PAVEMENT EVALUATION OF I 94 CONTROL SECTION 82022
Detroit Industrial Expressway from Ozga Rd. to US 24 - Telegraph Rd.

F. Copple

Research Laboratory Division
Office of Testing and Research
Research Project 39 F-7(14)
Research Report No. R-523

Lansing, June 1965

PAVEMENT EVALUATION OF I 94 CONTROL SECTION 82022
Detroit Industrial Expressway from Ozga Rd. to US 24 - Telegraph Rd.

In February 1965, R. L. Greenman received a request from G. J. McCarthy for a pavement survey of I 94 Control Section 82022 between Ozga Rd. and Telegraph Rd. In a memo to E. A. Finney dated February 18, 1965, Mr. Greenman assigned this work to the Research Laboratory, where it was conducted as a part of the Laboratory's program on evaluation of pavements.

General Description of Projects

An inspection of the pavement was completed on March 11, by F. Copple. Roughness measurements were taken and a pavement condition survey was conducted on March 16 by Research Laboratory personnel.

The survey included the following construction projects, from Ozga Rd. east to Telegraph Rd., located as shown in Fig. 1:

Project	Location	Roadway	Length, mi.*	Year Constructed	Slag Coarse Aggregate in Concrete
82-96, C3, C5	Ozga Rd. to Wayne Rd.	WB EB	1.00 1.00	1943-44	C3: all
82-96, C1	Wayne Rd. to Middlebelt Rd.	WB EB	2.97 2.97	1944	Some
82-96, C6	Middlebelt Rd. to Ecorse Rd.	WB EB	1.37 1.37	1944	Some
82-96, C7	Crossing Ecorse Rd.	WB EB	0.78 0.78	1943	All
82-96, C8, C9	East of Ecorse Rd. to Telegraph Rd.	WB EB	1.79 1.70	1944	C8: some C9: all

* Total approximate length: WB roadway, 7.9 mi.; EB roadway, 7.8 mi.

The projects share the following characteristics:

Pavement width - 24 ft
Reinforcement - none
Expansion joints - 120-ft spacing, 1-in. width, no load transfer
Contraction joints - 20-ft spacing
Concrete curing method - clear membrane
Air-entraining agent - Orvus
Traffic loading - (sum for both roadways) 1962 ADT = 41,000
percent commercial traffic = 17.5

These projects were constructed under wartime specifications, and had no reinforcing steel or load transfer. The natural subgrade consists of approximately 3 ft of loamy sand underlain by impervious clay. Surface drainage is generally not good and the underlying clay supports temporary or permanent water tables relatively close to the ground surface.

Median widths are considerable, with the minimum distance between roadways exceeding 120 ft.

In 1956, both roadways were resurfaced with asphaltic concrete which is the present wearing surface.

Results of Inspection and Condition Survey

During the inspection of the I 94 projects, it was found that the pavement east of Ozga Rd. was in much better condition than that lying west of Hannan Rd., which was reported previously. (1) This superiority of pavement performance from Ozga Rd. to Telegraph Rd. was due probably to superior drainage as a result of construction on a fill material higher than the surrounding terrain. Fig. 2 shows the contrast with pavement west of Hannan Rd. which was constructed at about the same elevation as the existing subgrade. Another reason for the superiority of pavement east of Ozga Rd. was the reduction in surface disintegration resulting from the use of air-entrained concrete, as compared with the pavement west of Hannan Rd. which contained no air-entraining agent.

Because of the uniform appearance of the pavement, it was decided to make condition surveys by random sampling of short lengths of each complete project. Thus,

---

(1) Copple, F. "Pavement Evaluation of I 94 Control Section 82021." Research Laboratory Division, Research Report No. R-465 (July 1964).

surveys were conducted over several 500-ft sample lengths of both the eastbound and westbound roadway for a minimum of two samples per project.

The condition surveys revealed that all joints, both transverse and longitudinal, had reflected through the bituminous surface (Fig. 3). In addition to joint reflections, transverse cracks averaged 20.6 per 500-ft pavement length in the traffic lane and 12.5 in the passing lane. This means that the traffic lane, which carries most of the heavy commercial vehicles, suffered about 62 percent more transverse cracking than the passing lane. There was no significant difference between the amount of transverse cracking in the eastbound and westbound roadways. Table 1 lists the transverse cracking data for each construction project. Including reflected transverse joints in the crack count, there is an average of about one crack per 12 ft of pavement length in the traffic lane and one crack per 15 ft in the passing lane.

Joint blowups, all of which had been repaired, are tabulated in Table 2. The eastbound roadway averaged about 3.4 blowups per mile and the westbound about 1.5 blowups per mile.

In addition to the longitudinal center joint, which had reflected through the bituminous surface for its entire length in both roadways, there were short lengths of transverse cracking, as shown in Fig. 4. Table 3 is a tabulation of transverse crack data, indicating that the westbound roadway suffered about twice as much longitudinal cracking as the eastbound.

The Michigan roughometer was used to obtain roughness measurements in the traffic lane for the entire length of all projects from Ozga Rd. to Telegraph Rd. Measured values indicated an average roughness of 211 in. per mile. In comparison, projects from Hannan Rd. west to Rawsonville Rd. had average roughness values of 280 and 244 in. per mile.[1] The arbitrary scale of riding quality values used with the Michigan roughometer is: 0 to 130 in. per mile = "good," 130 to 175 in. per mile = "average," and over 175 in. per mile = "poor."

There were few patches on the bituminous surface of the Control Section 82022 projects and very little evidence of alligator cracking. Even when heavier trucks passed over the pavement, there was no apparent slab rocking.

Discussion

The existing pavement, with its good surface drainage and absence of widespread disintegration, would provide a strong base for supporting a new surface and could profitably be salvaged.

However, unless a cushion is used over the old bituminous pavement, a new bituminous surface, constructed over the old, would probably show reflection cracks in less than one year.

TABLE 1
TRANSVERSE CRACK TABULATION
Total Cracks per 500-ft Sample Length

Lane	Project 82-96 Contracts and Roadways								
	C3, 5		C1		C6		C8, 9		Average
	EB	WB	EB	WB	EB	WB	EB	WB	
TL	25	6	12 (a)	11 (a)	26.5 (b)	23	23 (b)	38 (b)	20.6
PL	18	15	1 (a)	5 (a)	19 (b)	6	11.5 (b)	24.5 (b)	12.5
Total of Averages	43	21	13	16	45.5	29	34.5	62.5	
Total EB = 136.0, Total WB = 128.5									

(a) Average of three 500-ft samples.
(b) Average of two 500-ft samples.

TABLE 2
JOINT BLOWUP TABULATION

Roadway	Project 82-96 Contracts									
	C3, 5		C1		C6		C8, 9		Total	
	Total No.	No. per Mile	Total No.	No. per Mile	Total No.	No. per Mile	Total No.	No. per Mile	No.	Average No. per Mile
Eastbound	2	2	14	4.7	2	1.5	9	5.0	27	3.4
Westbound	7	7	0	0.0	1	0.7	4	2.4	12	1.5

TABLE 3

LONGITUDINAL CRACK TABULATION

Transverse Crack Length per 500-ft Sample Length

Roadway	Project 82-96 Contracts									
	C3, 5		C1		C6		C8, 9		Total of Average Crack Lengths, ft	Grand Average Crack Length per 500-ft Sample
	Average Total Length, ft	Average No. of Cracks	Average Total Length, ft	Average No. of Cracks	Average Total Length, ft	Average No. of Cracks	Average Total Length, ft	Average No. of Cracks		
Eastbound	85	7	1.7[a]	0.3[a]	131.5[b]	3.5[b]	214[b]	9.5[b]	432.2	108
Westbound	77	4	6.3[a]	0.3[a]	496.0	6.0	310.5[b]	8.0[b]	889.8	222
Total of Averages	162	11	8.0	0.6	627.5	9.5	524.5	17.5		

(a) Average of three 500-ft samples.
(b) Average of two 500-ft samples.

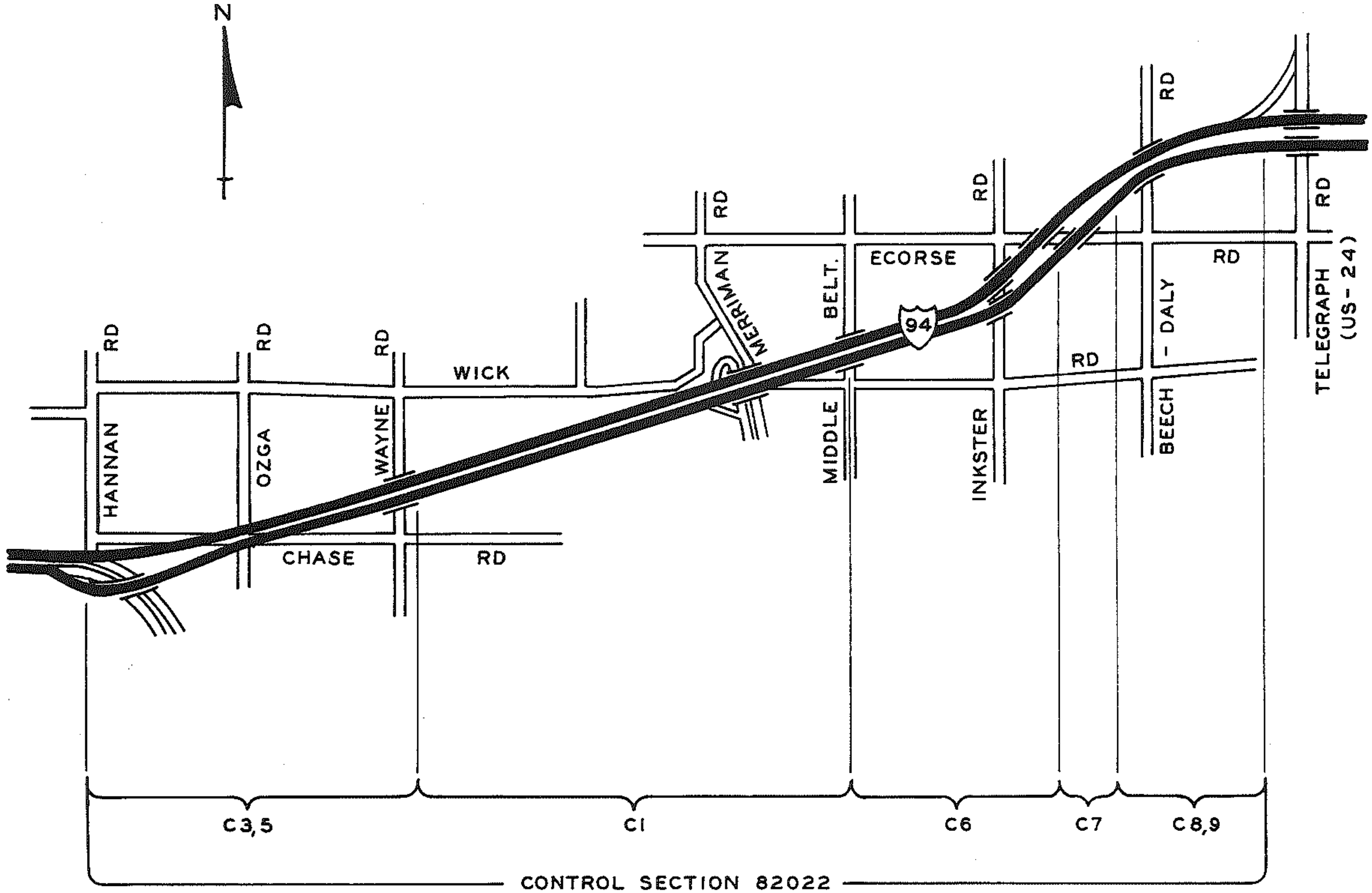

Figure 1. Schematic drawing of Control Section 82022, showing relative locations of projects from Ozga Rd. (west) to Telegraph Rd. (east). Control Section 82021 adjoins at west.

Figure 2. Typical view of median strip in Control Section 82022 (above) showing good drainage from roadways. This may be contrasted with typical poor drainage in Control Section 82021 (below).

Figure 3. Typical longitudinal and transverse cracks reflected from underlying rigid pavement joints.

Figure 4. Typical transverse and longitudinal reflection cracking. Note longitudinal cracking reflecting underlying centerline joint at center of pavement and short longitudinal cracks in foreground.