EVALUATION OF TWO-COMPONENT, COLD-POUR JOINT SEALING IN I 75 REST AREAS

Construction Projects I 25032C, C7; BI 73171C, C19; I 09034C, C10
Federal Designations I-75-2(89), I-75-2(90), I-75-2(91)

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Joint sealant condition in three new I 75 rest areas has been evaluated in accordance with a telephone request from R. L. Greenman to C. C. Rhodes on November 27, 1964. These same three projects were referred to in a letter to Howard E. Hill from D. E. Jones of the Bureau of Public Roads, dated December 18, 1964. This evaluation was somewhat delayed by bad weather conditions; the inspections were made on December 29, 1964, by M. G. Brown, G. C. Sigsby, and D. F. Simmons of the Materials Research Section.

Project I 25032C, C7 (I-75-2(89))

This project is located off the southbound I 75 roadway south of M 57. The concrete ramps and parking areas were poured in mid-July 1964, and joints were sealed in late August. The ramps are 16 ft wide, the truck area eight lanes wide, and the car area three lanes wide. A joint spacing of 99 ft was used. Sealant was produced by H. S. Peterson Co. of Detroit, and is a black, two-component, cold-pour, hand-mixed, self-leveling polyurethane. A sealant sample was tested by the Research Laboratory and met specification requirements for Michigan Type 3 (slow-setting, hand-mixed) sealants (Sample No. 64 MR-187, reported August 24, 1964). The manufacturer also furnished a primer to be

used with the sealer in concrete joints. A flexible filler of Dow Ethafoam was used to fill the joint space to within about 1 in. of the pavement surface, and the sealant poured approximately flush with the pavement surface. The sealing was done by the Ben T. Young Co. of Detroit.

The area was inspected thoroughly including truck and car parking areas and entrance and exit ramps. The ambient temperature was 30 F, with contraction joints open an average of about 7/16 in. beyond their initial width of 1/2 in. Sealant cohesion failure to full depth in contraction joints, as shown in Fig. 1, was the most prevalent failure type, and existed to greater or lesser degree in at least 70 percent of all such joints. Since the sealant passed laboratory tests, quite possibly some sealer batches were inadequately mixed at the job site, resulting in cohesion weakness. Thorough mixing and proportioning are necessary for quality performance of two-component sealer.

Although some adhesion failures were noted, these were infrequent and of short length. In many cases they appeared to result from loosening of mortar on the joint faces.

Evidence of adequate blast cleaning along the pavement surface and joint edges, which would be conducive to removal of laitance and fine spalling, was not evident in ramp areas but was found to varying degrees in the parking areas. Fine edge spalling extending 1/2 in. or less from the edges or lips of contraction joints is shown in Fig. 2. Such spalls may

have been caused by loosening while joints were being prepared for sealing, or may have occurred after joints were sealed. Fig. 3 shows a typical expansion joint in the truck parking area; considerable spalling along joint edges or lips was also encountered among expansion joints.

Certain isolated failures were observed to be attributable to placing of filler too high in the joint space, so that only a thin film of sealant covered it (Fig. 4).

Due to the extensiveness of cohesion failures and occasional adhesion failures, it is recommended that the old sealer be removed, all joint spalls be repaired, and the entire project resealed according to specifications.

Projects BI 73171C, C19 (I-75-2(90)) and I 09034C, C10 (I-75-2(91))

These two projects are located on northbound I 75 south of Saginaw and southbound I 75 south of Bay City, respectively. They were poured in late September and early October of 1964 and were sealed around November 1. Joint spacing on both projects was also 99 ft. The sealant used on both projects was Allied Materials Corp. 9015-C, a two-component, polysulfide, cold-pour material. This is a machine-mixed and machine-applied sealant which apparently was accepted for use by certification of the manufacturer. It is a Michigan Type 1 (fast-setting, machine-applied) sealant, which cannot presently be tested in the laboratory. The sealant was installed by Bailey-Zumo Co. and was poured to the full

2-in. depth of the joint without using any flexible filler or bond breaker beneath it.

On December 29, 1964, when this evaluation was made, all joints looked very good with no evidence of any failure and negligible amount of spalling. Fig. 5 shows a typical joint. The ambient temperature was about 30 F and the average contraction joint opening was 3/4-in. A number of epoxy mortar spall repairs were noted and there was evidence that joints had been sandblasted prior to sealing. Although these joints appeared very good at this time, they were not sealed according to supplemental specifications, which require that a compressible filler and a bond-breaker be placed below the sealant. These joints were poured full depth. The purpose of the compressible material and bond breaker is not to conserve sealant, but to form a favorable "shape-factor" or cross-section in the sealant. This reduces stresses in the sealant, thus minimizing failures in adhesion and cohesion.

Since the joint cleaning and spall repair were in accordance with specifications and the performance of the sealer to date is satisfactory, no recommendation is being made relative to its replacement.

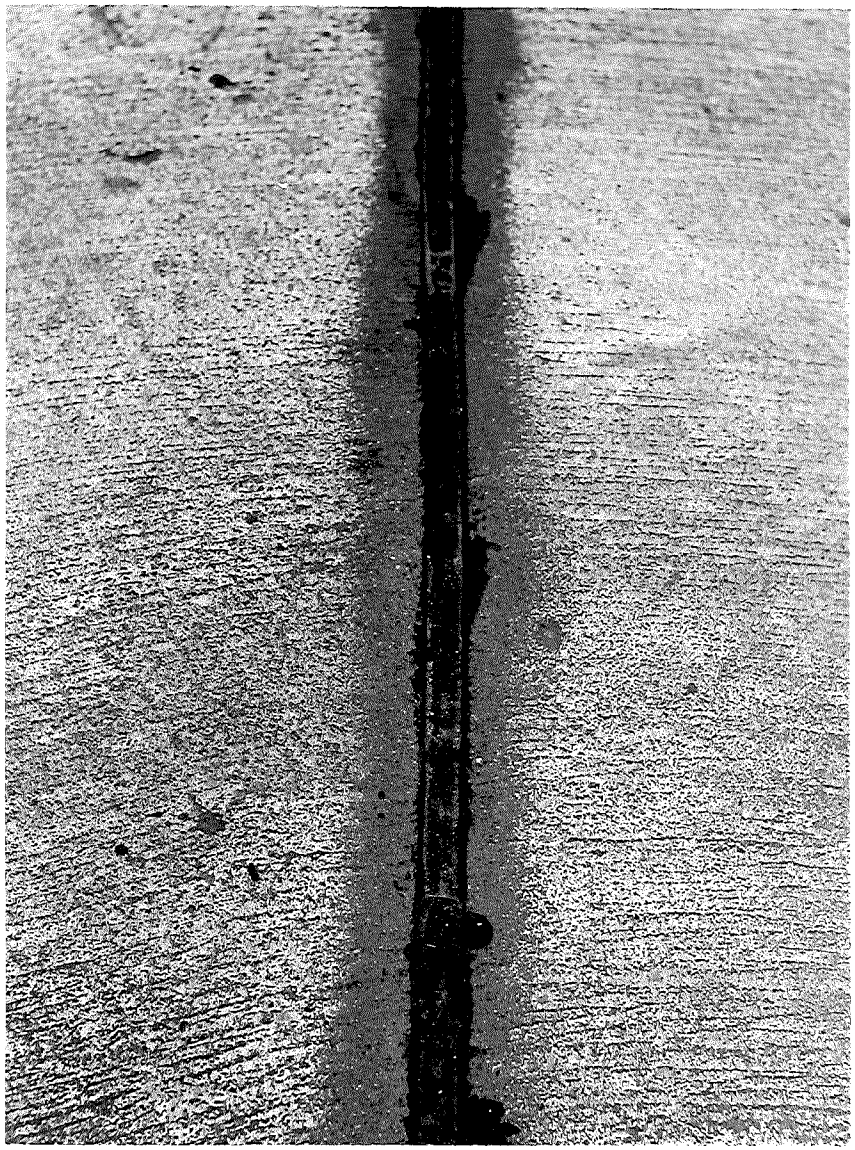

Figure 1. Extreme cohesion failure in truck parking area. Light-colored areas on pavement in these photos are not membrane curing compound, but light snow which was broomed off along joints at the time of this inspection (Project I 25032, C7). (I-75-2(89))

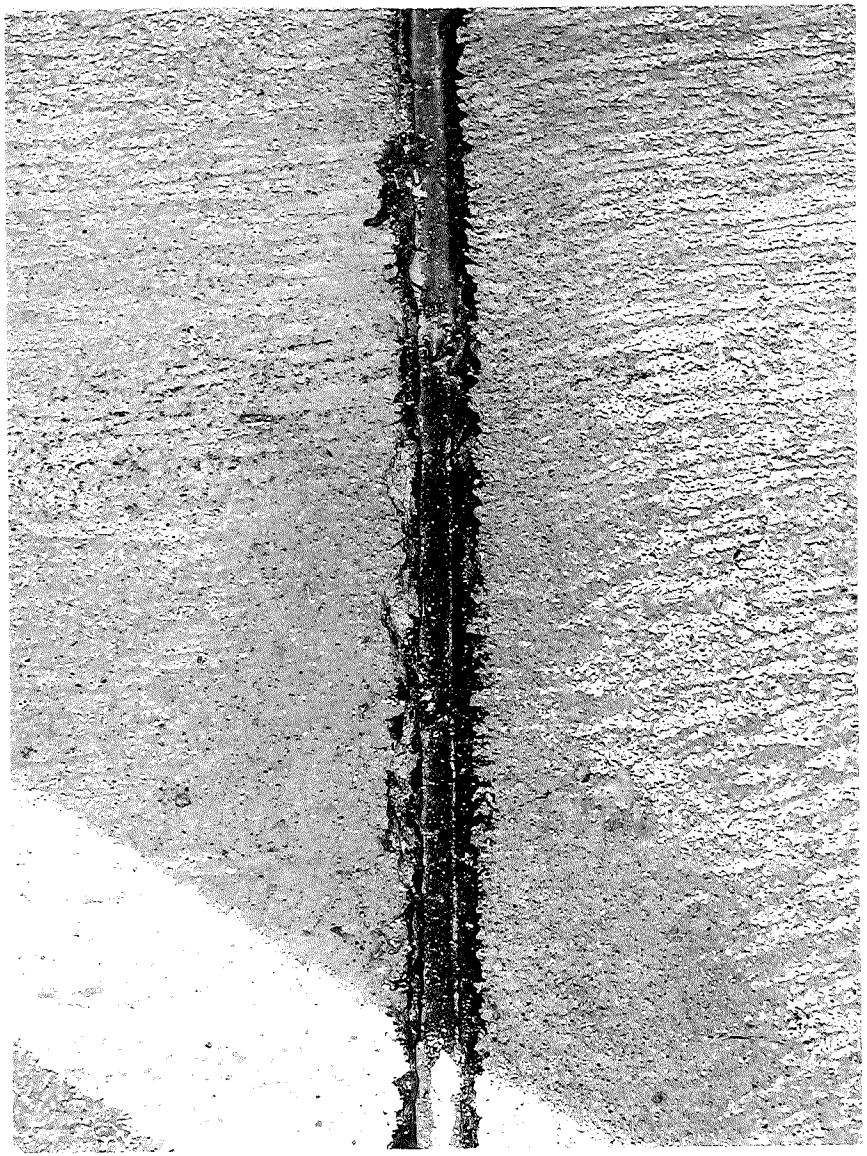

Figure 2. Spalling along contraction joint lip or edge (Project I 25032, C7). (I-75-2(89))

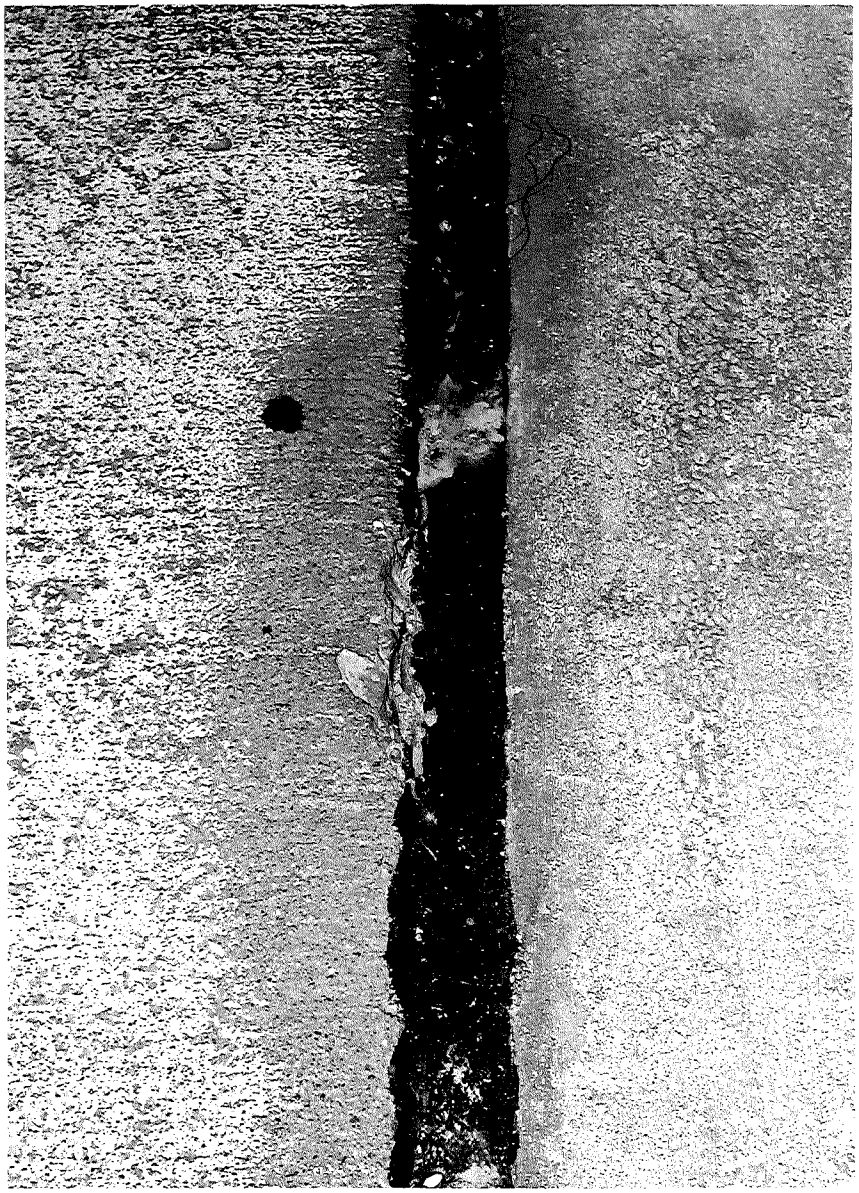

Figure 3. Spalling along expansion joint edge in extreme north portion of truck parking area (Project I 25032, C7). (I-75-2(89))

Figure 4. Placement of filler (white exposed material) too close to joint surface (Project I 25032, C7). (I-75-2(89))

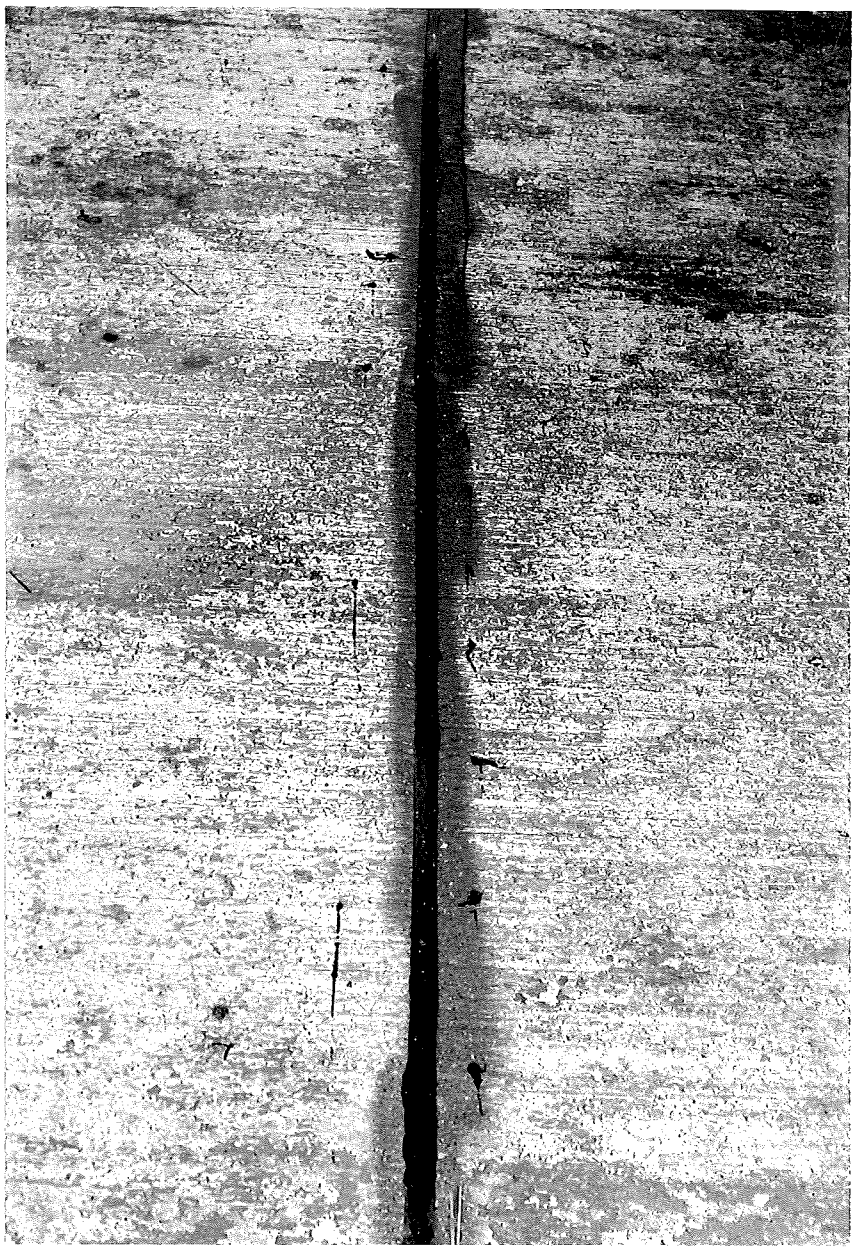

Figure 5. Contraction joint without adhesion or cohesion failure, typical of those in Projects I 09034C, C10 and BI 73171C, C19. (I-75-2(90) and I-75-2(91))