

OFFICE MEMORANDUM



MICHIGAN
DEPARTMENT OF STATE HIGHWAYS

April 25, 1966

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To: W. W. McLaughlin
Testing and Research Engineer

From: E. A. Finney

Subject: Review of the Department's Experience with Vinyl Type Coatings for Bridge Structural Steel. Research Project 49 G-50. Research Report No. R-580.

The following review was compiled by A. J. Permoda in accordance with your request, and J. E. Meyer's prior memorandum of March 14, 1966.

While the Office of Testing and Research has been evaluating coatings for structural steel for over 30 years, for several reasons it did not study vinyl coatings intensively in the early years of this program. In the first place, suppliers of coatings for the Department program rarely favored or furnished vinyls for evaluation, partly because of a general disinterest by most Highway Departments. Secondly, our own earlier program recognized two shortcomings of the vinyls: a) low dry film thickness of an applied coat, and b) requiring application by spray equipment.

In the late 1950's, several occurrences caused us to increase our interest in vinyl coatings. These were: a) the Department's study relative to revising specifications to permit field application of paint by spray equipment, b) a proprietary vinyl system (all coats vinyl) which earned a good performance rating in Laboratory screening tests, and c) H. E. Hill's calling attention to the U. S. Army Corps of Engineers' use of a vinyl coating system on Mississippi River dam gates.

As a result of these developments, the following field studies were initiated to assess the merits of vinyl coatings on bridge structural steel:

1. In 1960, two bridges on relocated M 78 near Durand were coated with 12 test coating systems, two of which included vinyl paints, to determine their comparative performance using a standard Department system for control purposes. These coatings remain under observation, as described in the sixth progress report on our long-term study of protective coatings (Research Report No. R-524, dated June 23, 1965).
2. In 1964, the Elm Road grade separation over I 94 north of Jackson was maintenance repainted with an all-vinyl system. Project Engineer J. N. McCowan's construction history and your memorandum to P. A. Nordgren dated February 12, 1965 reported the difficulty encountered in spray application which produced a rough and a variable-shaded appearance noticeable in the topcoat at that time. The coating system

remains under observation. The latest inspection, made March 17, 1966, showed an apparent improvement in appearance of the topcoat, but initial rusting was visible in girder areas, where field connected.

3. In 1965, vinyl coating specifications were revised to minimize the undesirable qualities experienced on the Elm Road structure. The revised specifications were required for structures in two separate areas:

a. The Burns Ave. grade separation over I 94 in Detroit which was being maintenance repainted; a vinyl-alkyd topcoat was specified, experimentally, since it could be brush applied.

b. Three new structures over US 127 near Mason were to evaluate three test paint systems, including an all-vinyl system, an inorganic-zinc primer overcoated with vinyl, and the standard Department system as a control. Here, all the vinyl paints were to be spray applied.

Our experience on these 1965 test structures was unfortunate since not one was completed. All went through the winter under various stages of incomplete painting. The Burns Ave. structure span over eastbound I 94 had only the field-applied double prime coat of gray vinyl which rusted badly as shown in Figure 1. The new US 127 structures, having only the shop-applied double prime coat of white vinyl, are in considerably better condition although they also show some rusting.

4. In 1966, five new structures over US 27 near Grayling are scheduled to be test painted using several proprietary zinc-rich primers, overcoated with vinyls, plus the standard Department system as a control.

The coating systems are again based on revised specifications, embodying expected improvements based on prior experience with the vinyls. In our tests, the vinyl primer has proved deficient in rust inhibition, as shown by comparing Figures 1 and 2, and probably for this reason California now specifies a zinc primer-vinyl topcoat paint system on coastal structures (similar to that mentioned above), rather than an all-vinyl system.

Summary

For about the last seven years, the Department has accelerated its program to evaluate the merits of vinyl paints as coatings for highway structural steel.

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To date, the results have not always been heartening. This was to be expected, since we did not have much prior experience in formulation and application techniques to allow optimum exploitation. Field tests set up during this interim have indicated that the tested vinyls, similar to Corps of Engineers' specifications, are not superior rust-inhibiting primers for bridge structural steel. Current tests will determine the merits of the vinyls as topcoats over primers of the zinc-rich type, comprising a system similar to that currently being favored by the California Division of Highways for its coastal structures.

OFFICE OF TESTING AND RESEARCH



E. A. Finney, Director
Research Laboratory Division

EAF:AJP:jcb

cc: H. E. Hill
J. E. Meyer
C. B. Laird
H. J. Rathfoot ✓

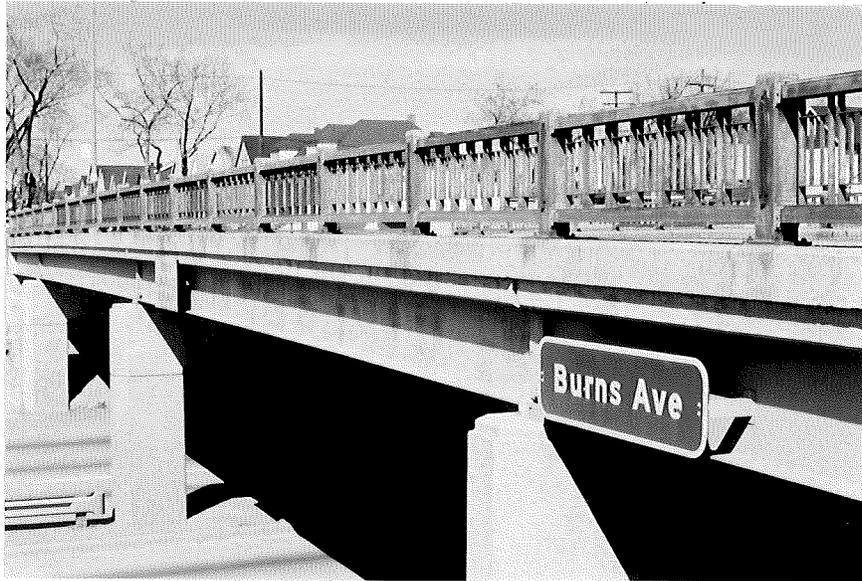


Figure 1. Double-applied primer coat of gray vinyl shows bad rusting on Burns Ave. span over eastbound I 94, after one winter of service in Detroit area. Adjoining spans, having additional coats of vinyls, gave adequate protection to the sand blasted steel beams (Photographed 3-15-66).

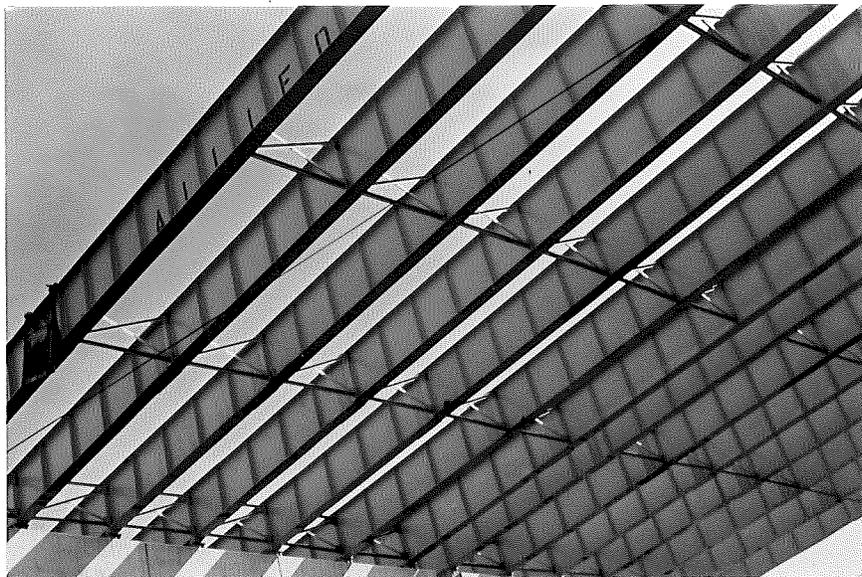


Figure 2. Primer coat of MDSH No. 1A (1) red primer on Rouge River bridge (I 75), after one winter of service shows no gross rusting of blast-cleaned steel beams (Photographed 3-2-66).