R-387

OFFICE MEMORANDUM

MICHIGAN
STATE HIGHWAY DEPARTMENT
JOHN C. MACKIE, COMMISSIONER

June 25, 1962

To: Traffic Control Devices Committee

From: A. J. Permoda, Chairman
Traffic Paint Subcommittee

Subject: Evaluation of Initial Striping on Concrete Pavements: 1960 Tests. Research Project R-47 G-36(13a) and New Materials Committee Project 60 NM-23. Report No. R-387.

Premature deterioration of some initial applications of white and yellow traffic paint striping on new concrete pavements was discussed at meetings of the Traffic Control Devices Committee on March 9 and July 15, 1960, and also at meetings of the Committee for the Investigation of New Materials on July 19 and September 19, 1960. The consensus at these meetings was that failure could be attributed to the concrete curing compound and to alkaline or "green" concrete. A typical example of the observed preferential failure of white paint in white-black striping is shown in Fig. 1.

Investigation of this subject was then assigned to the Research Laboratory Division and the Traffic Paint Subcommittee. In compliance, a field test was initiated on November 14, 1960, as covered by progress reports of November 15 and 21, 1960, on new concrete of US 23 at Whitmore Lake, to evaluate the following corrective measures for the suspected causes:

1. Removal of concrete curing compound by power wire-brushing before stripe application, and

2. Additional effect of the following pretreatments on wire-brushed concrete prior to stripe application:

   a. Neutralizing concrete alkalinity by phosphoric acid diluted in methanol.

   b. Applying water-repellent barrier film of silicone diluted in hydrocarbon solvent.

   c. Applying alkali-resistant sealer of acrylic lacquer.

These treatments, interspersed with control sections with no brushing or pretreatment, were striped using highway equipment on November 14, 1960, as outlined in Fig. 4. Subsequently, several inspections of the test striping were made, ending with an inspection on January 11, 1962, when all striping was still in good condition after 14 months of service.

Summary

In E. A. Finney's letter to W. W. McLaughlin of February 20, 1962, regarding the effect of concrete curing compound on pavement marking paint, it was stated that from past observations we would estimate that about 75 percent of initial striping on new concrete has a normal service-life, while the remaining 25 percent is short-lived.

As might be expected, the new US 23 concrete selected for the striping tests happened to fall in the former category. Control sections of the test striping, deposited in the standard way without prior brushing or treatment of the concrete, were still in good condition after 14 months of service (Fig. 2). Striping adjoining these control areas, but placed on various test combinations of wire-brushed and pretreated concrete, was in equivalent but not better condition after 14 months of service. An explanation is that wire-brushing and pretreating of concrete are intended to improve the bonding of striping to concrete, but if the bond is adequate then both wire brushing and pretreating are superfluous.

The condition of test striping placed over the longitudinal joint on wire-brushed and silicone-pretreated concrete, after 14 months of service, is shown in Fig. 3. Stripe erosion first occurred here in a narrow belt adjoining the joint.

Conclusions

The US 23 tests show that:

1. Some initial striping on new concrete roadways does have a normal service life.

2. Striping applied over the center longitudinal joint is likely to fail first in a narrow belt along this joint.

3. Because the new concrete roadway selected for these tests happened to fall into Category 1 above, these tests did not show the reasons and subsequently point to possible solutions for correcting the occasional premature failures of initial striping on new concrete that have been observed generally to be preferentially confined to white paint in white-and-black skip striping. This failure, however, must be due to some innately poorer ability of white paint to stick to newly cured or green concrete. It is believed that unneutralized alkali in new concrete, flaky or chalky concrete curing compound, and application under unfavorable weather condition or on dew-moistened or dusty roadways contribute to the observed striping failures.

Recommendations

Since only a small proportion of initial striping on concrete roadways is known to fail prematurely, the Subcommittee does not recommend repeating this type of test

at this time, because it is not statistically likely that the concrete roadway selected for such test would be conducive to early failure of the test striping.

Additional studies and field tests may be requested if Office of Maintenance surveys show that a significant amount of initial striping on concrete roadways has become short-lived.

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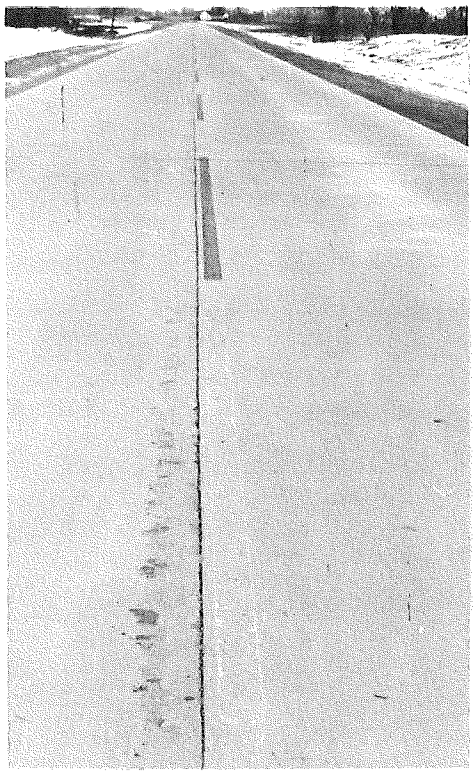

Figure 1. Typical preferential failure of initial white striping on new concrete roadway of M 43 (not in test area).

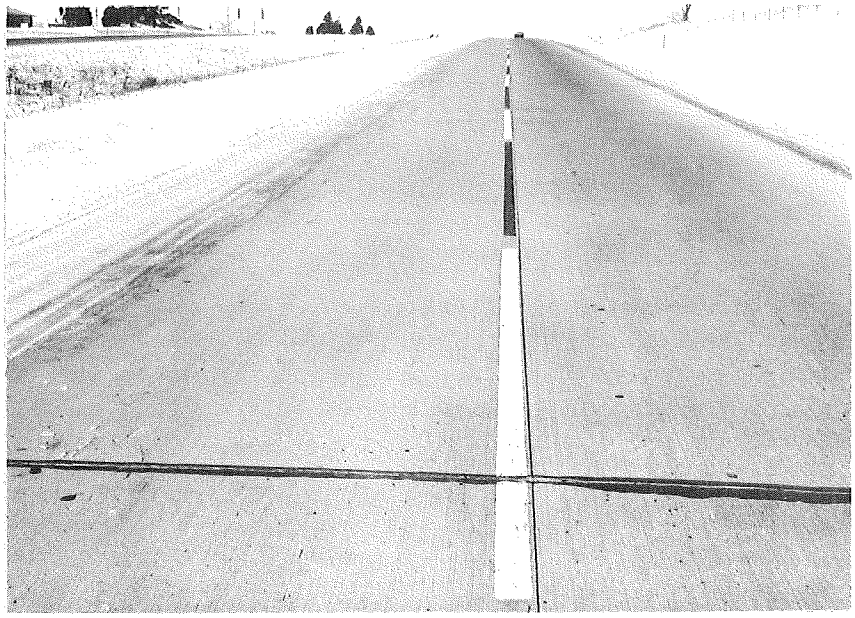

Figure 2. Test initial striping on new concrete (US 23) in good condition after 14 months of service. Area shown is standard striping that received neither brushing nor pretreating before application.

Figure 3. After 14 months of service, this test striping placed at longitudinal centerline shows greatest deterioration over the joint. The area shown was brushed and silicone-pretreated before stripe application.

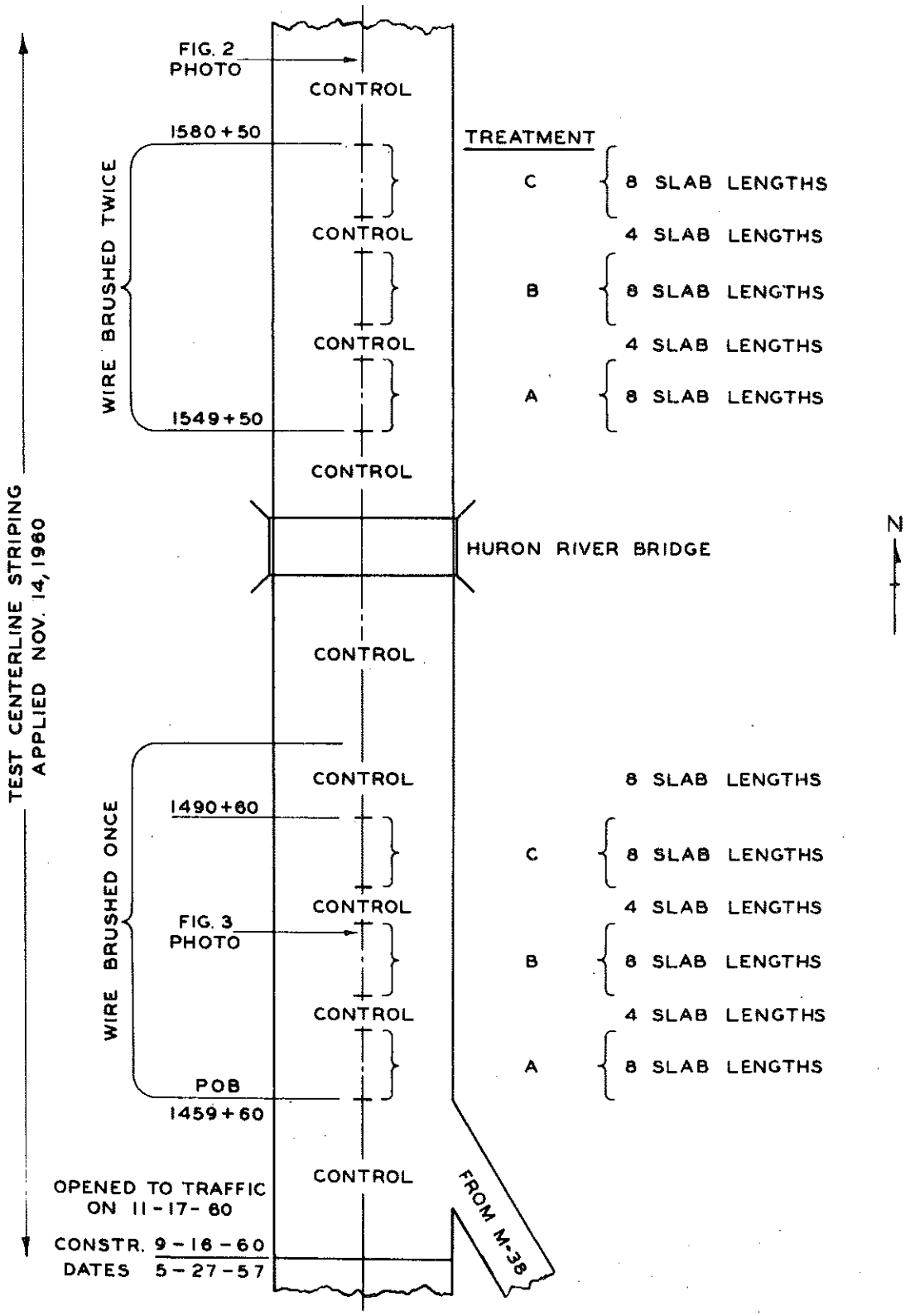

Figure 4. Arrangement of wire-brushed, pretreated, and control section for test striping evaluation on US 23 northbound lane at Whitmore Lake. Pretreatment types: a) concrete alkalinity neutralized by phosphoric acid diluted in methanol, b) water-repellent barrier film of silicone diluted in hydrocarbon solvent, and c) alkali resistant sealer of acrylic lacquer.