

OFFICE MEMORANDUM



MICHIGAN

STATE HIGHWAY DEPARTMENT

December 7, 1966

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

From: H. L. Patterson

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Subject: "Parlon" Based Curing and Sealing Compound: First Progress Report.
Research Project 63 NM-96. Research Report No. R-617.

The purpose of this project was to test and evaluate a new material that would serve both as a concrete curing compound, and as a sealant to protect concrete decks poured in late fall from ice removal salts. Two bridges were selected by the Office of Construction for evaluation of this new material--S27 of 63174A (Nine Mile Rd over I 75) as authorized by Recommendation 6F dated November 9, 1965, and S24 of 63174A (John R. over I 75) as authorized in a letter dated December 23, 1965, from P. A. Nordgren to C. B. Laird. The authorization also included a suggested basis for comparison, furnishing field test information to supplement or confirm laboratory data being accumulated under Research Project 63 NM-96.

A product named "Euco" Clear or White Pigmented Floor Coat, supplied by the Euclid Chemical Company, Cleveland, Ohio, was used as the deck curing and anti-scaling compound on these projects. The principal component in Euco is a chlorinated rubber epoxy compound called "Parlon" manufactured by Hercules, Inc. "Tri-Kote," a product manufactured by the T. K. Products Co. of Minneapolis, Minnesota, also uses Parlon in their curing and sealing compound. The Tri-Kote material actually initiated the subject research project, but Euco was more easily supplied for the two bridges. On the basis of Laboratory tests, Tri-Kote and Euco appear almost identical in composition. Both Tri-Kote and Euco clear and white materials are made to meet Federal Specification TT-C-00800, Types I and II, with only 18- and 25-percent solids, respectively.

Although physical properties of clear membrane curing compounds vary considerably, a comparison of clear Euco with a clear membrane curing compound manufactured by Murphy-Phoenix showed the following. There are 18.7-percent non-volatiles by weight in Euco while the non-volatiles in the clear membrane curing compound averaged about 46 percent. In moisture retention, the Euco lost 0.044 g of moisture per sq cm compared with an average of 0.018 for the clear membrane curing compound.

Description of Test Bridges

The two I 75 bridges selected for application and evaluation were both in Royal Oak. They are very similar and have the following features in common: four spans on a skew, concrete decks on steel stringers, and composite interior spans and non-composite end spans. Both have end spans cantilevered over the outside piers, and interior spans simply supported on the center pier at one end and suspended from the cantilever at the other. The Laboratory's inspection party on September 9, 1966, included H. L. Patterson, D. T. DeLoach, and M. R. Hargreaves.

Nine Mile Rd Bridge--White Euco vs. Linseed Oil

On the Nine Mile Rd structure, the concrete deck was poured in late November 1965. Ten deck pours were sprayed with the white Euco compound at about 200 sq ft per gal the same day that they were cast, five were sprayed with the white compound the day after they were cast (Pours B, G, J, K, M), and one was sealed with a linseed oil-white gas mixture after curing with insulation blankets and tarpaulins (Pour D). The other pours were also protected with insulation blankets and tarpaulins at all times until they were cured. Sidewalk pours were sprayed with clear Euco. Ian H. Brown, Jr., Project Engineer, reported in his letter of December 15, 1965, to P. A. Nordgren that the temperature at the time the concrete was poured was about 40 F, necessitating the use of heated concrete. He also said that the white Euco compound was easy to apply, covered well and dried rapidly, and formed a tough durable finish, but seemed to attack rubber and neoprene. This bridge was opened to traffic January 6, 1966.

At the time of the September 9 inspection the white Euco compound was still slightly visible along the shoulder portion of the roadway. There were a few popouts scattered about the bridge deck, and a small amount of scale on Span 4, but the most prominent blemishes were several peculiar, well defined cracks. They were peculiar in that they were confined to their pours and apparently did not cross construction joints into adjacent pours. This would seem to indicate that they were plastic shrinkage cracks, and were not caused by live loading of the bridge. Upon inspecting the underside of the bridge, we noticed that most of these cracks were full depth, and heavy salt stains had accumulated on the concrete at the cracks.

John R. Bridge--Clear Euco vs. Linseed Oil

On the John R. bridge, the concrete deck was poured in late December 1965. George Lawrence, field inspector, said that the concrete mix was preheated

before pouring and then cured under cold weather insulation blankets and tarpaulins. He also recalled that the deck was sealed on the east or northbound side (roadway, curb, and walk) with a boiled linseed oil and naphtha mixture, and on the west or southbound side with a clear Euco compound. The linseed oil-naphtha mix was applied in two coats. The first was put down on February 15, 1966, at the rate of 125 sq ft per gal. The air temperature was 30 F in the morning and 42 F in the afternoon. The second was applied on February 16, 1966 at the rate of 100 sq ft per gal, when the air temperature was 32 F in the morning and 39 F in the afternoon. The clear Euco compound was also applied on February 16, at the rate of 219 sq ft per gal. Mr. Lawrence said both the naphtha and the Euco compound attacked the hot-poured rubber-asphalt in the joints and caused them to leak. Rust stains were visible on the underside of the construction joint over the center pier. How water leaked past the 8-in. copper waterstop is not clear. This bridge was opened to traffic on February 24, 1966.

Upon inspection, we found the clear Euco compound and the linseed oil sealing coats still present and clearly visible on the shoulder portion of the roadway. The linseed oil was present as a dirty, gummy scum. Possibly some of the linseed oil-naphtha mixture drained off the crown and puddled at the shoulder, causing a heavier concentration than originally applied. There probably would have been a greater degree of penetration if the temperature had been higher. There were a few cracks in the sidewalk, but none were visible on the top of the slab. However, from underneath the deck several obscure hairline cracks were visible upon close inspection. None of these cracks showed any salt stains, possibly for one of three reasons: they did not go through the entire thickness of the slab, they went through the slab but were sealed at the surface, or they were not exposed long enough to winter conditions due to the late opening date of the bridge to traffic. A couple cases of light scale were also noted to be developing, but this was not significant.

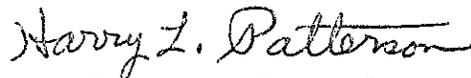
Conclusion

The two bridge decks described have not been exposed to sufficient winter weather to cause any appreciable weathering damage, so it is impossible at present to make any objective comparison between the performance of the linseed oil and the Parlon-based Euco compounds. However, another inspection in April or May of 1967 should reveal more information.

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Very recently, the Office of Construction picked a third field structure for comparison of both clear and white Euco materials with conventional white compounds--S10 of 82252L, carrying Eight Mile Rd over I 75. Details of application and the first inspection will be reported early next spring. Treatment was described in Authorization 55F, dated October 3, 1966.

OFFICE OF TESTING AND RESEARCH



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HLP:jk

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