Designation: D 3665 – 99

Standard Practice for Random Sampling of Construction Materials[1]

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1. Scope

1.1 This practice covers the determination of random locations (or timing) at which samples of construction materials can be taken. For the exact physical procedures for securing the sample, such as a description of the sampling tool, the number of increments needed for a sample, or the size of the sample, reference should be made to the appropriate standard method. The selection procedures in Section 4 utilize the table of three-digit numbers given in Table 1.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

C 172 Practice for Sampling Freshly Mixed Concrete[2]
C 183 Practice for Sampling and the Amount of Testing of Hydraulic Cement[3]
D 75 Practice for Sampling Aggregates[4]
D 140 Practice for Sampling Bituminous Materials[4]
D 345 Test Method for Sampling and Testing Calcium Chloride for Roads and Structural Applications[4]
D 979 Practice for Sampling Bituminous Paving Mixtures[4]
D 5361 Practice for Sampling Compacted Bituminous Mixtures for Laboratory Testing[4]
E 105 Practice for Probability Sampling of Materials[5]
E 122 Practice for Choice of Sample Size to Estimate a Measure of Quality for a Lot or Process[5]
E 141 Practice for Acceptance of Evidence Based on the Results of Probability Sampling[5]

3. Significance and Use

3.1 This practice is useful for determining the location or time, or both, to take a sample in order to eliminate any intentional or minimize any unintentional bias on the part of the person taking the sample.

NOTE 1—The effectiveness of this practice in achieving random samples is limited only by the conscientiousness of the user in following the stipulated procedures.

3.2 A less detailed procedure is included in 5.8 for normal usage and is considered the most practical means except where the sampling is deemed extremely critical or where dispute is anticipated.

3.3 The selection procedures and examples in this standard provide a practical approach for ensuring that construction material samples are obtained in a random manner. Additional details concerning the number of sample increments, the number of samples, the quantities of material in each, and the procedures for extracting sample increments or samples from the construction lot or process are contained in Practices C 172, C 183, D 75, D 140, D 979, D 5361, and Test Method D 345.

3.4 This standard contains examples citing road and paving materials. The concepts outlined therein are applicable to the random sampling of any construction material and can easily be adapted thereto.

3.5 Additional sampling guidance is provided in Practice E 105 concerning probability sampling, Practice E 122 concerning choosing sample sizes to estimate the average quality of a lot or process (see Note 2), and in Practice E 141 for acceptance of evidence based on results of probability sampling.

NOTE 2—The guidance contained in Practice E 122 is not available in other documents referenced in this section.

3.6 The best and most practical method for ensuring that samples of construction materials include the full range of a construction process is by incorporating a stratified-random sampling procedure into the sampling process. To implement a stratified-random sampling procedure, divide the lot to be sampled into the desired number of equal sublots and randomly sample each sublot in accordance with this standard.

NOTE 3—If the sublots are of unequal size, it will likely be necessary to weight the samples in order to maintain a fair and defensible sampling process.

4. Selection Procedures

4.1 *Sampling from a Belt or Flowing Stream of Material*:

4.1.1 Determine the length of time, *t*, in minutes, for the lot of material to be sampled to pass the sampling point and determine the number of samples, *n*, to be taken from the lot.

[1] This practice is under the jurisdiction of ASTM Committee D-4 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.30 on Methods of Sampling.

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[2] *Annual Book of ASTM Standards*, Vol 04.02.
[3] *Annual Book of ASTM Standards*, Vol 04.01.
[4] *Annual Book of ASTM Standards*, Vol 04.03.
[5] *Annual Book of ASTM Standards*, Vol 14.02.

TABLE 1 Table of Random Numbers

	0	1	2	3	4	5	6	7	8	9
1	0.272	0.519	0.098	0.459	1.000	0.554	0.250	0.246	0.736	0.432
2	0.994	0.978	0.693	0.593	0.690	0.028	0.831	0.319	0.073	0.268
3	0.039	0.449	0.737	0.501	0.960	0.254	0.239	0.474	0.031	0.720
4	0.144	0.695	0.339	0.621	0.128	0.032	0.413	0.617	0.764	0.257
5	0.312	0.138	0.670	0.894	0.682	0.061	0.832	0.765	0.226	0.745
6	0.871	0.838	0.595	0.576	0.096	0.581	0.245	0.786	0.412	0.867
7	0.783	0.874	0.795	0.430	0.265	0.059	0.260	0.563	0.632	0.394
8	0.358	0.424	0.684	0.074	0.109	0.345	0.618	0.176	0.352	0.748
9	0.494	0.839	0.337	0.325	0.699	0.083	0.043	0.809	0.981	0.499
10	0.642	0.514	0.297	0.869	0.744	0.824	0.524	0.656	0.608	0.408
11	0.485	0.240	0.292	0.335	0.088	0.589	0.127	0.396	0.401	0.407
12	0.728	0.819	0.557	0.050	0.152	0.816	0.404	0.079	0.703	0.493
13	0.029	0.262	0.558	0.159	0.767	0.175	0.979	0.521	0.781	0.843
14	0.918	0.348	0.311	0.232	0.797	0.921	0.995	0.225	0.397	0.356
15	0.641	0.013	0.780	0.478	0.529	0.520	0.093	0.426	0.323	0.504
16	0.208	0.468	0.045	0.798	0.065	0.315	0.318	0.742	0.597	0.080
17	0.346	0.429	0.537	0.469	0.697	0.124	0.541	0.525	0.281	0.962
18	0.900	0.206	0.539	0.308	0.480	0.293	0.448	0.010	0.836	0.233
19	0.228	0.369	0.513	0.762	0.952	0.856	0.574	0.158	0.689	0.579
20	0.746	0.170	0.974	0.306	0.145	0.139	0.417	0.195	0.338	0.901
21	0.363	0.103	0.931	0.389	0.199	0.488	0.915	0.067	0.878	0.640
22	0.663	0.942	0.278	0.785	0.638	0.002	0.989	0.462	0.927	0.186
23	0.545	0.185	0.054	0.198	0.717	0.247	0.913	0.975	0.555	0.559
24	0.360	0.349	0.569	0.910	0.420	0.492	0.947	0.115	0.884	0.452
25	0.789	0.815	0.464	0.484	0.020	0.007	0.547	0.941	0.365	0.261
26	0.279	0.609	0.086	0.852	0.890	0.108	0.076	0.089	0.662	0.607
27	0.680	0.235	0.706	0.827	0.572	0.769	0.310	0.036	0.329	0.477
28	0.078	0.444	0.178	0.651	0.423	0.672	0.517	0.660	0.657	0.972
29	0.676	0.830	0.531	0.888	0.305	0.421	0.307	0.502	0.112	0.808
30	0.861	0.899	0.643	0.771	0.037	0.241	0.582	0.578	0.634	0.077
31	0.111	0.364	0.970	0.669	0.548	0.687	0.639	0.510	0.105	0.549
32	0.289	0.857	0.948	0.980	0.132	0.094	0.298	0.870	0.309	0.441
33	0.961	0.893	0.392	0.377	0.864	0.472	0.009	0.946	0.766	0.287
34	0.637	0.986	0.753	0.566	0.213	0.807	0.017	0.460	0.515	0.630
35	0.834	0.121	0.255	0.453	0.376	0.583	0.422	0.371	0.399	0.366
36	0.284	0.490	0.402	0.151	0.044	0.436	0.747	0.694	0.136	0.585
37	0.038	0.814	0.594	0.911	0.324	0.322	0.895	0.411	0.160	0.367
38	0.351	0.283	0.027	0.220	0.685	0.527	0.943	0.556	0.853	0.612
39	0.143	0.384	0.645	0.479	0.489	0.052	0.187	0.990	0.912	0.750
40	0.512	0.056	0.018	0.122	0.303	0.803	0.553	0.729	0.205	0.925
41	0.296	0.705	0.156	0.616	0.534	0.168	0.564	0.866	0.739	0.850
42	0.451	0.536	0.768	0.518	0.481	0.880	0.835	0.734	0.427	0.847
43	0.837	0.405	0.591	0.370	0.104	0.848	0.004	0.414	0.354	0.707
44	0.724	0.153	0.841	0.829	0.470	0.391	0.388	0.163	0.817	0.790
45	0.665	0.825	0.671	0.623	0.770	0.400	0.068	0.440	0.019	0.944
46	0.573	0.716	0.266	0.456	0.434	0.467	0.603	0.169	0.721	0.779
47	0.332	0.702	0.300	0.570	0.945	0.968	0.649	0.097	0.118	0.242
48	0.755	0.951	0.937	0.550	0.879	0.162	0.791	0.810	0.625	0.674
49	0.439	0.491	0.855	0.446	0.773	0.542	0.416	0.350	0.957	0.419
50	0.700	0.877	0.442	0.286	0.526	0.071	0.154	0.988	0.333	0.626

Following the instructions accompanying Table 1, pick *n* numbers to determine the times *t* to select the necessary samples.

4.1.2 *Example*:

4.1.2.1 The lot of material to be sampled from a flowing stream at a transfer point is defined as 480 min of production. Five samples are required from the lot. From Table 1, the following five numbers were picked:

0.091
0.420
0.217
0.370
0.006

These numbers are used directly (decimals disregarded) to determine the sample selection times. Any number over 480 should be discarded and another chosen.

4.1.2.2 Thus, samples will be taken at the following times