

**HIGHWAY CONSTRUCTION – Materials Sampling & Testing Frequency (MSTF) Table**

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Excavation	Acceptance	(1)	Gradation, P.I. <sup>(5)</sup> , Moisture, (or visual description, if organic)	1 per 5,000 CY waste or undesignated waste cut	For unsuitable excavation, number consecutively EX-W-1. No need to test if waste is designated on plans
Embankment	Source Quality	(1)	L.L., P.I. <sup>(5)</sup>	1 per source-and as required based on changes in material	
	Acceptance	(1)	Standard Density	As required based on changes in material	Number consecutively BM-SD-1 or EX-SD-1.
			Field Density <sup>(2)</sup>		Number consecutively BM-D-1 or EX-D-1.
			Gradation	1 per 5,000 CY or 1 per 10,000 Tons <sup>(6)</sup>	Number consecutively BM-G-1 or EX-G-1.
	Independent Assurance	(1)	Standard Density <sup>(3)</sup>	1 per source	Use numbers that correspond to acceptance samples. Include field test results with sample.
Field Density <sup>(2)</sup> , Gradation, P.I.			1 per 50,000 CY or 1 per 100,000 Tons		
Bedding & Backfill for Conduits and Minor Structures	Source Quality	(1)	P.I. <sup>(5)</sup>	1 per source-and as required based on changes in material	
	Acceptance	(1)	Standard Density	As required based on changes in material	One density per structure (manhole, catch basin, inlet, utility vault, etc.) or pipe, with a minimum of one density per 100 lineal feet of trench (for pipes, conduit, buried cables, etc.) installed same day and same manner. Perform densities within 18 inches of the structure or outside diameter of pipe.
			Field Density	<sup>(4)</sup> (2)	
Gradation	1 per source and as required based on changes in material				
Backfill and Foundation Fill for Major Structures	Source Quality	(1)	L.L., P.I. <sup>(5)</sup>	1 per source-and as required based on changes in material	
	Acceptance	(1)	Standard Density	As required based on changes in material	
			Field Density <sup>(2)</sup>	1 per 35 CY <sup>(9)</sup> (1 layer)	
			Gradation,	1 per source and as required based on changes in material	

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Subbase	Source Quality	150 lbs.	L.A. Wear, Micro-Deval, L.L., P.I. <sup>(5)</sup>	1 per source prior to use and as required based on changes in material	Allow minimum of 14 days for transport and testing. Number consecutively Q-SB-1.
	Acceptance	<sup>(1)</sup>	Standard Density	1 per source and as required based on changes in material	Number consecutively SB-SD-1.
			Field Density <sup>(2)</sup>	1 per 2,500 CY or 1 per 5,000 Tons <sup>(7)</sup>	Number consecutively SB-D-1.
			Gradation, Fracture,		Number consecutively SB-G-1. Fracture to be performed on grading C & D only
	Independent Assurance	<sup>(1)</sup>	Standard Density <sup>(3)</sup>	1 per source	Use numbers that correspond to acceptance samples. Include field test results with sample.
			Field Density	1 per 25,000 CY or 1 per 50,000 Tons	
			Gradation, P.I., Fracture,		
Crushed Aggregate Base Course and Surface Course	Source Quality	150 lbs.	L.A. Wear, Micro-Deval, Fracture, Soundness, L.L., P.I. <sup>(5)</sup>	1 per source prior to use and as required based on changes in material	Allow minimum of 14 days for transport and testing. Number consecutively Q-BC-1 or Q-SC-1.
	Acceptance	<sup>(1)</sup>	Standard Density	1 per source and as required based on change in material	Number consecutively BC-SD-1 or SC-SD-1.
			Field Density	1 per 1,000 CY or 1 per 2,000 Tons <sup>(7)(8)</sup>	Number consecutively BC-D-1, SC-D-1, or BCM-D-1. Number consecutively BC-G-1, SC-G-1, or BCM-G-1.
			Gradation, Fracture,		
	Independent Assurance	<sup>(1)</sup>	Standard Density <sup>(3)</sup>	1 per source	Use numbers that correspond to acceptance samples. Include field test results with sample.
			Field Density		
Gradation, L.L., P.I., Fracture			1 per 10,000 CY or 1 per 20,000 Tons		

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Asphalt Treated Base Course	Source Quality	150 lbs. Aggregate	L.A. Wear, Micro-Deval, Fracture, Soundness, F&E <sup>(5)</sup> , Absorption	1 per source prior to use and as required based on changes in material	Allow minimum of 14 days for transport and testing.
	Mix Design	300 lbs. <sup>(11)</sup> Aggregate	Mix Design <sup>(9)</sup> <sup>(10)</sup>	1 per source and as required based on change in material	Allow 15 days or contract specified time for mix design and testing after receiving proposed gradation from contractor. AB = Asphalt Binder. If possible, sample at the plant for the Mix Design.
		Three 1-gallon cans of AB			
		1 pt. of Anti-strip			
	Acceptance	<sup>(1)</sup> <sup>(9)</sup>	Mat Density, Gradation, Binder Content, Fracture	1 per 1,000 Tons <sup>(7)</sup>	See the contract requirements.
Independent Assurance	<sup>(9)</sup>	Mat Density, Gradation, Binder Content, Fracture	1 per 10,000 Tons	Use numbers that correspond to acceptance samples. Include field test results with sample.	
Emulsified Asphalt Treated Base Course	Mix Design	300 lbs. Aggregate	Mix Design <sup>(9)</sup>	1 per source and as required based on change in material	Allow 15 days or contract specified time for mix design and testing after receiving proposed gradation from contractor.
		Three gallons Asphalt Emulsion			
	Acceptance	<sup>(9)</sup>	Standard Density	1 per source and as required based on change in material	See the contract requirements.
			Mat Density, Gradation, Fracture	1 per 5,000 SY	See the contract requirements.
Crushed Asphalt Base Course	Acceptance	<sup>(9)</sup>	Standard Density	1 per source and as required based on change in material	See the contract requirements.
			Mat Density <sup>(23)</sup> , Gradation	1 per 5,000 SY	

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Foamed Asphalt Stabilized Base Course	Source Quality	150 lbs. Aggregate	L.A. Wear, Micro-Deval, Soundness, P.I. <sup>(5)</sup> , Fracture	1 per each grade and source prior to use.	Allow 14 days for transport and testing.
	Mix Design	500 lbs. existing Aggregates, 200 lbs. RAP <sup>(9)</sup>	Mix Design <sup>(9)</sup>	1 per source and as required based on change in material <sup>(14)</sup>	AB = Asphalt Binder
		Ten 1-gallon cans of AB			
		1 sack Portland Cement			
Acceptance	<sup>(9)</sup>	Mat Density	1 per 5,000 SY		

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Hot (or Warm) Mix Asphalt Pavement	Source Quality	150 lbs. Aggregate	L.A. Wear, Nordic Abrasion <sup>(12)</sup> , Micro-Deval, Deg Soundness, P.I. <sup>(5)</sup> , F&E <sup>(24)</sup>	1 per source prior to use and as required based on changes in material	Allow 25 days for transport and testing.
	Mix Design	500 lbs. <sup>(11)</sup> Aggregate	Mix Design <sup>(9)</sup> <sup>(10)</sup>	1 per source and as required based on change in material	Allow 15 days or contract specified time for mix design and testing after receiving proposed gradation from contractor. AB = Asphalt Binder. If possible, sample at the plant for the Mix Design.
		Five 1-gallon cans of AB			
		1 pt. of Anti-strip			
	Acceptance	<sup>(1)</sup> <sup>(9)</sup>	MSG (Maximum Specific Gravity)	1 per 10 sublots <sup>(9)</sup>	Use MSG value from Mix Design on first lot and then from the first subplot of each additional lot, including shortened lots. <sup>(9)</sup>
		<sup>(1)</sup> <sup>(9)</sup>	Mat Density, Gradation, Binder Content, Fracture	1 per subplot <sup>(7)</sup>	
		<sup>(9)</sup>	Joint Density	Top lift <sup>(9)</sup>	
	Independent Assurance	<sup>(9)</sup>	MSG	1 per project minimum	Required when MSG is run in the field
		<sup>(9)</sup>	Mat Density, Gradation, Binder Content, Fracture	1 per 10 sublots	Use numbers that correspond to acceptance samples. Include field test results with sample.
	Informational	30 lbs.	3-Marshall Biscuits or 2-gyratory samples	1 per Mix Design minimum	Compare results to Mix Design.
Asphalt Binder	Source Quality	<sup>(9)</sup>	<sup>(9)</sup>	1 per each grade and source prior to use.	Manufacturer's certification required and Recycled Engine Oil Bottom (REOB) certificate.
	Acceptance	Three 1-quart cans	<sup>(9)</sup>	1 per 50,000 gallons or 1 per 200 Tons	Sampled on project. Test for anti-strip, if required by RME or RQE.

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Liquid Asphalt for:	Source Quality	(1)	Type and Grading	1 per each grade and source prior to use.	Manufacturer's certification required.
a. Tack Coat					
b. Prime Coat	Acceptance	One 1-gallon plastic jug (for emulsified asphalt)	(9)	1 per 50,000 gallons or 1 per 200 Tons	Sample must be tested by a Lab that did not test material for Quality.
c. Seal Coat					
d. Surface Treatment					
Aggregate for Cover Coat and Surface Treatment	Source Quality	150 lbs. Aggregate	L.A. Wear, Micro-Deval, Soundness	1 per each grade and source prior to use.	Allow 25 days for transport and testing. Test for anti-strip, if required by RME or RQE.
	Acceptance	(1)	Gradation, Fracture	1 per 500 Tons or 11,000 SY <sup>(7)</sup>	May be taken from stockpile or production.
	Independent Assurance		Gradation, Fracture	1 per 5,000 Tons or 110,000 SY	
Portland Cement Concrete	Source Quality				
a. Cement and Cementitious	Quality	a. Two 1-gallon cans, each	(9)	1 per shipment <sup>(13)</sup> <sup>(15)</sup>	Allow 45 days for transport and testing. Manufacturer's certification required.
b. Water		b. 1/2 gallon in glass jar	(9)	1 per source	Allow 20 days for transport and testing. Potable water may be accepted by the Engineer.
c. Coarse Aggregate		c. 100 lbs.	Deleterious substances, L.A. Wear, Soundness, Clay lumps	1 per source <sup>(22)</sup>	Allow 25 days for transport and testing.
d. Fine Aggregate		d. 25 lbs.	Deleterious substances, Soundness	1 per source	Allow 25 days for transport and testing.

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Portland Cement Concrete	Mix Design Submittal <sup>(9)</sup> <sup>(13)</sup>				
a. Cement and Cementitious	Mix Design	a. 94 lbs., each	Mix Design verification as required by RME or RQE.	1 per source prior to use	For verification of Contractor-furnished mix design, allow 45 days for transport and testing.
b. Water		b. None			
c. Coarse Aggregate		c. 330 lbs.			
d. Fine Aggregate		d. 330 lbs.			
e. Admixtures		e. 1 quart each			
Coarse Aggregate	Acceptance	(1)	Gradation,	1 per 100 CY <sup>(20)</sup>	Number consecutively CA-G-1.
Fine Aggregate			Gradation, Fineness Modulus	1 per 100 CY <sup>(20)</sup>	Number consecutively FA-G-1.
Mix			Temperature, Slump, % Air, Water/Cement Ratio, Unit Weight, Proportions Tolerance per CY	1 per 50 CY or 1 per half-day pour <sup>(16)</sup> <sup>(17)</sup> <sup>(21)</sup>	
	Cylinders	Compressive Strength	1 per 50 CY or 1 per half-day pour <sup>(16)</sup> <sup>(17)</sup>	Mold two (6"x12") or three (4"x8") cylinders. Test at 28 days. <sup>(18)</sup>	
	Informational	Cylinders	Compressive Strength	As required. (e.g. for 7 and 14-day breaks)	Mold two (6"x12") or three (4"x8") cylinders. "As Required" for Strength Data.

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
<b>Concrete Continued:</b>					
Coarse Aggregate	Independent Assurance	(1)	Gradation	1 per 1,000 CY with minimum of 1 per project if over 100 CY is placed <sup>(17)</sup> <sup>(20)</sup>	Use numbers that correspond to acceptance samples. Include field test results with sample.
Fine Aggregate			Gradation, Fineness Modulus		
Mix			Temperature, Slump, % Air, Water/Cement Ratio, Unit, Weight, Proportions Tolerance per CY	1 per 500 CY	
		Cylinders	Compressive Strength	1 per 500 CY	
Prestressing Concrete	Quality and Acceptance	Refer to contract specifications for approval of specific components			
Grout	Acceptance	Set of 3 cubes	Compressive Strength	1 per half-day pour <sup>(16)</sup> <sup>(19)</sup>	Test at 28 days or per contract specifications.
	Independent Assurance	Set of 3 cubes	Compressive Strength	1 per project	Test at 28 days or in conjunction with acceptance specimens.
Porous Backfill	Source Quality	(1)	Clay Lumps	1 per source <sup>(22)</sup>	
	Acceptance		Gradation	1 per source and as required based on change in material	Number consecutively PB-G-1.



Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Asphalt Sidewalk	Source Quality	150 lbs. Aggregate	L.A. Wear, Micro-Deval, Soundness, P.I. <sup>(5)</sup>	1 per source prior to use and as required based on changes in material	Allow 25 days for transport and testing.
	Mix Design	500 lbs. <sup>(11)</sup> Aggregate	Mix Design <sup>(9)</sup> <sup>(10)</sup>	1 per source and as required based on change in material	Allow 15 days or contract specified time for mix design and testing after receiving proposed gradation from contractor. AB = Asphalt Binder. If possible, sample at the plant for the Mix Design.
		Five 1-gallon cans of AB			
		1 pt. of Anti-strip			
Ditch Lining	Acceptance	<sup>(1)</sup>	Gradation Count	1 per source	If ATM 304 is not feasible, use Gradation Count.
Riprap	Source Quality	125 lbs.	L.A. Wear	1 per source prior to use and as required based on changes in material	Allow 25 days for transport and testing.
	Acceptance	<sup>(1)</sup>	Gradation Count	1 per source for each class	
Topsoil	Source Quality	15 lbs.	Organic Content, Gradation, pH	1 per source prior to use and as required based on changes in material	Allow 15 days for transport and testing.
	Acceptance	<sup>(1)</sup>	Gradation	1 per 15,000 SY or 1 per 2,500 CY	Number consecutively TS-G-1.

<b>Notes:</b>	
(1)	See the specified test method for minimum sample size.
(2)	If material is impractical to test for field density, document quantity and/or area by reporting percent oversize and compactive effort used on a Agency density acceptance form. IA density testing is not required when material (as shown by gradation testing) is Too Coarse to Test (TCTT).
(3)	Required when Standard Density is performed in project laboratory.
(4)	See bedding and Backfill remarks
(5)	During quality testing any value obtained for P.I. will result in acceptance testing at the gradation frequency for the property that received a value. The RQE or RME may reduce the number of tests required if the source is known to have no value for liquid limit and be non-plastic.
(6)	For large unclassified embankments, a field density and gradation testing frequency of 1/10,000 CY or 1/20,000 Tons is acceptable subject to the approval of the RQE, RME or Statewide Materials Engineer (SME).
(7)	Perform Fracture tests on the first ten acceptance tests. If these tests indicate the fracture meets specification, additional acceptance tests need only be performed when IA samples are taken.
(8)	Take one Field Density test per 250 square yards for acceptance of Bed Course Material.
(9)	Refer to project specifications.
(10)	Recommendations regarding anti-strip requirements must be determined for each mix design.
(11)	For multiple stockpiles, proportion each stockpile sample to the proposed Job Mix Design blend ratio.
(12)	Include Nordic Abrasion testing of source material when specified. Report test results to Statewide Materials section.
(13)	Cement stored in silos or bins over six months, or in bags over three months, may require re-testing. See project specifications.
(14)	Manufacturer's certifications and aggregate test reports required.
(15)	Manufacturer's Certification for cement used on project may be accepted in lieu of sampling as approved by the RQE or RME.
(16)	Half day pour considered to be 6 hours or less.
(17)	Commercial sources which are periodically inspected do not have to be tested if day's total quantity of concrete placement is less than 5 CY. Placement reports summarizing all minor pours will be completed.
(18)	For non-structural or minor concrete construction, as determined by the RQE or RME, 1 set minimum per project is recommended.
(19)	A reduced frequency may be allowed as approved by RQE or RME.
(20)	For known Commercial sources that are periodically inspected, the RQE or RME may reduce the frequency of sampling and testing to 1 per project per mix design.
(21)	For Section 550 Commercial Concrete perform Proportion Tolerance verification at the frequency for acceptance testing of concrete.
(22)	For known quarry sources, the RQE or RME may waive Clay Lumps testing if visual inspection for deleterious materials has been performed and the percent passing (by weight) the No. 200 sieve is 3% or less.
(23)	If material is impractical to test for field density, document quantity and/or area by compactive effort used on a agency density acceptance form. Obtain approval from the RQE/RME.
(24)	During quality testing a value greater than zero obtained for F&E will result in acceptance testing at the gradation frequency.

### **Small Quantities of Miscellaneous Materials and Installations**

**If the Pay Item quantity at bid opening is equal to or less than the amounts listed below, the following applies:**

1. Acceptance and Independent Assurance sampling & testing is not required.
2. Documentation required to support the Acceptance decision is:
  - I. Asphalt/Aggregate Mixtures and Bituminous Materials – Mix design and Project Materials Report (PMR).
  - II. Portland Cement Concrete – Mix design, batch tickets, Concrete Placement Report (CPR), and PMR.
  - III. Soils and Aggregates – PMR.
3. Inspection of materials and workmanship is still required.
4. Source quality testing may be required as noted below.

#### **I. Small Quantities of Asphalt/Aggregate Mixtures and Bituminous Materials:**

- a) Asphalt Treated Base Course — not to exceed 3,000 Tons.
- b) Emulsified Asphalt Treated Base Course and Crushed Asphalt Base Course — 10,000 Square Yards.
- c) Bituminous Material — not to exceed 85 Tons of asphalt binder or 15 Tons for other liquid asphalt.
- d) Landscaping and paved ditches -- all quantities.
- e) Driveways -- all quantities.
- f) Guardrail paving -- all quantities.
- g) Temporary materials -- all quantities.

#### **II. Small Quantities of Portland Cement Concrete:**

- a) Sidewalks — not to exceed 150 Square Yards per day.
- b) Curb and gutter — not to exceed 250 Lineal Feet per day.
- c) Slope paving and headers -- all quantities.
- d) Landscaping and paved ditches -- all quantities.
- e) Driveways -- all quantities.
- f) Catch basins, manholes, inlets, and grout for risers, pipes and invert channels -- all quantities.
- g) Culvert headwalls for pipe diameters 48 inches or less – all quantities.
- h) Guardrail anchorages – all quantities.
- i) Temporary materials – all quantities.

#### **III. Small Quantities of Soils and Aggregates:**

- a) Aggregates for Base Course, Surface Course, and Subbase -- not to exceed 500 Tons or 250 Cubic Yards with PMR; 2,000 Tons or 1,000 Cubic Yards with PMR and source quality report.
- b) Selected Material — not to exceed 3,000 Tons or 1,500 Cubic Yards.
- c) Riprap — not to exceed 500 Tons or 250 Cubic Yards.
- d) Topsoil — not to exceed 600 Square Yards or 100 Cubic Yards.
- e) Bedding and Backfill for culvert extensions deemed by the Engineer to be outside of the structural section – all quantities.
- f) Temporary materials – all quantities.