# OFFICE MEMORANDUM

MICHIGAN
STATE HIGHWAY DEPARTMENT
JOHN C. MACKIE, COMMISSIONER



December 16, 1964

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

From: J. E. Simonsen

Subject: Construction and Sealing of Transverse Contraction Joints Containing Acme Load Transfer Assemblies. Research Project R-39 F-1(3). Research Report No. R-487.

An experimental concrete pavement section containing Acme contraction joint assemblies was approved by the Office of Construction for incorporation into the Sheridan Street Extension in the City of Lansing (Construction Projects U 33061D, C11, and U 33061E, C12). On October 28, 1964, installation of the Acme assemblies was observed by L. T. Oehler and J. E. Simonsen, and neoprene sealing operations were observed by D. F. Simmons and J. E. Simonsen on November 18, 1964.

The experimental pavement section is located between Seymour St. and Washington Ave. and consists of three 12-ft lanes of 9-in. uniform thickness with curb and gutter on both sides. A total of six 36-ft transverse contraction joints contained Acme assemblies, each joint consisting of three 12-ft assemblies. Joint spacing varied, because standard 1-in. expansion joints were installed at the spring points of street intersections, but in no case did the spacing of the Acme joints exceed the specified 71 ft 2 in. The joints are located as follows:

| Joint No. | Station |
|---|---|
| 1 | 471+06 |
| 2 | 472+34 |
| 3 | 473+05 |
| 4 | 473+76 |
| 5 | 476+54 |
| 6 | 477+24 |

The Acme assemblies are of the type specified by New York State for use on Federal-Aid projects, and are designed for 60-ft slab lengths. A typical load transfer assembly installation is shown in Fig. 1, and assembly details are illustrated in Fig. 2 which shows a groove forming bar (to be removed after machine finishing of the pavement surface) inserted in clips placed on the center plate of the assembly. The top of the groove bar was approximately 1 in. below pavement surface. The assemblies were staked to the subgrade through the bottom dowel spacer plates with eight 3/8-in. diam, 12-in. long spikes per 12-ft assembly.

Observation of paving operations over the assembly installed at Sta. 471+06 indicated that no tipping or horizontal movement of the assembly occurred. Because of the assembly's height, the front spreader's screw auger must be lifted in order to clear the assembly while moving over it.

The joint grooves were formed by use of 12-ft long hollow plastic tubes, 3/8 in. wide at the top and with tapered sides. The following five separate operations, illustrated in Figs. 3 through 7, were required to construct the grooves:

1. Forming a groove in the machine-finished concrete surface by manually pulling the groove bar up through the overlying concrete. The clips holding the bar in position during paving operations were left attached to the center plate of the Acme joint assembly.

2. Preparing the hollow plastic tubes for installation in the formed groove. This included joining two 12-ft long tubes by inserting a small wood strip into the mating ends of the tubes and attaching two-way clips to the bottom of the tubes.

3. Placing the prepared plastic tube in the formed groove. The free ends of the clips attached to the tube were fastened to the center plate of the joint assembly, thereby preventing upward movement of the tube.

4. Consolidating the concrete displaced during the groove forming operation against the sides of the tube by use of hand trowels.

5. Floating of the surface in the immediate joint area.

The plastic groove former is disposable, and thus is left in place for protection against dirt infiltration until the joint is sealed.

The Acme joint assemblies were approved by the Construction Division on an experimental basis for incorporation in this project. Acme also furnished preformed neoprene sealer compatible with the assembly, since the Department's standard neoprene sealer for contraction joints could not be used with their assemblies. To obtain information on properties of Acme's neoprene before placing it in service, a sample was taken to the laboratory from stock at the project site, and tested for conformance with Departmental specifications, with the following results:

| | Sample | Specification |
|---|---|---|
| Specific Gravity 23/23C | 1.34 | 1.37 ± 0.03 |
| Tensile Strength, psi | 2018 | 2000 minimum |
| Elongation at Break, percent | 273 | 250 minimum |
| Permanent Set at Break, percent | 6 | 10 maximum |
| Hardness, Shore Type A Durometer | 55 | 60 ± 5 |
| Heat Aged, 70 hr at 212 F | | |
| Tensile Strength, change, percent | 0 | -30 maximum |
| Elongation, change, percent | -12 | -40 maximum |
| Hardness, change, percent | +8 | +10 maximum |
| Oil Swell, 70 hr at 212 F, percent by volume | 39 | +80 maximum |
| Recovery After Compression to 50 percent of Original Width, percent | | |
| 70 hr at 212 F | 80 | 85 minimum |
| 70 hr at 14 F | 65 | 80 minimum |
| 22 hr at -20 F | 80 | 75 minimum |

A typical cross-section of this material,/3/16-in. wide at the top with tapered sides to facilitate installation in the tapered joint groove, is shown in Fig. 8.

Sealing of the joints was preceded by removal of the plastic groove former and cleaning of the groove by compressed air. No difficulty was experienced in removing the plastic tubes. The resulting grooves had smooth side walls and generally were straighter than styrofoam constructed grooves. Some honeycombing in the groove walls was noted (Fig. 9), apparently caused by insufficient consolidation of the concrete along the sides of the plastic tubes.

Installation of the neoprene sealant was performed under the supervision of T. C. Bowman, representative of the Acme Highway Products Corp. of Buffalo, New York. The lubricant adhesive (Acme Neo-Lube) was applied to the groove walls by use of a portable garden sprayer equipped with a pressure pump, hose, and special nozzle designed to distribute the adhesive equally on both joint walls at one time. A manual roller was used to install the sealer. Adhesive application and sealer installation are shown in Figs. 10 and 11, respectively.

Depth of sealer below the pavement surface was noted to vary from approximately 1/16 to 1/4 in. Inspection of the sealer installation revealed that pressing the sealer into the joint groove resulted in both top edges of the sealer being folded over toward the center of the groove (Fig. 12). Therefore, the top 1/4 in. of each sealer side was not in contact with the joint groove side walls.

OFFICE OF TESTING AND RESEARCH

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Attachments

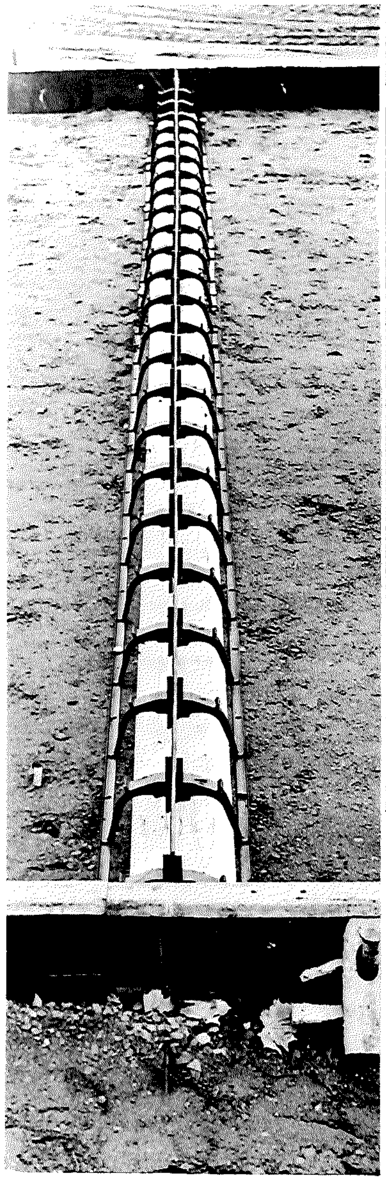

Figure 1. Typical installation of Acme load transfer assembly.

Figure 2. Details of Acme load transfer assembly.

Figure 3. Removal of groove forming bar.

Figure 4 (right). Preparation of plastic joint groove former.

Figure 5. Installation of plastic groove former.

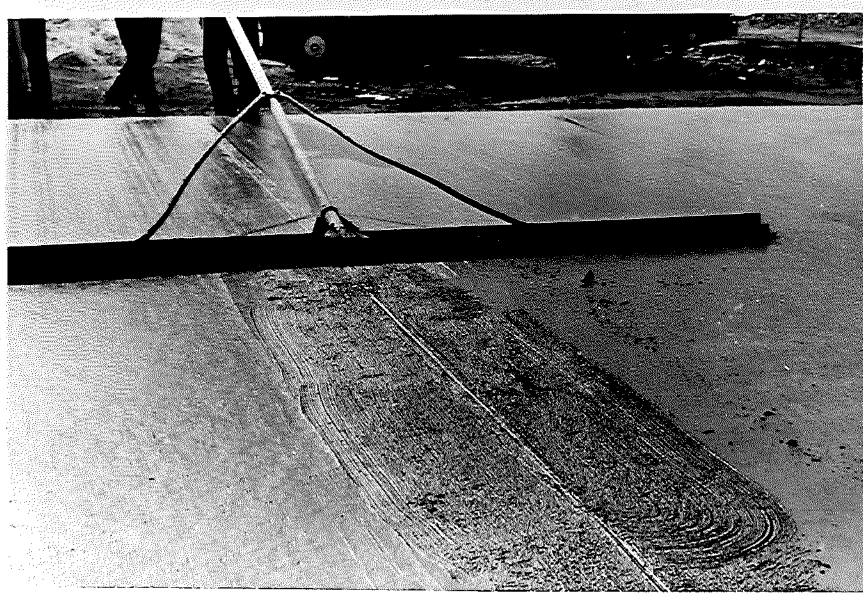

Figure 6 (above). Consolidation of concrete against sides of plastic groove former.

Figure 7 (left). Final finish of pavement surface.

Figure 8 (right). Acme neoprene seal, cross-sectional view.

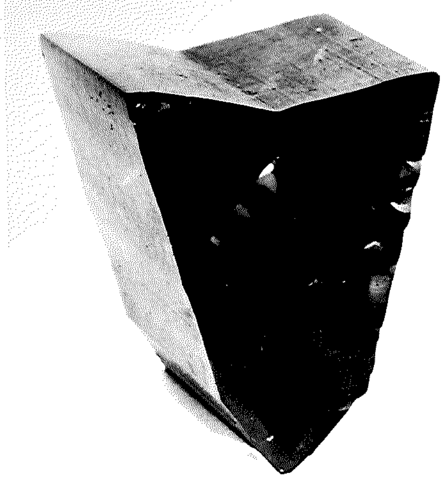

Figure 9. Typical honeycombing of walls of unsealed joint.

Figure 10 (below). Applying lubricant adhesive to joint grooves.

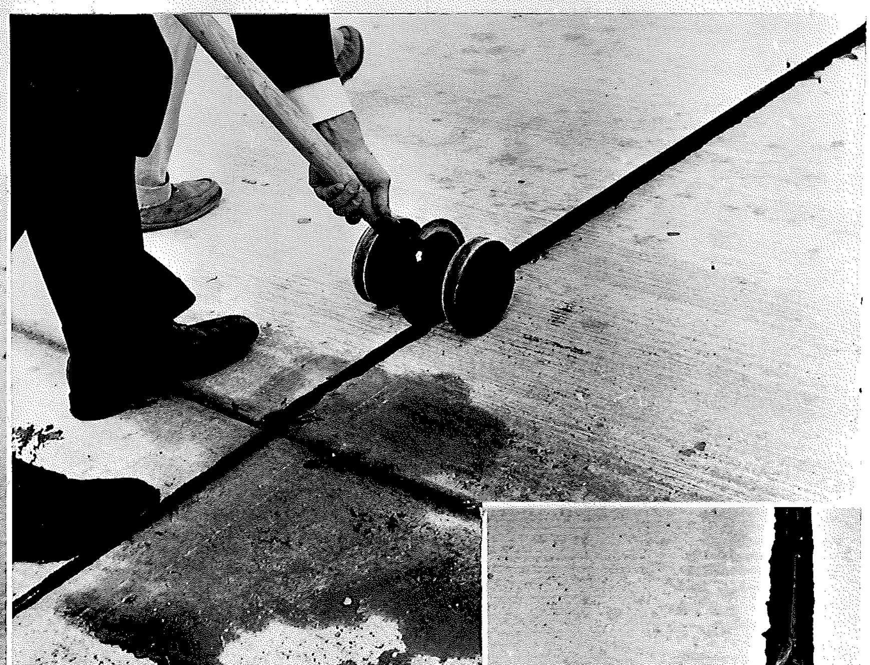

Figure 11 (above). Installing Acme neoprene seal.

Figure 12 (right). Fold-over condition of Acme neoprene seal during installation.