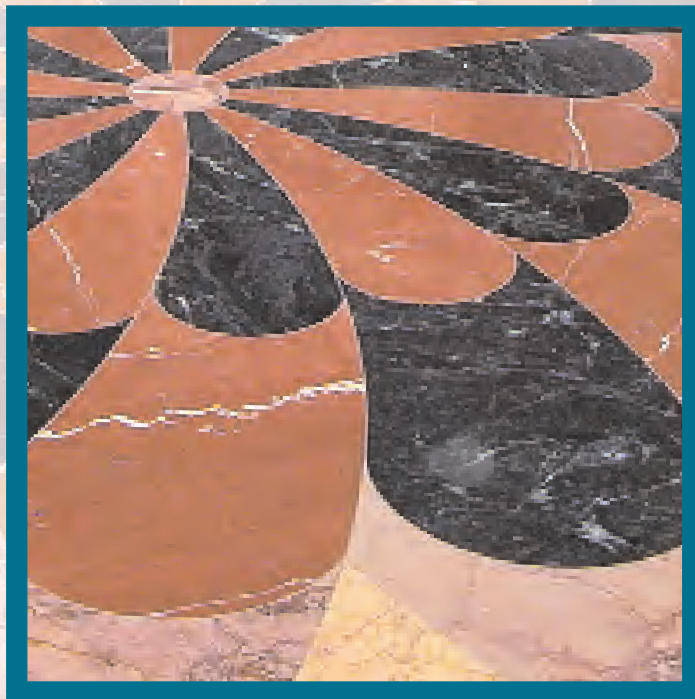




**A Guide
to the Care & Cleaning
of Natural Stone**



About the Marble Institute of America

The Marble Institute of America (MIA) is the leading resource for information and education for the natural stone industry. MIA Members, numbering over 1,200 worldwide, include marble, granite, limestone, sandstone, and other natural stone producers and quarriers, fabricators, installers, distributors, and contractors.

The association's mission is to promote the use of natural stone and be the authoritative source of information on standards of workmanship and practice and suitable application of stone products.

MIA publishes a monthly newsletter, markets a range of technical publications and consumer pamphlets on natural stone, sponsors business and technical meetings and seminars on industry-related topics, and provides educational programming for architects and construction specification professionals. MIA also honors outstanding natural stone projects worldwide through its annual Pinnacle Awards competition.

For more information, contact MIA at **440-250-9222**, e-mail MIAinfo@marble-institute.com, or visit www.marble-institute.com.

Further Reading Suggestions

ASTM International. ASTM C1515: **Cleaning of Exterior Dimension Stone, Vertical and Horizontal Surfaces, New or Existing**. West Conshohocken: ASTM International.

Cleaning Masonry - Review of the Literature, by Grimm, Clayford T., P.E. Construction Research Center, University of Texas at Arlington, 1988.

Cleaning Stone and Masonry, Clifton, James R., Editor, ASTM Special Technical Publication 935, American Society for Testing and Materials, 1983.

Keeping It Clean, by Grimmer, Anne E., U.S. Department of the Interior, National Park Service, Washington, DC: U.S. Government Printing Office, 1988.

"Cleaning of Masonry Interiors of Public Buildings," **Cleaning Stone and Masonry**, by Roth, J.W., ASTM STP 935, 1986.

"Chemical Cleaning of Historical Structures - A Practical Approach," **Cleaning Stone and Masonry**, by Rudder, T.H., ASTM STP 935, 1986.

"A Case Study of the Cleaning of Marble at the Schenectady, New York, City Hall," **Cleaning Stone and Masonry**, by Waite, J.C. and R.J. Chen, ASTM STP 935, 1986.

"A Macrosteriogrammetric Technique for Measuring Surface Erosion Losses on Stone," **Cleaning Stone and Masonry**, by Winkler, E.M., ASTM STP 935, 1986.

Stain Removal Guide for Stone and Masonry, by Hueston, Frederick M., NTC Enterprises Inc.

Historic Stone & Tile Restoration Manual, by Hueston, Frederick M., NTC Enterprises Inc., 1998.

Stone Maintenance Manual for Professional Cleaning Contractors, by Hueston, Frederick M., NTC Enterprises Inc., 1996.



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The MIA would like to thank Joe Kapcheck, Past MIA President, for inspiring this project.



The natural stone you have in your home, office, or commercial building is an investment that will give you many years of beautiful service.

Simple care and maintenance will help preserve your stone's beauty for generations to come.

This brochure has been developed for you by the Marble Institute of America (MIA) to present routine cleaning guidelines as well as procedures for stain removal should it become necessary. All methods of cleaning should be in accordance with ASTM C1515-01.

Definitions

Finishes: There are three primary stone finishes:

- A **polished** finish has a glossy surface that reflects light and emphasizes the color and markings of the material.
- A **honed** finish is a satin smooth surface with relatively little reflection of light. Generally, a honed finish is preferred for floors, stair treads, thresholds, and other locations where heavy traffic will wear off the polished finish. A honed finish may also be used on furniture tops and other surfaces.
- A **flamed** finish is a rough textured surface used frequently on granite floor tiles.

Many other finishes are available and used throughout the world. Consult with a stone professional if your finish does not match these three primary types.

Lippage: A condition where one edge of a stone is higher than adjacent edges, giving the finished surface an uneven appearance.

Maintenance: Scheduled cleaning, specific procedures, and inspections performed on a daily, weekly, or other regular basis to keep the stone in proper condition.

Poultice: A liquid cleaner or chemical mixed with a white absorbent material to form a thick, stain-removing paste.

Refinishing: Repolishing or honing of dull, once-polished marble, limestone, or granite floors and walls.

Renovation: Cleaning and repolishing of neglected dimension stone surfaces.

Restoration: Large-scale remedial actions taken to restore a structure or area to its original or acceptable "near original" condition. Generally applies to historic structures.

A Note on Historical Buildings

In the case of historically important buildings and landmarks, many of the cleaning, maintenance, and restoration protocols are established by historical preservation committees and other agencies/departments of the government. Please consult with these organizations when developing your normal maintenance program.

Know Your Stone

Natural stone can be classified into two general categories according to its composition: siliceous stone or calcareous stone. Knowing the difference is critical when selecting cleaning products.

Siliceous stone is composed mainly of silica or quartz-like particles. It tends to be very durable and relatively easy to clean with mild acidic cleaning solutions. Types of siliceous stone include: granite, slate, sandstone, quartzite, brownstone, and bluestone.

Calcareous stone is composed mainly of calcium carbonate. It is sensitive to acidic cleaning products and frequently requires different cleaning procedures than siliceous stone. Types of calcareous stone include: marble, travertine, limestone, and onyx. What may work on siliceous stone may not be suitable on calcareous surfaces.

What Type of Stone Is It?

It is advisable to maintain careful records about the type, name, and origin of the stone existing in your building. If such records do not exist, you should explore the following options before determining a cleaning and maintenance program:

1. **Consult with a professional** stone supplier, installer, or a restoration specialist to help identify whether your stone is siliceous or calcareous.

2. **Conduct a visual identification** of the stone. While there are exceptions, the following characteristics are common:



- **Granites** have a distinct crystal pattern or small flecks; very little veining.



- **Limestones** are widely used as a building stone. Colors are typically gray, tan, or buff. A distinguishing characteristic of many limestones is the presence of shell and/or fossil impressions.



- **Marbles** are usually veined, fine-textured materials that come in virtually unlimited color selections.



- **Sandstones** vary widely in color due to different minerals and clays found in the stone. Sandstone is light gray to yellow or red.



- **Slates** are dark green, black, gray, dark red, or multi-colored. They are most commonly used as a flooring material and for roof tiles and are often distinguished by distinct cleft texture. Some notable cladding projects have also included slate.

3. **Conduct a simple acid sensitivity test** to determine if your stone is siliceous or calcareous. You will need:

- 4 ounces of a 10% solution of muriatic acid or household vinegar
- Eyedropper

Because the test may permanently etch the stone, select an out-of-the-way area (a corner or closet) several inches away from any mortar joint. Apply a few drops of the acid solution to the stone surface on an area about the size of a quarter. Two possible reactions will occur:

- 1) Acid drops will bubble or fizz vigorously – a sign that the stone is calcareous.
- 2) Little or no reaction occurs – stone can be considered siliceous. See note below.

Rinse the area thoroughly with clean water and wipe dry.

NOTE: This test may not be effective if surface sealers or liquid polishes have been applied. If an old sealer is present, chip a small piece of the stone away and apply the acid solution to the fractured surface.

CAUTION: Muriatic acid is corrosive and is considered to be a hazardous substance. Proper head and body protection is necessary when acid is used. Again, it is always wise to consult with a stone professional if you are unable to visually identify the stone and/or are uncomfortable using the acid test.

Assessing the Stone's Current Condition

Knowing the current condition of the stone is another critical first step. It is recommended that you develop a checklist of questions to use in your routine examination of the current conditions. Your checklist should include questions such as:

- Are the tiles flat and even?
- Are there any cracked tiles?
- What type of stone finish exists?
- Has the stone been coated with any waxes, acrylics, enhancers, or other coatings? If so, which type and manufacturer?
- Is there any evidence of staining? What type?
- If the stone has been sealed with a topical sealer, are there any signs that the sealer has worn off?

Your answers to these and other questions will help you pinpoint your next step. For example:

- Uneven tiles (a sign of lippage) may result in the floor needing to be ground flat, honed, and then polished.
- Cracked tiles will allow dirt and other debris to accumulate in the cracks. This may require that the tiles be replaced, or at a minimum, filled.
- Knowing the type of stain (organic, oil-based, etc.) will help identify the proper stain removal technique needed. Also, the level of stains or spills the stone can be exposed to will play a role in determining if an application of a sealer is appropriate.

Care and Precautions

Countertops: General guidelines for both siliceous and calcareous stones: Use coasters under all glasses, particularly those containing alcohol or citrus juices. Do not place hot items right off a stove or out of an oven directly on the stone surface. Use trivets or mats under hot dishes and placemats under china, ceramics, silver, or other objects that can scratch the surface.

For calcareous stones, many common foods and drinks contain acids that will etch or dull the stone surface.



Flooring Surfaces: Many flooring surfaces can become slippery when wet. When wet conditions occur, reduce potential hazards by doing the following:

1. Spread carpeted runners from each outside door into lobbies and corridors to help dry shoe soles.
2. Place bright-colored "slippery when wet" pylons on walking surfaces in conspicuous places.
3. Mop or shovel walking surfaces as often as necessary to remove standing water, ice, and/or snow.
4. Issue standard instructions to building maintenance personnel and prominently post at all janitorial workstations.
5. Follow local building and safety codes.

Keep a checklist of questions to use in your examination.

Do's & Don'ts

General Guidelines for Stain Removal

1. Remove any loose debris.
2. Blot spills; wiping the area will spread the spill.
3. Flush the area with plain water and mild soap and rinse several times.
4. Dry the area thoroughly with a soft cloth.
5. Repeat as necessary.
6. If the stain remains, refer to the section in this guide on stain removal.
7. If the stain persists or for problems that appear too difficult to treat, call your stone care professional, installer, or restoration specialist.

Cleaning Do's and Don'ts

When discussing care and cleaning procedures with your maintenance staff, there are recommended do's and don'ts that should always be followed:

Do dust mop floors frequently.

Do clean surfaces with mild detergent or stone soap.

Do thoroughly rinse and dry the surface with clean, clear water after washing.

Do blot up spills immediately.

Do protect floor surfaces with non-slip mats or area rugs and countertop surfaces with coasters, trivets, or placemats.

Don't use vinegar, lemon juice, or other cleaners containing acids on marble, limestone, travertine, or onyx surfaces.

Don't use cleaners that contain acid such as bathroom cleaners, grout cleaners, or tub & tile cleaners.

Don't use abrasive cleaners such as dry cleansers or soft cleansers.

Don't mix bleach and ammonia; this combination creates a toxic and lethal gas.

Don't ever mix chemicals together unless directions specifically instruct you to do so.

Don't use vacuum cleaners that are worn. The metal or plastic attachments or the wheels may scratch the stone's surface.



Sealing Natural Stone

Several factors must be considered prior to determining if the stone should be sealed:

- What is the hardness, density, and durability of the stone?
- How porous is the stone and how fast will it absorb a liquid (also referred to as the absorption coefficient)?
- Is the stone expected to be in frequent contact with a staining agent?
- What type of finish was applied to the surface? For example, a polished surface is more resistant to staining than a honed surface.
- Will the sealant affect the color or other aesthetics of the stone?
- If a resin was applied to the stone, how will the sealant react with the resin?
- Where is the stone located (e.g. countertop, floor, wall, foyer, bathroom, etc.)? Residential or commercial?
- What type of maintenance program has the stone been subjected to?

The type of stone, its finish, its location, and how it is maintained all need to be considered when determining how to protect the stone.

In some cases it makes sense to seal the stone. Once properly sealed, the stone will be protected against everyday dirt and spills. In other cases, it is best to leave the stone untreated. Topical sealers can alter the surface texture and finish as well as build up on the surface, creating a layer that is less durable than the stone. Generally, topical sealers are not recommended in exterior applications because they can trap moisture within the top layer of the stone, which may lead to surface deterioration during freeze/thaw cycles.

The Marble Institute of America's position on sealers is as follows:

The Marble Institute of America (MIA) recognizes the benefits that sealers can provide in certain applications. MIA recommends that care be exercised in the application of any chemical to a stone's surface. Although normally innocent in and of themselves, some sealers have reportedly reacted with some cleaning/maintenance chemicals and/or with components within the stone surface, causing some reactions.



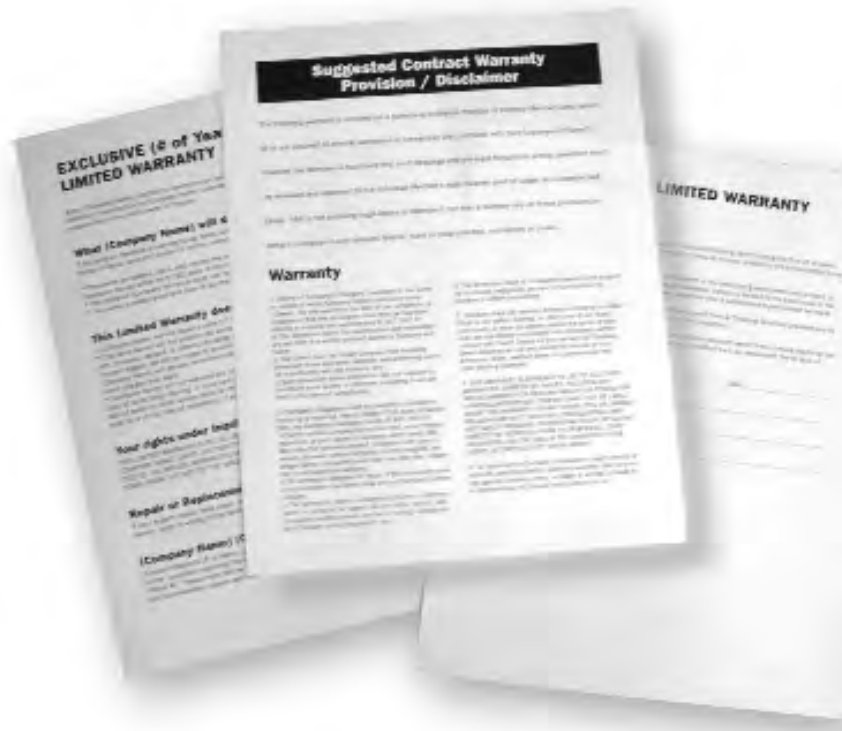
If you have decided to treat your stone, make sure you understand the differences between the types of sealers available on the market:

- **Topical Sealers** are coatings (film formers) designed to protect the surface of the stone against water, oil, and other contaminants. They are formulated from natural wax, acrylic, and other plastic compounds. When a topical sealer is applied, the maintenance program often shifts from a program focused on stone care to a program focused on the maintenance of the sealer (for example: stripping and reapplication).

- **Impregnators** are water- or solvent-based solutions that penetrate below the surface and become repellents. They are generally hydrophobic (water-repelling), but are also oleophobic (oil-repelling). Impregnators keep contaminants out, but do not stop the interior moisture from escaping. These products are considered “breathable,” meaning they have vapor transmission.

Vanity tops and food preparation areas may need to have an impregnator applied. Check with your installer for recommendations. If an impregnator is applied, be sure that it is safe for use on food preparation surfaces. If there are questions, check with the product manufacturer.

Make sure
you understand
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between the types
of sealers available
on the market.



Before sealing, always:

- Read the Manufacturers Warranty and Instructions.
- Contact the manufacturer prior to application if you are unsure or need clarification. The wood-working analogy of ‘measure twice, cut once’ applies.
- Consider the life span of the application (1-year, 2-years, 5-years, etc.) – keep a log of each application.
- Don’t switch from one product to another without fully understanding any potential issues. Not all products are alike – again, consult with the manufacturers.
- Consult with your stone professional as necessary.
- Ask yourself, does the stone need to be treated in the first place?

Daily Cleaning Procedures and Recommendations

Countertop Surfaces:

Clean stone surfaces with a few drops of neutral cleaner, stone soap (available at hardware stores or from your stone dealer), or a mild liquid dishwashing detergent and warm water. Use a clean soft cloth for best results. Too much cleaner or soap may leave a film and cause streaks. Do not use products that contain lemon, vinegar, or other acids on marble or limestone. Rinse the surface thoroughly after washing with the soap solution and dry with a soft cloth. Do not use scouring powders or creams; these products contain abrasives that may scratch the surface.

Floor Surfaces:

Dust mop interior floors frequently using a clean, non-treated dry dust mop. Sand, dirt, and grit do the most damage to natural stone surfaces due to their abrasiveness. Mats or area rugs inside and outside an entrance will help to minimize the sand, dirt, and grit that will scratch the stone floor. Be sure that the underside of the mat or rug is a non-slip surface.

Normally, it will take a person about eight steps on a floor surface to remove sand or dirt from the bottom of their shoes.

Normal maintenance involves periodic washing with clean, potable water and neutral (pH 7) cleaners. Soapless cleaners are preferred because they minimize streaks and film. Mild, phosphate-free, biodegradable liquid dishwashing soaps or powders or stone soaps are acceptable if rinsing is thorough.

Wet the stone surface with clean water. Using the cleaning solution (following manufacturer's directions), wash in small, overlapping sweeps. Work from the bottom up if it is a vertical surface. Rinse thoroughly with clean, potable water to remove all traces of soap or cleaner solution. Change the water in the rinse pail frequently. Dry with soft cloth and allow to thoroughly air dry.

Bath and Other Wet Areas:

Soap scum can be minimized by using a squeegee after each use. To remove soap scum, use a non-acidic soap scum remover or a solution of ammonia and water (about $\frac{1}{2}$ cup ammonia to a gallon of water). Frequent or over-use of an ammonia solution may eventually dull the surface of the stone.

Outdoor Pool and Patio Areas:

In outdoor pool, patio, or hot tub areas, flush with clear water and use a mild bleach solution to remove algae or moss.

Exterior Stone Maintenance:

The large expanses of stone generally found on exterior applications may make it impractical to perform normal maintenance on a frequent basis. Large installations, however, should be given periodic overall cleaning as necessary to remove accumulated pollutants. Easily accessible stone surfaces such as steps, walkways, fountains, etc., should be kept free of debris and soiling by periodically sweeping and washing with water.

Normal maintenance should include periodic inspection of stone surfaces for structural defects, movement, deterioration, or staining.





Moisture Damage

Water penetrating exterior wall cavities through defective flashing or unsealed joints can cause **efflorescence**, a mineral salt residue left on the surface of masonry when water evaporates. In addition, condensation in wall cavities prevented from reaching the exterior surface because of blocked weep holes can dislodge masonry in a freeze-thaw climate. Look for a darkening affect of the stone.

It is recommended that you contact your stone professional for a remedy.



Moisture damage on exterior floor slabs.



Wet stone on granite fireplace from a leak in chimney.

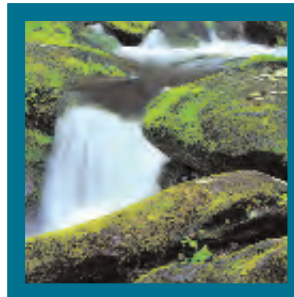
Moisture coming up through a floor slab seeks the easiest possible pathway to evaporate into the atmosphere. Often, the veining or micro-cracks in the structures of some stones provide that path. The moisture dissolves all the salts from the ground, the substrate, and the stone, carries them to the surface, and deposits them as the moisture evaporates, giving the appearance of a faulty stone.

Contact your stone professional for assistance.

Identifying & Removing Stains



Oil-Based Stains (grease, tar, cooking oil, cosmetics) —Will darken the stone and normally must be chemically dissolved so the stain's source can be rinsed away. Clean gently with a soft liquid cleanser, household detergent, ammonia, mineral spirits, or acetone.



Biological Stains (algae, mildew, lichens, moss, fungi)—Clean with a dilute ($\frac{1}{2}$ cup in a gallon of water) ammonia, bleach, or hydrogen peroxide. **WARNING: DO NOT MIX BLEACH AND AMMONIA! THIS COMBINATION CREATES A TOXIC GAS!**



Organic Stains (coffee, tea, fruit, tobacco, paper, food, urine, leaves, bark, bird droppings)—May cause a pinkish-brown stain and may disappear after the source of the stain has been removed. Outdoors, with the sources removed, normal sun and

rain action will generally bleach out the stains. Indoors, clean with 12% hydrogen peroxide and a few drops of ammonia.



Ink Stains (magic marker, pen, ink)—Clean light-colored stones with bleach or hydrogen peroxide. Use lacquer thinner or acetone for dark-colored stones.



Inorganic Metal Stains (iron, rust, copper, bronze) — Iron or rust stains are orange to brown in color and leave the shape of the staining object, such as nails, bolts, screws, cans, flowerpots, or metal furniture. Copper and bronze stains appear as

green or muddy brown and result from the action of moisture on nearby or embedded bronze, copper, or brass items. Metal stains must be removed with a poultice (see page 12). Deep-seated, rusty stains are extremely difficult to remove and the stone may be permanently stained.



Paint Stains—Small amounts can be removed with lacquer thinner or scraped off carefully with a razor blade. Heavy paint coverage should be removed with a commercial liquid paint stripper. **DO NOT USE ACIDS OR FLAME TOOLS TO STRIP PAINT FROM STONE.**

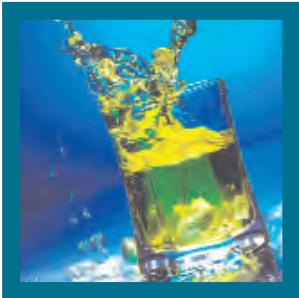


Water Spots and Rings (surface accumulation of hard water)—Buff with dry 0000 steel wool.



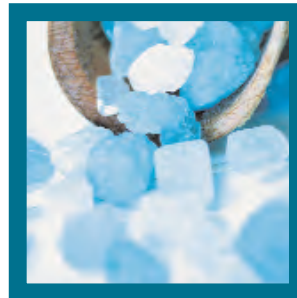
Fire and Smoke

Damage—Older stones and smoke- or fire-stained fireplaces may require a thorough cleaning to restore their original appearance. Commercially available smoke removal products may save time and effort.



Etch Marks (calcareous stones)—Caused by acids (typically from milk, fruit juices, alcohol, etc.) left on the surface of the stone, some will etch the finish but not leave a stain; others will both etch and stain. Once the stain has been removed, wet

the surface with clear water and sprinkle with marble polishing powder. Rub the powder into the stone with a damp cloth or by using a buffing pad with a low-speed power drill or polisher. Continue buffing until the etch mark disappears and the marble surface shines. Honing may be required for deep etching. This process may require the services of a stone maintenance professional.



Efflorescence—A white powder that may appear on the surface of the stone, it is caused by water carrying mineral salts from below the surface of the stone to the surface and evaporating. When the water evaporates, it leaves the

powdery salt residue. If the installation is new, dust mop or vacuum the powder. Repeat as necessary as the stone dries out. Do not use water to remove the powder (adding water will only add to the problem).

If the problem persists, contact the stone contractor to identify and remove the cause of the moisture.

Stains & Solutions

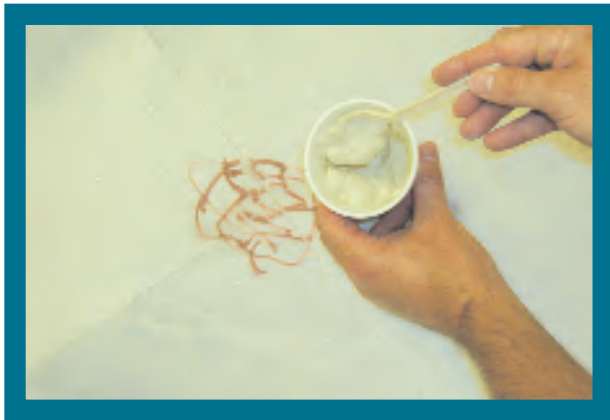
Using Stain-Removing Poultices

Materials:

Poultice materials include kaolin, fuller's earth, whiting, diatomaceous earth, powdered chalk, white molding plaster, and talc. Approximately one pound of prepared poultice material will cover one square foot. Do not use whiting or iron-type clays such as fuller's earth with acid chemicals; the reaction will

cancel the effect of the poultice. A poultice can also be prepared using white cotton balls, white paper towels, or gauze pads. Premixed poultices that require adding only water are also available from stone maintenance supply companies.

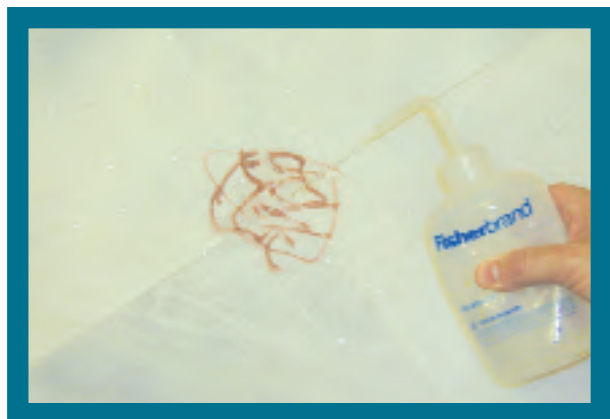
Preparing & Applying the Poultice:



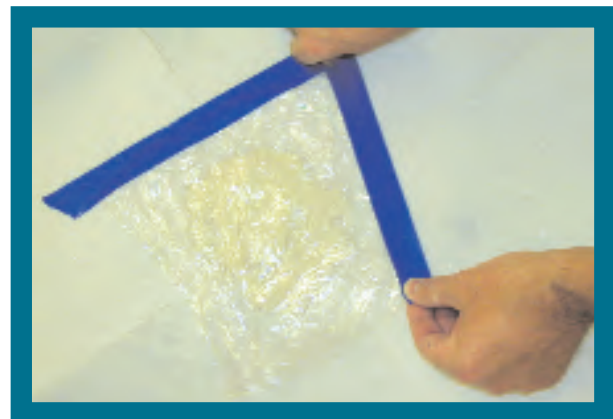
1. Prepare the poultice. If using powder, mix the cleaning agent or chemical to a thick paste the consistency of peanut butter. If using paper, soak the chemical and let drain. Don't let the liquid drip.



3. Apply the poultice to the stained area about $\frac{1}{4}$ " to $\frac{1}{2}$ " thick and extend the poultice beyond the stained area by about one inch. Use a wood or plastic spatula or scraper to spread the poultice evenly.



2. Prepare the stain area. Wet the stained area with distilled water.



4. Cover the poultice with plastic and tape the edges to seal it.



5. Allow the poultice to dry thoroughly, usually about 24 to 48 hours. The drying process is what pulls the stain out of the stone and into the poultice material. After about 24 hours, remove the plastic and allow the poultice to dry.



6. Remove the poultice from the stain, rinse with distilled water, and buff dry with a soft cloth. Use the wood or plastic scraper if necessary.



7. Repeat the poultice application if the stain is not removed. It may take five or more applications for difficult stains.

8. If the surface (calcareous stones) is etched by the chemical, apply polishing powder and buff with a polishing pad recommended by the polishing powder manufacturer.

It is possible that some stains may never be completely removed. Consult with a stone professional to determine additional steps that might be taken.

Additional Resources:

The MIA has a short video available that demonstrates the poultice process; call 440.250.9222 for more information.

Photo Source: The National Training Center for Stone & Masonry Trades

