# OFFICE MEMORANDUM

MICHIGAN
STATE HIGHWAY DEPARTMENT
JOHN C. MACKIE, COMMISSIONER

349



November 1, 1960

To: W. W. McLaughlin
Testing and Research Engineer

From: E. A. Finney

Subject: Performance of Non-Metallic Base Plates. Research Project 53 G-70. Report No. 349.

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

For consideration by the Committee for Investigation of New Materials, the Research Laboratory Division has prepared two reports comparing the performance of metallic and non-metallic base plates as used in concrete pavement construction. These reports were numbered 334 (June 1960) and 343 (September 1960).

Subsequently, Research Laboratory personnel visiting certain construction projects have noted various unusual and significant instances of trouble in the installation and performance of the non-metallic base plates. These instances are summarized here to supplement the two earlier reports.

The problems and poor performance associated with these base plates are well illustrated by photographs taken at construction sites. Figs. 1 and 2 show some of the difficulties arising in shipping and handling non-metallic base plates. The tight coiling of the base plate into rolls results in a permanent set in the rolled position, making it very difficult to correct the wrinkling of the bottom plate and ruffling of the plane of weakness strip. Poor positioning of the end plate is caused to some extent by this difficulty in getting the base plate to lie straight and flat.

The sequence of operations during installation is shown in Fig. 4. In Fig. 5, a typical metallic base plate installation illustrates the comparative simplicity of placing the metal base and end plates in proper position at a joint.

Some of the problems encountered on completed pavement where non-metallic plate is used are shown in Figs. 7 through 9:

1. A large-radius curve of the base plate at the pavement edge, rather than a right-angle corner, results in a thinner slab at this most critical point and a possibility of a corner break (Fig. 7A).

2. A badly tilted end plate results from lack of stiffness of the material and from its wrinkled condition when uncoiled (Fig. 7B). The tilt prevents proper alignment with respect to the top joint groove.

3. A joint groove not properly placed with respect to the base plate and load transfer assembly, is a serious deficiency which, it has been noted repeatedly, may cause a broken joint on the side containing little or no dowel length (see letter from E. A. Finney to W. W. McLaughlin, 12-29-57). This trouble is not associated with the type of base plate material, but is caused by lack of care is placing the styrofoam strip above the joint (Fig. 7C).

4. End plate material is often partially or completely torn off either during construction or subsequent grading operations (Fig. 8).

5. An end plate loose from the concrete permits side infiltration of foreign material into the joint crack (Fig. 9).

A good installation of a non-metallic base plate is shown in Fig. 10.

To determine the prevalence of the various construction irregularities as described above, a statistical approach was used by analyzing 25 consecutive joints on two construction projects (those shown in Figs. 7 through 9) where non-metallic base plates were used (Table 1). It should be noted that almost all the end plates examined had some deficiency.

Previous inspections of construction projects where metallic base plate was used would indicate that the number of deficiencies and their prevalence is not as great as shown here for non-metallic base plate.

OFFICE OF TESTING AND RESEARCH

E. A. Finney, Director
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TABLE 1
CONSTRUCTION IRREGULARITIES OF NON-METALLIC BASE PLATE
(25 Consecutive Joints for Each Project)

| Base Plate Condition | Construction Project | | | |
|---|---|---|---|---|
| | 38103, C7 & C8 Westbound Outside Edge | | 81104, C5 Eastbound Median Edge | |
| | Number | Percent | Number | Percent |
| Deficiencies | | | | |
| Curved rather than right-angle corner (Fig. 7A) | 6 | 24 | 7 | 28 |
| End plate tilted (Fig. 7B) | 5 | 20 | 8 | 32 |
| Joint groove not properly positioned (Fig. 7C) | 10 | 40 | 14 | 56 |
| End plate torn (Fig. 8) | 4 | 16 | 0 | 0 |
| End plate loose (Fig. 9) | 8 | 32 | 4 | 16 |
| TOTALS* | 33 | 132 | 33 | 132 |
| Proper Installation (Fig. 10) | 0 | 0 | 1 | 4 |

* Totals are more than 25 joints, or 100 percent, because some joints had more than one deficiency.

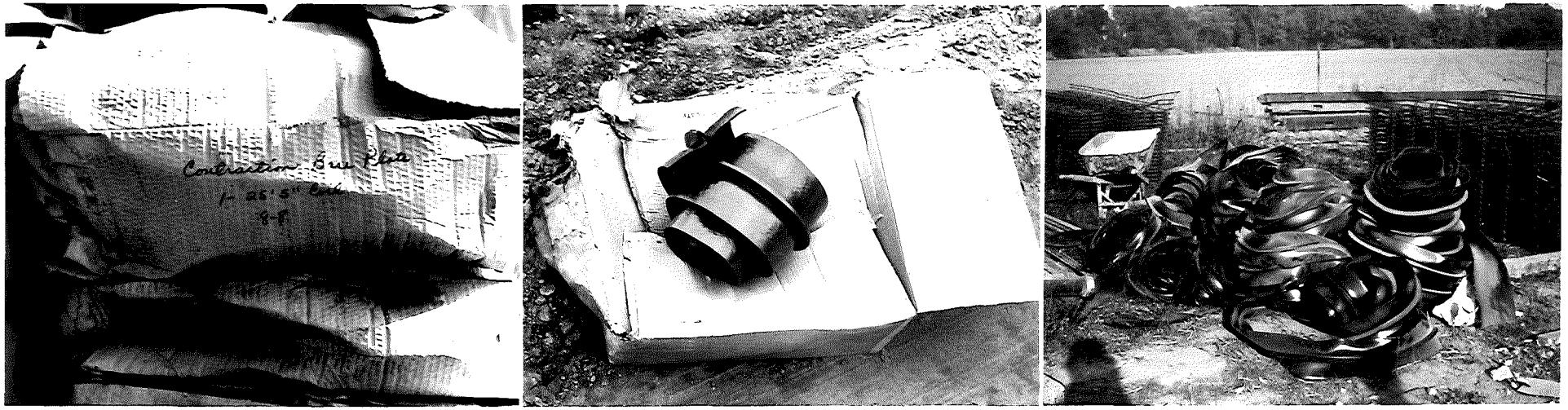
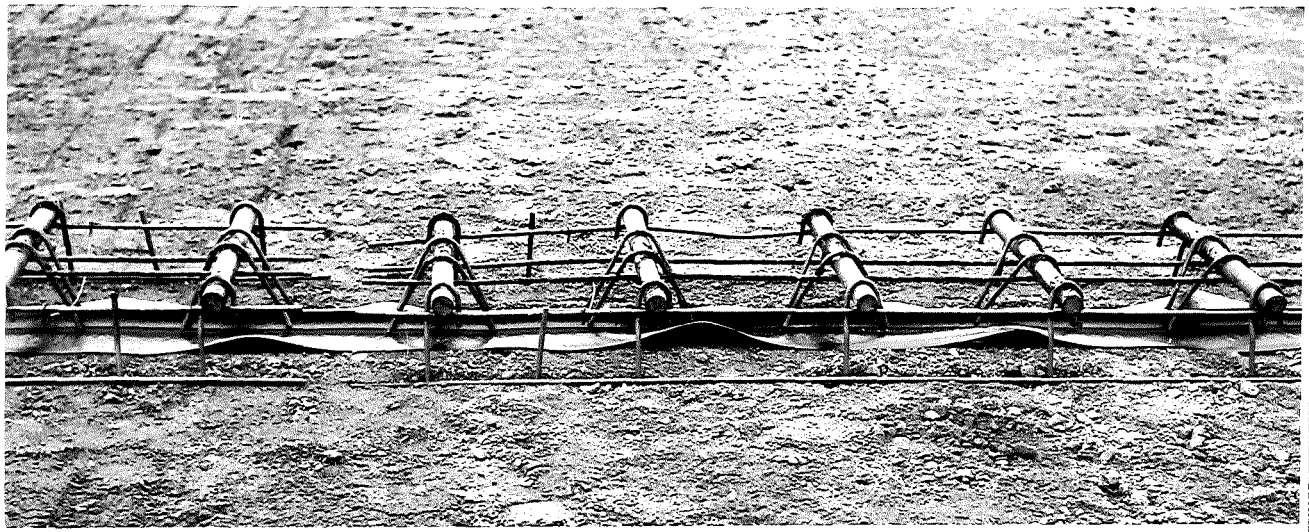


Figure 1. Base plates are received from the manufacturer in light-weight boxes (left), tightly coiled (center). The plates were found stored in the contractor's construction yard (right).

Figure 2. A typical wrinkled base plate, immediately before installation (left). The same plate is shown at center with the end plate turned up, and at right after installation as concrete is being poured.



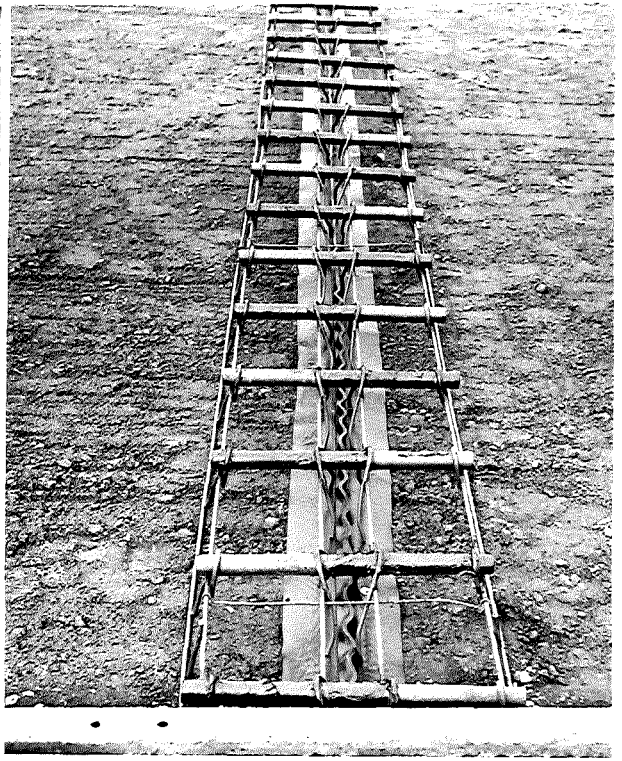
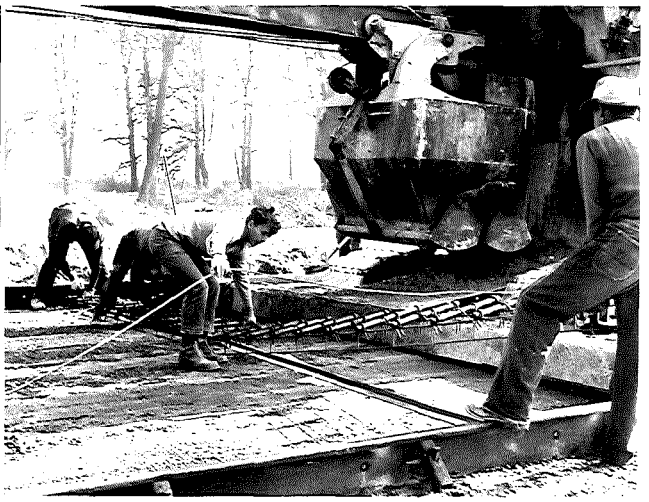


Figure 3. Typical warped plates in place in a joint assembly, showing poor contact with base (left). Overhead view (right) shows wrinkled plane-of-weakness strip, due to permanent stretching resulting from tight rolling of the plate during shipping.

Figure 4. At a typical joint the base plate is placed on the subbase (left), and the two joint dowel assemblies are positioned over the plane-of-weakness strip (center and right).



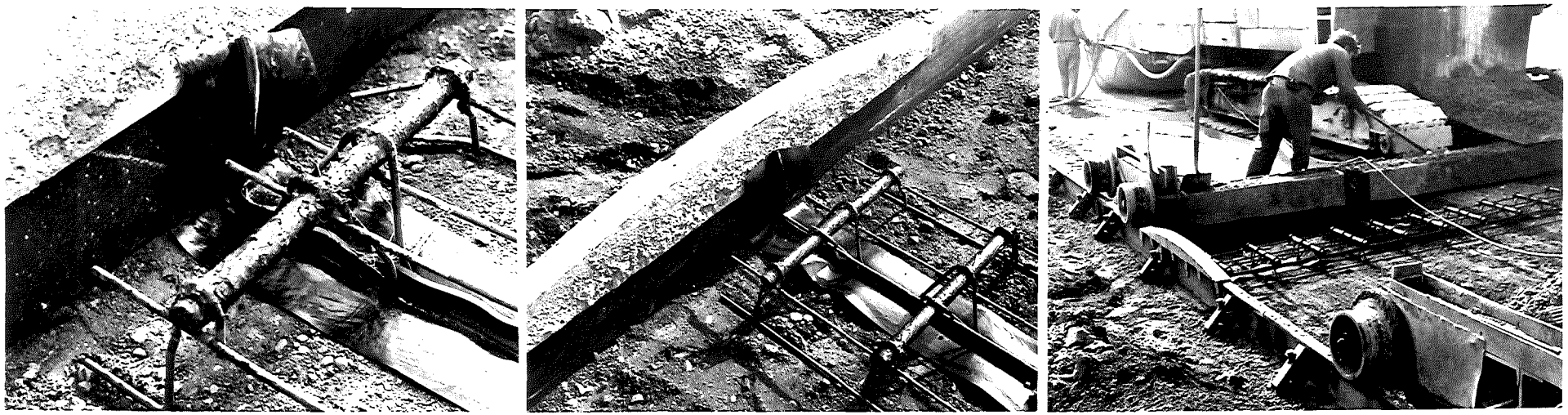


Figure 5. Views of the two ends of one wrinkled plate show poor contact with the base and paving forms (left and center). The same plate is shown at right as paving machine approaches.

Figure 6. This metal base plate characteristically rests in good contact with the base (left). Its end plate forms a right angle and stands flat against the paving form.

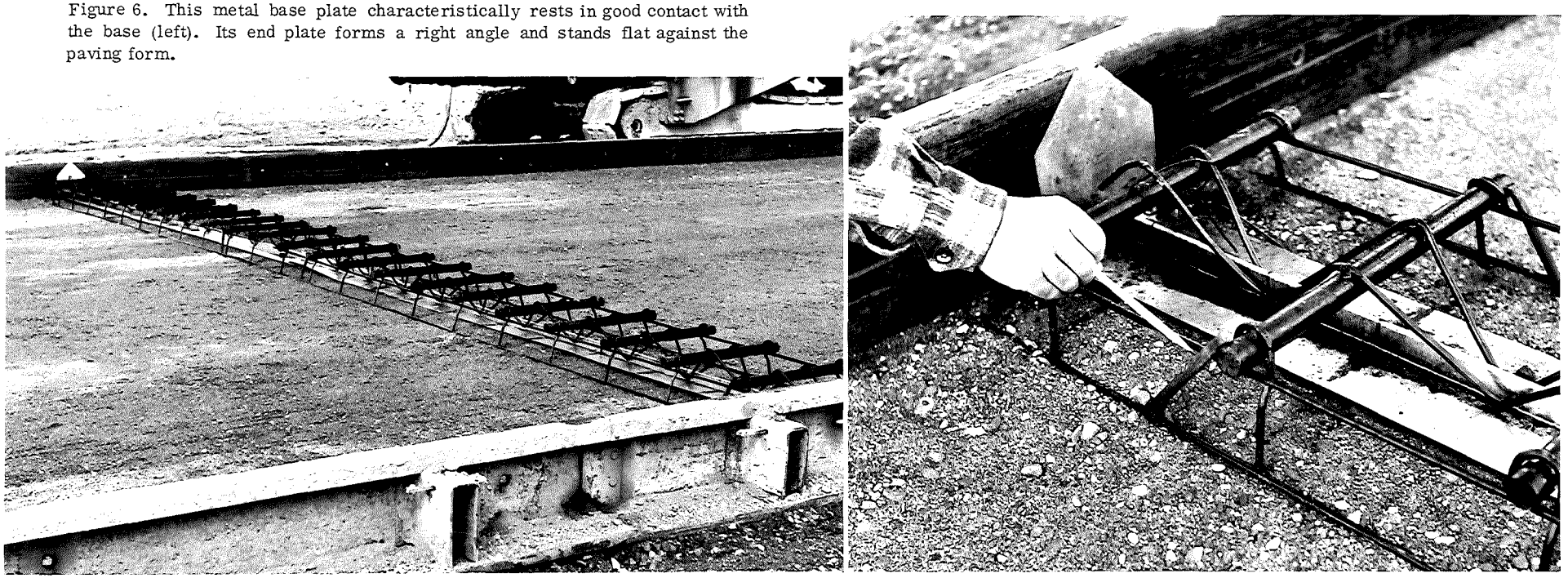
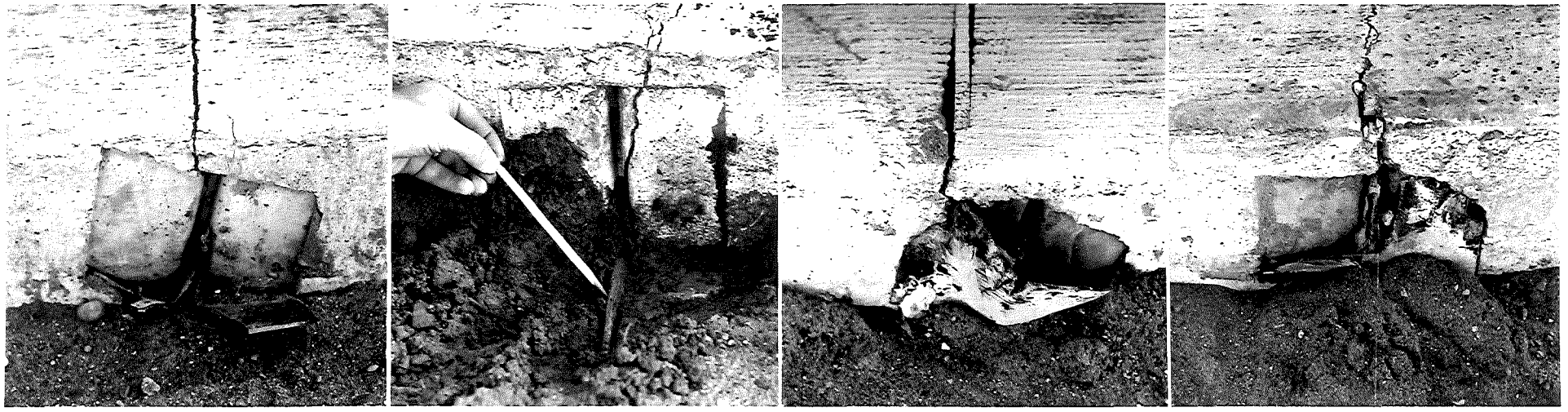


Figure 7. The three most common types of incorrect placement for non-metallic base plates are formation of a curve rather than a right angle at the pavement edge (left); tilting of the plate during pouring operations (center); and misalignment of the top surface joint groove (right).

Figure 8. End plates are often torn or otherwise damaged, either during construction or subsequent grading operations.



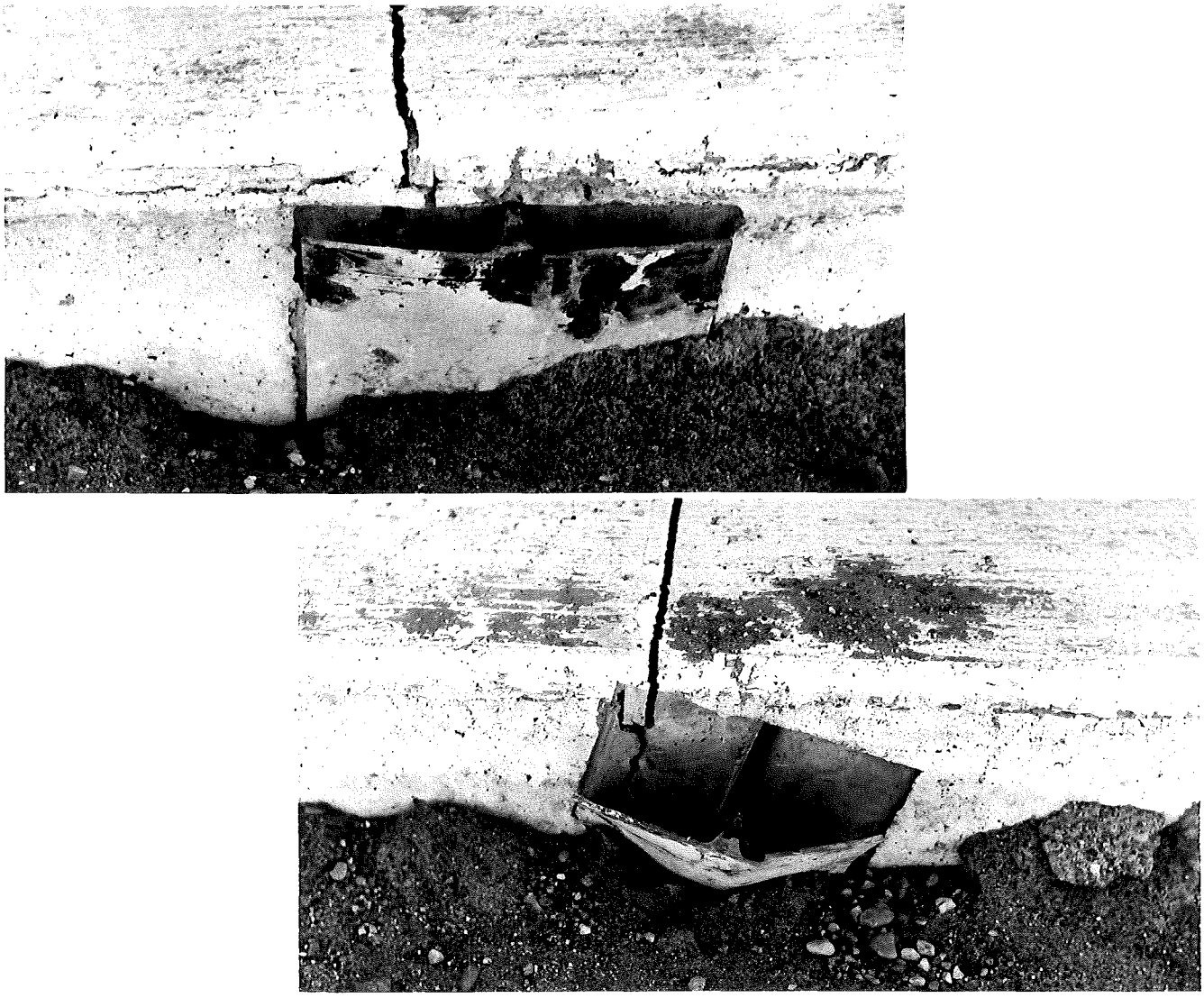


Figure 9. When non-metallic end plates fail to adhere to the slab edge, foreign material freely infiltrates into the joint crack.

Figure 10. The non-metallic plate forms a correct right-angle end plate, is adhering well to the slab edge, and is properly centered with the top surface joint groove, which has not yet been opened.