

Supplemental Technical Specification for
Material Properties for Asphalt Mixtures

SCDOT Designation: SC-M-402 (January 1, 2023)

APPROVED:

Division Administrator

By: _____

FEDERAL HIGHWAY ADMINISTRATION

1. SCOPE

1.1 Use the following specifications for preparing, constructing, and accepting asphalt mixture material properties. **NOTE: Refer to the Standard Specifications for Asphalt Base, Intermediate, and Surface Courses for additional properties and specifications that may not be included here.**

2. REFERENCED DOCUMENTS

2.1 SCDOT Standard, Supplemental, and Supplemental Technical Specifications

2.1.1 Division 300, 400, SC-M-407

2.2 AASHTO Standards

2.2.1 T 85, T 96, T 104, T 312, T 335, T 340

2.3 ASTM Standards

2.3.1 D8225

2.4 SCDOT Test Methods

2.4.1 SC-T-77, SC-T-102

3. REQUIREMENTS FOR MIXTURES

3.1 Aggregates

3.1.1 For all asphalt mixtures use only fine and coarse aggregates listed on SCDOT Qualified Products List 1 and 2.

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

3.1.3 If crushed stone is required in the following tables, use crushed coarse aggregate meeting these additional requirements. Must 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 T 335.

3.1.4 Determine coarse aggregate Sodium Sulfate Soundness by AASHTO T 104.

3.1.5 Determine LA Abrasion by AASHTO T 96.

3.1.6 Determine Absorption by AASHTO T 85.

3.1.7 Use aggregates with a combined effective specific gravity of 2.90 or less.

3.1.8 Ensure all Recycled Materials conform to Supplemental Technical Specification SC-M-407.

3.2 Asphalt Mix Requirements

3.2.1 Master gradation ranges for each mix type are listed in section 3.3 and 3.4. The table below states the sieve tolerances that are applied by the Department to the individual sieve targets on the job mix formula to establish upper and lower specification limits. Sieve targets must be within +/- 3.0% of the computed-combined gradation unless otherwise permitted by the AME. However, the tolerances are not permitted to extend outside the master ranges in order for the mix to be considered a particular mix type.

Sieve Size % Passing	Intermediate Courses +/- tolerance	Surface Courses +/- tolerance
3/8 inch & larger	7.0%	7.0%
No. 4	6.0%	7.0%
No. 8	6.0%	6.0%
No. 30	5.0%	5.0%
No. 100	4.0%	4.0%
No. 200	2.0%	2.0%

3.2.2 Conform to the following Dust to Asphalt (D/A) Ratio requirements for Surface and Intermediate Courses:

D/A Ratio	Mix Design Requirement (Washed Gradation) SC-T-76	Field Requirement (Dry Gradation) SC-T-102
Range Limits	0.60 -1.20	0.40-1.10

D/A Ratio is computed by taking the combined gradation for the passing No. 200 sieve and dividing by the optimum binder content for the mix design.

3.2.3 Conform to the following 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

Nominal Maximum Aggregate Size is defined as one sieve size larger than the first sieve to retain more than 10%

3.2.3 Ensure rutting susceptibility is checked based on mix type as determined by AASHTO T 340. Conform APA mixtures to the requirements in the table below.

Type of Asphalt Mixture	Maximum Rut Depth (mm) after 8000 cycles in APA @ 64°C
Surface B, Intermediate A, Intermediate B, and Intermediate B Special	5.0
Surface Type A	3.0

3.2.4 Ensure cracking susceptibility is checked based on mix type as determined by ASTM D8225.

3.2.5

Conventional dense graded Surface and Intermediate mixtures may be adjusted using a Corrected Asphalt Binder Content (COAC) based on the amount of aged binder contribution. The amount of correction is based on a 75% binder availability factor in the recycled asphalt binder content when utilizing RAP and RAS. This adjustment is performed by the Department after all other mix properties are met including Percent Air Voids, VMA, VFA, and Gradation.

3.3

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	65.0 – 100.0
No. 30	16.0 – 36.0	16.0 – 36.0	20.0 – 40.0	20.0 – 50.0	30.0 – 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.)	NR	NR	NR	NR	2500
ITS Testing Required?	Yes	Yes	Yes	No	No
Rutting Susceptibility (max mm)	3.0	5.0	NR	NR	NR
Liquid ASA Permitted	Yes	Yes	Yes	Yes	Yes
Required Aggregate Criteria					
Local Sand Allowed?	No	No	Yes	Yes	Yes (30% Max)
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)
RAS	No	No	Yes	Yes	No
Recycled Glass	No	No	No	No	No

***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.**

Intermediate Courses				
Designation	Type A	Type B	Type B Special**	Type C
System Application	New Construction	Interstates High Volume Primary FDP	Rehabilitation Repairs Interstates High Volume Primary FDP	Low Volume Primary Secondary Build up FDP
Gradation Requirements				
1"	100.0	100	100.0	100.0
¾"	90.0 – 100.0	98.0 - 100.0	98.0 - 100.0	90.0 – 100.0
½"	75.0 – 90.0	90.0 – 100.0	90.0 – 100.0	80.0 – 95.0
3/8"	64.0 – 80.0	72.0 – 90.0	72.0 – 90.0	68.0 – 87.0
No. 4	38.0 – 54.0	44.0 – 62.0	44.0 – 62.0	45.0 – 68.0
No. 8	22.0 – 36.0	23.0 – 43.0	23.0 – 43.0	30.0 – 46.0
No. 30	8.0 – 22.0	10.0 – 25.0	10.0 – 25.0	12.0 – 29.0
No. 100	3.0 – 10.0	4.0 – 12.0	4.0 – 12.0	4.0 – 13.0
No. 200	2.00 – 8.00	2.00 – 8.00	2.00 – 8.00	2.00 – 8.00
Required Design Criteria				
Gyrations	75	75	75	50
Binder Limits, %	4.0 – 5.5*	4.5 – 6.0*	4.5 - 6.0*	4.0 - 6.0*
Binder Grade	PG 64-22	PG 64-22	PG 64-22	PG 64-22
Air Voids, %	3.2 - 4.0	3.2 - 4.0	2.5 – 3.0	3.5 - 4.5
VFA, %	70.0 – 78.0	70.0 – 78.0	70.0 – 85.0	70.0 – 77.0
Design D/A Ratio	0.60 - 1.20	0.60 - 1.20	0.60 - 1.20	0.60 - 1.20
Min. Stability (lbs.)	No Requirement (NR)			
ITS Testing Required?	Yes	Yes	Yes	Yes
Rutting Susceptibility (max mm)	3.0	5.0	5.0	NR
Liquid ASA Permitted?	Yes	Yes	Yes	Yes
WMA Required?**	No	No	Yes	No
Required Aggregate Criteria				
Local Sand Allowed?	No	No	No	Yes
Crushed Coarse Aggregate Required? (% fractured faces)	Yes (90% min.)	Yes (90% min.)	Yes (90% min.)	No
Coarse Aggr. – max. % Passing No. 200	1.5	1.5	1.5	NR
LA Abrasion (B), max. %	55.0	55.0	55.0	60.0
Sodium Sulfate Soundness, max %	No Requirement (NR)			
Crusher Run / Asphalt Sand Allowed?	No	No	No	Yes (50% max)
Absorption, max. %	1.5	1.5	1.5	NR
Limestone Allowed? (CA / Screenings)	No / No	No / Yes	No / Yes	Yes / Yes
Slag Allowed?	Yes	Yes	Yes	Yes
RAP	Yes	Yes	Yes	Yes
RAS	No	No	No	Yes
Recycled Glass	No	No	No	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.**

**** - Chemical process only**

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	65.0 - 100.0	----	35.0 - 55.0
No. 30	----	----	30.0 - 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	Yes	Yes	Yes	Yes	Yes
Required Aggregate Criteria					
Local Sand Allowed?	No	Yes	Yes (30% Max)	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
RAS	Yes	Yes	No	No	Yes
Recycled Glass	Yes	Yes	No	No	Yes