Serving Michigan's technical highway needs for over 70 years

MATES

MATERIALS AND TECHNOLOGY ENGINEERING AND SCIENCE

Published by the Materials and Technology Division of the Michigan Department of Transportation

Issue No. 3 **January 1987**

BRIDGE PAINTING — WHY THE NEED TO CHANGE?

Over the years, many people have come to believe that specification changes are made for the poorest of reasons. "After all, it's the job of researchers to change specs; no changes, no job!" With this perception it is easy to understand many people's frustration in having to contend with new specifications. This notion, coupled with the idea that, "If it ain't broke, don't fix it." has led to many misunderstandings.

Recently, a meeting was held between M&T representatives and District 5 personnel to discuss problems related to bridge painting and the rationale behind the new specifications. The problems with the old system were explained and the reasons for the 'new' painting system were discussed. Many people simply didn't realize that the old system was not only 'broke' but it wasn't 'fixable.' They also didn't realize that there were many compelling reasons for choosing the current system, and that as with any change, there is a learning process that one must go through to achieve maximum performance. Once all this was discussed the 'new' painting specification pill was much easier to swallow.

Another result of the meeting was the suggestion that the information discussed should be disseminated among all the districts (M&T Division personnel will be happy to do this in any district). Some of the basics, however, need to be made available to everyone to apprise them that the recent changes were really necessary. How we arrived at these changes—all of the various successes and problems, such as the unsightly fading problem that has occurred on a number of our vinyl coated structures—is simply too lengthy a topic to be undertaken in this brief article. Thus, the rest of this article will be devoted to highlighting the reasons for the changes.

The old 'red lead' (four-coat red lead alkyd) system was unacceptable for five reasons:

1) It contained lead. Whether in the form of red lead (white lead being the unacceptable form) or not was not the issue; it contains lead and the use of lead nationwide is being discouraged or prohibited.

2) It contained chromate. The problems with chromate are very similar to those of lead.

3) It was deceptively tolerant of specification violations such as inadequate preparation and priming so that, in some cases, long-term system effectiveness was substantially reduced below that of a properly applied system.

4) The system so resembled simple household paint that the inspection process was perceived as being simple; if it looked good, it was good.

5) The system, at best, is not good enough. The maximum possible paint life is about 20 years. The current funding levels allow us to paint a bridge approximately every 100 years.

There are numerous details that are pertinent to each of these five areas, but their description demands the time that only a personal visit or a detailed report can afford.

The 'new' system attempts to address the problems outlined above, and to meet the new requirements. After experimenting with various coating systems, the current system, an epoxy zinc-rich primer, an epoxy intermediate coat, and a urethane topcoat, evolved. This system is used both for coating new bridge steel members in the shop, prior to shipping to the job site, and for repainting existing structures after the old red lead system has been removed. The advantages of the new system are:

1) The new system has displayed substantially improved durability and corrosion protection in laboratory tests and field applications to date have been most satisfactory.

2) Tests indicate that even when poorly applied, the new coating system lasts longer and provides better protection than the corresponding lead-based system.

3) The new system employs a 'time-independent primer' which rapidly stabilizes and does not deteriorate with age, unlike the lead-based system whose primer resin remains chemically active and eventually becomes so brittle that it peels off the structure.

4) The FHWA will now fund only the new generation of coatings developed to replace the red lead system.

5) The cost of the new system is lower on an initial basis and significantly cheaper in the long run on a cost per square foot per year of service basis.

We believe these are strong, valid reasons for adopting the new system and welcome the opportunity to discuss them with every district. At that time we will go into as much detail as necessary to fully explain the necessity of the new specifications.

This article has presented a brief general overview of current improvements in our structural paint systems. In the near future, we will be publishing follow-up articles further explaining the system and its underlying rationale. Meanwhile, we welcome your comments, questions, and suggestions.

-Gary Tinklenberg

A recently published MDOT Research Report, "The Development of Michigan's Bridge Painting Specification," by Gary Tinklenberg goes into some detail on the evolution of the new specs. Upon publication, the report was distributed to the director of the transportation department in each state. Although the report is no substitute for an in-person session, where specific questions can be addressed, it covers the topic in some depth. Copies are available upon request from this Division.

Four three-day paint inspector training schools are being offered by M&T personnel, two during the month of March, and two in April. Should anyone be interested in attending a school, details are available from Sally Walker, Construction Division Training Unit, (517) 335-2254.

WEATHERING STEEL UPDATE

In 1974, a cooperative study was initiated between MDOT and the Bethlehem Steel Corp. to compare weathering steels in an 'urban environment' and an 'urban highway environment' (the steel samples being mounted atop a building in the first instance, and beneath a highway overpass for the second). After 8 years it was decided that the samples weren't performing as expected in the 'urban highway' environment. It was suggested that the 'urban highway environment' samples were in an atypical situation, and that a second eight-year study be conducted with those samples being moved to a more 'typical' situation. This report evaluates the results of the second eight-year study.

The second study essentially validates the first; namely, it concludes that the corrosion rate in the urban highway environment is much greater than in the urban—non-highway—environment, and that corrosion factors vary significantly from one environment to another. Weathering steel should be considered an experimental material. The relationships between corrosion factors (or rates) for boldly exposed steels and other types of exposure (e.g., crevices, sheltered exposure, chloride's effects, time of wetness) are not documented for these steels. Further the effects of corrosion on the engineering properties are not well documented; nor are the effects of mill scale on the type and distribution of corrosive attack. There is a great deal of conflicting opinion in the literature even among producers. These steels should be painted when used in exposures subject to chloride contamination or long time of wetness.

The report confirms the continuation of the moratorium on the use of such steels in the unpainted condition in Michigan.

"Evaluation of Weathering Steel in A Detroit Freeway Environment: Second Eight-Year Study," by Gary L. Tinklenberg (Research Report R-1277)

TECHADVISORIES

The brief information items that follow here are intended to aid MDOT technologists by advising or clarifying, for them, current technical developments, changes or other activities that may affect their technical duties or responsibilities.

GENE CUDNEY

On January 24, Gene Cudney retires after 36 years with the Materials and Technology Division. Gene started as a part-time MSU student employee of the Research Lab, as a Research Aide A1, in 1951. In 1953 he was hired full-time as a Physical Research Engineer. He became the Supervising Engineer of the Structural Design and Stress Analysis group in 1956, head of the Physical Research Unit in 1965, and in 1967 he was appointed Assistant Research Engineer. For the past year, Gene has acted as head of the Instrumentation and Data Systems group. As well as making key contributions to Michigan's pavement and bridge programs, Gene gained national recognition through his service on various committees, perhaps the most significant being as a member and Chairman of the NCHRP Committee on Fatigue of Welded Bridges. In 1968, Gene won the coveted Award of Outstanding Merit from the Transportation Research Board for a paper, "The Effects of Loading on Bridge Life," delivered at the Board's 47th Annual meeting in Washington. The Department is losing a valuable asset and the Division is losing one of its key technologists. His presence and contributions will be sorely missed.

All in our division wish Gene and his wife Lorraine the very best of everything in their retirement.

MARTIN ('MIKE') REEVES

Mike Reeves is retiring this month after 40 years of service with the Department. Mike started in 1946 with the Maintenance Division, where he remained for four years; he transferred to Construction and spent nine years there, before coming to M&T where he has spent 27 years as a Traveling Bituminous Mix Inspector, largely in the Kalamazoo District. Thanks, Mike, for your years of service for the Division and the Department, and we wish you many happy retirement years.

BOB MANNINEN

Bob Manninen, our Bituminous Mix Design Engineer, has transferred to the Design Division as Pavement Design Engineer. Bob was with M&T for 4 years where his consciencious effort and his contributions were greatly appreciated. We wish him success in his new position.

RECENTLY PUBLISHED RESEARCH REPORTS

Report Number	Title
1270	Evaluation of Servicised Flex Lox Filler for Pressure Relief Joints - Final Report (Research Project 77 G-224)
1271	Experimental Concrete and Bituminous Shoulders, Interim Report (Research Project 72 F-126)
1272	Investigation of the Field Coating of Environmentally Exposed Weathering Steel - Interim Report (Research Project 83 G-261)
1273	Polishing Resistance of Arenaceous Limestone from the Bayport Bedrock Formation (Research Project 71 C-13)
1275	The Development of Michigan's Bridge Painting Specification (Research Project 77 G-230)
1276	A Study to Evaluate the Performance of Bituminous Wearing Course Containing Sandy Limestone, Final Report (Research Project 77 C-18)

SPECIFICATION UPDATE

Electrical Grounding System, 5.03 (9b), dated 10-31-86. The changes that this revision makes are in materials and in construction methods and the changes were required to include the latest technology and to reflect current practice. Further, the pay unit was changed from lump sum to each.

Delineator Reflectors, 8.26 (4), dated 10-07-86. The changes that this new specification makes were necessary to improve the quality of the reflectors, yet at the same time be reasonable enough for the manufacturers to meet. The results of this specification may not be as obvious in the field but it is hoped that there will be fewer shipments rejected.

Accuracy Requirements for Placing Steel Reinforcement in Structures, 5.03 (12b), dated 08-28-86. This new specification requires the Contractor to place the reinforcement in structures with more accuracy. The reasons are to ensure that the steel has adequate cover, but not so deep as to be ineffective.

This document is disseminated as an element of MDOT's technical transfer program. It is intended primarily as a means for timely transfer of technical information to those MDOT technologists engaged in transportation design, construction, maintenance, operation, and program development. Suggestions or questions from district or central office technologists concerning MATES subjects are invited and should be directed to M&T's Technology Transfer Unit.

Technology Transfer Unit
Materials and Technology Division
Michigan DOT
P.O. Box 30049
Lansing, Michigan 48909
Telephone (517) 322-1637