

OFFICE MEMORANDUM

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MICHIGAN

STATE HIGHWAY DEPARTMENT

JOHN C. MACKIE, COMMISSIONER

May 25, 1964

To: W. W. McLaughlin
Testing and Research Engineer

From: E. A. Finney

Subject: Fifth Progress Report on Special Painting of Steel Bridge Girders Under Project "Bridges and Bridge Railings--Construction and Maintenance." Research Project R-49 G-50(4). Research Report No. R-460.

A third field inspection has been completed in a program of performance observations of 12 special paint systems applied to steel deck girders of two bridges on relocated M 78 near Durand. The previous inspection was reported in a memorandum dated November 2, 1962.

Laboratory personnel made this inspection on February 25, 1964, assisted by J. Badalucco of the Office of Maintenance (Fig. 1). They report that after about 3-1/4 years of service the test coatings were generally in fair to good condition and did not show significant deterioration except in the following areas:

1. Incipient failures appearing along the sharp corners of some of the beams' lower flanges have not worsened significantly since the last inspection and report. The reason for this is not known. It may be due to the blast cleaning of the steel, the wash-priming, the heavier 5-mil thickness of the coating systems, or a combination of these factors.
2. Significant and increased deterioration was present under the deck transverse joints since the sealer has progressively failed in performing its function, especially outside the roadway tire tracks. Leakage through the joints has significantly corroded the ends of most girders, some diaphragms, and most pier bearings. A complication from this is that the leakage has collected on the bottom surface of lower flanges, run down the slope of the girders (sometimes nearly their full length) before dripping off, and has left an increasing accumulation of salts in its wake as the moisture evaporates (Fig. 2).
3. It is noteworthy that no significant coating deterioration had yet appeared at the juncture of the top flange of steel girders and the bottom of concrete decks. This is undoubtedly due to total absence of concrete deck cracking in these two test bridges, and hence no leakage into these areas.

After 3-1/4 years of service it is difficult to assess the test coatings on a rating scale although the following specific comments may be made relative to their performance to date:

1. The two zinc-rich primed systems (one on each bridge) showed no corrosion on beam edges though a few small blisters and bare spots were appearing in these areas, complicated by the joint leakage previously mentioned.
2. The galvanized coating on the M 71 overpass, especially on the fascia beam, showed a few small 1/4-in. nodules, but no base corrosion. These nodules probably resulted from a reaction with cement drippings or from flux inclusions concentrated near the overlap of the double-dip during galvanizing of the beams. White rust has appeared on the bottom face of the lower flange of beams, due to the joint leakage.
3. The tar enamel intermediate coat of Systems 4 and 5 on the Shiawassee River bridge showed increased bleeding and objectionable discoloration of the top-coat, especially on interior beams (Fig. 2). The fascias showed significantly less bleeding, but did show increased distress from cracking and alligating. However, this system showed almost no corrosion on beam edges.
4. No other unusual behavior was noticed for the remaining systems.

Summary

Based on current and past inspections, the preselected test coating systems are giving better-than-average performance after 3-1/4 years of field service on structural steel of the two test bridges (Figs. 1 and 3). This is probably due to the blast cleaning of the steel and to the four-coat, 5-mil thickness of the coating systems. No definite superiority was yet apparent for any of the 12 test coating systems, although the system employing the tar enamel appears to be undesirable from the standpoint of discoloration.

With the possible exception of the galvanized coating, which probably could not be specified as a standard system because of practical limitations, none of the test coating systems appears capable of giving anything beyond a projected 10-to-15 year service life, because of concentrated deterioration resulting from a) leakage at the transverse joints, and b) thin coating thickness and scaffold damage at sharp corners of lower flanges of the beams. Expected coating failure at the juncture of the top flange of the beam and the bottom of the concrete deck has not yet appeared on these test bridges because of a total absence of concrete deck cracking after 3-1/4 years of service.



Figure 1. Condition of bridge coatings inspected using Office of Maintenance Strato-Bucket on M 71 over M 78.



Figure 2. Area of east pier on westbound lanes of Shiawassee River bridge, showing salt deposits on lower flange of beams, with discoloration of System 4 coating on interior beams in background.

Figure 3. Good condition of test coatings on most steel after 3-1/4 years of service on westbound Shiawassee River bridge.