



Cleaning Historic Masonry

Rehabilitation Standard No. 7 - Part 1

Rehabilitation Standard No. 7: Chemical or physical treatments (such as sandblasting) that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.



Masonry includes brick, terra cotta, natural stone, cast stone, concrete and concrete block.

Any cleaner can have an adverse effect on masonry, and therefore must be tested on an inconspicuous area before full treatment. When cleaning masonry, protect other elements that could be damaged by the chosen treatment such as wood, glass, iron window bars, internal masonry cramps/ties, etc.

Each cleaning project should be viewed as unique to the specific building. Before cleaning identify prior treatments as well as the soiling material being removed such as soot, smoke, stains from oil or metal, mold, mildew, ivy, or paint.

Cleaning Methods

There are three categories of methods: Water, Chemical, and Abrasive

- All cleaning methods should be used with extreme caution and chemicals applied according to manufacturer's instructions. Since many historic buildings will have at least one layer of lead-based paint, proper health and safety precautions must be taken, and any waste produced from paint removal disposed of properly.

- It is best to start cleaning at the bottom, proceeding to the top, while keeping all surfaces below the working area wet. This is because dirty water or cleaning effluent that drips down will leave streaks on a dirty surface, but won't streak a clean surface as long as it is kept wet.

Water Methods



Water Cleaning Methods are generally the 'gentlest means possible.'

Four types: **Soaking**, **Pressure Water Washing**, **Water Washing Supplemented with Non-ionic Detergent**, and **Steam or Hot Pressurized Water Cleaning**.

Use bristle brushes, never metal brushes, to scrub masonry.

Hazards: Building must be watertight with sound mortar joints. Water supply may have iron or copper that can discolor masonry. Never use a water method in cold weather due to freezing and cracking. Never use water at too high pressure (power washing or water blasting which are abrasive).

Chemical Methods



Chemical cleaner types are acids, alkalis and organic compounds. They can be applied as a liquid or poultice.

Acidic cleaners should be used only on non-acid sensitive masonry (unpolished granite, most sandstones, slate, unglazed brick, unglazed terra cotta, cast stone, and concrete).

Alkaline cleaners should be used on acid sensitive stones (limestone, marble, calcareous sandstone, glazed brick, glazed terra cotta, and polished granite).

It is a common misconception all historic masonry was initially unpainted. Research should be done before any paint removal. To remove non-historic paint, coatings, and graffiti alkaline or organic solvents may be used.

Always apply cleaners and poultices according to manufacturer's instructions. If certain chemicals are left on too long or not washed off completely, damage, etching or efflorescence can occur.

Hazards: Most chemical methods use water rinses, so the same hazards with Water Methods apply. Chemical cleaners can be hazardous to cleaning operators as well as the environment. Proper protection and disposal must be conducted in the appropriate manner.

Abrasive (Mechanical) Methods



Generally, abrasive cleaning methods are not acceptable for use on historic masonry buildings because they remove a portion of the surface, instead of cleaning it.

Examples: Grit Blasters (Sandblasting), Grinders, and Sanding Discs.

Blasting methods use gritty substances forced through a nozzle, and directed at a surface. (I.E. ground slag or volcanic ash, rice husks, ground corncobs, ground coconut shells, crushed eggshells, silica powder, ground garnet, aluminum oxide, plastic particles, finely ground glass, baking soda, ground nut shells, and pieces of sponge). Ice particles and pelletized dry ice are also used, but are too abrasive for historic masonry when blasted. To remove mastic or asphaltic coatings, you may apply a slab of dry ice to freeze the coating, and then carefully chip off.

Grinders and sanding discs, like blasters, do not really clean masonry, but instead remove the surface of the masonry.

In very limited instances, highly controlled, gentle abrasive cleaning may be appropriate for hard to clean areas of historic masonry, but only under watchful supervision of a professional conservator, and not used on the entire building.

Steps for Appropriate Cleaning of Historic Masonry

- 1.) **Identify the masonry material being cleaned as well as the soiling material or paint.**
- 2.) **Evaluate condition of the masonry and water-tightness of the building envelope.**
- 3.) **Identify various appropriate cleaning methods** based on information from this guideline and *Preservation Brief 1: Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings*.
- 4.) **Test appropriate cleaning methods on an inconspicuous area of the masonry.** (See Note for appropriate testing procedures.)
- 5.) **Consider the level of cleanliness desired.** (A 'brand new' appearance is inappropriate for an older building as well as difficult to achieve.)
- 6.) **Consider environmental effects of chosen cleaning method** and take appropriate precautionary measures using EPA guidelines.
- 7.) **Consider possible health dangers** to anyone in contact with the cleaning area (passers-by as well as cleaning operators) and take proper precautionary measures as prescribed by the MSDS for any chemical product used during cleaning.
- 8.) **Cover any building feature that may be vulnerable to chemical cleaners** such as non-masonry materials including glass, metal and wood that are on windows, doors and special architectural details.
- 9.) **Clean masonry using proper techniques appropriate to selected method of cleaning.** (Based on this guideline, *Preservation Brief 1*, EPA and MSDS guidelines, and product manufacturer information.)
- 10.) **Dispose of any waste produced from cleaning using appropriate agencies for transport, storage and/or disposal.** (Consider chemical cleaners, VOCs and lead paint.)

Appropriate Testing Procedures

Testing various, appropriate methods should always begin with the gentlest, least invasive method proceeding gradually, if necessary, to more complicated methods, or a combination of methods. (Each material and different finish should be tested separately)

The test area should be on an inconspicuous location, and in an area of sufficient size to give a true indication of effectiveness. The test area can increase from six inches to a square yard or more and should include several masonry units and mortar joints.

Test areas should be allowed to dry completely and if on the exterior, weather for an extended period of time (ideally one year or at least a month or two).

All tests should be documented with photographs, and the chosen method preserved as a standard for the rest of the work.



CAUTION -The examples listed below are considered appropriate cleaning methods for the masonry type listed, but may NOT be the best way to clean every building. Each building and material is unique, so testing must be done to determine the most effective, gentlest cleaning method that should be used.

Masonry	Recommended	Not Recommended	Note	Example
Brick	Water or Chemical (Acids may only be used on unglazed brick)	Abrasive	Abrasive cleaning can cause subsurface cracking, mortar joint erosion, and removes the outer protective crust on the brick.	A low pressure wash (100-200 psi) with non-ionic detergent* and scrubbed with a soft bristle brush. Follow with a final water rinse.
Concrete	Water, Chemical or Abrasive (only for sound, high-strength concrete)	Strong Acid Cleaners Hydrochloric (Muriatic) or Hydrofluoric Acid	Abrasive cleaning will damage fragile or deteriorated concrete and can alter surface texture. Chemicals may stain or bleach concrete.	A low pressure water wash (< 200 psi) or steam. Detergent cleaners can be added for severe soiling, scrubbed with a soft bristle brush, followed by a final water rinse.
Cast Stone	Water or Chemical	Abrasive	Cast stone may have marble or limestone aggregates that are sensitive to acidic cleaners. For these use cleaning method below.	Only for Cast Stone with NO marble or limestone: Pre-wet surface, then apply acid cleaner, keeping surface wet while acid “works”. Remove all acid with a low pressure water wash.
Acid Sensitive Stone	Water or Non-Acidic Chemical	Abrasive and Acidic Cleaners	Acid-Sensitive Stones: Limestone, Marble, Polished Granite, and Calcareous Sandstone	Pre-wet surface. Apply alkaline cleaner followed by an acid neutralizing wash and final water rinse. Steam cleaning or poulticing can also be effective.
Non-Acid Sensitive Stone	Water or Chemical	Abrasive	Non-Acid Sensitive Stones: Slate, Unpolished Granite, and Most Sandstone	Pre-wet surface, then apply acid cleaner, keeping surface wet while acid “works”. Remove all acid with a low pressure water wash. Steam cleaning or poulticing can also be effective.
Terra Cotta	Water or Chemical (Acids may only be used on unglazed terra cotta)	Abrasive	Never use abrasive methods, strong acids, high-pressure water or metal bristle brushes as it will remove glaze and expose soft tile body.	Mixture of water and detergent applied with a soft bristle brush. Stubborn dirt may be cleaned with steam or WEAK solutions of muriatic or oxalic acid.

* Non-ionic detergents are synthetic, organic compounds especially effective in removing oily soil. They are not the same as soaps, which can leave a solid, visible residue on masonry. Some examples are Igepal by GAF, Tergitol by Union Carbide, and Triton by Rohm & Haas.

Sources

Preservation Brief 1 - Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings
<www.nps.gov/history/hps/tps/briefs/brief01.htm>

Preservation Brief 6 - Dangers of Abrasive Cleaning to Historic Buildings <www.nps.gov/history/hps/tps/briefs/brief06.htm>

Preservation Brief 7 - The Preservation of Historic Glazed Architectural Terra-Cotta <www.nps.gov/history/hps/tps/briefs/brief07.htm>

*Preservation Brief 15 - Preservation of Historic Concrete**

Preservation Brief 42 - The Maintenance, Repair and Replacement of Historic Cast Stone <www.nps.gov/history/hps/tps/briefs/brief42.htm>

Images (from left to right, top to bottom)

1: Bethany Kluesner

2-3: State Historic Preservation Office

4: Bethany Kluesner

5: State Historic Preservation Office

6: www.buildipedia.com

7: Bethany Kluesner

8: www.morrispainting.com

9: Bethany Kluesner

For More Information

Preservation Brief 2 - Repointing Mortar Joints in Historic Masonry Buildings <<http://www.nps.gov/history/hps/tps/briefs/brief02.htm>>

Preservation Brief 11 - Rehabilitating Historic Storefronts <www.nps.gov/history/hps/tps/briefs/brief11.htm>

Preservation Brief 37 - Appropriate Methods for Reducing Lead-Paint Hazards in Historic Housing
<www.nps.gov/history/hps/tps/briefs/brief37.htm>

Preservation Brief 38 - Removing Graffiti from Historic Masonry <www.nps.gov/history/hps/tps/briefs/brief38.htm>

*Preservation Brief 47 - Maintaining the Exteriors of Small and Medium-Size Historic Buildings**

The Secretary of the Interior's Standards for Rehabilitation & Illustrated Guidelines for Rehabilitating Historic Buildings
<www.nps.gov/history/hps/tps/tax/rhb/index.htm>

The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings <www.nps.gov/history/hps/tps/standguide/index.htm>

All Wet & How to Prevent It: Managing Moisture in Your Historic Home <www.nps.gov/history/hps/tps/allwet/index.htm>

*Keeping it Clean: Removing Exterior Dirt, Paint, Stains and Graffiti from Historic Masonry Buildings**

*A Glossary of Historic Masonry Deterioration Problems and Preservation Treatments**

Preservation Tech Note - Masonry No. 1: Substitute Materials: Replacing Deteriorated Serpentine Stone with Pre-Cast Concrete
<<http://www.cr.nps.gov/hps/tps/technotes/PTN23/index23.htm>>

*Preservation Tech Note - Masonry No. 2: Stabilization and Repair of a Historic Terra Cotta Cornice**

*Preservation Tech Note - Masonry No. 3: Water Soak Cleaning of Limestone**

Preservation Tech Note - Masonry No. 4: Non-destructive Evaluation Techniques for Masonry Construction
<www.nps.gov/history/hps/tps/technotes/PTN40/intro.htm>

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