

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

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Excavation	Acceptance	(5)	Gradation, P.I. (4), Moisture (or visual description if organic)	1 per 5,000 CY waste or undesignated waste cut	Number consecutively EX-W-1. No need to test if waste is designated on plans.
Embankment	Acceptance	(5)	Standard Density	As required based on change in material	Number consecutively BM-SD-1 or EX-SD-1
			Field Density (1)	1 per 5,000 CY or 1 per 10,000 Tons (6)	Number consecutively BM-D-1 or EX-D-1.
			Gradation, P.I. (4) and Deleterious (visual)		Number consecutively BM-G-1 or EX-G-1.
	Independent Assurance	(5)	Standard Density (2)	1 per source	Use numbers that correspond to acceptance samples. Include field test results with sample.
			Field Density (1), Gradation, P.I. (4) and Deleterious (visual)	1 per 50,000 CY or 1 per 100,000 Tons	
Bedding & Backfill for Conduits and Minor Structures	Acceptance	(5)	Standard Density	As required based on change in material	
			Field Density (1) (3)		
			Gradation, P.I., (4) and Deleterious (visual)	1 per source or as required based on change in material	
Backfill and Foundation Fill for Major Structures	Acceptance	(5)	Standard Density	As required by change in material	
			Field Density (1)	1 per layer	
			Gradation, P.I. (4), and Deleterious (visual)	1 per source or as required based on change in material	

General: When acceptance testing is performed in the Department's Regional Laboratories that are accredited in the specified test method, Independent Assurance (IA) testing is not required. If the regional laboratories perform acceptance testing and choose to perform IA testing, they must use different personnel and equipment for IA testing than was used for acceptance testing.

- (1) If material is impractical to test for field density, document quantity and/or area by reporting percent oversize and compactive effort used on a proper density acceptance form. IA density testing is not required when material (as shown by gradation testing) is Too Coarse to Test (TCTT).
- (2) Required when Standard Density is performed in project laboratory.
- (3) 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.
- (4) Perform Plasticity Index (P.I.) tests on the first five acceptance samples at the start of production from any source. If these tests indicate the material to be non-plastic, additional acceptance tests need only be performed when IA samples are taken. The Regional Quality Assurance Engineer (RQE) or Regional Materials Engineer (RME) may reduce the number of tests required if the source is known to have no value for liquid limit and be non-plastic.
- (5) See the specified test method for minimum sample size.
- (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).

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Subbase	Source Quality	150 lbs.	L.A. Wear, Micro-Deval	1 per source prior to use or as required based on changes in material	Allow minimum of 14 days for transport and testing. Number consecutively Q-SB-1.
	Acceptance	(5)	Standard Density (1)	1 per source and as required based on change in material	Number consecutively SB-SD-1
			Field Density (1)	1 per 2,500 CY or 1 per 5,000 Tons (3) (4)	Number consecutively SB-D-1
			Gradation, L.L., P.I. (3), Fracture, Deleterious		Number consecutively SB-G-1
	Independent Assurance	(5)	Standard Density (2)	1 per source	Use numbers that correspond to acceptance samples. Include field test results with sample.
			Field Density (1)	1 per 25,000 CY or 1 per 50,000 Tons	
			Gradation, L.L., P.I. (3), Fracture, Deleterious		
Crushed Aggregate Base Course and Aggregate Surface Course	Source Quality	150 lbs.	L.A. Wear, Micro-Deval, Soundness, Nordic Abrasion (7),	1 per source prior to use or as required based on change in material	Allow minimum 14 days for transport and testing. Number consecutively Q-BC-1 or Q-SC-1
	Acceptance	(5)	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)	1 per 1,000 CY or 1 per 2,000 Tons (3) (4) (6)	Number consecutively BC-D-1, SC-D-1 or BCM-D-1
			Gradation, L.L., P.I. (3), Fracture, Deleterious		Number consecutively BC-G-1, SC-G-1, BCM-G-1
	Independent Assurance	(5)	Standard Density (2)	1 per source	Use numbers that correspond to acceptance samples. Include field test results with sample.
			Field Density (1)	1 per 10,000 CY or 1 per 20,000 Tons	
			Gradation, L.L., P.I. (3), Fracture, Deleterious		
<p>(1) If material is impractical to test for field density, document quantity and/or area by reporting percent oversize and compactive effort used on a proper density acceptance form. IA density testing is not required when material (as shown by gradation testing) is TCTT.</p> <p>(2) Required when Standard Density is performed in the project laboratory.</p> <p>(3) Perform Liquid Limit (L.L.) and Plastic Index (P.I.) tests on the first five acceptance samples at the start of production from any source. If these tests indicate the material to be non-plastic, additional acceptance tests need only be performed when IA samples are taken. 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.</p> <p>(4) Perform fracture tests on the first ten acceptance tests. If these tests indicate the fracture to be 5% or more above specification, additional acceptance tests need only be performed when IA samples are taken.</p> <p>(5) See the specified test method for minimum sample size.</p> <p>(6) Take one Field Density test per 250 square yards for acceptance of Bed Course Material.</p> <p>(7) Include Nordic Abrasion testing of source material. Report test results to Statewide Materials section.</p>					

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, Soundness, Nordic Abrasion (7)	1 per source prior to use or as required based on change in material	Allow minimum of 14 days for transport and testing.
	Mix Design	300 lbs. (5) Aggregate, 3 one gal. cans of AB, 1 pint of Anti-strip	Mix Design (1) (2)	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 (same as asphalt cement). If possible sample AB at the plant for the Mix Design.
	Acceptance	(1) (6)	Mat Density, Gradation, Binder Content, P.I. (3) Fracture, Deleterious (visual)	1 per 1,000 Tons (3) (4)	See the contract requirements
	Independent Assurance	(6)	Mat Density, Gradation, Binder Content, P.I. (3), Fracture, Deleterious	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, 3 gals. Asphalt Emulsion	Mix Design (1)	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.
	Acceptance	(1)	Mat Density, Gradation, Fracture	1 per 5,000 SY	See the contract requirements
Crushed Asphalt Base Course	Acceptance	(1)	Mat Density, Gradation	1 per 5,000 SY	See the contract requirements
<p>(1) Refer to project specifications.</p> <p>(2) Recommendations regarding anti-strip requirements must be determined for each mix design.</p> <p>(3) Perform Plastic Index (P.I.) tests on the first five acceptance samples at the start of production from any source. If these tests indicate the material to be non-plastic, additional acceptance tests need only be performed when the IA samples are taken. 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.</p> <p>(4) Perform fracture tests on the first ten acceptance tests. If these tests indicate the fracture to be 5% or more above specification, additional acceptance tests need only be performed when IA samples are taken.</p> <p>(5) For multiple stockpiles, proportion each stockpile sample to the proposed Job Mix Design blend ratio.</p> <p>(6) See the specified test method for minimum sample size.</p> <p>(7) Include Nordic Abrasion testing of source material. Report test results to Statewide Materials section.</p>					

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, Micro-Deval , Soundness, P.I. (3), Nordic Abrasion (9)	1 per source prior to use or as required based on change in material	Allow 25 days for transport and testing.
	Mix Design	500 lbs. (6) Aggregate, 5 one-gallon cans of AB, 1 pint of Anti-Strip	Mix Design (1) (2), Flat and Elongated, Fracture	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 contractor's proposed gradation. AB = asphalt binder (same as asphalt cement). If possible sample AB at the plant for the Mix Design.
	Acceptance	(1) (7)	MSG (Maximum Specific Gravity)	1 per lot (1)	(1) From Mix Design on first lot and then from the first subplot of each additional lot
		(1) (7)	Mat Density, Gradation, Binder Content, P.I. (3), Fracture, Flat & Elongated, and Deleterious (visual)	1 per 500 Ton subplot (3) (4) (5) (8)	Ross Count (AASHTO T 195, Coating Test) as required by RQE or RME.
		Joint Density	(1)	Top lift (1)	
	Independent Assurance	(8)	MSG	1 per project minimum	Required when MSG is run in the field
			Mat Density, Gradation, Binder Content, P.I. (3), Fracture, Flat & Elongated, and Deleterious (visual)	1 per 5,000 Tons (8)	Use numbers that correspond to acceptance samples. Include field test results with sample.
	Information	30 lbs.	3-Marshall Biscuits or 2 gyratory samples	1 per Mix Design minimum	Compare results to Mix Design

- (1) Refer to project specifications.
- (2) Recommendations regarding anti-strip requirements must be determined for each mix design.
- (3) Perform Plastic Index (P.I.) tests on the first five acceptance samples at the start of production from any source. If these tests indicate the material to be non-plastic, additional acceptance tests need only be performed when the IA samples are taken. 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.
- (4) Perform fracture tests on the first ten acceptance tests. If these tests indicate the fracture to be 5% or more above specification, additional acceptance tests need only be performed when IA samples are taken.
- (5) Perform Flat and Elongated (F&E) tests on the first five acceptance samples from any source. For known sources, the RQE or RME may waive this requirement.
- (6) Proportion each stockpile sample to the proposed Job Mix Design blend ratio.
- (7) See the specified test method for minimum sample size.
- (8) For sidewalks, medians, and other non-traffic areas acceptance sampling and testing frequency will be 1 per 1,000 Tons or 1 per 10,000 Square Yards; and IA sampling and testing frequency will be 1 per 10,000 Tons or 1 per 100,000 Square Yards.
- (9) Include Nordic Abrasion testing of source material. Report test results to Statewide Materials section.

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Asphalt Binder	Source Quality	(1)	(1)	1 per each grade and source prior to use	Manufacturer's certification required
	Acceptance	Three 1-quart cans		1 per 50,000 gals. or 1 per 200 Tons	Sampled on project. Test for anti-strip if required by RQE or RME
Liquid Asphalt for: a. Tack coat b. Prime coat c. Seal coat d. Surface Treatment	Source Quality	(1)	Type and Grading	1 per each grade and source prior to use	Manufacturer's certification required
	Acceptance	1-1 gallon plastic jug (for emulsified asphalt)	(1)	1 per 50,000 gallons or 1 per 200 Tons	Sample must be tested by a Lab that did not test material for Quality. Material sampled prior to dilution
Aggregate for Cover Coat and Surface Treatment	Source Quality	150 lbs. Aggregate	L.A. Wear, Soundness, Micro-Deval	1 per each grade and source prior to use	Allow 25 days for testing and transport Test for anti-strip if required by RQE or RME
	Acceptance	(3)	Gradation, Fracture, Deleterious (visual)	1 per 500 Tons (2)	May be taken from stockpile or production
	Independent Assurance		Gradation, Fracture, Deleterious (visual)	1 per 5,000 Tons	
<div>(1) Refer to project specifications.</div> <div>(2) Perform fracture tests on the first ten acceptance tests. If these tests indicate the fracture to be 5% or more above specification, additional acceptance tests need only be performed when IA samples are taken.</div> <div>(3) See the specified test method for minimum sample size.</div>					

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Portland Cement Concrete	Source Quality				
a. Cement and Cementitious	Quality	a. Two 1-gal. cans, each	See Remarks	1 per shipment (2) (4)	Allow 45 days for transport and testing. Manufacturer's certification required.
b. Water		b. ½ gal. in glass jar	See Remarks	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	1 per source	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.
Portland Cement Concrete	Mix Design Submittal (1) (3)				
a. Cement and Cementitious	Mix Design	a. 94 lbs., each	Mix Design Verification as required by RQE or RME.	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 qt. each			
<div>(1) Refer to project specifications.</div> <div>(2) Cement stored in silos or bins over six months, or in bags over three months, may require re-testing. See project specifications.</div> <div>(3) Manufacturer's certifications and aggregate test reports required.</div> <div>(4) Manufacturer's Certification for cement used on project may be accepted in lieu of sampling as approved by the RQE or RME.</div>					

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Concrete Continued:					
Coarse Aggregate	Acceptance	As required by test method	Gradation, Deleterious (visual)	1 per 100 CY (6)	Number consecutively CA-G-1
Fine Aggregate			Gradation, Deleterious (visual), Fineness Modulus	1 per 100 CY (6)	Number consecutively FA-G-1
Mix			Temperature, Slump, % Air, Water/Cement Ratio, Unit Weight, Yield, Proportions per CY	1 per 50 CY or 1 per day	(3)
		Cylinders	Compressive strength	1 per 50 CY or 1 per day	Mold two (6"x12") or three (4"x8") cylinders. Test at 28 days. (3) (4)
		Information	Cylinders	Compressive strength	As required (e.g. for 7 and 14 day breaks)
Coarse Aggregate	Independent Assurance	As required by test method	Gradation, Deleterious (visual)	1 per 1,000 CY with minimum of 1 per project if over 100 CY is placed (6)	Use numbers that correspond to acceptance samples. Include field test results with sample. Mold two (6"x12") or three (4"x8") cylinders.
Fine Aggregate			Gradation, Deleterious (visual), Fineness Modulus		
Mix			Temperature, Slump, % Air, Water/Cement Ratio, Unit Weight, Yield, Proportions 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 ½ days pour (2) (5)	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
<div>(1) Refer to project specifications.</div> <div>(2) Half day's pour considered to be 6 hours or less.</div> <div>(3) 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.</div> <div>(4) For non-structural or minor concrete construction, as determined by the RQE or RME, 1 set minimum per project is recommended.</div> <div>(5) A reduced frequency may be allowed as approved by RQE or RME.</div> <div>(6) 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.</div>					

Material	Type of Sample	Sample Size	Type of Tests	Frequency	Remarks
Misc. Hardware	Source Quality	(1)		1 per pay item or assembly, min.	Manufacturer's certification or sample for testing.
Concrete Reinforcing Steel	Source Quality	(2)		1 for each type, grade and size in a shipment	Manufacturer's certification or sample for testing.
Structural Steel	Source Quality	(2)		1 for each component in a shipment	Manufacturer's certification or sample for testing.
Piling	Source Quality	(2)		1 for each type of pile in shipment	Manufacturer's certification or sample for testing.
Joint Sealer, Joint Filler, and Curing Materials for Concrete	Source Quality	1 quart for each liquid (see remarks)	See remarks (1)	1 per type	Project Engineer documentation if on Qualified Products List (QPL). If not on QPL, manufacturer's certification or sample for testing.
Porous Backfill	Source Quality	(3)	Clay Lumps, Deleterious	1 per source (4)	
	Acceptance		Gradation, Deleterious (visual)	1 per source or as required based on change in material	Number consecutively PB-G-1
Riprap	Source Quality	125 lbs.	LA Wear	1 per source prior to use or as required based on change in material	Allow 25 days for transport and testing.
	Acceptance	5 CY min.	Gradation count	1 per source for each class	
Topsoil	Source Quality	15 lbs.	Organic content, Gradation, pH	1 per source prior to use or as required based on change in material	Allow 15 days for transport and testing.
	Acceptance	(3)	Gradation	1 per 15,000 SY or 1 per 2,500 CY	Number consecutively TS-G-1
Signals and Lighting	Quality and Acceptance	Within 30 days following award of the contract, the contractor shall submit to the Project Engineer for approval a complete list of material and equipment that is proposed to be used for this item. The data shall include catalog cuts, diagrams, test reports, manufacturer's certifications, etc. The above data shall be submitted in eight sets. Any proposed deviation from the plans shall also be submitted. Check the QPL.			

(1) Certificates of Compliance per Specifications Section 106.

(2) Mill Test Reports to include heat numbers, fabrication date, physical and chemical properties.

(3) See the specified test method for minimum sample size.

(4) 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.

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 (4).
- 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.