

OFFICE MEMORANDUM



MICHIGAN

DEPARTMENT OF STATE HIGHWAYS

July 11, 1973

To: J. F. Oravec
Engineer of Maintenance

From: L. T. Oehler

Subject: Joint Failures on I 75 North of Flint.
Research Project 68 F-102. Research Report No. R-869.

On June 12 we were notified by Martin O'Toole, of the Maintenance Division, that two precast slabs on the subject pavement were reported to have lifted up at one of the joints between the new and old slab. At his request an inspection of the repairs was made and this memorandum reports our findings.

The two repairs are located on the portion of I 75 where the Department is currently in the process of adding a third lane on the median side. One repair was found at Sta. 1436+20 about two miles south of M 57 on the northbound roadway and the other about one mile south of M 57 at Sta. 1369+90. Both repairs were made earlier this year and both were in the inside lane adjacent to the median. Figure 1 shows a typical precast slab repair after the existing shoulder and base materials have been removed. At the two inspected repairs new base material had been placed along the pavement edge.

The slab at Sta. 1436+20 (northbound) was found to be about 1-in. high along the south edge. A corner spall, measuring about 12 by 18 in. at the surface, had occurred in the precast slab as can be seen in Figure 2. The slab was about 2 in. wider than the existing pavement lane and the spall appeared to have resulted from the slab being hit by equipment used to remove the existing shoulder. It is believed that the severity of the collision was sufficient to cause a vertical misalignment of the slab. The problem may have been aggravated by the increase in compressive forces resulting from the hot weather in early June. During that period a blowup occurred in the passing lane 1,400 ft south of the precast slab repair. The traffic lane had been repaired with a precast slab earlier, but no relief was provided in the adjacent passing lane.

The condition of the repair of Sta. 1369+90 (southbound) is shown in Figure 3. The slab had raised up about 1 in. along the south edge. The precast slab extended about 2 in. beyond the existing slab edge and had been hit during removal of the shoulder and base materials. The filler was completely compressed and a surface corner spall had occurred (Fig. 4). A surface spall along the offset between the traffic and passing lane slab extended a-

bout 3 ft out from the centerline (Fig. 5). This spall appeared to be about 1-1/2 to 2 in. deep. The precast slab had also spalled along the joint in this area. As in the case of the slab on the northbound roadway the vertical misalignment could have occurred initially during removal of the shoulder. The spalling has been caused by expansion of the pavement which possibly could have increased the amount of vertical alignment offset. The reason for the compression failure is that only the passing lane was available to resist the pavement expansion because a repair had been made at the adjacent joint in the traffic lane without providing relief in the passing lane. Thus, twice as much expansion can be accommodated in the traffic lane as compared to the passing lane.

Experience with the present special repairs, which provide expansion space on both sides of a repair, has shown that when one lane of a two-lane pavement is repaired the other lane must be relieved within 300 ft of the repair. Otherwise a failure in the unrepaired lane will occur. Also, where two or more repairs in one lane are adjacent, or less than 300 ft apart, the other lane must be relieved at one or more locations so that each lane has equal expansion space available. We are presently working on drawing, and specification changes to cover the amount of expansion space for use under various field conditions to minimize failures caused by providing different amounts of expansion space in pavement lanes.

TESTING AND RESEARCH DIVISION

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Engineer of Research

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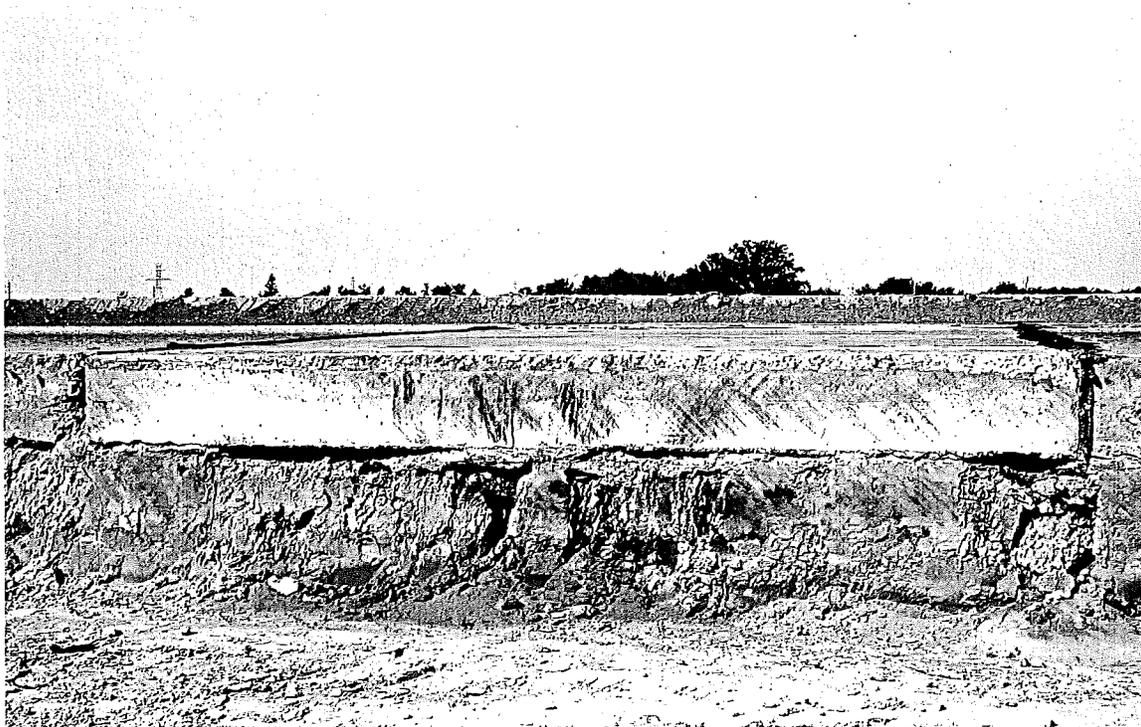


Figure 1. Typical precast slab repair in an area where shoulder and base materials have been removed.

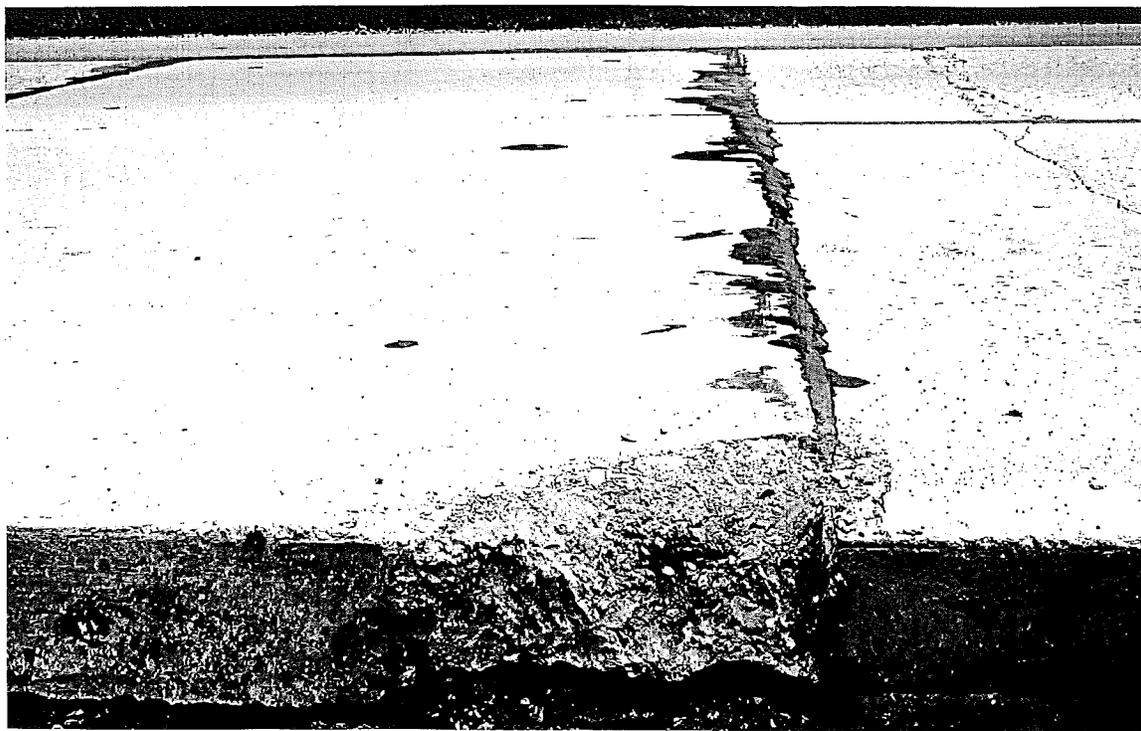


Figure 2. General view of precast slab repair at Sta. 1436+20 (northbound) showing high side and damaged corner.

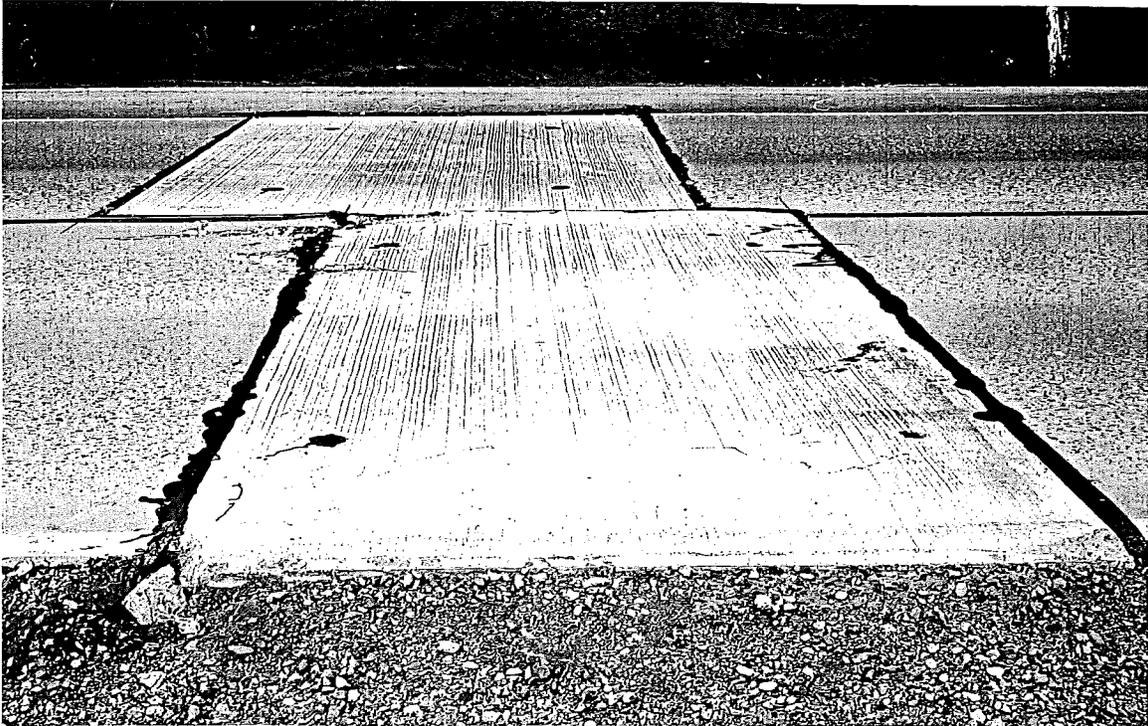


Figure 3. Condition of repair at Sta. 1369+90 (southbound). High side of slab and spalling are on the left side of repair.



Figure 4. Corner of slab showing spall and compressed compound filler.



Figure 5. Condition of repair along the centerline showing spalled area.