

OFFICE MEMORANDUM



MICHIGAN
DEPARTMENT OF STATE HIGHWAYS

November 26, 1969

To: L. T. Oehler, Engineer of Research
Research Laboratory Section

From: A. J. Permoda

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Subject: Aluminum-Coated (Hot Dipped) Bolts for Bridge Railing Posts. Research Project 60 NM-27, (60 G-102). Report No. R-722.

At the September 19, 1960 meeting, the Committee on New Materials inspected an aluminum-coated bolt submitted by the Bethlehem Steel Co. The bolt was coated by a newly perfected hot-dip process, bearing a "Bethalume" trade name. The bolt was referred to the Research Laboratory for screening evaluation and comments.

Since no reliable laboratory evaluation tests are available for metallic coatings, it was decided to obtain several bolt samples from the producer and conduct a field installation test. Four bolts were so obtained bearing about 0.4 oz aluminum per sq ft (roughly equivalent in thickness to 1.1 oz zinc per sq ft of surface). With the cooperation of G. E. Fagg, Project Engineer, these were installed on the Willow Hwy bridge over I 96 W of Lansing in October 1961. These were installed, one per corner post, with a different relative position on each post (Fig. 1). Unfortunately, the comparison bolts were standard cadmium-plated bolts (indicated thickness less than 0.2 mils) with a poor history of protection.

An inspection after four years of service showed that about half of the cadmium coating was weathered away on the comparison bolts, while the aluminum-coated test bolts showed no loss to the point of rusting. After eight years the cadmium coating was essentially weathered away on the bolt assemblies, while the aluminum-coated bolts showed only initial minor loss of protection (rusting) as shown in Figures 2 and 3.

The continuing performance of the test bolts will be observed.

Recommendations

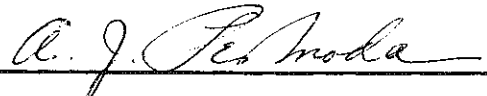
The aluminum-coated test bolts (at listed thickness) have given eight years of virtually rust-free performance and have proved superior to comparison cadmium-plated post bolts, and should be used in preference to the latter in specifications.

The relative performance of the aluminum coating versus galvanizing (also used for post bolts) is being evaluated on chain-link fencing and will be reported subsequently under Research Project 61 NM-33.

Reference

A cognate report covering cadmium-plated bolts in several end-uses was issued in September 1963, under Research Project 63 G-130, Report No. R-433.

TESTING AND RESEARCH DIVISION

A handwritten signature in cursive script, reading "A. J. Permoda", is written over a horizontal line.

Supervisor - Materials Research Unit
Research Laboratory Section

AJP:sjt

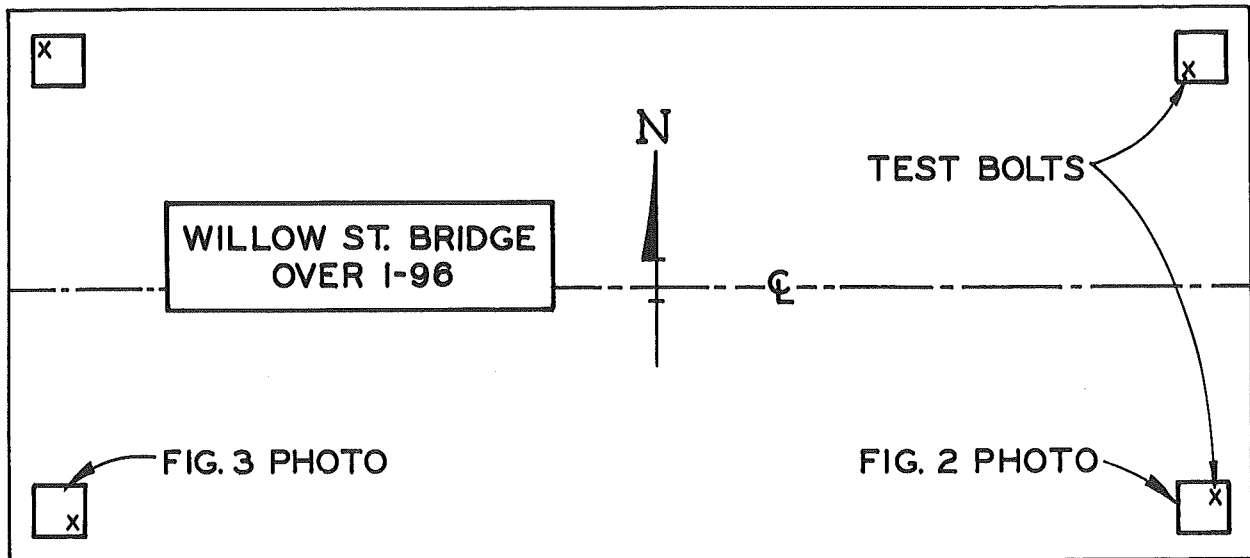


Figure 1. Sketch shows placement of 4 test aluminum-coated bolts on railing corner posts of Willow Hwy bridge.

Figure 2. Appearance of bolts on SE post after 8 yrs of service shows almost complete loss of cadmium plating on 2 right assemblies, except for thread tops, and almost no loss on aluminum-coated bolt (left front).

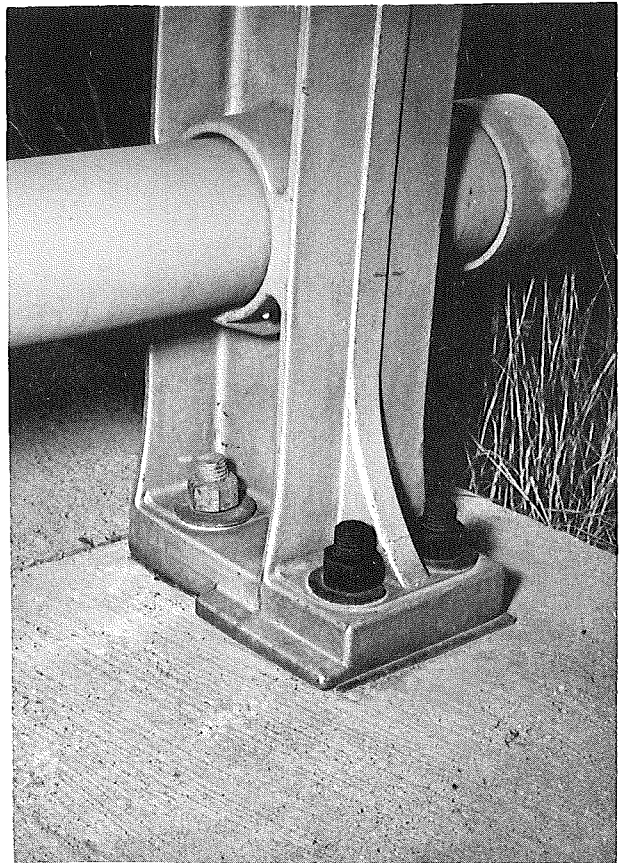


Figure 3. Appearance of bolts on SW post after 8 yrs of service shows complete loss of cadmium plating on 2 front assemblies and almost no loss on aluminum-coated bolt (left rear).

