximately 27 kg were wrapped with polyethylene film, and packaged in cardboard cartons. To evaluate the lot, a 1000-gram portion was taken at the start and during the filling of each fifth container.

**TESTS:** Two determinations of Mooney viscosity were made on each portion according to the procedure described in ASTM Designation D 1646-63 using integral dies in the viscometer.

**Procedure I**—Thirty-six compounds were prepared from nine portions in accordance with the formulation and mixing procedure described in ASTM Designation D 15-64T for Standard Formula 2D; the black was dried for one hour at 100 °C before weighing and the mixing done in a room conditioned at  $23^{\circ} \pm 1$  °C and  $35 \pm 3$  percent relative humidity.

**Procedure II**—Thirty-six compounds were prepared from nine portions in accordance with the formulation and mixing procedure described in ASTM D 15-64T for Standard Formula 1D in a room conditioned at  $23^{\circ} \pm 1$  °C and  $35 \pm 3$  percent relative humidity.

The following NBS Standard Reference Materials were used to prepare the compounds by Procedures I and II: Zinc Oxide-370b, Sulfur-371e, Stearic Acid-372f, Benzothiazyl-disulfide-373c, Tetramethylthiuramdisulfide-374b, and Channel Black-375e.

The viscometer cure characteristics of each compound were determined at 150 °C according to ASTM Designation D 1646-63 selecting for the cure index the time required to increase from 5 to 35 points above the minimum. The remaining compound was vulcanized at 150 °C as described in ASTM Designation D 15-64T using a four-cavity mold machined directly in the hot plates of the press for the following periods:

Procedure I—25, 50 and 100 minutes for cures A, B, and C, respectively;

Procedure II—20, 30 and 50 minutes for cures A, B, and C, respectively.

Stress at 400 percent elongation, stress at failure, and elongation at failure were measured on vulcanizates prepared by Procedure I in accordance with ASTM Designation D 412-64T using Die C. Strain was measured as described in ASTM Designation D 1456-61 using a load of 400 lb/in<sup>2</sup> for vulcanizates prepared by Procedure I and 5 kg/cm<sup>2</sup> for those prepared by Procedure II.