OFFICE MEMORANDUM

MICHIGAN
DEPARTMENT OF STATE HIGHWAYS

July 17, 1969

To: L. T. Oehler, Engineer of Research
Research Laboratory Section

From: J. E. Simonsen

Subject: Polyethylene Center Strip. Research Project 68 NM-221. Research Report No. R-712.

At its April 8, 1969 meeting, the New Materials Committee discussed a trial installation of the subject material. Such an installation was recommended by the Research Laboratory on the basis of satisfactory performance reports received from other states. The Committee asked that the Laboratory visit installations in neighboring states before approving the use of the polyethylene strip on an experimental basis. This memorandum reports the results of inspection of installations in Illinois and Ohio.

The Illinois installations were inspected on June 3, 1969 by F. Bashore and the writer. D. Fowler and J. Saner of the Illinois Department of Public Works and Buildings accompanied us on the survey. In Illinois the polyethylene strip is allowed as an alternate to sawing. Their specifications require a strip 10-mils minimum in thickness and a minimum width of 2 in., but not less than 1/4 of the thickness of the concrete slab being placed.

The inspection included an 8-in. continuously reinforced portion of Interstate 80 east of Joliet and a 10-in. standard pavement project on Illinois 131 southwest of Waukegan. Both projects were constructed in 1967 and were open to traffic at the time of our inspection. On the I 80 project, the joint was straight and appeared very neat (Fig. 1), but in some areas the strip had failed to perform its function of controlling random longitudinal cracking (Fig. 2). The straightness of the joint on the standard pavement project was good, but it had a zig-zag appearance (Fig. 3). This was apparently caused by the strip being installed too deep. Longitudinal cracking had occurred parallel to the joint at some locations and in some areas the strip had failed to initiate the intended fracture in the pavement (Fig. 4).

The amount of longitudinal cracking is estimated to be between 2 and 8 percent. Although the areas of failure have been inspected and some cores taken by Illinois personnel, they have been unable to determine why these longitudinal cracks have formed. In some cases it appeared that the longitudinal crack was caused by factors other than the plastic strip. The median performance for

124 Michigan projects after 10 years of service constructed with a 1/4- by 2-in. bituminous filler strip was approximately 10 ft of longitudinal cracking per mile of equivalent two-lane pavements or 0.2 percent.

The Ohio installations were inspected on June 18, 1969 by D. Wickham, F. Bashore, the writer, and J. Dixon of Ohio Department of Highways. The Ohio specifications allow the polyethylene center strip for creating the longitudinal joint. The minimum allowed thickness of the strip is 12 mils and the depth is specified as 2-1/2 in. for 8- and 9-in. pavement and 3 in. for 10-in. pavement.

Two polyethylene installations in standard 9-in. pavement were inspected; one on I 70 west of Columbus and one on I 270 south of Columbus. Both pavements were constructed in the fall of 1968 and were not as yet open to traffic.

The joints on both projects appeared very neat and no random longitudinal cracking was observed anywhere (Fig. 5). At a few locations, small spalls had occurred along the strip but none appeared to have any detrimental effect on the joints performance (Fig. 6). One short length of joint was found where the concrete apparently had not been completely consolidated around the plastic strip (Fig. 7). According to Mr. Dixon, the polyethylene strip has performed satisfactorily. On only one project in the southern part of the state have they experienced problems with longitudinal cracking. They are investigating to determine the cause, but as yet have not been able to find the reason why cracking occurred on this particular project.

In neither state were we able to observe the installation of the polyethylene strip. However, we were assured by both Illinois and Ohio personnel that installation is quite simple and presents no problem. Their experience indicates that the best result is obtained when the strip is installed so that its top is just slightly below, to 1/8 in. below, the surface of the slab. In their opinion, a conscientious contractor can install the strip consistenly to that depth.

Machines for installing the strip are available from several manufacturers. There is a small amount of handwork necessary to start installation at the night joint and when splicing the plastic strip. Otherwise the machine dispenses the strip automatically in the plastic concrete.

In both states the use of the polyethylene strip method for making the centerline joint has resulted in savings when compared to the cost of sawing and sealing the joint. In cases where its use has been authorized on projects

originally set up for sawing, a saving of 5 cents per lineal foot was realized in Illinois, and Ohio obtained a rebate of 1.8 cents per square yard of pavement (4.8 cents per lineal foot). In addition to being less expensive than sawing, the plastic strip creates a plane of weakness before the concrete hardens. Therefore, the possibility that longitudinal cracking will occur before a joint is constructed is prevented.

On the basis of our inspections and discussions with personnel from Illinois and Ohio, we recommend that the polyethylene strip method for forming the longitudinal centerline joint be tried on a project here in Michigan. Because of the excellent results obtained in Ohio, we recommend that the dimension of the plastic strip used there (12 mil thick, 2-1/2 in. wide for 9-in. slab) be specified if a trial installation is approved.

TESTING AND RESEARCH DIVISION

Jens Sivonen

Experimental Field Studies
Research Laboratory Section

JES:sjt

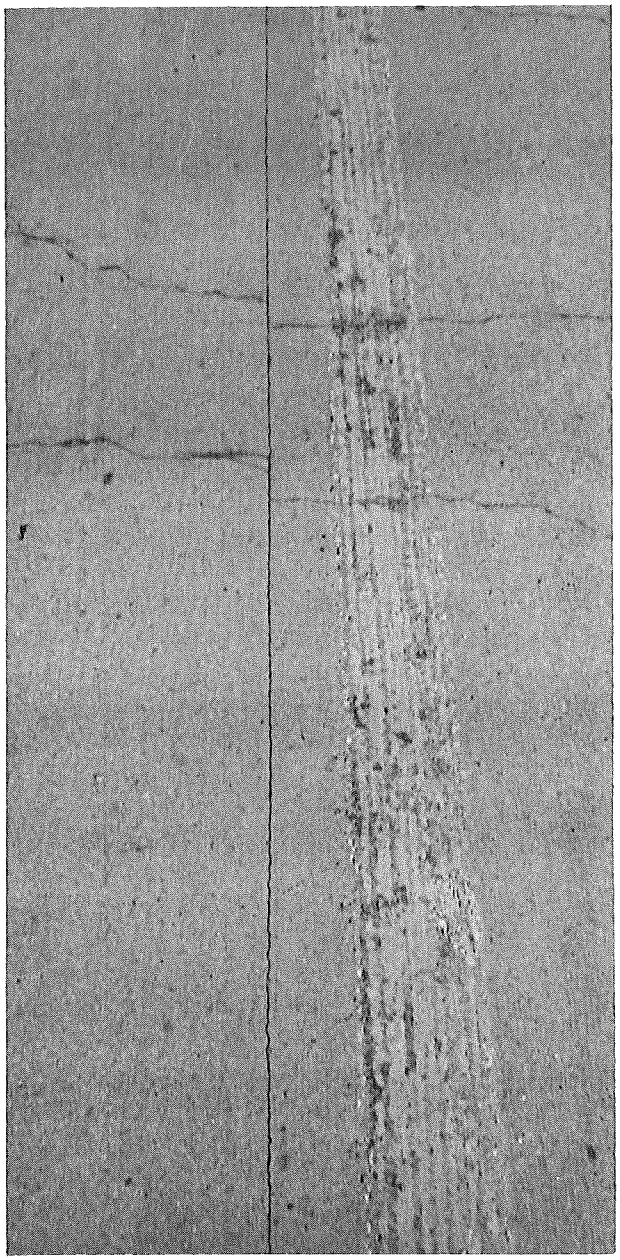

Figure 1. Neat appearing joint in continuously reinforced concrete pavement on I 80, Illinois.

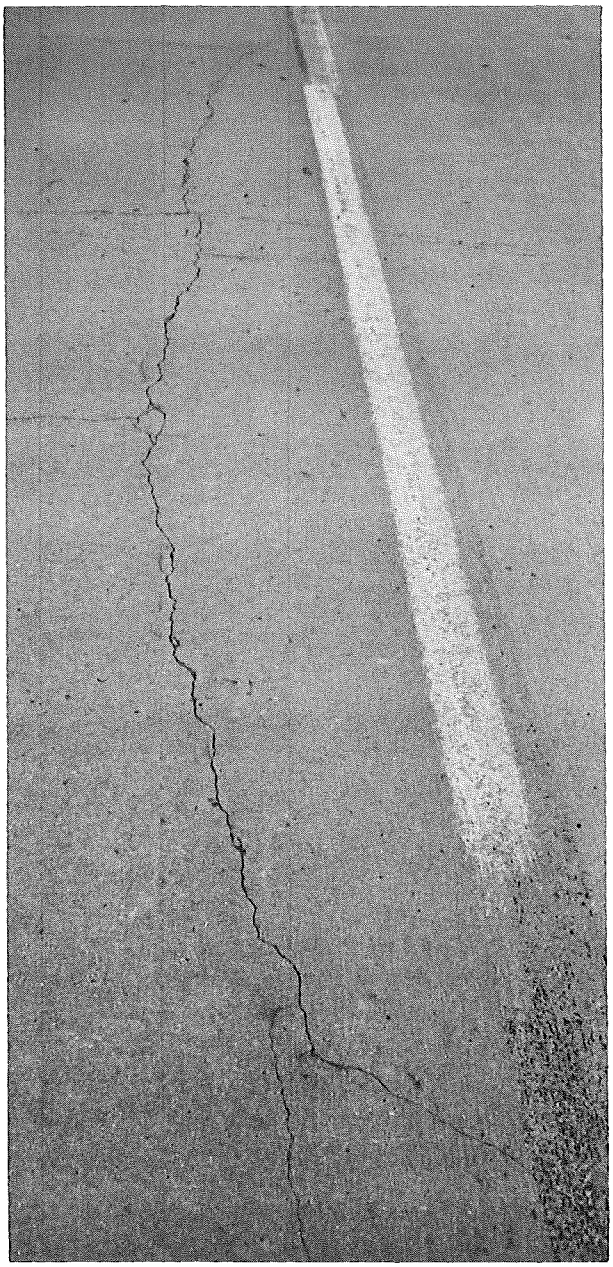

Figure 2. Random longitudinal cracking in continuously reinforced concrete pavement on I 80, Illinois.

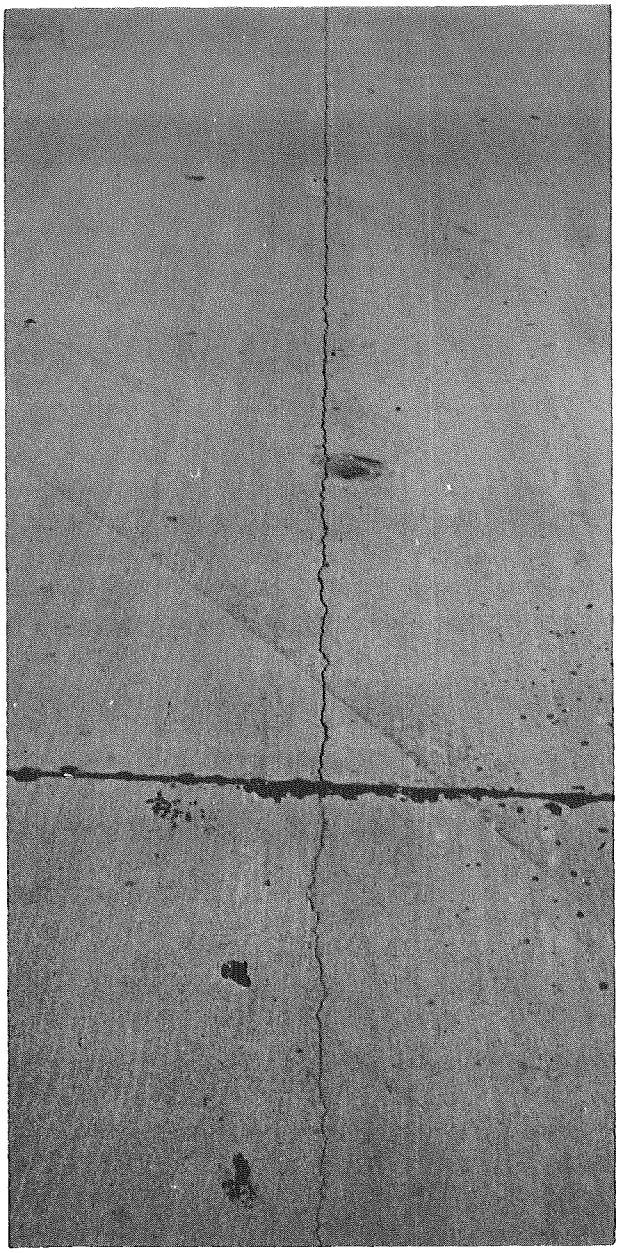

Figure 3. Condition of joint in standard pavement on Ill. 131. Note zig-zag appearance.

Figure 4. Random longitudinal crack (upper left corner) in standard pavement on Ill. 131. Note that the plastic strip failed to cause crack to form (upper center of photograph).

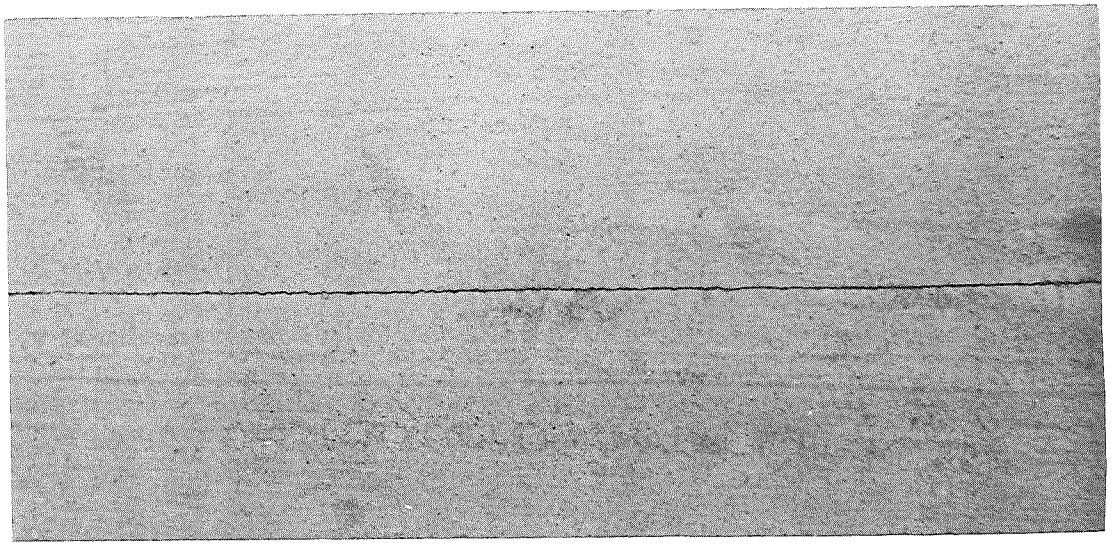

Figure 5. Neat appearing joint in standard pavement on I 70, Ohio.

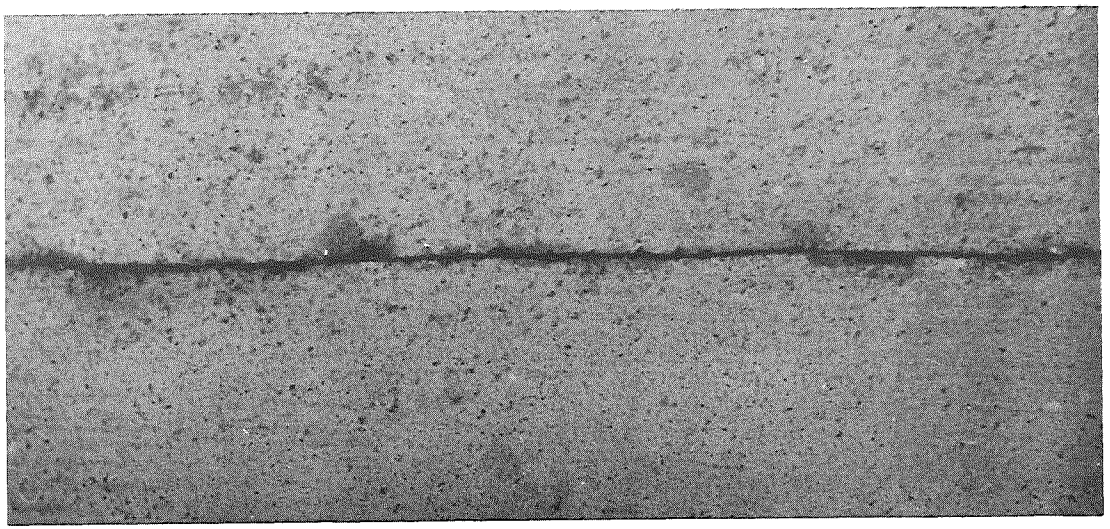

Figure 6. One of the few areas where small spalls had occurred along strip on I 70, Ohio.

Figure 7. Condition along strip in area where concrete had not been consolidated around strip; I 70, Ohio.