

1103- AGGREGATES FOR HOT MIX ASPHALT (HMA)

SECTION 1103

AGGREGATES FOR HOT MIX ASPHALT (HMA)

1103.1 DESCRIPTION

This specification covers the quality, composition and gradation requirements of aggregates for hot mix asphalt (HMA) on QC/QA projects.

1103.2 REQUIREMENTS

a. Composition Individual Aggregates. Use aggregate from each source that complies with the gradation requirements listed in **TABLE 1103-1**.

(1) Crushed Aggregates. Limit crushed aggregates to the following materials.

(a) Produce Crushed Stone (CS-1) and Crushed Stone Screenings (CS-2) by crushing limestone, sandstone, porphyry, (rhyolite, basalt, granite, and Iron Mountain Trap Rock are examples of porphyry) or other types of stone.

(b) Produce Crushed Gravel (CG) by crushing siliceous gravel containing not more than 15% non-siliceous material. If 95% or more of crushed gravel is retained on the #8 (2.65 mm) sieve, then the material must have a minimum Uncompacted Void Content of Coarse Aggregate (UVA) value of 45 when tested in accordance with KT-80. Testing will be the same frequency as KT-50. Do not use material with a UVA value less than 45.

(c) Provide Chat (CH-1) obtained during the mining of lead and zinc ores in the tri-state mining district.

(d) Consider materials complying with Mineral Filler Supplements MFS-1, MFS-2, MFS-4, and MFS-7 as crushed aggregate.

(e) Produce Crushed Steel Slag (CSSL) by crushing electric furnace steel slag. Some sources of steel slag are angular when produced and may be treated the same as crushed gravel and manufactured sand. Use steel slag with an Uncompacted Void Content of the Fine Aggregate "U" Value, determined by test method KT-50, of more than 42.00 and the Coarse Aggregate Angularity greater than the minimum specified value. The maximum allowable quantity of crushed steel slag is 50% of the total aggregate weight.

(f) Manufactured sand shall have an Uncompacted Void Content of the Fine Aggregate "U" Value, determined by test method KT-50, greater than or equal to 42.00. Produce manufactured sand by crushing siliceous sand and gravel (designate as crushed gravel (CG-2, CG-3, etc) in the mix design), or by washing or screening crushed stone (designate as crushed stone (CS-2, CS-3, etc) in the mix design), or by washing or screening chat (designate as chat (CH-2, CH-3, etc) in the mix design).

(2) Uncrushed Aggregates. Limit uncrushed aggregates to the following materials.

(a) Produce Sand-Gravel (SSG) by mixing natural sand and gravel formed by the disintegration of siliceous and/or calcareous materials.

(b) Provide Natural Sand consisting of particles formed by the natural disintegration of siliceous and/or calcareous materials. Use natural sand with an Uncompacted Void Content "U" value of less than 42.

(c) Provide Grizzly (Grizzly Waste) consisting of the matrix or bedding material occurring in conjunction with calcitic or dolomitic cemented sandstone "Quartzite", generally separated from the sandstone prior to crushing.

(d) Provide Wet Bottom Boiler Slag (WBBS) consisting of a hard angular by-product of the combustion of coal in wet-bottom boilers. Quality requirements do not exist for this material. Obtain written approval by the Chief of Construction and Materials for use in HMA. The use of WBBS does not modify the requirements for minimum contents of either crushed stone or natural sand.

(3) Mineral Filler Supplement. Provide a mineral filler supplement that is easily pulverized and free of cemented lumps, mudballs, and organic materials that complies with the following and the general requirements in **subsection 1103.2c**. Do not blend 2 or more materials to produce mineral filler supplement. Provide only 1 mineral filler supplement in each HMA design.

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- (a) Mineral Filler Supplement designation MFS-1 is Portland cement, blended hydraulic cements, or crushed stone.
- (b) Mineral Filler Supplement designation MFS-2 is crushed limestone.
- (c) Mineral Filler Supplement designation MFS-3 is water or wind deposited silty soil material.
- (d) Mineral Filler Supplement designation MFS-4 is Hydrated lime. The minimum allowable quantity of MFS-4 or Hydrated Lime is 1% of the total aggregate weight when required as a supplement on the Contract Documents.
- (e) Mineral Filler Supplement designation MFS-5 is volcanic ash containing a minimum of 70% glass shard. The maximum allowable quantity of MFS-5 is 5% of the total aggregate weight when specified as acceptable mineral filler supplement.
- (f) Mineral Filler Supplement designation MFS-6 is fly ash. Fly ash is the finely divided residue resulting from the combustion of ground or powdered coal and is transported from the boiler by flue gasses. The maximum allowable quantity of MFS-6 is 3% of the total aggregate weight when specified as acceptable mineral filler supplement.
- (g) Mineral Filler Supplement designation MFS-7 is processed chat sludge that has been dewatered at the source of supply, and does not exceed 15% moisture content by weight at the time of shipping.

(4) Reclaimed Asphaltic Pavement (RAP). Use RAP in HMA only when such an option is permitted by Contract Special Provision. Subject the RAP to the limitations (i.e. source, max. percent allowed in mix, etc.) shown on the Contract Documents and contained in the appropriate Contract Special Provisions. Screen the RAP through a 2 ¼ inch screen or grizzly before it enters the HMA plant.

Fractionated Reclaimed Asphaltic Pavement (FRAP) is defined as having two or more RAP stockpiles, where the RAP is divided into a minimum of two fractions consisting of coarse and fine fractions. Subject the FRAP to the same limitations shown on the Contract Documents and contained in the appropriate Contract Special Provisions for RAP. Comprise the maximum percentage of FRAP of coarse or fine FRAP or a combination of coarse and fine FRAP, unless otherwise stated in the Contract Documents. Utilize a separate cold feed bin for each stockpile of FRAP used. Add FRAP to the mix through the RAP collar. Include the processing requirements for each FRAP stockpile within the Quality Control Plan.

(5) Recycled Asphalt Shingles. Recycled Asphalt Shingles (RAS) are allowed in any mixture specified to use RAP. The Contractor may use the %RAP as shown in the Contract Special Provision or a maximum of 5% RAS and 10% RAP.

Follow the guidelines in AASHTO PP 53 except as modified in this Special Provision. Drop the grade of the virgin binder one grade from both the top and the bottom grade specified for 0% RAP. For example, if a PG 64-22 is specified for 0% RAP, then the virgin grade of the binder for up to 5% RAS and 10% RAP is PG 58-28.

Comply with the Kansas Department of Health and Environment’s Bureau of waste Management Policy 2011-P3 or current version and other regulations pertaining to the recycling of shingles.

Grind the shingles to a minus 3/8-inch size. Remove deleterious materials from waste, manufacturer, or new shingles. Use post-consumer RAS that contains less than 0.5% wood by weight or less than 1.0% total deleterious by weight. Determine the gradation of the aggregate by extraction of the binder or by using TABLE 2 as a standard gradation:

TABLE 1103-1: SHINGLE AGGREGATE GRADATION	
Sieve Size	Percent Retained
3/8 in.	0
No. 4	5
No. 8	15
No. 16	30
No. 30	50
No. 50	55
No. 100	65
No. 200	75

b. Quality of Individual Aggregates.

- Soundness, minimum (KTMR-21) 0.90

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Soundness requirements do not apply to aggregates having less than 10% material retained on the No. 4 mesh sieve.

- Wear, maximum (AASHTO T 96).....40%
Wear requirements do not apply to aggregates having less than 10% retained on the No. 8 sieve.
- Absorption, maximum (KT-6)4.0%
Test aggregates for absorption as follows:
 - Crushed Stone (CS-1)Test Method KT-6, Procedure I
 - Screenings (CS-2)Test Method KT-6, Procedure II
 - Sand Gravel (SSG)/Crushed Gravel (CG)Test Method KT-6, Procedures I & IIApply the specified maximum absorption to both the fraction retained on the No. 4 sieve and the fraction passing the No. 4. Screenings produced concurrently with CS-1 will be accepted without tests for absorption.
Crushed aggregates with less than 10% materials retained on the No. 4 sieve (excluding mineral filler supplements) must be produced from a source complying with the official quality requirements of this Section prior to crushing.
- Plasticity Index, the maximum P.I. for MFS-1, MFS-2, MFS-3, MFS-5, and MFS-7 is 6.

c. Product Control of Individual Aggregates

(1) Size Requirements. Produce each individual aggregate that complies with **TABLE 1103-2 and 1103-3**

(2) Deleterious Substances. Provide combined aggregates free from alkali, acids, organic matter, or injurious quantities of other foreign substances that does not exceed the following maximum percentages by weight.

- Shale or Shale-like (KT-8) 1.0%
- Clay lumps and friable particles (KT-7) 1.0%
- Sticks (wet) (KT-35) 0.1%
- Coal (AASHTO T-113) 0.5%

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TABLE 1103-2: REQUIREMENTS FOR INDIVIDUAL AGGREGATES								
Designation	Material	Percent Retained – Square Mesh Sieves						
		1”	½”	3/8”	No. 4	No. 8	No. 30	No. 200
CS-1	Crushed Stone	0						95.5-100.0
CS-2	Crushed Stone Screenings		0	0 - 5				60-100
CG	Crushed Gravel	Blend gradation with other aggregates in the mix.						
CH-1	Chat	Blend gradation with other aggregates in the mix						
SSG	Sand & Sand Gravel	0						80-100
WBBS	Wet Bottom Boiler Slag		0	Blend gradation with other aggregates in the mix.				
CSSL	Crushed Steel Slag	Blend gradation with other aggregate in the mix.						

TABLE 1103-3: REQUIREMENTS FOR MINERAL FILLER SUPPLEMENTS								
Designation	Material	Percent Retained – Square Mesh Sieves						
		1”	½”	3/8”	No. 4	No. 8	No. 30	No. 200
MFS-1	Cement or Crushed Stone			0		0-5	0-8	0-40
MFS-2	Crushed Limestone			0		1-10		60-80
MFS-3	Silt			0	0-5			0-40
MFS-4	Hydrated Lime	Blend gradation with other aggregate in the mix						
MFS-5	Volcanic Ash			0		0-5	0-8	0-40
MFS-6	Fly Ash	Blend gradation with other aggregate in the mix						
MFS-7	Processed Chat Sludge			0		0-5	0-8	0-40

d. Stockpiling. Stockpile and handle aggregates in such a manner to prevent detrimental degradation and segregation, the incorporation of appreciable amounts of foreign material, and the intermingling of stockpiled materials.

e. Special Requirements for aggregates used in ultrathin bonded asphalt surface (UBAS).

TABLE 1103-4: INDIVIDUAL COARSE AGGREGATE PROPERTIES		
Property	Test Method	Limits
Coarse Aggregate Angularity (% min.)	KT-31	95/90 ^a
Los Angeles Abrasion (% max.) ^b	AASHTO T 96	35 ^c
Micro-Deval, (% max.) ^b	AASHTO T 327	18 ^d
Soundness (% min.)	KTMR-21	0.90 ^d
Absorption (% max.)	KT-6	4.0 ^d
Methylene Blue (% max.)	AASHTO T 330	10 ^e
An individual aggregate will be considered a coarse aggregate source if it contributes more than 5% of the total plus No. 4 sieve material of the combined aggregate (individual aggregate contribution No. 4 / total JMF retained No. 4 > 5%).		
a – 95% of the coarse aggregate has one fractured face & 90% has two or more fractured faces.		
b – Sample from stockpiled material with top size aggregate not larger than the maximum aggregate size for the mix designation type from TABLE 613-1 .		
c - For calcitic or dolomitic cemented sandstone “quartzite”, the maximum percent is 40.		
d - May use KDOT’s Official Quality results		
e – Perform this test on all individual aggregates that contribute more than 1.0% to the JMF for the material passing the No. 200 sieve.		

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Property	Test Method	Limits
Methylene Blue (% max.)	AASHTO T 330	10
Soundness (% min.)	KTMR-21	0.90 ^a
Los Angeles Abrasion (% max.)	AASHTO T 96	40 ^a
Absorption (% max.)	KT-6	4.0 ^a

a –May use KDOT’s Official Quality results.

- The above requirements for wear do not apply for aggregates having less than 10% material retained on the No. 8 sieve.
- The above requirements for soundness do not apply for aggregates having less than 10% material retained on the No. 4 sieve.

1103.3 TEST METHODS

Test aggregates according to the applicable provisions of **SECTIONS 1115 and 2501**.

1103.4 PREQUALIFICATION

Prequalify aggregate sources according to **subsection 1101.4**.

1103.5 BASIS OF ACCEPTANCE

Aggregates covered by this subsection are accepted based on the procedure described in **subsection 1101.5**.