Care and Maintenance of St. Joseph's Historic Stone Walls

Contents:

One of the most distinctive elements to the historic streetscapes of St. Joseph are the stone retaining walls. Based on information found in real estate listings of the era, it appears that these walls were built at the same time as the structures, c. 1870-1910. The streets in the historic core of the city were cut lower than the level of many of the building lots, necessitating the stone retaining walls. The distinctive form and construction of our walls is quite unusual – many have a raised and rounded mortar joints, while some are also crenelated. They are a vital component to our historic streetscapes.

Threats

Just like anything else which has been around for more than a century, the historic stone walls require ongoing maintenance and appropriate repair when necessary. Among the threats to this structural integrity of the walls are:

One of the major threats to the integrity of historic stone walls is the damage done by vegetation.

- Water – Because the mortar used in these walls is relatively soft, they are susceptible to water damage.
  - The yearly *freeze/thaw cycle* can cause cracking and crumbling. This is created when water enters the small cracks or holes in the stone and masonry. As the temperature falls below freezing, the water freezes and expands. When the temperatures rise and the ice thaws it leaves behind even larger gaps in the masonry that then allow more water to enter. If this is left untreated it can lead to *spalling* – when the stone and/or mortar crumbles, flakes, and begins to fall away.
  - Water build up behind the wall is another cause of failure.
- Vegetation – The roots of trees behind the wall can loosen some of the stones. Vegetation growing on the wall itself poses a threat.
- Neglect – Nothing lasts forever. If problems are not addressed when they are small, they can quickly become massive failures.

Maintenance

A regular routine of inspection will help to bring problems to light before they become serious threats to the wall. Spring, after the freezes of winter, is a good time to take a close look at your wall to identify potential problems. Over time stones may become loose or cracked and mortar joints may be damaged. Some fundamental things to look out for:

- Keep the wall free of vegetation growth: Despite our romantic notions of ivy-covered stone walls, ivy and other vegetation can cause significant damage to your historic stone wall. The tendrils of the plant that attach it to the wall are damaging to the structure and additionally, the plants can hold moisture against the surface and cause deterioration.
  - ❖ Vegetation growth on stone and masonry can lead to a number of problems:
    - Scouring the surfaces
    - Erosion of mortar joints
    - Holding moisture against the surface
    - Hampering access for maintenance and repairs

This damage is both chemical and mechanical:

- Chemical: The respiration process of many plants produces acids as a byproduct. Through a process called chelation, these acids dissolve the minerals in stone or pull out specific elements from minerals found in masonry thus causing deterioration in the surface of the stone.
- Mechanical: plants have a mechanism to attach themselves to stone structures. Often the chemical action described above results in a softening of the masonry and creates a "foothold" for the plant to insert itself into the stone itself. As the plant grows, those anchors become larger and do increasing damage. These footholds also provide a means for water to enter the structures, making the wall more susceptible to the damage caused by the freeze and thaw cycle and can result in spalling.
- Use care when applying herbicides. Herbicides most often contain salts that damage stone and masonry; thus, their use on stone or masonry structures is strongly discouraged.
- Removal of Vegetation: In the guidance that follows on the removal of vegetation, ***the herbicide is only applied to the actual plant and not to the masonry or the surrounding soil***.

  Tools Needed, in addition to a commercial herbicide (see note above)
  - Pruning shears
  - Small paint brush
  - Garden hose with nozzle
  - Sharp knife
  - Soft bristle (non-metallic) brushes
  - Wood scrapers (eg: popsicle sticks, tongue depressors)

  - Vine Removal: Conduct an initial inspection to determine if the roots of the vine have penetrated either the stone or the mortar joints. *If you find that the mortar joints or the stone have deteriorated as a result of root incursion or the weight of the vine, you should consult a professional mason with experience on historic masonry –* ***do not attempt to remove the vine*** *as you could do significant damage to the structure of the wall.* If the vine has not yet damaged the wall:
    - Use pruning shears to cut the vine trunk to approximately four inches above the soil level and remove a six inch section of the stem above the cut; you will create a six inch gap between the remaining stump of the trunk and the plant stem.
    - Making vertical cuts in the stump and peel the bark back exposing approximately one inch of the inner wood.
    - Using the small paint brush, paint the commercial herbicide directly on the exposed wood of the stump. *Ensure that you do not get any of the herbicide on the stone surface or the soil*. This should kill the vine's roots and prevent regrowth.

    - Allow the stem of the vine to die naturally and remove the dead material. Do not wrench the dead material away from the historic masonry, rather use the wooden scrapers to gently remove the dead vegetation.
    - It is not a good idea to leave dead material in place on the wall. As the wood decays it may leave voids in the masonry that could lead to additional problems.
    - Following the removal of as much plant material as possible, gently scrub the affected surface of the wall with the soft bristle brush and clean water sprayed from a garden hose at low pressure (40 psi or below).
- Poison Ivy Removal: One of the most troublesome of the invasive plants that can take up residence in and around your historic stone wall is poison ivy. Poison Ivy can be removed either chemically or manually.
    - Manual removal, pulling, is safer for the historic masonry but does have the obvious downside of exposure to the toxins in the plant. If you are going to try to manually remove the plant, water the root area heavily as it will make it easier to remove.
    - There are a number of commercial herbicides made that specifically target poison ivy. It may take multiple applications to completely eradicate the infestation. The FDA provides helpful information on the removal of poison ivy. https://www.fda.gov/consumers/consumer-updates/outsmarting-poison-ivy-and-other-poisonous-plants
- Moss and Lichen Removal: Plants such as moss and lichen can be safely removed using an appropriate biocide and a soft bristle brush. It is important to wet the surface before attempting removal.
- Small plants: Removing small plants that are growing in the crannies of the wall can be done by gently pulling them. Take care not to “yank” the plants as they may be more firmly rooted than expected and vigorous pulling may result in damage to the masonry. If the plant appears to be difficult to remove, follow the guidance given above for the removal of vines.

Cleaning

There are two types of cleaning methods that are appropriate for historic masonry: water and chemical.

- Water Cleaning: As a general rule of thumb, water cleaning is the gentlest method and can be used to remove dirt from most historic masonry. There are four methods of water cleaning: water washing, soaking, water washing with detergents, and steam.
    - Water Washing: Begin with very low pressure of 100 psi or below and progress slowly upwards as needed, without exceeding 300-400 psi. Keep the nozzle of the hose at least 12 inches from the surface of the stone. Utilize natural bristle brushes to help loosen and dislodge soiling if necessary.
    - Soaking: Prolonged spraying or misting can help to loosen heavy accumulations of soiling, soot, or mineral crusts. This may take several days but is a very gentle approach.
    - Water Washing with Non-Ionic Detergents: Non-ionic detergents (note: this is not the same as using soaps; do not use common household detergents such as Dawn dishwashing soap) are particularly useful in removing oily soil. Adding a non-ionic detergent to a low- to medium-power wash and scrubbing with a natural bristle brush can help in dislodging soil deposits. This treatment should be followed with a clear water rinse using low- to medium-pressure.
    - Steam Cleaning: Since the steam condenses upon its exit from the hose, this is essentially low-pressure hot water washing. This gentle method is particularly useful in removing soil build up or dead plant material.

- Chemical Cleaning: Since most of the historic stone walls in St. Joseph are made of limestone which is acid-sensitive, it is important that non-acidic cleaners be used. These type of products are essentially comprised of two ingredients: 1) a non-ionic detergent (see above, “Water Washing with Non-Ionic Detergents”) and 2) an alkali. When using this type of cleaning method, you should wet the stone to be cleaned before applying the non-acidic cleaner. The stone needs to be kept wet as the chemical cleaner works. Once the cleaner has done its job, rinse it off with water and then give the masonry a wash with a slightly acidic product, generally acetic acid – this has a neutralizing effect – and then rinse with clear water.

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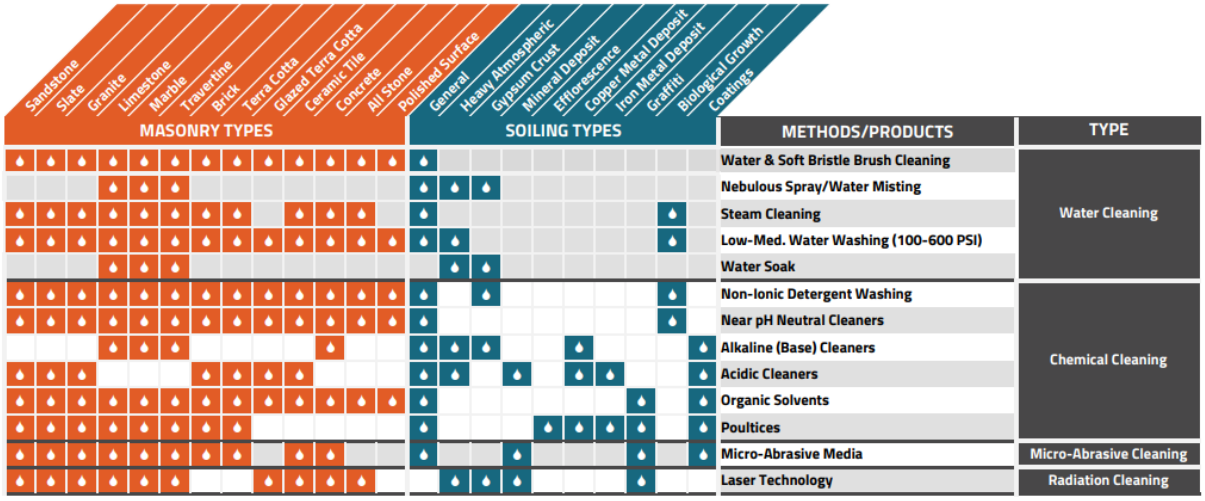
MASONRY RESTORATION CLEANING GUIDE



This Masonry Restoration Cleaning Guide is intended to be used as a general guide in developing an appropriate cleaning campaign for existing and historic masonry, therefore this information may not apply in unique situations. We recommend always beginning with the least aggressive cleaning method. Whichever cleaning method(s) are chosen, always test in discreet but representative locations before the cleaning campaign. When utilizing a proprietary cleaner, work with the manufacturer to determine if the product/method is appropriate for your project.

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Repairs

- Make small repairs to mortar joints: If the damage to your wall is minimal and the area impacted is not too large it may be appropriate for you to make the small repairs yourself. If you choose to undertake the repairs yourself some things to remember are:
    - Utilize a soft mortar mix – those purchased in standard home improvement stores are too hard and will result in breakage of the stone.

A good basic mortar mix is:
3 parts sand
1 part lime
Up to 1 part Portland Cement

    - The new mortar should match the existing historic mortar in terms of color, texture, profile. To check for match in terms of color and texture, place a small amount of the mortar mix on a piece of wood (or a stone that is not a part of the wall itself) and allow it to dry (this process can be expedited by using a hair dryer). Then check to ensure that the new mortar is a close match to that already present in the wall.
    - Work in the proper season: the wall temperature should be between 40 and 95 degrees Fahrenheit; this prevents both freezing and excessive water evaporation from the mortar. If at all possible, the work should be done in the shade as strong direct sunlight will make the mortar dry too quickly.
    - Old mortar should be carefully removed to a minimum depth of two to two-and-one-half times the width of the joint. Any loose or damaged mortar beyond this depth should be removed. The traditional method of removing old mortar is using hand chisels and mash hammers. This is time and labor intensive but poses the least threat to the historic structure. The use of power saws or grinders should be avoided as they can cause profound damage.
    - Remove rubble and any loose stones. Clean the old cement from the wall itself and the loose stones you have removed by gently tapping them with a small hammer. Remove debris that is created by this process and brush away the dust.
    - Carefully measure and mix the components of the mortar working to create a mix that matches the historic mortar and that is consistent. The dry ingredients should be measured and mixed prior to the introduction of water. In order to prevent oversanding, only introduce damp loose sand.
    - Using a sponge, wet the stones in the portion of the wall where you are making the repair; this prevents the stones from leaching too much water from the new mortar. This will help prevent the mortar from cracking.

    - Using a trowel, fill in the open spaces between stones. A wooden scraper tool, such as a tongue depressor, can be used to fill in smaller areas and to sculpt the fresh mortar to match the profile of the historic mortar joints.
    - If you are resetting a stone that has come lose, “butter” the joints and fit the stone into the cavity. Once the stone is settled into place tuckpoint the stone, using a wooden scraper to tool the mortar to match the existing profile.
    - Brush away excess mortar after it has had a chance to set for a few hours.

- **If there is a substantial amount of the wall in need of repair, or if the damage appears to have threatened the structural integrity of the wall, consult a professional mason with experience with historic masonry.**

Dos & Don'ts

Inappropriate cleaning and repair can create more problems than they resolve. Always begin with the gentlest and least invasive procedure before progressing to more aggressive techniques.

Do Not Use:

- High pressure water nozzles: start with very low pressure (100 psi or below) and generally do not go higher than 300-400 psi**.** The nozzle should be kept a reasonable distance from the surface of the stone (generally avoid having the nozzle closer than 12 inches) and resist the temptation to bring the nozzle into close contact in order to expedite the process. **Do not use power washers on historic masonry**.
- Metal bristle brushes: use only natural or synthetic bristle brushes. Metal bristle brushes can abrade the surface of the stone and deposit metal particles which can result in discoloration.
- Abrasive cleaning methods such as sand blasting. This type of treatment can do irreparable damage to the stone wall.
- The wrong mortar: The wrong mortar can make the wall more susceptible to the freeze-thaw cycle that leads to spalling (see above)
    - Modern S type mortar is too hard (see appropriate recipe above)
    - Do not use synthetic caulking compounds

When repairing your stone wall, the aim is to retain the historic appearance of the wall.

Do:

- Reuse as much of the historic material as is possible
- Replace damaged stones with ones which match the original in size, shape, texture, and color.
    - Check architectural salvage yards for replacement stones
    - Do NOT use man-made landscaping stones such as those sold in home improvement stores
    - Do NOT use cement blocks
    - Do NOT use landscape timbers or railroad ties in place of the stone
- Maintain the color, width and shape of the mortar joints
- Replace the cap stones with stones of the same profile and laid in the same pattern as the original.

When repairing your wall do not use non historic materials such as railroad ties and make sure that the repaired mortar joints are the same color and profile as the original.

If your wall requires significant repair, consult a professional with experience in historic masonry.

Resources for Further Information:

Chicora Foundation, Inc., "Removing Climbing Plants from Stone and Masonry," http://chicora.org/pdfs/Removing%20Climbing%20Plants%20from%20Stone%20and%20Masonry.pdf

International Masonry Institute: Masonry Restoration Cleaning Guide, https://imiweb.org/wp-content/uploads/Masonry-Cleaning-General-Reference-Guide-2020-final.pdf

Mack, Robert C. and Anne E. Grimmer, "Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings," Preservation Brief 1, https://www.nps.gov/tps/how-to-preserve/briefs/1-cleaning-water-repellent.htm

Mack, Robert C. and John P. Speweik, "Repointing Mortar Joints in Historic Masonry Buildings," Preservation Brief 2, https://www.nps.gov/tps/how-to-preserve/briefs/2-repoint-mortar-joints.htm

U.S. Food & Drug Administration, "Outsmarting Poison Ivy and Other Poisonous Plants," https://www.fda.gov/consumers/consumer-updates/outsmarting-poison-ivy-and-other-poisonous-plants

If you have questions concerning your historic stone wall contact the Historic Preservation Planner's Office in Room 107, City Hall (1100 Frederick Avenue). (816) 271-5349