

OFFICE MEMORANDUM



MICHIGAN
DEPARTMENT OF STATE HIGHWAYS

May 2, 1969

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To: F. Copple, Supervisor
Pavement Performance

From: R. L. Felter

Subject: Pavement Cracking on I 75 in Hamtramck: Research Project
39F-7(14). Research Report No. R-700.

In response to a letter from J. C. Brehler dated September 23, 1968, an investigation was made of pavement cracking on State Projects I 82252-079 and BI 82252-118, located on I 75 in Hamtramck.

These projects consist of dual 48-ft reinforced concrete pavement with 71-ft contraction joint spacing and no expansion joints. Slag from E. C. Levy Company's Dix Yard was used for the fine and coarse concrete aggregate and also for the subbase. The paving was done from July 16, 1968, through July 30, 1968, with daily temperatures of 80 degrees. Joint cutting operations followed the paving operation by three days.

Cracking was first noticed approximately two weeks after all pouring operations were completed. The extent of cracking is shown in Figure 1. This cracking pattern is of a random nature, as shown in Figures 3 through 8, which is not characteristic of normal shrinkage cracking but rather suggests excessive vertical movement caused by loading or settlement. Cores taken September 23, 1968, in the cracked areas show the cracks extend to the depth of the reinforcing steel. Compression tests on the cores met or exceeded 28 day strength requirements.

The paving operation was sequenced as shown in Figure 2. While placing the inside pours the paver and batch trucks traveled on the outside pours which were only from seven to eleven days old. Standard specifications allow the paver to operate on new concrete only after full design strength has been attained unless written permission is granted by the Project Engineer. Although dependent upon curing conditions, design strength is normally attained in 28 days. It is also noted that all major cracking occurs at the beginning of a pour. This "morning sickness" or evidence of lesser quality in concrete near the beginning of a pour has been observed in a number of projects studied in the past.

Profiles have been taken by the Rapid Travel Profilometer to investigate the possibility of settlement in the cracked areas. However, due to electronic problems, these profiles are not yet available. Any significant conclusions resulting from the profiles will be reported when they can be analyzed.

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A telephone conversation with the Project Engineer, Tony Sarotte, disclosed that there is apparently another section of I 75 to the south, BI 82252, C2, that is showing the same form of cracking. This project will be inspected and reported on as soon as possible.

No definite conclusions as to the cause of the cracking can be drawn on the available evidence. However, since the cracking exists in areas at the beginning of a day's pour and is thus more likely to be concrete with the lesser quality, it appears that this, coupled with premature loading, might be the cause of distress. Also, the wandering transverse cracks that cross the centerline, are strong evidence that the pavement was loaded before the centerline joint was cut. Possibly, future comparisons between this project and BI 82252, C2 will permit more definite conclusions to be drawn.

TESTING AND RESEARCH DIVISION



Supervisor, Pavement Serviceability Studies
Physical Research Unit
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RLF:slt

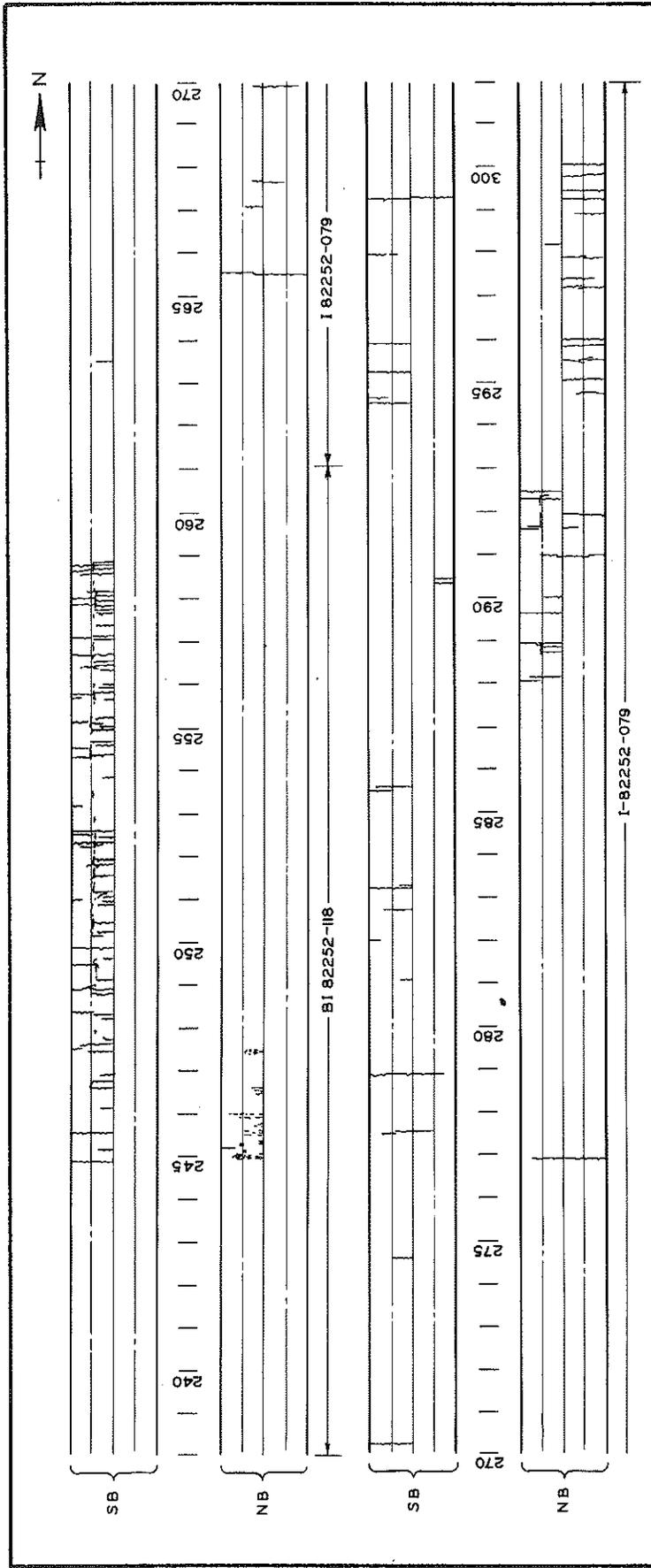


Figure 1. Layout of project showing extent of cracking. Survey taken October 1968.

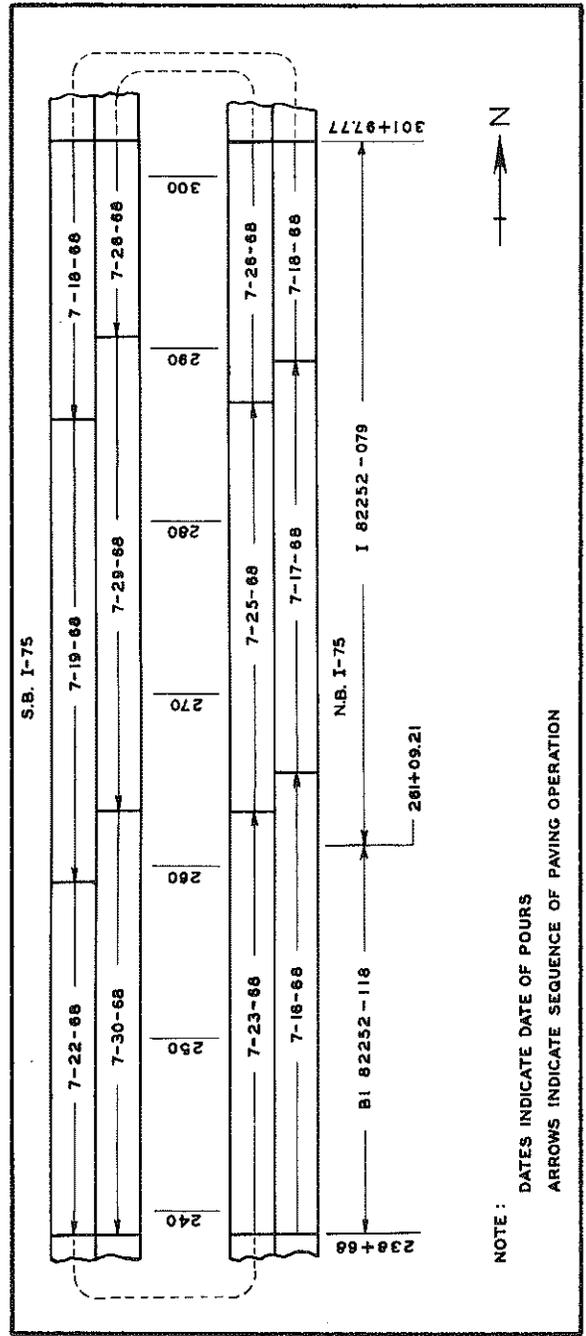


Figure 2. Schematic of control section showing sequence of paving operations.

Figure 3. Typical cracking pattern.
Sta. 253+40 SB, BI 82252-118.



Figure 4. Typical cracking pattern.
Note how cracks appear uninterrupted by
center longitudinal joint. Sta. 254+50
SB, BI 82252-118.

Figure 5. Typical cracking pattern.
Sta. 255+20 SB,
BI 82252-118.

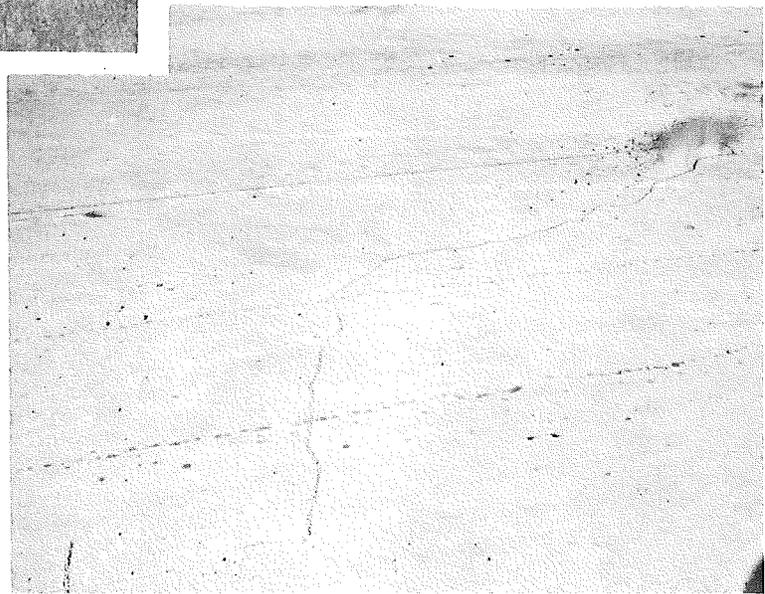


Figure 6. Typical cracking pattern. Note uninterrupted path of crack across center longitudinal joint. Sta. 255+80 SB, BI 82252-118.



Figure 8. Typical cracking pattern. Sta. 288+90 NB, I 82252-079.

Figure 7. Typical cracking pattern showing random nature of cracks. Sta. 288+80 NB, I 82252-079.

