

ABATEMENT

7

In this chapter you will learn about:

- ☐ Replacement Abatement Method;
- ☐ Enclosure Abatement Method;
- ☐ Encapsulation Abatement Method;
- ☐ Paint Removal;
- ☐ How to Keep Lead Out of the Air;
- ☐ How to Clean the Abatement Area;
- ☐ How to Set Up the Abatement Area;
- ☐ How to Treat Lead-based Paint on Windows, Doors, Woodwork, Walls, Ceilings, Floors, Staircases, Porches;
- ☐ Removal of Lead-based Paint from Steel and Concrete Structures; and
- ☐ Dangers of Blasting and Burning Lead-based Paint.



A Choice: Treat the Lead Paint or Manage It?

In every building with lead paint we have a choice: treat the lead paint or leave it there and manage it. This is a tough decision that is handled by specially trained experts called lead risk assessors. **Treating** the lead paint is called lead paint **abatement** – you can remove the paint or cover it with sheet rock or special paints. **Managing** the lead paint is called **interim controls**.

Lead Paint Abatement

Abatement means the methods used to permanently get rid of lead-paint hazards. Getting rid of lead-based paint hazards means making lead-based paint unavailable and removing it as a hazard. There are four basic methods of lead abatement:

1. **Replacement** – Removing the building part with lead-based paint on it and replacing it with a new one.
2. **Enclosure** – Covering the lead-based paint with a solid barrier (not a permanent solution).
3. **Encapsulation** – Coating the lead-based painted surface so that it is not accessible (not a permanent solution).
4. **Paint removal.**

Replacement

Replacement means removing the lead-painted building part (like a window) and replacing it with a new one. This method is mostly recommended for windows, doors, and other woodwork painted with lead-based paint.

Advantages

Replacement is the easiest and quickest way to get rid of lead-based paint. Replacement removes lead-based paint forever. It's a **permanent solution**. When combined with overall modernization, replacing windows can be used to upgrade the building itself. Replacement can lower heating bills and maintenance costs.

Disadvantages

Replacement can be expensive. It takes a lot of work. Skilled carpenters are often needed to put in the new parts – especially windows and doors. Surfaces next to the part being removed may get damaged. The replacement part may or may not be as good as the original.

Replacement can involve demolition work. It can create a lot of dust. To keep lead levels down, wet mist and HEPA vacuum the old building part before removing it.

Replacement often requires manual demolition of old building parts, a Class 1 Task. You must wear a respirator and protective clothing. After removing the building part, wet-mist the part again, wrap it in poly, seal it with duct tape, and store it until it can be disposed of properly. Wet down and clean up debris as you work, thus keeping the lead dust levels down.



Enclosure

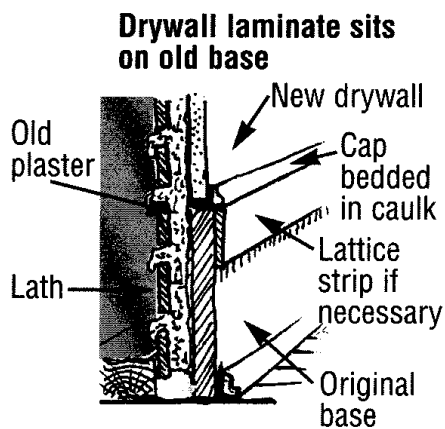
Enclosure means covering the lead-based paint with a solid, dust-tight barrier. An enclosure keeps the lead-based paint away from the rest of the building and, more importantly, it's occupants. The materials used to enclose the lead-painted surface must be durable. Wall paper and contact paper are not enclosure materials because they are not dust-tight. Common materials used to build enclosures include:

- ▶ Underlayment
- ▶ Plywood
- ▶ Fiber board
- ▶ Vinyl
- ▶ Paneling
- ▶ Tile
- ▶ Aluminum
- ▶ Drywall
- ▶ Acrylic sheets

Before you enclose a surface, remove all peeling and chipping paint. Also fix any source problems such as water leaks or moisture sources. If source problems are not fixed, the enclosure that you

build will get damaged and fail. After fixing the source problem, HEPA vacuum the area to be enclosed. Vacuuming will collect any loose lead dust.

When you enclose a surface, make sure that the lead dust will not leak out of the edges or seams. Back-caulk the perimeter of the enclosure material before you install it. Then, using nails or screws, mechanically attach the enclosure material to the lead-painted surface. You need to use both adhesive and physical fasteners to prevent lead dust leaks.



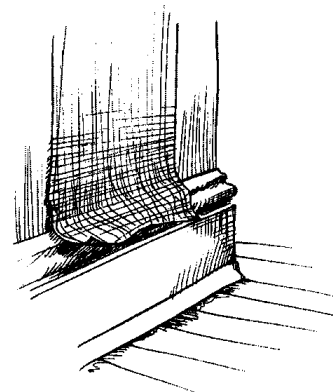
The new surface must be in place permanently. The enclosure must be made so that no one, especially not a small child, can remove it. If there are building plans, the areas where enclosures cover lead-based paint need to be marked and identified in the plan. This will show workers who work in the building in the future that lead is located there.

Disadvantages

Enclosure may not be a permanent solution. The lead source still remains underneath the covering. Any renovation or repair work to enclosed surfaces will disturb the lead-based paint and releasing lead dust that has collected behind the enclosure barrier. Enclosed surfaces and joints of the enclosures must be monitored for damage and deterioration.

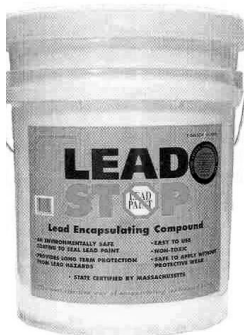
Encapsulation

Encapsulation means coating the lead-painted surface with a thick, durable sealing paint-like material. Encapsulants are best used on building materials in good condition. Some systems include a mesh covering to prevent lead dust from being released. You



need a layer of mesh for surfaces that are chipping or peeling.

Encapsulants must be flexible and strong enough so you can't easily break the surface or chip them. You should not be able to damage the encapsulated surface with impact. They must completely cover the lead surface and have a dust-tight seal. Make sure that the encapsulant you use is not toxic and that it is flame resistant. Read the MSDS.



There are many different kinds of encapsulants on the market and the quality and reliability of encapsulants vary greatly. Right now there are no standards for approving encapsulants. More research is needed to test how they last. Check your state and local laws because in many areas of the country encapsulants must be approved by state or local governments. **Wall paper, contact paper, and new paint are not encapsulants.**

Preparing the Surface

You must follow all of the manufacturer's instructions on how to prepare the surface. Encapsulation will not work if the surface is damaged or deteriorated. Nor will encapsulation work if the wall is separating from the wood or lath, or if the plaster is separating.

The surface to be covered needs to be prepared before being covered. Moisture sources must be eliminated and the surface allowed to dry. Peeling paint should be wet scraped. The surface should be cleaned (Trisodium Phosphate (TSP), a lead-specific commercial cleaner, or home detergent), HEPA vacuumed, and allowed to dry. If these steps are skipped, the process will fail.



Applying the Encapsulant

You must follow all of the manufacturer's instructions on how to apply the encapsulant. Encapsulants are usually easy to apply. Often they can be applied like you apply paint. If the encapsulant

is improperly applied, it will fail. It can separate from the paint will cause the paint to peel and create lead dust.

Do a Test Patch

Not all encapsulants can be used on all surfaces. For this reason, you must do a test patch of the encapsulant on the surface to be covered. Read and follow the manufacturer's instructions. If the test patch bubbles or cracks, then it has failed. If the test fails, do not use this encapsulant on this surface. Test other encapsulants or use another abatement method.

Use the Right Personal Protective Equipment

The type of personal protective equipment you need depends on the type of encapsulant you use. Suits and respirators should be worn when you do any repair work before applying the encapsulant. For some chemical encapsulants, you will need organic vapor as well as a HEPA filters on your respirator, chemical resistant gloves, and protective clothing.

Make sure the area has a good flow of air. You might need extra ventilation. Be sure to check the product MSDS for specific safety measures.



Disadvantages

Encapsulation may not be a permanent solution. The lead source still remains underneath the covering. Any renovation or repair work to encapsulated surfaces will disturb the lead-based paint. Encapsulants do not work on all surfaces. They need to be tested. Patch testing the encapsulant takes time.

Encapsulated surfaces need to be inspected regularly for damage and deterioration. Encapsulants can fail. Sometimes encapsulants separate from the surface. This is called encapsulant

failure. If the encapsulant is not applied well to a well-prepared surface, it will fail. Encapsulants should not be used on impact or friction surfaces. Some encapsulant products will create **hazardous waste**.

Paint Removal

Removal means taking off lead-based paint. Removal methods create a lot of lead dust and waste. To begin, wet-mist and HEPA vacuum old building parts. Clean up debris as you work to keep lead dust levels down. Paint can be removed by using one or more of the following methods:

- ▶ Wet scraping down to the surface below;
- ▶ Wet planing;
- ▶ Electric heat guns;
- ▶ Local exhaust hand tools;
- ▶ Chemical stripping; and
- ▶ Vacuum and blasting w/media
(exterior only)



Electric HEPA
paint scraper

Wet Scraping

Wet scraping means misting loose paint before scraping it. Dry scraping paint creates a huge amount of dust. Never dry scrape lead-based paint. Mist the loose paint before you scrape it and continue to wet it while scraping.

Wet scraping is often used to prepare a surface for painting. It does not mean removing all of the paint – only the loose paint. Wet scraping and painting can be used as an interim control. Never wet surfaces near electrical outlets even if the circuit is turned off.

A scraper is a blade-like tool used to remove paint. They come in different sizes. Scrapers should be kept sharp at all times.

Clean up the paint scrapings and dust as you work. Wet and bag the debris as you go. This keeps lead dust



levels down. Wear a respirator, disposable suit, gloves, and goggles when you wet scrape. HEPA vacuum the outside of your suit as you exit the work area.



Wet Planing

Wet planing is much like wet scraping. It means misting the surface before you plane it. Wet planing creates some dust. Wear a respirator and protective clothing to be safe.

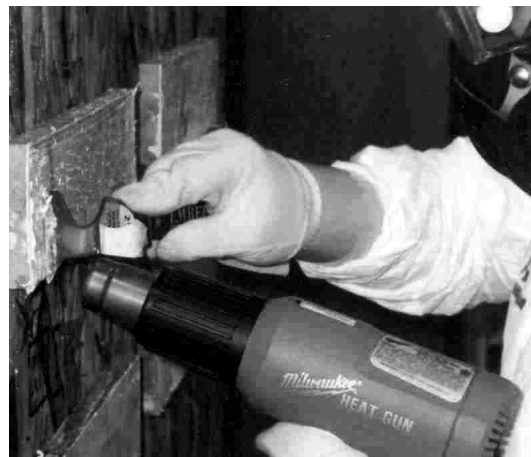
A plane is a carpenter's tool for shaving a wood surface. You can use a plane to remove lead-based paint from impact surfaces like the edges of a door or from friction surfaces like the edges of windows that rub together when you open or close the window.

Electric Heat Guns

Using heat guns is not recommended. Electric heat guns work by forcing warmed air onto a painted surface. The heat softens the paint which is then scraped off with hand tools.

Use heat guns very carefully. Heat guns can cause serious burns on your skin. They can damage the building material from which you are removing paint. They can even cause a fire. Before using a heat gun, check the building material and the other side of the wall. Heat guns can ignite a fire on the other side of the surface material. Have an ABC – rated fire extinguisher on hand.

Extreme heat causes lead to give off toxic fumes. The HUD Guidelines of 1995 do not allow heat guns above **1,100° F**. Lead fumes contain many tiny particles of lead. These tiny particles are very easy to breathe. The lead fumes quickly travel into your lungs and then to the blood. Heat can also cause the



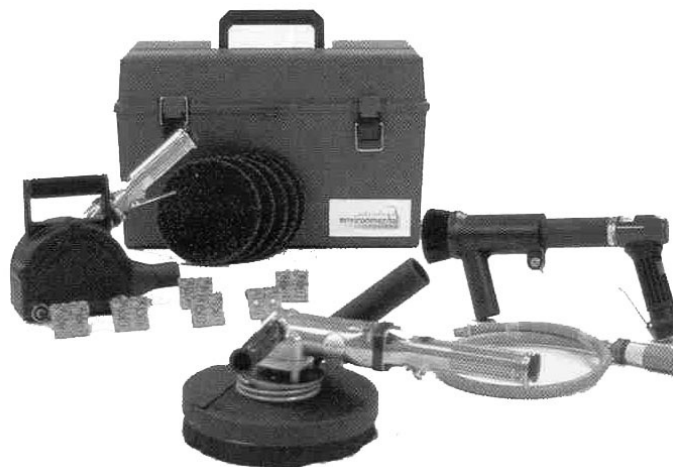
paint to release organic vapors from the chemicals used to make paint. High heat can turn the chemicals into dangerous vapors.

You should wear a PAPR equipped with a HEPA filter/organic vapor cartridge when you use a heat gun to protect yourself against dust and fumes. Some states require that you wear a PAPR when using a heat gun.

Local Exhaust Hand Tools

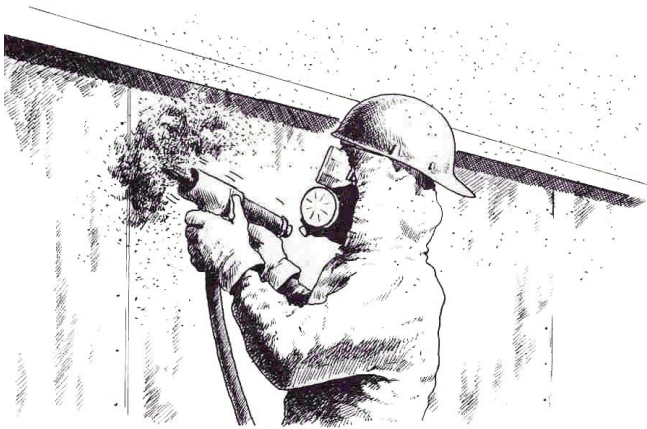
Local exhaust hand tools have a hose that attaches to a vacuum. The vacuum has a HEPA filter and one or more pre-filters. This system is called a local HEPA exhaust system. There are a number of local exhaust hand tools for lead abatement work. You must wear a respirator and protective clothing. (Some companies advertise that their shrouded, HEPA vacuum exhaust power hand tools are so efficient at capturing lead dust that they operate under the Action Level for lead.)

Follow the manufacturer's instructions for proper use of local exhaust hand tools. Never remove or pull back the shroud or cover. The cover is needed for the vacuum to work. Shrouded tools are difficult to use. Sometimes you cannot see what you are doing. You must move the tool very slowly to keep the shroud in place. The tool must be used flat against the surface. If you work too fast, the shroud seal will break and lead dust will get into the air.



Roto-peen (left); Sander (center); Needle Gun (right)

HEPA sanders generate large amounts of dust. These are power sanders fitted with a HEPA vacuum to catch and filter lead dust as it is created. Always use a HEPA sander when sanding lead-based paint and limit the use of HEPA sanding to flat surfaces for feathering or finishing only.



The **needle gun** with HEPA vacuum exhaust has many vibrating metal rods contained inside a shroud (cover). The rods loosen and break the surface paint while shroud catches most of the lead dust. The local exhaust pulls the dust into the HEPA filter. Needle

guns are best used on metal or masonry surfaces, particularly pipes and structural steel. They will damage wood surfaces. Wear hearing protection when using a needle gun.

HEPA grinders, saws, and drills can be fitted with HEPA exhaust systems. The drill has a cover like the needle gun. Wear hearing protection when you use HEPA powered hand tools.

Chemical Stripping



The use of chemicals to strip off paint is called chemical stripping. Chemical stripping works with solvents or caustic paste. Chemical solvents dissolve the paint. Caustic paste melts paint into a goo that is scraped off with hand tools. Chemical stripping always involves manual scraping.



Wear eye protection, a respirator (with HEPA/Organic Vapor combo filters), and protective clothing (not just a plain Tyvek®) to be safe from the chemicals and from the lead.

Caustic strippers will burn your skin. And, when scraped, caustic stripper paste can create a dust or mist that can get in your eyes, nose, mouth, and throat. Some solvent strippers can damage your skin while others pass through your skin into your blood, causing damage to your brain, nervous system, blood, liver, kidney, and heart. It is illegal to use a solvent stripper containing **methylene chloride**.

After the paint is removed, carefully clean the surface. Then use a special rinse to neutralize the surface. The rinse balances the acid or base of the stripping chemicals. Check to make sure the neutralizer worked. The surface may need to be smoothed and re-glued before it is repainted. Newer and less toxic chemical strippers do not need a neutralizer.



Off-site Chemical Stripping

You can send painted material off site to be stripped. Wet down and clean up any debris generated when you remove the component. Mist the building part with water and remove it. Wrap it in poly. Wear a respirator and protective clothing when you do this.

Send the component to a professional paint stripping shop. At the shop it will be dipped in a tank full of chemical stripping agents and the paint will dissolve right off the surface.

When the component is returned, wash it to ensure it that its surfaces have been properly neutralized before you reinstall it. It may also need to be refinished. Wear a respirator if you sand the

surface – chemical stripping always leaves some lead behind.

Advantages

Chemical paint strippers are useful to preserve the detail on decorative doors, molding, and trims. They are used on old antique trims or molding that can not be replaced. Sending the work somewhere else keeps hazardous chemical strippers out of your work area.

Disadvantages

Chemical strippers create **hazardous waste**. Strippers are often made of hazardous materials and must be disposed of as hazardous waste. The liquid waste generated through rinsing and cleaning may also be hazardous waste. Hazardous waste has to be contained and disposed of in a special way or it can hurt workers and the environment. Sending the work off-site protects you and your work site, but it does not protect the work site or workers where the chemical stripping takes place.

Chemical stripping leaves some lead behind. This leftover lead soaks into the pores and cracks of a surface, especially wood, where it hardens. Clean the stripped surface carefully or the leftover lead will mix with the new non-lead paint. When the new paint chalks, chips, or peels, the lead will get in the dust all over again.

Another reason the new paint might fail is that the neutralizer did not work properly. If the surface is not neutral, you must clean and neutralize it again.

Removing a building component for off-site stripping will create dust. An old building component may break when you try to remove it. To keep dust levels down, mist the component with water before you remove it. Wet down and clean up any debris generated. Wear respirators and protective clothing, and follow proper hygiene practices.

Vacuum and Water Blasting (exterior methods)

Paint can be removed by vacuum blasting and water blasting.

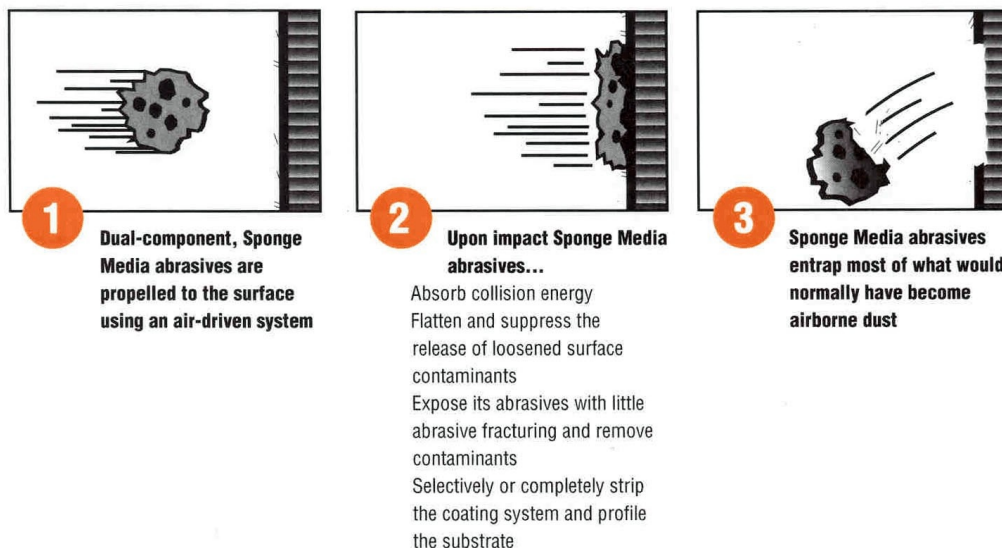
These methods are to be used for exterior work only. Vacuum blasting requires a HEPA vacuum. Both methods are very expensive. They create a lot of waste. They can damage the treated surface, especially wood. Neither method is used very often.

Vacuum blasting can be used on a variety of surfaces, but it works best on flat surfaces. **Water blasting** creates waste water that is considered hazardous. It must be contained and disposed of properly.

After the lead-based paint is removed, the bare surface must be cleaned and smoothed. Then, the surface must be inspected. If it passes inspection, it can be repainted with non-lead paint or covered with other materials.

New technology developments in lead-based paint removal include the use of **recyclable sponge media** with embedded abrasive bits which, when blasted onto interior, exterior, and mechanical surfaces, effectively removes layers of lead-based paint with minimal lead dust creation and debris.

Conventional Abrasive Bonded Into Sponge Media



Prohibited Methods

There are some methods which HUD and some states do not allow on residential lead abatement jobs. These methods are not allowed because they are hazardous and they just do not work.

- ▶ Torch or flame burning
- ▶ Open abrasive blasting
- ▶ Uncontained water blasting
- ▶ Machine sanding (unless equipped with a HEPA exhaust)
- ▶ On-site use of methylene chloride
- ▶ On-site use of flammable solvents
- ▶ Solutions of potassium or sodium hydroxide (caustic paste allowed with special precautions)
- ▶ Dry scraping (allowed in Massachusetts)
- ▶ Wall papering or repainting as an abatement method

Interim Controls

Interim controls are actions that temporarily reduce the lead hazard. They can be very helpful. They keep the lead dust levels down and can prevent lead poisoning. Areas where interim controls are being used need to be regularly inspected to make sure the controls are still working. **Interim controls listed in Title X include:**

1. Education programs;
2. Special cleaning; and
3. Repairs, repainting (with regular paint), and maintenance.

In-place Management

In-place management is necessary whenever you use interim controls. Keeping a lead-based paint surface in good condition prevents damage and dust. Controlling lead dust and paint chips during routine cleanup and maintenance activity also helps reduce lead hazards.

In schools, hospitals, and other public and commercial buildings, custodians and maintenance personnel clean and repair the building. Any facility that has lead painted surfaces should have an in-place management program. A good in-place management program can help prevent lead poisoning. It can help make and keep a building lead safe. A good program should include the following:

- ▶ An education program for workers and occupants to make them aware of lead-based paint hazards, where the lead is, and what is being done to make the building safe;
- ▶ Special training for maintenance workers;
- ▶ A written plan for each building that shows where the lead is;
- ▶ A lead manager who explains what is happening to workers, outside contractors, and occupants regularly;
- ▶ On-going monitoring and checking of the condition of lead-painted surfaces; and
- ▶ Records of all inspections, work activities, maintenance, ongoing monitoring, worker medical exams, air monitoring, waste disposal, and other activities.



Typical maintenance issues might include:

- ▶ It makes no sense to replace windows if the replacement doesn't make the building easier to heat and cool. Energy-efficient windows will also increase the value of the building.
- ▶ Roof leaks and other water problems lead to peeling paint and can encourage termite damage and building problems. Repair all leaks before or during abatement.
- ▶ Carpets can store lead dust as well as bacteria and **mold** that cause respiratory disease. Whenever possible, carpets should be removed and replaced.
- ▶ Everyone in the building is involved in preventing lead hazards when an in-place management program and maintenance is working.

Rules for Setup and Lead Work

The following steps will keep lead from spreading outside of the work area. It will also make final cleanup of the work area much easier.

1. Keep dust out of the air
2. Contain the work area
3. Wash your hands and face often
4. Use personal protective gear and clothing
5. Clean up dust as you work

1. Keep the Dust Levels Down

The purpose of lead abatement is to reduce a hazard. But, while you do the abatement, you will stir up and even create new lead dust. It is very important to keep lead dust levels down. According to the law, your employer must use methods and tools which create the least amount of lead dust. This program must be in writing and is called a **compliance program**. As a worker, you can control lead dust levels by:

- ▶ Avoiding methods that create a lot of dust and waste.
- ▶ Using a special vacuum called a HEPA exhaust vacuum.
- ▶ Using wet methods.
- ▶ Cleaning up as you work.
- ▶ Never dry sweeping.



Special Cleaning Methods

Special cleaning methods must be used when you work with lead-painted surfaces. Special cleaning can be used by itself to control lead dust, but it must also be used with all other interim controls and all abatement methods.

Research shows that HEPA vacuuming and washing with a lead cleaner are the methods that work well to reduce lead dust. They work best when they are used together, one right after the other:

1. HEPA vacuum all surfaces.
2. Wash all surfaces with a lead cleaner.
(phosphate-free cleaner pictured right →)
3. HEPA vacuum all surfaces again.

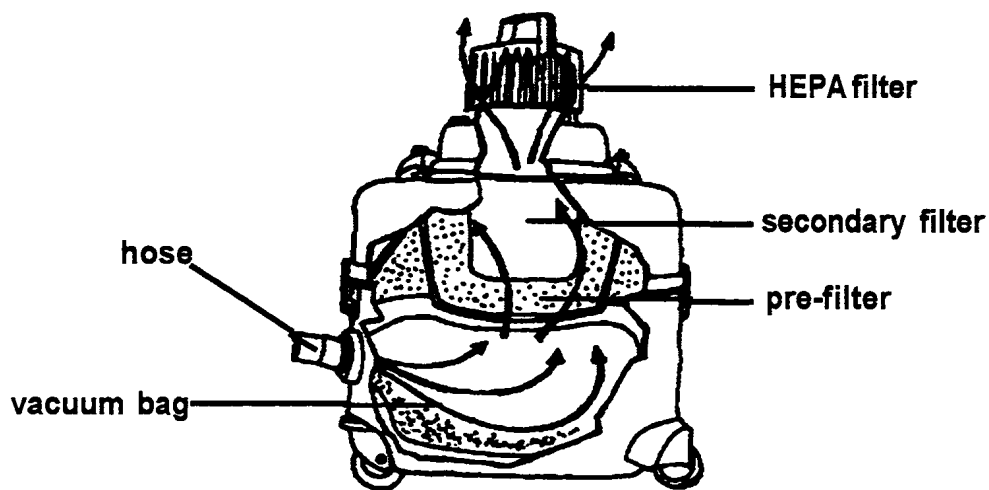


HEPA Vacuum

Always use a HEPA vacuum on a lead job. A HEPA vacuum is an industrial strength vacuum cleaner equipped with a HEPA filter to catch lead dust. A regular shop vacuum will not filter out the lead dust. It just blows the lead back out into the room.

Most HEPA vacuums have three filters: a HEPA filter, a secondary filter, and a pre-filter.

1. Debris gets sucked in through the hose into the vacuum bag.
2. The air and dust get filtered through the pre-filter, the secondary filter, and the HEPA filter.
3. The HEPA filter captures the lead dust before the air is released into the work area again.



How to use a HEPA Vacuum

1. **Lightly mist area with water to keep dust levels down.** Some HEPA vacuums can combine a wet wash with the vacuum. Read the manufacturer's instructions on how to use it.

2. **Move slowly.** Vacuum slowly so the HEPA vacuum can pick up all the lead dust.
3. **HEPA vacuum all surfaces.** Start at the end farthest from the main entrance/exit. As you vacuum, move towards the main exit and finish there. Begin at the top of each room and work down. For example, start with the top shelves, the top of the woodwork, and so on and work down to the floor. Do every inch of the windows, especially the window wells.
4. **Use Special Attachments.** Use the rubber cone where the floor meets the baseboard and along all the cracks in the floor boards. Use the brush tool for walls and woodwork. Use the wheeled floor nozzle for bare floors and the carpet beater for rugs.

Maintain the HEPA Vacuum

You should periodically check the HEPA vacuum for:

- ▶ Damaged wires;
- ▶ Worn gaskets and switches;
- ▶ Torn vacuum bag (if used); and
- ▶ Damaged and clogged filters.

Whenever you repair the HEPA vacuum, wear protective clothing and your respirator. Repair and replace parts for HEPA vacuums in a contained work area. Replace parts as needed. Check the pre-filter often for dust and debris and change the pre-filter when appropriate. When checking the HEPA vacuum, clean it off using a second HEPA vacuum. This keeps the HEPA vacuum working properly. Use parts and filters that are the same make as the originals. Never use shop vacuum parts on a HEPA vacuum. Remember



to clean up the area when you are done.

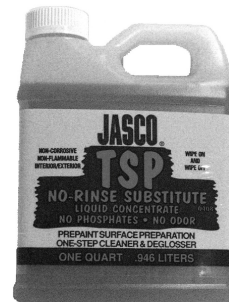
Lead Cleaner

Trisodium phosphate (TSP) is a special ingredient used in some detergents that bonds with lead dust. Lead dust sticks to the TSP. Washing with the lead cleaner TSP helps get lead dust particles out of the cracks and crevices. Rinse surfaces well after washing them with TSP or any other lead cleaner.



Lead cleaners like TSP should not be used on certain surfaces, such as finished furniture. Use a tack cloth (a soft, lintless cloth such as a handkerchief) on such surfaces.

Phosphates like TSP are harmful to the environment. A number of other lead cleaners may be used instead of TSP. You can buy this cleaning agent in most hardware or janitor supply stores. (Dishwasher detergent may contain 5% phosphate. If so, this is okay to use – but it is more expensive.) Some states and local governments do not allow the use of TSP. Other states require you to use TSP as a lead cleaner. Be sure to check your state and local laws.



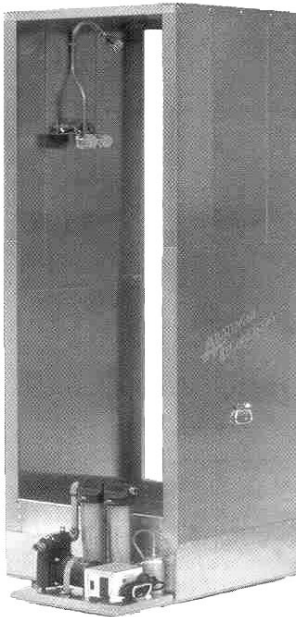
2. Contain the Work Area

The OSHA Lead Standard says that the work area must be separated from the non-work area. HUD says the work area must be sealed off. The work area can be contained with sheets of 6-mil polyethylene, called **poly or visqueen**. (Some states allow the use of one layer 4-mil poly on walls and 2 layers on floors.) Containing the work area:

- ▶ Protects non-lead surfaces from lead dust.
- ▶ Keeps lead dust from spreading outside the work area.
- ▶ Keeps everyone but workers away from the lead.
- ▶ Makes clean up easier.

It is important to look for rips in the poly every day before you begin work. Repair any rips with duct tape as soon as you see them.

3. Use Personal Protective Gear and Clothing



4. Wash up, Shower, and Change

Wash your hands and face each time you leave the work area. Lead dust will get on you while you work. Washing up each time you leave the work area prevents you from getting lead dust in your mouth. Never eat, drink, smoke, or put on chapstick or makeup in the work area.

When your exposure to lead is above 50 $\mu\text{g}/\text{m}^3$, your employer is required to provide showers whenever feasible. When showers are available, take a shower at least the end of the work day, if not every time you exit the work area through the decon. Do not wear contaminated work clothes or shoes home.

5. Clean Up as You Work

Cleanup is very important because prevents future exposures to lead. It protects you while you work by keeping harmful lead dust levels down and it prevents you from spreading lead dust outside the work area. Good cleanup is required for the abatement job to pass the final inspection.

Setup

There are many different parts of the setup job. You have to turn off and seal off the ventilation system. You have to clean and protect the room. You may have to bring in extension cords. A good setup makes the rest of your job much easier and it also prevents many safety problems. The exact type of setup that you do will depend on your job.

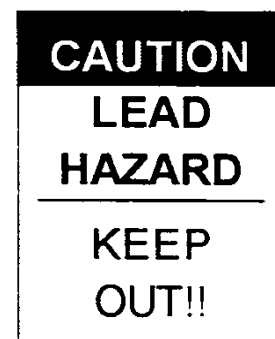
It is important to think about how to set up without creating a bigger lead dust hazard. Identify the contaminated areas. Locate where the shower or wash area will be set up and **how you will move in and out of the contaminated area**. Check your state regulations for work area preparation.

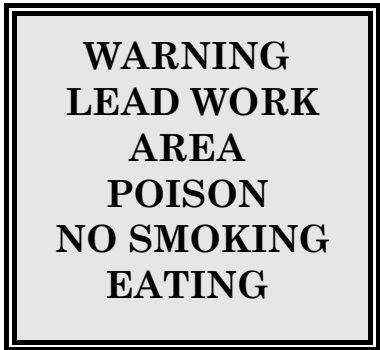
Setup Check List

- Put up warning signs.
- Identify work site safety hazards.
- Clean and remove anything you can move. Clean, cover, and seal the things you cannot move.
- Shut off and seal off ventilation system.
- Provide airflow for workers.
- Do necessary repair work.
- Shut off and lock out electricity.
- Set up the decontamination area and wash area.
- Clean, cover, and seal everything left in the work area.
- Mop and seal the floor.
- Bring in equipment and tools.
- Seal off the work site.
- Separate equipment room area from the rest of the work area.
- Set up locked storage space for waste.
- Secure the work site.

1. Put up Warning Signs

Only the people working on the lead abatement job should enter the job site. People who live in homes where work is done will need to pack up their belongings and stay somewhere else until the abatement job passes final inspection. Even on jobs where interim controls are being used, occupants must be out of the house during work.





The building owner needs to warn everyone in advance that lead work will be done. Warning signs need to be put up at the exits and entrances of the area to be abated. Many states and local governments say you must post warning signs. Make sure you check your state and local laws.

Some states say the contractor performing the abatement must put up warning signs on the doors leading to the work area.

These signs prevent anyone from wandering onto the work site. The signs tell everyone there is a lead hazard. The OSHA Lead Standard says these signs must be posted if you are working above the PEL. Warning signs should be written in the language of the occupants and the workers.

2. It is important to identify work site safety hazards before starting the job.

You will look for problems like:

- ▶ Exposed electrical wires and switches;
- ▶ Water damage;
- ▶ Water leaks;
- ▶ Collapsed or damaged ceilings, walls, floors, stairs; and
- ▶ Any other structural damage.

You will need to put up warning signs until you repair the problems.

3. Take Out and Clean Off Anything You Can Move

Clean and move anything you can out of the room. Large appliances such as stoves, refrigerators, washers, and dryers may be left. But gas stoves and refrigerators must be disconnected.

Clean everything off with rags and a lead cleaner like TSP. Immediately rinse off the lead cleaner with clear water. Do not use



TSP on finished furniture. Use tack cloth instead. Put the used rags in 6-mil poly bags and label the bags **LEAD CONTAMINATED**. Dispose of them with other waste. The wash water must be stored in non-corrosive containers. It may be hazardous waste.

All cloth must be removed and cleaned. Cloth includes clothes, curtains, carpets, and upholstered furniture.

Removing carpet kicks up a lot of dust. Workers must wear protective gear, especially respirators.

Rugs and fabric on furniture must be cleaned. It is very difficult to clean cloth and carpets. If they cannot be cleaned, they should be removed. Warn the owner about the things you cannot clean.

If the owner agrees to throw contaminated items away, wrap them in two layers of 6-mil poly and seal them up with duct tape. Label the items: **LEAD-CONTAMINATED WASTE**. Dispose of them with other abatement waste.

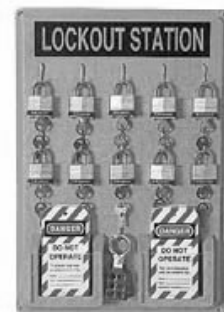


4. Shut Off the Ventilation System and Seal It

The ventilation air system carries air through the building, with it lead dust and fumes. The ventilation system for the work area must be shut off at the electrical box. Lock the box and label it with a tag that says: **DANGER: Do Not Operate**.

Locking and tagging the electrical box is called Lockout/Tagout. The OSHA Lockout/Tagout Standard (1910.147) requires:

- ▶ Training for workers who do lockout, work on locked out equipment, and work in the area.
- ▶ Strong, coded locks.
- ▶ Written standard operating procedures for lockout.
- ▶ Testing machinery after lockout to make sure it can't be turned on.



The ventilation system is often called the **HVAC system**. HVAC stands for Heating, Ventilating, and Air Conditioning. Cover and seal the air vents with poly and duct tape. Coverings such as these are called **critical barriers**.

Since the heat is turned off, in cold weather it is necessary to bring in alternative heat sources. Also be sure to protect water pipes and fixtures from freezing. If necessary, drain the pipes and wrap the water entrance from the street with electrical tape.

5. Provide Ventilation (airflow) for Workers

There are times when extra ventilation is necessary. Your employer might use a negative air machine to both ventilate the work area and clean the air. A negative air machine is like an exhaust fan with a HEPA filter. When you use a negative air machine, there must be an opening for fresh air to come in. This is called **make up air**. The OSHA Lead Standard says you must have extra ventilation if you are working above the PEL (but a negative air machine is not mandatory).



6. Do Necessary Repair Work

Some of the structural problems you identified at the crew's pre-job meeting have to be fixed. Collapsed stairways, ceilings, and floors can make the work area too dangerous to start the job. You will have to fix these problems before you can start the abatement work.

Check for moisture damage. If you find any moisture damage, determine the source of the moisture or water damage. Fix the source problem or inform the owner of the need to have it fixed. Roof leaks, poor flashing, bad plumbing and other water leaks must be repaired. Uncorrected water leaks will cause the abatement to fail. Walls must be allowed to dry out. Moisture in a wall can cause abatement to fail. Watch out for **mold**.

Any damaged plaster will need repair if it is going to be abated.

Otherwise, the method will fail. Remember to contain the area before you do this repair work.

You also need to make sure the water system is working. You will need on-site running water to wash up. You will need water for some abatement methods and for cleanup procedures. If the water service is shut off, you will have to bring water to the site.

7. Shut Off Electricity and Lockout the Electrical System

Lead abatement jobs use water. This is an electrical hazard. Water can leak into an electrical outlet and kill you. For small residential jobs, you can cut off the electricity at the fuse or breaker box for the rooms that you are working on.



For large jobs, the electrical system should be shut off at the electrical box. Lock the box and label it with a tag that says **DANGER - Do Not Operate**. Turning off wall switches is not enough. Someone who does not know about lead abatement work could electrocute you by mistake.

Machines also have to be shut off. A machine with moving parts could hurt someone. It has to be turned off and locked so that people can work safely around it.

Ventilation machines, safety lights, HEPA vacuums, and powered hand tools all need power. Bring in extension cords for all the equipment. Extension cords are sometimes called **temporary wiring**. Tape the cords onto the walls so that workers will not trip on them. Do not hang cords with metal wire. Use a special outlet called a Ground Fault Circuit Interrupter (GFCI or GFI) for all cords. This is a sensitive circuit breaker that will protect you if there is a short.



8. Set Up the Decontamination Area (decon)

You go into and out of the work room through a special area. It

is called the **decontamination unit** or **decon**. This is where you **decontaminate** or **get clean**.

Your employer needs to set up a decon. Set up the decon in a clean area. The kind of decon you use depends on the size of the job. Some contractors build their own decons. Some use hard plastic decons. Others use decon trailers that go outside the building.

For a large-scale job, the decon may be separate rooms. These rooms should be lined with two layers of poly and have poly flaps between them. The decon should be sealed to the work room. For small-scale work, like single unit abatement or interim control work, you may not be able to use a full decon. Your employer is still required to provide an area to decontaminate, a wash area, and a clean changing area that are separate from the work area.

The decon has three rooms. They have to be in this order, starting from the work room:



1. Equipment Area	2. Wash Area	3. Clean Area
<p>The equipment area must have a container to put your dirty protective clothing in. This container has to have a lid that closes. The container should be labeled. Sometimes called the dirty area.</p>	<p>The wash area must have an eye wash station, running warm water, clean towels, and soap. When possible there should be a shower. Your employer must also provide onsite toilets.</p>	<p>The clean area must have a clean place to store your street clothes and respirator. Your street clothes should never be in contact with your dirty work clothes.</p>

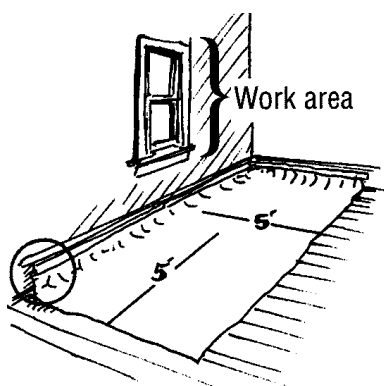
9. Clean, Cover, and Seal Everything Left in the Room

HEPA vacuum and wipe off with a damp rag anything that you cannot remove (like a refrigerator, oven, piano, etc.). Wet mop all surfaces. Wait until the surfaces dry and then cover and seal them with 6-mil poly (sometimes 4-mil) and duct tape. This seal may not be broken until the final inspection. Remember to duct tape the poly to the floor.



10. Put up Critical Barriers

Duct tape poly on air vents, heat ducts, windows, and any other openings. This helps prevent lead dust from escaping the work area.



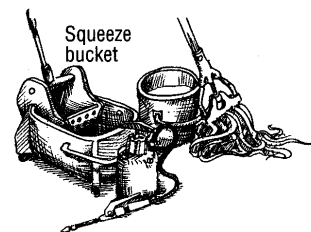
11. Seal the Floors

Wet-mop the floor, particularly where the floor meets each wall. Let it dry. Cover the floor with 6-mil poly, taping it around the outside edges with duct tape. When the surfaces are dry, cover the **first sheet of poly with a second sheet of poly** where demolition or removal will create high dust levels. Tack this layer down with small piece of duct tape so the second layer can be taken up without pulling up the first layer.

It's important to look for tears in the poly every day before you begin working. Repair any rips as soon as you notice them.

12. Bring in Equipment and Tools

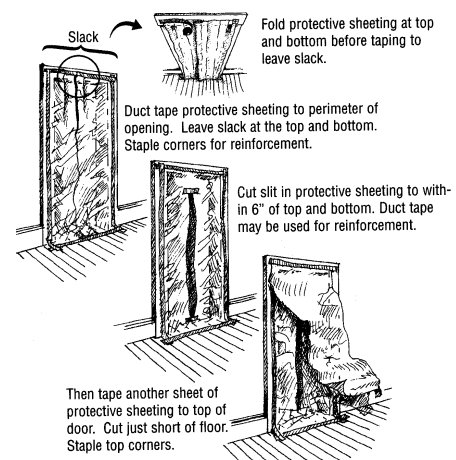
Be sure that all the tools and cleaning equipment you need are in the workroom before abatement begins. You should bring in cleaning equipment, negative air machines (if required), ladders, and scaffolding before the decon area is built and before the area is sealed.



13. Seal Off the Work Site (from the rest of the building)

If you're only removing paint from one room or one part of a building and another part of the building is occupied, seal off the work area from the rest of the building. The barrier must prevent people from accidentally passing through. Examples of this kind of barrier are a locked door or plywood nailed to a frame. The edges must be sealed on all sides with duct tape to make them dust tight. This seal may not be broken until the work is complete in this area, the area is cleaned, and the area passes final clearance.

Workers should enter and exit from the work area through a door. If this is not possible (for example, the work area is more than three floors up), a full decon system must be used between the work area and the rest of the occupied building.



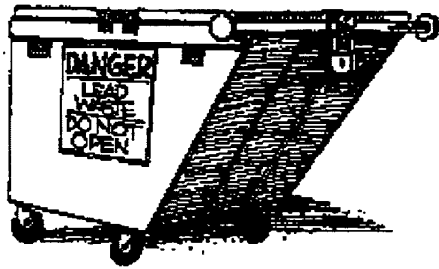
14. Separate Dirty Work Areas From Rest of Work Area

Demolition, chemical stripping, and any other work that will generate a lot of lead dust or waste is called **dirty work**. It is a good idea to separate this heavy dust/fumes creating work area from the rest of the work area. Doing so helps control the transfer of dust.

- ▶ Put up two layers of 6-mil poly over the dirty area exit.
- ▶ Seal off ventilation registers.
- ▶ (If possible) do not remove debris through other areas.
- ▶ Avoid tracking dust from the dirty area when you move to other parts of the work area.

15. Set Up a Locked Storage Space for Waste

Use a locked dumpster or an area that can be locked. The waste storage area must not be accessible to children or animals.



Put up a warning sign that says: **DANGER! LEAD WASTE.** If you use a dumpster, be sure the rental company knows you will be storing lead waste in it. Do not track lead dust from the work area to the storage area.

When you walk on lead dust it can stick to your shoes or boots. It then falls in another area. This is called **lead tracking**. Tracking lead dust is a big problem on lead abatement jobs. Lead dust can be tracked on your shoes from the work area to outside. Sometimes lead dust from the outside soil is tracked into the decon area. Lead dust from a porch or non-work area can get tracked into a clean area. When this happens, the whole area must be cleaned.

16. Secure the Work Site

Secure the building at the end of each work day. This prevents vandalism and loss of property and it also keeps people from entering the contaminated area.



Setup Checklist for Interim Controls or a Maintenance Activity

- Post warning signs and mark off work area with tape.
- Keep people out of the work area.
- Wear protective clothing and respirators.
- Clean and remove nearby objects. Send rugs out to be cleaned, after labeling.
- Clean and seal (critical barriers) what remains in the area.
- Seal air vents and other openings (critical barriers).
- Set up equipment (dirty) area, wash area, and clean area.
- Lay layers of poly at least 6 feet in every direction from the area where you will be working.
- Bring all work tools and equipment into the work area.

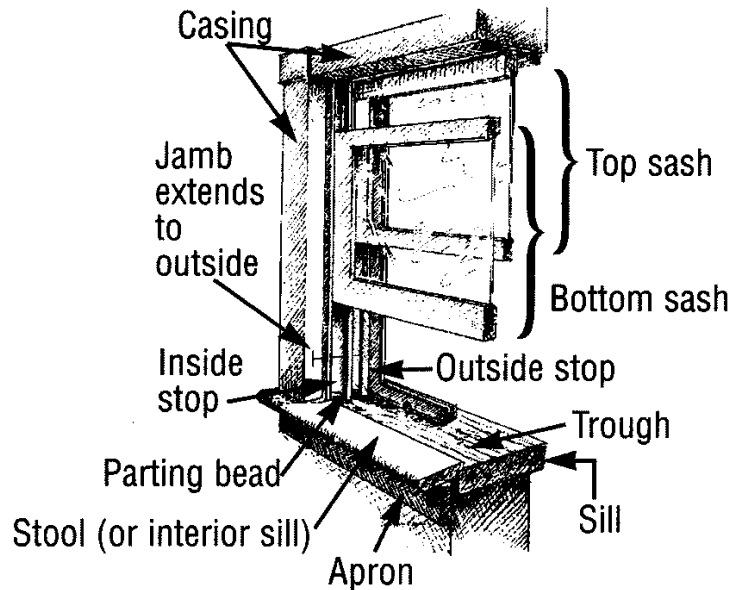
Doing Residential Abatement

Windows

Opening and closing windows causes friction between painted surfaces. This friction creates dust. Windows are exposed to water, sun, wind, and temperature changes which cause paint to deteriorate and create dust.

Put extra poly up when you work on

windows. Attach the poly to the wall underneath the window and extend the poly out at least 6 feet. Do this both inside and outside the window. You can also cover the outside of the window with a critical barrier and remove the window from the inside.



Window Abatement

Replacing lead-painted windows is a good choice because:

- ▶ They cause lead dust;
- ▶ Children like to play at windows;
- ▶ Old windows are expensive to maintain;
- ▶ New windows save energy; and
- ▶ New windows increase property value.

If you must keep the old sashes, you can:

1. Remove the sashes and have them stripped off site. Clean, re-glue, refinish, and paint them before reinstalling.
2. Replace the stops and the parting bead.

3. Enclose or chemically strip the jamb.
4. Replace the casing and the apron.
5. Replace the stool (inside sill) or enclose it.
6. Enclose the outside of the window with wood or coil stock (sheet metal). **Warning:** Enclosing wood with coil stock may cause exterior wood to rot.

Interim Controls

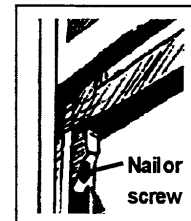
If you are not going to abate lead-painted windows right away, you can still treat them so they create less lead dust. (Make sure these options are legal in your state and local area.)

The Sashes

The goal is to eliminate friction against leaded surfaces.

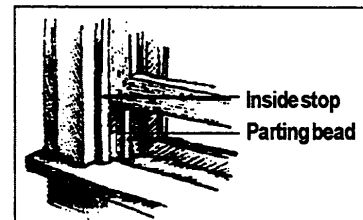
Fix the Top Sash in Place

Nail or screw in wood blocks under the top sash to hold it in place. (Make sure this is legal to do in your area.) This way you will only have to work the bottom sash.



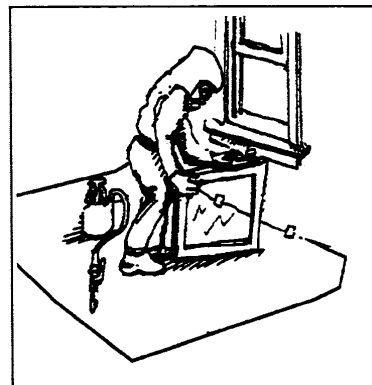
Remove and Dispose of Inside Stop

Do the same with the **parting bead** if you are treating the top sash as well as the bottom.



Remove the Bottom Sash

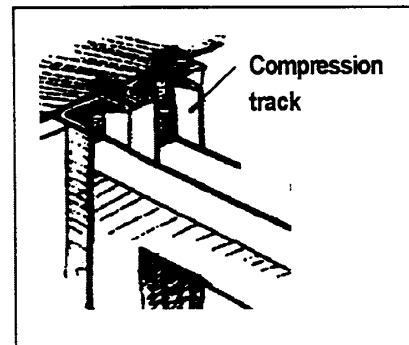
If the counter-weight ropes or chains are in place, do not let them drop into the weight compartment.



Remove the Paint from Edges that rub against stop, stool, and parting bead.

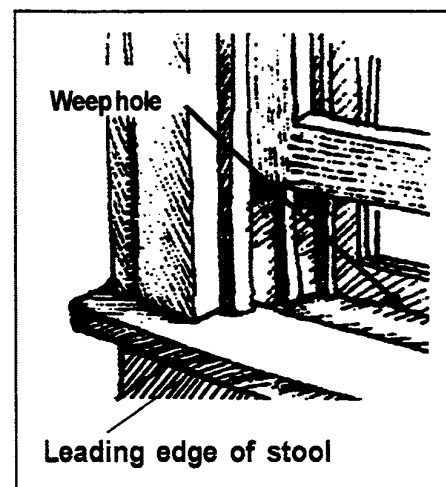
Rehang the Sash(es)

in a compression track. If there is no counter weight or spring system, install one.



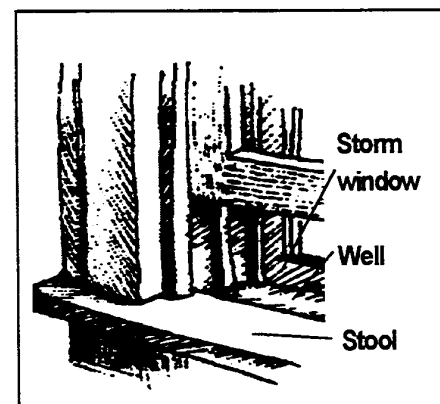
The Well and the Stool

When there is a storm window frame a well is created between the storm window and the stool. This area is one of the highest dust areas.



HEPA vacuum the well

Create a cleanable surface by enclosing the well with vinyl or metal coil stock (sheet metal). First caulk the back of the material around all the edges (back caulk it) and then nail it down. Then caulk the edges again from the top.



Open or Drill Out Weep Holes. Weep holes are drain holes in bottom of storm windows.

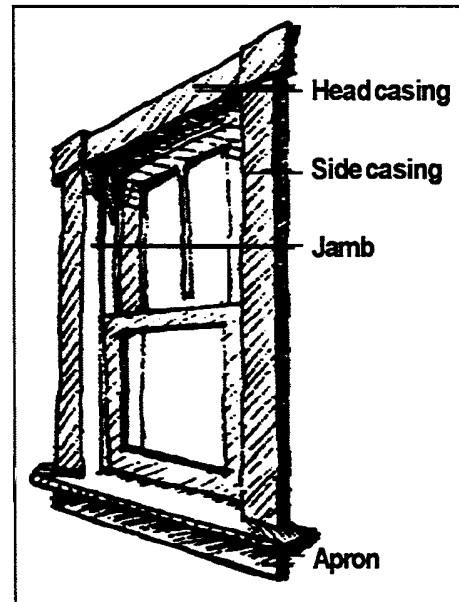
The stool is at the base of the window, inside the house.

Children often look out the window and may put their mouths on the stool. Wet plane or enclose the edge facing the room. You may also need to enclose or remove the paint from the top surface.

The Casing, Apron, & Jamb

If the paint on the casing, apron, and jamb is in good shape, you may be able to just wet scrape and repaint. Remember, paint is not an encapsulant. Repainting is only a temporary solution.

If the outside jamb is still exposed and the outside casing is damaged, wet scraping and painting may not be enough. Seal any exposed wood with boiled linseed oil (or equivalent) and paint. Enclosing the trim with coil stock will also work, but may cause exterior wood to rot.

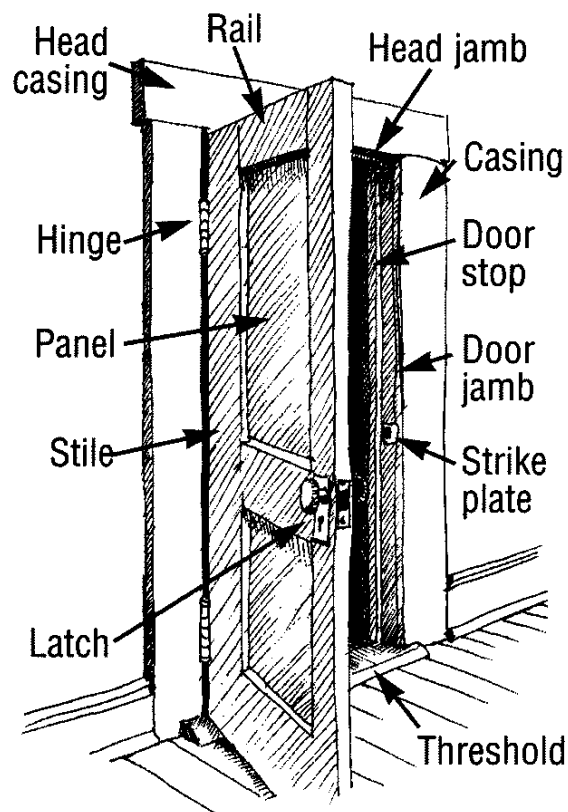


Doors

Opening and closing doors creates an impact. When you impact a surface again and again, you create dust. Outside doors are exposed to water, sun, wind, and temperature changes. These cause paint to deteriorate and create lead dust.

Door Abatement

Replacement is often the easiest, most cost effective method. There are a number of ways to do this:



- ▶ Replace door and door stop.
- ▶ Install a pre-hung door and keep old jamb.
- ▶ Install a pre-hung door and new casing.

Taking out old casing can damage the surrounding wall. New casing should be wide enough to cover any damage. It should also cover the jamb edge and the area where the old casing met the wall.

Remove the Paint Off-site.

If you must preserve the door and casing, send them to be stripped off-site. Clean them when they come back. Re-glue, fill in any holes or cracks, and sand them. Reinstall and paint after inspection.

Remove the Paint On-site.

You can remove the lead-based paint on-site with chemical stripping, wet scraping, or by using a heat gun. For metal doors, you might use a needle gun equipped with a HEPA exhaust vacuum. These methods require time and patience.

Interim Controls

If you are not going to abate lead-painted door systems, you can still treat them so they create less lead dust. (Make sure these options are legal in your state and local area.)

- 1. Replace the stop-or wet plane it.**
- 2. Wet plane the corner edges** of the door on its latch side where it contacts the stop.
- 3. Re-set the hinge screws if necessary.**
The door should not make any wood-to-wood contact, except against the latch (knob) side stop. If it does, rehang the door or plane the hinge side of the door until there is about

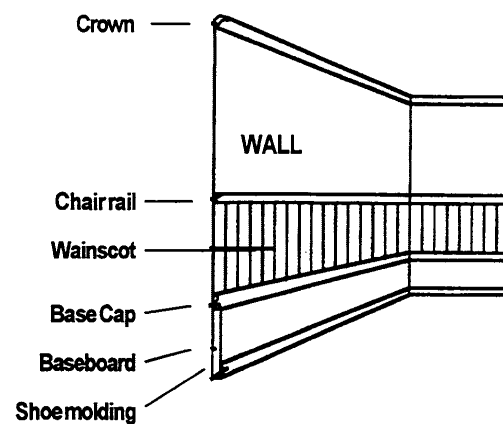
1/8-inch space between the door and the jamb on all sides. The door should not scrape the threshold or make contact with the hinge side stop.

Woodwork (not including doors and windows)

Lead-painted woodwork can be a source of lead dust, especially impact points such as chair rails, baseboards, and jamb edges.

Woodwork Abatement

1. **Replacement.** All woodwork can be replaced. Remember to back caulk (caulk the back of the material around all the edges) and then nail down replacement parts when you install them.
2. **Encapsulate** (if the paint is in good shape).



Interim Controls

If you are not going to abate lead-painted woodwork, you can still treat it so it creates less lead dust. (Make sure these options are legal in your state and local area.)

1. **Wet plane and enclose any edges** from surfaces where children may put their mouths.
2. **Where paint is intact, paint over with a high grade paint.** Paint is not an encapsulant. Repainting is only a temporary measure.
3. **Cover impact points** (chair rails, baseboards, jamb edges, etc.) with a strip of solid lattice or corner protector.

Walls

Kitchen, bathroom, and basement walls were often painted with lead-based paint. Sometimes other walls in a home can have lead-

based paint, too. Encapsulation and enclosure are the methods most often used to abate lead-painted walls.

Wall Abatement

1. Encapsulating Walls

The wall must be sound. Plaster or plaster board must be in good shape. There cannot be any major delamination (coming apart) of the existing paint layers. If not, the encapsulant could pull right off the wall. If the wall is sound, but has minor cracks or chips, a mesh system works well. It will seal the cracks and chips. Old wallpaper should be removed because it can cause the encapsulant to fail.

- ▶ Prepare the wall. Wet scrape any loose paint. Clean off any oil, dirt, and grease with a solvent or detergent.
- ▶ Wear the right protective gear. You may need to use chemical resistant protective gear and wear your respirator with the right filters (possible combo) and goggles. Check the encapsulant MSDS.
- ▶ Mix the encapsulant. Follow the manufacturer's directions.
- ▶ Do a test patch.
- ▶ Ventilate the area. Some products need extra ventilation.

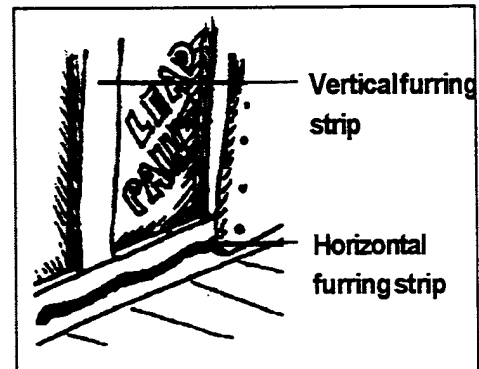
2. Enclosing Walls

Before you enclose a wall, label the wall surface **lead paint** to alert anyone who works on the wall later on that they are disturbing lead-based paint.

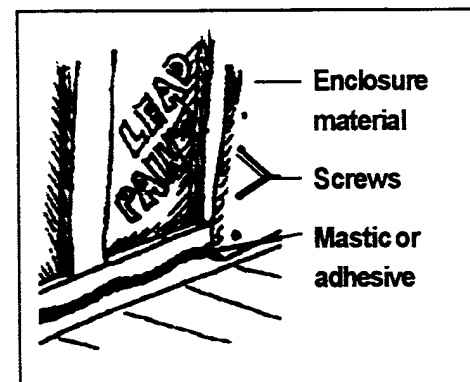
Both sound walls and damaged walls can be enclosed. Enclosure is recommended where the substrate (wall material) is damaged. Before you install an enclosure, you have to get rid of all moisture sources and let the walls dry out. Watch for **mold**.

Put up Furring Strips. When plaster is damaged, you must install enclosure material to studs or furring strips. Furring strips are thin strips of wood you fasten to the studs. This way, even if the plaster fails, the enclosure will stand. Furring strips should be attached with adhesive and screws into the studs. Putting up furring strips is called **furring out the wall**.

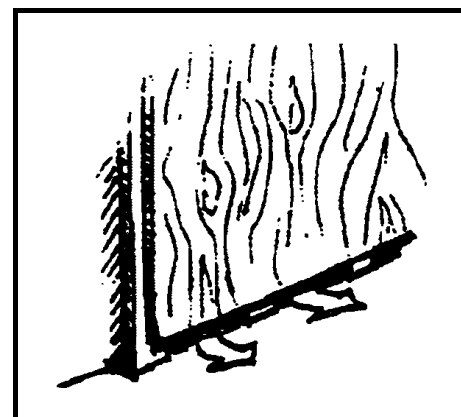
- ▶ First lay out a horizontal furring strip along the base of the wall.
- ▶ Then put up vertical furring strips. Line them up with the studs.



Fasten the Enclosure Material Fasten the enclosure material to the studs. If you furred out the wall, fasten the enclosure material to the furring strips. Use both adhesive and screws. If the wall is plaster on masonry and the plaster is sound, the enclosure material can be attached with a combination of mastic and masonry fasteners.

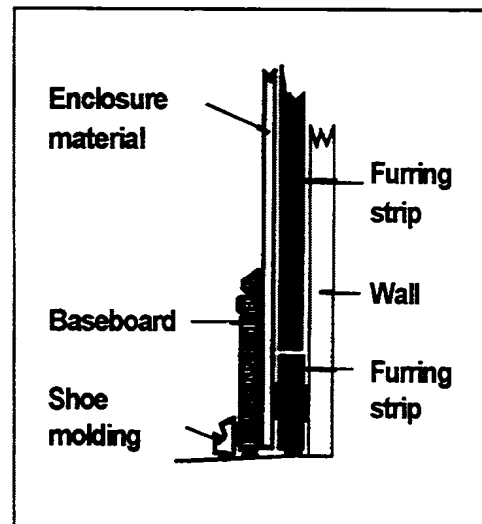


Create a Dust-tight Seal Paint deteriorates more quickly behind an enclosure. All edges of an enclosure – especially the bottom – must be sealed well or lead dust will leak out.



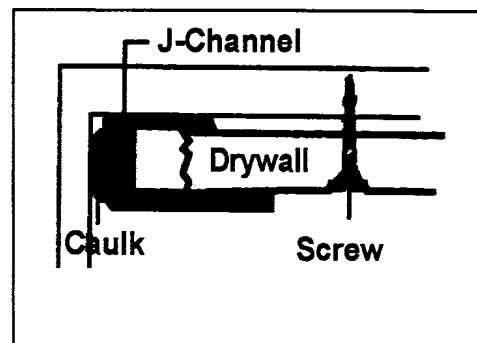
Seal the Bottom Edge

- ▶ Caulk the enclosure material at the bottom. Caulk around the edge of the back of the baseboard, then nail in place.
- ▶ Caulk around the back and the bottom of the shoe molding and nail it in place.



Seal the Seams and Other Edges

- ▶ Caulk around the back of any seams that aren't taped and spackled. Use a high quality adhesive caulk.
- ▶ Use a **J-channel** where drywall meets a finished surface. A J-channel is a final strip you attach to the rough edge of drywall to make a finished edge. It's called a **J channel** because of its shape. Caulk the outside edge so it seals with the finished surface and screw the drywall in place.



3. Replacing Walls

Replacing drywall and plaster is extremely messy and expensive. Sometimes it is the most practical solution – for example, when partition walls will be built or new electric, plumbing, or heating systems will be installed within a wall.

Taking out the old walls or wall substrate (plaster) is demolition work. Follow all worker and environmental protection rules:

- ▶ Remove all furniture and personal items and seal off the area. Put down a second layer of poly on the floor for added protection.
- ▶ Keep area misted to lower dust levels.
- ▶ Clean up often and dispose of waste. Wear protective suits and respirators and use extra ventilation.

Interim Controls

If the lead-painted walls are not damaged, flaking, or peeling, you might just wet scrape and repaint them. Remember, paint is not an encapsulant and repainting is not an abatement method, it is only a temporary solution. When the new paint does chip and peel, the old paint may chip with it and create lead dust.

Ceilings

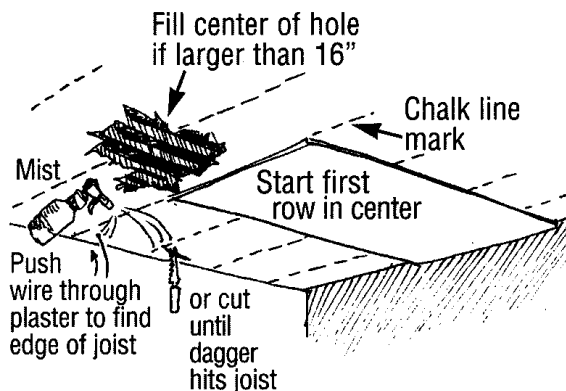
If a lead-painted ceiling is damaged, it must be enclosed. Ceilings can be enclosed with drywall – or any other type of covering that seals the seams and edges. An enclosure must be dust-tight. It must be sealed along all edges, joints, and seams. **A drop ceiling is not an enclosure.**

Ceiling Abatement

New drywall must be attached to the ceiling beams – called joists – with drywall screws. You can find the joists by cutting through the old plaster ceiling with a drywall dagger. Never attach the new ceiling to the old ceiling itself. The new ceiling must be fastened to the joists. To find the joists, use a dry wall dagger and:

1. Cut to the joists on both sides.
2. Mark the center of each joist on the wall.
3. Draw a chalk line across the ceiling from center mark to

- center mark.
4. Screw the new drywall into the joists along these lines.
5. Tape and spackle all edges.
6. Where new dry wall meets a finished surface, use a J-channel.



Interim controls

If the ceiling is not damaged, flaking, or peeling, you might repaint it to take care of the lead hazard in the short run. Remember, paint is not an encapsulant nor is repainting an abatement method, it is only a temporary solution. When the old paint does chip and peel, it will create lead dust.

Floors

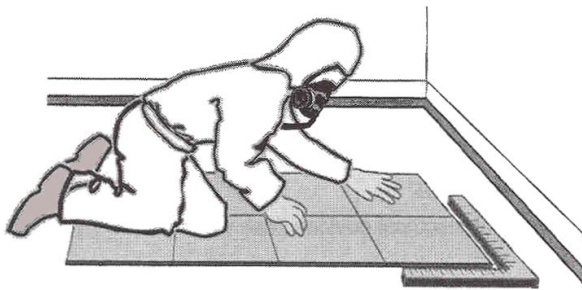
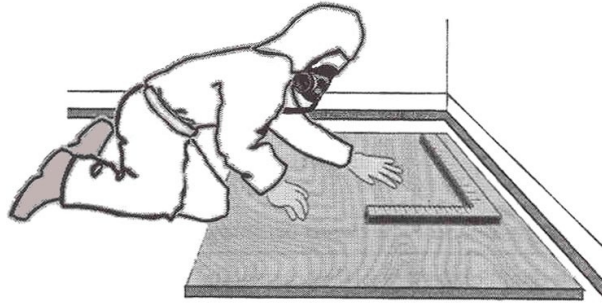
Lead-painted floors are a major source of lead dust. They are impact and friction surfaces. People walk on them. Children and pets play on them. Things get dropped on and dragged around on them. These activities create lead dust.

Floors should be abated last. Ceilings, walls, and windows need to be done first. This will reduce the amount of lead dust that gets on the new lead-free floor. The less dust that gets on the floor, the easier it will be to clean at the end of the job.

Floor Abatement

1. TSP (or comparable substitute) clean the floor to remove lead dust.
2. Install a sub floor before installing the finished floor (unless you are installing a new tongue-and-groove floor). Use ½-inch or thicker plywood or tempered underlayment. **Do not** use masonite. First back-caulk the edges (caulk the back of the material around all the edges), especially the borders.

Then nail it down. HEPA vacuum the floor and all cracks and fill large cracks with a filler that won't turn brittle or break.



3. Install the Finished Floor. You can use vinyl, tile, or wood. (If you use urethane, use extra ventilation and follow instructions carefully.) You can also use carpeting, but wait until final cleanup is complete before installing. Carpeting alone is not an enclosure. Wall-to-wall carpeting is discouraged in homes with lead-based paint because it is not cleanable.

Carpet Removal

Lead dust falls on and sticks to carpet fibers and it settles under the carpet. Taking out lead-contaminated carpets can be dangerous. **You will be exposed to high levels of lead dust.**

1. Seal the area from other parts of the house.
2. Wear a respirator and protective clothing.

3. Ventilate the area.
4. Dampen rug and any dust under it to keep the dust levels down.
5. Wrap up the carpet in 6-mil poly and seal it with duct tape.
6. HEPA vacuum the area and wash over it with a TSP or comparable detergent solution.

Carpets contaminated with lead are very difficult to clean. You or your employer should advise the owner of the carpet to remove it. Do not remove the carpet away without the owner's written permission. If the carpet is not removed, it must be slowly HEPA vacuumed.

After the Abatement

Floors should be abated at the end of the job—after windows, doors, walls, and ceilings. It is very difficult to clean floors of lead dust. Once you finish abating the floor, seal off the area until the final cleanup and a clearance inspection can be done.

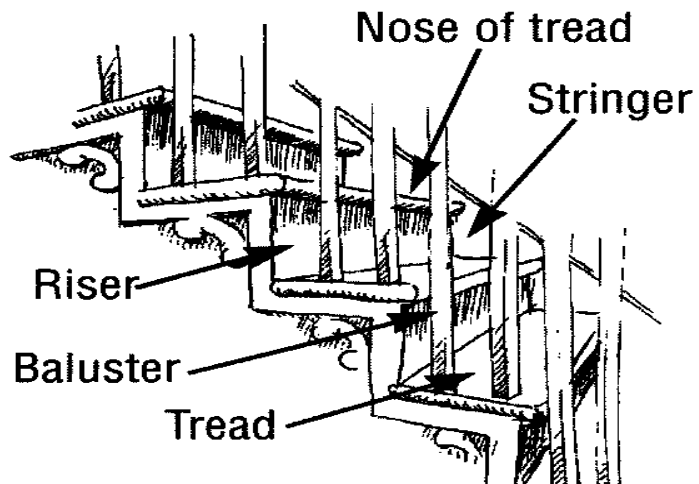
Staircases

Staircase abatement can be done in a number of ways. The entire staircase can be replaced, but this is extremely expensive and is not recommended. Parts of the staircase can be replaced, while other parts can be enclosed or encapsulated.

Staircase Abatement

1. Stringers and Newels

Stringers and newels cannot be removed without taking out the whole staircase, which is costly. It is better to remove



the lead paint on site or use an encapsulant that will take impact.

2. Railings, Newels, and Balusters

Railings, newels, and balusters can be treated with some encapsulants. However, the rail is a high friction area. An encapsulant may not work on the rail. The outside corners of the newel post and the top edge of the railing may need to be enclosed, wet planed, or chemically stripped.

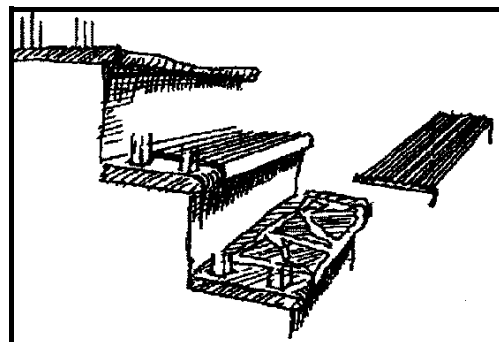
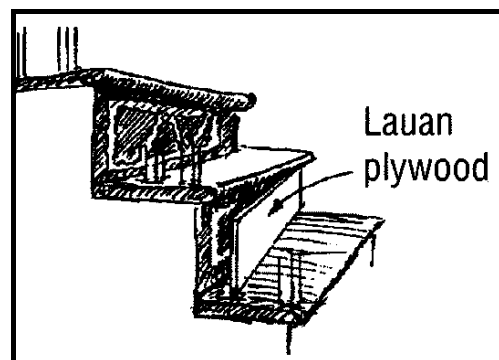
In some cases, the balusters and rails can be removed and off-site stripped or replaced. The paint in between balusters must be removed on-site.

As an **interim control** for square railing caps, you could wet plane them across the top side.

3. Enclose treads and risers.

A rubber tread with metal nosing works well. Rubber nosing may work, if it fits snugly on the nose of the stair and the stairs are not used very often.

- ▶ Enclose risers with thin plywood (like luan plywood) or some other hard material. Whatever you use must fit snugly.
- ▶ Back-caulk the edges of treads. Place them and nail or screw them down. Screw or nail the metal nosing on.



4. Enclose the Whole Railing System.

You can enclose the railing cap, balusters, and newels with plywood or drywall. Then you would cap the new system with a wooden rail. This solution changes the design of the room a lot. It also takes a long time, is a lot of work, and is expensive.

After Abating the Staircase

Once the staircase is abated, cover it with 6-mil poly. Staple down some type of non-slip material on top of the poly for worker safety. You can use cardboard stapled to the treads.

Porches

Wooden porches with lead-based paint are serious lead hazards because: surfaces get worn down from weather changes; children spend a lot of time there.

Porch floors should be replaced or enclosed. Use treated planks, treated tongue-and-groove, or exterior or marine grade plywood. Make sure the floor slants down away from the house. The slant allows for proper water drainage.

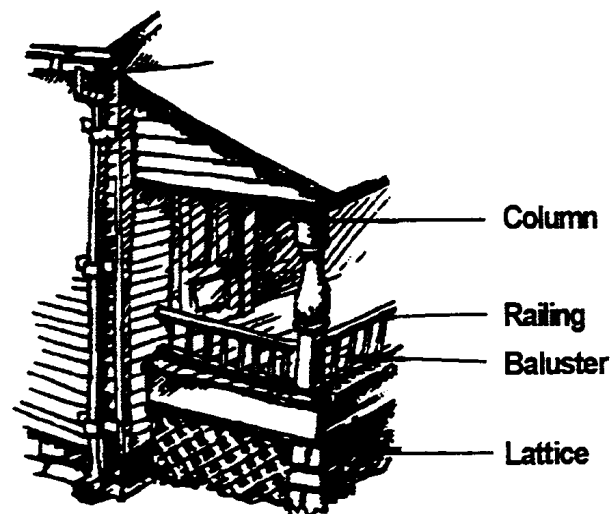
Balusters may be on-site stripped or encapsulated. They are often in such bad shape that they need to be replaced.

Rails can be replaced, stripped, or wet planed.

Structural columns can be wet scraped, encapsulated, or stripped.

Lattice (criss-crossed strips of wood or metal) should be replaced.

Ceilings may be enclosed with exterior grade plywood. Remember to back-caulk the perimeter.



Removing Lead-base Paint on Metal, Steel, Concrete, Wood, and Other Surfaces

Lead-based paint was not only used in houses. It was used on metal, steel, concrete, wood, and other surfaces. It was used in factories and power plants. It was painted on bridges, water towers, and pipelines. In fact, it was even painted on highways. When repair work must be done on these painted surfaces, lead-based paint may need to come off. The lead-based paint may also be removed before demolition of these structures.



Lead-based paint can be removed from steel or concrete by grinding, sanding, using a needle gun, or a roto-peener (left) on the painted surface. Grinding and sanding creates a lot of lead dust. They are considered Class 2 tasks. Lots of dust is released into the air. Collecting the lead-based paint dust can be difficult. Lead dust is easy to breathe and can get on your clothing.

Sometimes lead-based paint is blasted off of steel structures. Rather than scraping or removing a piece of structure intact, the paint is removed by blasting. Grit, shot, or water blasting is very dangerous. It can make large amounts of lead dust. It also makes the dust smaller. Instead of chips, small particles are made. Some of these can be seen but many are invisible. You can breathe the particles. The particles can also get on your hands, clothing and tools. Blasting is a Class 3 task.



Sometimes lead-based paint is burned off. When painted steel beams are cut using torches, the paint is burned off. This also happens when welding is done on metal with lead-based paint. Heating the paint to high temperatures puts lead into the air. This is lead fume. Lead fumes are easily breathed. Whenever you burn lead-based paint you will be breathing lead fumes. Burning is the

most dangerous removal method and is prohibited in many states. Burning lead is prohibited in residential work by HUD. Burning lead is a Class 3 task.

Finally, you may remove lead-based paint from metal or concrete surfaces using a chemical stripper. This is the same method of chemical stripping used in residential removal of lead-based paint. The chemicals used are usually either solvents or caustics. Industrial chemical strippers are often stronger and more hazardous. Chemical stripping makes less dust than some methods. However, solvents and caustics may be dangerous to breathe and get on your skin. Using this method also makes lots of liquid waste which can be hazardous.



The lead in the waste is dangerous. The chemicals may be dangerous. They have to be handled carefully. If you are using an air-purifying respirator, you must always use an organic vapor cartridge as well as a HEPA filter in combination whenever you are chemical stripping lead-based paint. Just like in home abatement jobs, you should avoid using chemical strippers with methylene chloride. If you must use a chemical stripper with methylene chloride, then you must wear a supplied-air respirator.

Work Safely

Blasting, power tool removal and burning lead-based paint can make large amounts of lead dust. You must use special work practices and respirators to protect yourself. This work can also hurt the environment. The lead dust can get into water and soil. People in communities nearby can also be exposed if work is not done right.

Let's look at the different types of lead-based paint removal on steel and concrete surfaces. There is a safe way and an unsafe way of working. If work like this is not done correctly, you may get sick. Workers who operate the tools or equipment are at risk. Other workers who are exposed include:

- ▶ Clean-up workers;
- ▶ Helpers;
- ▶ Workers loading or tending pots;
- ▶ Supervisors or inspectors; and
- ▶ Workers performing tasks in containments.

Type of Job	Exposure Level	Source
Blasting/Bridge	1,070-10,400 ug/m³	Rekus, 1988
Blasting/Boiler	640-1,400 ug/m ³	Adkinson, 1989
Blasting/Bridge	3,690-29,400 ug/m³	NIOSH, 1991
Riveting/Bolting	1-189 ug/m ³	NYCDOH, 1992
Burning/Power Plant	2,100-22,400 ug/m³	Rekus, 1988
Burning/Cutting Industrial Demolition	21,330 ug/m³	Holness, et. al. 1988
Disc Sanding Ship Overhaul	56-1,570 ug/m ³	Booher, 1988
Rivet busting Bridge Overhaul	18-3,653 ug/m ³	NYCDOH, 1992
Removal w/Power Tools	80-790 ug/m ³	Adkinson, 1989

Build a Work Area Containment

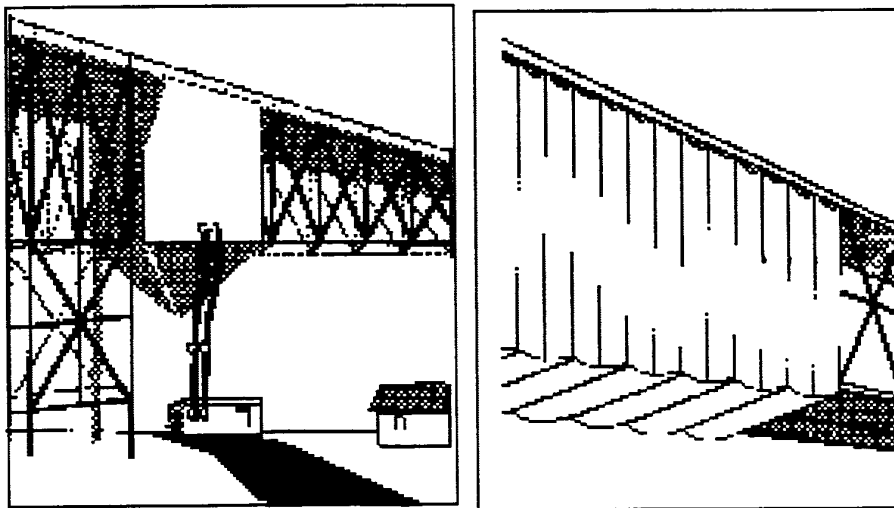
Your company will have to build a containment for many industrial paint removal jobs. The removal work takes place inside the containment. Containing the work area helps with two things:

- ▶ Keep lead dust out of the air in the environment and
- ▶ Collect the lead-based paint and other debris (including water) created during removal.

The containment is built to protect people who may live near your work site. It also protects the air, water, and soil in the area

near your job. If ventilation is set up right, it can protect workers on the job, too.

Containments can be built with rigid or flexible materials. Rigid containments can be built with plywood and metal or wood framing. Flexible containments are built using mesh screens, heavy duty plastic sheeting or tarpaulins (tarps). Mesh screen



RIGID CONTAINMENT

FLEXIBLE CONTAINMENT

allows some air to go through. They also allow some dust to get out. They can be hung using guy wires and cables. Tarps do not allow air through so dust cannot get out. They must be attached to the structure using rigid staging. Sometimes flexible containments can be moved along the structure. This is done with a pulley and winch system.

When a containment is built on a tower or large bridge, the wind can be dangerous. An engineer should approve the design of the containment.

Containments are also built to collect debris. Blasting with non-recyclable materials produces a lot of debris. If you are doing water jetting a lot of liquid sludge is made. Containments for these jobs must channel the debris or sludge and collect it in containers for waste disposal. Setting up, moving, and tearing down these containments can cause high lead exposure.

The inside of containment is usually very dusty. Special work

practices are required when you work in containment:

1. Keep your respirator on. Don't take it off. This means no eating or drinking, no smoking or chewing tobacco, and no chapstick while you are in the containment.
2. Use a HEPA vacuum to clean dust and debris. OSHA requires you to use a HEPA vacuum whenever possible.
3. Clean all surfaces – except bare steel – with a lead cleaner regularly (at least once per shift). Do not wet clean bare steel surfaces. Bare steel will rust very quickly. This is called **flash rusting**. Bare steel must be dry cleaned.
4. Do not use **compressed air** to clean surfaces unless you use the compressor in a containment that is hooked up to a ventilation and filtering system.

Set Up and Use Ventilation

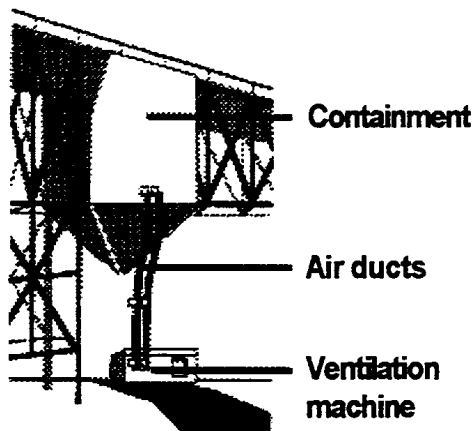
Ventilation may be set up on many jobs. Ventilation can keep dust out of the air. It can be used on jobs in three different ways:

1. Local Exhaust Ventilation

Local exhaust ventilation collects dust almost as soon as it is released. An example of local exhaust ventilation is a power tool connected to a HEPA exhaust vacuum, like the needle gun being used on the bridge pictured at the right. The tool must have a special hood around the grinding wheel or sanding disk. The hood has a place for the vacuum hose to attach.

When the vacuum is turned on it pulls the dust through the hood into itself. Some tools have a flexible hood also known as a shroud. Local exhaust ventilation keeps the dust away from you and out of the air.





2. General Ventilation

General ventilation is used with containments. The containment is built with air intakes at one end and portable air moving machines at the other. The ventilation machines have heavy duty fans that can move as much as 20,000 cubic feet of air each minute.

The air may come through ducts built right into the containment. The fans push or pull the air through the containment. Ducts can be used to distribute the air flow. The air moving machines have HEPA and pre-filters which take out lead and other dust, but heavy debris still falls to the floor of the containment.

3. Negative air ventilation

Some job specifications require negative air ventilation.

This type of ventilation makes the air pressure inside the containment lower than the air pressure outside. Air with lead dust cannot leak out of the containment. Only air from outside can leak in.

The equipment is the same as for general ventilation. An air moving machine is set up at one end of the containment. The machine pulls air across the containment into the machine. The air then goes through filters and lead dust is trapped. **The difference is that with negative air ventilation more air is forced out than is let in.** By forcing more air out than you allow in, a negative pressure is created. If there are leaks in the containment, air will go in, not come out.

Set Up and Use a Decontamination Area

A decon entrance must be built. Both flexible and rigid containments will have a decon entrance. The decon consists of a

equipment (dirty) change area, a shower area, and a clean area. The decon hopefully is attached to the containment.

Wear Protective Gear

You also must be provided with protective clothing to keep lead dust off of you. **Never take work clothing from a lead job home.** Your employer must give you clean work clothing and launder it for you. You also have to have a clean place on the job to



change into work clothing at the beginning of each shift. Use the same place to change back into street clothing to go home. Protect your hearing – wear earplugs or ear muffs underneath the hood of your respirator. Blasting, needle guns, roto-peens, and other methods of paint removal create high levels of noise that could permanently damage your hearing and cause stress-related problems.

Use Type CE Respirators

Blasting to remove lead-based paint makes a lot of dust. It can send steel shot, grit, or other hard particles into the air at high rates of speed. A very protective respirator is needed. Protection for your head and face is needed as well. For most blasting work you will use a Type CE pressure-demand respirator. This respirator is a supplied air respirator with a helmet or hood attached to the mask. There are different types available. Some CE respirators are pressure-demand and others are continuous flow. You need pressure-demand when you do blasting work. Type CE respirators supply breathing air (**Grade D**) from a outside source to the user. A pressure-demand CE respirator will protect you in areas with high dust levels and the helmet will protect against grit and shot. You will also need a pressure-demand CE



respirator if you are welding, cutting, or torch burning surfaces covered with lead-based paint.

Methods of Removal

1. Power Tools

Power tools are used on industrial lead-based paint removal jobs to remove small amounts of lead-based paint, rust, and mill scale. Power tools you may use include:

- ▶ Sanders
- ▶ Needle guns
- ▶ Oscillating saws
- ▶ Grinders
- ▶ Drills
- ▶ Roto-peens



Power tools work best when used for small jobs. They can be fitted with local exhaust ventilation. The tools have a shroud (or cover) on them. This cover is connected to a HEPA vacuum. When the HEPA vacuum is turned on the dust is sucked into the shroud and then into the vacuum. Power tools with local exhaust attachments, such as the setup with several needle guns pictured to the left, put less dust in the air. Power tool cleaning with local exhaust ventilation is a Class 1 Task under the OSHA Lead Standard. Power

Power tool cleaning without local exhaust ventilation is a Class 2 Task.

2. Burning, Cutting, and Brazing

Do not burn, weld, or braze lead-based paint. These methods heat the paint and release high levels of lead fumes in the air. HUD and many states prohibit burning lead-based paint in residential work. Your employer should always try to use another way of getting the job done. For example, if you are doing demolition of structural steel or architectural metal, do

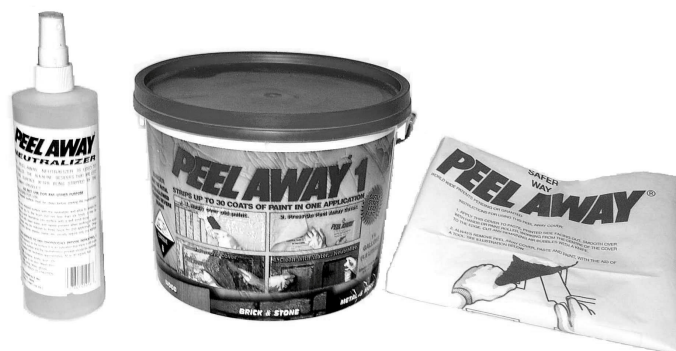
not torch cut the metal. Cut the metal with a backhoe attached hydraulic shears. Or, remove the paint first with power tools or chemical strippers, then torch cut it. When you are welding a piece of lead-painted metal, first remove the paint with power tools or chemical strippers and then weld.

3. Chemical Stripping

Chemical stripping is the use of chemicals to loosen paint on metal or concrete surfaces. The chemicals used can be very dangerous. Think about it. If it can loosen paint it has to be strong. The chemicals used fall into two categories: solvents and caustics.

Solvents are liquid chemicals that dissolve dirt, oil, paint and other substances easily. Oil-based paints can be cleaned with gasoline, which is sometimes used as a solvent. Other solvents include toluene, trichloroethylene, and methylene chloride. These chemicals evaporate easily. This makes them easy to breathe and they can also be absorbed into your skin. Solvents can damage your nervous system, cause liver and kidney disease, and may cause cancer.

Caustics are strong chemicals that can loosen paint and other products. They can also burn your skin and mucous membranes. If you get these chemicals in your eyes, sinuses or lungs, they can burn and cause damage. Examples of caustics are sodium hydroxide, lye, potassium carbonate, and potassium hydroxide. These chemicals may also cause long term health problems like permanent lung disease.



When stripping metal or concrete surfaces with chemicals, make sure that you wear protective clothing such as gloves, a polyethylene suit and a respirator. Your eyes need protection, too, so make sure that you have on a full-face respirator or wear eye goggles or a face shield.

Chemical strippers are applied to the paint using a trowel or spray system. Usually it has to sit on the paint for hours, sometimes overnight, before you can scrape the paint off.

When you scrape the paint and chemical off, the debris (paint and chemical) is usually hazardous waste. Your employer must test it using the **TCLP test**. This waste can be very dangerous to the environment. Don't let it go down the sewer system, into water, or onto soil. When doing chemical stripping jobs, put down canvas and poly sheet plastic to catch the paint and chemical waste. The plastic and canvas system must have barrier edges. This is so that the sludge cannot spill out. All the waste sludge is collected and put into drums for disposal.

4. **Blasting**

Blasting has been done for many years to remove paint on steel structures. But blasting is prohibited in residential work by HUD and many states. There are many kinds of blasting. All blasting uses compressed air to make very high pressures. The high pressure is used to propel an abrasive material against the paint. Some of the common kinds of blasting are:

Sand blasting – a powerful machine blows sand out of a nozzle. The machine uses compressed air to blow the sand out. It is blown out at high pressures. The sand blows the paint off of the metal or concrete. Paint, sand, and debris get thrown into the air. Sand blasting exposes you to silica. It is very dangerous.

Other non-recyclable blasting – other abrasive materials that are used to blast are corn cob pieces, coal slag ("Black Beauty"), and carbon dioxide pellets. Like sand, the corn cob is used once and thrown away. The carbon dioxide

evaporates into the air. These kinds of blasting make a lot of dust and debris which have to be disposed of.

Recyclable blasting – some blasting machines use abrasive materials that can be collected and used again. Steel grit or shot, aluminum oxide, plastic pellets, and sponge media are some of these. Compressed air is used to blowout the material at a very high pressure. These machines recycle the grit or pellets and the material can be used again. This makes less debris to clean up but lots of lead-based paint dust is blown into the air.



Water blasting – this kind of machine mixes water with an abrasive material. The water or mixture is blown out of the machine at very high pressures. The paint is blown off of the surface. This kind of blasting makes less dust than dry blasting, but creates lots of water waste with lead-based paint in it.

Water jetting – this machine sprays water at very high pressures, usually over 20,000 psi (pounds per square inch). The force of this water alone can remove paint and rust. The force of the water can also cut flesh. Workers operating this equipment and working inside the work area must be protected.

Vacuum blasting – this machine has a shroud or cover which seals against the surface being cleaned. The abrasive is contained in the shroud and sucked along with the lead-based paint debris into a vacuum.

All of these kinds of paint removal can cause lead poisoning. Sand blasting also can cause a lung disease called silicosis. Sand blasting is very dangerous and not recommended. If you do sand blasting, make sure you are properly protected.

Blasting lead-based paint can be done relatively safely. It requires proper containment, ventilation, and cleanup procedures. It also takes proper work practices, respirators, and

protective clothing. Your employer must provide you the type of respirator you need. When you do blasting, you must work carefully. OSHA has a separate standard about how to work with blasting safely.

1. Build work area containment.
2. Set up and use ventilation.
3. Set up and use a decontamination area.
4. Use Type CE, pressure-demand respirators.
5. Wear protective gear.

Disposal of Industrial Waste

When lead paint is removed from bridges, water towers, or other outdoor structures, the waste belongs to the owner of the structure. For example, lead paint and shot from a bridge abatement job belongs to the State Department of Transportation that owns the bridge. The Kansas Department of Transportation and the U.S. DOT have studied a way to treat lead paint waste from bridges on site. By mixing the lead paint and shot with Portland cement and water, the lead is sealed in or stabilized at the work area. This mixture passes the test for non-hazardous construction waste. It can be sent to a regular landfill with other non-hazardous construction waste. This method cuts the cost of disposal from \$1.30/ft² to \$0.50-\$0.96/ft². The U.S. EPA must be notified when on-site treatment is done.



Mobile spongejet recyclable abrasive media decontamination unit.

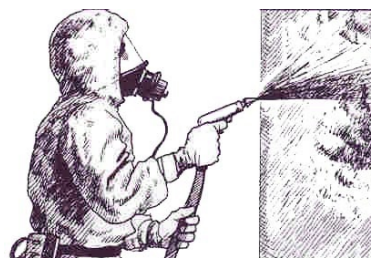
Activity #9: Abatement Methods Exercise

Lead abatement in a home doesn't always mean removing lead. Sometimes the best solution is to tear out the lead-painted windows or seal up the paint. For each of the surfaces below, decide which method you think is best. In your groups, discuss the examples, decide on the method, and explain why you think it's best.

	Replace	Enclose (build a box)	Encapsulate (special paint)	Remove paint	Why do you think this is best?
Stairs					
Windows					
Walls					
Doors					
Porch					
Pipes					



Applying
Peel Away
ST-1



Applying an encapsulant

Activity #10: Setup Exercise

Imagine you are beginning a new deleading job in an apartment complex. In addition to abating the lead, you will be replacing the windows.

One of the residents has some worries about the job being done right. She knows the abatement needs to be done because her youngest child had a high blood lead level and is colicky . She is worried because has heard that if lead abatement is not done right it can make the situation worse. She is concerned about a lot of invisible dust being left on her floors, cabinets, and window sills.

Also, her apartment is not in good repair. Some of the windows are painted shut. And the plaster on the bathroom ceiling is falling in because of a leak from the apartment upstairs.

What will you do to make sure the apartment is not contaminated by the deleading job?

What about the windows that are painted shut and the ceiling that is falling in? What does this have to do with lead abatement?

Activity #11: Doing Abatement Work Exercise

You may use many different methods on one deleading job. For example, you may rip out the windows, use a chemical stripper on the doors, and enclose the ceiling with new drywall. There are special methods for each surface. For this exercise, each group choose one or two surfaces (windows, doors, other woodwork, walls, ceilings, floors, stairs, or porches) and answer the questions below.

1. What surface did you choose? (windows, doors, other woodwork, walls, ceilings, floors, stairs, or porches)
2. How do you abate the lead on this surface? (e.g., with ceilings, find the center of the joist by cutting through the old drywall with a drywall knife. Screw new drywall into the joists.)
3. What do you need to watch out for when you do the work on this surface? (e.g., with stairs, you need to remove or enclose the railing and the newel post because they get so much wear.)

Activity # 12: Industrial Removal Exercise

What do
you think?



In March 1988, lead poisoning was diagnosed in workers employed by a contractor to demolish a bridge spanning a river in western Massachusetts.

From November 1987 to March 1988, four of the nine workers had used acetylene torches to cut apart large sections of the bridge; one had cut these sections into smaller pieces on a barge moored below the bridge. The other four workers did not work near anyone who was torching. Respirators were sometimes used on the job.

“Lead poisoning in Bridge Demolition Workers in Massachusetts.”
MMWR 38(40): 692-694

Discussion questions:

1. What do you think caused the workers to get lead poisoned?
2. Which workers are at greatest risk of getting lead poisoned?
3. Which workers are at smallest risk of getting lead poisoned?
4. How could lead poisoning have been prevented?
5. How do you think the workers found out they were getting poisoned?

Key Facts for Chapter 7

- 🔑 In every building with lead paint we have a choice: treat the lead paint (**abatement**) or leave it there and manage it (**interim controls**).
- 🔑 There are four methods to abate lead-based paint.
 - Replace
 - Enclose
 - Encapsulate
 - Paint Removal
- 🔑 **Replacement is a permanent solution.** Replacement can mean some demolition.
- 🔑 **An enclosure is a dust-tight solid barrier that prevents lead dust from leaking out.** An enclosure may not be a permanent solution. The enclosure must be strong and durable.
- 🔑 **Encapsulation means coating the lead-painted surface with a thick material.** Encapsulation is best used on building parts in good condition. Encapsulation may not be a permanent solution. Encapsulants may fail.
- 🔑 **Paint removal makes a lot of lead dust.** Removal is done with scrapers, heat guns, tools with HEPA filters exhaust systems, and chemical and caustic paint strippers.
- 🔑 **Heat guns** may create dangerous lead fumes and toxic vapors. Do not use a heat gun above **1,100° F**.
- 🔑 **Only use local exhaust tools that have a HEPA vacuum attached to them to remove lead-based paint.** Electric powered hand tools may make a lot of lead dust. Only use sanders, saws, needle guns or drills with HEPA attachment. Use a shroud when available.

- 🔑 **Chemical and caustic paint strippers are hazardous.** They often create hazardous waste on and off-site.
- 🔑 **Vacuum and water blasting** should only be used for outside work.
- 🔑 **HUD and some states do not allow these lead abatement methods for residential work:** torch or flame burning, open abrasive blasting using sand, uncontained water blasting, machine sanding without local exhaust, using flammable solvents, using strippers with methylene chloride, and dry scraping.
- 🔑 **Interim controls are ways to control lead dust from exposed lead paint.** They include special cleaning, small-scale repairs, training for maintenance workers, and regular inspections.
- 🔑 **When working with lead, you must:**
 - ▶ Keep dust levels down.
 - ▶ Seal off the work area.
 - ▶ Repair tears in poly as you work.
 - ▶ Wear disposable suits and booties while in the work area.
 - ▶ Wash your hands and face each time you leave the work area.
 - ▶ Shower or wash up before leaving for home.
 - ▶ Clean up as you work and at the end of each shift.
 - ▶ Secure the work site.
- 🔑 **To set up you will use the following materials:**
 - ▶ Disposable coveralls and booties;
 - ▶ Poly and duct tape;

- ▶ HEPA vacuum; and
- ▶ Lead cleaner, sprayers, buckets, rags, and sponges.



Before doing the abatement:

1. Clean and remove everything that you can from the work area (such as furniture, appliances, etc.).
2. Clean and cover anything that you cannot remove with poly.
3. Remove all carpeting.
4. Cover all floors with poly.
5. If you're only removing paint from one room or one part of a building, then seal off the work area from the rest of the building with poly.



During interim controls, setup is important to contain any lead dust that is created.



Replacing lead-painted windows, doors and woodwork is a good way to reduce lead hazards. Back-caulk and nail (or screw in) replacement parts when you install them.



Do not use encapsulants on structurally damaged walls or walls that are separating from the substrate.



Enclosure is often used for lead-painted floors and ceilings. Create a dust-tight seal when you enclose a surface. Back-caulk and nail (or screw in) enclosure materials.



Interim controls are only temporary solutions. They are actions you can take to reduce lead dust levels until you do an abatement. Interim controls should not take the place of abatement. Interim controls may not be allowed in

your state or local area. Check your state and local laws.



Lead-based paint is removed from **steel structures** by: power tools, chemical stripping, and blasting.



Whenever you use chemical strippers:

- ▶ Always use an organic vapor cartridge on your respirator;
- ▶ Wear eye goggles or a face shield; and
- ▶ Avoid burning lead-based paint and sand blasting with silica.



Whenever you blast you must:

1. Contain the work area.
2. Set up and use ventilation in the work area.
3. Build a decontamination area.
4. Use a Type CE respirator.
5. Wear protective clothing.

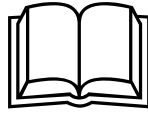


Ventilation can be:

- ▶ Local exhaust ventilation;
- ▶ General ventilation; and
- ▶ Negative air ventilation.



Local exhaust ventilation on power tools collects lead dust as it is created.



For More Information

These publications have more information on the topics covered in this chapter.

EPA. *Final Report for the Comprehensive Abatement Performance Study, Volume II: Detailed Statistical Results*. EPA 230-R-94-013b. (April, 1996).

HUD. "Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing." *Federal Register*, (April 18, 1990).

HUD. *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*. HUD (June, 1995).

HUD. *Lead Paint Safety: A Field Guide for Painting, Home Maintenance, and Renovation Work*. HUD-1779-LHC. (March, 2000).

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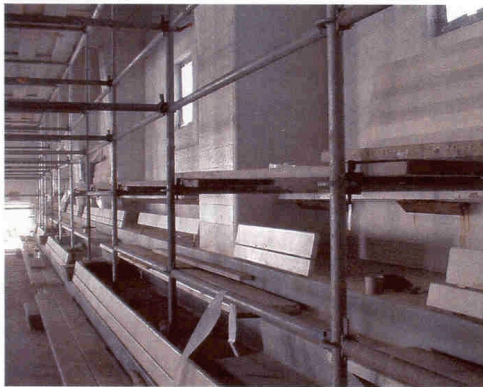
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Case History

Lead Paint Removal from Concrete at Cal Poly

Reusable, low dust Sponge Blasting™ technology suppresses dust, limits airborne lead levels and reduces waste at Cal Poly State University



School officials searched for a technology that could remove lead paint in the pool house at California Polytechnic State University (Cal Poly). Lead-based paint was peeling in the pool house, posing potential health risks to its users.

Cal Poly expected to use abrasive blasting, but harbored concerns for overall project safety, air quality, process leaching, and waste generation. The contractor chose the Sponge Blasting System, which responded to the school's concerns, and offered a clear solution:

■ **Dry and Easily Containable** - The Sponge-Jet technology offered a non-leaching, easily containable

solution. Other wet, leaching blast technologies were impractical, or too costly to confine.

■ **Low Airborne Dust** - Lead dust suppression was critical to limiting exposure to system operators as well as surrounding students and faculty.

■ **Safe for Workers and Employees** - The process had to be safe to use with California's stringent EPA air quality regulations.

■ **Process Sensitivity** - The process had to be aggressive enough to offer efficient production rates, without damaging the concrete substrate.

The three-mil lead paint was successfully removed from the pool house's walls and ceiling. Silver Sponge Media™ abrasive was safely recycled seven times, minimizing both waste disposal and total costs.

Cal Poly officials and the painting contractor enjoyed the hassle free project, and the pool was quickly opened.



Visit Sponge-Jet, Inc. at
www.SpongeJet.com
or call **800-SpongeJet**
to learn more about the
Sponge Blasting™ System

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