

SEVENTH PROGRESS REPORT ON SPECIAL TEST PAINTING  
ON M 78 BRIDGE STRUCTURAL STEEL

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MICHIGAN DEPARTMENT OF STATE HIGHWAYS

SEVENTH PROGRESS REPORT ON SPECIAL TEST PAINTING  
ON M 78 BRIDGE STRUCTURAL STEEL

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Research Laboratory Section  
Testing and Research Division  
Research Project 49 G-50(4)  
Research Report No. R-661

State of Michigan  
Department of State Highways  
Lansing, December 1967

# OFFICE MEMORANDUM



MICHIGAN  
DEPARTMENT OF STATE HIGHWAYS

January 1, 1968

To: R. L. Greenman  
Testing and Research Engineer

From: L. T. Oehler

**Subject:** Seventh Progress Report on Special Test Painting on M 78 Bridge Structural Steel under Research Project 49 G-50(4); Research Report No. R-661.

A fifth inspection was made covering the performance of 12 selected paint systems applied in 1960 on steel deck girders of two bridges on relocated M 78 near Durand. The preceding inspection was covered in Research Report No. R-524, dated June 23, 1965. The following is A. J. Permoda's report:

For review purposes, the subject tests were established to determine the following:

1. The comparative performance of other recommended paint systems against the Department's standard, based on red lead-linseed oil undercoats.
2. The comparative performance of the Department's standard system on hand-cleaned versus blast-cleaned steel.
3. The comparative performance of the above paint systems versus a hot-dip galvanized coating.

Note: To remove some important variables from consideration in the tests all coating systems were applied, (a) on two bridges in the same area, (b) to a 5 mil dry thickness, (c) on blast-cleaned steel, mostly, to not penalize those based on fast-drying undercoats, and (d) all except the galvanizing were finish coated with Aluminum Paint to eliminate color differences.

Laboratory personnel made the inspection of the M 71 grade separation with S. M. Cardone of Maintenance Division on November 18, 1966, and of the Shiawassee River bridge on December 5, 1967 with the help of District personnel and equipment. Comments regarding the performance of the coating systems on the two bridges are summarized by them, as follows:

M 71 Bridge over M 78. The four span, 2 lane structure was divided at the longitudinal centerline to provide 8 test areas, each with a different coating system.

Observations after 6 years coatings service show that:

1. All have deteriorated in the joint area, to an extent that is probably dependent on the leakage in the area, Figures 1 and 2: The paint coatings exhibit red rusting while the galvanized coating shows white rusting.

2. All, except the galvanizing, now show minor, spotty rusting on edges of lower flanges of beams, Figure 3.

3. On blast-cleaned steel, two of the paint coatings show gross, spotty failure, (a) the two-package epoxy system has progressively larger blister failure on fascia beam (see photo in previous report) and (b) the one-package zinc rich primed system shows initial blistering and rusting on lower flange of an interior beam. The other four paint systems, including the Department's control, are performing satisfactorily and are still rated as equals.

4. The Department's control paint system is beginning to show more failure on hand-cleaned than on blast-cleaned steel (confined to lower flange area).

5. The galvanized coating shows no red rusting and localized minor white rusting. Though probably superior, at this stage it is difficult to rate it against the paint systems.

M 78 Bridge over Shiawassee River. The three span, 4 lane divided structure, provides 6 distinct test areas, each with a different paint system. All steel was blast-cleaned before painting. Observations after 7 years coatings' service shows slightly better performance, generally, than on M 71 structure. This is probably due to, (a) locking of joints over central piers, allowing only insignificant spotty leakage, and (b) in line with other observations, paints on river bridges are often more durable than on highway grade separations.

On performance to-date, the paint systems were rated as follows:

1. Best systems were 1 and 6; the former was based on the Department's control system, while the latter was based on a two-package zinc primer plus a vinyl alkyd intermediate coat and an aluminum topcoat.

2. System No. 2, based on undercoats containing a basic lead silico chromate pigment in a linseed oil-alkyd vehicle, rated a close second.

3. System No. 3, based on an epoxy-ester binder, was rated a poor third, because of initial freckle failure extending over all portions of the steel mainly in the center pier area.

4. Systems 4 and 5 were rated as unsatisfactory, mainly because of bad bleeding and discoloration of the aluminum topcoat, as shown in photo of previous report. The bleeding is probably due to undercuring of the high-build bituminous intermediate coat before application of the topcoat in fall weather, when the painting was done. Both systems utilized a proprietary bituminous intermediate coat and an aluminum topcoat recommended and furnished by the same producer. However, both systems have given excellent anti-rust protection to the steel.

The subject tests continue to provide the Department with information on the performance of the selected coating systems, on structural steel, and reasons for their deterioration. The tests will be followed by continuing inspections, which will be reported.

TESTING AND RESEARCH DIVISION

*L. T. Oehler*

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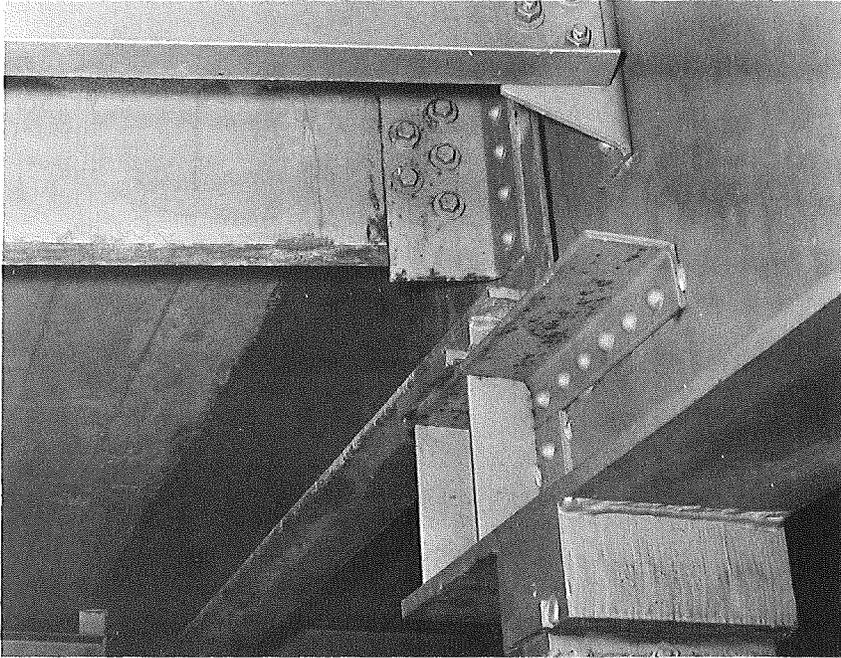


Figure 1. (left) Progressive coatings' failure in joint area after 6 years service. Photo over N pier, shows 2 package epoxy primed system in foreground and zinc rich primed system in background.

Figure 2. (below) Very minor coatings' deterioration is just beginning to appear in joint area (construction joint, non-opening) over center pier. Photo shows systems 3 and 4 in foreground and systems 5 and 6 in background.

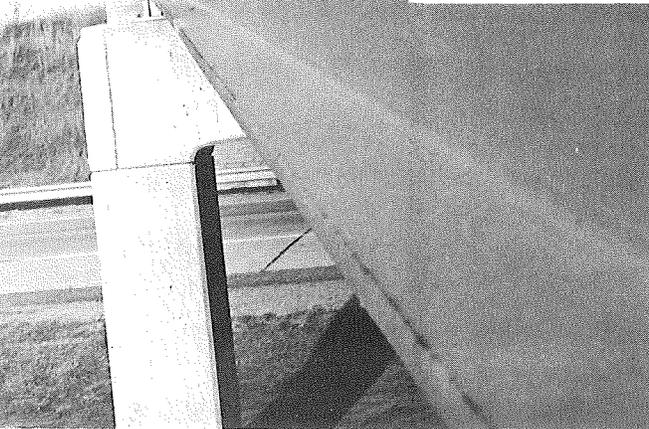
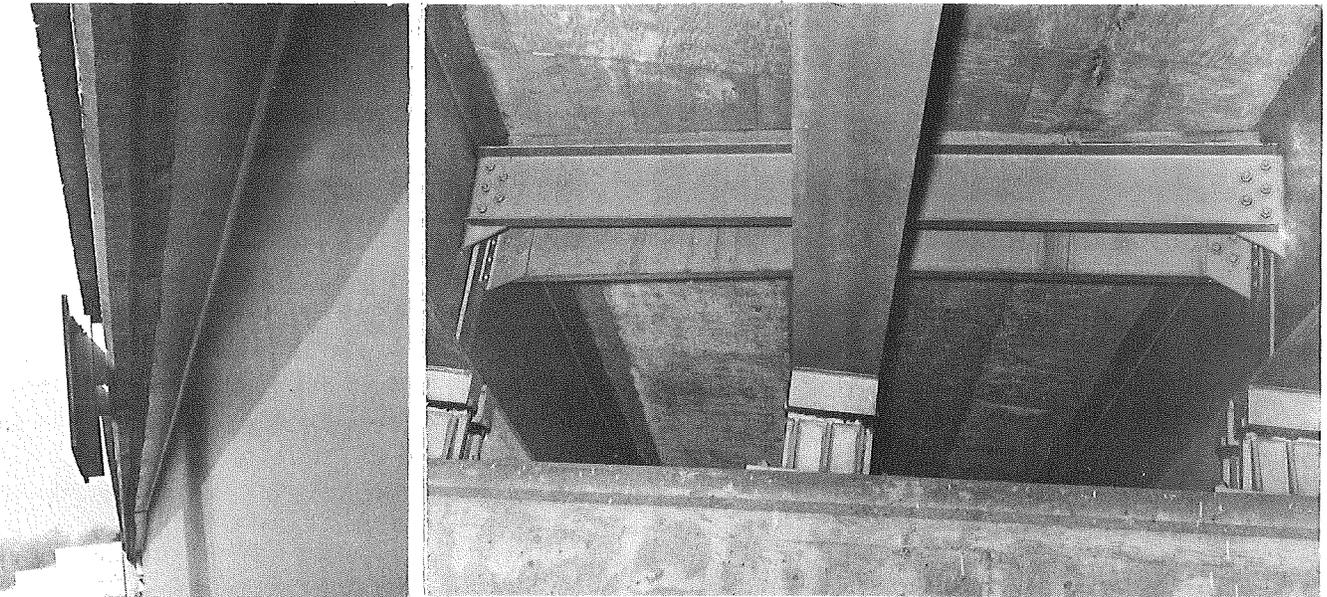


Figure 3. (left) Minor and spotty coatings' failure on sharp edges of lower flanges is present, but has progressed only moderately. Remainder of surface is in good condition. Photo shows facia of system 4 based on a SSPC primer containing red lead and fractionated linseed oil.