CONDITION SURVEY OF SOIL-CEMENT ROADS

By W. H. Mills, Jr.

Last year the Subcommittee presented in a series of six tables[1] the pertinent data concerning the construction and condition after a period of service of 68 soil-cement projects in 23 States, which comprised practically all of this type of work in place at that time.

A more detailed analysis of the condition data has since been made and is presented here in order to complete the survey. For ready reference the tables, included in Figures 1 to 6 are reproduced.

The conditions of the projects were classified as: excellent, good, fair, poor and very poor.

In order to arrive at overall ratings for the projects, failed areas were assigned a value of 80 per cent, areas of deep ravel or softening to depths of ¾ in. to 2½ in. 15 per cent and areas of very thin ravel or surface scale 5 per cent. For instance; if a project contains 1 per cent failed area, 10 per cent deep ravel and 20 per cent surface scale the overall rating would be:

$$0.01 \times 80\% + 0.10 \times 15\% + 0.20 \times 5\% = 3.3\%$$

This would place the project in the classification "good" on the following scale:

Class	Overall rating, %
Excellent	Less than 1
Good	1 to 5
Fair	5 to 15
Poor	15 to 30
Very poor	Over 30

On this basis the soil-cement bases of 64 projects were classified as follows: excellent 44, good 17, fair 3. Information for proper rating was lacking on four projects, and none was rated poor.

[1] Report of Subcommittee on Use of Portland Cement in Soil Stabilization, *Proceedings*, Highway Research Board, Vol 20, p 812

SUPPLEMENTARY DISCUSSION OF DATA

Figures 1, 2, 3

Age The projects in service vary in age from 1 to 7 years. Four projects in South Carolina are more than 5 years old and one project in Texas is over 7 years old It should be remembered that projects less than one year old were not included as the committee felt that the service records on such projects would not be significant.

Soil Information is presented on the soils which were mixed with cement and on the subgrade soils. The data show that soils of almost every conceivable type have been used In general, A-2 and 3 soils predominate but many projects are reported where A-4, 6 and 7 soils were used. The cement contents likewise vary greatly The minimum cement content reported was on a project in South Carolina where 3 per cent by weight was used with a soil having 38 per cent clay, 19 per cent coarse sand and a plasticity index of 14. The maximum cement content of 14 5 per cent is reported on a project in Illinois where the soil has 34 per cent clay, no coarse sand and a plasticity index of 16. There are no definite relations between any of the soil tests and the cement contents but in general the cement content is increased with increases in the percentage of clay. The cement content for the projects was determined usually by laboratory tests designed to show differences not only in clay content, plasticity index, etc, but also differences due to organic matter. In most cases, the Tentative Standard Procedures of the A S T M. were followed Seven to 7 9 per cent cement by volume is reported on 8 7 per cent of the projects, 8 to 8 9 per cent on 38 per cent of the projects, 9 to 9.9 per cent on 25 per cent of the projects, 10 to 10.9 per cent on 39 per cent of the projects. In most cases the quantity was

varied within the limits of a project due to differences in the soil and the foregoing figures in many instances include two or more percentages for the same project

In general, the subgrade soils were of the same type as the material stabilized but in a few instances selected soils were used for the base course

FIGURE 4

Climatic Conditions It is difficult to present any summary of these data because of great variations encountered in different sections of the country The maximum annual rainfall reported was 60 in and the minimum was 5.8 in. Nine projects are reported in areas having less than 20 in. annual rainfall and 32 where the rainfall is more than 40 in. Some rainfall is reported on practically all projects during construction. It is a coincidence that the project showing the least annual rainfall had the most rainfall during construction.

Snowfall ranged from a maximum of 72 in. on the upper peninsula in Michigan to a minimum of zero for projects in California and Georgia. Twenty-three projects had more than 10 in. of snowfall.

The minimum temperature reported was a low of −30° F. in New York. A project in Michigan was subjected to the most freezing as it was reported that the thermometer was below freezing for 159 days per year at this location. Alternations of freezing-thawing are probably more severe than continuous freezing but data on the number of alternations are not available.

Design: In general, design features of the projects varied almost as much as the climatic conditions. The widths varied from 9 to 30 ft. with shoulders from 1 to 10 ft. wide, ditches from 0 5 to 6 ft deep and crown from 1¼ in. to 6 in. with most projects having 2 in. or less. The thicknesses are generally 6 in compacted but a minimum thickness of 3 in. was reported on one project and a maximum thickness of 14 in on another.

Traffic The projects are for the most part subjected to relatively light traffic but on one project in Texas 6,800 vehicles per day is reported The minimum reported is 43 vehicles per day. Forty projects have traffic densities below 500 and three projects have densities above 1,000 The traffic on the other projects is between 500 and 1,000 per day. Truck traffic is variable, a maximum of 684, 5-ton or heavier, trucks being reported on one project and none at other locations.

FIGURE 5

Equipment The information shows that in general the same type of construction equipment has been used on all projects and that the mixed-in-place method has been followed on the majority of the projects. Fourteen projects have been constructed by traveling mixing plants and, of course, use of this equipment resulted in great differences in procedures It is impossible to describe in this report the methods of handling the various pieces of equipment but this factor probably contributed more towards the efficiency of construction than the use of any particular apparatus

Pulverizing Pulverization of the soil prior to the application of cement has caused considerable concern and the data show that in the majority of instances pulverization to at least 80 per cent passing the No. 4 screen was secured.

Spreading Cement The hand method of applying cement was used generally but mechanical spreaders were used on 17 projects.

Compacting and Finishing All of the projects except some of the very old ones were compacted with a sheepsfoot roller Finishing operations and the rolling of the top surface are of great importance and generally the final rolling of the top of the surface was performed with a three-wheel steel roller. Some States re-

port the use of a roller with pneumatic tires for this operation and in a great many instances ⅛ in to ½ in of the top mulch was bladed off and wasted for the final finishing operation In several instances softening of the top ½ in. to 1 in. is reported where the final finishing was not satisfactory.

Protective Cover. Most of the bases were protected from evaporation losses for seven days following the final finishing operation. The use of wet earth is most common and was reported on 23 5 per cent of the projects Wet straw and sawdust were used on 14 5 per cent of the projects, sprinkling for 2 or 3 days on 4 3 per cent and covering with waterproof paper on 1 4 per cent. Moist burlap or cotton mats were used on 4.4 per cent of the projects Applications of tar prime are reported on 8 7 per cent, asphalt emulsions on 1.4 per cent and cut-back asphalts on 2.9 per cent. Three States report that no protection was used and no protective cover is reported for 26.1 per cent of all projects. At the completion of the curing period many of the projects were opened to traffic before the surface course was applied. This period varies from 0 to 425 days but in the majority of instances, the surfacing was applied before the base was 60 days old.

Prime: Tar was used as the priming material in the majority of cases and 47 8 per cent of the projects are reported as primed with tar In general, the quantity varied from 0 2 to 0 3 gal. per sq yd Cut-back asphalts were used on 30 4 per cent of the projects and asphalt emulsions were used on 4 3 per cent.

FIGURE 6

Condition The most frequent defect reported is that of scaling of the wearing surface which is frequently accompanied by slight softening of the top surface of the base; 43.5 per cent of the projects contain this defect. Areas in which there was deeper scaling or softening for depths of ¾ in. to 2½ in of the soil-cement base are reported on 27.5 per cent of the projects Areas of actual failures of the soil-cement base are few in number and extent. No project was reported with more than 9 5 per cent of the total area as failures but some failures are reported on 27.5 per cent of all of the projects. Among different causes of failures are listed: (1) low cement content; (2) inadequate subgrade drainage and support; (3) unsatisfactory compaction due both to inadequate moisture control and poor subgrade support, (4) excessive mixing time after the application of the cement and water.

MATERIALS DATA ON SOIL-CEMENT PROJECTS

U/ NUMBER	STATE & COUNTY	OFFICIAL DESIGNATION	LENGTH OF PROJECT MILES	AGE OF PROJECT YEARS	SOIL DATA FOR SOIL PROCESSED								DATA ON SOIL-CEMENT MIXTURE							TYPE OF SOIL IN SUBGRADE
							GRADATION						CEMENT CONTENT		DENSITY		MOISTURE			
					PI	LL	% RETAINED ON SIEVE NO 4	% RETAINED ON SIEVE NO 10	SAND COARSE %	SAND FINE %	SILT %	CLAY %	BY VOLUME %	BY WEIGHT %	LABORATORY #/CU FT	FIELD #/CU FT	LAB OPTIMUM %	FIELD ## %	SURFACE ###	
ARK 1	ARK. WOODRUFF CO.	11163 RT 33	1.877	1.25	16	32	23	28	22	16	26	36	10	9.6	106.8	103	13.5	13.0	13.5	A 4
					28	45	17	22	—	—	—	—	12	13.3	106.2	97.5	16.0	18.5	16.0	A 7
					5	22	16	23	31	16	29	24	8	7.1	113.3	108	12.0	13.7	12.0	A 2
					6	26	0	6	5	23	51	15	11	10.9	104.4	—	17.0	—	17.0	A-4
ARK. 2	ARK - MISSISSIPPI CO	10225 RT 77	2.745	1.50	0	17	0	0	55	36	6	3	10	9.2	111.6	119	12.5	12.0	12.5	A 3
					0	18	24	34	29	40	20	11	8	8.9	112.0	114	12.7	12.6	12.7	A 3
ARIZ 1	ARIZ - COCHISE CO	US 666 114 G	1.52	0.5	1	24	—	—	26	44	18	—	10 12	9.2 11.1	140.0	107	14.0	14-16	11 16	A 2
CAL 1	CAL. - SISKIYOU CO	U-515 12.8	3.00	2.5	0	22	0	5	31	40	9	4	9	8.6	118	106	13.5	14 16	10 15	A 2
					—	—	0	2	28	58	7	2	9	8.6	115	106	13.5	14-16	10 15	A 2
					—	—	0	3	32	59	6	3	9	8.6	114	106	13.5	14-16	10 15	A 2
					—	—	6	2	32	46	12	3	9	8.6	115	106	13.5	14-16	10 15	A 2
CAL 2	CAL - CONTRA COSTA CO	IN CC 108C	3.35	1.25	1	20	0	1	17	57	17	4	8	—	117	110	10.5	10-12	10 18	A 2
					12	37	21	22	3	24	33	9	8	—	110	95	16.0	16 20	10 18	A 2
					9	30	0	0	2	52	28	7	8	—	111	95	15.0	16 20	10 18	A 2
					8	27	0	2	17	49	21	10	8	—	123	109	10.0	10-13	10 18	A 2
CAL 3	CAL - KERN CO.	IN KER 33 A	1.000	3.00	16	38	42	46	5	24	13	6	—	5.1	129	121	12	12	13	A 4
					—	—	51	59	6	14	18	6	—	5.1	129	121	12	12	13	A 4
					—	—	49	57	7	20	7	5	—	5.1	129	121	12	12	13	A 4
CAL 4	CAL - KERN CO	IN KER 139A	1.000	2.75	—	—	0	1	23	58	12	4	9	7.7	118.5	110	12	12-14	12	—
					—	—	0	1	17	62	13	4	9	7.7	118.5	110	12	12-14	12	—
					—	—	0	1	15	54	18	6	9	7.7	118.5	110	12	12-14	12	—
GA. 1	GA. - CLARK CO.	1502A	2.000	2.33	1	31	0	0	56	24	15	25	10	—	104	—	18	18	—	A4 5
					0	47	0	0	37	24	17	22	10	—	94	—	21	21	—	A4-5
					0	58	0	0	48	25	9	18	10	—	107	—	17	11	—	A4 5
					3	37	0	0	42	21	9	28	10	—	103	—	17	—	—	A4 5
GA 2	GA - JEFFERSON CO	1648	3.723	1.00	12	28	0	0	28	39	5	28	10	—	117.3	123	12.5	15.0	—	A2-4
					23	44	0	0	16	41	10	33	10	—	102.4	104	18.5	14.4	—	A2 7
					15	31	0	0	18	32	15	35	10	—	103.9	108	17.4	14.4	—	A 6
GA.-3	GA. - CALHOUN CO.	1517	11.732	2.25	—	—	2	2	41	43	6	9	10	—	118.5	113	9.0	9.6	—	A 2P
					—	—	2	2	43	39	8	10	10	—	118.5	113	11.0	9.6	—	A 2P
					—	—	0	0	35	36	8	19	8	—	115.0	113	12.5	10.5	—	A-2P
					—	—	2	2	30	32	10	28	8	—	117.3	122	9.2	9.0	—	A 2P
					—	—	0	0	35	35	7	23	8	—	113.5	—	15.3	—	—	A 2P
					—	—	0	0	46	40	6	8	8	—	114.7	—	11.0	—	—	A 3
ILL. 1	ILL. LOGAN & MENARD CO	RTE 5&15 SEC 1	2.9	1.25	18	34	0	0	0	12	58	30	14	13.9	108	88	17	18-20	VARIED	A 6 4
					16	35	0	0	0	14	52	34	14	14.5	104	93	18	22-24	—	A 6
ILL. 2	ILL. - WINNEBAGO CO	RTE 76-SEC 2WH	1.14	4.00	5	22	0	0	5	54	24	17	10	9.12	112	120	16	15	13 16	A 2
					0	14	0	0	9	72	10	9	10	8.19	124	120	10	15	13 16	A-2
IA.-1	IA.-CASS CO SEC 16	F.H 594	0.90	2.00	19	36	16	24	←	16	→	44	16	8	—	122	108	11.6	15.9	> OPT	A 7
					18	35	21	29	←	15	→	41	15	8	—	122	109	11.7	—	—	A 7
IA 2	IA - CASS CO SEC. 17	F.H 594	0.72	2.00	22	42	15	18	←	10	→	49	23	12	—	111.7	98	16	—	—	A-7
					18	38	4	7	←	7	→	61	25	12	—	112.3	98	16	—	—	A 7
IA 3	IA - CASS CO SEC 18	F.H 447	0.55	2.00	26	42	7	10	←	23	→	37	50	10	—	118.6	105	10.1	14.5	—	—
IA 4	IA - CASS CO SEC 19	F.H 447	0.55	2.00	24	41	10	14	←	22	→	35	29	12	—	116	104	13.6	13.5	—	—
					22	40	10	15	←	20	→	36	31	12	—	117.4	103	14.4	13.5	—	—
					25	43	10	15	←	23	→	28	36	12	—	118.6	104	12.0	—	—	—
IA 5	IA - WAYNE CO.	F.H 918	1.64	3.15	20	36	15	28	20	5		28	19	10	10	110	104	13.6	14	—	A 7
					13	28	18	32	31	10	•	16	11	10	10	125	108	11.0	13.6	—	A 7
					17	29	23	33	28	7		20	16	10	10	120	104	11.5	13	—	A 7
KAN 1	KAN - STAFFORD CO	F.A 462 F	1.23	2.16	5	22	0	3	38	46	8	5	8	—	121	115	10	10	—	A 1
					2	21	0	1	44	44	6	6	8	—	118.5	114.3	9	10	—	A 1
					5	23	0	1	32	50	10	5	8	—	120.5	115	9.5	10	—	A 1
					6	23	0	1	35	40	15	6	10	—	119.0	—	10	—	—	A 1
KY. 1	KY. - DAVIESS CO.	STATE FA	6.535	0.66	7	20	30	41	6	15	31	7	8	7.88	115.2	113	11.7	—	—	A 4
													10	8.66	115.5	118	12.5	—	—	A 4
MD 1	MD. - WORCESTER CO.	STOCKTON TO LITTLE MILLS	2.65	2.25	0	15	0	0	24	50	17	9	10	8.29	122	113	10	10 TO 12	11.5	A 2
													10	9.18	112	113	11	10 TO 12	11.5	A 2
MD 2	MD. - CARROLL CO.	MANCHESTER TO PA. STATE LINE	1.1	1.33	11	31	25	11	18	15	21	12	8	6.78	118.4	121.2	13.5	12-18	12-18	A-4
					13	36	20	12	21	16	17	14	8	7.21	111.9	121.2	14.1	12-18	12-18	A 4
													10	9.26	118.8	121.2	11.7	12-18	12-18	A-4
MICH 1	MICH. - CHEBOYGAN CO.	MC 16 17 C 3	1.35	3.50	3	—	7	4	←	11	→	18	11	7.8	6.4	130.7	123.9	8.6	8.8	ABOUT OPT.	A 2
					0	—	2	1	←	16	→	17	8	9.2	7.9	124.1	120.6	9.0	9.8	—	A 3
					0	—	0	10	←	66	→	12	2	9.6	7.8	121.5	—	11.8	11.8	—	A-3
					0	—	2	2	←	80	→	7	4	9.7	8.0	122.5	115.8	11.5	11.5	—	A 3
					0	—	0	3	←	75	→	19	7	9.1	8.2	119	119.0	11.1	11.1	—	A 3

U/ THIS NUMBER USED FOR IDENTIFICATION ON OTHER TABULATIONS
—• NOT SHOWN

• AVERAGE DENSITY OF COMPLETED WORK
•• MOISTURE CONTENT AT TIME OF COMPACTION
••• MOISTURE CONTENT OF SURFACE DURING FINISHING

FIGURE 1

MATERIALS DATA ON SOIL-CEMENT PROJECTS

Y NUMBER	STATE & COUNTY	OFFICIAL DESIGNATION	LENGTH OF PROJECT MILES	AGE OF PROJECT YEARS	SOIL DATA FOR SOIL PROCESSED								DATA ON SOIL-CEMENT MIXTURE							TYPE OF SOIL IN SUBGRADE
							GRADATION						CEMENT CONTENT		DENSITY		MOISTURE			
					PI	LL	% RETAINED ON SIEVE NO 4	% RETAINED ON SIEVE NO 10	SAND COARSE %	SAND FINE %	SILT %	CLAY %	BY VOLUME %	BY WEIGHT %	LABORATORY #/CU FT	FIELD* #/CU FT	LAB OPTIMUM %	FIELD** %	SURFACE***	
MICH 1	MICH CHEBOYGAN CO	Mc 16 17C 3	1.35	3.50	24	40	0	0	←— 12 —→		52	37	—	—	—	—	—	—	ABOUT OPT.	A 6
					0	—	0	4	← 93 →		3	3	11.5	10.5	115.6	115.3	11.5	—	—	A 3
					0	—	0	3	← — 78 — →		14	7	9.5	8.1	117.8	111.6	11.1	—	—	A 3
MISS 1	MISS CL. KOSSUTH CO	SPFS 1269 S.C.D	23.776	1.17	0	29	0	0	17	17	3	3	9.5	7.5	119	115	11	11	11	A 3
					6	27	0	0	73	12	6	9	9.5	7.5	115	111	11	11	11	A 1-2
					17	47	0	0	61	6	8	19	9.5	7.5	110	115	13	13	13	A 2-P
MO 1	MO HODAWAY CO	SS 1 B	4.435	2.16	16	48	0	0	0	17	67	16	9	—	109.5	98	11.0	—	>OPT	SILTY LOAM
					23	50	0	0	0	15	61	24	9	—	103.5	—	19.7	19	" "	SI CLAY LOAM
					26	56	0	0	0	11	56	33	9	—	105.5	—	19.5	—	"	SILTY CLAY
					32	61	0	0	0	20	51	43	9.5	—	102.5	—	20.0	—	" "	CLAY
MO 2	MO FRANKLIN CO	RTE 100	0.982	3.16	20	41	0	0	0	7	69	34	6	—	107	101	15.5	16.2	—	SILTY LOAM
					17	36	0	0	0	8	56	36	8	—	103	99	14.0	15.2	—	" "
MO 3	MO FRANKLIN CO	RTE 100	1.0	3.00	20	42	0	0	0	7	60	33	6	—	109	—	17.5	18.1	—	A 5-7
													8	—	105.5	—	18.0	17.4	—	A 5-7
													6	—	104.1	—	18.7	19.3	—	A 5-7
NEB 1	NEB. LANCASTER CO	33 98A	5.2	1.08	(b) 20	35	0	0	0	12	50	38	10	—	109	105	15.8	17	16-19	A 4 TO A 7
					—	—	0	2	80	13	3	2								
NY 1	N Y LEWIS CO	FAS 55 38-53	1.14	1.25	—	—	—	—	—	—	—	—	—	—	—	—	—	17.2	—	—
O 1	O FRANKLIN CO (LIMBERT RD)	CO RD NO 291	2.9	1.33	10	26	45	48	17	11	16	5	6	4.5	132	135	8.8	8.6	8.4	A 2
O 2	O MORROW CO	38(19)17	5.009	0.58	6	21	34	12	28	12	11	7	8	9.16	126	121	11.0	11.4	10.0	A 4
		FASP 35 1(1)			11	27	18	4	9	19	30	20	8	8.14	117	106.8	14.0	16.7	13.0	A 4
OKLA 1	OKLA CADDO CO	SAP 656C	5.804	0.25	25	41	11	6	11	23	25	22	10	10.30	110	110.2	16.8	18.3	15.8	A 7
					9	28	0	0	0	46	38	15	8.9.10	—	108	117.5	18	16.7	VAR	A 2-4
					13	32	0	0	0	30	48	22	9.10.11	—	106	114.4	17	17.4	VAR	A 2-4
N C 1	N C BEAUFORT CO	2 9 15 113	1.5	2.08	0	15	0	0	7	18	6	9	12.0	11.6	118	117.6	11.7	11.5	9.7	A 2
					2	19	0	0	2	27	10	11	7.0	6.0	119	108.6	12.7	12.5	10.1	A 2
N C 2	N C ALAMANCE CO	5 4-42	2.4	1.08	31	55	0	1	7	29	28	36	12	12.1	104.5	98.9	18.8	19.6	19.3	A 7
					6	20	0	4	15	39	25	11	8	7.0	115.1	101.7	15.5	15.4	16.0	A 2
					11	31	0	5	10	36	25	29	10	9.0	118.2	106.8	15.0	16.2	15.5	A 4
					40	56	0	0	4	24	44	28	12	10.5	100.3	93.0	18.0	19.0	19.2	A 7
N C 3	N C WAKE CO	4 7 38 60	2.1	2.33	21	58	0	4	20	25	17	38	12	11.7	97.6	92.4	25.6	27.4	26.1	A 7
					37	73	0	7	17	15	13	55	12	11.1	107.8	109.1	15.5	17.4	16.0	A 7
					16	41	0	2	28	33	18	25	12	11.8	101.0	—	17.9	—	18.4	A-4 7
					20	44	0	4	26	29	12	33	12	10.9	116.6	—	14.4	—	14.9	A 7
N C 4	N C CARTERET CO	2-7 16 3	1.06	3.00	0	17	0	0	2	60	7	11	11.8	11.0	111.8	110.7	13.4	13	13.9	A 2
					0	18	0	0	2	78	7	13	11.8	11.4	108.8	112.4	14.0	14.8	14.5	A 2
PA 1	PA LEBANON CO	38050	1.97	3.00	4	21	64	54	36	27	23	19	10	—	—	123	—	15.6	VARIED	A 2
					7	22	86	79	27	25	27	21	10	—	—	123	—	15.7	"	A-6
					15	36	38	32	38	16	23	23	10	—	—	123	—	14.2	"	A 6
					0	18	87	83	35	29	23	15	10	—	—	123	—	—	"	A 2
S C 1	S C-LEXINGTON CO	CAYCE EXP STATE 578	0.3	6.5 70	10	27	—	3	23	—	4	22	10	8.1	NOTEST	NOTEST	NOTEST	NOTEST	NOTEST	—
					17	32	—	3	52	—	5	24	10	8.1	" "	" "	" "	" "	" "	—
					9	17	—	4	57	—	4	19	10	8.1	" "	" "	" "	" "	" "	—
S C 2	S C-CHESTER CO	STATE 815 B	1.38	2.25	28	73	—	3	6	—	22	64	12	10	111	102	19.5	20-21.5 OPT	—	—
		669 REOP			8	31	—	13	22	—	18	25	9	7	123	108	11	"	—	—
					24	50	—	7	29	—	18	38	9	7	125	107	14.5	"	—	—
					8	29	—	18	43	—	15	15	9	7	129	—	10	"	—	—
S C-3	S C-GEORGETOWN CO	STATE 414 A	6.76	2.00	15	30	0	0	1	—	10	44	9	8	110	—	15.6	"	—	—
					—	—	0	0	12	—	7	8	9	7	115	111	11.2	"	—	—
					—	—	0	3	16	—	9	12	9	7	119	109	12.4	"	—	—
					7	21	0	1	27	—	5	19	8	6	119	107	12.6	"	—	—
S C 4	S C McCORMICK CO	STATE 126	0.3	5.84	0	25	0	—	9	—	44	31	10	8	NOTEST	NOTEST	NOTEST	NOTEST	NOTEST	—
					—	—	—	—	5	—	45	35	7.6	6.6	" "	" "	" "	" "	" "	—
S C 5	S C-HORRY CO	NRH 350C	2.12	4.00	6	19	0	0	31	—	16	17	10.8	8.0	121	123	9.0	11	—	—
					8	21	0	0	40	—	20	19	10.8	7.7	131	126	9.5	9.5	—	—
					0	19	0	0	58	—	10	14	10.8	7.7	126	—	10.5	—	—	—
S C 6	S C ABBEVILLE CO	STATE 805	4.5	2.0	0	18	0	0	38	—	5	12	11.1	8.0	130	119	9.5	8.7	—	—
					16	38	0	1	11	—	28	21	9	7	109	92	17.2	20-21.5 OPT	—	—
					16	38	0	1	20	—	27	24	9	7	108	94	17.2	"	—	—
					20	48	0	4	21	—	23	33	10	9	104	100	20.4	"	—	—
S C 7	S C WILLIAMSBURG CO	NRH NSRC 380	1.48	4.66	33	62	0	0	5	—	21	55	11	10	97	—	28.2	"	—	—
					0	19	0	0	70	—	11	19	8.3	6	131	120	10.0	13.5	—	—
					24	52	0	0	69	—	3	28	8.3	6	131	—	10.0	—	—	—
					5	25	0	0	72	—	3	20	9.6	7	126	118	9.0	11.6	—	—
					0	21	0	0	83	—	6	11	6.8	5	127	118	8.5	15.0	—	—

// THIS NUMBER USED FOR IDENTIFICATION ON OTHER TABULATIONS (b) 60% SELECTED SOIL PLUS 40% COARSE SAND

— = NOT SHOWN

* AVERAGE DENSITY OF COMPLETED WORK

** MOISTURE CONTENT AT TIME OF COMPACTION

*** MOISTURE CONTENT OF SURFACE DURING FINISHING

FIGURE 2

MATERIALS DATA ON SOIL-CEMENT PROJECTS

# NUMBER	STATE & COUNTY	OFFICIAL DESIGNATION	LENGTH OF PROJECT MILES	AGE OF PROJECT YEARS	SOIL DATA FOR SOIL PROCESSED								DATA ON SOIL-CEMENT MIXTURE							TYPE OF SOIL IN SUBGRADE
							GRADATION % RETAINED ON SIEVE NO						CEMENT CONTENT		DENSITY			MOISTURE		
					PI	LL	4	10	SAND COARSE %	SAND FINE %	SILT %	CLAY %	BY VOLUME %	BY WEIGHT %	LABORATORY #/CU FT	FIELD* #/CU FT	LAB OPTIMUM %	FIELD** %	SURFACE ***	
SC-8	SC-GREENWOOD CO	STATE 203	2.0	2.25	13	28	0	17	25	—	19	33	9	7	115	—	14.6	10.6	—	—
					11	30	0	6	24	—	12	40	9	7	117	—	13.6	—	—	—
					11	28	0	5	16	—	17	38	9	7	116	—	15.0	15.9	—	—
					14	31	1	7	19	—	21	41	9	8	114	—	15.2	12.6	—	—
SC-9	SC-GREENWOOD CO.	STATE 203	7.0	2.66	10	24	1	6	20	—	20	36	8	6	130	—	9.8	9.8	90-115% OF OPT	—
					12	26	1	6	18	—	21	39	8	6	130	—	9.6	9.6	" "	—
					5	24	5	16	4	—	55	34	8	6	124	—	11.6	—	—	—
					8	27	12	24	10	—	43	36	8	6	124	—	11.6	—	—	—
SC-10	SC-HAMPTON CO	STATE 872	0.89	3.00	—	—	2	8	54	—	7	8	9	7	129	—	7.0	—	—	—
					—	—	0	4	37	—	9	13	8	6	131	—	8.4	—	—	—
					—	—	0	1	34	—	11	10	8	6	132	—	7.7	—	—	—
					—	—	1	9	35	—	10	11	11	8	132	—	7.2	—	—	—
SC-11	SC McCORMICK CO	STATE 602-B	0.1	5.86	28	50	—	5	3	—	28	39	10	8	NO TEST	NO TEST	NO TEST	NO TEST	NO TEST	—
					22	50	—	5	—	—	28	50	10	8	" "	" "	" "	" "	" "	—
SC-12	SC-FLORENCE CO.	KINGSBURG EXPERIMENT	0.3	5.92	—	20	0	2	39	—	6	15	10	8	" "	" "	" "	" "	" "	—
					10	27	0	0	14	—	12	25	10	8	" "	" "	" "	" "	" "	—
					—	21	—	0	11	—	14	19	10	8	" "	" "	" "	" "	" "	—
SC-13	SC UNION CO	STATE 85 B FA 364	7.19	7.66 10.2 25	8	28	5	14	56	—	8	11	8	6	126	109	10.8	90-115% OF OPT	—	—
					10	41	1	10	37	—	16	19	8	5	116	103	14.8	" "	—	—
					10	34	1	8	42	—	12	18	8	7	118	108	14.4	" "	—	—
					14	47	0	16	33	—	18	24	8	7	105	—	18.0	" "	—	—
SC-14	SC-LANCASTER CO.	ESP DOC 5715.6-55	0.0	1.88	14	37	2	7	16	—	34	36	4	3	111	—	16.0	—	—	—
					29	54	2	2	5	—	32	56	8	7	105	101	19.6	19.5	—	—
					21	51	0	2	4	—	40	50	11	10	105	103	17.2	19.0	—	—
					11	36	0	2	10	—	44	51	8	7	108	106	17.2	—	—	—
SC-15	SC OCONEE CO.	STATE 919	0.25	7.0	27	59	0	2	21	—	12	50	—	7	97	—	24	90-115% OF OPT	—	—
					—	—	0	1	32	—	13	16	—	6	105	—	18	" "	—	—
SC-16	SC-HAMPTON CO	STATE 368	10.5	3.15 TO 3.50	—	—	0	0	13	—	3	5	8.2	7.0	109	110	8	8	APPR. OPT	—
					—	—	0	0	13	—	5	26	9.1	7.5	116	—	13.5	12	" "	—
					—	—	0	0	4	—	8	14	7.8	6.4	115	114	9	10	" "	—
					—	—	0	1	20	—	12	20	8.4	6.1	129	—	9	—	" "	—
SC-17	SC-GREENVILLE CO	STATE 316-A	0.6	2.75	17	35	1	2	22	—	11	49	9	8	114	—	15.8	90-115% OF OPT	—	—
					—	—	1	7	31	—	12	31	9	7	123	—	11.7	" "	—	—
					9	24	6	13	24	—	13	39	9	7	123	—	11.2	" "	—	—
					—	—	1	10	38	—	10	32	9	7	123	—	11.2	" "	—	—
SC-18	SC ABBEVILLE CO.	STATE 584 AND 805	6.4	1.9	17	46	0	1	4	—	34	48	11	10	100	103	22	" "	—	—
					3	18	3	5	17	—	27	16	8	6	118	111	12	" "	—	—
					12	28	5	16	19	—	26	25	9	7	120	118	13.2	" "	—	—
SC-19	SC OCONEE CO	868-B	0.485	2.86	5	21	1	4	19	—	25	24	8	7	121	—	12.4	" "	—	—
					28	61	1	3	31	—	6	48	9	7	117	108	14	" "	—	—
					16	33	1	5	31	—	9	28	8	6	118	102	13	" "	—	—
					18	36	0	4	36	—	8	32	8	6	110	102	13	" "	—	—
					—	—	1	4	33	—	11	32	—	—	—	—	—	—	—	—
TEX-1	TEX-HARRIS CO	(WBM) 11 6-4	0.34	0.42	7	18	17	40	—	—	—	—	4.8	—	—	—	—	NEAR OPT	NEAR OPT	A-2
TEX-2	TEX-DONLEY CO.	M-62-1-B	0.265	1.25	15	36	9	11	5	45	22	10	8	—	106.2	106.3	—	15.1	APPR. OPT.	A-2
TEX-3	TEX-BURLESON CO	M 186-2-5	0.151	2.00	4	—	0	1	—	—	—	—	5.45 7.3	—	—	—	—	—	—	A-2
TEX-4	TEX. LYNN CO.	CWE 257 6 5	3.00	1.2	5	21	0	0	0	75	14	8	—	9.10.11	115.3	99.4	13	11.0 TO 15.6	NEAR OPT	A-2
					5	21	0	0	0	70	18	7	—	9.10.11	116	99.4	13	11.0 TO 15.6	—	A-2
TEX-5	TEX MADISON CO.	CO LOCAL RD.	0.088	7.25	—	—	—	NO TEST	—	—	—	—	—	—	—	—	—	—	—	CLAY
TEX-6	TEX-DALLAM CO.	M-40-1-9	0.717	1.00	10	31	20	—	—	—	—	—	6.6	7	106.3	102.6	—	18.3	OPT 2.2%	A-2
					13	32	20	—	—	—	—	—	6.6	7	101.9	102.6	—	18.3	" "	A-2
TEX-7	TEX RED RIVER CO	FAS 2A(2)	4.005	1.00	0	17	0	0	0	67	26	5	8.55	7.22	119.5	111.1	6.0	12.6	" "	A-2
					8	22	0	0	0	64	24	3	8.55	7.22	115	106.9	8.0	15.6	" "	A-2
					18	36	0	0	8	48	30	4	8.55	7.09	116	106.9	8.0	16.8	" "	A-2
TEX-8	TEX GALVESTON CO.	FAS 15 STATE 30	0.5	0.56	OYSTER SHELL AND BEACH SAND MIXTURE								—	6.6	120	120	—	12.5 TO 14.5	APPR 15%	A-6
TEX-9	TEX-KENNEDY CO.	SCT-2-3	3.693	2.53	11	28	0	0	0	76	8	5	10	—	112.5	110	—	12.5	—	A-2
					4	22	0	0	0	92	5	2	10+15% SILT	—	116.1	112	—	14.5	—	A-2
					13	30	0	0	0	68	11	8	6	—	105.5	111	—	13.0	—	A-2
VA-1	VA-YORK CO	1177-D-E	2.75	1.08	6	18	0	0	7	48	27	18	8	—	119	111	11	10	OPT LESS 1%	A-2
					12	28	0	0	6	51	18	15	8	—	116	113.5	12.6	15	" "	A-2-4
					9	19	0	0	8	67	12	12	8	—	118	113.5	10.5	9.5	" "	A-2
VA-2	VA. NEW KENT CO.	1177	2.0	2.25	22	44	0	0	5	22	39	34	10	—	108	103	11.5	15.4	" "	A-7
					11	28	0	0	17	49	11	23	8	—	115	110	14	12	" "	A-4
WASH. 1	WASH. WHITMAN CO	SC 99	1.0	7.0	10	32	53	—	11	9	21	6	7.4	6.9	130	101.6 #4	11.2	16.2 #4	16.2 #4	A-4
MASS	MASS. MIDDLESEX CO	LOWELL	0.86	1.0	—	—	44	53	56	11	0	0	10	7	117	135	—	5.7	5	A-2

THIS NUMBER USED FOR IDENTIFICATION ON OTHER TABULATIONS
— = NOT SHOWN

* AVERAGE DENSITY OF COMPLETED WORK
** MOISTURE CONTENT AT TIME OF COMPACTION
*** MOISTURE CONTENT OF SURFACE DURING FINISHING

FIGURE 3

METEOROLOGICAL AND DESIGN DATA

NUMBER	METEOROLOGICAL DATA						DESIGN DATA								REMARKS
	RAINFALL		SNOW FALL INCHES	TEMPERATURE			WIDTH OF BASE COURSE FT	WIDTH OF SHOULDERS FT	DEPTH OF DITCHES FT	CROWN INCHES	COMPACTED THICKNESS OF SOIL CEMENT INCHES	TRAFFIC			
	AVERAGE ANNUAL INCHES	DURING * CONSTRUCTION INCHES		AVERAGE ANNUAL °F	MINIMUM °F	DAYS OF FREEZING						TRUCK OVER 5 TON	PASSENGER CARS	TOTAL	
												VEHICLE PER DAY			
ARK-1	48	—	4.9	62.3	55.2	58	22	4	1.0	3	6	—	—	300	ONE DAY OF RAIN DURING CONST
ARK 2	50	—	9.1	61.8	49.4		20	4	1.0	3	6	—	—	900	65 DAYS RAINFALL DURING CONST.
ARIZ 1	15	0.5	6	60	29	60	28	0	2.5	—	6	10	240	240	
CAL 1	8	0	2.5	48	5	60	22	8	VARIABLE	2.5	6	—	—	—	
CAL 2	12	0	0	62	25	0	24	7	-	2.5	5.5	—	—	—	
CAL 3	66	6	0	63	25	5(EST)	23	10	-	2.5	10 12	—	—	—	
CAL 4	58	4.5	0	63	26	5(EST)	22	8	2	2.5	6	—	—	—	
GA -1	—	—	—	—	—	—	20	6	2	2	6	—	—	—	OLD GRADE
GA -2	—	—	0	—	—	—	30	CURB & GUTTER	CURB & GUTTER	2.5	C	—	—	—	NEW GRADE
GA 3	—	—	0	—	—	—	21	5.5	2	1.5	6	25 (EST)	175	200	OLD GRADE
ILL 1	36	BELOW NORMAL	20	52	44	92	20	5	1.5	2	6	10 20 (EST)	80 90 (EST)	100 (EST)	" "
ILL 2	35	NORMAL	35	48	37	—	18	5	—	2	6	—	—	—	" " CONSTRUCTION DELAYED BY RAIN TWICE
IA - 1	31	2.9	30	49	-16	—	26	5	2 0 3 0	2.5	5	—	—	150	" "
IA 2	31	2.9	30	49	16	—	26	5	2 0 3 0	2.5	5	—	—	150	" "
IA 3	31	—	30	49	16	—	26	—	2 0 3 0	2.5	5	—	—	450	2 HEAVY RAINS NEAR END OF CONSTRUCTION OLD GRADE
IA 4	31	—	30	49	16	—	26	5	2 0 3 0	2.5	5	—	—	450	" " " " " " " "
IA 5	32	—	30	50	15	—	26	5	2 0 2 5	2.5	5	—	—	422	4 RAINS DURING CONSTRUCTION PERIOD
KAN 1	26	3	16	55	44	126	28	0	2 0	2	6	25	775	1000	3" RAIN ON COMPLETED BASE BEFORE ARMOR COAT APPLIED
KY - 1	46	-	14	57	-	-	20	4	1.5	3	9	150	450	600	OLD GRADE
MD 1	40	3	12	55	35	95	16	10	1.5 3.0	2	6	—	—	50	GRADE 1 YEAR OLD 3" RAIN WHILE OPEN TO TRAFFIC
MD 2	44	4.2	30	54	27	125	18	7	1.0 4.0	2	6	0 50	50 100	100	" " " " " " TRUCK TRAFFIC SEASONAL
MICH 1	26	SOME RAIN	72	43	37	159	20	8	—	—	6	0	≤ 5	≤ 5	NEW GRADE
MISS 1	52	FAIRLY HEAVY	1	66	50	20	22	5	2.0	1½	6	10	390 440	400 450	OLD GRADE
MO 1	36	LIGHT RAINS	17	56	48	106	22	5	2.0	4	6	—	—	602	" "
MO 2	38	INTERMITTENT RAINS	—	55	—	111	22	5	2.0	4	6	—	—	818	" "
MO 3	38	NONE	—	55	—	111	22	5	2.0	4	6	—	—	916	" "
NEB 1	32	SOME RAIN	30	60	15	80	24	4	1.5	3	5	100±	420±	520	GRADE 1 YEAR OLD
NY 1	60	2 LIGHT SHOWERS	36	41	30	120	10	7	1.5	1½	6	5±	75±	80±	NEW GRADE
O 1	—	—	—	—	—	—	18	6	1.0 2.0	2	6	—	—	—	OLD GRADE
O 2	40	SEVERAL SHOWERS	32	52	41	107	18	6	2.0	2	6	—	—	183	60% NEW GRADE
OKLA 1	—	—	—	—	—	—	28	8.5	2.0	1½	6	—	—	—	NEW GRADE
NC 1	53	—	—	62	11	—	18	6	1.3	1½	6	—	—	—	" "
NC 2	45	SEVERAL RAINS	—	59	—	—	20	5	1.3	1½	6	2	155	157	" "
NC 3	46	" "	—	60	-2	—	20	5	1.3	1½	6	—	—	310	" "
NC 4	51	—	16	64	4	—	20	5	1.3	1½	6	0	—	172	11 OF 30 DAYS DURING CONSTRUCTION RAIN FELL
PA 1	40	RAIN & SNOW	23	54	47	79	14	5	1.0	3½	6	0	43	43	2 DAYS RAIN DURING CONSTRUCTION
SC 1	44	—	2.5	64	24	32	20	4.5	1.5	2	6	3	47 97	50 100	OLD GRADE - 3 DAYS RAIN DURING CONSTRUCTION
SC 2	42	OCCASIONAL RAINS	0.5	62	29	40	21	5.5	1.5	2	6	16	248	324	OLD GRADE
SC 3	43	SOME RAIN	1.0	64	25	15	21	6	1.5	2	6	77	185	262	NEW GRADE
SC 4	49	—	1.1	64	24	36	20	3	1.5	2	6	132	224	356	" "
SC 5	45	SOME RAIN	1.9	64	23	20	22	6	1.5	2	6	98	198	296	OLD GRADE
SC 6	34	OCCASIONAL RAIN	1.3	62	19	40	21	3	1.5	2	6	145	647	792	" "
SC 7	44	SOME RAIN	1.7	64	23	20	22	5.5	1.5	2	4	30	220	250	NEW GRADE 1 DAY CONSTRUCTION WETTED BY RAIN-COMPACTED FOLLOWING DAY, GOOD COND
SC 8	44	OCCASIONAL RAIN	2.4	62	21	40	21	3	1.5	2	4 6	57	348	405	OLD GRADE
SC 9	44	"	2.4	62	21	40	21	3	1.5	2	6	108	266	374	RAIN WETTED TOO UNCOMPACTED MATERIAL FINISHED FOLLOWING DAY, EXCELLENT CONDITION
SC 10	44	SOME RAIN	2.4	62	21	40	21	6	1.5	2	6	113	589	702	OLD GRADE
SC-11	49	—	1.1	64	—	36	30	CURB & GUTTER	CURB & GUTTER	2	6	130	259	389	OLD GRADE TWO SECTIONS WETTED BY RAIN COMPACTED 2 AND 3 DAYS LATER
SC 12	44	OCCASIONAL RAIN	1.7	64	23	20	20	3	1.5	2	6	—	—	—	
SC 13	42	" "	0.5	62	20	40	20	5.5	1.5	2	6	64	380	444	
SC 14	38	SOME RAIN	2.5	61	21	40	22	2 0 3 0	1.25	2½	6	44	280	324	NEW GRADE
SC 15	43	1 DAY RAIN	3.3	61	20	40	21	5.5	1.5	2	4 6	30	218	248	" "
SC 16	54	SOME RAIN	0.2	65	30	0	22	5	1.5	2	4 5 8	—	—	—	VERY HEAVY TRUCK TRAFFIC 400 WAS LEFT UNCOMPACTED FOR 3 DAYS
SC 17	38	—	5.3	60	19	50	22	5	1.5	2	6	100	170	270	OLD GRADE
SC 18	44	—	2.4	62	21	40	21	9	CURB & GUTTER	CURB & GUTTER	SLOPE 1.18	5	454 2155	2609	NEW GRADE
SC 19	45	OCCASIONAL RAIN	3.3	61	20	50	22	3	1.5	2	4	28	185	213	" "
TEX-1	21	NONE	0	70	—	17	18	CURB & GUTTER	CURB & GUTTER	2½	6	2	98	100	PART NEW GRADE
TEX-2	17	"	2.4	66	-7	82	24	8	2 0 6 0	2	6	200	800	1000	OLD GRADE VERY FEW TRUCKS
TEX-3	21	"	—	70	25	51	24	8	2 0 6 0	2	6	200	800	1000	OLD GRADE
TEX-4	17	"	1.0	69	—	99	24	5	1.0 2.0	2	9 (10 DOSE)	150 200	550 600	700 800	" "
TEX 5	41	"	—	68	25	51	26	6	1.0	2	6	8 25	392 1115	400-1140	NEW GRADE
TEX. 6	17	SOME RAIN	1.9	66	-1	145	24	4	2.0	2	6	10	190 290	200 300	OLD GRADE
TEX 7	41	0	0	69	15	67	22	0.6	1.0 2.0	3	6	54	486	540	" "
TEX 8	41	SOME RAIN	—	71	25	11	24	3	1.5	2½	6	15	285+	300+	" "
TEX 9	27	NONE	—	72	20	—	22 TO 24	7	1.0 4.0	2	8	684 (EST)	6156	6840	NEW GRADE
VA - 1	—	—	—	—	—	—	22	9	0.5 1.0	2	6	—	150-200	150 200	" "
VA 2	—	—	—	—	—	—	20	6	—	2	8	—	—	—	" "
WASH 1	18	NONE	33	47	-12	131	20	6	—	2	6	—	—	—	" "
MASS	41	—	55	48	38	110	20	4	2.0	—	6	45	255	300	OLD GRADE
							24	3	NONE	4½	6	0	—	LIGHT TRAFFIC	" "

*COVERS PERIOD OF CONSTRUCTION AND ALSO PERIOD DURING WHICH PROJECT WAS OPEN TO TRAFFIC BEFORE SURFACING WAS PUT ON

— = NOT SHOWN

FIGURE 4

CONSTRUCTION DATA

NUMBER	SUBBASE TREATMENT	PULVERIZATION REQUIREMENT*	MIXING AND PULVERIZING EQUIPMENT USED	TYPE OF ROLLERS	TOTAL ELAPSED CONSTRUCTION TIME DAYS	WATER: METHOD OF APPLICATION	WATER: TIME HRS. & MIN	METHOD OF APPLYING CEMENT	PROTECTION TYPE AND TIME	TIME BASE WAS OPEN TO TRAFFIC WITHOUT SURFACE DAYS	BITUMINOUS PRIME COAT: TYPE	BITUMINOUS PRIME COAT: QUANTITY GALS./SQ.YD.	REMARKS
ARK 1	NONE	80% NO.4	1,2,3,4,6,7, T P	A,B	14	P D	2 23	TP-BARBER GREENE	WET STRAW	14	MC 1	0.22	⅜" MULCH AT FINISHING ½" WASTED, PULVERIZED 80% < #4
ARK. 2	"	" "	1,2,3,4,6,7, T P.	A,B	39	P.D.	2 25	" " "	" "	60 TO 150	NONE		" " " " " " " 100% " "
ARIZ. 1	"	—	3,4,6,TP GARDNER	(8T)A,B	9	T P	4 30	HAND	MOIST EARTH	11	SC-2	0.24	
CAL-1	—	100% - NO.4	1,2,3,4,5	B,C (GT)	20	P D.	—	HAND & BLADE	" "	21	SC 1A	0.25	1½"-2" MULCH AT FINISHING NONE WASTED, PULVERIZED 100% < #4
CAL-2	—	" "	2,3,4,5,6	(8T)A,B	18	P D	—	" " "	SPRINKLING 3 DAYS	0	E.A.	0.25	" " " " " " " " " 99% " "
CAL 3	—	—	1,2,3,4,5	(12T)A,B	16	P D	—	HAND	MOIST EARTH 7 DAYS	180	—	—	2" MULCH AT FINISHING NONE WASTED
CAL-4	NONE	100% - NO 3	2,3,4,5	(12T)A,B	5	P D	—	HAND & BLADE	TRAFFIC AFTER 24 HRS	180	SC-2	—	" " " " " " , COMPACTION PLANES NEAR SURFACE
GA 1	"	80% - P #4	1,2,3,5,6	A,B	—	T.T.	—	HAND	WET EARTH 7 DAYS	7	RT-2	—	½ " " " , PULVERIZED 85% < #4
GA-2	"	" "	1,2,5,6	B C	—	T.T	—	"	WET SAWDUST 7 DAYS	60	RT-2	—	" " " " " " " " "
GA-3	"	" "	1,2,4,6 T P	A,B,C	—	P D.	—	TP BARBER GREENE & FLYNN	WET EARTH 7 DAYS	—	RT 2	—	" " " " " " " " " "
ILL 1	"	" "	1,2,4,5,6,8-SEAMAN	(5T)A,B,C	14	P D	2-30	HAND	WET STRAW 7 DAYS	425	MC 1	0.2 TO 0.3	1" " " " " " " 58% " "
ILL 2	"	" "	1,2,4	(8T)A,B,C	16	P D.	4 00	"	MOIST EARTH 7 DAYS	330	TC 1	—	" " " " ½" " " 90% " "
IA. 1	"	60% "	2,3,4,5,6	A,B,C	—	T T	—	BUCKEYE SPREADER	TAR PRIME	0	TAR	0.2	1" 1½" " " ½" " " 70% "
IA.-2	"	" "	2,3,4,5,6	A,B,C	—	T T	—	" "	" "	0	"	0.2	" " " " " " " 70% " "
IA. 3	"		2,3,4,5,8	A,B,C	—	T,T	—	SPREADER	" "	0	"	—	" " " " " " " " 60%
IA.-4	"	" "	2,3,4,5,8	A,B,C	—	T T	—	"	" "	0	"	0.2	" " " " " 67% " "
IA 5	"	70% "	2,3,4,6	A,B,C	12	P D.	4 15	BUCKEYE SPREADER	" "	0	"	0.2	
KAN-1	"	95% < 1", 80% < #4	1,2,3,5,6	A,B,C	—	P.D.	4 00	HAND	SPRINKLING 2 DAYS SC-4	22	SC 3	0.4	1" MULCH AT FINISHING, PULVERIZED 95% < 1", 80% < #4
KY.-1	200' FARM TILE	80% < #4	1,2,4,5,6	(10T)A,B	69	—	1-30	HAND, HARROW	WET STRAW 7 DAYS	60	—	—	1½" " " " " ½" WASTED, PULVERIZED 90%-95% < #4
MD-1	NONE	"	1,2,3	(10T)A	19	P D.	3 00	HAND	WET EARTH 4 7 DAYS	30	NO PRIME		1" " " " NONE " " 90% < #4
MD-2	"	"	1,2,3	(10T)A,D	12	P D	3 30	"	EARTH 5 10 DAYS	46	MC 1	0.3	" " FINAL FINISHING-NONE WASTED, PULVERIZED 80% < #4
MICH-1		100% "	1,2,4	(5T)A,B	57	P D	0 30	"	7 DAYS	NO SURFACING	NONE	NONE	" " " FINISHING NONE WASTED, PULVERIZED 100% < #4
MISS.-1	A 2, 15"	80% "	1 TP (FLYNN RB BLDR)	C	90±	T P	—	"	SISALKRAFT 3 DAYS	0-5	RT 2	—	½" " " " ½ " " " " "
MO.-1	NONE	70% < ½"	2,4,5,6	(10T)A,B,C	60	P D.	3 30	"	RT 3-0.2 GAL	21	RT-3	0.2	1" " " ½" " " 70% < ½"
MO-2	"	" "	1,2,3,4,6	(10T)A,B,C	—	P.D.	4 20	"	MC 1 4 WEEKS	28	MC 1	—	" " " " ½" " " " " "
MO. 3	"	" "	1,2,3,4,5,6,T P.	(10T)A,B,C	—	T P	—	TP BARBER GREENE	" "	28	MC 1	0.2	1" 1½" " " " " " " "
NEB.-1	"	80% < #4	2,3,4,5,6,8 SEAMAN	(7T)A,B,C	—	P D	—	HAND	WET STRAW 7 DAYS	3 14	MC 1	0.25	" " " " ½" " 80%-90% < #4
N.Y 1	"	" "	2,3,4,5	(14T)A,B	4	P D	4 10	"	WET HAY - 7 DAYS	14	TAR	0.2	⅜" " " NONE "
O-1	"	" "	1,2,3,4,5,6	(10T)A,B	24	P D.	3 00	"	WET STRAW 7 DAYS	75	MC 1	0.2	1"-1½" " " " " PULVERIZED 87% < #4
O.-2	"	" "	1,4,6,TP FLYNN	(8T)A,B	17	P D	0-01	"	" "	14	RT 2	0.2	1" " " " " " 90% " "
OKLA-1	"	" "	2,3,4,5,6,8 ARIENS	A,B,C	46	—	2 47	"	—	45	NONE	NONE	½" " " " , PULVERIZED 83% < #4
N.C.-1	"	" "	1,2,3,4	B,C	12	P D	—	"	EARTH 7 DAYS	—	RT 2	0.3	1½" " " NONE WASTED, PULVERIZED 80% < #4
N C-2	"	" "	1,2,3,4,	A,B,C,D	30	P D	—	"	" "	330	RT LMC LRC 1B	0.3	" " " " " " " "
N C. 3	"	" "	1,2,3,4	A,B	28	P D.	4 20	"	" "	—	RT 2	0.3	1" " " " " " "
N C-4	"	" "	1,2,3,4	B D	8	P D	1 30	"	" "	—	RT 2	0.25	1½" " " " " " " " "
PA. 1	"	" "	1,2,3,4,6	(10T)A,B	16	P D	3 15	"	NONE	30	CB TAR	0.25	" " " " " " " 75% 90% < #4
S C-1	"	—	1,2,4,5	(5T)A,D		T T	2 00	SAND SPREADER	130 CANVAS NONE	180	TC 1	0.2	
S C-2	"	—	1,2,4 TP BARBER GR	B,C	56	P D.	—	TP-BARBER GREENE	NONE	2 TO 10	RT 2	.25-.30	1"-1½" MULCH AT FINAL FINISHING - ⅛" WASTED
S C-3	"	—	1,2,4	B,C	68	P D.	2 00	HAND	NONE	42 (LOCAL TRAFFIC)	RT 2	0.2 0.28	" " " " " " "
S C. 4	"	—	1,2,4 5	D	—	P D.	2 00	SAND SPREADER	"	60		0.15	
S C-5	"	—	1,2,4	B D	22	P D	2 00	BUCKEYE SPREADER	"	14 (LT LOCAL TRAFFIC)	TC 1	0.25	1" 1½" MULCH AT FINAL FINISHING - ⅛" WASTED
S C 6	"	—	1,2,4 TP BARBER GR	B,C	18	P D.	4 30	TP BARBER GREENE	"	—	—	0.2 0.3	" " " " " " " " "
S C-7	"	NONE	1,2,4	B,D	47	P.D.	2 45	SAND SPREADER	"	365	RT 1	0.204	⅛" MULCH WASTED
S C. 8	"	—	1,2,4	B,D	27	T T	2 00	TRUCK TAIL GATE	"	—	RT 2	0.28	1" 1½" MULCH AT FINAL FINISHING - ⅛" WASTED
S C. 9	"	—	1,2,4	B,C	—	P D.	2 30	BUCKEYE SPREADER	"	—	RT 5	0.25 0.30	⅛" MULCH WASTED
S C 10	"	—	1,2,4,6	B,C,D	10	P D	—	SAND SPREADER	"	—	—	0.25 0.30	
S C 11	"	—	1,2,4,5	D	1	—	2 40	" "	"	—	RC	0.2	
S C 12	"	—	1,2,4,5	D	—	P D.	2 00	" "		120	NONE		
S.C 13	"	—	1,2,4 TP BARBER-GR	B,C	76	P D	—	TP BARBER GREENE	NONE	—	RT 2	0.25 0.30	1 1½ MULCH AT FINISHING - ⅛" WASTED
S.C 14	"	—	1,2,4,6	B,D	47	P D.	3 00	SAND SPREADER	NONE ON 4 MI	60	RT 1	0.2	1" " " " " " , CURED 1 MI RT 2 & 1 MI E. ASPHALT
S.C-15	"	—	1,2,4	B,C	3	P D	2 30	BUCKEYE SPREADER	NONE	7	RT 2	0.25	⅛" ¼" MULCH WASTED
S C 16	"	—	1,2,4 TP-BARBER GR	B,D	180±	T P	—	TP BARBER GREENE	"	60 (LOCAL TRAFFIC)	RT 2	0.25	1" MULCH AT FINAL FINISHING ⅛" WASTED
S C 17	"	—	1,2,4	B,C	8	P D	2 00	BUCKEYE SPREADER	"	10	RT 5	0.25	
S.C 18	"	—	1,2,4,6 TP-BARBER-GR	B,C	17	P D	—	HAND	"	14	RT 2	0.20 0.35	1"-1½" MULCH AT FINAL FINISHING ⅛" WASTED
S C. 19	"	—	1,2,4	B,D	—	P D	1 00	BUCKEYE SPREADER	"	14	RT 1	0.25	" " " " " " "
TEX 1	"	—	1,2,4	A,D	98	T T	1 00	HAND	SPRINKLING 5 DAYS	14	RC 2	0.12	" " " " " " ⅛" " , PULVERIZED 100% < #4.
TEX 2	"	80% < #4	2,3,4,5	(5T)A,B,C	7	P D.	4 00	HAND & BLADE	DAMP EARTH 7 DAYS	22	RC 2	0.2	½" " " " " ¼" " " 80% " "
TEX 3	"	100% < 4 OBTAINED	PUGMILL AT PLANT &	EQUIPMENT	—	P D.	60-00	PUGMILL	NONE	7	RC 1M	0.5	" " " NONE "
TEX. 4	"	75% < ¼"	1,2,3,4,5,6,7	A,B,C	23	P D	4-00	HAND & BLADE	EMULSION	0	E.A. 11-M	0.2	0 " " " " , PULVERIZED 75% < #4
TEX 5	"	—	CONCRETE MIXER	(10T)A	—	AT MIXER	—	AT MIXER	MOIST BURLAP 5 DAYS	0	RC 1	0.3	
TEX 6	"	80% < #4	1,2,3,4,5,6	(5T)A,B,D	7	P D	3 30	HAND	DAMP EARTH 7 DAYS	0	RC 2	0.2	⅛" MULCH AT FINAL FINISHING - ⅛ WASTED, PULVERIZED 64% < #4
TEX 7	"	" "	1,2,4,6 TP JAEGER	(5T)A,B,C	39	P D	—	"	COTTON MATS-7 HRS, E.A.	14	E.A. 11-M	0.3	½" 1½" " " " " ⅛ ½" " 90% " "
TEX 8	"	NONE	2,3,4,6	A,B,D	180±	—	1 30		COTTON MATS 5 DAYS	0	RC 2	0.2	1" " " " " NONE " " 65% " "
TEX 9	"	—	4 TP FLYNN	(10T)A,B,D	32	P D.	—	"	VARIOUS	VARIOUS	VARIOUS	VARIOUS	
VA 1	(a)	NONE	1,2,3,4,5	(5T)A,B	25	—	1 00	"	EARTH 7 DAYS	—	RC 2	0.25	1" MULCH AT FINAL FINISHING - ⅛" ¼" WASTED, PULVERIZED 80% < #4
VA. 2	(a)	"	1,2,3,4	(5T)A,B	14	—	1 00	"	"	60	RT-4	0.6	" " " " " " " " " " " "
WASH 1	NONE	—	—	(10T)A	—	—	3 00	"	WET STRAW 7 DAYS	30	NONE	NONE	
MASS	SAND & GRAVEL 12"	—	2,3,5	A,B	15	P D	1 00	"	WET HAY 7 DAYS	270	RT 3	0.25	0" MULCH WASTED

* PERCENT PASSING AND SIEVE SIZE SHOWN IN THIS COLUMN
(a) FRENCH DRAINS CD 1 & CD 2 38 & 48 12" STONE 20 & 30

1 SCARIFIER
2 DISC HARROW
3 FIELD CULTIVATOR
4 MOTOR PATROL OR BLADE GRADER
5 - GANG PLOW
6 SPIKE TOOTH HARROW
7 TEAM & FRESNO
8 TILLER

A SELF PROPELLED SMOOTH ROLLER
B SHEEPSFOOT
C RUBBER TIRE
D TRUCKS

P D - PRESSURE DISTRIBUTOR
T T - TANK TRUCK
T P TRAVELING PLANT
— • NOT SHOWN

FIGURE 5

CONDITION OF SOIL-CEMENT AND BITUMINOUS COVER

NUMBER	PERCENT OF TOTAL AREA OF SOIL-CEMENT WITH				FINAL OVERALL RATING %	FINAL OVERALL RATING	BITUMINOUS COVER		NOTES ON SOIL CEMENT AND BITUMINOUS COVER DEFECTS
	COMPLETE LOSS	DEEP RAVEL ⅜" - 2½"	THIN RAVEL 0" - ⅜"	TOTAL			THICKNESS INCHES	CONDITION	
ARK 1	5	50	24	79	127	FAIR	06	GOOD TO FAIR	LOW CEMENT CONTENTS INADEQUATE CONTROL OF SURFACE COMPACTION
ARK 2	0	100	-	100	150	FAIR	05	POOR	INADEQUATE CONTROL OF SURFACE COMPACTION
ARIZ 1	-	-	-	-	-	GOOD	05	GOOD	" " " " "
CAL 1	0	8	10	18	17	GOOD	05 TO 20	-	SURFACING LESS THAN 1" THICK SLIPS ON BASE
CAL 2	0	0	0	0	0	EXCELLENT	3	GOOD	
CAL 3	0	10	50	60	40	GOOD	1½	EXCELLENT TO GOOD	
CAL 4	1	5	20	26	7 25	"	1½	" " "	
GA 1	0	0	0	0	0	EXCELLENT	⅜ TO ¾	EXCELLENT TO GOOD	SLIPPING WHERE SURFACE TREATMENT <1 ALSO CRACKING
GA 2	0	0	0	0	0	"	-	-	
GA 3	0	0	0	0	0	"	-	-	
ILL 1	1	2	30	33	260	GOOD	¾"	EXCELLENT	NO FAILURE 1" MULCH AT SOUTH END WORE AWAY UNDER TRAFFIC
ILL 2	2 5	5	25	32 5	400	"	APPROX ⅜"	-	ORIGINAL SURFACE RATED GOOD LIGHT PATCH COAT PLACED 1940 EXCELLENT
IA 1	0	0	0	0	0	EXCELLENT	½	GOOD TO FAIR	MAINTENANCE ONLY TO IMPROVE RIDING QUALITIES
IA 2	0	0	0	0	0	"	-	-	" " " " "
IA 3	0	0	0	0	0	"	-	FAIR TO GOOD	15% TOTAL AREA PATCHED IN MAINTENANCE
IA 4	0	0	0	0	0	"	-	GOOD TO FAIR	" " " " "
IA 5	0	0	0	0	0	"	-	-	PATCHING TO IMPROVE RIDING AND AREAS WHERE SNOW PLOWS INJURED SURFACE TREATMENT
KAN 1	0	0	0 5	0 5	0 03	"	½"	FAIR	
KY - 1	0 1	0 3	1 1	2 1	0 66	"	-	-	222 SQ YDS CAUSED BY INADEQUATE SUBGRADE DRAINAGE OR SUPPORT
MD 1	0	0	0	0	0	"	-	EXCELLENT TO GOOD	AGGREGATE ¼ - ⅜ 23#/SQ YD CONDITION OF WEARING SURFACE AFTER 2ND TREATMENT
MD 2	0	0	0	0	0	"	-	" " "	" " 28#/ SQ YD " REPORTED AFTER 2ND TREATMENT
MICH 1	0	15	20	35	3 75	GOOD	NONE	-	EASE EXPOSED SINCE CONSTRUCTION NO SURFACE TREATMENT
MISS 1	1	15	25	41	4 30	"	-	GOOD TO FAIR	INADEQUATE CONTROL OF SURFACE MOISTURE AND COMPACTION
MO - 1	0	0	0	0	0	EXCELLENT	⅝	EXCELLENT TO GOOD	
MO - 2	0 9	0	11 3	12 2	1 3	GOOD	½"	" " "	
MO 3	4 9	0	5 0	9 9	4 17	"	1	GOOD TO FAIR	UNSATISFACTORY COMPACTION, INADEQUATE SUBGRADE DRAINAGE AND SUPPORT
NEB 1	1	5	30	36	3 05	"	⅛" TO ½"	" " "	EXCESSIVE MIXING TIME LAMINATIONS DURING COMPACTION
NY - 1	1	5	10	16	2 05	"	½	EXCELLENT TO GOOD	EXCESSIVE LONGITUDINAL CRACKS CLAIMED TO HAVE BEEN CAUSED BY SEVERE WINTER
O 1	0	1	10	11	0 95	EXCELLENT	½" TO ¾"	FAIR	
O 2	9 5	2 3	2 0	13 8	8 0	FAIR	½	GOOD TO FAIR POOR	INADEQUATE DRAINAGE AND SUPPORT
OKLA 1	0	0	0	0	0	EXCELLENT	1½	-	
PA - 1	0	0	50	50	2 5	GOOD	½	EXCELLENT TO GOOD	
N C - 2	3 0	4 8	8 5	68 8	4 95	"	¾"	" " "	WHERE TWO COURSE CONSTRUCTION WAS USED SOME FAILURE TO BOND OBSERVED
N C - 3	0	0	15	15 0	0 75	EXCELLENT	½	-	SCALING ATTRIBUTED TO INTERFERENCE WITH FINAL COMPACTION BY RAINS
N C - 4	0 1	0	0	0 1	0 08	"	-	EXCELLENT	SOFT SPOT IN SUBGRADE CAUSING INADEQUATE COMPACTION
PA - 1	0	0	0	0	0	"	-	-	
SC - 1	0	0	0	0	0	"	-	EXCELLENT	
SC 2	3 5	4	13	20 5	4 1	GOOD	½"	FAIR TO POOR	HEAVY SOIL, INSUFFICIENT CEMENT, BARBER GREENE GIVE POOR DISTRIBUTION OF CEMENT
SC 3	0	0 4	0 3	0 7	0 08	EXCELLENT	-	EXCELLENT	SOME FAILURES ON GUMBO SUBGRADE, DRAINAGE POOR
SC 4	0	-	-	-	-	-	⅛" TO ⅜"	-	
SC-5	0 8 5	0 4	0 8	1 9	0 77	-	½"	-	FAILURE ON WET UNSTABLE SUBGRADE, ALSO WHERE 5% CEMENT LOWERED TO STUDY EFFICIENCY OF DURABILITY TEST
SC 6	0 8	-	0 3	1 1	0 61	-	¾	-	TWO FAILURES IN CUTS ON VERY BAD SUBGRADE
SC-7	0 5	0	1 1	1 6	0 48	-	1½	-	MOISTURE - DENSITY CONTROL METHOD USED FOR FIRST TIME
SC 8	0	0	0	0	0	-	½"	-	
SC 9	0	-	-	0	0	-	-	-	
SC 10	0	0	7 9	7 9	4 0	GOOD	-	GOOD TO FAIR	POOR COMPACTION AT EDGES - SIDEWALKS IN EXCELLENT SHAPE
SC 11	-	-	-	-	-	EXCELLENT	½" TO ⅝"	-	
SC-12	0	0	0	0	0	"	¾"	-	WEARING SURFACE PEELED OFF ON UNPRIMED SECTIONS
SC-13	-	-	-	-	-	"	½"	EXCELLENT	
SC 14	0 1	1 6	-	2 3	0 84	"	⅝"	EXCELLENT TO GOOD	150' THROUGH CUT, INADEQUATE SUPPORT AND DRAINAGE
SC 15	0	0	0	0	0	"	-	-	
SC-16	0 16	-	1 5	1 66	0 93	"	1	EXCELLENT	BLOWUPS OCCURED AFTER SURFACE PRIMED SPRING 1937 STEEL TIRED WAGONS CAUSED FAILURES
SC-17	0	0	0	0	0	"	-	"	" " " " "
SC 18	0	0	0 2	0 2	0 01	"	¼ TO ¾"	"	" " " " "
SC-19	0	0	-	0	0	"	½"	EXCELLENT TO GOOD	
TEX 1	0	0	0	0	0	"	⅝	-	
TEX-2	0	0	0	0	0	"	¾"	-	
TEX-3	0	0	0	0	0	"	-	EXCELLENT	
TEX-4	0	0	20 TO 30	20 TO 30	5	GOOD	½	GOOD TO POOR	MUCH DILUTED EMULSIFIED ASPHALT OVERWETTED TOP OF SOIL CEMENT BASE AND IT SPALLED OFF ON FREEZING
TEX-5	0	0	0	0	0	EXCELLENT	¾"	EXCELLENT TO GOOD	
TEX 6	0	0	0	0	0	"	-	-	
TEX 7	0	0	100	100	5	GOOD	½	GOOD TO FAIR	
TEX 8	0	0	0	0	0	EXCELLENT	⅝	EXCELLENT TO GOOD	
TEX-9	0	0	0	0	0	"	-	-	
VA - 1	0	0	0	0	0	"	-	-	
VA 2	0 1	0 1	0 1	0 3	0 10	"	1½	-	
WASH 1	-	-	-	-	-	"	2 ½	FAIR	
MISS.	0	0	0	0	0	"	⅜	-	

- = NOT SHOWN

FIGURE 6