

703.01 Fine Aggregate for Concrete. Fine aggregate for concrete shall conform to the requirements of AASHTO M 6, Class A. The minimum sand equivalent, as tested in accordance with Colorado Procedure 37 shall be 80 unless otherwise specified. The fineness modulus, as determined by AASHTO T 27, shall not be less than 2.50 or greater than 3.50 unless otherwise approved.

703.02 Coarse Aggregate for Concrete. Coarse aggregate for concrete shall conform to the requirements of AASHTO M 80, Class A, except that the percentage of wear shall not exceed 45 when tested in accordance with AASHTO T 96.

703.03 Aggregate for Bases. Aggregates for bases except Aggregate Base Course (RAP) shall be crushed stone, crushed slag, crushed gravel, natural gravel, or crushed reclaimed concrete. Aggregate Base Course (RAP) shall be 100 percent crushed recycled asphalt pavement material. All materials except Aggregate Base Course (RAP) shall conform to the quality requirements of AASHTO M 147 except that the requirements for the ratio of minus 75 µm (No. 200) sieve fraction to the minus 425 µm (No. 40) sieve fraction, stated in 3.2.2 of AASHTO M 147, shall not apply

The requirements for the Los Angeles wear test (AASHTO T 96 and ASTM C535) shall not apply to Class 1, 2, and 3. Aggregates for bases shall meet the grading requirements of Table 703-2 for the class specified for the project, unless otherwise specified.

The liquid limit shall be as shown in Table 703-2 and the plasticity index shall not exceed six when the aggregate is tested in accordance with AASHTO T 89 and T 90 respectively.

**Table 703-2
CLASSIFICATION FOR AGGREGATEBASE COURSE**

Sieve Size	Mass Percent Passing Square Mesh Sieves						
	LL not greater than 35			LL not greater than 30			
	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7
150 mm (6")			100				
100 mm (4")		100					
75 mm (3")		95-100					
60 mm (2 ½")	100						
50 mm (2")	95-100			100			
37.5 mm (1 ½")				90-100	100		
25 mm (1")					95-100	100	100
19 mm (¾")				50-90		95-100	
4.75 mm (#4)	30-65			30-50	30-70	30-65	
2.36 mm (#8)						25-55	20-85
75 µm (#200)	3-15	3-15	20 max	3-12	3-15	3-12	5-15
NOTE: Class 3 material shall consist of bank or pit run material.							

Aggregate Base Course (RAP) shall be 100 percent reclaimed asphalt pavement material conforming to the requirements of Table 703-3.

Table 703-3
CLASSIFICATION FOR RECLAIMED ASPHALT PAVEMENT
AGGREGATE BASE COURSE

Sieve Size	Mass Percent Passing Square Mesh Sieves
	ABC (RAP)
50 mm (2")	100
25 mm (1")	85-100
19 mm (¾")	75-100
12.5 mm (½")	55-90
9.5 mm (⅜")	45-80
4.75 mm (#4)	25-55
1.18 mm (#16)	5-25
75 µm (#200)	0-5

703.04 Aggregates for Hot Mix Asphalt. Aggregates for hot mix asphalt (HMA) shall be of uniform quality, composed of clean, hard, durable particles of crushed stone, crushed gravel, natural gravel, or crushed slag. Excess of fine material shall be wasted before crushing. A percentage of the aggregate retained on the 4.75 mm (No. 4) sieve for Gradings S, SX and SG— and on the 2.36 mm (No. 8) sieve for Gradings SF and ST—shall have at least two mechanically induced fractured faces when tested in accordance with Colorado Procedure 45. This percentage will be specified in Table 403-1, as revised for the project in Section 403. The angularity of the fine aggregate shall be a minimum of 45.0 percent when determined according to AASHTO T 304. Grading SF mixes, when determined by the Region Materials Engineer, may not require fine aggregate angularity of 45.0 percent. Aggregate samples representing each aggregate stockpile shall be non-plastic if the percent of aggregate passing the 2.36 mm (No. 8) sieve is greater than or equal to 10 percent by weight of the individual aggregate sample. Plasticity will be determined in accordance with AASHTO T 90. The material shall not contain clay balls, vegetable matter, or other deleterious substances.

The aggregate for Gradings ST, S, SX, and SG shall have a percentage of wear of 45 or less when tested in accordance with AASHTO T 96.

**Table 703-4
MASTER RANGE TABLE FOR HOT MIX ASPHALT**

Sieve Size	Percent by Weight Passing Square Mesh Sieves				
	Grading SF	Grading ST	Grading SX	Grading S	Grading SG
37.5 mm (1½")					100
25.0 mm (1")				100	90 – 100
19.0 mm (¾")			100	90 – 100	
12.5 mm (½")		100	90 – 100	*	*
9.5 mm (⅜")	100	90 – 100	*	*	*
4.75 mm (#4)	90 – 100	*	*	*	*
2.36 mm (#8)	*	28 – 58	28 – 58	23 – 49	19 – 45
1.18 mm (#16)	30 – 54				
600 µm (#30)	*	*	*	*	*
300 µm (#50)					
150 µm (#100)					
75 µm (#200)	2 – 12	2 – 10	2 – 10	2 – 8	1 – 7

* These additional Form 43 Specification Screens will initially be established using values from the As Used Gradation shown on the Design Mix.

Aggregates for stone matrix asphalt (SMA) shall be of uniform quality, composed of clean, hard, durable particles of crushed stone, crushed gravel, or crushed slag. A minimum of 90 percent of the particles retained on the 4.75 mm (No. 4) sieve shall have at least two mechanically induced fractured faces when tested in accordance with Colorado Procedure 45. The particles passing the 4.75 mm (No. 4) sieve shall be the product of crushing rock larger than 12.5 mm (1/2 inch) and shall be non-plastic when tested in accordance with AASHTO T 90.

Additionally, each source of aggregate for SMA shall meet the following requirements:

- (1) No more than 30 percent when tested in accordance with AASHTO T 96 Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- (2) No more than 12 percent when tested in accordance with AASHTO T 104 Soundness of Aggregate by Use of Sodium Sulfate.

**Table 703-5
MASTER RANGE TABLE FOR STONE MATRIX ASPHALT**

Sieve Size	Percent by Weight Passing Square Mesh Sieves			
	4.75 mm (#4) nominal	9.5 mm (3/8") nominal	12.5 mm (1/2") nominal	19.0 mm (3/4") nominal
25 mm (1")				100
19.0 mm (3/4")			100	90-100
12.5 mm (1/2")	100	100	90-100	50-88
9.5 mm (3/8")	100	90-100	50-80	25-60
4.75 mm (#4)	90-100	26-60	20-35	20-28
2.36 mm (#8)	28-65	20-28	16-24	16-24
1.18mm (#16)	22-36			
600 µm (#30)	18-28	12-18	12-18	12-18
300 µm (#50)	15-22	10-15		
150 µm (#100)				
75 µm (#200)	12-15	8-12	8-11	8-11

The aggregates for hot mix asphalt (HMA) and stone matrix asphalt (SMA) shall meet the requirements of Table 703-6 when tested in accordance with CP-L 4211 Resistance of Coarse Aggregate to Degradation by Abrasion in the Micro-Deval Apparatus. The Contractor shall be assessed a price reduction of \$1,000 for each production sample of the combined aggregate with a value greater than 20 according to CP-L 4211.

**Table 703-6
AGGREGATE DEGRADATION BY ABRASION
IN THE MICRO-DEVAL CP-L 4211**

	Not to exceed
Combined Aggregate (Mix Design)	18
Combined Aggregate (1/10,000 tons, or fraction thereof during production)	20

703.05 Aggregate for Cover Coat Material. Aggregates for cover coat material shall be crushed stone, crushed slag, crushed gravel, or natural gravel. Aggregates shall be composed of clean, tough, durable fragments free from an excess of flat, elongated, soft, or disintegrated pieces and free from fragments coated with dirt or other objectionable matter. Slag shall be air-cooled blast-furnace slag reasonably uniform in density.

The aggregate shall conform to the following requirements:

- (1) The percentage of wear, Los Angeles Abrasion Test (AASHTO T 96), shall not be more than 35.
- (2) The maximum amount of flat and elongated aggregate with a ratio of 3:1 shall not exceed 12 percent as determined by ASTM D4791.
- (3) When blast-furnace slag is used, the weight per cubic foot shall be at least 70 pounds.
- (4) For Type I, II, or IV cover coat material, 90 percent by weight of the particles retained on the 4.75 mm (No. 4) sieve shall have at least two fractured faces when tested in accordance with Colorado Procedure 45.
- (5) Lightweight aggregate used for cover coat material shall be an aggregate prepared by expanding shale, clay, or slate in a rotary fired kiln. Lightweight aggregate shall have a dry loose unit weight of 35 to 55 pounds per cubic foot determined in accordance with AASHTO T 19, Shoveling Procedure. The total mass of the test sample of lightweight aggregate used in AASHTO T 96 (Los Angeles Abrasion) shall be 2,000 g.

**Table 703-7
GRADATION SPECIFICATIONS FOR COVER COAT AGGREGATE**

Sieve Size	Percent by Weight Passing Square Mesh Sieve		
	9.5 mm (3/8") Type I	12.5 mm (1/2") Type II	19.0 mm (3/4")* Type IV
19.0 mm (3/4")			100
12.5 mm (1/2")		100	95-100
9.5 mm (3/8")	100	70-100	60-80
4.75 mm (#4)	0-15	0-4	0-10
75 µm (#200)	0-1.5	0-1.5	0-1.5

*Type IV shall be used only with lightweight aggregates.

703.06 Mineral Filler. Mineral filler shall conform to the requirements of AASHTO M 17 and shall consist of rock dust, slag dust, hydrated lime, hydraulic cement, fly ash, or other suitable mineral matter. It shall be free of organic

impurities and agglomerations. When used, it shall be dry enough to flow freely.

Mineral filler shall be graded within the following limits:

Sieve Size	Mass Percent Passing
600 µm (No. 30)	100
300 µm (No. 50)	95-100
75 µm (No. 200)	70-100

Mineral filler shall have a plasticity index not greater than four excluding hydrated lime and hydraulic cement.

If mineral filler other than limestone dust is used in stone matrix asphalt (SMA) it shall consist of mineral matter that meets the requirements of Tables 703-8, 703-9 and the following:

Alternative mineral filler shall consist of finely divided mineral matter such as rock dust, slag dust, fly ash, loess, or other suitable mineral matter. Calcium oxide content of any mineral filler shall not exceed 22 percent.

Alternative mineral filler test data shall be provided as part of the SMA mix design submittal and as required in Table 703-8 during production.

The Contractor shall sample and test alternative mineral filler at the frequencies listed in Table 703-8. Production will be suspended if alternative mineral filler test results fail to meet requirements. The Contractor shall submit written plans to correct the mineral filler operation to the Engineer for approval prior to commencing paving.

**Table 703-8
REQUIRED TESTING FOR ALTERNATIVE
SMA MINERAL FILLERS**

Type of Test	Contractor Testing Frequency	Specification Limit	Remarks
Plasticity Index AASHTO T90	One per 10,000 tons of SMA placed♦	4% Maximum	▲
Hydrometer Analysis AASHTO T88	One at Mix Design submittal	Report	
Gradation AASHTO T37	One per 10,000 tons of SMA placed♦	Table 703-9	▲
Calcium Oxide Content ASTM C25	One at Mix Design submittal	22% Maximum	
Modified Rigden Voids – NAPA Publication IS-101	One per 10,000 tons of SMA placed♦	Shall not exceed 50	▲
♦ The minimum frequency shall be twice per project			
▲ Sampling of alternative mineral fillers shall be at the point of introduction to the SMA and a split sample shall be submitted to the Engineer			

**Table 703-9
ALTERNATIVE SMA MINERAL GRADATION**

(AASHTO M17/ASTM D242-95)	
Sieve	Percent Passing
600 μm (#30)	100
300 μm (#50)	95 - 100
75 μm (#200)	70 - 100

703.07 Bed Course Material.

- (a) Bed course material for sidewalks, curbing, and bikeways shall consist of cinders, sand, slag, gravel, crushed stone, or other approved material of such gradation that all particles shall pass through a sieve having 19.0 mm (3/4 inch) square openings.
- (b) Bed course material for slope protection, or riprap filter blanket shall be a porous, free draining material consisting of sand, gravel, cinders, slag, crushed stone, or other approved free draining material. This material shall meet the following gradation requirements:

Sieve Size	Mass Percent Passing Square Mesh Sieves
75 mm (3 inch)	100
4.75 mm (No. 4)	20-65
75 μm (No. 200)	0-10

703.08 Structure Backfill Material.

- (a) Class 1 structure backfill shall meet the following gradation requirements:

Sieve Size	Mass Percent Passing Square Mesh Sieves
50 mm (2 inch)	100
4.75 mm (No. 4)	30-100
300 μm (No. 50)	10-60
75 μm (No. 200)	5-20

In addition, this material shall have a liquid limit not exceeding 35 and a plasticity index of not over six when determined in conformity with AASHTO T 89 and T 90 respectively.

- (b) Class 2 structure backfill shall be composed of suitable materials developed on the project. To be suitable for use under this classification, backfill shall be free of frozen lumps, wood, or other organic material. If the material contains rock fragments that, in the opinion of the Engineer, will be injurious to the structure, the native material shall not be used for backfilling and the Contractor shall furnish Class 1 structure backfill material at the contract unit price. If contract unit price does not exist for Class 1 structure backfill, it will be paid for in accordance with subsection 104.03.

(c) Class 3 structure backfill shall be a sandy gravel and meet the following gradation:

Sieve Size	Mass Percent Passing Square Mesh Sieves
9.5 mm (3/8 inch)	90-100
4.75 mm (No. 4)	45-80
0.075 mm (No. 200)	5-12

703.09 Filter Material. Filter material shall consist of free draining sand, gravel, slag, or crushed stone. The grading requirements are set forth in Table 703-10.

**Table 703-10
GRADATION SPECIFICATIONS FOR FILTER MATERIAL**

Sieve Size	Mass Percent Passing Square Mesh Sieves		
	Class A	Class B	Class C
75 mm (3")	100		
37.5 mm (1½")		100	
19.0 mm (¾")	20-90		100
4.75 mm (No. 4)	0-20	20-60	60-100
1.18 µm (No. 16)		10-30	
300 µm (No. 50)		0-10	10-30
150 µm (No. 100)			0-10
75 µm (No. 200)	0-3	0-3	0-3

703.10 Aggregate for Median Cover. Aggregate for median cover shall consist of clean crushed stone, crushed gravel, or natural gravel. The percentage of wear, when tested in accordance with AASHTO T 96, shall not be more than 70. The grading requirements shall be as follows:

Sieve Size	Mass Percent Passing Square Mesh Sieves
63 mm (2 1/2 inch)	100
50 mm (2 inch)	95-100
19.0 mm (3/4 inch)	0-15