

## OFFICE MEMORANDUM



MICHIGAN  
STATE HIGHWAY DEPARTMENT  
JOHN C. MACKIE, COMMISSIONER

September 8, 1960

To: W. W. McLaughlin  
Testing and Research Engineer

From: E. A. Finney

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Subject: Performance of Metallic and Non-Metallic Base Plates for Joints.  
Research Project 53 G-70. Report No. 343.

Reported by O. L. Lindy and L. T. Oehler

At a meeting of the Committee for Investigation of New Materials on July 13, 1960, non-metallic base plates for concrete pavement joints were discussed in connection with Research Laboratory Report No. 334, "Study of Premolded Rubber and Polyvinyl Chloride Base Plates for Joints." The Committee requested further investigation of projects on which non-metallic base plates have been used.

Premolded non-metallic base plates on a US 16 (Interstate 96) project built in 1957, were inspected on August 8, 1960 (19022, C1RN and 34044, C1RN; M 100 to Portland). For performance comparison, steel base plates were also inspected, on a nearby US 16 project built in 1958 (34044, C3; Portland Road to the Grand River Bridge). The photographs included in this report are views of some joints where deterioration was visible on the pavement surface.

The inspection and comparison indicated that the non-metallic base plates were doing a better job of preventing infiltration of foreign material between the concrete and the end plate (Metal: Figs. 1 and 2; non-metallic: Figs. 3 through 11).

It appears that greater care during construction in placing both types of base plates would improve pavement joint performance. The following observations were made when the plates were exposed at various locations:

1. Metal base plates were generally better aligned with the top joint groove than were the non-metallic base plates, because the metal plates are aligned with the dowel assemblies by means of aligning wires or straps, before concrete is poured. Alignment of the non-metallic base plate is more subject to human error.
2. At some joints, the non-metallic base plates were not long enough or were not properly placed to provide sufficient material for end plates, and as a result these ends were brought up against the paving forms in curves rather than right angles. Thus, when concrete was poured, slab thickness at the joint corner was diminished by the curves, with an equivalent weakening of the slabs at these points (Fig. 8).

3. Certain base plates of both materials were tilted out of vertical alignment with the joint groove, either by improper placement on the subgrade, or disturbance during paving operations (Fig. 11e).

4. End plates of some metal base plates were pulled away from the concrete at joints, possibly when construction equipment scraped the pavement edge (Figs. 1 and 2). The non-metallic base plate adhered better to the concrete and appeared less susceptible to this type of damage.

The inspection of August 8 confirms the observation made in Report 334, that "... considerable care must be taken to position the turned-up ends properly and to avoid displacement of these ends by fresh concrete during pouring operations."

OFFICE OF TESTING AND RESEARCH

E. A. Finney, Director  
Research Laboratory Division

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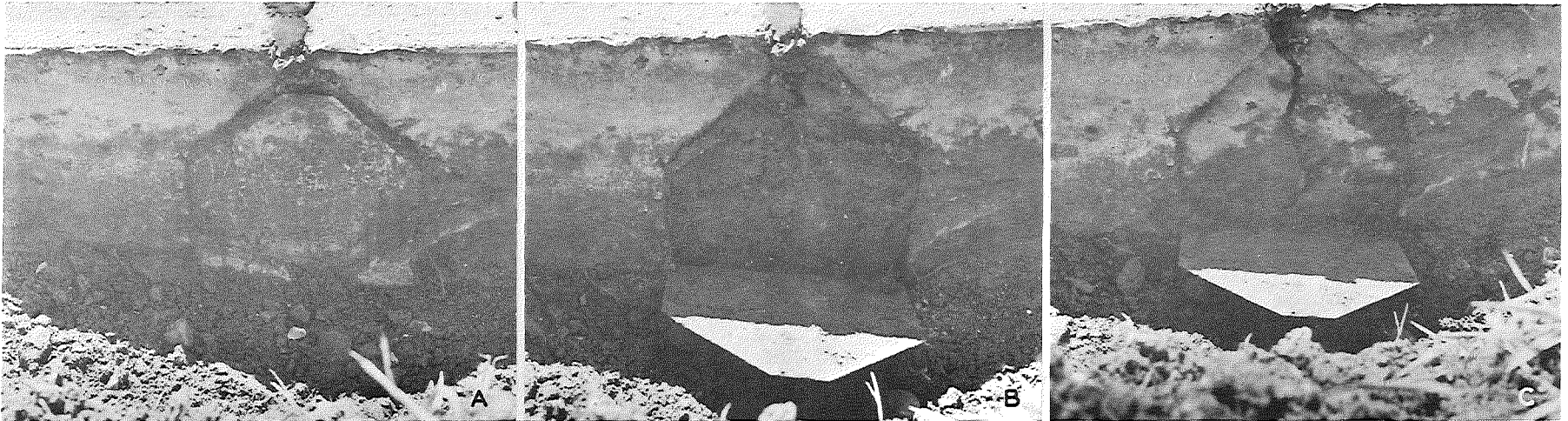
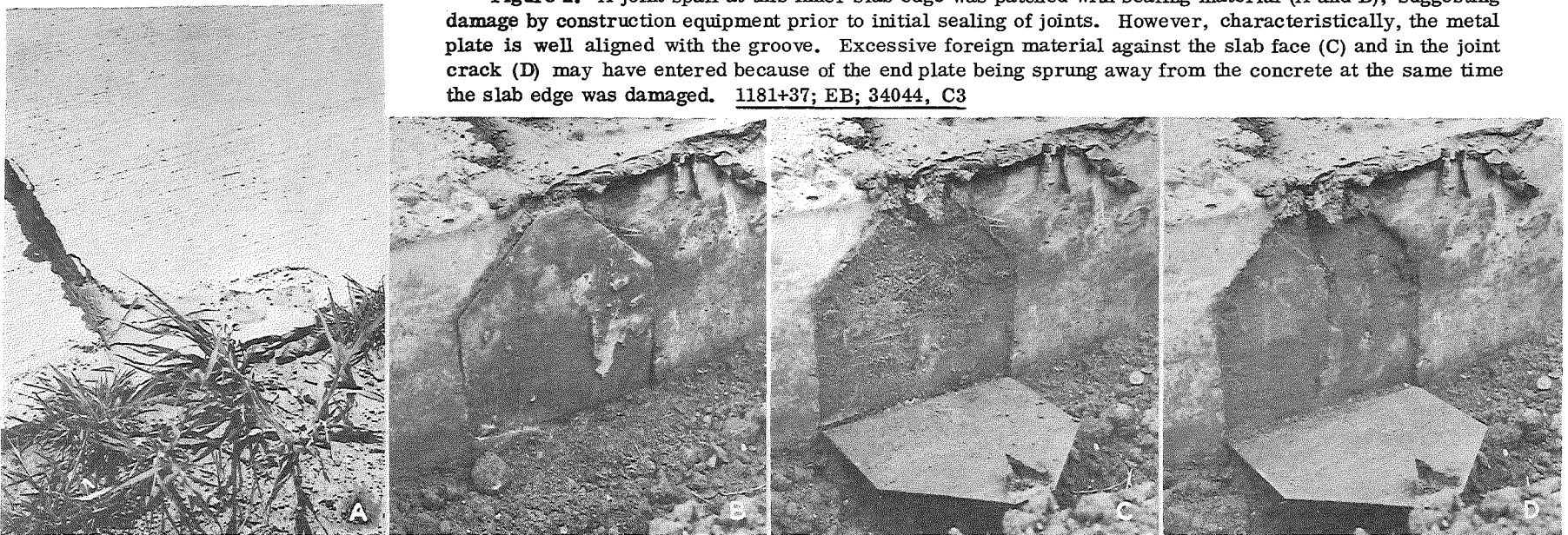


Figure 1. This metal base plate at the inner slab edge, although well aligned with the joint groove (A), contained foreign material against the slab face (B), and within the joint crack (C). 1172+62; EB; 34044, C3

Figure 2. A joint spall at this inner slab edge was patched with sealing material (A and B), suggesting damage by construction equipment prior to initial sealing of joints. However, characteristically, the metal plate is well aligned with the groove. Excessive foreign material against the slab face (C) and in the joint crack (D) may have entered because of the end plate being sprung away from the concrete at the same time the slab edge was damaged. 1181+37; EB; 34044, C3



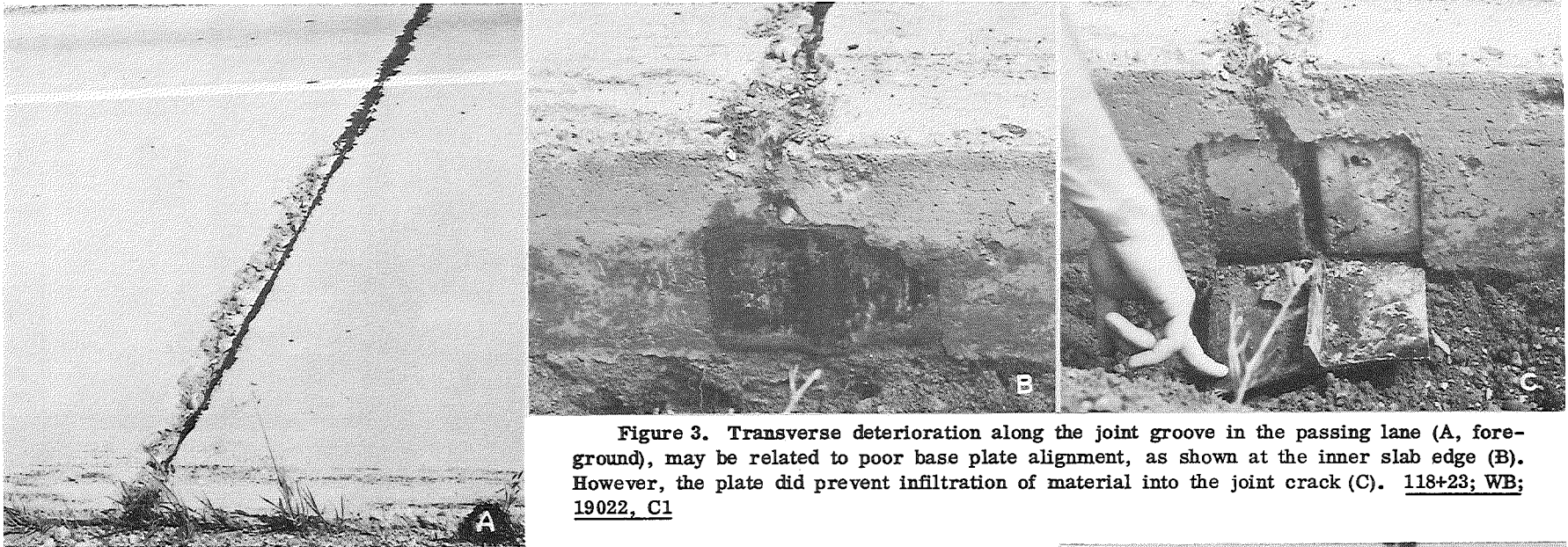
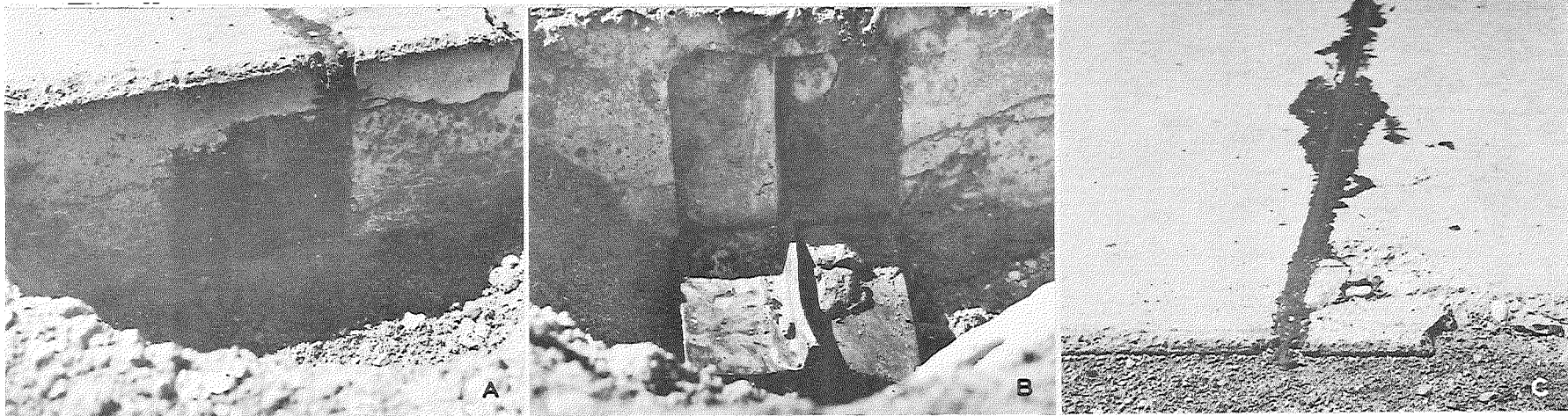


Figure 3. Transverse deterioration along the joint groove in the passing lane (A, foreground), may be related to poor base plate alignment, as shown at the inner slab edge (B). However, the plate did prevent infiltration of material into the joint crack (C). 118+23; WB; 19022, C1

Figure 4. The most extreme misalignment of a non-metallic base plate and a joint groove encountered in this field inspection was found at this outer slab edge (A). The slab edge spalling (C) and longitudinal edge cracking (A) appear to be related to this misalignment. The foreign material behind the base plate (B) seems to have entered from the longitudinal crack. 202+91; WB; 19022, C1





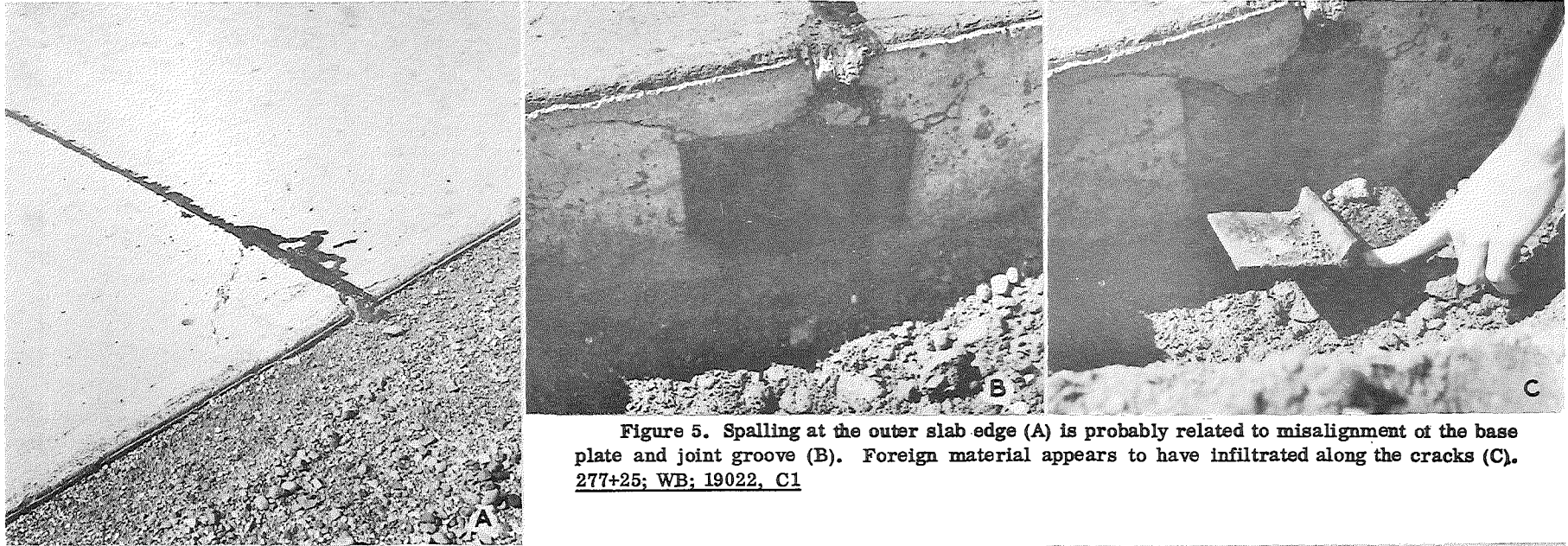
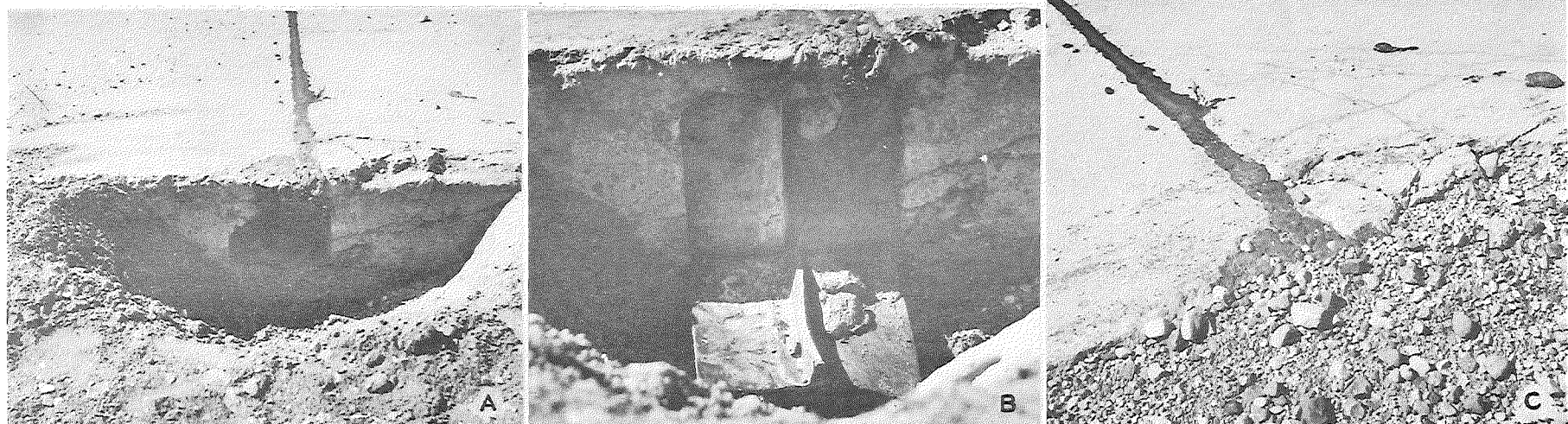


Figure 5. Spalling at the outer slab edge (A) is probably related to misalignment of the base plate and joint groove (B). Foreign material appears to have infiltrated along the cracks (C). 277+25; WB; 19022, C1

Figure 6. Severe spalling at this joint (C) may be associated with poor alignment of the base plate and joint groove (A). At this outer edge, a slight amount of foreign material has infiltrated (B), again along the slab cracks. 309+88; WB; 19022, C1



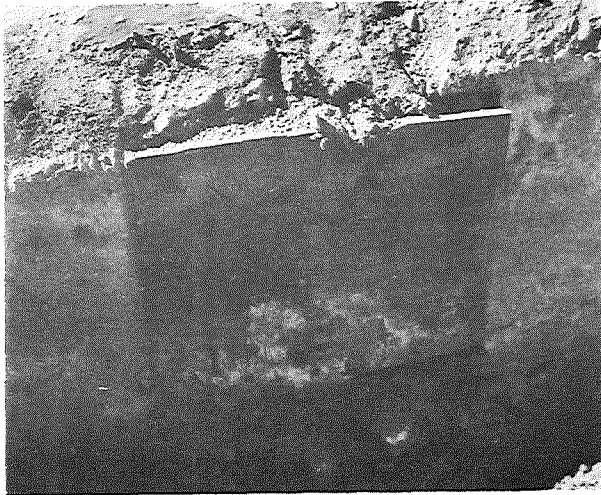


Figure 7. The condition of the outer slab edge at this joint (left) probably resulted from damage during pavement construction. The non-metallic base plate, which was pulled away from the concrete during construction operations, has allowed foreign material to infiltrate between the plate and the slab face (right). 312+76; WB; 19022, C1

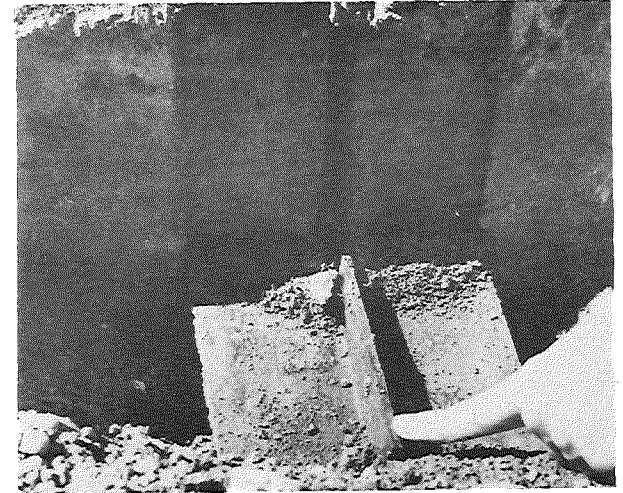
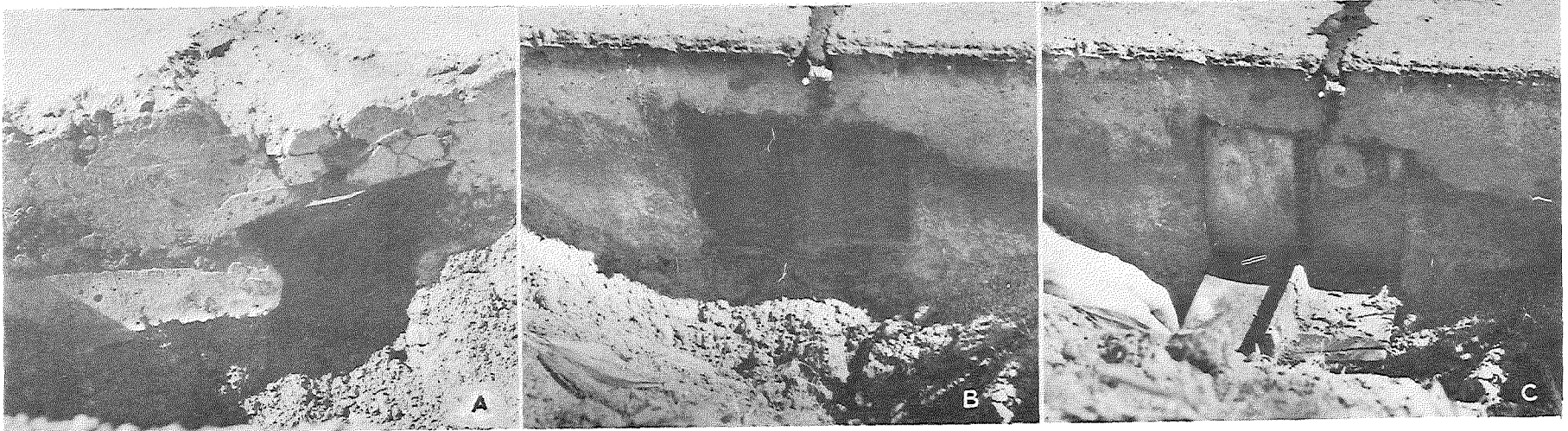


Figure 8. At both the outer and inner slab edges (A and B), the non-metallic plate at this joint was embedded in the pavement concrete and incorrectly aligned with the joint groove. Exposing the joint crack at the inner shoulder (C) disclosed foreign material between the plate and slab face. Spalling at the outer slab edge (A) is probably related to undercutting of the slab by curving the base plate rather than forming a right angle, thus reducing concrete thickness at this point. 323+15; WB; 19022, C1





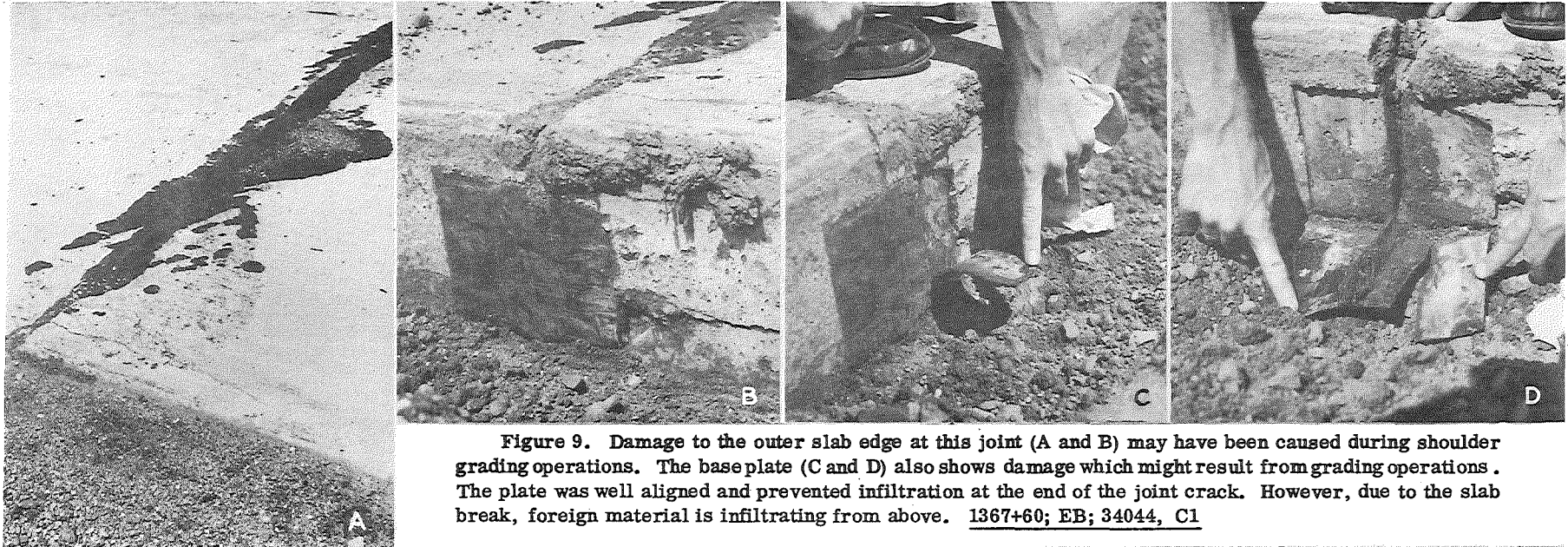


Figure 9. Damage to the outer slab edge at this joint (A and B) may have been caused during shoulder grading operations. The baseplate (C and D) also shows damage which might result from grading operations. The plate was well aligned and prevented infiltration at the end of the joint crack. However, due to the slab break, foreign material is infiltrating from above. 1367+60; EB; 34044, C1

Figure 10. Deterioration along this joint (C) may be related to dowel misalignment, which could also explain the base plate's tilt and misalignment (A). Spalling at this outer slab edge has allowed infiltration of foreign material into the joint (B). 1371+57; EB; 34044, C1



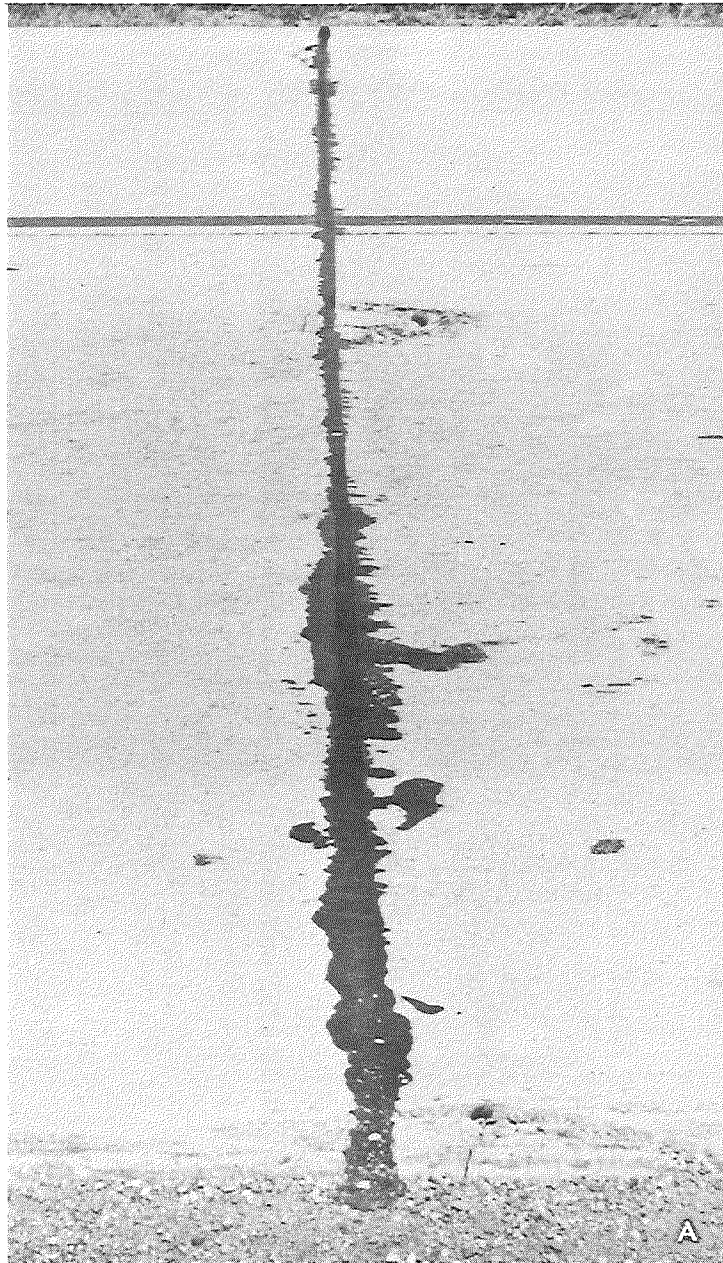


Figure 11. Spalls were observed near the inner edge, near the centerline, and at the outer edge of this joint (A, view from outer edge). Excavation at the outer edge showed fair alignment of the base plate and joint groove (B), with considerable infiltration of foreign material (C). However, excavation at the inner edge (D) showed base plate embedment in the slab concrete. The extreme tilt of the base plate (E) suggests that it may have been moved by paving equipment during pouring or placed on an unlevel base. In either case, the dowel bar assembly may also have been tilted, a possible explanation for the surface spalling. 1392+42; EB; 34044, C1

