OFFICE MEMORANDUM

MICHIGAN
STATE HIGHWAY DEPARTMENT
JOHN C. MACKIE, COMMISSIONER

December 20, 1962

To: L. T. Oehler, Supervisor
Physical Research Section

From: C. J. Arnold

Subject: Trenching for Expansion Joints. Research Project R-39 F-7(14). Report No. R-407.

At the request of R. F. Durfee, installation of expansion joints has been checked on I 96 south of Lansing, particularly with reference to the trenching required. MSHD specifications require that the filler material be cut to the crown and shape of the slab cross-section and that the top of the filler be not less than 1/2-in. nor more than 3/4-in. below the finished surface. The specification also requires that the filler be furnished in lengths not less than the lane width, except that lengths greater than 12 ft will not be required. The filler pieces now used are rectangular, 12-ft long, and 8-1/2 in. high. With the 9-in. pavement, the 8-1/2 in. filler reaches the lower limit of the specified groove depth, with no chance for adjustment.

The current practice of offsetting the crown to the center of the passing lane for Interstate highways has caused problems, in that the filler and basket in the passing lane rock on the high point of the crown in the subbase, and the filler is too close to the surface either at the center of the roadway or at the outside edge of the passing lane. The remedy has been to dig out about an inch of the subbase under the entire basket assembly (Fig. 1), which lowers the high point of the filler sufficiently, but leaves too deep a groove elsewhere. Trenching also lowers the position of the dowel bars about 1 in. below their proper location.

Another problem is that the metal channel cap, which is straight, cannot possibly conform to a curved or segmented filler. The channel rocks on high spots and is offset so as to form faults where channels end, as shown in Figs. 2 and 3. These metal protrusions increase the overall height of the assembly, and permit possible interference with the spreader and finishers.

Quoting the standard specification: "The channel cap shall be shaped to the proposed crown of the pavement and shall extend over the full length of the filler."

Possible solutions might include the following steps:

1. When the offset crown is used, the filler for the passing lane, if not shaped to the crown, could be shaped as shown in Fig. 4 better to approximate the crown. There would be no need to change the filler for the traffic lane.

2. All fillers might be made 8-1/8 in. high and the specification changed to require a groove depth of not less than 3/4-in. nor more than 1 in. This would allow a better shaped groove for joint sealer.

3. The metal channel, if not shaped to the crown, could be furnished in four 6-ft sections instead of three 8-ft sections. This would allow better approximation to the crown by the straight metal pieces, and would provide a metal junction coinciding with the junction in the filler at the center of the roadway, eliminating the most prevalent fulcrum (Fig. 5).

It was also observed that the filler material, and presumably the basket, in some instances have been tipped during construction operations. Figs. 6 through 8 show three finished joints, where the tilt in every case is in the direction of pour, perhaps indicating that the spreader dragged too much concrete along as it advanced over the basket assembly.

Quoting the standard specifications again: "During installation, the joint shall be held in place by an approved installing device which shall be securely staked."

It is imperative, especially in the case of an expansion joint where the joint width is at least 1 in., that the dowel bars be maintained in the plane of the pavement. Suitable hold-down devices should be employed to ensure that the proper alignment is maintained.

OFFICE OF TESTING AND RESEARCH

C. J. Arnold, Civil Engineer
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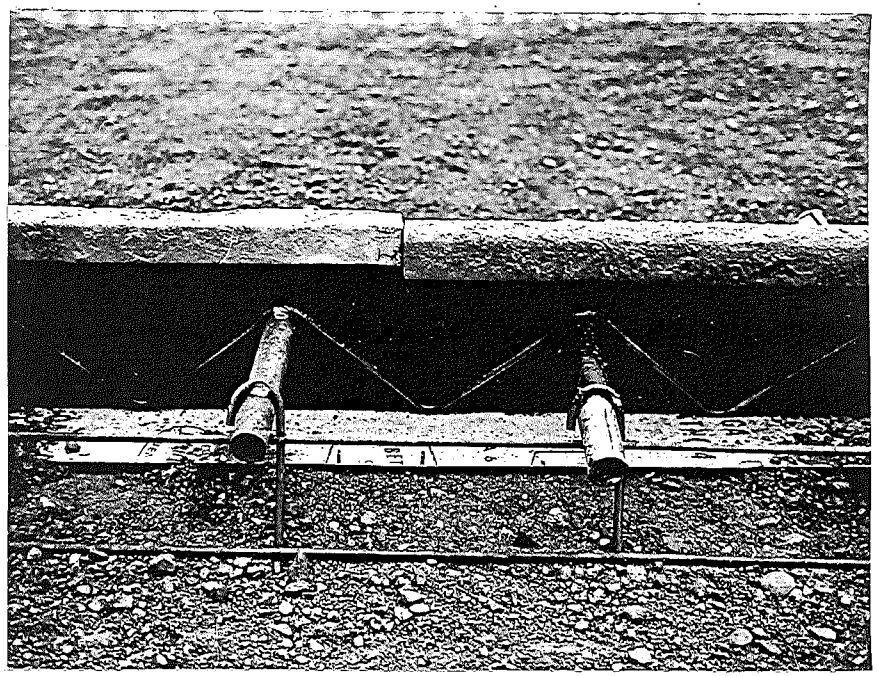
CJA:js



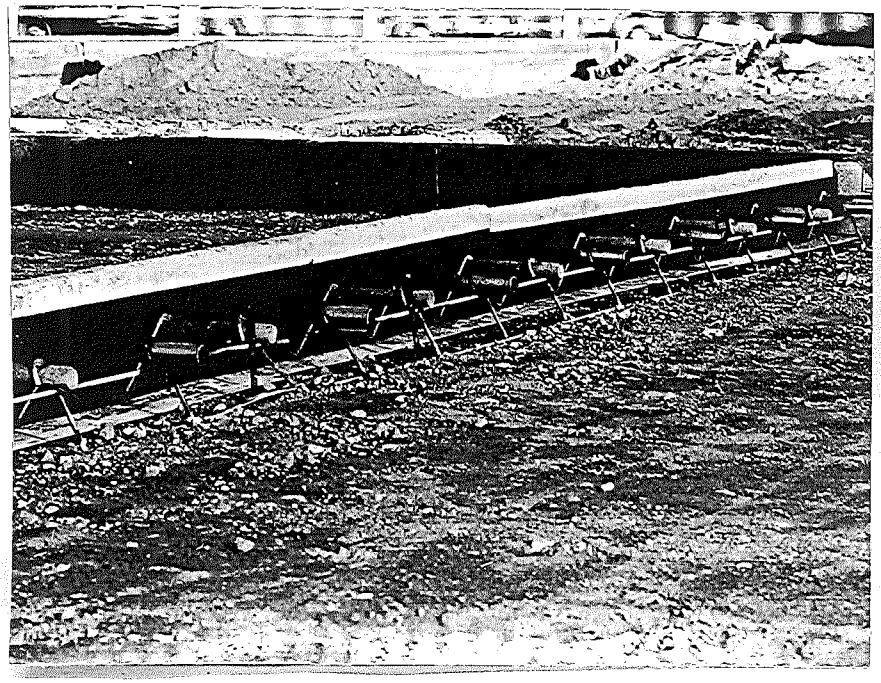


Figure 1 (upper left). Trenching prior to installation of expansion joint.

Figure 2 (above). Channels rock on high points of filler, causing fault.

Figure 3 (left). Another fault at junction of channels.

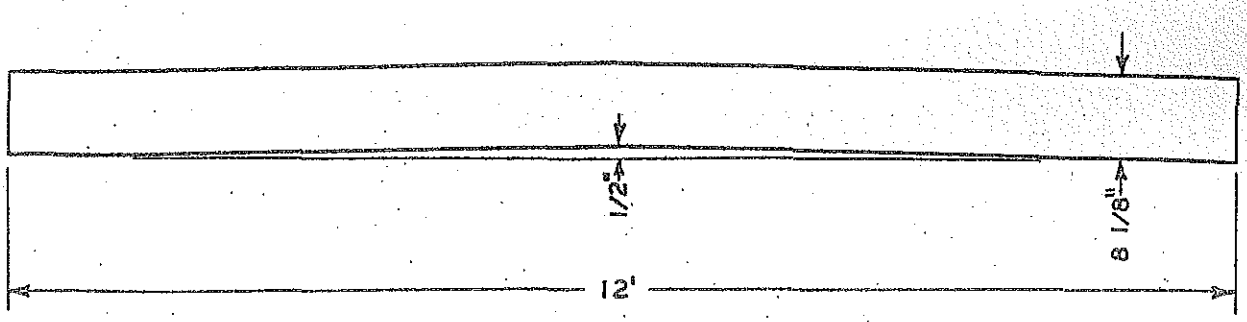


Figure 4. Possible cross-sectional silhouette of joint filler in passing lane, shaped so as better to approximate an offset crown.

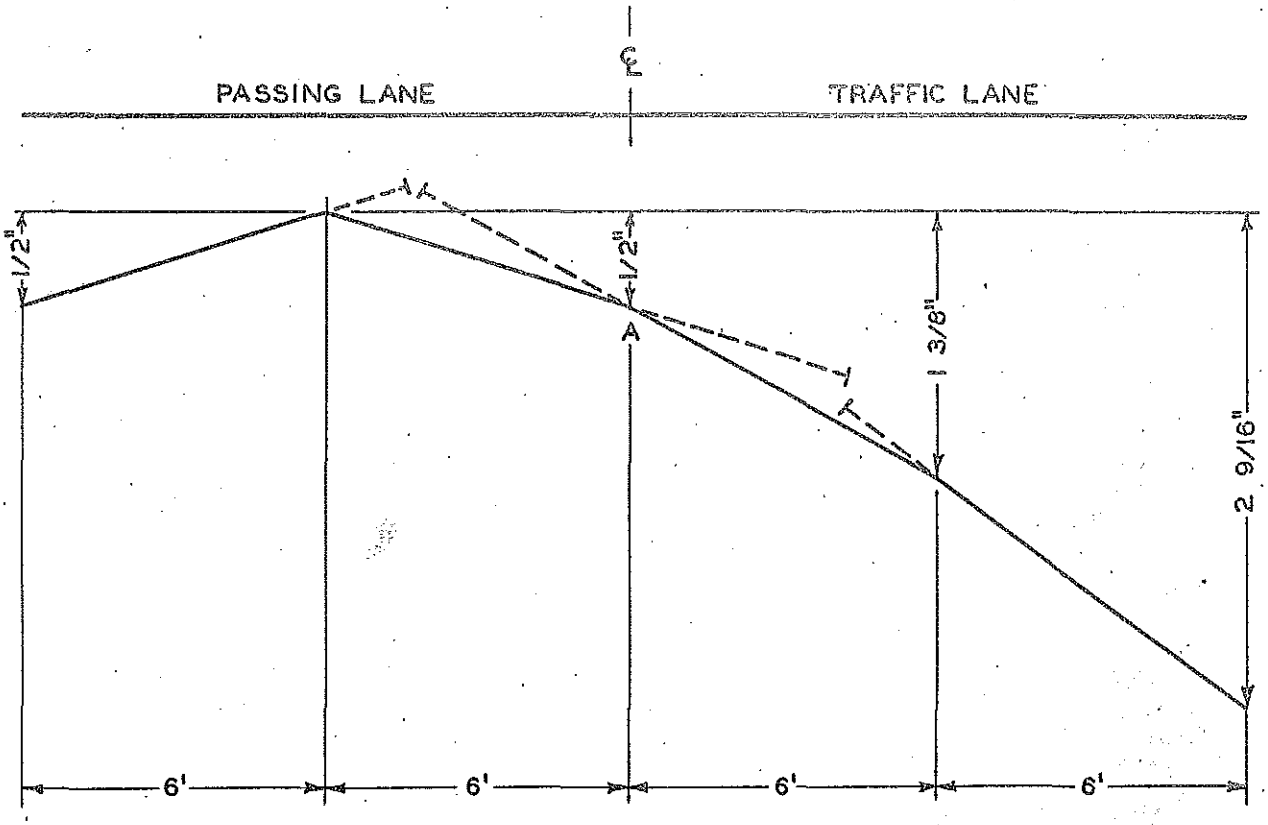
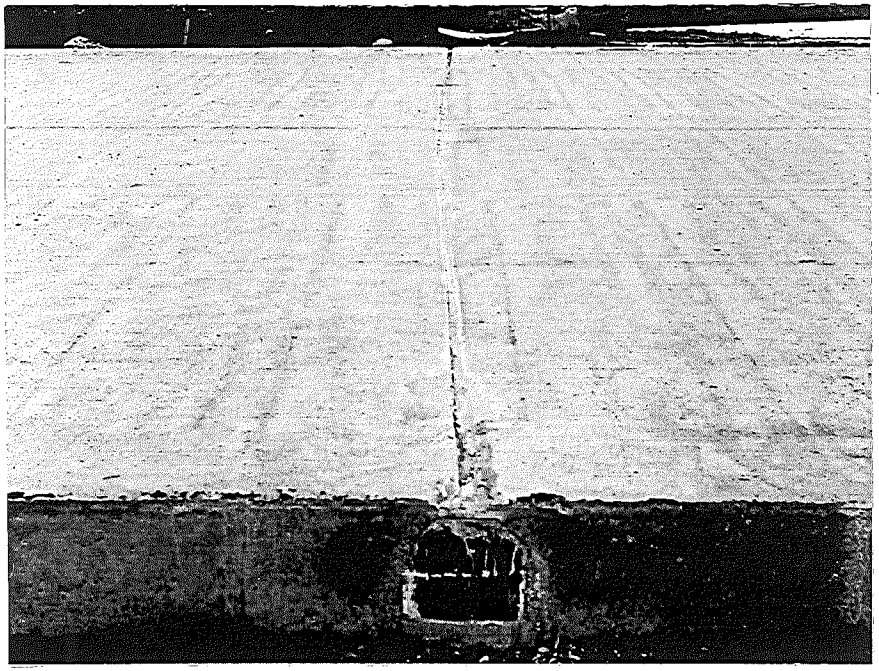
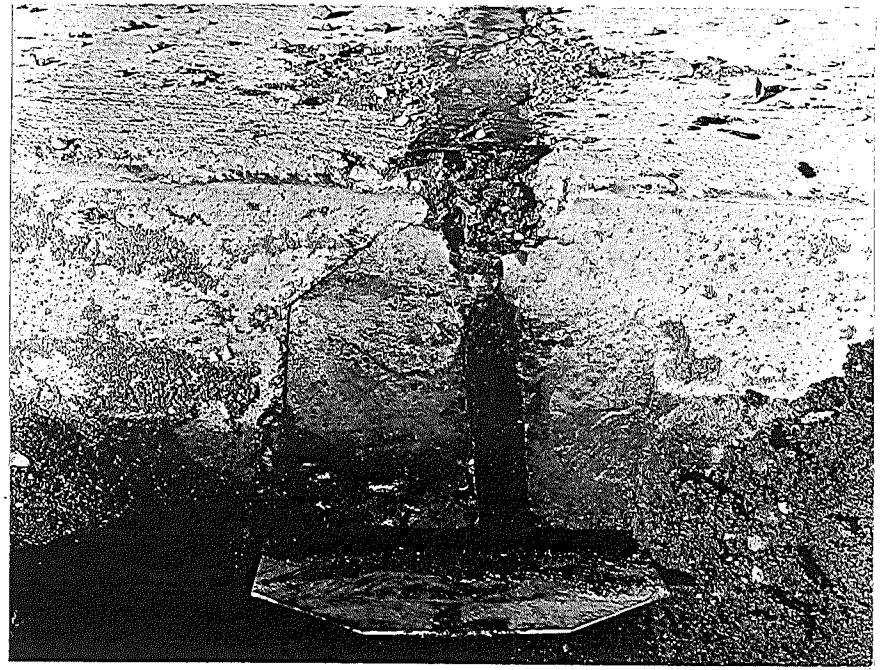


Figure 5. Effect of change in channel cap length on approximation of crown cross-section. Solid lines show crown as approximated by four 6-ft straight line segments, which would follow the true curve closely. The dotted projections show possible positions of the metal channel cap when placed in 8-ft sections. Vertical scale exaggerated.





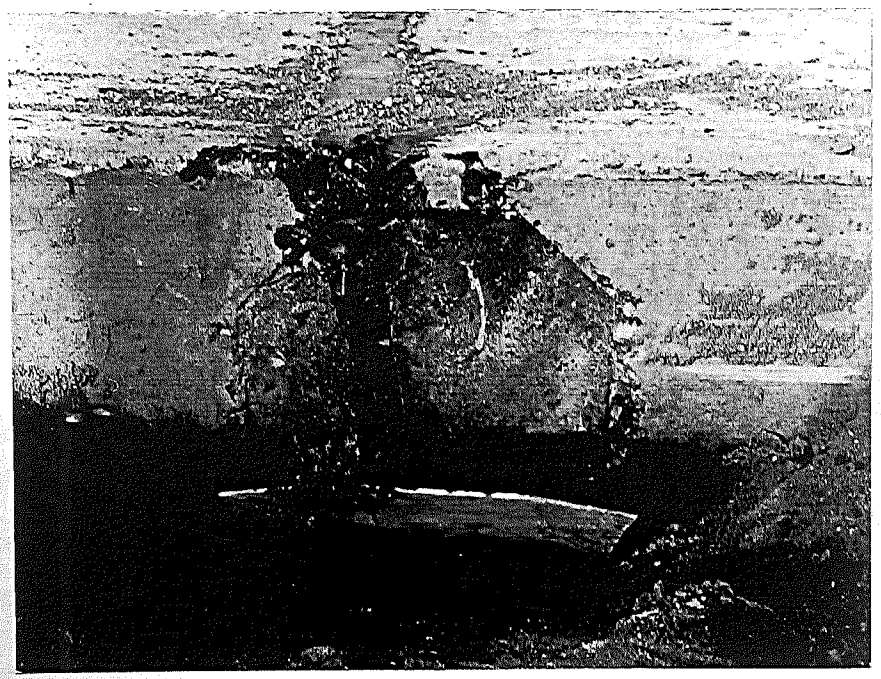


Figure 6 (upper left). Expansion joint curved in direction of pour.

Figure 7 (above). Tipped expansion joint (Station 713+12 eastbound).

Figure 8 (left). Another tipped expansion joint (Station 397+36 eastbound).