REMR Technical Note EM-PC-1.5

Evaluating Aged Red Lead Coating Systems for Service-Life Extension

Purpose

To present methods for evaluating aged red lead paint systems and a decision-making process for determining the viability of extending the service life of the coatings.

Background

The removal of leaded coatings prior to recoating is both hazardous and expensive. Current research being conducted under REMR Work Unit 32666, "Removal of Lead Pigmented Paints from Hydraulic Structures," addresses the problems associated with lead paint removal and disposal. Civil Works Construction Guide Specification CWGS-09940, "Painting: Hydraulic Structures and Appurtenant Works," describes the use of coatings for the corrosion protection of Civil Works structures. This guide specification formerly called for the use of red lead primers on structural steel exposed in the atmosphere. Coating systems employing Federal Specification TT-P-86, "Red Lead Primer," have been used extensively on items such as service bridges, cranes, and lockwall armor. Federal, State, and local regulations govern the removal and disposal of lead-containing paints. The cost associated with leaded paint removal projects is typically much higher than for other projects. This is due in part to the newness of lead containment and removal. Containment technologies have not matured to the point that costs have stabilized. One means of avoiding the high current cost of total coating removal is simply to delay the repainting of structures painted with leaded coatings. However, such delays may have negative consequences, including loss of steel cross section and impaired integrity of structural components. Alternatively, the service-life of existing red lead systems may be extended by upgrading or recoating without total coating removal and containment, thus avoiding the high current costs of abatement.

Evaluating Aged Red Lead Systems for Recoatability

A careful evaluation of the old coating system must be performed to determine the practicality of service-life extension by overcoating. A complete evaluation is composed of four components: (a) visual examination, (b) measurement of coating thickness, (c) evaluation of coating adhesive and cohesive strength, and (d) application of a test patch.

a. *Visual examination.* A visual examination of the structure should be conducted in accordance with ASTM D 610, "Standard Method of Evaluating Degree of Rusting on Painted Steel Surfaces." This method provides for a comparison of visible corrosion to pictorial standards as a means of estimating the percentage surface area rusted.

b. *Measurement of coating thickness.* Total film thickness of the aged paint system may be measured by either of two methods. Total dry paint thickness may be measured using any of several types of magnetic gages listed in CWGS-09940. Alternatively, ASTM D 4138 describes the measurement of dry film thickness by destructive means. The Tooke Gage conforms to ASTM D 4138 and may be used to determine the number of individual coats and their thicknesses as well as the total paint system thickness.

c. *Coating adhesive and cohesive strength.* Coating adhesion should be evaluated in accordance with ASTM D 3359, "Measuring Adhesion by Tape Test." Method A of this standard is the most appropriate. The test consists of scribing an X cut through the coating. Pressure sensitive tape is applied over the scribed area and sharply removed. Adhesion is rated based on the amount of coating removed by the tape. The test will determine the adhesion of the coating system to the substrate as well as the cohesive strength between layers of paint.

d. *Application of test patch.* A test patch of the proposed overcoat system should be applied in accordance with ASTM D 5064, "Standard Practice for Conducting a Patch Test to Assess Coating Compatibility." The test patch should be applied over the existing coating system using the same surface preparation proposed for the project. The test will establish the compatibility of the overcoat system with the aged red lead system.

Criteria for Upgrading by Overcoating

Paint systems with more than 10-percent surface rust are not good candidates for overcoating. Old coating systems with less than 3-percent rust are excellent choices for upgrading by overcoating. Old coatings with dry film thicknesses of less than 20 mils may often be overcoated. Adhesion as measured by ASTM D 3359 should not be less than a 2A or 1/8 in. removed along the score. If the above minimum criteria are met, then a test patch of the proposed overcoat system should be applied. If the paint systems are compatible and no lifting, delamination, or intercoat adhesive failures are detected, then the aged lead paint system may be overcoated. The OSHA interim final standard for lead exposure in the construction industry became effective June 3, 1993. It is CFR 1926.62, and it impacted CWGS-09940 (June 1993). Necessary guidance on lead exposure will be added to Corps guide specifications through the criteria update program.

Materials for Recoating

Coatings used to overcoat aged red lead systems should not shrink excessively as they cure. Extreme shrinkage may cause delamination or peeling of existing weakly adherent paints. Conventional paints should not be applied at excessive thicknesses. Where practical, spot priming of bare steel is preferred to the application of an overall prime coat. High build overcoat materials should be high solids materials with low solvent content. This will help prevent softening and lifting of the old paint. Case histories indicate that high build materials, capable of being applied in two coats with a minimum dry film thickness of 10-mils, are providing good service. Some aluminum-filled epoxy and urethane mastic coatings have also been shown to be good overcoat materials.

Cost of Upgrading Aged Red Lead Coating Systems

Maintenance paint jobs that involve the total removal and containment of lead containing paints generally cost between $5 and $10 per square foot. Upgrading an existing coating by using minimal surface preparation prior to overcoating will cost about $2 per square foot. These figures are representative of recent projects in the northeastern United States. Actual costs may vary considerably by location and type of structure.

Surface Preparation for Overcoating Projects

Regulations surrounding surface preparation of structures having leaded paint present a number of varied problems. Any worker who performs such work must be trained in lead removal procedures and medically evaluated. Open abrasive blasting, even for spot blasting, requires a costly containment structure. And the common practice of brush-off abrasive blasting damages underlying coatings that are not removed by the blasting process. As a result, it may not significantly increase the cost of the job to increase the surface preparation from open spot blasting to complete blasting to the near-white grade. This would completely remove the lead and allow the application of a more durable paint system. Vacuum shrouded power tools and vacuum blasting are the preferred methods for spot preparation, but this equipment has a low production rate, especially on complex structures. These methods produce less hazardous waste and do not result in weakened paint layers. Blow down with compressed air may in some cases be all that is needed to prepare intact paint for overcoating. Power water washing at pressures sufficient to remove only dirt and chalk are ideal. Solvent cleaning may be necessary in some cases to remove grease or oil deposits from the surface.

Recommendations

Upgrading existing red lead paint systems to extend their service-life should be considered when available resources are not adequate to permit the total removal of the coating system. Upgrading by overcoating with a suitable paint system is appropriate when the old coating meets certain minimum criteria for percent surface rust, adhesion, and coating thickness and when a test patch of the overcoat material has been shown to be compatible. Upgrade decisions must consider the OSHA interim final standard. Points of Contact are listed below.

References

Guide Specification CWGS-09940. (June 1993). "Painting hydraulic structures and appurtenant works."

Kline, E. S., and Corbett, W. D. (1992). "Beneficial procrastination: delaying lead paint removal projects by upgrading the coating system," *Journal of Protective Coatings and Linings* 9(3).

Trimber, K. A. (1993). *Industrial lead paint removal handbook.* 2nd ed., Steel Structures Painting Council Publication SSPC 93-02.