Standard Method of Test for
Wash Method for Determining Gradation of HMA Mixtures
SCDOT Designation: SC-T-92 (9/08)

1.   SCOPE

1.1.   This method is used to determine the gradation of the aggregate from a Hot Mix Asphalt (HMA) sample when the asphalt content of the mixture has been determined by SC-T-75.

2.   REFERENCED DOCUMENT

2.1.   AASHTO Standards
M 231
T 27
R 18

2.2.   South Carolina Test Methods
T 100
T 62
T 72
T 75

3.   SIGNIFICANCE AND USE

3.1.   The purpose of this procedure is to determine the aggregate gradation of an asphalt mixture in field applications. This procedure is often used to prevent aggregate breakdown of asphalt mixtures, and to ensure that the gradations meet job mix specifications.

4.   APPARATUS

4.1.   Balance - sufficient capacity and sensitivity to 0.1g. (AASHTO M-231)

4.2.   Solvent- shall be a biodegradable, nontoxic asphaltic extracting solvent.

4.3.   Oven capable of maintaining 135°C $\pm$ 5°C.

4.4.   Hot plate or Oven- capable to maintaining 110 $\pm$ 5°C.

4.5.   Sieves and shaker- to conduct gradation analysis.

4.6.   Miscellaneous Equipment: Pans dimensions 305mm x 203mm x 76mm deep (12in x 8in 3in deep) or bowls with the capacity of approximately 9.5 L (10 quarts), spatula for stirring sample, and sieve brushes

5.   TEST SPECIMEN

5.1.   Representative sample of bituminous mixture to yield a minimum sample size as listed in Figure SC-T-92-A after quartering.

6. PROCEDURE

6.1. Obtain a representative sample of the mixture using SC-T-62, and reduce a HMA sample to testing size using SC-T-72, according to Figure SC-T-92-A. The correct sample size is determined by the nominal maximum sieve size of the HMA mixture.

Nominal Maximum Aggregate Size, mm	Minimum Mass of Sample, gms
No. 4	1000
3/8 in.	1100
1/2 in.	1250
3/4 in.	1500
1.0 in.	3000
1 ½ in.	4000

Figure SC-T-92-A – Sample size

6.2. Dry the sample for 15 to 30 minutes in an oven at 125°C $\pm$ 5°C (257°F $\pm$ 9°F) and weigh to the nearest 0.1g. RAP stockpile samples shall be heated until dry, approximately 30 to 60 minutes.

6.3. Determine the percent asphalt binder being added to the mixture at the time that the sample was obtained from the results of the ignition oven using SC-T-75.

6.4. Place the mixture in the pan, pail or bowl and cover with solvent. Gently agitate the sample frequently with a spatula. Continue this process for 15 to 30 minutes for plant produced mixtures and 30 to 60 minutes for RAP stockpile samples.

6.5. Decant the solvent, pouring over a No. 8 sieve nested over a No. 200 sieve. Dispose of the solvent according to the products MSDS. Add water, agitate and decant over the same sieves. Continue washing with water until the wash water is clear. Material retained on either of the sieves shall be washed back into the sample. Decant off any excess water. Care should be taken to avoid the loss of particles.

6.6. Dry the sample to a constant weight in an oven or on a hot plate at 125°C $\pm$ 5°C (257°F $\pm$ 9°F). Stir occasionally to avoid excessive temperature in the drying process.

6.7. Conduct a gradation test on the aggregate according to the procedures of AASHTO T-27.

7. CALCULATIONS

7.1. Calculate the total dry weight of the aggregate as follows:

$W_{agg} = W_{mix} * (1 - (\% \text{ Binder} / 100))$.

W_{agg} = Total dry weight of the aggregate before wash, gms.
W_{mix} = Total dry weight of the HMA mixture, gms.
% Binder = Percent asphalt binder determined by SC-T-75.

Calibration Factor	C_F	0.11
Test Temperature	$T\ (°C)$	538
Temperature Compensation Factor	T_{CF}**	0.21
Wt. Basket	W_b	3611.5
Wt. Basket + Sample	W_T	5056.8
Wt. Sample (Initial)	$W_i = W_T - W_b$	1445.3
Wt. Sample (Final)	W_f	1370.4
Uncorrected % AC	$\% AC_{UNCORR} = [(W_i - W_f)/W_i] * 100\%$	5.18
Corrected % AC	$\% AC_{CORR} = \% AC_{UNCORRECTED} = + C_F + T_{CF}{}^{**}$	5.50

Figure SC-T-92-B

Original Sample		Example Calculations
Initial Wt. Sample & Container	W_{Ti}	1747.9
Wt. of Container	W_C	500.0
Initial Sample Wt.	$W_{mix} = W_{Ti} - W_C$	1247.9
Material Dried		
Wt. of Binder	$W_B = W_{mix} \times (\% AC_{corr} / 100)$	68.6
Wt. Before Wash	$W_{agg} = W_{mix} - W_B$	1179.3
Wt. Sample & Container After Wash	W_{Tf}	1622.3
Final Sample Wt.	$W_f = W_{Tf} - W_C$	1122.3
Total Loss Thru No. 200 sieve	$W_L = W_{agg} - W_f$	57.0

Figure SC-T-92-C

7.2. Calculate the gradation as required using the dry weight of aggregate determined in the above calculation.

Sieve Size	Wt. Passing (gms.)	$+ W_L$ (gms.)	= Total Wt. Passing (gms.)	Total % Passing
3/4 in.	1122.3	57	1179.3	100.0
1/2 in.	1083.2	57	1140.2	96.7
3/8 in.	1012.0	57	1069.0	90.6
No. 4	766.3	57	823.3	69.8
No. 8	592.3	57	649.3	55.1
No. 30	353.2	57	410.2	34.8
No. 100	52.3	57	109.3	9.3
No. 200	12.1	57	69.1	5.86

Figure SC-T-92-D

8. REPORT

8.1. The results of the sieve analysis should be recorded to the nearest 0.1 percent on all sieves other than the No. 200 sieve (0.01 percent) on Form 400.03 – Ignition Oven Worksheet, and reported on Form 400.05 – Daily Plant Report.