USING RANDOM NUMBER TABLES

DOTD Designation: S 605-99

I. Definitions

A. *Lot:* An isolated quantity of material from a single source. A measured amount of construction assumed to be produced by the same process. Examples of lots are: 1000 tons of asphaltic concrete, 1000 lin ft of base course, approximately 4000 yd^2 of P.C.C. pavement, an identifiable pour of structural concrete not exceeding 200 yd^3.

B. *Sublot:* A portion of a lot. Under some circumstances, a lot may be divided into sublots for sampling purposes. Examples of sublots are: one half of a lot of asphaltic concrete (approximately 500 tons) sampled for extraction testing, one quarter of a lot of asphaltic concrete (approximately 250 tons) sampled for Marshall properties, one fifth of a lot of asphaltic concrete paving sampled for pavement density.

C. *Random:* Without aim or reason, depending entirely on chance alone.

D. *Sample:* A small part of a lot or a sublot which represents the whole. A sample may be made up of one or more increments or test portions.

E. *Random Number:* A number selected entirely by chance as from a table of random numbers (see Tables 1 through 5).

II. Method of Sampling

A. Procedures

When samples are to be obtained on the basis of time, quantity or location:

1. Select the unit of measure (tons, cubic yards, linear feet, time, etc.) that represents the lot or sublot.
2. Pick random numbers as needed from the Tables of Random Numbers, Tables 1 through 5.
3. Multiply the unit of measure selected in step 1 above by the selected random numbers.
4. The resulting values will represent the quantity, time or location to be sampled for each increment. Should the resulting value be outside the specified limits, this value shall be discarded and another number chosen.

B. Examples

1. *Tonnage*

The specifications for asphaltic concrete require four samples to be obtained per lot for Marshall properties testing.

a. Divide the lot into four sublots of approximately equal size by tonnage (approximately 250 tons per sublot).

b. Choose any number at random from Tables 1 - 5.
e.g. .667

c. Multiply the random number selected by 250.
250 x .667 = 166.75

d. The truckload in which ton number 167 occurs would then be sampled for Marshall properties for the first sublot.

e. For subsequent sublots, repeat steps b and c, then add the ton number selected to the number of tons in the preceding sublot.
e.g. (1) Assume sublot 1 actually consists of 253 tons of asphaltic concrete.

(2) Assume that .022 is the random number selected for sublot 2.

(3) 250 x .022 = 5.5
253 + 5.5 = 258.5
The truckload in which ton number 258 occurs would be sampled for Marshall properties for the second sublot.

2. *Time*

The specifications require that two samples (one per half day's operations) of asphaltic concrete friction course be obtained for extraction testing per lot.

a. Assume the plant operates seven hours (4 hours the first half and 3 hours the second half).

b. Pick any two numbers from Tables 1 - 5.
e.g. .541 and .201

c. Multiply the first number picked by 4 (.541 x 4 = 2.16) and the second number by 3 (.201 x 3 = .603).

d. If the plant started at 7:00 a.m., then the time to obtain the first sample would be calculated as follows:
Multiply 2.16 (obtained in step c) by 60 minutes.
60 x 2.16 = 129.8 minutes
Add 130 minutes to 7:00 a.m.
The first sample would be obtained at 9:10 a.m.

e. Assume the plant stops production from 11:00 a.m. - 1:30 p.m. The time for the second sample would be obtained in the same manner.
Multiply .603 (from step c) by 60 minutes
60 x .603 = 36.18 min
Add 36 minutes to 1:30 p.m.
1:30 + 36 = 2:06 p.m.

3. *Exact Location Based on Transverse and Longitudinal Distance*

a. Longitudinal Testing

The specifications for asphaltic concrete require that the finished surface of the final wearing course be tested for conformance to surface finish tolerances at a randomly selected distance from the lane edge.

(1) Pick a number from Tables 1 - 5.

(2) Multiply the width of the lane by the random number selected.

e.g. Lane Width = 12 ft
Random Number = .343
12 x .343 = 4.116

The lane would be tested for the entire length of the day's production at a point 4.1 ft from the lane edge.

b. Core Locations

The specifications for asphaltic concrete require that five samples be taken from each lot of material placed on a project for pavement density testing.

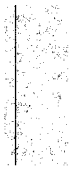
(1) Divide the lot into five sublots of approximately equal length.

(2) Select a number for each sublot form Tables 1 - 5.

(3) Multiply the length of each sublot by the random number selected for that sublot, then add the product to the beginning station for the sublot to obtain the sampling location.

e.g. (a) Assume the lot begins at station 1 + 54 and extends for 6840 linear feet.
Each sublot would be 1368 linear feet.

(b) Assume .418 is the random number selected.



(c) .418 x 1368 = 571.824 = 572 ft
(1 + 54) + 572 = 7 + 26
The sample for pavement density for the first sublot would be obtained at station 7 + 26.

(d) Repeat for each sublot using the random numbers selected for that sublot.

(4) To select the exact sample location transversely, apply the method in step 3.a. for each station location.

TABLE

196	.430	.116		776	.669	.868	.665	.300	.989
.391	400	280		732	794	.313	.256	664	.016
.647	.457	.087	.836	.034	.678	.032	.423	666	.556
929	.878	564	.998	.297	.447	.064	.311	.073	.771
035		.094	.050	.459	135	369	.321	.110	.803
.988	.209	.068	.656	146	.346	.714	.909	198	.707
.273	.882	.534	541	.536	.863	.037	.822	.196	.088
.590	974	.633	483	.435	.481	.582	.967	.493	.951
.916	.783	.641	.022	.985	.495	.498	.068	.388	.838
.836	.419	.394		715	.673	.351	759	.449	.291
248	530	.707	.439	.467	.472	.702	.675	.916	.275
.357	556	.955	.094	.737	.788	.342	.703	.463	.248
141	.410	.386	.343	572	342	.727	.318	.903	.562
274		.921	.535	.931	.077	.068	.244	.923	.374
.820	.429	.810	749	.407	.974	.233	.821	.538	.536
214	.793	.248	.241	.141	.268	.708	.002	.038	.443
725	.400	522	.348	.623	.481	.297	165	.331	.020
.714	.027	.761	.411	137	.632	.523	.762	.888	.697
.832	.466	.090	.395	.267	306	.217	.001	.994	.767
	148	948	.636	.967	.024		143	966	.886
	763	.470		.053	.439	.149	.830	.600	.551
136	546	.968	.240	.475	483	.873	.818	.078	.269
.005	.220	.002	.069	.250	.519	.525	.091	.212	.296
.954	695	580	.990	.603	.955	.715	.417	.354	.807
785	.547	468	.981	385	.037	.647	.324	.049	.666
.092	.844	791	.435	.354	.561	.697	.314	.129	.516
.233	.206	.934	.836	.949	.846	.025	.410	.949	.199
.052	.470	.936	.345	150	.510	.180	.613	.782	.001
.954	976	.383	.192	.826	.624	.724	.606	.231	.693
.785	104	182	.583	.903	784	.540	.251	.357	.692
963	.579	.859	.053	.757	.840	.865	.944	.524	766
779	151	.323	.691	.473	.333	.234	.065	.084	.366
.073	294	.232	.748	.416	.328	548	.777	100	.332
	.309	707	736		258	292	152	.050	.825
.024	533	.211	.555	.339	.817	.073	.215	.307	102
158	261	.172	.190	.617	.898	.925	.283	.885	.098
719	.819	.591	.224	.305	.194	.183	.999	.268	.238
.644	108	165	.016	.283	.229	.103	.168	.656	.834
797	924	494	.432	.810	543	.952	.865	.136	.081
353	538	.445	.672	909	849	938	608	.931	.851
.052	.329	197	.082	147	.667	.437	.354	.936	.527
.564	.380	387	774	190	.939	.460	.647	.661	.210
.962	121	541	108	.758	.986	.711	.102	.289	165
983	.269	.600	.201	.624	.385	.421	.350	.461	126
525	.350	.163	969	.803	114	.543	.578	.472	.747
.784	.830	.259	.236	.432	.064	.999	144	.644	.377
.495	.241	.081	.535	.087	.041	.773	.079	.451	.886
.321	.075	.831	.252	731	.618	.238	.418	.454	.268
113	.363	.268	.799	.494	.534	.191	.059	.766	
	.210	.870	.241	.907	.889	.813	.130	.644	.614

940		.324		598	163		.843	414	.820
		885	015		.035		750	489	.603
					314	.728	.334	.392	149
	102		.867			.065		739	.552
	.600		343	258		572	.618		.326
660		.950			.487		481	370	
	030		818		.169		647		
	.589		.260		.654	463	366	947	
		869	307	943		268		124	
.083	975	358		081	.987	.871			
		853		294		.730			310
130		540	243	.477		.474		.310	699
		.985		244		.432		114	082
	004	903		574	368	.538	743	.086	741
	326	266	087		779		886		454
603			678		242		.003		214
497		920	086		209	592	973	029	250
		164		.390	066	830	.832		628
		998		.812	987		.412		.568
440		.073		764		985			.514
414	149			149			556		905
		.496		.703	682		.099	744	740
	.360			.908			790		.072
502	113	.417		.247		554	667		.892
413				.409		950	783		.816
258			920		385	.907		988	583
061		883	041		808	689			.882
		744			.838	364	.489	180	.061
	.893	104			.941	926		.670	.067
	120	.467			292		808	775	
493				.217			174		.438
									215
			674			967	244		.393
923	.932		347			394			564
		313	924	.855		.581			.518
381	756			.958	067		885	.706	
			502	.926	719		203	193	
			680	.676		691	.845	385	600
		576	266			140	153		
		289	896		562	.623	589	088	985
	826	185				788	.499		
.668	.495	323	985			263	.463	553	
724	230			925		784	276		
.210	050				.500	152	139	595	
953					.857	.550	374	.358	
.497	380		452	340	.726			.366	424
582			716	502	.345		.092		.939
		.682	.417	739	145	.303			
			.732	.468	088	734			.220
		512	.302	.608	109	.214			.837

TABLE 3

039				653			886	
	554	.328	083	860	.297		712	.853
		.920			590		279	.909
326		.958	009	936	763		808	.514
695		.395	.905	619	.295	.616		780
	591		494	148		.100	908	
		929		418	.382	.943	780	
.305		102		396	.309		.559	485
037		758			.166	352	.875	823
482		857	619		.433	356	168	311
	653	350	949		.297	019	.989	231
	.402		442	.349	374	700	.099	.065
	.405		232	.993	600		.159	253
	845		606		646		.196	
	747		.408			.476	.852	
317		689	339	.154		.886	031	
884		144	504	.200	977	748	.413	508
	.744	074	828	.737	.533		.405	942 .380
	893		748		128		.617	820
782	993		.386	443	486	657	.014	.220
418		.468	326	346	300		.345	193 549
		.692	.460	.453			.855	.951
	294	140		.597		765	513	.396 544
	337			.165		116		.021
	898			686		928		884 584
208	156			.793			267	106 .391
	.924			.335		558	.641	.704
	297			.595		.668	515	.497 .037
776	019		.080	205		.962	.257	.616
386			545			.439	.680	.438 .693
		.700	.021		312	.718	.957	689
652		.372	.295	058	119	.927		184
		186			.005	.049		147
		.053			759	.451	.332	.837 .567
		.950			.558			169
837	873			608	983		.349	203
143	345			.435	318		.761	.411
513			.074	887			.431	.678
		.808	.002	948			.436	
	306		.464			728	.834	799 .416
395	484			.485	.247	186		.241
				.751	724		583	.997
	120			.929			763	.940
		135	200	.699				186 872
		295	627	949				004 997
344	157	868					783	.362
.634	363	.449		360		763	605	.659
.670		933					807	.202
794		521			.243	469		593 938
917	552	047	031					.997 478

TABLE

100	533	765		.346	.876	.809	117	.392	.945
.375		648	296	.248	.037	.206	.402	.008	.665
.084	953	196	.303	.232	.560	.159	.764	.350	.060
990	529	.093	.715	.383	165	.886	.397	.044	.659
128		.801	147	.640	.653	.989	.877	.121	.833
.660		.340	.850	.366	170	.658	.885	119	170
.310	.805	.455	.406	.353	.614	.867	.439	.234	.732
.852	.602	.020	.692	.686	.818	.730	.247	.186	.579
635	135	.053	.048	.905	.548	.284	.709	.834	.624
737	753	.035		.358	.282	.609	344	.352	.435
.985	767	149	.607	.221	.558	609	.433	505	.998
.118	.431	398	732	.507	.248	.294	.201	.527	.851
.834	634	.062	.083	.137	.078	.184	.610	.687	.817
.886	.200	.865	.401	.367	.951	.903	.493	.296	.062
.995	.348	.875	.969	.918	.928	.937	.368	.234	.113
.654	674	174	.950	.580	.974	.730	186	.402	.544
.801	.635	.117	.015	.453	.374	.211	.253	.143	.763
743	.817	.774	.214	.432	.210	.455	.237	.962	.655
.699	.803	.662	.148	.369	.203	.766	.990	.944	.418
098	.505	.142	.514	.464	.788	.962	.822	543	.598
	.523	.684	.686	.461	.554	.947	.923	.370	.048
.803	.598	.269	.858	.702	.135	.531	.340	.420	.341
.441	.949	.851	.954	.329	.575	.576	.881	.222	.431
.125	742		.040	.128	.697	.966	.439	.287	.815
.636	329	.165	484	.402	.563	.436	.082	.072	.790
	.446	.264	.774	519	729	.653	.593	.425	.527
.154	266	.952	.953	593	848	.823	.118	.332	.466
945	.573	.678	.387	.546	.431	.911	.592	.929	.973
	.213	.973	.721	168		.030	.059	.257	.670
.235		.732	.837	.689		.262	.663	.055	.562
.044	.494	.752	.824	.458	.025	.619	.335	.653	.472
.005	.654	640	.159	.961	.896	.546	.391	.232	.529
.359		268	.354	.333	.462	.779	.024	.901	.333
.598	391	.454	.842	.836	.700	130	892	785	.106
.460	236	.013	.286	.772	.077	939	.647	.706	.941
321	.597	.873	.241	.055	.007	.867	157	.853	.838
.692	.406	.201	.204	159	.050	.187	.423	.971	.338
.195	.430	.017	.379	.404	.585	.666	.806	.849	.207
.451	.938	.194	.246	.436	.543	.590	.033	.208	.541
.948	994	.361	.851	.348	.553	.015	.456	.050	176
980	.826	.452	.404	.449	.896	.390	.407	354	.880
	.232	.419	.949	.894		.886	.994	.375	.043
809	.406	.963	.774	.201	.387	250	.298	.946	.171
797	140	.719	296	.698	.591	748	539	.003	.579
.186		981	571	.310	.674	.054	.427	.779	.936
.740	902	.775	.270	.977	.119	.525	.021	.808	.748
541	.611	.809	.143	.053	.969	.561	.255	.360	.324
116	.883	.520	.827	.593	539	.099		.884	.356
.483	928	.312	.710	.022	.870	.323	546	.150	.994
.690		.876	976	.355		.105	.613	.018	.938

TABLE

.091		328			304		642	.044
900		519			997	.918	684	.659
			269			.271		.760
757		209	749		272	.953		178
	056		.003	006	.398	207	.077	
	910			136	.873	.563	.312	
		813		.405	893	.475		
538		815		512		795		
917		616		502	212	.514	.834	
894		003		126		.489	306	945
775		.868	901	.684	774	980	728	
		699	288		773	.251	653	
	313				156	.070	.046	318	.452
514	499		.621		345	.191	080	
	331	.623	170		.830	142	438	.834
	007		.869	519		.822	931	.972
.852		113		288		.735	711	.643
.841	640	.440		738		.612	.623	.423
	234				622	.854	.816	.880
	806		.261			.458	856	
380			.711		937	.742	.049	.698
.374		013	586		086	.473	.605	.438
971		.870		218	250		.047	578
		.471		646	902	.491	.441	.552
		957	035	857	296			.202
.076	929	030	072	962	156	.238	.047	.994
.605			.814		695	.055	.612	
.835			983		719	.774	923	
		995	507		.319		.064	.362
	952				.814		.310	
	478	755		888	.486		041	
		237		908	.022		959	.953
	668	946			.091	820	.400	054
	659		437	.496			676	962	.836
	264			.074					358
.913				366	.728			.289	
.684	688				.408			.098	
.489			591	357			.692		
.069			.601	118			.901		
		142	712			.883	.851	.436	
128	343				392	.179	.077	907	
217	976	.388			.096	.632	.023		.449
			.659	.862	258	695			.529
	670	.355	563	.792	686			266	.802
605			992	451	529				.344
			850	588	859				642
246	.736	743	342	526				.037	.873
.830	.451	889	815					.519	867
	334					939	.552	.548	759
	157	571			.458	576	.979	.651	.860