GDT 73

A. Scope

For a complete list of GDTs, see the Table of Contents.

Use these test methods to randomly select and test for acceptance asphaltic concrete mixes and pavement construction. The characteristics to be tested are mixture composition and compaction.

B. Apparatus

For Method C, the apparatus consists of the following:

1. Computer—Use the computer specified in Section 152 of the Specifications.

C. Sample Size and Preparation

1. Lot Boundaries

   An Acceptance Lot normally consists of the amount of asphaltic concrete produced and placed in one construction day, or at least 500 tons (500 Mg).
2. Evaluate each Lot with the sampling procedures and the specified acceptance criteria for mixture composition and voids.
3. When evaluating these features, always use the same Lot boundaries. If the Job Mix Formula changes significantly, the Engineer may end one Lot and begin a new Lot.

D. Procedures

1. Selecting Loads to be Sampled
   a. Randomly sample the designated Lot based on the load number.
   b. Randomly sample the mix for the Lot from sublots consisting of approximately 500 tons (500 Mg).
   c. Sublots may be increased to 750 tons (750 Mg) if approved by both the District Testing Management Operations Supervisor and the Area Bituminous Technical Services Engineer. To be considered for use of expanded sublots, the contractor must have produced at least 2,000 tons (2,000 Mg) of a specific mix per day for three consecutive working days. Approval for increased sublot sizes may be rescinded upon agreement by both the District Testing Management Operations Supervisor and the Area Bituminous Technical Services Engineer any time the Contractor fails to produce at least 2,000 tons (2,000 Mg) of mix in any one day of production.
   d. Method A: Use random numbers chosen from Table 1.

      Method B: Draw numbered tokens from a container.

      Method C: Use the FDCS computer-generated numbers.

      See examples in Calculations, for using each of these methods.
2. Testing for Asphalt Cement Content and Gradation
   a. Use GDT 83 or GDT 125 to test the asphalt cement content.
      1) When the plant that produces the mix is operating and the mix is tested according to GDT 125, use the asphalt cement content calculated from the ticket .Calculate the content from the appropriate ticket that corresponds to the load from which the sample was taken. The ticket and gradation worksheet should be attached to the TM159-5 report and retained in the project files. In all cases, test the mixture gradation with GDT 38.
   b. Project personnel may submit to the Central Laboratory for approval any other method for random sampling when existing conditions make load sampling impractical.

Note: Test according to GDT 83 or GDT 125 and GDT 38. Accept according to Section 400 of the Standard Specifications.

3. Determining Core locations for Mixture Acceptance
   a. Determine core locations as follows:
      1) Divide the Lot into 5 sub-lots for lots containing greater than 500 tons (500 Mg) or 1 sub-lot per 100 tons (100 Mg) if 500 tons (500 Mg) or less (Example)

Lots ≥ 500 tons (500Mg) of mix should be divided into 5 sub-lots of equal distance.

Lots <500 tons (500Mg) of mix should be comprised of a sub-lot or sub-lots consisting of up to 100 tons (100 Mg) of mix each. There may be less than 5 sub-lots.

Note: Round up for any fraction tonnage to the next 100 tons (100 Mg). Example: 301 tons = 4 cores

GDT 73 Table 1

1		2		3		4		5		6		7	
.576	.730	.430	.754	.271	.870	.732	.721	.998	.239	.053	.899	.554	.627
.892	.948	.858	.025	.935	.114	.153	.508	.749	.291	.810	.159	.225	.163
.669	.726	.501	.402	.231	.505	.009	.420	.517	.858	.081	.277	.035	.039
.609	.482	.809	.140	.396	.025	.937	.310	.253	.761	.982	.468	.334	.921
.971	.824	.902	.470	.997	.392	.892	.957	.640	.463	.095	.801	.576	.417
8		**9**		**10**		**11**		**12**		**13**		**14**	
.427	.760	.470	.040	.904	.993	.509	.025	.794	.850	.917	.887	.751	.608
.549	.405	.285	.542	.231	.919	.371	.059	.164	.838	.289	.169	.569	.977
.860	.507	.081	.538	.986	.501	.165	.996	.356	.375	.654	.979	.815	.592
.690	.806	.879	.414	.106	.031	.477	.535	.137	.155	.767	.187	.579	.787
.251	.884	.522	.235	.398	.222	.788	.101	.434	.638	.021	.894	.324	.871
15		**16**		**17**		**18**		**19**		**20**		**21**	
.698	.683	.566	.815	.622	.548	.947	.169	.817	.472	.864	.466	.897	.877
.796	.996	.901	.342	.873	.964	.942	.985	.123	.086	.335	.212	.875	.969
.348	.743	.470	.682	.412	.064	.150	.962	.925	.355	.909	.019	.190	.696
.358	.595	.068	.242	.667	.356	.195	.313	.396	.460	.740	.247	.341	.688
.698	.539	.874	.420	.127	.284	.448	.215	.833	.652	.601	.326	.846	.355
22		**23**		**24**		**25**		**26**		**27**		**28**	
.209	.862	.428	.117	.100	.259	.425	.284	.882	.227	.552	.077	.454	.731
.109	.843	.759	.239	.890	.317	.428	.802	.464	.658	.629	.269	.069	.998
.757	.283	.666	.491	.523	.665	.919	.146	.123	.791	.503	.447	.659	.463
.587	.908	.865	.333	.928	.404	.892	.696	.116	.120	.721	.137	.263	.176
.831	.218	.945	.364	.673	.305	.195	.887	.836	.206	.914	.574	.870	.390
29		**30**		**31**		**32**		**33**		**34**		**35**	
.716	.265	.058	.075	.636	.195	.614	.486	.629	.663	.619	.007	.296	.456
.917	.217	.220	.659	.630	.673	.665	.666	.399	.592	.441	.649	.270	.612
.994	.307	.631	.422	.804	.112	.331	.606	.551	.928	.830	.841	.602	.183
.798	.879	.432	.391	.360	.193	.181	.399	.564	.772	.890	.062	.919	.875
.104	.755	.082	.939	.183	.651	.157	.150	.800	.875	.205	.446	.648	.685

2) Take one random core in each sublot insuring that cores meet minimum weight requirements in GDT 125.

3) Select successive numbers, depending on the number of sublots, from Table 1 for the longitudinal coordinate.

4) Select the same number of successive numbers for the transverse coordinate.

5) Determine the axis based on the beginning of a sublot and the left-hand edge of the pavement looking ahead.

b. Example for coring lots for Acceptance (using Method A).

You are given the following:

- The lot is 3,000 ft (914.4 m) long and the lane is 12 ft (3.65 m) wide and has 300 tons (300 Mg) of mix.

1) You are cutting three cores from the lot. By an unbiased method, use the First random number in Block 18 of Table 1 in the right column and the two successive numbers (0.947, 0.942, and 0.150) to determine longitudinal values.

2) Take the lane width minus 1 foot and place 1 pill per foot into a can to be drawn out for Transverse Coordinate (12 foot lane 1 through 11 in can-pills 3, 5, 9).

Note: It is the intention of this procedure to sample materials from the population in a random manner. The use of a Random Number Generator such as those found as a function on some Scientific Calculators and as found within the Field Data Collection System is allowed. If a Random Number Generator is used, determine the test location by substituting the randomly generated number for the random numbers from Table 1 in the examples of Method A

Location of Sample from Beginning of Each Sublot		
Sample No.	**Longitudinal Coordinate**	**Transverse Coordinate**
1	1000 ft. x 0.947 = 947 ft	3 ft
2	1000 ft. x 0.942 = 942 ft	5 ft
3	1000 ft. x 0.150 = 150 ft	9 ft

Note: In some individual cases due to safety reasons, material must be tested within a lane closure**. This will make equal sublots impossible; however, you must include the full length of each day's production in the Lot. There are also safety issues to be considered. In the event that a test site falls in a unsafe area (i.e. in blind curves or just over the crest of a hill) the test location should be move to just beyond the unsafe area but within the boundaries of the sublot being tested. In the event that either of these is the case, an explanation should be included in the remarks section of TM 150 test report.**

4. Determining locations with Nuclear Gauge

a. The length of the Lot is 5,000 ft (1,524 m). Use 1,000 ft (1,524 m) per sublot (5000 ft/5 = 1000

b. To determine stations, use an unbiased method. The first random number in block 18 in the right column and the four successive ones (.947, 0.942, 0.150, 0.195, and 0.448) determine the stations.

Station Within Each Sublot	
Sublot 1	1000 feet x 0.947= 947 feet from start of sublot
Sublot 2	1000 feet x 0.942= 942 feet from start of sublot
Sublot 3	1000 feet x 0.150= 150 feet from start of sublot
Sublot 4	1000 feet x.195 = 195 feet from start of sublot
Sublot 5	1000 feet x 0.448= 448 feet from start of sublot

Note: Do not test any section within 25 ft of a transverse joint. Do not test any turning lanes, turnouts, and driveways less than 200 ft in length or tapered sections less than 10 ft wide.

c. To determine transverse coordinates, divide the lane into three equal transverse zones.

d. Record on the work sheet one reading within each zone at the random selected site.

e. Determine the average and record it as a test.

f. If the width of lane is 12 feet you will use 4 feet per zone (12 ft/3 zones = 4 ft per zone

g. For this example, place 4 tokens, numbered 1 through 4, in a container.

h. By an unbiased method, you select three numbers from the pill can to determine the transverse locations of the test sites. The numbers are 2, 3, and 1.

i. Since the left edge of the lane looking ahead is the axis, take the readings at the following transverse locations:

Zone	Calculation	Location
1	Pill 2	2ft
2	Pill 3	3 ft
3	Pill 1	1 ft

Note: Avoid testing sites that fall on the edge of a paving lane. For example, use 1 ft (300 mm) for any sites falling 1 ft (300 mm) or less.

j. Take the 3 gauge readings for sublot #1 starting 947 ft- from the beginning of the sublot at 2 ft, 7 ft, and 9 ft from the left edge of the lane.

k. Use the average of the three readings as the test for that sublot.

l. Determine the test locations for the remaining sublots using the same process.

Note: Before reporting test results for payment, automatically retest non-conforming lots of asphaltic concrete density. Test at the same longitudinal location as the previous tests and at a randomly selected transverse site according to GDT 39. Base official values for non-conforming average Lot density on the core average from step 5 below.

5. Re-evaluating Non-Conforming Average Voids

a. If you reevaluate beyond the automatic recheck, use randomly determined cores at new locations as described in Procedure 4. 1 and 2

b. Determine the Transverse Coordinates by taking the lane width minus 1 ft and placing 1 pill per foot into a can.

Draw a pill from the can and core at that transverse location on the mat.

E. Calculations

1. Method A

a. Method A Calculations

This example uses Table 1 to calculate the sublot tests. You are given the following:

Expected plant production: 1,600 to 1,800 tons (1,600 to 1,800 Mg) (3 to 4 samples)

Average load of haul vehicles: 20 tons (20 Mg)

1) Therefore, use 25 loads [(500 tons (500 Mg)) / (20 tons (20 Mg)/load) = 25] for the first sublot.

2) By an unbiased method, use the last random number in Block 18 of Table 1 in the right column and the four successive numbers (.215, .284, .802, .146 and .696).

3) Calculate the loads to sample as follows:

Sample	Calculation	Load
1	25 loads x .215 = 5.4 or 5 +0	= 5th Load
2	25 loads x .284 = 7.1 or 7 + 25	= 32nd Load
3	25 loads x .802 = 20.1 or 20 + 50	= 70th Load
4	25 loads x .146 = 3.7 or 4 + 75	= 79th Load

4). If the plant produced 92 loads for that day, take samples of the mix from loads 5, 32, 70, and 79 to represent that Lot.

2. Method B (Random Tokens)

   This example uses Method B to calculate the sublot tests. You are given the following:

   Plant production: 2,600 to 3,000 tons (2,600 to 3,000 Mg) (4 to 5 samples)

   Average load of haul vehicles: 22 tons (22 Mg)

   a. Therefore, use 34 loads (750 tons (750 Mg) / 22 tons (20 Mg)/load = 34) for the sublots.
   b. Place 34 tokens numbered 1 through 34 in a container.
   c. Draw a token from the container.
   d. Record the number and return it to the container.
   e. Calculate the sublots to be tested as follows:

Sample	Calculation	Load
1	Token #1 drawn = 1	= 1st Load
2	Token #16 drawn = 16 + 34	= 50th Load
3	Token #31 drawn = 31 + 68	= 99th Load
4	Token #16 drawn = 16 + 102	= 118th Load
5	Token #11 drawn = 11 + 136	= 147th Load

   f. If the plant produced 130 loads for that day, take samples of the mix from loads 1, 50, 99, 118, and 147 to represent that Lot

3. Method C (DOT Computer Program)

   This example uses Method C to calculate the sublot tests.

   a. Using the computer program developed by the Georgia DOT, enter the requested pertinent data about expected production and the haul load sizes. The program will randomly select the loads per sublot for the entire Lot.
   b. Retain this list for future reference.

Note: Method C is the preferred method when performing sampling at an asphalt plant. It should be utilized as the correct sampling procedure at all times unless specific permission is granted by both the District Testing Management Operations Supervisor and the Area Bituminous Technical Services Engineer

F. Re-Evaluation

1. Mixture Acceptance

   For all mix types other than PEM, OGFC, Mixture paid as patching and thin lift courses < 110 lbs/yd^2, the Department will take the same number of new tests on cores taken at the locations where the loads sampled were placed and will use only those cores results for acceptance. If the location of the sampled loads cannot be isolated and documented to the approval of the Engineer, the lot will not be re-evaluated and the original test results will be used for acceptance. For PEM, OGFC and thin lift courses < 110 lbs/yd^2, the retained opposite quarter shall be used for revaluation when a re-evaluation is requested by the Contractor.

2. Compaction Acceptance

   The Department will reevaluate the lot through additional testing by cutting the same number of cores originally obtained at randomly selected locations and averaging these results with the results from the original density tests.

Note: Reevaluation of Lots and acceptance will be based on Department evaluations. The Request for reevaluation shall be made within 5 working days of notification of the Lot results. The Department will be reimbursed for the cost of the re-evaluation. Traffic control will be the responsibility of the contractor. The TMOS, Assistant, or TSE must be present during re-evaluation(The cost can be found below in the RE-Evaluation Cost Table)

G. Report

Keep track of the loads sampled and locations sampled and report actual tests on the respective forms:

1. From GDT 83 or GDT 125 for Asphalt Cement Content.
2. From GDT 38 for Mixture Gradation.
3. From GDT 59 for Nuclear Gauge Compaction.
4. From GDT 39 for Core Compaction.

RE- Evaluation Cost Table

GDT	Hr/Rate	Mileage	Bit wear	Test
GDT-39	$55.00 per person	.70 mile	$12 per inch	$25 per core
GDT-125	$55.00 per person	.70 mile	$12 per inch	$150 per core