3138 AGGREGATE FOR SURFACE AND BASE COURSES

3138.1 SCOPE

This Specification lists the quality requirements for Aggregates used for 2118, "Aggregate Surfacing," 2211, "Aggregate Base," and 2221, "Shoulder Base Aggregate."

3138.2 REQUIREMENTS

A General

Provide Aggregates that have uniform: appearance, texture, moisture content, and performance characteristics.

B Virgin Materials

Provide virgin Aggregates meeting the following requirements:

(1) Comprised of naturally occurring sound mineral Materials
(2) Class 2 must be composed of 100 percent crushed quarry rock
(3) Conforms to the quality requirements of Table 3138.2-1

Table 3138.2-1
Quality Requirements for Virgin Materials

Requirement	Class			
	1 and 2	3 and 4	5	6
Maximum Shale	NA	7.0 percent	7.0 percent	7.0 percent
Minimum Crushing Requirements *	NA	NA	25 percent	30 percent
Maximum Los Angeles Rattler (LAR) loss from Carbonate quarry rock	40 percent	40 percent	40 percent	35 percent
Maximum Insoluble residue for the portion of quarried Carbonate Aggregates passing the No. 200 Sieve	10 percent	10 percent	10 percent	10 percent
Maximum amount of Brick	1.0 percent ‖			
Maximum amount of other objectionable Materials including but not limited to: wood, plant matter, plastic, plaster, and fabric	0.1 percent ‖			

* Material crushed from quarries is considered crushed Material.
‖ The Contractor/supplier may not knowingly allow brick and other objectionable Material and must employ a QC process to screen it out, before it becomes incorporated into the final product.

C Recycled Materials

The Contactor may substitute recycled Aggregates for virgin Aggregates, if they meet the following requirements:

(1) Recycled Aggregates contain only recycled asphalt pavement (RAP), recycled concrete Materials, recycled Aggregate Materials, or certified recycled glass (not allowed in 3138.2D, "Surfacing Aggregates.")
(2) Must meet the requirements of Table 3138.2-2

Table 3138.2-2
Quality Requirements for Recycled Materials

Requirement	Class 1	Classes 3, 4, 5, and 6
Maximum Bitumen Content of Composite	4.0 percent	4.0 percent
Maximum Masonry block percent	10 percent	10 percent
Maximum percentage of glass *	Not Allowed	10 percent
Maximum size of glass *	Not Allowed	3/4 inch
Maximum amount of Brick	1.0 percent ‖	1.0 percent ‖
Maximum amount of other objectionable debris including but not limited to: wood, plant matter, plastic, plaster, and fabric	0.2 percent ‖†	0.2 percent ‖†

* Glass must meet certification requirements on the Grading and Base website. Combine glass with other Aggregates during the crushing operation.
‖ The Contractor/supplier may not knowingly allow brick and other objectionable Material and must employ a QC process to screen it out, before it becomes incorporated into the final product.
† It is recognized that recycled Aggregates may occasionally contain debris, and the 0.2 percent requirement is meant to be an average requirement for each Material delivery.

D Surfacing Aggregates

Provide surfacing Aggregates in accordance with 3138.2A, "General," 3138.2B, "Virgin Materials,"
and 3138.2C, "Recycled Materials," and meeting the following requirements:

(1) 100 percent of the Material passes the 3/4 inch Sieve, regardless of the class specified; this modifies the requirements of Table 3138.2-3, Table 3138.2-4, and Table 3138.2-5 for surfacing Aggregates
(2) Does not contain glass
(3) Recycled concrete Materials may only be used for the Roadway Shoulders
(4) There is no restriction on the bitumen content, if used for shouldering
(5) Provide Aggregate with a minimum clay content of 3 percent and a Plasticity Index (PI) of 5 – 12. The requirements for PI and minimum clay content are fulfilled if one of the following are met:

(a) the Material composed of at least 25 percent recycled Materials
(b) the Material composed of at least 50 percent crushed quarry Aggregate

Note: Class 2 must be composed of 100 percent crushed quarry rock per 3138.2B, "Virgin Materials," Note (2).

E Gradation Requirements

(1) For products containing less than 25 percent recycled Materials, conform to Table 3138.2-3.
(2) For products containing 25 percent or more recycled Materials and less than 75 percent recycled concrete, conform to Table 3138.2-4.
(3) For products containing 75 percent or more recycled concrete, conform to Table 3138.2-5.
(4) Bituminous millings meeting a gradation of 100 percent passing the 1 1/2 inch Sieve and 95-100 percent passing the 1 inch Sieve may be used for the 1-2 feet fillet/rollover outside of a paved Shoulder for class 1 and class 2.

(5) Perform gradation tests prior to bituminous extraction.

(6) The Contractor may substitute reclamation Material (recycled bituminous and Aggregate) for classes 3, 4, 5 or 6, if used for base, subbase, or stabilizing Aggregate. Meet the gradation in Table 3138.2-6, and other requirements of 3138, "Aggregate for Surface and Base Courses," except that there is no maximum bitumen content.

Table 3138.2-3
Base and Surfacing Aggregate (Containing less than 25 percent recycled Aggregates)
Total Percent Passing *

Sieve Size	Class 1 (Surfacing ‖)	Class 2 (Surfacing †)	Class 3 (Subbase)	Class 4 (Subbase)	Class 5 (Base)	Class 6 (Base)
2 inch	—	—	100	100	—	—
1 1/2 inch	—	—	—	—	100	100
1 inch	—	—	—	—	—	—
3/4 inch	100	100	—	—	70 - 100	70 - 100
3/8 inch	65 - 95	65 - 90	—	—	45 - 90	45 - 85
No. 4	40 - 85	35 - 70	35 - 100	35 - 100	35 - 80	35 - 70
No. 10	25 - 70	25 - 45	20 - 100	20 - 100	20 - 65	20 - 55
No. 40	10 - 45	12 - 35	5 - 50	5 - 35	10 - 35	10 - 30
No. 200	8.0 - 15.0	5.0 - 16.0	5.0 - 10.0	4.0 - 10.0	3.0 - 10.0	3.0 - 7.0

* If product contains recycled Aggregate, add letters in parentheses for each Aggregate blend designating the type of recycled products included in the mixture: (B) = Bituminous, (C) = Concrete, (G) = Glass, (BC) = Bituminous and Concrete, (BG) = Bituminous and Glass, (CG) = Concrete and Glass, (BCG) = Bituminous, Concrete, and Glass.
‖ Recycled concrete when used for surfacing is only allowed for Shoulders.
† Class 2 must be composed of 100 percent crushed quarry rock per 3138.2B, "Virgin Materials," Note (2).

Table 3138.2-4
Base and Surfacing Aggregate
(Containing 25 percent or more recycled Aggregates & 75 percent or less recycled concrete) Total Percent Passing *

Sieve Size	Class 1 (Surfacing ‖)	Class 3 (Subbase)	Class 4 (Subbase)	Class 5 (Base)	Class 6 (Base)
2 inch	—	100	100	—	—
1 1/2 inch	—	—	—	100	100
1 inch	—	—	—		
3/4 inch	100	—	—	70 - 100	70 - 100
3/8 inch	65 - 95	—	—	45 - 90	45 - 85
No. 4	40 - 85	35 - 100	35 - 100	35 - 80	35 - 70
No. 10	25 - 70	20 - 100	20 - 100	20 - 65	20 - 55
No. 40	10 - 45 † 5 - 45	5 - 50	5 - 35	10 - 35	10 - 30
No. 200	5.0 - 15.0 † 0 - 15.0	0 - 10.0	0 - 10.0	0 - 10.0	0 - 7.0

* Add letters in parentheses for each Aggregate blend designating the type of recycled products included in the mixture: (B) = Bituminous, (C) = Concrete, (G) = Glass, (BC) = Bituminous and Concrete, (BG) = Bituminous and Glass, (CG) = Concrete and Glass, (BCG) = Bituminous, Concrete, and Glass.
‖ Recycled concrete is only allowed for Shoulders.
† Note: For Class 1, if the bitumen content is ≥ 1.5 percent, the gradation requirement is modified to 5 – 45 percent for the No. 40 Sieve and 0 – 15.0 percent for the No. 200 Sieve.

Table 3138.2-5
Base and Surfacing Aggregate
(Containing more than 75 percent recycled concrete)
Total Percent Passing *

Sieve Size	Class 1 (Surfacing ‖)	Class 3 (Subbase)	Class 4 (Subbase)	Class 5 (Base)	Class 6 (Base)
2 inch	—	100	100	100	100
1 1/2 inch	—	—	—	—	—
1 inch	—	—	—	—	—
3/4 inch	100	—	—	45 - 100	45 - 100
3/8 inch	65 - 95	—	—	25 - 90	25 - 85
No. 4	40 - 85	35 - 100	35 - 100	15 - 65	15 - 65
No. 10	25 - 70	20 - 100	20 - 100	10 - 45	10 - 45
No. 40	10 - 45	0 - 20	0 - 20	0 - 20	0 - 20
No. 200	5.0 - 15.0	0 - 6.0	0 - 6.0	0 - 6.0	0 - 6.0

* Add letters in parentheses for each Aggregate blend designating the type of recycled products included in the mixture: (B) = Bituminous, (C) = Concrete, (G) = Glass, (BC) = Bituminous and Concrete, (BG) = Bituminous and Glass, (CG) = Concrete and Glass, (BCG) = Bituminous, Concrete, and Glass.
‖ Recycled concrete is only allowed for Shoulders.

Table 3138.2-6
Reclamation Material Permitted as a Substitute for Class 3, 4, 5, or 6 Total Percent Passing

Sieve Size	Class 3	Class 4	Class 5	Class 6
3 inch*	100	100	100	100
3/4 inch	-	-	70 – 100	70 - 100
3/8 inch	-	-	45 – 90	45 - 85
No. 4	35 -100	35 -100	35 -80	35 - 70
No. 10	20 - 100	20 - 100	20 - 65	20 - 55
No. 40	5 - 50	5 - 35	10 - 35	10 - 30
No. 200	0 – 10.0	0 – 10.0	0 – 10.0	0 – 10.0

* Note for bedding within 2 feet of plastic pipe, the requirement is 100 percent passing the 1 inch Sieve.

3138.3 SAMPLING AND TESTING

Report the No. 200 Sieve results to the nearest 0.1 percent and other Sieve results to the nearest

1 percent.

A Sampling..... *Grading and Base Manual*

B Sieve Analysis .....*Laboratory Manual* Methods *1202 and 1203*

C Los Angeles Rattler Loss .....*Laboratory Manual* Method 1210

D Shale Tests .....*Laboratory Manual* Methods 1207 and 1209

E Bitumen Content .....*Laboratory Manual* Method 1852

F Insoluble Residue .....*Laboratory Manual* Method 1221

G Reclaimed Glass.....AGI Visual Method (AGI Data sheet 15.1 and 15.2)

H Particle Size Analysis .....*Laboratory Manual* Method 1302

I Liquid Limit Determination.....*Laboratory Manual* Method 1303

J Plastic Limit Determination .....*Laboratory Manual* Method 1304

K Crushing .....*Laboratory Manual* Method 1214