



## OFFICE MEMORANDUM

DATE: June 29, 1982

TO: F. Copple, Supervisor  
Research Services Unit

FROM: R. L. Felter

SUBJECT: Concrete Pavement Cracking, Interim Report  
Research Project 78 G-240, Research Report No. R-1198

This project was established in 1978 to evaluate the effectiveness of cracking (then called shattering) concrete pavement, prior to placing a bituminous overlay, to reduce reflection cracking in the overlay.

Since that time, the process has been included, in varying forms, on several projects. Only one was originally set up as a research project, US 2 from Thompson to Garden Corners. Two additional projects, however, US 2 from M 117 west and M 93 north of Grayling, are also being monitored.

The following is a description of each monitored project and a general evaluation of performance to date.

US 2 from Thompson to Garden Corners - This was originally established as a research project and included a work plan. Alterations to the project that occurred following submittal of the work plan, however, reduced its value as a research project. The most notable of these was the elimination of a control section; that is, an area where an overlay was placed without first cracking the existing concrete. The project will continue to be monitored and is expected to produce information to evaluate the cracking process.

The original concrete on this project was constructed in 1936. It was 20 ft wide, of 9-7-9 cross-section, 30-ft joint spacings, and bar mat reinforced. It had received bituminous overlays in 1951 and 1970.

Contract specifications called for removing the existing bituminous overlays (for later use as a recycled bituminous base course), cracking the concrete pavement full depth to a maximum 18 in. by 18 in. size, and then covering with 440 lb/sq yd bituminous base course No. 5 and 250 lb/sq yd bituminous surface mix No. 11. Bid price for the 41,000 sq yd of cracking required was \$0.55/sq yd.

Approximately 25 percent of the cracking was completed in the fall of 1980 with the remainder completed during the summer of 1981. A hydraulic operated CMI Dyna Pulse

was used to perform the cracking operations. A survey conducted by District personnel in March 1982 revealed 111 apparent transverse reflection cracks in the 3.2 miles. This represents 19.6 percent of the existing joint locations. Unfortunately, an adjacent control section, consisting of uncracked pavement and the approximately 7 in. of bituminous surface, is not available for comparison.

US 2 from M 117 West - This project was not established under a work plan but will continue to be monitored and should provide information for evaluating the cracking process.

The original concrete pavement was constructed in 1941, was 22 ft wide, of 9-7-9 cross-section, had 30-ft joint spacing, and was reinforced with standard wire mesh. The specification for cracking called for a maximum size of 12 in. by 12 in. The proposed overlay called for bituminous mix No. 5 applied at 440 lb/sq yd and bituminous mix No. 11 applied at 170 lb/sq yd. The bid price for cracking was \$0.41/sq yd for 144,000 sq yd.

Cracking was completed on the project during the summer of 1981. A modified diesel pile driver was used to perform the cracking operations. A survey conducted during March 1982, revealed 83 apparent transverse reflection cracks in the 9.8 miles. This represents 4.8 percent of the existing concrete pavement joints. A suitable control section for comparison is not available on this project.

M 93 North of Grayling - This project will also be monitored although it was constructed without a work plan. The original concrete pavement was constructed in 1949, was 22 ft wide, 8-1/2 in. thick, had 20-ft joint spacing, and was not reinforced. Specifications for cracking required a maximum final size of 20 in. by 20 in. A 270 lb/sq yd bituminous surface No. 11 was proposed. The bid price for the 27,000 sq yd of cracking was \$1.00/sq yd.

Cracking was completed during the fall of 1980. A hydraulic operated CMI Dyna Pulse was used to perform the cracking operations. A survey conducted by R. A. Welke, Supervisor of the Bituminous Technical Services Unit, revealed 33 apparent transverse reflection cracks in the 2.1 miles. This represents 5.9 percent of the existing concrete pavement joint location. A suitable control area for comparison is not available.

### Summary

An inspection party composed of W. J. MacCreery (Design), R. R. Scraver, A. P. Chritz, R. Oja, and M. Coburn (Construction), and R. A. Welke, T. A. Coleman, R. Ward, and R. L. Felter (Testing and Research), visited the US 2 projects on March 10, 1982. It was learned from the project engineers, that most cracking started near an outside edge of a pavement lane and proceeded across the pavement in one direction and across the adjacent shoulder in the other. This is somewhat untypical of reflection cracking which normally starts near the center of a pavement and proceeds both ways. After continued conversation with the project engineers, it was learned that

the existing aggregate shoulder and 3 ft bituminous ribbon were left in place along one side during construction. It was generally felt that the crack in the shoulder material extending out from the joints was instrumental in initiating the reflection cracks. Also, in one location, a bituminous acceleration ramp was left in place with the existing cracks initiating reflection cracks in the overlay.

There is a general feeling that the reinforcing steel in these two projects may be encouraging the slabs to remain intact and diminishing the effectiveness of the pavement cracking. The M 93 project, which was unreinforced, is performing comparably and used a much thinner overlay (2-1/2 in.).

All three of these projects will continue to be monitored. Additional projects may be added as constructed. Plans are currently underway to use the process on a roadway with higher traffic loadings.

TESTING AND RESEARCH DIVISION

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Supervisor, Pavement Performance  
Group

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