Dealing with Lead Paint Removal

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During the course of repair and restoration projects it is not uncommon to encounter lead paint. Here we will examine the history and use of lead paint and consider the health and safety requirements for dealing with lead paint removal, as well as the best approaches for remediating lead paint from various substrates, including steel and wood. Although other hazardous materials are frequently found in paint, lead is the most commonly mentioned hazard.

It's important to know the health and safety requirements and appropriate methods for dealing with lead paint removal during repair and restoration projects.

FROM PLUMBING TO PAINT

Lead has been a part of human culture for thousands of years. The Roman Empire used lead widely; in fact, the word "plumbing" is derived from *plumbum*, Latin for lead, which also gave rise to the chemical symbol for lead, Pb. In Roman times, lead was used for everything from piping, dishware,

pottery glazes and even as an ingredient in wine. Many speculate that lead poisoning caused the fall of the Roman Empire.

More recently, lead was used for building flashings, window cames (an H- or C-shaped lead bar that holds pieces of glass in place), plumbing, as an additive to gasoline and, as will be discussed in further detail, in paint. Today lead continues to be used in sheets, solders, lead crystal glassware and ammunitions. By far the largest percentage of lead use today is for batteries.

Lead is usually found in ore with zinc, silver and copper, and it is refined from these metals. The Galena (PbS), a lead sulfide mineral, is commonly mined for lead along with cerrussite and anglesite. Galena is primarily mined in Australia, which produces almost 20 percent of the world's refined lead, followed by the USA, China, Peru and Canada. World production of refined lead is about six million tons a year.

Most lead concentrations found in the environment are a result of human activities. During the 70 years that car engines used leaded gas, lead salts were created as a byproduct in the environment. Larger particles of lead salts were deposited into the environment fairly close to their sources, resulting in polluted soils and waters. By contrast, smaller particles traveled longer distances through the air and remained in the atmosphere until they mixed with rainwater and fell back to earth. As a result, lead pollution became a worldwide issue and resulted in a ban of leaded gas in the 1970s.

When using a chemical stripper to remove lead paint, as shown here, it is important to conduct a trial to determine which stripper is most effective, the number of applications required and the duration of each application to have the most effective results. PHOTOS COURTESY OF WISS, JANNEY, ELSTNER ASSOCIATES UNLESS OTHERWISE INDICATED

Around 1900, lead-based paint gained popularity on the interior surface of homes over the use of wallpaper, which had been popular during Victorian times. The medical profession at the time believed that most diseases were caused by germs. As a result, it was thought paint was “cleaner” than wallpaper, and painted surfaces could be washed regularly without damage.[1]

In 1955, the American Academy of Pediatrics established a voluntary program to eliminate the use of lead-containing paints on the interiors of homes. Lead-containing paint on the exterior was not thought to an issue for children. In 1971, lead-based house paint was phased out in the United States with the passage of the Lead-Based Paint Poisoning Prevention Act. Lead-containing paint was banned from use in residential buildings in 1978. Homes built prior to 1978 may have lead-containing paint applied to interior and exterior surfaces.[3]

Prior to various studies and readily available blood testing, early diagnosis of lead-related illness was limited to the manifestation of symptoms. In the 1930s and 1940s, lead blood levels above 80 milligrams per deciliter (mg/dl) were thought to be harmful; in the 1960s that level was lowered by the Centers for Disease Control to 60 mg/dl, and the threshold level steadily decreased each decade to 5 mg/dl in 2012.[4] Even today, according to the Centers for Disease Control and Prevention, more than 250,000 children under the age of six have elevated lead levels in their blood.[5]

The need to remediate hazards from lead-containing paint is necessary when dealing with the repair and restoration of residential and commercial buildings constructed prior to 1978. Abating lead-containing paint can only be accomplished by removal and recoating. While overcoating is certainly the most economical approach, it is not always practical or appropriate and may create increased hazards. In fact, in most instances, any preparation work related to overcoating, such as scraping or sanding, may trigger many of the same requirements mandated for the complete removal of lead paints.

EPA REGULATIONS ESTABLISHED

As of April 22, 2010, the Environment Protection Agency (EPA) established regulations called the Lead Renovation, Repair and Paint (RRP) Rule. These regulations state, among other things, that a certified lead-abatement firm must perform lead-containing paint abatement. Today, lead in paints is limited to 0.009 percent, while bridge and marine paints can contain greater amounts of lead.[6] Regulations include notifying the EPA at least five business days prior to conducting lead-containing paint abatement activities. The only exception is when an emergency abatement order is received. In that instance, the EPA must be notified no later than the day abatement activities begins.

The RRP Rule requires that all renovation, repair and painting firms be certified when working in housing, or facilities where children are routinely present, built before 1978. Individuals within these firms must also be certified ("Certified Renovator"), they must be assigned to each job, and they must provide lead-safe work practices training to all non-certified renovation workers on a jobsite. To become a Certified Renovator, a person must complete either an EPA-accredited renovator training course or one conducted through an EPA-authorized program.[7]

The EPA program for addressing lead-containing paint consists of the following activities:

- Determining presence of lead-containing paint;
- Encapsulating the area to prevent dust and debris from escaping;
- Providing personal protection equipment for all workers;
- Minimizing dust;
- Leaving the work area clean;
- Disposing of the waste; and
- Verifying cleaning.

LEAD ABATEMENT OPTIONS

When lead abatement is required during a repair or restoration project, there are four options to consider. These options are:

1. **Enclosure:** Considered the easiest method, the lead-containing paint is simply covered with a solid barrier. This is an ideal solution for large surfaces.
2. **Encapsulation:** Similar to enclosure, but the lead paint is covered with a new coating to seal in the lead paint.
3. **Replacement**: In this option, the building component (door, window, molding, etc.) containing lead paint is simply removed and replaced. For preservation projects, this is often not an acceptable option.
4. **Paint Removal:** This option completely removes the lead paint from the building component, and is the option that will be examined further in this article.

Based on the results of the chemical stripper mockup shown above, the amount of time the chemical stripper is applied to the surface may need to be adjusted to achieve maximum results.

Removal means taking lead paint off of the building component. There are many options available for removal, each with inherent benefits and challenges, and with some methods proving a better approach for certain substrates as opposed to others. Depending on the scale of the paint removal, some methods may be more efficient and cost-effective than others.

Prior to removal ensure that proper safety protocols, discussed above, are in place, including personal protective equipment (respirator, disposable suit, gloves, goggles) and containment, as required.

Wet Scraping

For small-scale lead paint removal, and as a means to address loose lead paint as an interim solution until complete removal can occur, wet scraping is a viable option. During wet scraping, the surface containing lead paint is wetted, and a scraper is used to remove the loose paint. The surface should continue to be misted during the scraping to prevent dust. This method works well on flat wood or metal surfaces. This method is not viable for highly ornate elements.

Wet Planing

This is very similar to wet scraping, but a plane is used instead of a scraper. While this method removes more than just the loose paint, it may need to be used as the first step in conjunction with a second removal process to ensure removal of all lead paint.

Heat Guns

A heat gun blows warmed air onto the painted surface, which softens the lead paint so a hand tool (such as a scraper) can be used to remove the lead paint from the surface. Due to the high temperatures, heat guns not only have the ability to damage the substrate but also to start fires if special care is not taken during operation. Since lead heated above 1,100 degrees Fahrenheit produces toxic fumes, heat guns that generate heat at this temperature or higher should not be used.

The tools used in the methods above are best suited for flat surfaces. The next two options provide the ability to remove lead paint from ornate components, such as those often present on restoration projects.

Local-Exhaust Hand Tools

In this method, power tools are equipped with a hose attached to a vacuum with a high-efficiency particulate (HEPA) filter. A HEPA filter is a mechanical air filter that forces air through a fine mesh that traps harmful particulates. Depending on the building component from which paint is being removed, the power tool might be a sander, needle gun, drill, saw or any hand tool to which a HEPA exhaust system can be fitted.

On this cast iron door trim, shown after the removal of paint using a chemical stripper, flash rust occurred during paint removal. As a result, additional surface preparation may be necessary prior to the application of new paint.

It's possible that a highly ornate building component may require more than one type of hand tool to remove all the paint. A sander should be limited to flat surfaces. For more intricate details, a needle gun, which uses small-diameter tightly grouped rods to break apart the paint, has the ability to remove paint from hard-to-reach areas. Needle guns are effective for removing paint from metal and masonry, but care should be taken not damage the softer substrate when using them on masonry. Needle guns should not be used on wood due to the damage it will cause.

Chemical Stripping

Chemical stripping uses solvents to dissolve the paint binder, which is then removed using scrapers and other hand tools. This process can be used for large- or small-scale paint removal and can be completed in-situ or offsite. Due to the use of chemicals, additional steps are required. Depending on the chemical stripper used, this may require wiping the surface with a cloth or steel wool that has been soaked in water, mineral spirits or a neutralizer. Because of its ability to dissolve the paint, chemical stripping is an approach to be considered for use on highly ornate building details, such as door and window trim. Unlike the other methods previously discussed, chemical

stripping can be used successfully on a variety of substrates and level of detail due to the nature of product being used for removal.

All necessary precautions should be taken when using chemical strippers because they are dangerous to both the building components and the user if not used as directed.8 The active ingredients in chemical paint strippers include methylene chloride, toluene, methanol, ethanol and acetone. All of these solvents are known to cause an array of health issues due to long-term exposure including respiratory damage (nose and throat irritation), skin burns and nervous system damage (headaches, dizziness and nausea).

AFTER REMOVAL

Generally, in residential instances, once the lead paint has been removed, the EPA allows for the waste to be handled as household waste. This allows disposal to be affordable for homeowners as well as contractors with the hope of reducing lead in and around children. The recommended protocol for handling lead paint includes collection of the debris in plastic bags, and storing the bags in protected areas until the work is completed, if it is not removed daily. Disposal should be coordinated with applicable local authorities. Commercial disposal is much more involved and heavily regulated and beyond the scope of this article.

From small to large, plain to ornate, wood or metal, there are a variety of safe methods to remove lead paint from historic building components. Careful consideration must be made in deciding which method is the best approach for your project. Most repair and restoration projects will encounter lead paint. Choosing how to abate lead-containing paint is an important task which should not be overlooked on any project.

ENDNOTES

1. The History of Lead-Based Paints, author unknown
2. Ibid.
3. History of Lead Use via Toxipedia
4. Ibid.
5. A Contractor's Guide to the New Lead-Paint Regulations via Green Building Advisor
6. Lead Toxicity: What Are U.S. Standards for Lead Levels? via Agency for Toxic Substances and Disease Registry
7. Lead-Based Paint Activities: Professionals via United States Environmental Agency
8. Chapter 7, Abatement Methods via epa.gov

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