SAGINAW COUNTY ROAD COMMISSION

3020 Sheridan Avenue
Saginaw, Michigan 48601

INVITATION TO BID

for

FURNISHING AND HAULING PLACING 23 NATURAL GRAVEL

Notice is hereby given that sealed bids for the construction of county road system improvements will be received and publicly opened at **10:00 a.m., Wednesday, July 5**, **2017** at the office of the Board of County Road Commissioners, 3020 Sheridan, Saginaw, Michigan, furnishing materials as called for in the proposal.

MAJOR ITEMS OF WORK AT VARIOUS LOCATIONS INCLUDE:

23A Natural Gravel Aprox. 14,800 Ton +-
This work is to include all labor, equipment, and materials required to complete the project.

Attached are specification and various project locations.

Bids must be sealed and delivered to the Board of County Road Commissioners, Saginaw County, Michigan, before 10:00 a.m., Wednesday July 5, 2017.

The Saginaw County Road Commission reserves the right to reject any or all bids, to waive any technicalities, and to accept any bid which it deems advantageous to the County. No bid shall be withdrawn after the opening of bids without consent of the Saginaw County Road Commission for a period of thirty (30) days.

Dated: June 15, 2017

BOARD OF COUNTY ROAD COMMISSIONERS
SAGINAW COUNTY, MICHIGAN

Richard H, Crannell. P.E. Chair
Deb Kestner, Vice Chair
John Sangster, Member
Ronald L. Sholtz, Member
Todd M. Hare, Member

Section 902. AGGREGATES

902.01. General Requirements. The Department may re-inspect and retest aggregates regardless of inspection at the producing plant. Provide safe access to the material for sampling from haul units or stockpiles.

Do not use spent metal casting foundry sand, unless the contract expressly allows for its use.

Do not contaminate aggregate during loading or measurement. Transport and place aggregate without loss of material.

902.02. Testing. Test aggregate materials in accordance with the following:

Material	Test
Wire Cloth and Sieves	AASHTO M 92
Materials Finer than 75 mm (No. 200) Sieve in Mineral Aggregates by Washing	AASHTO T 11
Specific Gravity and Absorption of Coarse Aggregate	AASHTO T 85
Specific Gravity and Absorption of Fine Aggregates	AASHTO T 84
Sieve Analysis of Fine and Coarse Aggregate	AASHTO T 27
Sampling and Testing Fly Ash	ASTM C 311
Sand Equivalent of Fine Aggregate	ASTM D 2419
Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate	ASTM D 4791
Organic Impurities in Fine Aggregate	AASHTO T 21
Sieve Analysis of Mineral Filler	AASHTO T 37
Mortar Strength	AASHTO T 71
Particle Size Analysis	AASHTO T 88
Plastic fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test	AASHTO T 167
Uncompacted Void Content of Fine Aggregate	AASHTO T 304
Water Asphalt Preferential Test	MTM 101
LA Abrasion Resistance of Aggregate	MTM 102
Insoluble Residue in Carbonate Aggregate	MTM 103
Sampling Aggregates	MTM 107
Loss by Washing	MTM 108
Sieve Analysis of Aggregate	MTM 109
Deleterious and Objectionable Particles	MTM 110
Aggregate Wear Index	MTM 112
Selection and Preparation of Coarse Aggregate Samples for Freeze-Thaw Testing	MTM 113

Making Concrete Specimens for Freeze-Thaw Testing on Concrete Coarse Aggregate ..... MTM 114
Freeze-Thaw Testing of Coarse Aggregate ..... MTM 115
Crushed Particles in Aggregates ..... MTM 117
Angularity Index of Fine Aggregate ..... MTM 118
Sampling Open-Graded Drainage Course Compacted in Place ..... MTM 119
Dry Unit Weight (LM) of Coarse Aggregate ..... MTM 123
Determining Specific Gravity and Absorption of Coarse Aggregates ..... MTM 320
Determining Specific Gravity and Absorption of Coarse Aggregates ..... MTM 321

A. **Terminology.** The Department uses the following terminology in the testing and acceptance of aggregates:

Natural Aggregates. Aggregates originated from stone quarries, gravel, sand or igneous/ metamorphic rock deposits.

Slag Aggregates. By-products formed in the production of iron, copper, and steel.

Iron Blast Furnace Slag. A synthetic nonmetallic by-product simultaneously produced with pig iron in a blast furnace that primarily consists of a fused mixture of oxides of silica, alumina, calcium, and magnesia.

Reverberatory Furnace Slag. A nonmetallic by-product of refined copper ore.

Steel Furnace Slag. A synthetic by-product of basic oxygen, electric or open-hearth steel furnaces that primarily consists of a fused mixture of oxides of calcium, silica, iron, alumina, and magnesia.

Crushed Concrete Aggregate. Crushed portland cement concrete.

Salvaged Aggregate. Dense-graded aggregate saved or manufactured from Department project sources that may consist of natural aggregate, blast furnace slag, crushed concrete, or reclaimed asphalt pavement with particle sizes no greater than 2 inches and no visible organic or foreign matter.

Manufactured Fine Aggregate. One hundred percent crushed rock, gravel, iron blast furnace slag, reverberatory furnace slag, steel furnace slag, or portland cement concrete.

Natural Sand 2NS and 2MS. Fine, clean, hard, durable, uncoated particles of sand free from clay lumps, and soft or flaky granular material resulting from the natural disintegration of rock, and used in concrete mixtures, mortar mixtures, and intrusion grout for pre-placed aggregate concrete.

Stone Sand 2SS. Sand manufactured from stone sources. These stone sources must meet the physical requirements for coarse aggregate 6A prior to crushing. The Engineer will only allow stone sand in concrete base course or structural concrete not exposed to vehicular traffic.

Soft Particles. Structurally weak particles or particles experiencing environmental deterioration, including shale, siltstone, friable sandstone, ochre, coal, and clay-ironstone.

Crushed Particles. Particles with at least one fractured face. The contract will specify the number of fractured faces based on required use. Unless otherwise specified, one fractured face is considered a crushed particle.

Base Fineness Modulus. The average fineness modulus typical of the source for a specific fine aggregate.

Cobblestones (Cobbles). Rock fragments, usually rounded or semi-rounded, with an average dimension between 3 inches and 10 inches.

902.03. Coarse Aggregates for Portland Cement Concrete. For coarse aggregates for portland cement concrete, use Michigan Class 4AA, 6AAA, 6AA, 6A, 17A, and 26A coarse aggregate produced from natural aggregate, iron blast furnace slag, or reverberatory furnace slag sources.

The Contractor may produce Michigan Class 6A, 17A and 26A from crushed portland cement concrete for uses specified in this subsection.

Ensure the bulk dry specific gravity falls within the limits established by freeze-thaw testing.

Provide coarse aggregates for portland cement concrete in accordance with Table 902-1, Table 902-2, and this subsection.

A. **Slag Coarse Aggregate.** Use slag coarse aggregate consisting of iron blast furnace slag or reverberatory furnace slag with a dry (loose measure) unit weight of at least 70 pounds per cubic foot in accordance with MTM 123.

B. **Crushed Concrete Coarse Aggregate.** Use Department-owned concrete on the project to produce crushed concrete coarse aggregate. The Contractor may use crushed concrete coarse aggregate in the following concrete mixtures: curb and gutter, valley gutter, sidewalk, concrete barriers, driveways, temporary pavement, interchange ramps with a commercial ADT less than 250, and concrete shoulders.

Do not use crushed concrete coarse aggregate in the following: mainline pavements or ramps with a commercial ADT greater than or equal to 250, concrete base course, bridges, box or slab culverts, headwalls, retaining walls, pre-stressed concrete, or other heavily reinforced concrete.

Avoid contamination with non-concrete materials, including joint sealants, HMA patching, and base layer aggregate or soil, when processing crushed concrete coarse aggregate. Limit contamination particles retained on the ⅜-inch sieve to no greater than 3.0 percent, based on a particle count of the total retained ⅜-inch aggregate particles. The Engineer will reject any aggregate stockpile contaminated with building brick, wood, or plaster. Steel reinforcement pieces may remain in the stockpile if they can pass the maximum grading sieve size without aid. Ensure the fine aggregate portion of the gradation does not exceed a liquid limit of 25.0 percent or a plasticity index of 4.0.

The Engineer will test the freeze-thaw durability of crushed concrete coarse aggregate for each project. After the Department's central laboratory receives the aggregate samples, each test requires at least three months for testing.

Crush concrete ensuring it maintains uniform aggregate properties with no apparent segregation. The specific gravity must not vary more than ±0.05 nor the absorption by more than ±0.40. Separate crushed concrete aggregate according to the original coarse aggregate type, except in the following situations:

1. If the weighed quantities of each aggregate type retained on the No. 4 sieve do not differ from the average quantities obtained from at least three representative samples by more than 10 percent; or
2. If using aggregate produced from concrete pavement with only one type of aggregate, but repaired with concrete patches with a different aggregate type.

C. **Aggregates for Optimized Gradation.**

1. **Coarse Aggregate Requirements.**

   a. Coarse aggregate includes all aggregate particles greater than or retained on the ½-inch sieve.
   b. The physical requirements for coarse aggregate are as specified in Table 902-2 for Class 6AAA and the following:

      i. Maximum 24 hour soak absorption of 2.50 percent;
      ii. Maximum freeze-thaw dilation of 0.040 percent per 100 freeze-thaw cycle;
      iii. Maximum flat and elongated particles of 15.0 percent as measured on the greater than or retained on the ¾-inch sieve using a 3:1 aspect ratio (ASTM D 4791); and
      iv. Maximum Loss by Washing per MTM 108 of 2.0 percent for materials produced entirely by crushing rock, boulders, cobbles, slag or concrete; otherwise 1.0 percent.

2. **Intermediate Aggregate Requirements.**

   a. Intermediate aggregate includes all aggregate particles passing the ½-inch sieve through those retained on the No. 4 sieve.
   b. The physical requirements for intermediate aggregate are as specified in Table 902-2 for Class 6AAA and the following:

      i. Maximum freeze-thaw dilation of 0.067 percent per 100 freeze-thaw cycle;
      ii. Maximum sum of soft and chert particles of 4.0 percent by weight (MTM 110); and
      iii. Maximum Loss by Washing per MTM 108 of 2.0 percent.

3. **Fine Aggregate Requirements.**

   a. Fine aggregate includes all aggregates particles passing the No. 4 sieve.
   b. The fine aggregate must meet the requirements of subsection 902.08.

902.04. Chip Seal Aggregates. For chip seal, use 34CS aggregate with a maximum moisture content of 4 percent, calculated in accordance with section 109 at the time of placement, and in accordance with Table 902-7, and Table 902-8.

902.05. Dense-Graded Aggregates for Base Course, Surface Course, Shoulders, Approaches and Patching. When necessary, combine fine aggregate with natural aggregate, iron blast furnace slag, reverberatory furnace slag, or crushed concrete to produce Michigan

Class 21AA, 21A, 22A, and 23A dense-graded aggregates in accordance with Table 902-1, Table 902-2, and this subsection.

Ensure dense-graded aggregate produced by crushing portland cement concrete does not contain more than 5.0 percent building rubble or hot mix asphalt by particle count. The Department defines building rubble as building brick, wood, plaster, or other material. The Engineer will allow pieces of steel reinforcement capable of passing through the maximum grading sieve size without aid.

Do not use Class 21AA, 21A and 22A dense-graded aggregate produced from crushing portland cement concrete to construct an aggregate base or an aggregate separation layer when the dense-graded layer drains into an underdrain, unless at least one of the following conditions apply:

A. A vertical layer of at least 12 inches of granular Class I, II, IIA, or IIAA exists between the dense-graded aggregate layer and an underdrain; or
B. A geotextile liner or blocking membrane, that will be a barrier to leachate, placed between the crushed concrete and the underdrain.

Only produce Class 23A dense-graded aggregate from steel furnace slag for use as an unbound aggregate surface course or as an unbound aggregate shoulder.

902.06. Open-Graded Aggregates for Earthwork, Open-Graded Drainage Courses and Underdrains. Use Michigan Class 4G, 34G, and 34R open-graded aggregates produced from natural aggregate, iron blast furnace slag, reverberatory furnace slag, or crushed concrete in accordance with Table 902-1and Table 902-2.

Ensure open-graded aggregate 4G produced by crushing portland cement concrete does not contain more than 5.0 percent building rubble or hot mix asphalt by particle count. The Department defines building rubble as building brick, wood, plaster, or other material. The Engineer will allow pieces of steel reinforcement capable of passing through the maximum grading sieve size without aid.

Do not use open-graded aggregate 34G or 34R produced from portland cement concrete.

902.07. Granular Materials for Fill and Subbase. Use granular materials consisting of sand, gravel, crushed stone, iron blast furnace slag, reverberatory furnace slag or a blend of aggregates in accordance with Table 902-3 and this subsection.

The Contractor may make the following substitutions:

A. Class I or Class IIAA material for Class II material;
B. Class I, Class II, Class IIA, Class IIAA or Class IIIA material for Class III material; and
C. Class I material for Class IIAA material.

Do not use material with cementitious properties or with permeability characteristics that do not meet design parameters for subbase.

The Engineer will only allow the use of granular material produced from crushed portland cement concrete for swamp backfill, embankment (except the top 3 feet below subgrade) and as trench backfill for non-metallic culvert and sewer pipes without associated underdrains.

The Engineer may allow the placement of granular material produced from steel furnace slag below the top 3 feet of the embankment and fill.

902.08. Fine Aggregates for Portland Cement Concrete and Mortar. Ensure that, when tested for organic impurities in accordance with AASHTO T 21, the aggregate does not produce a color darker than Plate 3 (light brown). The Engineer may approve the use of fine aggregate that fails the test for organic impurities based on one of the following:

A. The discoloration resulted from small quantities of coal, lignite, or similar discrete particles, or
B. The tested concrete develops a relative seven-day strength of at least 95 percent in accordance with AASHTO T 71.

Uniformly grade the aggregate from coarse to fine in accordance with Table 902-4. Fine aggregate 2NS, 2SS, and 2MS must meet fineness modulus requirements in Table 902-4.

Do not use crushed portland cement concrete fine aggregate in new concrete mixtures.

902.09. Aggregate General Requirements for HMA Mixtures. Ensure the HMA mixture consists of aggregate materials meeting the requirements of Table 902-5 and Table 902-6 for the mix number and type required.

A. **Coarse Aggregates.** For HMA mixtures, use natural aggregate, iron blast furnace slag, reverberatory furnace slag, steel furnace slag, or crushed concrete as coarse aggregate.

B. **Fine Aggregates.** For HMA mixtures, use natural aggregate, iron blast furnace slag, reverberatory furnace slag, steel furnace slag, manufactured fine aggregate, or a uniformly graded blend as fine aggregate. Ensure fine aggregates are clean, hard, durable, uncoated,

and free of clay lumps, organic matter, soft or flakey material and other foreign matter.

902.10. Surface Treatment Aggregates.

A. **Paver-Placed Surface Seal.** For paver-placed surface seal, use aggregate 27SS or 30SS consisting of material meeting the requirements of subsection 902.09.B and in accordance with Table 902-7 and Table 902-8.

B. **Micro-Surfacing.** For micro-surfacing, use 2FA and 3FA aggregates consisting of crushed material from a quarried stone, natural gravel, slag source, or a blend in accordance with Table 902-7 and Table 902-8.

C. **Slurry Seal.** For slurry seal, use 2FA aggregate consisting of crushed material from a quarried stone, natural gravel, slag source, or a blend in accordance with Table 902-7 and Table 902-8.

902.11. Mineral Filler for HMA Mixtures. For HMA mixtures, use dry, 3MF mineral filler consisting of limestone dust, dolomite dust, fly ash collected by an electrostatic precipitation method, slag, or hydrated lime with 100 percent passing the No. 30 sieve and 75 percent to 100 percent passing the No. 200 sieve. Mineral filler must be from a Department-approved source or must be tested on a per project basis. The free carbon content of the fly ash sample must not exceed 12 percent by weight as measured by the loss on ignition test in accordance with ASTM C 311.

Table 902-1
Grading Requirements for Coarse Aggregates, Dense-Graded Aggregates, and Open-Graded Aggregates

Material Type	Class	Item of Work by Section Number (Sequential)	Sieve Analysis (MTM 109) Total Percent Passing (a)										Loss by Washing (MTM 108) % Passing
			2½ in	2 in	1½ in	1 in	¾ in	½ in	⅜ in	No. 4	No. 8	No. 30	No. 200 (a)
Coarse Aggregates	4 AA (b)	602	100	90–100	40–60	—	0–12	—	—	—	—	—	≤2.0
	6 AAA (b)	602	—	—	100	90–100	60–85	30–60	—	0–8	—	—	≤1.0 (c)
	6 AA (b)	601, 602, 706, 708, 806	—	—	100	95–100	—	30–60	—	0–8	—	—	≤1.0 (c)
	6 A	205, 401,402, 601, 602, 603,706,806	—	—	100	95–100	—	30–60	—	0–8	—	—	≤1.0 (c)
	17 A	401,406,701,706, 708		—	—	100	90–100	50–75	—	0–8	—	—	≤1.0 (c)
	25 A		—	—	—	—	100	95–100	60–90	5–30	0–12	—	≤3.0
	26 A	706, 712	—	—	—	—	100	95–100	60–90	5–30	0–12	—	≤3.0
	29 A		—	—	—	—	—	100	90–100	10–30	0–10	—	≤3.0
Dense-Graded Aggregates	21 AA	302,304,305,306, 307	—	—	100	85–100	—	50–75	—	—	20–45	—	4–8 (d,e)
	21 A	302,305,306, 307	—	—	100	85–100	—	50–75	—	—	20–45	—	4–8 (d,e)
	22 A	302,305, 306,307	—	—	—	100	90–100	—	65–85	—	30–50	—	4–8 (d, e, f)
	23 A	306,307	—	—	—	100	—	—	60–85	—	25–60	—	9–16 (e)
Open-Graded Aggregates	4 G (g)	303	—	—	—	—	—	—	—	—	—	—	—
	34 R	401, 404	—	—	—	—	—	100	90–100	—	0–5	—	≤3.0
	34 G	404	—	—	—	—	—	100	95–100	—	0–5	—	≤3.0

a. Based on dry weights.
b. Class 6AAA will be used exclusively for all mainline and ramp concrete pavement when the directional commercial ADT is greater than or equal to 5,000 vehicles per day.
c. Loss by Washing will not exceed 2.0 percent for material produced entirely by crushing rock, boulders, cobbles, slag, or concrete.
d. When used for aggregate base courses, surface courses, shoulders and approaches and the material is produced entirely by crushing rock, boulders, cobbles, slag, or concrete, the maximum limit for Loss by Washing must not exceed 10 percent.
e. The limits for Loss by Washing of dense-graded aggregates are significant to the nearest whole percent.
f. For aggregates produced from sources located in Berrien County, the Loss by Washing must not exceed 8 percent and the sum of Loss by Washing and shale particles must not exceed 10 percent.
g. Reference contract documents.

Table 902-2
Physical Requirements for Coarse Aggregates, Dense-Graded Aggregates, and Open-Graded Aggregates

		Gravel, Stone, and Crushed Concrete						Slag (a)		All Aggregates
Material	**Series/ Class**	**Crushed Material, % min (MTM 117)**	**Loss, % max, Los Angeles Abrasion (MTM 102)**	**Soft Particles, % max (MTM 110)**	**Chert, % max (MTM 110)**	**Sum of Soft Particles and Chert, % max (MTM 110)**	**Freeze-Thaw Dilation, % per 100 cycle max (MTM 115)** (d)	**Sum of Coke and Coal Particles, % max (MTM 110)**	**Freeze-Thaw Dilation, % per 100 cycles max (MTM 115)** (d)	**Flat and Elongated Particles, ratio % max (ASTM D 4791)**
Coarse Aggregates (n)	4 AA (b)	—	40	—	—	2.0 (c)	0.020	1.0	0.020	3:1–15.0 (l)
	6 AAA	—	40	2.0 (e)	2.5	4.0	0.040 (f)	1.0	0.040 (f)	—
	6 AA (g)	—	40	2.0 (e)	—	4.0	0.067 (h)	1.0	0.067	—
	6 A (g)	—	40	3.0 (e)	7.0	9.0	0.067	1.0	0.067	—
	17 A (g)	—	40	3.5 (e)	8.0	10.0	0.067	1.0	0.067	—
	25 A	95	45	8.0 (i)	—	8.0	—	1.0	—	3:1–20.0 (m)
	26 A (g)	—	40	2.0 (e)	—	4.0	0.067	1.0	0.067	—
	29 A	95	45	8.0 (i)	—	8.0	—	1.0	—	3:1–20.0 (m)
Dense-Graded Aggregates (j)	21 AA	95	50	—				—		—
	21 A	25	50	—				—		—
	22 A	25	50	—				—		—
	23 A	25	50	—				—		—
Open-Graded Aggregates	4 G	95	45 (k)	—				—		—
	34 R	≤20	45 (k)	—				—		—
	34 G	100	45 (k)	—				—		—

Notes for Table 902-2:

a. Iron blast furnace and reverberatory furnace slag must contain no free (unhydrated) lime.
b. 2.50 percent maximum 24 hour soak absorption based on oven dry 6 series aggregate.
c. 1.0% maximum for particles retained on the 1 inch sieve.
d. If the bulk dry specific gravity is more than 0.04 less than the bulk dry specific gravity of the most recently tested freeze-thaw sample, the aggregate will be considered to have changed characteristics and be required to have a new freeze-thaw test conducted prior to use on Department projects.
e. Clay-ironstone particles must not exceed 1.0 percent for 6AAA, 6AA and 26A, and 2.0 percent for 6A and 17A. Clay-ironstone particles are also included in the percentage of soft particles for these aggregates.
f. Maximum freeze-thaw dilation is 0.067 when the directional commercial ADT is less than 5000 vehicles per day.
g. Except for pre-stressed beams, the sum of soft and chert particles may be up to 3.0 percent higher than the values determined from the sample tested for freeze-thaw durability. However, under no circumstances will the deleterious particle percentages exceed the specification limits in Table 902-2. In addition, a source may be restricted to a minimum percent crushed not to exceed 15 percent less than the percent crushed in the freeze-thaw sample. When the freeze-thaw dilation is between 0.040 and 0.067 percent per 100 cycles more restrictive limits will be applied.
h. Maximum dilation of 0.010 for pre-stressed concrete beams.
i. Friable sandstone is included in the soft particle determination for chip seal aggregates.
j. Quarried carbonate (limestone or dolomite) aggregate may not contain over 10 percent insoluble residue finer than No. 200 sieve when tested in accordance with MTM 103.
k. If a blend of different aggregate sources, the abrasion value applies to each source.
l. ASTM D 4791 Section 8.4 will be followed. The test will be performed on the material retained down to and including the 1 inch sieve.
m. ASTM D 4791 Section 8.4 will be followed. The test will be performed on the material retained down to and including the No. 4 sieve.
n. Grade P1M concrete requires an optimized aggregate gradation as specified in section 604. Use aggregates only from geologically natural sources.

Table 902-3
Grading Requirements for Granular Materials

Material	Sieve Analysis (MTM 109), Total % Passing (a)									Loss by Washing % Passing No. 200 (a), (b)
	6 in	3 in	2 in	1 in	½ in	⅜ in	No. 4	No. 30	No. 100	
Class I	—	—	100	—	45–85	—	20–85	5–30		0–5
Class II (c)	—	100	—	60–100	—	—	50–100	—	0–30	0–7
Class IIA (c)	—	100	—	60–100	—	—	50–100	—	0–35	0–10
Class IIAA	—	100	—	60–100	—	—	50–100	—	0–20	0–5
Class III	100	95–100	—	—	—	—	50–100	—	—	0–15
Class IIIA	—	—	—	—	—	100	50–100	—	0–30	0–15

a. Test results based on dry weights.
b. Use test method MTM 108 for Loss by Washing.
c. Except for use in granular blankets, Class IIA granular material may be substituted for Class II granular material for projects located in the following counties: Arenac, Bay, Genesee, Gladwin, Huron, Lapeer, Macomb, Midland, Monroe, Oakland, Saginaw, Sanilac, Shiawassee, St. Clair, Tuscola, and Wayne counties.

Table 902-4
Grading Requirements for Fine Aggregates

Material	Sieve Analysis (MTM 109), Total Percent Passing (a)							Loss by Washing % Passing No. 200 (a), (b)	Fineness Modulus Variation (c)
	⅜ in	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100		
2NS	100	95–100	65–95	35–75	20–55	10–30	0–10	0–3.0	±0.20 (d)
2SS (e)	100	95–100	65–95	35–75	20–55	10–30	0–10	0–4.0	±0.20 (d)
2MS	—	100	95–100	—	—	15–40	0–10	0–3.0	±0.20 (d)

a. Test results based on dry weights.
b. Use test method MTM 108 for Loss by Washing.
c. Aggregate having a fineness modulus differing from the base fineness modulus of the source by the amount exceeding the maximum variation specified in the table, will be rejected. Use ASTM C 136.
d. The base fineness modulus will be supplied by the aggregate producer at the start of each construction season and be within the range of 2.50 to 3.35. The base FM, including the permissible variation, will be within the 2.50 to 3.35 range.
e. Quarried carbonate (limestone or dolomite) cannot be used for any application subject to vehicular traffic.

Table 902-5
Superpave Final Aggregate Blend Gradation Requirements

Standard Sieve	Percent Passing Criteria (control points) Mixture Number 5	4	3	2	LVSP (a)
1½ in	—	—	—	100	—
1 in	—	—	100	90–100	—
¾ in	—	100	90–100	≤90	100
½ in	100	90–100	≤90	—	75–95
⅜ in	90–100	≤90	—	—	60–90
No. 4	≤90	—	—	—	45–80
No. 8	32–67	28–58	23–49	19–45	30–65
No. 16	—	—	—	—	20–50
No. 30	—	—	—	—	15–40
No. 50	—	—	—	—	10–25
No. 100	—	—	—	—	5–15
No. 200	2.0–10.0	2.0–10.0	2.0–8.0	1.0–7.0	3–6
Sieve	**Restricted Zone** (b,c)				
No. 4	—	—	—	39.5	(d)
No. 8	47.2	39.1	34.6	26.8–30.8	(d)
No. 16	31.6–37.6	25.6–31.6	22.3–28.3	18.1–24.1	(d)
No. 30	23.5–27.5	19.1–23.1	16.7–20.7	13.6–17.6	(d)
No. 50	18.7	15.5	13.7	11.4	(d)

a. For LVSP, less than 50 percent of the material passing the No. 4 sieve may pass the No. 30 sieve.
b. The final gradation blend must pass between the control points established. The following conditions must be satisfied in order for the final gradation blend to enter the restricted zone.
c. Mixture types E03, E1, E3, E10, E30, and E50 may enter the restricted zone provided the final gradation blend enters from above the maximum density line.
d. Restricted zone does not apply to LVSP.

Table 902-6
Superpave Final Aggregate Blend Physical Requirements

Est. Traffic (million ESAL)	Mix Type	Fine Aggregate Angularity Minimum Criteria		% Sand Equivalent Minimum Criteria		Los Angeles Abrasion % Loss Minimum Criteria		% Soft Particles Maximum Criteria (b)		% Flat and Elongated Particles Maximum Criteria (c)	
		Top & Leveling Courses	Base Course	Top & Leveling Courses	Base Course	Top & Leveling Courses	Base Course	Top & Leveling Courses	Base Course	Top & Leveling Courses	Base Course
<0.3	LVSP	—	—	40	40	45	45	10	10	—	—
<0.3	E03	—	—	40	40	45	45	10	10	—	—
≥0.3–<1.0	E1	40	—	40	40	40	45	10	10	—	—
≥1.0–<3	E3	40 (a)	40 (a)	40	40	35	40	5	5	10	10
≥3–<10	E10	45	40	45	45	35	40	5	5	10	10
≥10–<30	E30	45	40	45	45	35	35	3	4.5	10	10
≥30–<100	E50	45	45	50	50	35	35	3	4.5	10	10

a. For an E3 mixture type that enters the restricted zone as defined in Table 902-5, the minimum is 43. If these criteria are satisfied, acceptance criteria and associated incentive/disincentive or pay adjustment tied to this gradation restricted zone requirement included in the contract, do not apply. Otherwise, final gradation blend must be outside of the restricted zone.
b. Soft particles maximum is the sum of the shale, siltstone, ochre, coal, clay-ironstone, and particles that are structurally weak or are non-durable in service.
c. Maximum by weight with a 1:5 aspect ratio.

Table 902-7
CPM Final Aggregate Blend Gradation Requirements

Material	Mechanical Analysis, Total Percent Passing									
	¾ in	½ in	⅜ in	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200 (a)
27SS	100	85–100	55–80	22–38	19–32	15–24	11–18	8–14	5–10	4–7 (b)
30SS	—	100	85–100	22–38	19–32	15–24	11–18	8–14	5–10	4–7 (b)
34CS	—	100	90–100	0–10	0–5	—	—	—	—	≤2.0
FA2	—	—	100	90–100	65–90	45–70	30–50	18–30	10–21	5–15 (b)
FA3	—	—	100	70–90	45–70	28–50	19–34	12–25	7–18	5–15 (b)

a. Includes mineral filler.
b. No. 200 limits are significant to the nearest whole percent.

Table 902-8
CPM Aggregate Blend Physical Requirements

Material	Percent Crushed (Min) MTM 117	Angularity Index (Min) MTM 118	Uncompacted Void (Min) AASHTO T 304	Los Angeles Abrasion (% Loss Max) MTM 102	AWI (min.) MTM 112	Soft Particles (% Max) MTM 110	Sand Equivalent (% Min) AASHTO T 176	Flat and Elongated (% Max) ASTM D 4791	Absorp. (% Max) AASHTO T 85	Mico-Deval (% Loss Max) AASHTO T 327
27SS (h)	90 (b)	—	40	35	260	5.0 (a)	45	25.0 (e)	3.0	18
30SS (h)	90 (b)	—	40	35	260	5.0 (a)	45	25.0 (e)	3.0	18
34CS	95	—	—	35 (c)	260 (d)	3.5 (a)	—	12.0 (e)	—	—
FA2	—	4.0 (f)	—	45	260	—	60 (g)	—	—	—
FA3	—	4.0	—	45	260	—	60	—	—	—

a. Sum of shale, siltstone, clay-ironstone, and structurally weak.
b. Percent two-faced crushed.
c. L. A. Abrasion maximum loss of 45 for blast furnace slag.
d. Does not apply to shoulder area of the chip seal.
e. For material retained on the No. 4 sieve, ensure the ratio between length to width, or length to thickness, or combination is no greater than 3:1.
f. Angularity Index must exceed 2.0 for as least 50 percent of the blending sands for slurry seal applications.
g. Does not apply to slurry seals.
h. Must be 100% virgin aggregate.