R-455

OFFICE MEMORANDUM

MICHIGAN
STATE HIGHWAY DEPARTMENT
JOHN C. MACKIE, COMMISSIONER

April 3, 1964

To: E. A. Finney, Director
Research Laboratory Division

From: A. J. Permoda

Subject: Installation and First Inspection of Experimental Joint Sealants on I 496 (Construction Projects I 33045D, C1, S12, and S14 of 33045D) I 496-7(4) 146. Research Projects R-51 G-56, R-62 NM-62, R-62 NM-66, and R-63 NM-85. Research Report No. R-455.

The following memorandum summarizes the installation of experimental joint sealants, as supervised and reported by D. F. Simmons. This project was authorized by New Materials Committee decision of February 6, 1962. Scheduled originally for the summer of 1962, postponements had been made for various reasons.

From November 5 to 15, 1963, four different experimental joint sealants, including two two-component polyurethanes, one two-component polysulfide, and one preformed polyurethane foam, were installed in all pavement contraction and expansion joints on I 496, the Pine Tree Connector, between the Forest Road and Mt. Hope Road overpasses. Two of the sealers were used in the steel expansion dams on the northbound and southbound Cavanaugh Road overpasses. This is a slight departure from the area described in E. A. Finney's letter to S. M. Cardone dated July 18, 1963. The change in pavement joint location was made through Pat Rider, Project Engineer, due to the fact that the joints adjacent to the Cavanaugh Road structures had to be sealed early with conventional hot-pour sealer to prevent damage by construction traffic.

A joint sealing crew of the contractor's (Sargent Construction Co.) cleaned out all joints prior to filling with experimental sealants and also did some of the sealing. Various sealer company representatives and personnel of the Office of Construction and Research Laboratory Division did the balance of the joint sealing.

Locations of test joint sealers are indicated in Fig. 1, which shows that PRC 3000 FT, the two-component polyurethane, cold-pour sealant manufactured by Products Research Co. of Burbank, Calif., was used to seal the northbound steel expansion dam at Cavanaugh Road, all eight expansion joints, and the first eighteen contraction joints north of Forest Road in the northbound lanes.

The southbound steel expansion dam at Cavanaugh Road, all eight expansion joints, and the first eighteen contraction joints north of Forest Road in the southbound lanes, were sealed with Presstite 54/404, a two-component polysulfide, cold-pour sealant manufactured by the Presstite Division of Interchemical Corp. of St. Louis, Mo. This sealer meets Federal Specification SS-S-00195 (U.S. Army CE).

The seven remaining contraction joints on the northbound roadway just south of Mt. Hope were sealed with a special two-component, cold-pour polyurethane, grey colored sealant manufactured by Dow Chemical Co. of Midland, Mich. These were filled by Dow personnel.

The seven remaining contraction joints on the southbound roadway immediately south of Mt. Hope were sealed with "Compriband," a preformed, flexible, polyurethane foam, impregnated with asphalt, as manufactured by Secoa Inc. of Skokie, Ill. This continues field evaluation of Compriband begun two years ago on I 96 between Waverly Road and M 99, which was restricted to only two joints because of difficulty with the pre-compression machine used in the installation process. The sealant was furnished and placed by the manufacturer at his own expense. Different widths of the material were pre-compressed by machine and methods of installation in the southbound lanes were as follows:

First contraction joint south of Mt. Hope - Epoxy primed, 1-in. wide by 3/4-in. deep material.
Sta 680+90 - West one-half epoxy primed, east-one-half unprimed, 1-1/2-in. wide by 1-in. deep material.
Sta 679+91 - Epoxy primed, 1-1/2-in. wide by 1-in. deep material.
Sta 678+92 - "Compriband" primer, 1-1/2-in. wide by 1-in. deep material.
Sta 677+93 - "Compriband" primer, 2-in. wide by 1-in. deep material.
Sta 676+92 - Unprimed, 2-in. wide by 1-in. deep material.
Sta 675+95 - Unprimed, 2-1/2-in. wide by 1-in. deep material.

Conditions as a whole were not ideal during the entire sealing operations due to some necessary construction traffic along the shoulders and the persistence of damp and cold weather which retarded the setting time of the two-component materials. However, the sealed joints looked good after sealing.

Technical representatives of the involved companies were: J. R. Monk, Products Research Co.; Harry Shields and Henry G. Williams, Presstite Division of Interchemical Corp.; C. N. Goeders, Dow Chemical Co.; and Stephen B. Grube, Secoa, Inc.

First Inspection

The first complete condition survey of subject experimental project was made on February 24, 1964, by D. F. Simmons. The ambient temperature during the survey was about 15 F.

Presstite two-component cold-applied polysulfide type sealant 54/404 appeared in good condition in regular contraction and expansion joints (Fig. 2). On the roadway joints an adhesion loss of about 5 percent was estimated. In the steel expansion dam in the southbound structure over Cavanaugh Road complete adhesion loss was evident on the leading edge (Fig. 3). The supplier of material believed this to be caused by improper priming of joints. This sealer was softer and more resilient than standard rubber-asphalt sealer, at the 15 F inspection temperature.

The PRC 3000 FT two-component polyurethane cold-applied sealant, installed in the steel expansion dam in the northbound structure over Cavanaugh Road, looked very good in this particular joint. There were two small bond breaks on the far edge, one about 3-in. long and one about 6-in. long, which apparently were due to improper cleaning or priming in these spots. The PRC in the contraction joints and regular expansion joints did not appear as good as the Presstite in the same area (Fig. 4). They were not bad generally, but exhibited an estimated 20 percent adhesion loss over the entire project. This sealer also was softer and more resilient than the standard rubber-asphalt sealer at the 15 F inspection temperature.

The seven contraction joints of Dow two-component, grey polyurethane, cold-applied sealant remained fairly resilient, but exhibited about an 80 percent adhesion loss on both sides (Fig. 5). Since this sealer passed laboratory bond tests, this poor field performance is unexplainable, unless the sealer did not set-up properly at the cool temperature prevailing during installation.

The preformed, flexible, polyurethane foam sealer, impregnated with asphalt ("Compriband") had been installed in seven contraction joints in varying thicknesses of material with some joint faces primed and others left unprimed. At time of inspection most of the unprimed sealer had lost adhesion and had sunk to the bottom of the joint groove (Fig. 6). The primed sealer showed depressed levels because of a gradual sinking to the bottom of the joint groove; it could easily be pushed down, showing lack of adhesion or expansive pressure against the joint faces at the prevailing temperature. This was also noted on two "Compriband" sealed joints on I 96, discussed in Research Report No. R-401, dated November 13, 1962. The sealer on I 496 showed a surface bleaching or leaching-out of asphalt which may not be detrimental.

Survey Summary

The first condition survey showed that after three months of winter service two of the four experimental sealers were not performing satisfactorily: polyurethane foam impregnated with asphalt, and a proprietary two-component cold-pour polyurethane. The two other proprietary sealers--a two-component cold-pour polyurethane and a two-component polysulfide--gave better performance, but adhesion failures had developed along 5 to 20 percent of the sealer length. Of these two, the former is giving good field performance in the bridge steel expansion dam where it was placed, showing only two small spots of adhesion failure, while the latter exhibits complete adhesion failure along the joint leading edge on the parallel bridge structure.

The generally poorer-than-expected initial performance of the tested sealers on new construction is disappointing, notwithstanding the poor weather conditions during installation.

Future inspections and evaluations of all four experimental joint sealants will be reported to document any further performance changes that may occur.

OFFICE OF TESTING AND RESEARCH

A. J. Permoda

A. J. Permoda, Supervisor
Materials Research Section
Research Laboratory Division

AJP:js

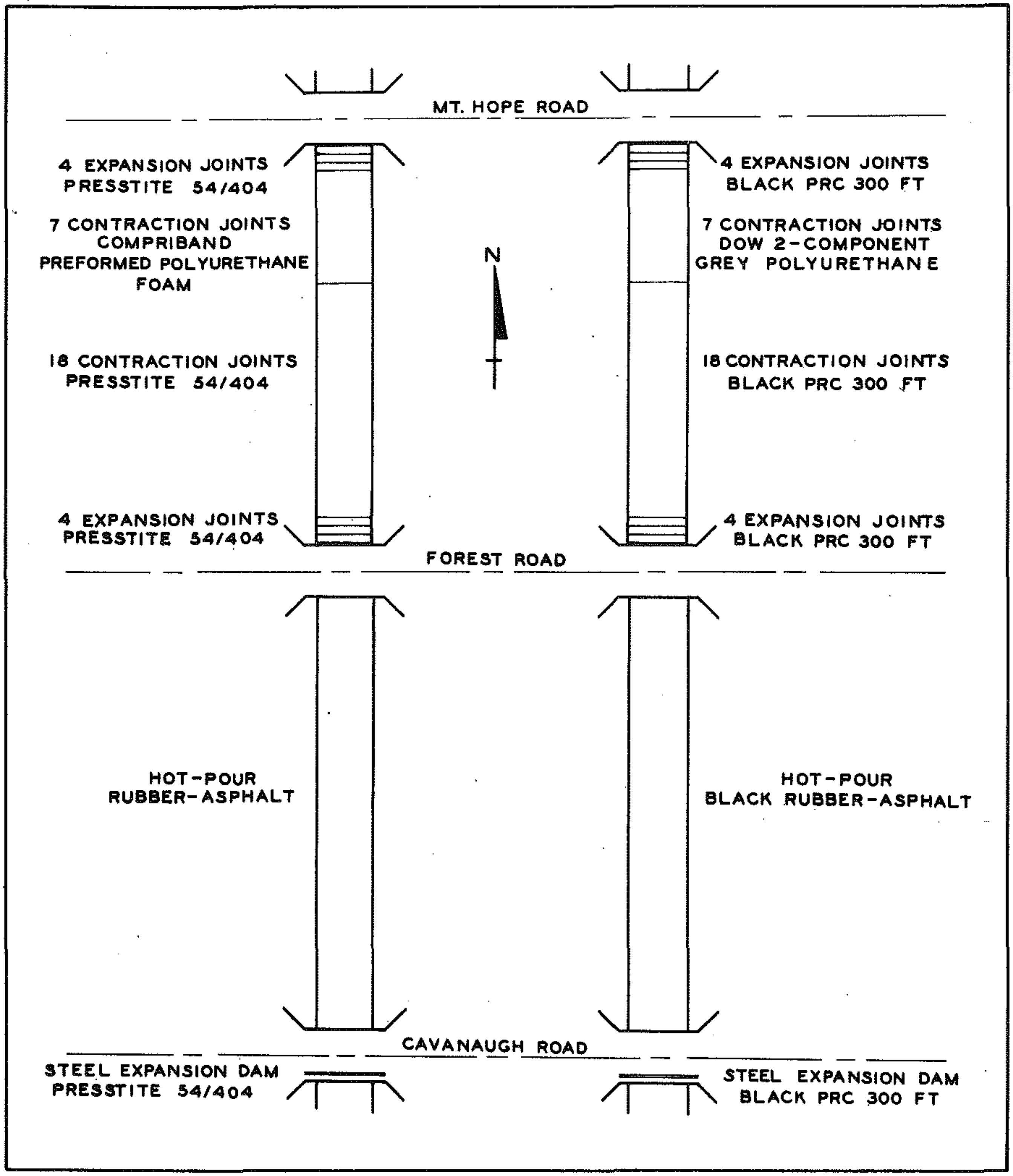

Figure 1. Distribution of experimental sealants.

Figure 2. Polysulfide two - component sealer (Presstite) gave satisfactory performance after three month's service; Sta 670+95 (SB).

Figure 3. Polysulfide sealer shows adhesion loss on leading edge of bridge expansion dam after three months of winter service.

Figure 4. Polyurethane sealer (PRC 3000 FT) giving satisfactory performance after three months of winter service; Sta 672+57 (NB).

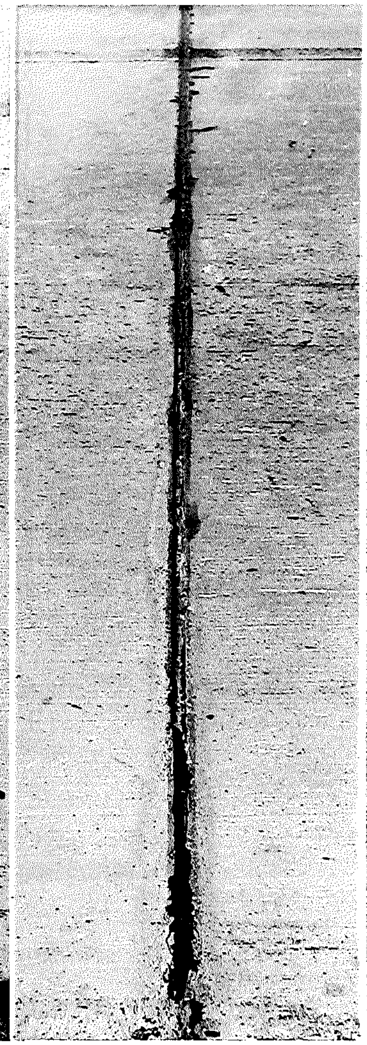

Figure 5. Grey polyurethane sealer (Dow) shows about 80-percent adhesion loss; Sta 679+50 (NB).

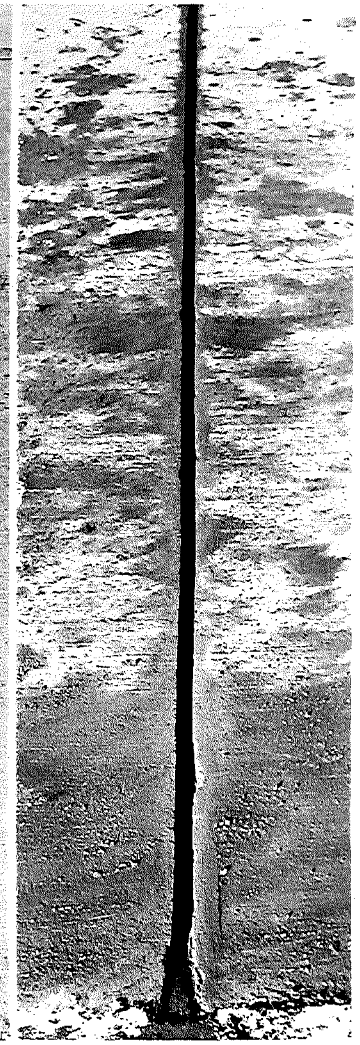

Figure 6. Preformed foam sealer ("Compriband") dropped to bottom of unprimed joint during three months of winter service.