OFFICE MEMORANDUM

MICHIGAN
STATE HIGHWAY DEPARTMENT

July 1, 1965

To: W. W. McLaughlin
Testing & Research Engineer

From: E. A. Finney

Subject: Inspection of Neoprene Preformed Sealant Failures in Battle Creek Projects (I 13033D, C8 and U 13121E, C2, C3). Research Projects 62 G-116(1) and (2). Research Report No. R-530.

Neoprene joint sealant failures were inspected on June 15, 1965, by E. A. Finney and F. J. Bashore of the Research Laboratory Division, and Karl Dunn, District Testing and Research Materials Supervisor.

Construction Project I 13033D, C8 (Sealed November 1964)

Several contraction joint seals had two to five breaks along their 24-ft length, indicating that they had been stretched during installation. Otherwise, contraction joints appeared to be in good condition. At each break, the open space ranged from 1 to 2 in. long (Fig. 1). Contraction seals were found in this condition on eastbound Columbia Ave. at Stas. 646+84, 645+90, and 635+63. Most expansion seals on Columbia Ave., and on I 194 approaching Columbia Ave. from the south, showed some degree of protrusion above the pavement surface. The following expansion joints were inspected:

Sta. 648+00: Eastbound Columbia Ave. Most neoprene seal was flush with the pavement surface. The south end was completely protruded for a distance of about 6 in. The joint opening was 1/2 in. at this point and about 1 in. at the other end of the joint (Fig. 2).

Sta. 636+33: Eastbound Columbia Ave. The seal in the outside lane had protruded uniformly to a maximum of 1/2 in. in one area, while the inside or passing lane was in satisfactory condition (Fig. 3). Mr. Dunn said the two lanes were paved at different times but sealed at the same time.

Sta. 643+30: Westbound Columbia Ave. This seal was in good condition and is shown in Fig. 4.

Sta. 645+34: Westbound Columbia Ave. This seal had protruded from 3/4 to 7/8 in. above the pavement surface at the center.

Sta. 637+66: Westbound Columbia Ave. The seal had protruded here on the inside lane but not on the outside. These lanes were also paved at different times but sealed at the same time (Fig. 5).

I 194 Ramp to Columbia Ave. An expansion seal was installed in the southbound lane and a contraction seal in the northbound lane. Part of the expansion seal at the west end had split longitudinally and horizontally in the joint, permitting the top portion of the seal to protrude out of the joint (Fig. 6). The joint opening at this point was 3/4 in. at the top and somewhat narrower at the bottom.

Sta. 822+06: I 194 south of Columbia Ave. Most of this seal was high, with 2 to 3 ft entirely protruded in the northbound lane. The joint at this point was 3-1/8 in. deep, 5/8 in. wide at the top, and 3/8 in. wide at the bottom (Fig. 7). A cross-section drawing is given in Fig. 9.

Construction Project U 13121E, C2, C3 (Sealed July-August 1964)

Installation of neoprene sealants in part of the joints on the I 94 BL was observed on July 30, 1964, and reported in a memorandum from D. F. Simmons of the Research Laboratory, dated August 12, 1964. The recent inspection of a limited number of contraction seals showed them to be in generally good condition, except for limited areas where the seals were high enough to have been slightly polished by traffic. Two expansion seals were found to be much too low in the joint, at the following locations:

Sta. 381+00: Eastbound I 94 BL. Approximately one-third of the seal was 1-1/4 in. below the pavement surface (Fig. 8). The edging tool formed a ledge 1 in. below the surface and about 7/32 in. wide. The joint was 1-3/8 in. wide above this ledge and 15/16 in. wide below it. A cross-section view is given in Fig. 10.

Sta. 379+14: Eastbound I 94 BL. Seal condition here was similar to that at Sta. 643+30 westbound, and is also shown in Fig. 8.

Summary

The inspection revealed joint seal failures associated with the following construction abnormalities:

1. Stretching of the neoprene sealant during installation caused it to break in the joint.

2. Improper forming of expansion joints (Fig. 9) caused sealant to extrude out of the joint when slabs expanded.

3. Excessive surface edging of expansion joints (Fig. 10) made it necessary to install seal too deep in the joint opening.

4. Lane-at-a-time construction created an installation problem when the entire joint was sealed after pouring of the second lane (Figs. 3 and 5).

Other factors of particular interest included the following:

a. Samples of sealant taken from the joint at Sta. 822+06 on I 94 south of Columbia Ave. were split on top and torn at the sides and bottom. This situation was discussed with a Du Pont representative, who stated that the material may have been overcured. He stated that other instances of this nature have been detected in material from the same source. This will be investigated further.

b. In designing sealant for expansion joints, it must be considered that sealant will be subjected to compressive forces far exceeding those at the time of installation, due to progressive closure of the joint with time. This poses a new problem in cross-section design for expansion joint sealant, which we are now working to resolve.

We understand all expansion joints on Project I 13033D, C8 are to be resealed, in which case we recommend that the joint grooves be reconditioned to original specification dimensions by appropriate procedures.

OFFICE OF TESTING AND RESEARCH

E. A. Finney

E. A. Finney, Director
Research Laboratory Division

EAF:FJB:nl

igure 1. Contraction seal with 2-in. long break.

Figure 2. Expansion seal with end partially expelled from joint, which is closed to 1/2-in. at this point (Sta. 648+00).

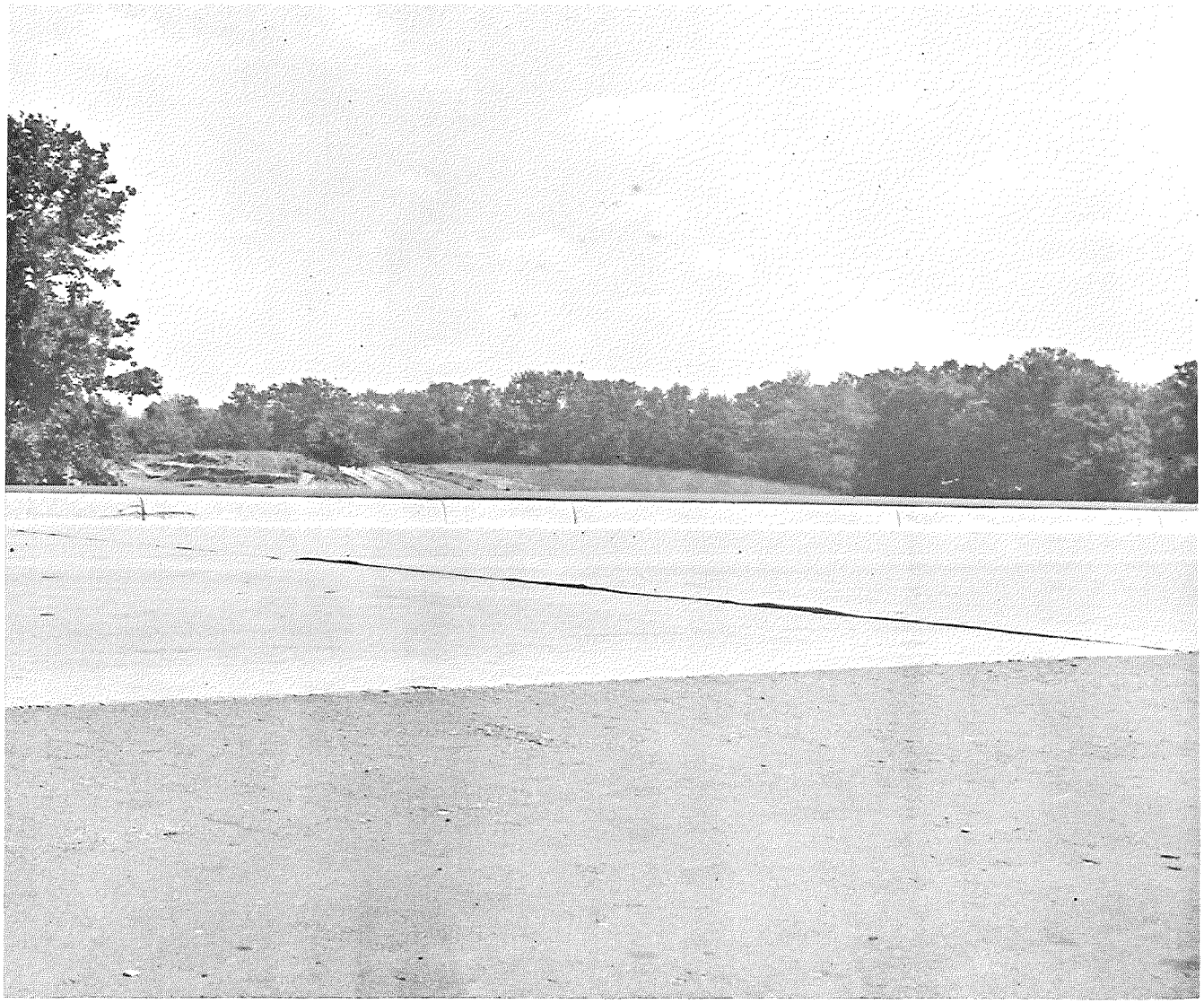


Figure 3. Expansion seal raised in traffic lane (foreground) but not in passing lane (Sta. 636+33).

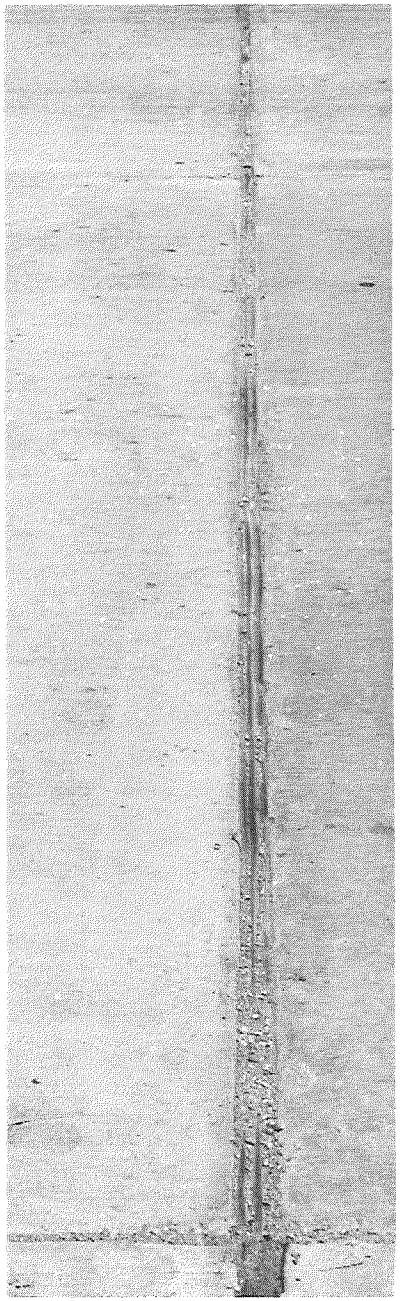
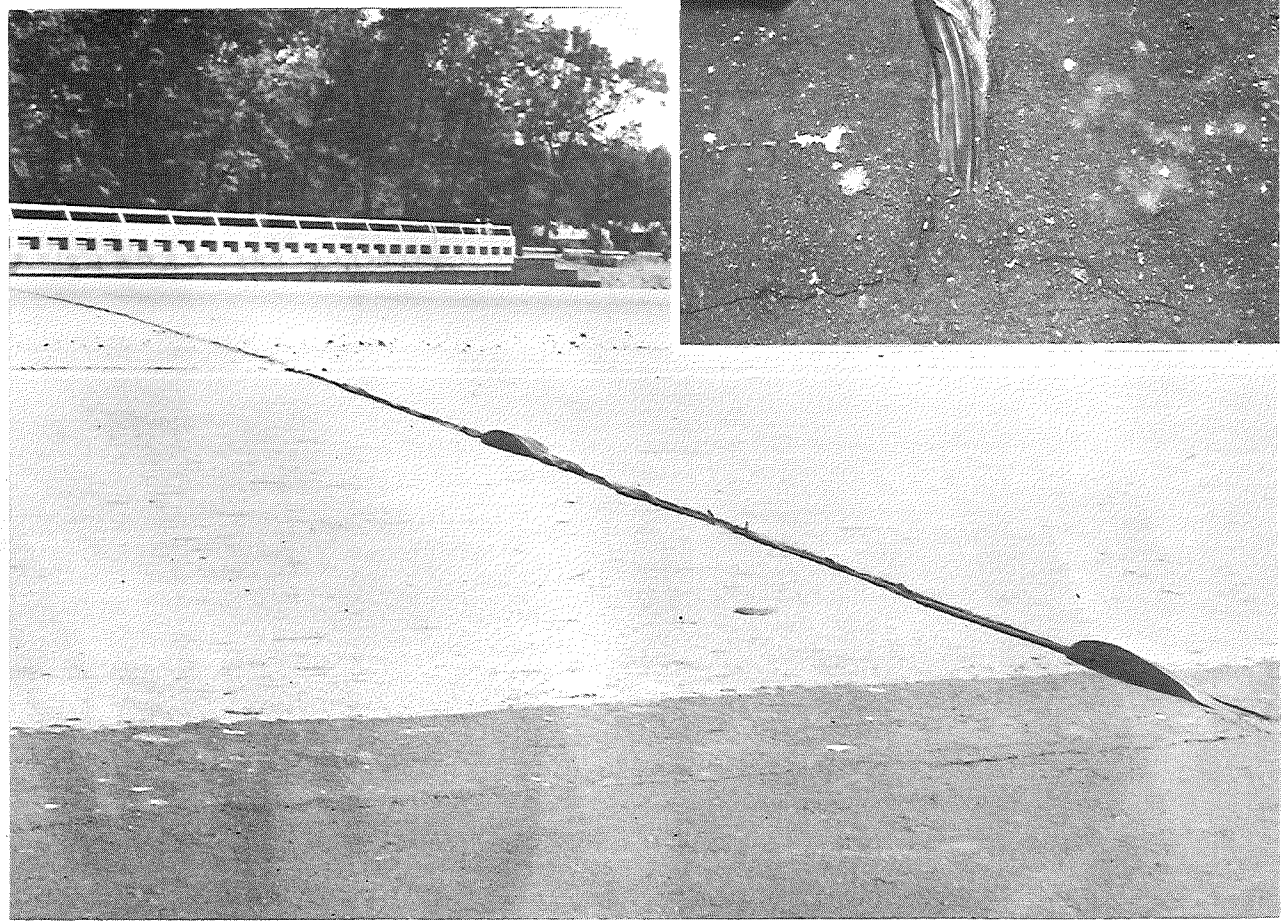


Figure 4. Expansion seal in good condition (Sta. 643+30).

Figure 5. Expansion seal raised in foreground lane but not in others (Sta. 637+66).

Figure 6. Expansion seal in near lane raised, with contraction seal in far lane in good condition (below). In close view (right), top portion of expansion seal is lifted to show lower portion still in joint. Bituminous shoulder material in foreground extends 1-ft onto pavement (ramp from I 194 to Columbia Ave.).



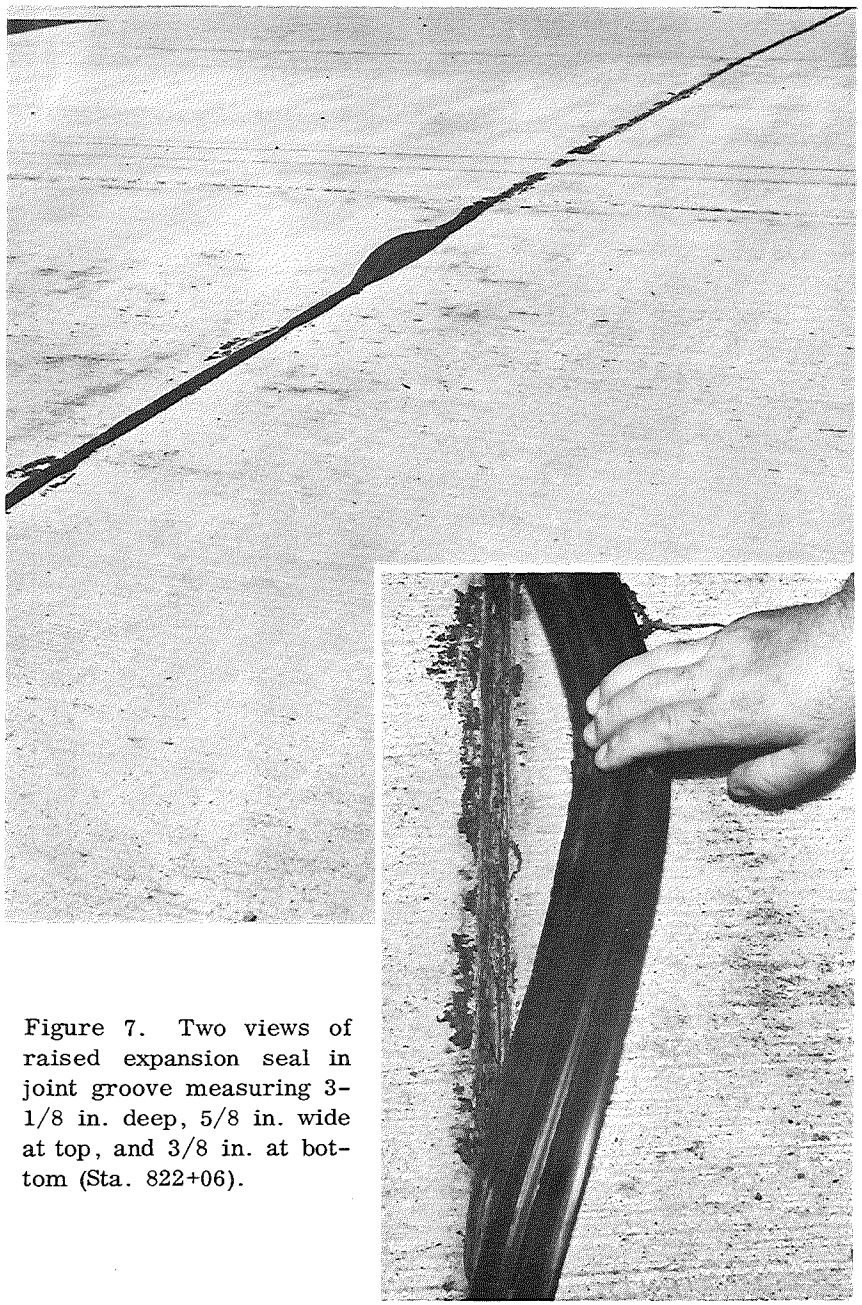


Figure 7. Two views of raised expansion seal in joint groove measuring 3-1/8 in. deep, 5/8 in. wide at top, and 3/8 in. at bottom (Sta. 822+06).

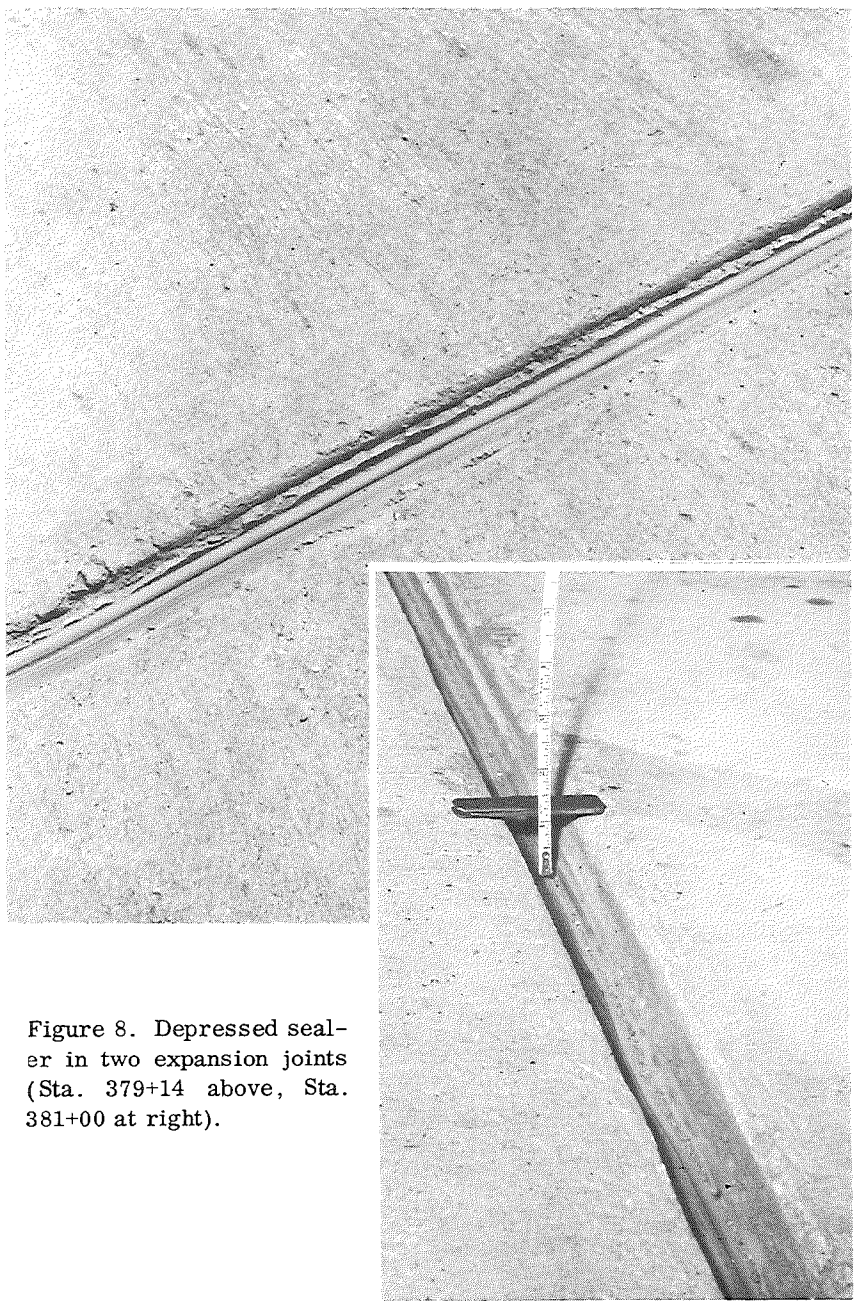


Figure 8. Depressed sealer in two expansion joints (Sta. 379+14 above, Sta. 381+00 at right).

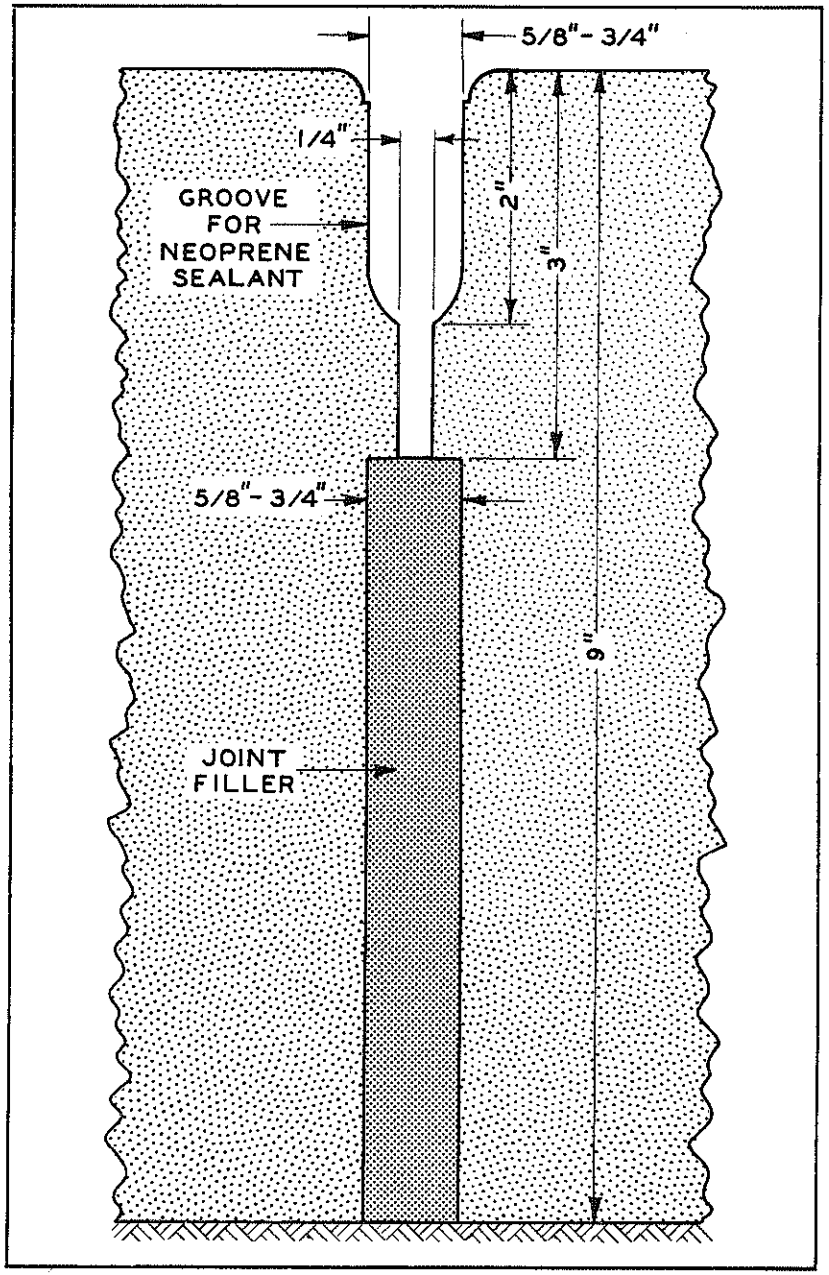


Figure 9. Cross-section of expansion joint shown in Fig. 7, from which neoprene sealer was extruded (Sta. 822+06).

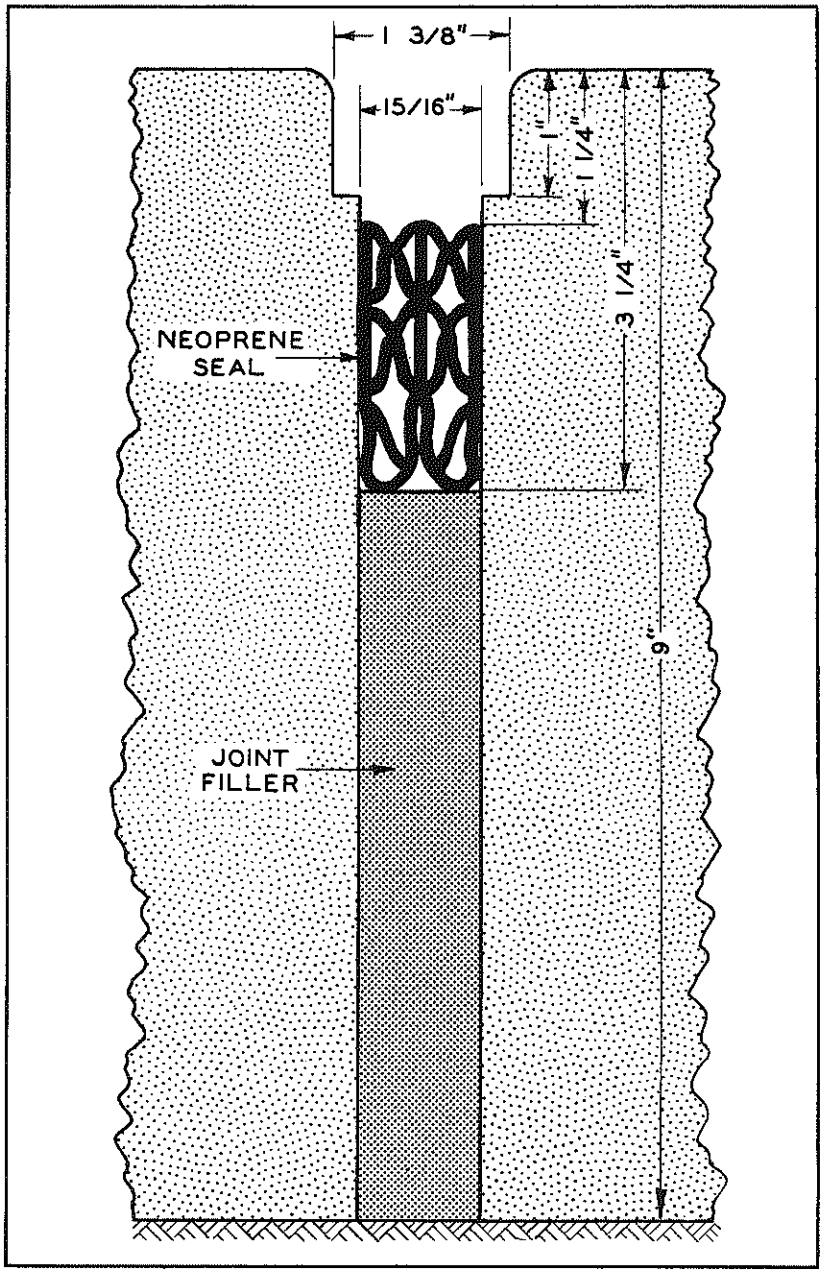


Figure 10. Cross-section of expansion joint shown in Fig. 8, indicating how depth of edging affects position of neoprene sealer (Sta. 381+00).