

SAMPLING AND SIEVING OF CRUMB RUBBER

(An Arizona Method)

1. SCOPE

- 1.1 This method describes the procedure for sampling and determining the sieve analysis of crumb rubber.
- 1.2 This test method may involve hazardous material, operations, or equipment. This test method does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user to consult and establish appropriate safety and health practices and determine the applicability of any regulatory limitations prior to use.
- 1.3 See Appendix A1 of the Materials Testing Manual for information regarding the procedure to be used for rounding numbers to the required degree of accuracy.

2. APPARATUS

- 2.1 Requirements for the frequency of equipment calibration and verification are found in Appendix A3 of the Materials Testing Manual.
- 2.2 Sieves for fine screening conforming to ASTM E11, with a diameter of 8 inches, nested in sizes: #8, #10, #16, #30, #40, #50, #100, #200, and bottom pan.
- 2.3 A balance or scale capable of measuring the maximum weight to be determined and conforming to the requirements of AASHTO M 231, except the readability and sensitivity of any balance or scale utilized shall be at least 0.1 grams.
- 2.4 Oven capable of maintaining a temperature of 140 ± 5 °F.
- 2.5 A small riffle splitter with one-half inch openings.
- 2.6 Mechanical sieve shaker which imparts a vertical, or lateral and vertical, motion to the sieves, causing the particles thereon to bounce and turn so as to present different orientations to the sieving surface.

- 2.7 Splitting blanket of adequate size for approximately 1500 grams of crumb rubber.
- 2.8 Talc (Talcum Powders) – Usually some mixture of magnesium silicate, silica, magnesium oxide, or magnesium-aluminum silicate. 100 percent of the particles shall pass a No. 200 sieve.
- 2.9 A one-quart glass jar with large opening, and lid.
- 2.10 Scoop, shovel, “sample thief” or other suitable device for obtaining samples.

3. SAMPLING

- 3.1 Samples shall be obtained at the hot plant or CRA (Crumb Rubber Asphalt) blending unit from bags selected by the Engineer.
- 3.2 The sample shall be obtained from the top of a randomly selected bag of crumb rubber, taken at a minimum of three random locations at least 3” below the surface, using a scoop, shovel, “sample thief”, or other suitable device. The combined sample size shall be approximately 1500 grams.
- 3.3 If the contractor suspects that segregation of the crumb rubber has occurred in the bag, the contractor may propose that the sample be obtained in a method which differs from that specified in Subsection 3.2 above. The proposed method of sampling must be approved by the Engineer and must render a representative sample. The sample shall be obtained by the contractor and witnessed by the Engineer.

4. SAMPLE PREPARATION

- 4.1 Dry the approximate 1500 gram sample to constant mass at a temperature of 140 ± 5 °F.
- 4.2 Spread the sample on the splitting blanket and break up clumps so that the material is free flowing.
- 4.3 Mix the material thoroughly by turning the entire sample over several times in the splitting blanket.

- 4.4 Obtain a representative 100 ± 10 gram test sample of the crumb rubber by splitting the entire sample through the splitter.
- 4.5 Place the test sample in the jar, breaking up any clumps of material. Weigh the sample to the nearest 0.1 gram and record as "Prewrite of Crumb Rubber".
- 4.6 Add 5.0 grams of talc to the jar. Place the lid on the jar and mix sample thoroughly by manually shaking until the rubber and talc are uniformly mixed (a minimum of one minute). Weigh the combined rubber and talc to the nearest 0.1 gram and record as "Prewrite of Crumb Rubber and Talc". Do not record this weight as "Corrected Dry Weight".
- 4.7 Empty the sample of combined rubber and talc into the nest of sieves, thoroughly removing any material clinging to the jar and lid.

5. PROCEDURE

- 5.1 Subject the test sample to mechanical sieving for 10 ± 0.5 minutes. In no case shall fragments be turned or manipulated through the sieves by hand. If there are clumps of material retained on any of the screens, break these apart, and recombine the rubber and talc from all the sieves and bottom pan; place the material in the jar, reshake, reweigh (recording new weight of combined rubber and talc), and resieve.
- 5.2 Determine the weight retained on each sieve and the bottom pan and record to the nearest 0.1 gram. Any material adhering to the bottom of a screen shall be brushed into the next finer screen.
- 5.3 Do not discard any of the sieved material until the sum of the individual weights retained is compared to the weight of the combined rubber and talc prior to sieving ("Prewrite of Crumb Rubber and Talc"). If the difference between the two weights is less than or equal to 1.0% of the "Prewrite of Crumb Rubber and Talc", an adjustment in weight shall be made on the sieve which has the largest weight retained, except no adjustment shall be made on the minus #200 material. If the difference is greater than 1.0%, discard this test sample and obtain another 100 ± 10 gram sample as specified in Subsection 4.4 and repeat the test.

6. CALCULATION

6.1 If the weight of minus #200 material from sieving is 5.0 grams or less, record a zero as the minus #200 weight corrected for talc.

6.2 If the weight of minus #200 material from sieving is greater than 5.0 grams, subtract 5.0 grams from it and record this difference as the minus #200 weight corrected for talc.

NOTE: The adjustments made in Subsections 6.1 and 6.2 above are to account for the 5.0 grams of talc added to the sample.

6.3 After determining the minus #200 weight corrected for talc as described above, determine the "Corrected Dry Weight" by adding the weights retained on sieve size #8, #10, #16, #30, #40, #50, #100, #200 and the minus #200 corrected for talc. Record this sum as the "Corrected Dry Weight".

6.4 Determine the sieve factor for calculating the sieve analysis by dividing 100 by the "Corrected Dry Weight". Record the factor to at least six decimal places.

6.5 The percent passing for each sieve is determined by multiplying the weight retained on that sieve by the factor, and subtracting the result from the unrounded % passing the next larger sieve. Values for "weight retained times the factor" and "percent passing each sieve" shall be determined and used in the calculations to at least six decimal places. The percent passing value for each sieve is recorded in the sieve analysis to the nearest whole percent, except the percent passing the #200 sieve (corrected for talc) is recorded to the nearest 0.1 percent.

6.6 As a check on the sieve analysis, the weight of material passing the #200 (corrected for talc) is multiplied by the factor. The result of this calculation, rounded to the nearest 0.1 percent, should be the same as the value for the percent passing the #200 determined in the paragraph above.

6.7 If desired, obtain the percent retained on each sieve by subtracting the rounded % passing value for that sieve from the rounded % passing value for the next higher sieve.

7. EXAMPLE

- 7.1 Figure 1 is an example of the calculations when the weight of minus #200 material is 5.0 grams or less.
- 7.2 Figure 2 is an example of the calculations when the weight of minus #200 material exceeds 5.0 grams.
- 7.3 A blank Crumb Rubber Tabulation laboratory card is provided in Figure 3.

ARIZONA DEPARTMENT OF TRANSPORTATION
 CRUMB RUBBER TABULATION

USE CAPITAL LETTERS

LAB NUMBER				ORG NUMBER			MATL		TYPE		PUR-POSE	TEST LAB	SIZE	SIZE %
TEST NO.		LOT OR SUFFIX		SAMPLED BY				MO	DAY	YEAR	TIME		MILITARY TIME	
SAMPLED FROM				LIFT NO.		RDWY		STATION			IF MILEPOST, INPUT DECIMAL			
ORIGINAL SOURCE				PROJECT ENGINEER / SUPERVISOR			PROJECT NUMBER			TRACS NUMBER				
REMARKS														
<i>TYPE B CRUMB RUBBER</i>														

EXAMPLE

PREWEIGHT OF CRUMB RUBBER = 103.7

PREWEIGHT OF CRUMB RUBBER AND TALC = 108.7

SIEVE FACTOR

$$0.947867 = \frac{100}{\text{CORRECTED DRY WEIGHT}}$$

	WEIGHTS RETAINED	% RET.	% PASS	SPECS.
#8	0.0	0	100	
#10	0.0	0	100	100
#16	4.4	4	96	65-100
#30	52.2	50	46	20-100
#40	35.9	34	12	
#50	8.0	7	5	0-45
#100	3.7	4	1	
#200	1.3	1		
#200	3.2			
Total	108.7			

CORRECTED FOR TALC

-#200	0.0	✓	0.0	0-5
Total	105.5			

CORRECTED DRY WEIGHT

- WHITE
- YELLOW
- BLUE

RECEIVED DATE _____ TEST OPERATOR & DATE _____ SUPERVISOR & DATE _____

FIGURE 1

ARIZONA DEPARTMENT OF TRANSPORTATION
CRUMB RUBBER TABULATION

USE CAPITAL LETTERS

LAB NUMBER				ORG NUMBER				MATL		TYPE		PUR-POSE	TEST LAB	SIZE	SIZE %
TEST NO.		LOT OR SUFFIX		SAMPLED BY				MO	DAY	YEAR	TIME		MILITARY TIME		
SAMPLED FROM				LIFT NO.		RDWY		STATION				IF MILEPOST, INPUT DECIMAL			
ORIGINAL SOURCE				PROJECT ENGINEER / SUPERVISOR				PROJECT NUMBER		TRACS NUMBER					
REMARKS															

PREWEIGHT OF CRUMB RUBBER =

PREWEIGHT OF CRUMB RUBBER AND TALC =

SIEVE FACTOR

$$\frac{\text{SIEVE FACTOR}}{\text{CORRECTED DRY WEIGHT}} = \frac{100}{\text{CORRECTED DRY WEIGHT}}$$

	WEIGHTS RETAINED	% RET.	% PASS	SPECS.
#8	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
#10	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
#16	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
#30	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
#40	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
#50	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
#100	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
#200	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
~#200	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
Total	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>

CORRECTED FOR TALC

~#200	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>
Total	<input style="width: 20px;" type="text"/>	<input style="width: 20px;" type="text"/>

CORRECTED DRY WEIGHT

- WHITE
- YELLOW
- BLUE

RECEIVED DATE _____ TEST OPERATOR & DATE _____ SUPERVISOR & DATE _____

FIGURE 3