

OFFICE MEMORANDUM

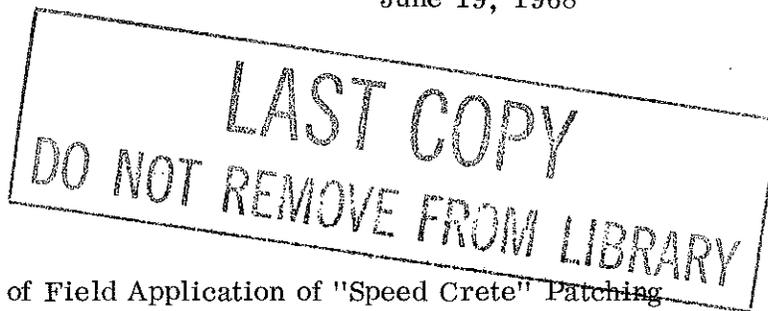


MICHIGAN DEPARTMENT OF STATE HIGHWAYS

June 19, 1968

To: L. T. Oehler, Director
Research Laboratory Section

From: M. G. Brown



Subject: Second-Inspection Report of Field Application of "Speed Crete" Patching Mixtures. Research Project 65 NM-140. Research Report No. R-676.

The following is the second pictorial report covering inspections made on a number of field applications of "Speed Crete" patching mixtures placed in 1966, 1967, and 1968. These inspections were conducted on May 16, 20, and 21, 1968 by H. L. Patterson and M. G. Brown.

Details of the initial application and first inspection of many of these patching installations, are presented in Research Reports R-618 (Dec. 1966) and R-646 (Aug. 1967). An extensive report covering the laboratory evaluation of Speed Crete and four other similarly used materials is being prepared and will be issued as a separate Research Report. To help compare the results of this report with the two earlier ones, the field projects are covered in the same chronological order.

Pavement Patch, US 23BR, Ann Arbor

A general view of this 4- by 6-ft full-depth patch after two years exposure is shown in Figure 1. It's condition did not appear to have greatly changed since June 6, 1967. Some of the fine surface cracking has become more prominent around the edges of the patch and some small pieces have broken loose adjacent to the old pavement.

Sidewalk Patches, N. Washington Avenue, Lansing

Figure 2 illustrates the condition of the original test patch placed April 29, 1966 and the later patching done in September, 1966. Visually, the patches appeared quite sound and in much the same condition as they were at the time of the June 1967 inspection. However, the original patch is full of fine cracks, especially near the curb, and has extensive hollow areas, indicating loss of bond. The later patching did not appear to be cracked as badly but has many hollow areas. After two winters, the patches still remain in place even though there is considerable bond loss indicated.

Northbound US 127 over NYCRR, North of Jackson

Figure 3 illustrates the general condition of three of the largest patches on this test bridge after two winters. The only significant change from a year ago is

the loss of a small piece of the large patch at the north end of the structure. Moreover, the hollow areas and cracking appear to be more pronounced in this patch. This advancement in cracking and bond loss also appear to be occurring in some of the other patches. Except for the patch loss mentioned, and one large pop-out repair in the east curb, the patches are remaining in place after two years.

South Pennsylvania over NYCRR, Lansing

The large patch and three smaller ones placed July 1966 in the northeast corner of Span four are shown in Figure 4. As in the cases already mentioned, these patches appear sound and in place but have some hollow areas when sounded-out with a hammer. Figure 4 also shows two new areas in the southbound side of the deck, placed in mid-May 1968, by the Lansing DPW. The large patch in Span three appears to have been opened to traffic too soon because it has been depressed by traffic down to the top steel, especially at the south end of the patch. These new patches will continue to be observed for performance, along with the older ones.

Paterson Street over the Kalamazoo River, Kalamazoo

This bridge deck has been extensively patched with Speed Crete since the first three patches were placed in the westbound side of Span four in July 1966. The original three patches appear in good condition except for some small hollow areas (Fig. 5). All four spans were patched further in July 1967 by Kalamazoo DPW, using the original procedure of saw-cutting the perimeter of the patch. Most of these newer patches appear in good condition except those along the transverse joint at Pier two. Figure 5 shows extensive failure and loss of patch along the joint opening. Water entering the joint opening or joint movement, or both, probably has caused the patch to break loose from the substrate.

Northbound I 75 over Huron River Drive, Rockwood

Since the inspection and report of last year (R-646) information was obtained on two locations of Speed Crete patching in Wayne County in 1966. One of these areas, a three-span structure carrying northbound I 75 over the Huron River Drive (S01 of 82191), had been patched extensively with Speed Crete in September 1966, and epoxy mortar in 1967 (Fig. 6). About thirty or so small Speed Crete patches were hand mixed and placed in September 1966 by a Wayne County bridge maintenance crew. Some of these failed and were replaced with epoxy mortar in 1967. All of the patching has been done in the east half of all three spans. It was noticed that this structure vibrates considerably under the heavy truck traffic, making it a difficult test site for any patching material. Many of the Speed Crete patches are holding in place but about one-third of them exhibit cracking and bond loss.

Two longitudinal pavement patches were placed in August 1966 in northbound I 696 under the Warren Avenue structure. About 20 bags of Speed Crete were machine-mixed in a mortar mixer and placed in two long patches for a total of 25 ft, about 3 in. deep and 1 ft wide along a construction joint between the inside and center lanes. These two patches appear to be sound and in place, although longitudinal cracks were noted in the patch surface.

Southbound US 131 over NYCRR, West of Kalamazoo

This last field application was inspected with C. H. Voss, District Engineer, in June 1967, and then patched by the District on August 2, 1967. Two spalled areas had developed in Span two of the southbound structure (X01 of 39014) along a longitudinal construction joint. The spalled areas and the two completed patches are shown in Figure 7. Good preparation and patching procedures were used, in that the patch boundary was saw-cut, loose concrete was chipped away, the area was sandblasted, and the finished patch was sprayed with membrane curing material. The finished patches, at present, are sound and in good condition after one winter.

SUMMARY

Based on the previously described field applications, it appears that a moderate degree of success may be expected from Speed Crete patches if proper procedures of preparation, mixing, placing, and curing are closely followed. Even then, if "down-time" to traffic was no factor, it is not anticipated that a good Speed Crete patch would last as long as a good portland cement mortar patch with equal preparation and curing. It would appear that the primary potential for Speed Crete would be for emergency patching, partial depth, of concrete areas that can only be closed to traffic a few hours. The relatively high cost of \$9.00 to \$10.00 per cu ft of mixture (two bags) makes it just as expensive as some of the currently used epoxy mortar systems. However, it is somewhat simpler than epoxies to use since only water and occasionally, small amounts of fine gravel are added to the packaged product.

The Illinois Division of Highways has been evaluating and using Speed Crete since 1965 and recently has given limited approval for its specialized usage. John E. Burke, Engineer of Research and Development, recently summarized Illinois' status on Speed Crete in his letter of April 25, 1968 to you. Mr. Burke stated that as a result of laboratory studies finished in February 1968, and generally favorable results of field usage in 1966 and 1967, they have "... recommended that Speed Crete be approved for use where the benefits accruing from its use would justify its relatively high cost."

It would appear that Speed Crete could be used to advantage for emergency repair of areas critical to traffic flow, as an alternate system to epoxy mortar

patching. Longer-lasting patches of epoxy mortar may be expected, however, in some bridge deck spall repair problems where unusual vibration and flexing is involved.

If the specialized usage of Speed Crete by District Maintenance forces is approved, it is suggested that a detailed usage specification be prepared and that a record be kept of all field applications for continued observations.

TESTING AND RESEARCH DIVISION



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MGB:sjt



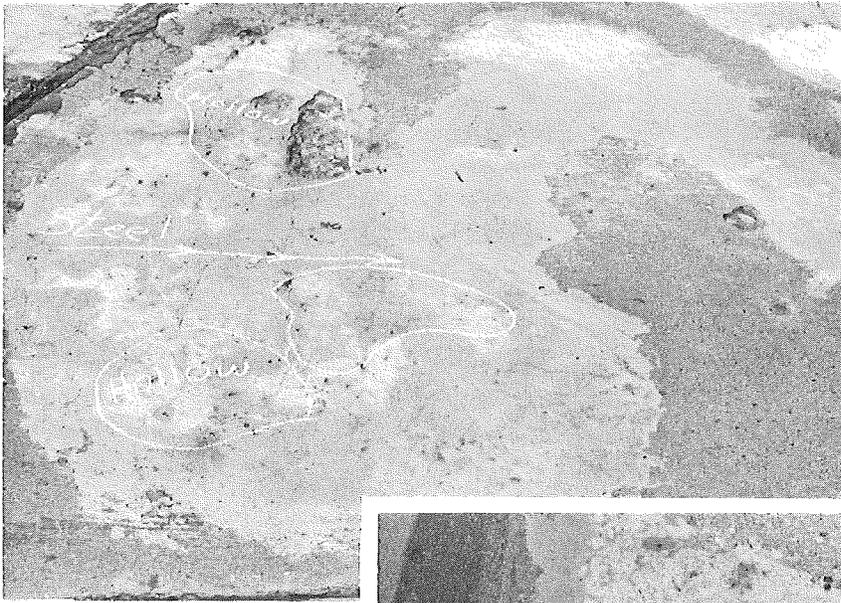
Figure 1 (left). Full-depth pavement patch in NB US 23 BR, Ann Arbor, showing extensive cracking around perimeter of patch (placed mid-April, 1966).



▲ (placed September, 1966).

◀ Extensive cracking near edge over hollow area in original patch (placed early April, 1966).

Figure 2 (above). Sidewalk patches in front of Gladmer Theater in Lansing.



Large patch in NW corner of Span 3. Note broken piece, cracking over steel, and hollow areas.

Patch at centerline of Span 1. Note fine cracking over steel.



Deep patch over lapped re-bars near east curb, Span 3.

Figure 3. Test patches in structure carrying NB US 127 over NYCRR near Jackson (placed mid-May, 1966).

Original patches in NE corner, Span 4 (placed late July, 1966). Small patch (upper left) breaking out, new spalled areas north of large patch.



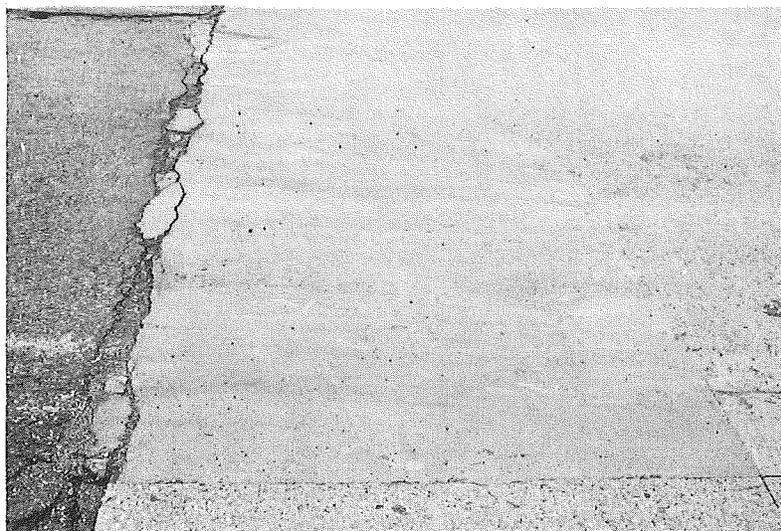
New patches in SW corner, Span 4 (placed May, 1968).

Large patch in NW corner, Span 3, shows shallow area and exposed steel near south end of patch (placed May, 1968).



Figure 4. Patches in structure carrying S. Pennsylvania over NYCRR, Lansing

Original patch with hollow areas outlined (placed late July, 1966). Newer patches above and to the right (placed July, 1967). Span 4, west end.



▲ Patch at east abutment has hollow areas adjacent to joint at left (placed July, 1967).

Extensive failure of patches at joint over Pier 2. Hollow areas outlined.

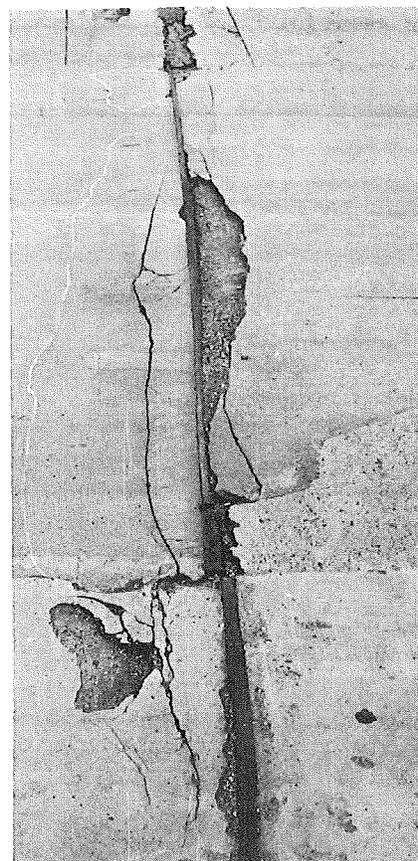


Figure 5. Patches in Paterson St. bridge over the Kalamazoo River, Kalamazoo (placed July, 1966 and July, 1967).

Light patches are Speed
Crete, others are epoxy
mortar and cold patch,
Span 3.



SE corner, Span 2.



Figure 6 (left and above). Patches in
deck of NB I 75 over Huron River Dr.,
Rockwood (placed Sept., 1966).



After one winter, mem-
brane curing still vis-
ible.

Typical spalling over lap-
ped re-bars, Span 2.

Figure 7 (right and above). US 131 over
the NYCRR west of Kalamazoo (placed
August, 1967).

