



COMMONWEALTH OF KENTUCKY  
DEPARTMENT OF HIGHWAYS  
FRANKFORT

July 21, 1961

HENRY WARD  
COMMISSIONER OF HIGHWAYS

ADDRESS REPLY TO  
DEPARTMENT OF HIGHWAYS  
MATERIALS RESEARCH LABORATORY  
132 GRAHAM AVENUE  
LEXINGTON 29, KENTUCKY

P. 3. 2.

MEMO TO: W. B. Drake  
Director of Research

SUBJECT: Pavement Surveys

REFERENCE: T. H. Baker's Letter, November 10, 1959  
W. B. Drake's Memos, Feb. 15, May 12,  
and June 17, 1960  
W. B. Drake's Memo, May 25, 1961  
My Memos, June 23, and July 11, 1961

A review of the above referenced reports has been made in order to determine reasonable criteria for portland cement concrete pavement surface condition evaluations. Table 1 is provided to allow comparison of the several projects which have been inspected for surface defects.

The major considerations in the evaluation of a slab's condition, where surface defects exist, are the number of defects, their type and size. It is possible for a slab to contain a large number of surface intrusions without being appreciably damaged, if the impairments are all very small. On the other hand, only a few very large defects would be very damaging. Certainly, the most satisfactory condition would be the complete absence of blemishes.

In the surveys which have been made since the beginning of these pavement investigations, soil holes, chert pop-outs, shale pitting, trash imbedments and cracks have comprised nearly one hundred percent of the defects observed. The defects are listed in declining order of damaging effect to the slabs inspected. By far, the most prevalent types of defects are soil holes and chert pop-outs. These surveys have been made, insofar as possible, to include all defects which were one-half inch or more in diameter and all transverse cracks.

The data in Table 1 show that for all the slabs examined the best ones had zero defects and the worst one 247. For generally uniform areas the extremes for average numbers of defects were 0.3 defects per slab and 64 defects per slab. For the same areas, the most frequently occurring slabs were found to be slabs with zero defects and at the other extreme slabs with 55 defects.

In order to relate the appearance of surface defects in a slab to the specification limits placed on the constituents used in the concrete the following hypothetical calculations have been made wherein a porous chert is the offending foreign matter.

Hypothetical chert concentration in a P. C. C. pavement.

Assume mix - 38% FA, 62% CA,

Assume CA - No. 36 crushed limestone, 1900 lbs./yd. concrete.

Grading of No. 36 stone, middle of specification:

<u>Sieve</u>	<u>% Passing</u>	<u>% Retained</u>
2-1/2	100	0
2	90	10
1	52-1/2	37-1/2
1/2	20	32-1/2
4	2-1/2	17-1/2
pan		2-1/2

Assume average size is 1 in. Assume chert could pop out through 1 in. of concrete. Hence, the chert in top 2 in. of concrete would be counted. Assume an average 1-in. chert particle to have the volume of a 1-in. sphere.

$$V = 4/3 \pi r^3 = 1/6 \pi D^3 = 1/6 (3.142)(1)^3$$

$$V = .524 \text{ in}^3.$$

If the specific gravity of this chert is 2.50, a 1-in. particle would weigh  $.524 \text{ in}^3 \times 62.4/1728 \times 2.50 = .0473 \text{ lbs/1-in. particle}$ . Assume 1% chert in CA,  $1900 \text{ lbs.} \times .01 = 19 \text{ lbs. chert/yd. concrete}$ . Number of average chert particles in one cu. yd. concrete =  $19/.0473 = 401.7$ . In a 9-in. pavement, a square yard consists of 1/4 cu. yd. of concrete. Hence,  $401.7/4 = 100.4 \text{ chert particles}$ . If only the chert in the top 2 inches has popped out,  $100.4/4.5 = 22.3 \text{ pop-outs per sq. yd.}$  would show a 24-ft. x 50-ft. slab consists of 133.3 sq. yds., and if 1% of chert were present in the CA and the above assumptions true, there would be  $133.3 \times 22.3 = 3026 \text{ pop-outs per slab}$ .

These figures show that even a small percentage of foreign matter, if it is in the form of medium to large lumps, in a concrete mix can under adverse conditions be very detrimental.

Kentucky Department of Highways Standard Specifications for Road and Bridge Construction, 1956 edition, give limitations for several types of foreign matter including shale, clay or silt, coal and lignite, and other deleterious substances in coarse and fine aggregates, articles 7.4.0 and 7.3.0 respectively. However, in no case are these limits less than 0.5% which is one half of the amount included in the foregoing hypothetical case. At this level a slab could still show 1513 defects, which are approximately six times more than the number counted in the worst slab observed in the course of these surveys and many times more than the worst average number of defects per slab computed for any given project. Nevertheless, there is no question that several of the slabs encountered were in poor condition.

Whenever large defects are present in a pavement it will not pass a critical visual inspection. Experience from these surveys indicates that any hole one and one-half inches in diameter or larger will attract critical attention. The more of this size or larger defects there are the more severe the appraisal of the slab becomes.

In order to prevent the occurrence of slabs with large defects it would seem prudent to include in the specifications strict limitations on the size of foreign matter in the constituents of concrete to supplement the existing limitations of the quantity of such materials. Along with this a strict enforcement of clean handling procedures for the materials should be required as in articles 4.1.4 and 5.6.2-F of the 1956 Specifications.

A compilation of the average number of defects per slab for each of the projects included in this study with the exceptionally bad areas omitted shows an over-all figure for these projects to be 6.3 defects per 50- x 24-ft. slab. The average number of defects per slab for the Versailles-Frankfort project after omitting the exceptionally bad areas is 7.2 and the combined average number of defects per slab for the other projects examined omitting the exceptionally bad areas is 4.5. Projects included in the above averages were: Versailles-Frankfort US 60; Versailles By-Pass; Paducah By-Pass; Watterson Expressway Extension; North Versailles Street, US 60 & US 62; South Versailles Street, State 33; and Elizabethtown-Upton, I 65.

  
Milton Evans, Jr.  
Research Engineer Associate

TABLE I

Comparison of Pavement Defect Summaries for Sections Surveyed April 27, 1961  
thru July 6, 1961

Project	Date & Section	Range	Avg. per 50-ft. Slab	Mode	Major Type (%)	
F 163(10) Paducah By-Pass	June 1, 1961 Total	0-14	1.5	0	88.7 - soil failure	
	1290-1305 WB	0-14	2.7	0	92.9 - soil failure	
	1438-1443 WB	0-5	2.1	2	100 - soil failure	
	1455-1464/50 WB	0-2	0.4	0	62.5 - soil failure	
	1438/50-1443 EB	0-2	0.6	0	67 - soil failure	
	1455-1464/50 EB	0-2	0.6	0	67 - soil failure	
I264 1 12 20 SP 56 628 Watterson Expressway Extension	June 2, 1961 Total	0-26	1.1	0	56.4 - soil failure	
	25-34/50 SB	0-4	1.4	1	50 - chert failure	
	68-74/50 SB	0-4	1.4	0	60 - soil failure	
	98-109/50 SB	0-2	0.3	0	33 - soil, chert & trash failures	
	25-34/50 NB	0-26	2.8	1	74.5 - soil failure	
	68-74/50 NB	0-3	0.9	0	46.2 - soil & chert failures	
	98-109/50 NB	0-4	0.6	0	66.6 - chert failure	
S-SG 155(1) Versailles- Frankfort US 60	May 25, 1961 Totals	0-247	14	2	39.5 - patches 24.3 - soil failure 30.0 - chert failure	
	EB & WB	0-247	15	2	41 - patches 24 - soil failure 29 - chert failure	
	69-94 WB	5-82	31	7,17,36	55.6 - chert failure 41.7 - patches	
	203-281 WB	6-166	64	*55	49.1 - chert failure 49.4 - patches	
	336-395 WB	2-247	57	29,36	55.7 - patches 41.5 - soil failure	
	399-414/50 WB	15-127	44	*39	45.9 - patches 50.7 - soil failure	
	6/50-16/50 EB	1-72	27		50 - patches 41.1 - chert failure	
	61-74 EB	6-56	22	8	31.6 - patches 65.4 - chert failure	
	Crossovers	0-64	7**	0	64.3 - chert failure 21.4 - patches	
	Versailles By-Pass Interchange & Midway Turnout	0-95	12***	2	67 - soil failure 18.5 - patches	
	421 Interchange Ramps-Frankfort	0-28	5***	2	62 - chert failure 18 - patches	
	Versailles By-Pass U.S. 60	July 6, 1961 Total	0-43	6	3	77.2 - soil failure
	Westbound	0-43	7	3	79.2 - soil failure	
	Eastbound	0-17	5	3	74.5 - soil failure	
	Crossovers	0-3	0.4**	0	100.0 - soil failure	

TABLE I (Continued)

S 155(2) North Versailles US 62	July 6, 1961 Total	0-10	3****	3	61.3 - soil failure
S 129(1) South Versailles Ky. 33	July 6, 1961 Total North & South Intersection	0-16 0-16 0-4	3**** 3.5***** 0.6	3 3 0	72.1 - soil failure 71.3 - soil failure 100.0 - soil failure
I-65	May 18-19, 1960 550-575 Total	1-77	18	8	92.0 - soil failure
"	SB	5-77	27	8,16,18	95.0 - soil failure
"	NB	1-20	9	8	85.0 - soil failure
	May 20, 1960 720-745 Total	0-19	7	3	94.0 - soil failure
"	SB	0-16	8	6	97.0 - soil failure
"	NB	0-19	6	3	89.0 - soil failure
	May 18-20, 1960 Combined	0-77	12	3	93.0 - soil failure
US 60 Lex.-Ver.	June 9-10, 1960 Fayette Co.	6-71	28*****	17	84.0 - shale pitting
US 60 Lex.-Ver.	June 10, 1960 Woodford	0-69	8*****	5	83.0 - shale pitting

\* Average mode - due to 5 actual modes

\*\* All slabs not necessarily 50 ft. long - varies from 20 ft. to 50 ft.

\*\*\* Slabs approximately 50 ft. long

\*\*\*\* A slab is 44' x 50' (10'-12'-12'-10') & (11'-11'-11'-11') rather than 24'x50'

\*\*\*\*\* Average per 30-foot slab.



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July 11, 1961

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COMMISSIONER OF HIGHWAYS

ADDRESS REPLY TO  
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MATERIALS RESEARCH LABORATORY  
132 GRAHAM AVENUE  
LEXINGTON 29, KENTUCKY

P.3.2

Memo. To: W. B. Drake  
Director of Research

Subject: Investigation of Concrete Pavements  
Versailles By-Pass - US 60  
North Versailles, US 60 & US 62, S155(2)  
South Versailles, State Route 33, S129(1)

On July 5, and July 6, 1961, surveys were made of the subject projects. The data are presented in the same manner as previously established for this type of data. For each project Summary Strip Performance, Summary of Pavement Defects, and Breakdown of Total Defects tabulations are given.

Tables 1 through 6 cover the Versailles By-Pass, Tables 7 through 9, the North Versailles Project, and Tables 10 through 12 the South Versailles Project. These data for the Versailles By-Pass supplement data originally reported June 17, 1960. The data for the other two projects are the first taken for them.

It should be noted that the slab size on the two new Versailles Street Projects are much larger than normal highway slabs, which are usually 24' x 50', such as exist on the Versailles By-Pass. The slabs on the North Versailles Project are 50' long and include two 10' parking lanes and two 12' traffic lanes. The slabs on the South Versailles Project are 50' long and include two 11' parking lanes and two 11' traffic lanes.

The major type of defect is soil for all of these projects. The average per slab on the Versailles By-Pass is now 6 defects per slab, as compared to only 3 defects per slab on May 24, 1960. This is a considerable increase and a good many more slabs show an excessive number of defects. The averages for both the North and the South Versailles Projects are 3 defects per slab (44' x 50') which are not excessively high averages. The North Project has no slabs with more than 10 defects, whereas the South Project has three slabs with more than 10, i.e., 11, 14, and 16. However, considering the larger surface areas involved in these slabs these three slabs do not appear as areas of high defect concentration.

*Milton Evans, Jr.*

Milton Evans, Jr.  
Research Engineer Associate

ME:K

Table 1  
 Summary Strip Performance  
 Date: July 5, 1961  
 Project: Woodford County, Versailles By-Pass  
 US 60 - Westbound Lanes, 4-Lane  
 Pavement

Station	Patched Defects	Defects Remaining					Total Defects per Slab
		Soil	Chert	Cracks	Other	Total	
67+25	0	0	2	0	1	3	3
+50	0	6	1	0	0	7	7
68	0	0	2	0	0	2	2
+50	0	0	0	0	0	0	0
69	0	5	0	0	0	5	5
+50	0	8	1	0	0	9	9
70	0	4	2	0	1	7	7
+50	0	9	0	0	0	9	9
71	0	22	2	0	0	24	24
+50	0	15	0	0	0	15	15
72	0	17	4	0	0	21	21
+50	0	8	0	0	1	9	9
73	0	2	1	0	0	3	3
+50	0	3	0	0	0	3	3
74	0	7	1	0	0	8	8
+50	0	7	1	0	0	8	8
75	0	6	4	0	0	10	10
+50	0	14	0	0	0	14	14
76	0	4	0	0	0	4	4
+50	0	14	1	0	0	15	15
77	0	15	0	0	0	15	15
+50	0	6	1	0	0	7	7
78	0	6	1	0	0	7	7
+50	0	2	1	0	0	3	3
79	0	4	0	0	0	4	4
+50	0	6	1	0	0	7	7
80	0	5	0	0	0	5	5
+50	0	1	0	0	0	1	1
81	0	7	0	0	0	7	7
+50	0	2	1	0	0	3	3
82	0	7	2	0	0	9	9
+50	0	8	0	0	0	8	8
83	0	2	0	0	0	2	2
+50	0	4	0	0	0	4	4
84	0	3	0	0	0	3	3
+50	0	2	0	0	1	3	3
85	0	1	0	0	0	1	1
+50	0	0	0	0	0	0	0
86	0	2	0	0	0	2	2
+50	0	2	0	0	0	2	2
87	0	0	0	0	0	0	0
+50	0	4	0	0	0	4	4
88+50	0	1	4	0	0	5	5

Table 1 (Contd)

Station	Patched Defects	Defects Remaining				Total	Total Defects per Slab
		Soil	Chert	Cracks	Other		
89	0	6	0	0	0	6	6
+50	0	11	1	0	1	13	13
90	0	12	1	0	0	13	13
+50	0	20	1	0	1	22	22
91	0	6	0	1	0	7	7
+50	0	5	0	0	0	5	5
92	0	3	0	0	0	3	3
+50	2	3	0	0	0	3	5
93	1	2	0	0	0	2	3
+50	0	6	1	0	0	7	7
94	0	5	0	0	0	5	5
+50	0	9	1	0	0	10	10
95	0	2	0	0	0	2	2
+50	0	0	0	0	0	0	0
96	0	2	1	0	0	3	3
+50	0	5	1	0	0	6	6
97	0	8	0	0	0	8	8
+50	0	6	0	0	0	6	6
98	0	2	0	0	0	2	2
+50	0	0	1	0	0	1	1
99	0	2	1	0	0	3	3
+50	1	7	1	0	0	8	9
100	0	7	1	0	0	8	8
+50	0	3	0	0	0	3	3
101	0	1	2	0	0	3	3
+50	0	2	0	0	0	2	2
102	0	1	0	0	0	1	1
+50	0	3	0	0	3	6	6
103	0	6	0	0	1	7	7
+50	0	5	2	0	0	7	7
104	0	6	0	0	0	6	6
+50	0	7	0	0	0	7	7
105	0	3	0	0	0	3	3
+50	1	16	1	0	0	17	18
106	1	3	1	0	0	4	5
+50	0	3	2	0	0	5	5
107	0	6	1	0	0	7	7
+50	0	6	3	0	0	9	9
108	0	6	2	0	1	9	9
+50	0	3	0	0	1	4	4
109	0	2	3	0	0	5	5
+50	1	1	1	0	0	2	3
110	0	2	0	0	1	3	3
+50	0	8	6	0	0	14	14
111	0	7	3	0	1	11	11



Table 1 (Contd)

Station	Patched Defects	Defects Remaining				Total	Total Defects per Slab
		Soil	Chert	Cracks	Other		
+50	0	2	1	0	0	3	3
112	0	3	0	0	0	3	3
+50	0	1	2	0	0	3	3
113	0	6	1	0	0	7	7
+50	0	10	1	0	0	11	11
114	0	15	0	0	0	15	15
+50	0	3	1	0	1	5	5
115	0	6	4	0	1	11	11
+50	0	11	2	0	0	13	13
116	0	14	0	0	0	14	14
+50	0	11	0	0	1	12	12
117	0	14	0	0	1	15	15
+50	0	8	0	0	1	9	9
118	0	9	1	0	1	11	11
+50	0	14	0	0	0	14	14
119	0	10	5	0	0	15	15
+50	0	16	1	0	0	17	17
120	3	37	3	0	0	40	43
+50	5	13	3	0	1	17	22
121	1	8	7	0	0	15	16
+50	2	4	2	0	0	6	8
122*	0	4	5	0	0	9	9
+25	3	5	4	0	0	9	12
+50	4	10	5	0	0	15	19
123	5	5	2	0	0	7	12
+50	6	14	4	0	1	19	25
124	0	8	1	0	1	10	19
+50	0	6	3	0	0	9	9
125	0	4	0	1	0	5	5
+50	0	5	1	0	0	6	6
126*	0	9	4	0	0	13	13
+25*	0	4	0	0	0	4	4
+50	0	2	0	0	1	3	3
127	0	7	0	0	0	7	7
+50	0	7	1	0	1	9	9
128	0	1	0	0	2	3	3
+50	0	1	0	0	1	2	2
129	0	9	0	0	0	9	9
+50	0	1	0	0	0	1	1
130	0	7	0	0	0	7	7
+50	0	3	2	1	0	6	6
131	0	2	0	0	0	2	2
+50	0	10	0	0	0	10	10

Table 1 (Contd)

Station	Patched Defects	Defects Remaining				Total	Total Defects per Slab
		Soil	Chert	Cracks	Other		
132	0	8	0	0	0	8	8
+50	0	0	0	0	0	0	0
133	0	3	1	0	1	5	5
+50	0	2	0	0	0	2	2
134	0	0	1	0	0	1	1
+50	0	3	2	0	0	5	5
135	0	8	0	0	0	8	8
+50	0	2	1	0	0	3	3
136	0	4	1	0	1	6	6
+50	0	3	1	0	0	4	4
137	0	3	1	0	1	5	5
+50	0	0	2	0	0	2	2
138	0	1	3	0	0	4	4
+50	0	0	0	0	1	1	1
139	0	0	1	0	0	1	1
+50	0	0	0	0	0	0	0
140	0	6	0	0	0	6	6
+50	0	1	0	0	0	1	1
141	0	0	0	0	0	0	0
+50	0	6	0	0	0	6	6
142	0	1	0	0	1	2	2
+50	0	2	0	0	0	2	2
143	0	1	0	0	0	1	1
+50	0	4	0	0	0	4	4
144	0	3	0	0	0	3	3
<hr/>							
Totals	36	870	151	3	33	1057	1093

\* Short Slabs.

Table 2  
 Summary Strip Performance  
 Date: July 5, 1961  
 Project: Woodford County, Versailles By-Pass,  
 US 60, Eastbound Lanes, 4-Lane  
 Pavement

Station	Patched Defects	Defects Remaining				Total	Total Defects per Slab
		Soil	Chert	Cracks	Other		
67*	0	0	0	0	3	3	3
+50	0	3	4	0	0	7	7
68	0	4	2	0	0	6	6
+50	0	3	1	0	0	4	4
69	0	2	2	0	0	4	4
+50	0	4	0	1	0	5	5
70	0	2	2	1	0	5	5
+50	0	2	4	0	1	7	7
71	0	4	0	0	0	4	4
+50	0	4	2	0	0	6	6
72	0	7	4	0	0	11	11
+50	0	5	1	1	0	7	7
73	0	3	3	0	1	7	7
+50	0	4	2	0	0	6	6
74	0	9	3	0	0	12	12
+50	0	7	1	0	0	8	8
75	0	3	0	0	0	3	3
+50	0	2	0	0	0	2	2
76	0	2	1	0	0	3	3
+50	0	1	1	0	1	3	3
77	0	6	0	0	0	6	6
+50	0	2	0	0	0	2	2
78	0	1	0	0	0	1	1
+50	0	1	1	0	0	2	2
79	0	4	1	0	0	5	5
+50	0	2	0	1	0	3	3
80	0	5	2	0	0	7	7
+50	0	3	1	1	0	5	5
81	0	3	1	0	0	4	4
+50	0	2	1	0	0	3	3
82	0	4	0	0	0	4	4
+50	0	3	0	0	0	3	3
83	0	2	0	0	0	2	2
+50	0	1	0	0	1	2	2
84	0	3	8	0	0	11	11
+50	0	1	0	0	0	1	1
85	0	1	1	0	2	4	4
+50	0	1	1	0	0	2	2

Table 2 (Contd)

Station	Patched Defects	Defects Remaining				Total	Total Defects per Slab
		Soil	Chert	Cracks	Other		
86	0	1	3	0	0	4	4
+50	0	5	4	0	0	9	9
87	0	1	2	0	0	3	3
+50	0	1	1	1	0	3	3
88+50	0	2	0	0	0	2	2
89	0	0	0	1	0	1	1
+50	0	5	0	0	0	5	5
90	0	2	2	0	0	4	4
+50	0	5	2	0	0	7	7
91	0	6	1	0	0	7	7
+50	0	3	0	0	0	3	3
92	0	2	3	0	0	5	5
+50	0	3	3	0	1	7	7
93	0	5	1	0	0	6	6
+50	0	10	0	0	0	10	10
94	0	9	0	0	0	9	9
+50	0	2	0	0	0	2	2
95	0	4	1	0	0	5	5
+50	0	6	0	0	0	6	6
96	0	8	0	0	0	8	8
+50	0	12	0	0	0	12	12
97	0	3	1	0	0	4	4
+50	0	3	0	0	0	3	3
98	0	2	0	0	0	2	2
+50	0	1	0	0	2	3	3
99	0	6	1	0	1	8	8
+50	0	2	1	1	0	4	4
100	0	6	0	0	2	8	8
+50	0	0	0	0	0	0	0
101	0	5	2	0	0	7	7
102	0	1	0	0	0	1	1
+50	0	1	0	0	0	1	1
103	0	1	0	0	0	1	1
+50	0	3	0	0	0	3	3
104	0	5	0	0	1	6	6
+50	0	4	2	0	0	6	6
105*	0	3	1	0	0	4	4
+25	0	1	0	0	0	1	1
+50	0	1	1	0	0	2	2
106	0	3	0	0	0	3	3
+50	0	6	0	0	1	7	7
107	0	3	0	0	0	3	3
+50	0	10	1	0	0	11	11
108	0	5	1	0	0	6	6
+50	0	4	1	0	0	5	5

Table 2 (Contd)

Station	Patched Defects	Defects Remaining				Total	Total Defects per Slab
		Soil	Chert	Cracks	Other		
109	0	1	1	1	0	3	3
+50	0	2	1	0	1	4	4
110	0	10	1	0	0	11	11
+50	0	12	0	0	0	12	12
111	0	6	0	0	0	6	6
+50	0	5	0	0	0	5	5
112	0	2	0	0	2	4	4
+50	0	4	1	0	0	5	5
113	0	5	0	0	0	5	5
+50	0	3	0	0	0	3	3
114	0	4	0	0	0	4	4
+50	0	3	0	0	0	3	3
115	0	0	2	0	0	2	2
+50	0	1	2	1	0	4	4
116	0	2	0	0	0	2	2
+50	0	3	1	0	0	4	4
117	0	0	3	0	1	4	4
+50	0	6	3	0	0	9	9
118	0	9	0	0	0	9	9
+50	0	15	0	0	2	17	17
119	0	8	0	0	0	8	8
+50	0	10	1	0	1	12	12
120	0	10	0	0	0	10	10
+50	0	13	0	0	0	13	13
121	0	15	2	0	0	17	17
+50	0	2	5	0	1	8	8
122	0	5	0	0	0	5	5
+50	0	8	1	0	0	9	9
123	0	1	1	0	0	2	2
+50	0	3	1	0	0	4	4
124	0	4	0	0	0	4	4
+50	0	9	0	0	0	9	9
125	0	3	0	0	0	3	3
+50	0	6	0	0	0	6	6
126	0	7	0	0	0	7	7
+50	0	9	2	0	4	15	15
127	0	6	2	0	0	8	8
+50	0	4	4	0	3	11	11
128	0	6	0	0	0	6	6
+50	0	3	0	0	0	3	3
129	0	2	0	0	1	3	3
+50	0	2	0	0	2	4	4
130	0	2	0	0	0	2	2
+50	0	1	4	0	1	6	6

Table 2 (Contd)

Station	Patched Defects	Defects Remaining				Total	Total Defects per Slab
		Soil	Chert	Cracks	Other		
131	0	2	0	0	0	2	2
+50	0	3	4	0	0	7	7
132	0	3	0	0	0	3	3
+50	0	3	2	0	0	5	5
133	0	6	0	0	0	6	6
+50	0	1	0	0	0	1	1
134	0	5	2	0	0	7	7
+50	0	2	2	0	0	4	4
135	0	5	3	0	0	8	8
+50	0	6	1	0	0	7	7
136	0	5	4	0	0	9	9
+50	0	6	2	0	0	8	8
137	0	3	1	0	0	4	4
+50	0	2	0	0	1	3	3
138	0	8	0	1	0	9	9
+50	0	1	0	0	1	2	2
139	0	3	0	0	0	3	3
+50	0	1	0	0	0	1	1
140	0	1	0	0	2	3	3
+50	0	2	0	0	1	3	3
141	0	2	1	0	0	3	3
+50	0	0	1	0	0	1	1
142	0	3	0	0	0	3	3
+50	0	3	0	0	0	3	3
143	0	1	0	0	0	1	1
+50	0	0	0	0	0	0	0
Totals	0	596	146	11	41	794	794

\* Short Slabs.

Table 3  
 SUMMARY STRIP PERFORMANCE  
 Crossovers  
 Woodforc County, Versailles By-Pass  
 US 60  
 July 5, 1961

Station	Patched Defects	Defects Remaining				Total	Total Defects per Slab
		Soil	Chert	Cracks	Other		
75 / 50	0	0	0	0	0	0	0
79 / 00	0	0	0	0	0	0	0
94 / 00	0	0	0	0	0	0	0
/ 50	0	1	0	0	0	1	1
99 / 00	0	0	0	0	0	0	0
/ 50	0	0	0	0	0	0	0
122 / 50	0	3	0	0	0	3	3
123	0	0	0	0	0	0	0
134 / 50	0	0	0	0	0	0	0
135	0	0	0	0	0	0	0
Totals	0	4	0	0	0	4	4

Table 4  
 SUMMARY STRIP PERFORMANCE  
 Woodford County, Versailles By-Pass  
 Lexington Road Intersection  
 July 5, 1961

Slab No.	Patched Defects	Defects Remaining				Total	Total Defects per Slab
		Soil	Chert	Cracks	Other		
*1	0	0	0	0	0	0	0
2	0	3	0	0	0	3	3
3	0	0	4	0	0	4	4
4	0	4	0	0	1	5	5
5	0	1	0	0	0	1	1
6	0	0	0	0	1	1	1
7	0	2	0	0	0	2	2
8	0	0	0	0	0	0	0
9	0	1	0	0	0	1	1
10	0	0	2	0	0	2	2
11	0	1	0	0	0	1	1
12	0	0	0	0	0	0	0
13	0	1	0	0	0	1	1
14	0	1	0	0	0	1	1
15	0	1	3	0	1	5	5
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0
18	0	0	0	1	0	1	1
19	0	0	0	1	0	1	1
<b>Totals</b>	<b>0</b>	<b>15</b>	<b>9</b>	<b>2</b>	<b>3</b>	<b>29</b>	<b>29</b>

\*For cross-reference between Slab No. and its location, see Sketch in Field Book.



Table 5  
 Summary of Pavement Defects  
 Date: July 6, 1961  
 Project: Versailles By-Pass, US 60

Defects per Slab	No. Slabs				Decumulative No. Slabs			
	East- Bound	West- Bound	Total	% Total	East- Bound	West- Bound	Total	% Total
0	5	9	14	4.25	161	168	329	100.00
1	16	16	32	9.73	156	159	315	95.75
2	16	16	32	9.73	140	143	283	86.02
3	27	24	51	15.50	124	127	251	76.29
4	23	8	31	9.42	97	103	200	60.79
5	14	15	29	8.82	74	95	169	51.37
6	14	10	24	7.30	60	80	140	42.55
7	14	15	29	8.81	46	70	116	35.25
8	9	9	18	5.47	32	55	87	26.44
9	8	11	19	5.77	23	46	69	20.97
10	2	4	6	1.82	15	35	50	15.20
11	5	4	9	2.74	13	31	44	13.38
12	4	3	7	2.13	8	27	35	10.64
13	1	4	5	1.52	4	24	28	8.51
14	0	4	4	1.22	3	20	23	6.99
15	1	6	7	2.13	3	16	19	5.77
16	0	1	1	0.30	2	10	12	3.64
17	2	1	3	0.91	2	9	11	3.34
18		1	1	0.30		8	8	2.43
19		1	1	0.31		7	7	2.13
21		1	1	0.30		6	6	1.82
22		2	2	0.61		5	5	1.52
24		1	1	0.31		3	3	0.91
25		1	1	0.30		2	2	0.60
43		1	1	0.30		1	1	0.30
Total	161	168	329	100.00				

Addendum to Table 5  
 Summary of Pavement Defects  
 Date: July 6, 1961  
 Project: Crossovers on Versailles By-Pass

Defects per Slab	No. Slabs		Decumulative No. Slabs	
	Crossovers	% Total	Crossovers	% Total
0	9	81.82	11	100.00
1	1	9.09	2	18.18
3	1	9.09	1	9.09
Total	11	100.00		

Table 6  
 Breakdown of Total Defects  
 Date: July 6, 1961  
 Project: Versailles By-Pass, US 60

	Eastbound		Westbound	
	Number	%	Number	%
Patches	1	0.1	35	3.2
Soil Failures	597	74.5	877	79.2
Trash	42	5.2	36	3.2
Cracks	13	1.6	3	0.3
Chert Popouts	149	18.6	157	14.1
Total	802	100.0	1108	100.0

Addendum to Table 6  
 Breakdown of Total Defects  
 Date: July 6, 1961  
 Project: Crossovers on Versailles By-Pass

	Number	%
Patches	0	0
Soil Failures	7	100
Trash	0	0
Cracks	0	0
Chert Popouts	0	0
Total	7	

TABLE 7  
SUMMARY STRIP PERFORMANCE  
North Versailles S 155(2) US 62  
July 6, 1961

Station	Patched Defects	Defects Remaining				Total	Total Defects per Slab
		Soil	Chert	Cracks	Other		
0 / 25	0	0	0	0	0	0	0
0 / 75	0	1	0	1	1	3	3
1 / 25	0	3	0	0	0	3	3
1 / 75	0	2	1	0	0	3	3
2 / 25	0	9	1	0	0	10	10
2 / 75	0	2	0	0	0	2	2
3 / 25	0	1	0	0	0	1	1
3 / 75	0	1	0	0	0	1	1
4 / 25	0	1	1	0	1	3	3
4 / 75	0	2	0	0	0	2	2
5 / 25	0	0	0	0	1	1	1
5 / 75	0	1	0	2	1	4	4
6 / 25	0	0	0	0	0	0	0
6 / 75	0	0	0	0	0	0	0
7 / 25	0	1	0	0	0	1	1
7 / 75	0	1	1	2	1	5	5
8 / 25	0	2	0	0	2	4	4
8 / 75	0	1	0	1	0	2	2
9 / 25	0	0	0	0	2	2	2
9 / 75	0	3	0	1	0	4	4
10 / 25	0	1	1	1	0	3	3
10 / 75	0	3	3	2	0	8	8
11 / 25	0	2	2	0	0	4	4
11 / 75	0	4	1	0	0	5	5
12 / 25	0	2	2	1	1	6	6
12 / 75	0	0	0	1	2	3	3
13 / 25	0	2	0	0	0	2	2
13 / 75	0	0	0	0	0	0	0
14 / 00	0	0	0	0	0	0	0
14 / 25	0	1	2	0	0	3	3
14 / 75	0	1	0	0	0	1	1
15 / 25	0	4	1	1	0	6	6
15 / 75	0	3	0	1	0	4	4
16 / 25	0	1	0	1	1	3	3
16 / 75	0	0	0	0	1	1	1
17 / 25	0	1	0	0	2	3	3
17 / 75	0	0	0	2	0	2	2
18 / 00	0	0	1	0	0	1	1
18 / 75	0	0	0	2	0	2	2
19 / 25	0	4	0	0	0	4	4
19 / 75	0	3	0	0	0	3	3
20 / 25	0	5	0	1	0	6	6
20 / 75	0	1	1	0	3	5	5
21 / 00	0	4	0	0	0	4	4
21 / 50	0	3	0	0	0	3	3
22 / 00	0	2	0	2	0	4	4
22 / 50	0	4	0	2	0	6	6
23 / 00	0	1	0	0	0	1	1
23 / 50	0	8	0	0	0	8	8
24 / 00	0	0	0	0	0	0	0
24 / 25	0	0	0	0	0	0	0
24 / 75	0	2	0	0	0	2	2

TABLE 7 (Continued)  
Summary Strip Performance

Station	Patched Defects	Defects Remaining				Total	Total Defects per Slab
		Soil	Chert	Cracks	Other		
25 / 25	0	5	0	0	0	5	5
/ 75	0	0	0	0	0	0	0
26 / 25	0	1	0	0	1	2	2
/ 50	0	1	0	0	0	1	1
/ 75	0	0	1	0	1	2	2
27 / 75	0	0	0	0	0	0	0
28 / 25	0	0	0	0	0	0	0
/ 75	0	3	1	0	0	4	4
<b>Total .....</b>	<b>0</b>	<b>103</b>	<b>20</b>	<b>24</b>	<b>21</b>	<b>168</b>	<b>168</b>

Table 8  
 Summary of Pavement Defects  
 Date: July 6, 1961  
 Project: S 155 (2) - North Versailles, US 62

Defects per Slab	No. Slabs		Decumulative No. Slabs	
	Total	% Total	Total	% Total
0	10	16.66	60	100.00
1	9	15.00	50	83.34
2	10	16.67	41	68.34
3	11	18.33	31	51.67
4	9	15.00	20	33.34
5	4	6.67	11	18.34
6	4	6.67	7	11.67
8	2	3.33	3	5.00
10	1	1.67	1	1.67
Total	60	100.00		

Table 9  
 Breakdown of Total Defects  
 Date: July 6, 1961  
 Project: S 155(2) - North Versailles, US 62

	Number	%
Patches	0	0.0
Soil Failures	103	61.3
Trash	21	12.5
Cracks	24	14.3
Chert Failures	20	11.9
Total	168	100.0

Table 10  
 Summary Strip Performance  
 Date: July 6, 1961  
 Project: South Versailles, S 129 (1) Ky. 33

Station	Patched Defects	Defects Remaining				Total	Total Defects per Slab
		Soil	Chert	Cracks	Other		
0+75	0	0	1	0	0	1	1
1+25	0	1	1	2	0	4	4
+75	0	2	0	1	0	3	3
2+25	0	2	1	0	0	3	3
+75	0	1	0	1	0	2	2
3+25	0	1	0	0	0	1	1
+75	0	6	0	2	0	8	8
4+25	0	1	0	1	0	2	2
+75	0	1	0	1	1	3	3
5+25	0	1	0	3	0	4	4
+75	0	1	0	1	0	2	2
6+25	0	1	0	1	0	2	2
+75	0	0	0	2	1	3	3
7+25	2	1	0	3	0	4	6
+75	0	1	0	1	1	3	3
8+25	0	1	0	0	0	1	1
+75	0	1	0	1	0	2	2
9+25	1	0	0	1	0	1	2
+75	2	3	0	0	0	3	5
10+25	1	2	0	0	0	2	3
+75	0	4	0	2	0	6	6
11+25	0	4	0	1	0	5	5
+75	0	1	1	1	0	3	3
12+25	0	1	0	0	0	1	1
+75	0	2	0	1	0	3	3
13+25	0	2	0	0	2	4	4
+75	0	3	1	0	0	4	4
14+25	0	3	0	1	0	4	4
+75	0	6	0	0	3	9	9
15+25	0	11	0	0	3	14	14
+75	0	2	0	0	0	2	2
16+25	3	7	0	0	0	7	10
+75	0	2	0	0	0	2	2
17+25	0	0	0	1	0	1	1
+75	0	4	0	0	0	4	4
18+25	0	4	0	0	0	4	4
+75	0	1	0	2	0	3	3
19+25	0	3	0	0	0	3	3
+75	0	16	0	0	0	16	16
20+25	0	5	0	0	0	5	5
+75	0	7	1	0	1	9	9

Table 10(Contd)  
Summary Strip Performance

Station	Patched Defects	Defects Remaining				Total	Total Defects per Slab
		Soil	Chert	Cracks	Other		
21+25	0	2	0	0	1	3	3
+75	0	0	0	0	0	0	0
22+25	0	1	0	1	1	3	3
+75	0	1	0	0	0	1	1
23+25	0	1	0	1	0	2	2
+75	0	1	0	1	1	3	3
24+25	0	0	0	0	0	0	0
+75	0	3	0	1	0	4	4
25+25	0	4	0	0	0	4	4
+75	0	3	0	0	0	3	3
26+25	0	3	0	0	0	3	3
+75	0	0	0	0	0	0	0
27+25	0	2	1	0	0	3	3
+75	0	3	0	0	1	4	0
28+25	0	0	0	0	0	0	0
+50	0	5	0	0	1	6	0
29+00	0	1	0	1	0	2	2
+50	0	2	0	0	0	2	2
30+00	0	2	0	0	0	2	2
+75	0	0	0	0	0	0	0
31+25	0	1	0	0	0	1	1
+75	0	10	0	1	0	11	11
32+25	0	10	0	0	0	10	10
+75	0	0	1	0	0	1	1
33+25	0	1	0	0	0	1	1
+75	0	2	0	0	0	2	2
34+25	0	0	0	0	0	0	0
+75	0	1	0	0	0	1	1
35+00	0	0	0	0	0	0	0
Totals	9	174	8	36	17	235	244



Table 11  
 Summary of Pavement Defects  
 Date: July 6, 1961  
 Project: S129 (1) South Versailles, Ky. 33

Defects per Slab	No. Slabs			%	Decumulative No. Slabs			
	North & South	Inter- Section	Total		North & South	Inter- Section	Total	%
0	7	9	16	19.51	70	12	82	100.00
1	10	1	11	13.41	63	3	66	80.49
2	13	1	14	17.07	53	2	55	67.08
3	16		16	19.51	40	1	41	50.01
4	10	1	11	13.41	24	1	25	30.50
5	3		3	3.66	14		14	17.09
6	3		3	3.66	11		11	13.43
8	1		1	1.22	8		8	9.77
9	2		2	2.45	7		7	8.55
10	2		2	2.44	5		5	6.10
11	1		1	1.22	3		3	3.66
14	1		1	1.22	2		2	2.44
16	1		1	1.22	1		1	1.22
Total	70	12	82	100.00				

Table 12  
 Breakdown of Total Defects  
 Project: S 129(1) - South Versailles, Ky. 33

	Number	%
Patches	9	3.6
Soil Failures	181	72.1
Trash	17	6.8
Cracks	36	14.3
Chert Failure	8	3.2
Total	251	100.0



COMMONWEALTH OF KENTUCKY  
DEPARTMENT OF HIGHWAYS  
FRANKFORT

June 23, 1961

HENRY WARD  
COMMISSIONER OF HIGHWAYS

ADDRESS REPLY TO  
DEPARTMENT OF HIGHWAYS  
MATERIALS RESEARCH LABORATORY  
132 GRAHAM AVENUE  
LEXINGTON 29, KENTUCKY

P.3.2

Memo. To: W. B. Drake  
Director of Research

Subject: Investigation of Concrete Pavements  
Paducah By-Pass - F 163 (10)  
Watterson Expressway Extension I 264 1 12 20 SP 56 628

Additional data, as requested by Mr. A. O. Neiser on May 26, 1961, covering the subject concrete pavements are tabulated herein.

Surveys were made June 1 and June 2, 1961, for the Paducah By-Pass and the Watterson Expressway Extension for comparison with other pavement surveys. Representative sections of the Paducah By-Pass and the Watterson Expressway Extension were inspected.

Tables 1 and 3 show the number of slabs containing given numbers of defects for the Paducah By-Pass and the Watterson Expressway Extension. Tables 2 and 4 show the types and number of defects of each type for each of the pavements.

These data indicate that neither of the subject projects have an excessive number of pavement defects. However, on the Paducah By-Pass one slab was found with 14 defects and on the Watterson Expressway Extension one was found with 26 defects. These appear to be exceptions and are not representative of the total projects which are generally good.

*Milton Evans, Jr.*  
Milton Evans, Jr.  
Research Engineer Associate

ME:K

Table 1  
 Summary of Pavement Defects  
 Date: June 1, 1961  
 Project: F 163 (10) - Paducah By-Pass  
 Sections: 1290 to 1305, 1438 to 1443, and 1455 to  
 1464 + 50 westbound; 1438 + 50 to 1443  
 and 1455 to 1464 + 50 eastbound

Defects per Slab	No. Slabs				Decumulative No. Slabs			
	West- Bound	East- Bound	Total	% Total	West- Bound	East- Bound	Total	% Total
0	25	16	41	44.57	62	30	92	100.00
1	9	10	19	20.65	37	14	51	55.43
2	9	4	13	14.13	28	4	32	34.78
3	7		7	7.61	19		19	20.65
4	6		6	6.52	12		12	13.04
5	1		1	1.09	6		6	6.52
6	4		4	4.35	5		5	5.43
14	1*		1	1.08	1		1	1.08
Total	62	30	92	100.00				

\* Slab at Sta. 1302 + 50 has an excessive number of defects. This is an exception to the average condition of the pavement.

Table 2  
 Breakdown of Total Defects  
 Project: F 163 (10) - Paducah By-Pass  
 Sections: 1290 to 1305, 1438 to 1443 and 1455 to  
 1464 + 50 westbound; 1434 + 50 to 1443  
 and 1455 to 1464 + 50 eastbound

	Westbound		Eastbound	
	Number	%	Number	%
Patches	0	0	0	0
Soil Failure	106	92.1	12	66.6
Trash	4	3.5	1	5.6
Cracks	1	0.9	1	5.6
Chert Failure	4	3.5	4	22.2
Total	115	100.0	18	100.0