Supplemental Technical Specification for

Hot-Mix Asphalt Material Properties

SCDOT Designation: SC-M-402 (07-2017)

1. SCOPE

1.1 Use the following specifications for preparing, constructing, and accepting Hot-Mix Asphalt (HMA) material properties. **NOTE: Refer to the Standard Specifications, Division 300 for HMA Base Courses and Division 400 for HMA Surface and Intermediate Courses for additional properties and specifications that are not included here.**

2. REFERENCED DOCUMENTS

2.1 SCDOT Standard Specifications

2.1.1 Division 300, Division 400, SC-M-407

2.2 AASHTO Standards

2.2.1 T85, T96, T104, T-312, T335, T340

2.3 SCDOT Test Methods

2.3.1 SC-T-77, SC-T-102

3. REQUIREMENTS FOR MIXTURES

3.1 Requirements for all HMA mixtures.

3.1.1 Have no more than 10% flat and elongated particles based on a 5:1 ratio based on SC-T-77.

3.1.2 Determine coarse aggregate Sodium Sulfate Soundness by AASHTO T104.

3.1.3 Determine LA Abrasion by AASHTO T96.

3.1.4 Determine Absorption by AASHTO T85.

3.1.5 The composition limits are master ranges of tolerances. Conform to a closer control meeting the tolerance requirements as specified in Section 401.2.3.3.

3.1.6 VMA requirements for Surface and Intermediate Courses:

Nominal Max. Aggregate Size	Minimum, %
3/4"	13.5
1/2"	14.5
3/8"	15.5
No. 4	17.5

3.1.7 Use hydrated lime as an asphalt anti-stripping additive (ASA) in all mixes unless otherwise permitted in the following tables.

3.2 If crushed stone is required in the following tables, use crushed coarse aggregate meeting the following requirements:

3.2.1 Have 2 or more freshly mechanically-induced fractured faces meeting the percentage stated in each table based on count of the material retained on the No. 4 sieve as determined by AASHTO T335.

3.3 Ensure rutting susceptibility is checked based on mix type as determined by AASHTO T340.

3.4 Ensure the Recycled Asphalt Pavement (RAP) conforms to Supplemental Technical Specification SC-M-407.

3.5 D/A Ratio requirements for Surface and Intermediate Courses:

D/A Ratio	**Mix Design Requirement (Washed Gradation)**	**Field Requirement (Dry Gradation) SC-T-102**
Range Limits	0.60 -1.20	0.40-1.00

3.2 Summary of Surface Course Requirements – Design Requirements*

Designation	Type A	Type B	Type C	Type D	Type E
System Application	Interstate / Intersections	High Volume Primary	High Volume Secondary	Low Volume Secondary	Seal Course
Gradation Requirements					
1”			----	----	----
¾”	100.0	100.0	100.0	100.0	----
½”	95.0 –100.0	95.0 –100.0	97.0 – 100.0	97.0 – 100.0	----
3/8”	76.0 –100.0	76.0 –100.0	83.0 – 100.0	90.0 – 100.0	100.0
No. 4	52.0 – 75.0	52.0 – 75.0	58.0 – 80.0	70.0 – 95.0	90.0 – 100.0
No. 8	36.0 – 56.0	36.0 – 56.0	42.0 – 62.0	50.0 – 82.0	70.0 – 100.0
No. 30	16.0 – 36.0	16.0 – 36.0	20.0 – 40.0	20.0 – 50.0	36.0 – 70.0
No. 100	5.0 – 18.0	5.0 – 18.0	5.0 – 20.0	6.0 – 20.0	4.0 – 28.0
No. 200	2.00 – 8.00	2.00 – 8.00	2.00 – 9.00	2.00 – 10.00	2.00 – 10.00
Required Design Criteria					
Gyrations	75	75	50	50	50
Binder Limits, %	4.8 - 6.0*	4.8 - 6.0*	5.0 - 6.8*	5.0 - 6.8*	6.0 - 7.0*
Binder Grade	PG 76-22	PG 64-22	PG 64-22	PG 64-22	PG 64-22
Air Voids, %	3.0 – 4.0	3.0 – 4.0	3.5 – 4.5	4.0 – 9.0	NR
VFA, %	70.0 – 80.0	70.0 – 80.0	70.0 – 77.0	60.0 – 70.0	NR
Design D/A Ratio	0.60 - 1.20	0.60 - 1.20	0.60 - 1.20	0.60 - 1.20	NR
Min. Stability 150mm x 95mm (lbs.)					2500
ITS Testing Required?	Yes	Yes	Yes	No	No
Rutting Susceptibility (max mm)	3.0	5.0	NR	NR	NR
Liquid ASA Permitted	No	No	Yes	Yes	Yes
Required Aggregate Criteria					
Local Sand Allowed?	No	No	Yes	Yes	No
Crushed Coarse Aggr. Required? (% fractured faces)	Yes (90% min)	Yes (90% min)	Yes (70% min)	No	NR
Coarse Aggr. Max. % Passing No.200	1.50	1.50	1.50	1.50	NR
LA Abrasion (B), max %	55.0	55.0	60.0	60.0	60.0
Sodium Sulfate Soundness, max %	15.0	15.0	15.0	NR	NR
Crusher Run / Asphalt Sand Allowed?	No	No	Yes (25% max)	Yes (50% max)	No
Absorption, max. %	1.5	1.5	1.5	NR	1.5
Limestone Allowed? (CA / Screenings)	No / No	No / Yes	No / Yes	Yes / Yes	No
Slag Allowed?	No	No	Yes	Yes	No
RAP	Yes	Yes	Yes	Yes	Yes (-4)

Asphalt binder content may be increased based on percentage of aged binder in the mixture by OMR. AV and VFA limits will be allowed to extend outside of design ranges above once binder content is adjusted by OMR to assist with coating and provide additional cracking resistance.

3.3 Summary of HMA Intermediate Course Requirements – Design Requirements*

HMA Intermediate Courses			
Designation	**Type A**	**Type B**	**Type C ***
System Application	New Construction	Interstates / High Volume Primary / FDP	Low Volume Primary / Secondary / Build up / FDP
Gradation Requirements			
1”	100.0	100	100.0
¾”	90.0 – 100.0	98.0 - 100.0	90.0 – 100.0
½”	75.0 – 90.0	90.0 – 100.0	80.0 – 95.0
3/8”	64.0 – 80.0	72.0 – 90.0	68.0 – 87.0
No. 4	38.0 – 54.0	44.0 – 62.0	45.0 – 68.0
No. 8	22.0 – 36.0	23.0 – 43.0	30.0 – 46.0
No. 30	8.0 – 22.0	10.0 – 25.0	12.0 – 29.0
No. 100	3.0 – 10.0	4.0 – 12.0	4.0 – 13.0
No. 200	2.00 – 8.00	2.00 – 8.00	2.00 – 8.00
Required Design Criteria			
Gyrations	75	75	50
Binder Limits, %	4.0 – 5.5*	4.5 – 6.0*	4.0 - 6.0*
Binder Grade	PG 64-22	PG 64-22	PG 64-22
Air Voids, %	3.2 - 4.0	3.2 - 4.0	3.5 - 4.5
VFA, %	70.0 – 78.0	70.0 – 78.0	70.0 – 77.0
Design D/A Ratio	0.60 - 1.20	0.60 - 1.20	0.60 - 1.20
Min. Stability (lbs.)	No Requirement (NR)		
ITS Testing Required?	Yes	Yes	Yes
Rutting Susceptibility (max mm)	3.0	5.0	NR
Liquid ASA Permitted	No	No	Yes
Required Aggregate Criteria			
Local Sand Allowed?	No	No	Yes
Crushed Coarse Aggregate Required? (% fractured faces)	Yes (90% min.)	Yes (90% min.)	No
Coarse Aggr. – max. % Passing No. 200	1.5	1.5	NR
LA Abrasion (B), max. %	55.0	55.0	60.0
Sodium Sulfate Soundness, max %	No Requirement (NR)		
Crusher Run / Asphalt Sand Allowed?	No	No	Yes (50% max)
Absorption, max. %	1.5	1.5	NR
Limestone Allowed? (CA / Screenings)	No / No	No / Yes	Yes / Yes
Slag Allowed?	Yes	Yes	Yes
RAP	Yes	Yes	Yes

Asphalt binder content may be increased based on percentage of aged binder in the mixture by OMR. AV and VFA limits will be allowed to extend outside of design ranges above once binder content is adjusted by OMR to assist with coating and provide additional cracking resistance.

3.4 Summary of HMA Base Course Requirements

HMA Base Courses					
Designation	**Type A**	**Type B**	**Type C**	**Type D**	**Shoulder Widening**
System Application	Interstates / Primary	Secondary	Specialty	Specialty	Specialty
Gradation Requirements					
1 ½"	100.0	100.0	----	----	100.0
1"	85.0 - 100.0	85.0 - 100.0	----	----	80.0 - 100.0
½"	60.0 - 80.0	60.0 - 80.0	----	----	75.0 - 92.0
3/8"	----	----	100.0	----	
No. 4	40.0 - 55.0	40.0 - 55.0	90.0 – 100.0	----	45.0 - 65.0
No. 8	30.0 - 45.0	30.0 - 45.0	70.0 – 100.0	----	35.0 - 55.0
No. 30	----	----	36.0 – 70.0	----	
No. 100	----	----	4.0 – 28.0	----	
No. 200	----	----	2.00 – 10.00	----	
Required Design Criteria					
Gyrations	----	----	50	50	----
Binder Limits, %	4.0 - 5.5	4.0 - 5.5	4.3 - 5.7	3.8 - 5.2	3.8-5.2
Binder Grade	PG 64-22	PG 64-22	PG 64-22	PG 64-22	PG 64-22
Min. Stability, lbs.	NR	NR	2500	1500	NR
ITS Testing Required?	No Requirement (NR)				
Rutting Susceptibility (max mm)	No Requirement (NR)				
Liquid ASA Permitted	No	Yes	Yes	Yes	Yes
Required Aggregate Criteria					
Local Sand Allowed?	No	Yes	No	Yes	Yes
Crushed Coarse Aggregate Required? (% fractured faces)	Yes (90% min)	No	No	No	No
LA Abrasion (B), max. %	60.0	60.0	60.0	60.0	60.0
Sodium Sulfate Soundness, max %	No Requirement (NR)				
Crusher Run / Asphalt Sand Allowed?	Yes (50% max)	Yes (50% max)	No	No	Yes
Absorption, max. %	No Requirement (NR)				
Limestone Allowed? (CA / Screenings)	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes
Slag Allowed?	Yes	Yes	Yes	Yes	Yes
RAP	Yes	Yes	Yes (-4)	Yes (-4)	Yes