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Lead-Paint Removal from Steel Structures

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Owners and engineers of steel structures need to be aware of regulations and liabilities associated with projects that require lead-paint abatement. This overview outlines some of the considerations necessary in testing, specifications, monitoring, and disposal in a lead-paint abatement project.

Lead—it's the "four-letter word" of the 1990s. Most engineers are aware that the Safe Water Drinking Act mandates the amount of lead permissible in tap water. However, not only do lead regulations affect the water we drink, but also the air we breathe and the ground our children play on. For years, industrial steel structures were painted with red-lead primer. At that time, red lead was the most cost-effective method of protecting steel from corrosion. But as more has been learned about the effects of lead on human health, the use of lead-based coatings has been phased out. Owners of steel structures are now faced with having to remove the lead-based paints from their structures without exposing the workers and the public to unsafe levels of lead in the atmosphere. Traditional methods of abrasive blasting are no longer acceptable. New regulations concerning the removal of lead-based coatings are continually being put in place, and enforcement of these regulations is becoming more stringent. An owner's (and engineer's) potential liability for public exposure to lead during the coating removal process is enormous. As a result, newer, more expensive methods of coating removal are being specified and developed. Keeping up with the latest regulations and technology is a herculean task.

When a lead-paint abatement project is undertaken, a professional approach is imperative. It would be wise to use a professional engineer with coating and lead abatement experience on projects of this type. This paper cannot and does not encompass all contingencies for a lead-paint abatement project. It is not intended to guide a specification writer, but rather to make steel structure owners and engineers aware of the huge liability associated with lead-paint abatement and to provide an overview of a typical project approach.

Current Regulations

The Clean Air Act currently states that not more than an average of 1.5 micrograms per cubic meter ($\mu g/m^3$) of lead may be released into the atmosphere per day over a 90-day period; that is, if the blast project requires 45 days, no more than an average of 3.0 $\mu g/m^3$ can be released. The National Ambient Air Quality Standard further states that not more than 450 $\mu g/m^3$ of particulate matter less than 10 μm in size (dust small enough to be inhaled into the deepest portion of the lungs) can be released into the atmosphere, on average, during an eight-hour work day. Based on this criteria, dust emissions on projects where so-called "lead-free" coatings are being removed—and even projects involving the field blasting of uncoated or shop-primed steel for new structures—are regulated.

Worker safety on lead-paint removal projects is an area of great concern. OSHA is currently drafting a new "Lead in Construction" standard to better protect construction workers exposed to lead and lead-based coatings. Until such time as this standard is released, workers must be properly protected for their own well-being and to prevent the potential for a third-party lawsuit. At present, OSHA is relying on their General Duty Clause and on Construction Industry Standards for hazardous material as a basis for determining safe working conditions.

Once the lead-based coatings are removed from the steel structure, the blasting debris must be disposed of and/or treated in accordance with EPA/RCRA regulations. Compli-

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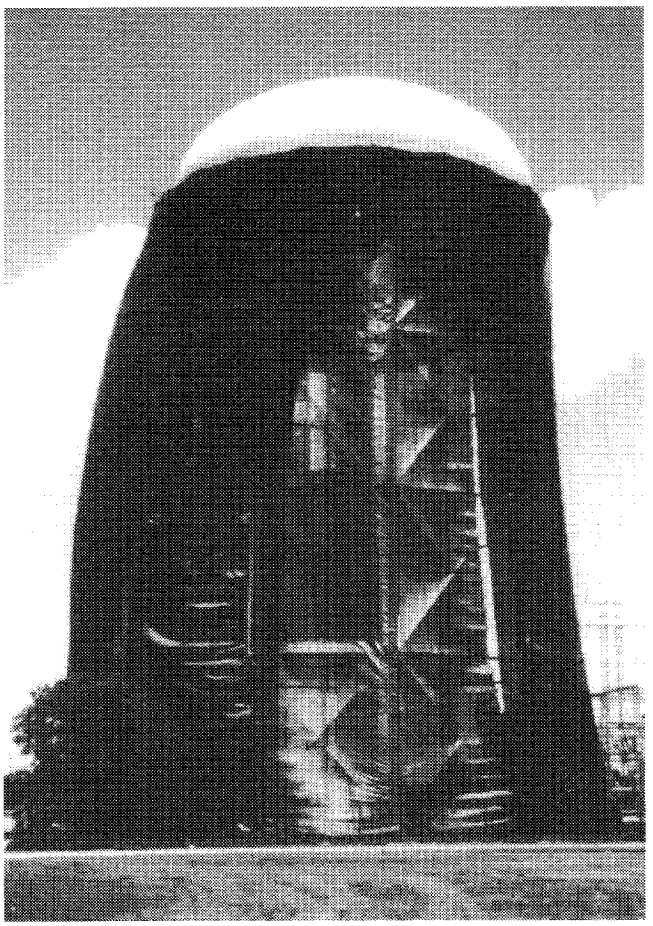
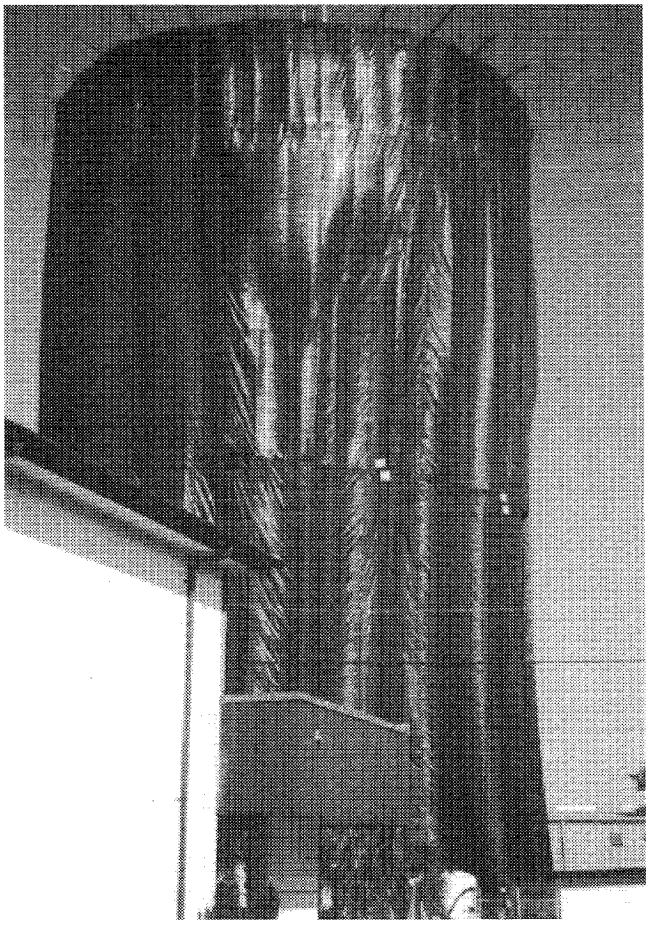


Partial containment of an elevated water tank.



Total containment of an elevated water tank.

ance with the "Land Ban" regulations must be closely monitored. The "Land Ban" is a regulation passed by the U.S. EPA which will eliminate the disposal of hazardous material in landfills. The "Land Ban" requires that waste be minimized and treated to remove its hazardous products prior to disposal.

In addition to lead in the air, there are also regulations for the amount of lead permissible in soil and water. Steps should be taken to protect the project site, neighboring property, and waterways during lead-paint abatement projects.

Initial Testing Procedures

Before beginning a repainting project, samples of the existing coating should be tested for lead content. A sample of each coating type on each different type of surface should be taken. Each different color of coating should also be tested. Care should be taken to include all of the primer in each sample, because typically the majority of the lead is found in the prime coat of the coating system. In addition, the areas from which the samples are taken should not be areas where spot cleaning has removed previous coating. The toxic metal content of each coating sample should be determined by quantitative analysis. For example, atomic absorption spectroscopy (AA) tests should be performed on each coating sample. The AA test will indicate the wt% of lead in the coating sample. The Consumer Product Safety Commission has a guideline for nonhazardous levels of lead in a coating which has been adopted by the coatings industry. In order to be considered "lead-free," the coating must contain less than 0.06 wt% lead.

A word of caution—this initial AA test only determines if there is lead present in the coating samples that have been taken. An AA test in no way guarantees a specific result for leachable lead in the spent debris. The leachability of the lead can be affected by the type of lead pigment in the coating, the type of coating, and the type and amount of abrasive used for removal. Because it is difficult to collect a truly representative sample of primer from the steel profile, this test may not accurately represent the total coating system. Also, variations in the thickness of the coating, types of coatings applied, graffiti, and the previous cleaning and painting operations will also affect the actual readings. (While this article deals specifically with lead, there are other regulated materials that could be present in the debris. These materials are listed in 40 CFR 261.24.) Additional testing to determine the amount of leachable contaminants (lead or other heavy metals) present in the spent cleaning debris will need to be performed following cleaning operations at the time of repainting.

However, quantitative analysis would alert the structure owner, specifying engineer, and contractor to the presence of lead in the coatings and would point out a potential threat to the environment, surrounding residents, and workers.

Preparation of Specifications

Once it has been determined whether or not the existing coatings contain lead, a specific project approach can be determined. Rather than completely removing existing coatings, more and more owners and engineers are investigating the possibility of applying a topcoat in the hope that advances in technology will make lead-paint removal less risky and costly in the future. When considering a topcoating operation, the "topcoatability" of the existing coating system should be thoroughly evaluated. While it may be feasible to apply a similar generic coating over the existing coating, factors such as the adhesion of the existing coating and the quality of workmanship on the original painting and the topcoating operations greatly affect the life of the topcoated system. Remember too that the dust and coating debris caused by spot cleaning the existing coating to prepare it to receive the topcoat—although of less volume than when completely cleaning and repainting the entire structure—must be contained, tested, treated, and disposed as any other potentially hazardous waste. On the plus-side, a properly applied topcoat can sometimes extend the life of the existing lead-based coating system as much as 15 years or more. In the meantime, extensive research in coating technology (such as the use of elastomeric coatings to topcoat older, less adhering coatings) may provide a viable alternative to removing the existing lead-based coatings.

While the lead-based paint is on a steel structure, the coating is not a hazardous waste. It is not until the coatings are removed that environmental regulations and restrictions come into play. Before any lead-based paint removal project is considered, all options should be carefully weighed to determine what is the best approach to meet the short- and long-term needs of the structure and to properly protect public health and welfare.

Repainting specifications must be carefully and professionally prepared. The specification should spell out (at a minimum):

- If the coating being removed contains lead;
- Requirements concerning worker safety;
- Method(s) to be used to protect the project site and property surrounding the site;
- Method(s) to be used to protect the atmosphere;
- Storage of blast debris;
- Blast debris (or paint residue) handling procedures; and
- Sampling and testing procedures.

Do not rely solely on a single paragraph in the specification requiring the contractor to "comply with all laws and regulations." In a competitive bidding situation, contractors that bid the job to comply with "all laws and regulations" may not be the low bidders. Awarding a contract to a bidder who has obviously not included a sufficient amount of money to comply with the environmental regulations implies that compliance may be "optional," and therefore, places additional responsibility on the owner and engineer.

Once the bids are received, it is important to review the low bidder's ability to complete a lead-paint abatement project. The low bidder's experience, references, and insurance should be closely reviewed. The project should be awarded to the lowest, responsible bidder.

Before beginning the field work, the contractor's submittals should be carefully reviewed for compliance with the specifications, and to determine the practical "workability" of the contractor's approach. The proposed methods of containment, testing, and disposal should be thoroughly examined.

There are currently six proven methods for removing lead-based coatings from large steel structures in compliance with Clean Air Regulations. These methods include: chemical stripping, power tool cleaning (with vacuum attachments), vacuum blasting, wet abrasive blasting, abrasive blasting within a relatively small enclosure around the blaster (mini-containment), and containment of the entire structure. There are also a number of methods being used on a prototype basis. To avoid the possibility of soil or water contamination, a combination of methods may be required.

Another consideration which should be evaluated is the level of community involvement associated with your lead-paint abatement project. There is no substitute for communicating with the public, whether it is about the repainting project on the water tank in the neighborhood, or a bridge over a shipping channel. Maintaining good community relations could be one of the most crucial steps to the successful completion of your repainting project.

Monitoring the Work in Progress

As the project moves toward the actual field work, owners and engineers are reminded of the importance of having a full-time project representative to monitor contractors' workmanship and compliance with the project specifications. This is especially important when dealing with lead-based paints. On these projects, not only is an owner concerned with the quality of the finished product, but also with protecting the environment and the public well-being. Environmental monitoring during lead-paint removal is being required more frequently.

Testing and Disposal of Waste

As the lead paint is being removed from the structure, the debris must be cleaned up at least daily and stored in watertight, covered containers. No debris should be allowed to fall directly on the ground. For structures that have been painted with several different types of coatings, each type of coating removed should be kept in separate containers. Once the lead paint has been removed and placed in containers, the debris should be tested. A sampling plan should be developed and at least four random samples from each container should be subjected to the Toxicity Characteristics Leaching Procedure (TCLP) testing procedure. Each TCLP test requires approximately 100 g (1 cup) of the de-

bris. If the tests indicate that the debris has significantly less than the permitted level of leachable toxins, then the debris can be disposed of at an industrial waste facility. If the testing indicates that the debris is hazardous, then the debris must be disposed and/or treated in accordance with EPA, RCRA, and other state and local regulations. Applicable regulations include the EPA Land Ban, which prohibits the disposal of much of the untreated abrasive blast residue in hazardous waste sites. The Land Ban requires that debris which has been tested and found to contain greater than the allowable levels of lead must in many cases be stabilized or the lead extracted prior to disposing of the materials.

The structure owner is the "generator" of the hazardous waste and, therefore, must obtain a generator's identification number from the state environmental protection agency. No matter what wording is contained in the project documents, the owner cannot abdicate this responsibility to the contractor. The owner "purchased" this lead-based paint and will always own it. Even when this lead paint is disposed of in a landfill (hazardous or otherwise), the owner still owns the lead-based paint. If the lead leaches out sometime in the future, the owner could be found responsible, and consequently have the financial responsibility to cleanup the area contaminated by the lead-based paint. Therefore, proper documentation, evidence of compliance with testing requirements, and completed manifest forms are imperative when handling the testing and disposal of the blast debris.

Conclusion

Obviously, a lead-paint abatement project is very expensive. Compliance with any regulations usually is. However, the risk and potential costs associated with noncompliance can be enormous. Several contractors, engineers, and owners have already experienced the heavy fines, cleanup costs, legal fees, and other damages associated with noncompliance.

Do not rely solely on a single paragraph in the specification requiring the contractor to "comply with all laws and regulations."

Engineers considering providing services for lead-paint abatement projects should review their current professional liability insurance policy for exclusions for pollution caused by lead-paint abatement.

When planning the next repainting project, take a professional approach: in addition to considering all of the options for removal of the existing coatings, be careful not to overlook the structural and operating requirements of the steel structure. Proper maintenance and corrosion control should allow the structure to meet the needs of today and tomorrow.