

Steam Paint Removal

Steam paint removal softens the paint film so it can be more easily scraped away. It works well with the heavy paint buildup commonly found on the wooden exteriors of older buildings during house restoration and historic preservation projects. It can also be used on interior paint and on window maintenance and repairs.

This method has significant advantages over mechanical scraping and shaving, chemical stripping and the dry-heat methods:

- **Helps control the lead-health risk** issue because it is a damp process that keeps down the dust and eliminates the lead-fume risk.
- **Eliminates the risk of starting a building fire** by keeping the paint surface temperature below 212 degrees.
- **No unhealthy fumes from chemicals and heat decomposition** of binders in the old paint and in the wood as with chemical and dry heat methods.
- **Portable steamer can be used on interior and exterior work**, even up on the scaffolding.
- **Equipment costs are moderate**, \$200-350.
- **Lower operating and supply costs** than chemical paint removal.
- **Lower residue disposal costs** than chemical paint removal.

However no single paint removal method is best in all cases. Steam Paint Removal has these disadvantages:

- **Will generate lead containing debris** if the paint contains lead.
- **Risk of skin burns.** Steam can burn human skin.
- **It is a damp process.** Damp wood is softer than dry wood and may be damaged at the surface during removal of the softened paint film.

Table of Contents

A Typical Project.....	2
How it Works	3
Advantages	4
Disadvantages.....	5
Comparison of Steam Generating Equipment	5
Methods and Techniques	6
Safety First	6
Steam Heads	7
Paint Removal	13
Projects.....	15
Window Casing	15
Column Capitals	16
My Steam Story.....	17
Resources	18
Equipment, Tools & Parts	18
Publications	20
How to Use this Report	21

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<http://www.historichomeworks.com/hhw/reports/reports.htm>

A Typical Project

Here's the setup on a recent project. I'm removing paint from a barn loft door, which has been taken off the barn and is set on an easel in the workshop. The gray steam generator is powered by an ordinary 120 Volt electrical outlet. The black hose runs from the steam generator up to the steam head, which I am holding flat against the paint film. We always follow Lead-Safe work practices, so you see I am outfitted with a hat, respirator, and a floor containment made of 6-mil plastic to catch and control lead-containing paint debris. The gloves are a type particularly suited to working with steam: thick fabric for thermal protection and water-proof coating in the palm and fingers. Other standard safety practices are long sleeves and pants, goggles, and the steam generator is plugged into the yellow Ground Fault Interrupter Circuit to protect from electrical shock.



After 30 seconds to 2 minutes of steaming the paint film is soft enough to remove with a stiff, slightly dull putty knife. This paint film stays soft for 10 to 15 seconds, which is plenty of time to remove a 3" x 9" area of paint. During removal the steam head is shifted over to the next section.





This paint film is about as thick as a dime (.035"). You can see there is some slight paint film residue left on the surface, which is easily scraped off with a sharp pull-type paint scraper while it is still soft. The result is a smooth clean surface ready to paint. Every paint removal project has different paint and wood conditions, so the procedure and results vary.

How it Works

This method of Steam Paint Removal makes the paint easier to remove in two ways:

It softens the paint film by heating it through the thickness of the film to a temperature of 190-205 degrees so it can be easily scraped off. As the water vapor condenses on the cooler surface of the paint film, latent heat in the water vapor moves into the paint film by conduction. At first the thin film of liquid water forming on the surface of the paint helps conduct the heat. As the film of liquid water on the surface grows thicker it tends to limit the transfer of heat. The paint warms up quicker on vertical surfaces because the liquid water dribbles away allowing more vapor to condense closer to the surface of the paint. I have put the door in the photo on an easel to hold the surface vertical so the process works more effectively, although it will also work on horizontal surfaces when that is more convenient.

It loosens the paint film from the wood surface by introducing water at the interface between the paint film and wood surface. This occurs when there are breaks in the paint film, such as alligatoring cracks and areas of missing paint. This moisture migration occurs by simple capillary action and not by pressure supplied by the steam generator. Sometimes I notice that the steam is traveling between layers of paint, and liquid water is percolating up out of cracks in the paint film outside the steam head.

It is good to review the obvious and cover a little “farmyard physics and kitchen chemistry.” Water takes three forms or states: liquid, solid and vapor. We all know liquid water very well, since we drink some

makes the heat transfer much more effective. However see the column capital project below where the steam from the end of a hose does work with a steam generator that makes much more steam.

Methods and Techniques

Here are the guidelines I find to be effective for the steam paint removal method:

Safety First

The steam can quickly burn skin. We wear safety goggles or glasses, fabric gloves that have rubber in the palms and working sides of the fingers, and long sleeves and long pants. We follow all the manufacturer's directions for the operation of the steamer.

Paint removal from older buildings (built before 1980) is likely to involve paint and other materials that should be assumed to contain lead. Lead-Safe work practices are needed to manage the lead health risk of any paint removal method. Any work done on older buildings is likely to produce lead-containing paint chips and airborne dust. These lead-containing materials can easily enter the body causing health problems, particularly for workers, pregnant women, infants and young children.

Read, understand and follow the Lead-Safe work practices described in the publication: "Lead Paint Safety, a field guide for painting, home maintenance and renovation work." (see the Resources section below for a source of this document)

Lead-Safe Operations Highlights

- **Protect People and the Environment:** Prevent the spread of lead to the rest of the building and the environment.
 - **Generate the least amount of dust,**
 - **In the smallest space,**
 - **For the shortest time,**
 - **Exposing the fewest people.**
 - **Use a Floor Containment** system that catches lead-containing debris and dust. Notice this floor containment serves both the sash easel and the end of the workbench. It is made of 6-mil poly with wood 1"x2" furring strips rolled into the edges of the poly and fastened at the corners with two sheetrock screws. Size the floor containment system to be 5 feet in each direction from the location where debris is generated. The floor containment can be made with a gap in the furring strips of the long-side so it folds up like a clam shell. This allows the containment to be moved from one area to another while



- keeping all the dust in the containment.
- **Wear Tyvek slippers** within the floor containment and removed them when ever you step out of the containment.
 - **Damp-wipe** materials and tools before removal from the containment.
 - **Change work clothes** for street clothes as you leave the work-space at the end of each work session. Launder work clothes separately from family clothes and then double rinse the washing machine before family laundry is done.
 - **Protect Occupants:** Keep them and their pets out of the work-space.
 - **Protect Workers:** Minimize exposure to keep lead out of their bodies.
 - **Wear hat** to keep lead dust out of hair.
 - **Wear goggles** to protect eyes from flying debris.
 - **Wear respirator** fit tightly to face around the mouth and nose that filters the air through replaceable cartridges.
 - **Do not eat or drink** during work periods to prevent ingestion of lead. This means workers must be well hydrated by drinking lots of water during breaks and off hours.
 - **Do not smoke** during work periods. Lead containing dust is easily transferred from fingers to the cigarette and is then vaporized and inhaled.
 - **Wash hands and face** when leaving work-space and before eating, drinking or smoking.
 - **Establish a Comprehensive Lead-Safe Program:** These highlights do not make up a complete lead-safe program.
 - Study and use the Lead Paint and Historic Buildings Training Manual. (See Resources.)
 - Hold a daily safety meeting.
 - Test workers for blood-lead levels.
 - Test work-spaces for lead before and after operations.

Steam Heads

We began by using the plastic steam head that comes with the fabric steamer. We held the steam head flat on the surface of the paint for 1 to 3 minutes, which softens the paint enough to easily remove it. The original steam head also worked for softening up window glazing putty. I have been getting somewhat better results by adapting the existing steam head and using alternate steam heads.

Keep in mind that adapting products and using them for unusual purposes, such as steam heads, usually voids any warrantee from the manufacturer, and may create a situation that is hazardous. Do not proceed if you cannot control the risk of harm or loss of property.

The original fabric-steamer head is made of plastic and has a flat plate with holes in it. I cut the plate off so the hollow inside of the head is exposed. (see below for the step-by-step procedure) This helps the heating process work better in some cases.

For steam heads of other shapes we are starting with "ShopVac®" brand plastic vacuum heads, and adapting them to meet our needs. We settled on "ShopVac" because the plastic they are made of seems to hold up to the heat. Other brands and cheap no-name vacuum parts warped and melted.

Publications

"Lead Paint Safety, a field guide for painting, home maintenance and renovation work."

Practical work methods including several for window work. by Dennis Livingston. Published by U.S. Department of Housing and Urban Development, Office of Healthy Homes and Lead Hazard Control. 84 pages. Download it from the internet at:

<http://www.historichomeworks.com/hhw/education/WindowsHandouts/leadsafetybk.pdf>

Lead Paint and Historic Buildings Training Manual

Cost-effective and common-sense solutions appropriate for historic buildings. Dispels confusion about regulations and explains how to rehab and maintain historic buildings lead-safely. Historic building owners, architects, contractors and managers can all benefit. by Dennis Livingston, et al Published by the Illinois Historic Preservation Agency in 2000. 197 pages, \$20. +\$4 ship

Teacher's Guide to Lead Paint And Historic Buildings

For those interested in teaching a training course based on the Lead Paint and Historic Buildings Training Manual. Differs from traditional Lead training because the cost-effective and common-sense solutions are appropriate to historic buildings. Published by the Illinois Historic Preservation Agency in 2000. 110 pages, \$45. +\$4. ship

Order the Manual and Guide from:

Building Research Council
One St. Mary's Road
Champaign, IL 61820
888 336-0616

<http://brc.arch.uiuc.edu/Pubcatalog.htm#special%20pubs>

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