

**CONSTRUCTION USING QUALITY CONTROL/QUALITY ASSURANCE SPECIFICATIONS**

SAMPLING AND TESTING FREQUENCY CHART

FOR

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CONSTRUCTION OR MATERIAL TYPE	TESTS REQUIRED (RECORD TO)	TEST METHOD	QUALITY CONTROL BY CONTRACTOR	VERIFICATION BY KDOT
1 CALCIUM CHLORIDE Sec. 302, 303, & 1702				b Sample first container received on project
2 AGGREGATE BASE COURSE Sec. 303 & 1105				
Individual Aggregate	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	c,k Minimum one per project	Minimum one per project
	Plasticity Tests (0.01 g or 0.01% of mass)	KT-10	c,k Minimum one per project	Minimum one per project
Binder Material	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	c,k Minimum one per project	Minimum one per project
	Plasticity Tests (0.01 g or 0.01% of mass)	KT-10	c,k Minimum one per project	Minimum one per project
Combined Material	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	c 300 m each lift or if total aggregate (no binder) each 500 Mg.	One per 2,000 m or if total aggregate is 3,500 Mg.
	Plasticity Tests (0.01 g or 0.01% of mass)	KT-10	c 300 m each lift or if total aggregate (no binder) each 500 Mg.	One per 2,000 m or if total aggregate is 3,500 Mg.
	Moisture Tests (0.1 g or 0.01% of mass)	KT-11	300 m each lift or if total aggregate (no binder) each 500 Mg.	One per 2,000 m or if total aggregate is 3,500 Mg.
Completed Base	Field Density Tests (1 kg/m <sup>3</sup> [0.1 lb/ft <sup>3</sup> ] or 0.1% of optimum density)	KT-13 or KT-41	One every 300 m.	One every 1,000 m.
	Moisture Tests (0.1 g or 0.01% of mass)	KT-11 or KT-41	One every 300 m.	One every 1,000 m.
3 STABILIZED SHOULDERS (Aggregate, Non-Bit.) Sec. 303 & 1114				
Individual Aggregate	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	c,k Minimum one per project	Minimum one per project
	Plasticity Tests (0.01 g or 0.01% of mass)	KT-10	c,k Minimum one per project	Minimum one per project

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3 (Continued) Binder Material	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	c,k Minimum one per project	Minimum one per project
	Plasticity Tests (0.01 g or 0.01% of mass)	KT-10	c,k Minimum one per project	Minimum one per project
Combined Material	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	K-2	c 300 m each lift or if total aggregate (no binder) each 500 Mg.	One per 2,000 m or if total aggregate is 3,500 Mg.
	Plasticity Tests (0.01 g or 0.01% of mass)	KT-10	c 300 m each lift or if total aggregate (no binder) each 500 Mg.	One per 2,000 m or if total aggregate is 3,500 Mg.
	Moisture Tests (0.1 g or 0.01% of mass)	KT-11	300 m each lift or if total aggregate (no binder) each 500 Mg.	One per 2,000 m or if total aggregate is 3,500 Mg.
Completed Shoulder	Field Density Tests (1 kg/m <sup>3</sup> [0.1 lb/ft <sup>3</sup> ] or 0.1% of optimum density)	KT-13 or KT-41	One every 300 m.	One every 1,000 m.
	Moisture Tests (0.1 g or 0.01% of mass)	KT-11 or KT-41	One every 300 m.	One every 1,000 m.
4 GRANULAR SUBBASE Sec. 304 & 1107				
Individual Aggregate	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	c,k Minimum one per project	Minimum one per project
	Plasticity Tests (0.01 g or 0.01% of mass)	KT-10	c,k Minimum one per project	Minimum one per project
Binder Material	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	c,k Minimum one per project	Minimum one per project
	Plasticity Tests (0.01 g or 0.01% of mass)	KT-10	c,k Minimum one per project	Minimum one per project
Pulverization	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	k Minimum one per project	Minimum one per project
Combined Material	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	300 m each lift or if total aggregate (no binder) each 500 Mg.	One per 2,000 m or if total aggregate is 3,500 Mg.
	Plasticity Tests (0.01 g or 0.01% of mass)	KT-10	300 m each lift or if total aggregate (no binder) each 500 Mg.	One per 2,000 m or if total aggregate is 3,500 Mg.

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4 (Continued)	Moisture Tests (0.1 g or 0.01% of mass)	KT-11	300 m each lift or if total aggregate (no binder) each 500 Mg.	One per 2,000 m or if total aggregate is 3,500 Mg.
Completed Work	Field Density Tests (1 kg/m <sup>3</sup> [0.1 lb/ft <sup>3</sup> ] or 0.1% of optimum density) Moisture Tests (0.1 g or 0.01% of mass)	KT-13 or KT-41 KT-11	One every 300 m.  One every 300 m.	One every 1,000 m.  One every 1,000 m.
5 HYDRATED LIME AND PEBBLE QUICKLIME Sec. 305, 1103, 2002, & 2003		KT-29		b 1 sample for each 10 loads
6 SURFACE OR RESURFACING AGGREGATE Sec. 307, 308, 1112, 1113	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	c One per 500 Mg	One per 2,500 Mg
	Material Passing the 75 µm (No. 200) Sieve by the Wash Method (0.1% of mass)	KT-3	c One per 500 Mg	One per 2,500 Mg
	Sticks in Aggregate (0.01% of mass)	KT-35	c,h	As required
	Clay Lumps and Friable Particles in Aggregate (0.1 g or 0.01% of mass)	KT-7	c,h	As required
	Moisture Tests (0.1 g or 0.01% of mass)	KT-11	One per 500 Mg	One per 2,500 Mg
7 CEMENT TREATED BASE Sec. 309	Moisture Tests (0.1 g or 0.01% of mass)	KT-11	Four per day per design	One per week
	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	c,h One per day	One per week
	Density Standard (1 kg/m <sup>3</sup> [0.1 lb/ft <sup>3</sup> ] or 0.1% of optimum density)	KT-37 or KT-20	One per day per design (NOTE:KT- 20 option is only permitted in conjunction with a fluid mix.)	One per project per design
	Compressive Strength (0.01 MPa or 1 psi)	KT-37	Four test specimens for each normal day's production	One test specimen for each day's production

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7 (Continued)	Field Density (1 kg/m <sup>3</sup> [0.1 lb/ft <sup>3</sup> ] or 0.1% of optimum density)	KT-41	Four per day per design	One per week per design
8 FLY ASH FOR STABILIZATION AND COLD RECYCLE Sec. 310, 608, & 2005		KT-29		b Two samples per month per source per district
9 PORTLAND CEMENT CONCRETE STRUCTURES AND MISCELLANEOUS CONSTRUCTION Sec. 402, 701, 720 & 721 Individual Aggregate	Material Passing the 75 µm (No. 200) Sieve by Wash (0.1% of mass)	KT-3	c One per 250 Mg of each individual aggregate	One per project per individual aggregate
	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	c One per 250 Mg of each individual aggregate	One per project per individual aggregate
	Shale or Shale-like Materials in Aggregate (0.1 g or 0.01% of mass)	KT-8	c,h	As required
	Clay Lumps and Friable Particles in Aggregate (0.1 g or 0.01% of mass)	KT-7	c,h	As required
	Sticks in Aggregate (0.01% of mass)	KT-35	c,h	As required
	Unit Weight (light weight Aggregate only) (50 g or 0.1 lb)	KT-5	c,k	As required
Combined Aggregates	Moisture in Aggregate (0.1 g or 0.01% of mass)	KT-6 or KT-24	One per 1/2 day	One per week
Concrete	Slump (5 mm or 0.25 in)	KT-21	One per 50 m <sup>3</sup>	One per week
	Mass (50 g or 0.1 lb)	KT-20	One per 50 m <sup>3</sup>	One per week
	Air Content (0.25%)	KT-18 or KT-19	One per 50 m <sup>3</sup>	One per week

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9 (Continued)	Temperature	KT-17	One per 50 m <sup>3</sup>	One per week
	Cylinders (1 N or 1 lbf; 1 mm or 0.1 in; 0.01 MPa or 1 psi)	KT-22	One per 50 m <sup>3</sup>	One set per week
	Beams (1 kPa or 1 psi)	KT-22 & KT-23	As required for opening to traffic	One set per week if required
	Density of Fresh Concrete (1 kg/m <sup>3</sup> [0.1 lb/ft <sup>3</sup> ] or 0.1% of optimum density)	KT-36	One per 150 m <sup>2</sup> for bridge decks, thin overlays and bridge deck surfacing	One per week
10 CONCRETE PAVEMENT Sec. 502				
Individual Aggregate	Material Passing the 75 µm (No. 200) Sieve by Wash (0.1% of mass)	KT-3	c,m One per 250 Mg of each individual aggregate	One per project per individual aggregate
	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	c,m One per 250 Mg of each individual aggregate	One per project per individual aggregate
	Shale or Shale-like Materials in Aggregate (0.1 g or 0.01% of mass)	KT-8	c,h	As required
	Clay Lumps and Friable Particles in Aggregate (0.1 g or 0.01% of mass)	KT-7	c,h	As required
	Sticks in Aggregate (0.01% of mass)	KT-35	c,h	As required
	Unit Weight (light weight Aggregate only) (0.1%)	KT-5	c,k	As required
Combined Aggregates	Moisture in Aggregate (0.1 g or 0.01% of mass)	KT-24	One per 1/2 day	One per week
Concrete	Mass (50 g or 0.1 lb)	KT-20	a One per 500 m <sup>3</sup>	One per day
	Slump (5 mm or 0.25 in)	KT-21	a One per 500 m <sup>3</sup>	One per day

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10 (Continued)	Temperature	KT-17	a One per 500 m <sup>3</sup>	One per day
	Air Content (0.25%)	KT-18 or KT-19	a One per 500 m <sup>3</sup>	One per day
	Density of Fresh Concrete (1 kg/m <sup>3</sup> [0.1 lb/ft <sup>3</sup> ] or 0.1% of optimum density)	KT-38	One complete transverse profile initially, then one density per 1/2 day	One density per week
	Beams (1 kPa or 1 psi)	KT-22 & KT-23	1 set of 3 as required for opening to traffic	One set of 3 per week
	Cores (1 N or 1 lbf; 1 mm or 0.1 in; 0.01 MPa or 1 psi)	AASHTO T-231 & KT-49	Obtain, measure, cap and compression test one per subplot	Measure and compression test one per lot
(Class I &/or II Aggregate)				See 5.02.05 (c)(4)b. of this manual
	Profilograph	KT-46 or KT-54	2 tracks per 4 m of width for the length of project	At the engineer's discretion
11 HMA CONSTRUCTION (Plant Mix) Sec. 603, 604, 605, 1103, & 1104				
Individual Aggregate	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	c One per 1,000 Mg of each individual aggregate	1 per project
	Shale or Shale-like Materials in Aggregate (0.1 g or 0.01% of mass)	KT-8	c,h	As required
	Clay Lumps and Friable Particles in Aggregate (0.1 g or 0.01% of mass)	KT-7	c,h	As required
	Sticks in Aggregate (0.01% of mass)	KT-35	c,h	As required
	Uncompacted Void Content of Fine Aggregate (0.01%)	KT-50	l One on the first lot, then one per 10,000 Mg of crushed gravel	One per project

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11 (Continued) Mineral Filler Supplement	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	c,h One per 250 Mg	One per project
	Plasticity Tests (0.01 g or 0.01% of mass)	KT-10	c,h One per 250 Mg	One per project
Combined Aggregate	Coarse Aggregate Angularity (0.1% of mass)	KT-31	c,g One per lot	One per week or per 10,000Mg
	Uncompacted Void Content of Fine Aggregate (0.01%)	KT-50	One on first lot then one per 10,000 Mg of comb. aggregate.	One per project
	Sand Equivalent Test (1%)	KT-55	f One per lot	One per project
	Flat or Elongated Particles (1%)	KT-59	One on 1st lot	One per project
	Moisture Tests (0.1 g or 0.01% of mass)	KT-11	One per lot	One per project
Asphalt Binder	Binder Sampling	KT-26	e,b [CMS=VER] One sample/3loads	One per project
HMA Mixtures	% Moisture in Mixture (0.1 g or 0.01% of mass)	KT-11	One per lot	One per project
	Air Voids (Va = 0.01%; Gmm = 0.001 & Gmb = 0.001)	KT-15, KT-39, KT-58 and SD/SF Manual	One per subplot (See Note o for Gmm)	j One per lot [Compact split sample on KDOT Gyratory; one per week or 15,000 Mg]
	Binder Content (by Ignition) (0.1 g or 0.01% of mass)	KT-57	One per subplot	j One per lot
	Mix Gradation (after ignition) (0.1 g or 0.01% of mass)	KT-34	One per subplot	One per lot
	Moisture Damage to Mix (Modified Lottman) (0.1%)	KT-56	d One on first lot then one per week or 10,000 Mg	One per project performed at District Lab
Reclaimed Asphalt Pavement (RAP)	Binder Content in RAP (by Ignition) (0.1 g or 0.01% of mass)	KT-57	One per 1,000 Mg	j One per 20,000 Mg

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11 (Continued)	RAP Gradation (after Ignition) (0.1 g or 0.01% of mass)	KT-34	One per 1,000 Mg	One per project
	% Moisture in RAP (0.1 g or 0.01% of mass)	KT-11	One per lot	One per project
Completed Road Work  (Use one of these 2 methods on all hot mix roadway or shoulder construction)	<u>Field Density Tests</u> Cores or Nuclear Density Gauge (Gmb = 0.001; 1 kg/m <sup>3</sup> [0.1 lb/ft <sup>3</sup> ] or 0.01% of optimum density)	KT-15 or KT-32	i 10 tests per lot	i 5 companion tests per lot
	Profilograph	KT-46 or KT-54	2 tracks per 4 m of width for the length of the project	At the engineer's discretion
12 COLD RECYCLE Sec. 608	Field Density Tests 1 kg/m <sup>3</sup> [0.1 lb/ft <sup>3</sup> ] or 0.1% of optimum density)	KT-32		Start of project and 2 locations/km/width laid
	Moisture before HMA Overlay (0.1 g or 0.01% of mass)	KT-11		n One per 2 km
	Emulsion	KT-26	e,b [CMS=VER] One sample/3 loads	One per project
	Gradation (0.1 g or 0.01% of mass)	KT-2	p One sample in AM and One sample in PM	One per project
	Pulverized Material		1 per km	I per project
	Average Milling Depth		q 2 per 0.5 day of production	q 1 per project
13 SURFACE RECYCLE Sec. 609	Depth of Recycling (0.01 kg/m <sup>2</sup> or 0.1 lb/ft <sup>2</sup> OR 5mm or 0.01 ft)	KT-47	1 per hour of operation.	1 per day
	Field Density Tests (1 kg/m <sup>3</sup> [0.1 lb/ft <sup>3</sup> ] or 0.1% of optimum density)	Same as Bit Const. (Plant Mix)	2 locations/km/width.	1 location/km/width.

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14 SLURRY SEAL Sec. 610, 611 & 1110	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	c One per 250 Mg of each individual aggregate	One per day
	Moisture Tests (0.1g or 0.01% of mass)	KT-11	Three per day	One per day
15 PAINT Sec. 702 & 1800		KT-28		b 1 Sample of the paint used on each bridge involving painting of structural steel. Do not take duplicate samples of lot no's. previously sampled in your district.
16 REINFORCING STEEL BARS Sec. 703, 1601 & 1602				b 6 per plant per district per year
17 WIRE FABRIC Sec. 1603				b 1 per plant per district per year
18 PORTLAND CEMENT, BLENDED HYDRAULIC CEMENT, FLY ASH FOR USE IN CONCRETE Sec. 2001 & 2004		KT-29		b Cement: See section 5.11 of this manual and Standard Specification. Fly Ash: Minimum of one sample semiannually/ source/each concrete project.
19 INDIVIDUAL AGGREGATE QUALITY				b For Aggregate Quality Only-One sample per source per year per district
20 DRAINABLE BASE Spec. Provisions	Sieve Analysis of Aggregate (1%, 0.1% for 75 µm, of mass)	KT-2	c One in AM and PM or each 500 Mg.	Combined aggregates 1 sample/3 km or 3,000 Mg

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<u>Code</u>	<u>Instruction</u>	<u>Code</u>	<u>Instruction</u>
			Frequency will be governed by field conditions. Written documentation of the agreed upon testing frequency shall be included in the project records.
a	The contractor may reduce the sampling and testing frequency to one test per 1,000 m <sup>3</sup> provided the first two tests each day show compliance with the specification requirements.		
b	Sampled by the district field personnel, or contractor and tested at KDOT Central Materials Laboratory (Materials and Research Center).	1	This testing of crushed gravel is only needed to confirm that less than 35% natural sand is used in the traveled way mixes. If 95% or more of a crushed gravel is retained on the 2.36 mm sieve, it will not normally be necessary to determine uncompacted voids on that material unless required by the engineer. This crushed gravel will be considered to have a "U" value of greater than 42.00.
c	The aggregate producers tests may be used for quality control purposes if the test were performed by an appropriately certified technician. In such cases, the contractor shall perform testing as necessary to determine the degrading effects of hauling and stockpiling on the individual aggregates. For CTB, the minimum testing frequency shall be every 4,000 Mg.	m	The contractor may reduce the sampling and testing frequency to one test per 1,000 Mg provided the first two tests each day show compliance with the specification requirements.
d	The first Modified Lottman Test will cover the first week or 10,000 Mg of production.	n	Reduction in testing (One per 5 km) can be established by the Engineer if weather conditions and/or time prove the moisture content remains below 1.5% during the first 2 tests.
e	Specification compliance will be determined on a producer basis not on a project basis. Producer and product testing frequency is maintained in CMS. Start with one in three loads, then generally, the sampling frequency will be reduced to one sample per 6 loads and then per 12 loads if test results determined by the Department show satisfactory compliance of the material with the specifications.	o	If more than 1 test is performed on the sample, use the average value.
f	Determine the Sand Equivalent (SE) value on the combined virgin aggregates on the first lot of production and then frequency may be reduced to one test per week provided the SE value exceeds the minimum specified value by five (5) percentage points. The frequency may be reduced to one test per two weeks provided the SE value exceeds the minimum specified value by 25 percentage points. When any test (including verification and assurance) shows the SE value to be less than five (5) percentage points above the specified minimum value then the testing frequency will revert to one per lot until two consecutive tests exceed the minimum specified value by five (5) percentage points.	p.	Air dry a processed RAP sample (minimum size 10,000 grams) and determine gradation. If six consecutive tests fall within the same asphalt pavement millings criteria (fine, medium or coarse) listed in Section 1, Sampling and Processing, gradation testing may be reduced to one test per two days. If one of the gradation tests fall outside the original asphalt pavement millings criteria, testing will revert to the frequency listed above.
g	All aggregate types except siliceous gravels and steel slag will be considered to have at least two crushed faces on 100 percent of the aggregate particles. For mixes containing crushed or uncrushed siliceous gravels, or steel slag, determine the Coarse Aggregate Angularity (CAA) value of the combined virgin aggregate of the first lot of production. After 3 consecutive passing tests, the frequency may be reduced to 1 per 3 lots or 1 per week. If any of the quality control or verification test fail, the frequency will revert to 1 per lot until the above criteria for reduced frequency is met.	q.	Using the quantities from weigh belts, calculate the quantity of RAP processed. Compare the quantity of RAP processed to the theoretical quantity that should have been processed. Average milling depth shall be equal to or greater than the depth of milling shown in the Contract Documents.
h	If during the determination of individual aggregate gradation, clay lumps and soft or friable particles, shale or shale like particles, or sticks are found then perform KT-7, KT-8 and KT-35 respectively at such frequencies as jointly deemed necessary by the Contractor and the District Materials Engineer.	<u>General Notes:</u>	
i	For small lots (lots with less than 1,000 Mg), the number of tests may be reduced (see special provision).	1	All sampling and testing frequencies are minimum. Additional quality control, verification, and assurance tests will be performed, when necessary, to provide effective control of the work. When any quality control test result fails to comply with the specification requirements then the next subplot of production after obtaining the failing test results will be sampled and tested, regardless of any lesser frequency specified in this table.
j	Provide access to Contractor owned forced air ignition furnace, ovens, and Superpave Gyrotory compactor for the State inspector to perform verification tests.	2	For the Construction Management System (CMS), Acceptance Sampling and Tests have been divided into two sections. Items called "ACC" will be Acceptance Tests and will have a quantity assigned. Items called "ACI" will be Acceptance Information Tests, and they will normally not have a quantity assigned. "ACC" tests make the assignment of tested materials to the contract or mix plant. "Type Insp" must = "ACC" when the assignment of a pay quantity is being made. "ACI" when recording test values for additional acceptance information.
k	Engineer's discretion. Frequency of tests shall be agreed upon by the Field Engineer and the District Materials Engineer.	3	For QUALITY CONTROL BY CONTRACTOR, CMS uses ACI or ACC unless otherwise noted. For VERIFICATION BY KDOT, CMS uses VER unless otherwise noted. For INDEPENDENT ASSURANCE BY KDOT, CMS uses ASW (Assurance Witness), ASR (Assurance Replicate), & ASP (Assurance Split) unless otherwise noted (See section 5.20-2).

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- 4 For a better explanation of metric (SI) units, see section 5.16  
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- 5 All samples will be taken from the place of incorporation into the  
project unless otherwise noted.