City of Newton
Historic Preservation

Guidelines for Masonry & Stucco

Many of Newton's significant historic homes - such as this brick house in Chestnut Hill - are constructed of masonry.

PURPOSE

These *Guidelines* were prepared to provide property owners with information when considering the repair, alteration or installation of masonry and stucco. They are not intended to replace consultation with qualified architects, contractors, the Newton Historical Commission (NHC), Local Historic District Commissions (HDC) and their Staff. The City's Preservation Planner and the NHC/HDC will be happy to provide a preliminary consultation addressing design or materials issues to potential applicants free of charge.

These *Guidelines* were developed in conjunction with the City of Newton's Historical Commission (NHC), Local Historic Districts Commissions (HDC), and the Planning and Development Department (PDD). Familiarity with this material can assist owners of designated historic properties to move a project quickly though the City of Newton review and approval process. Information pertaining to all properties with a City of Newton historic preservation review designation is marked with the abbreviation **(ALL)**. Information pertaining specifically to properties in Local Historic Districts **(LHD)**, to Local Landmarks **(LL)**, or to properties with Preservation Restrictions **(PR)** is marked accordingly. Information in the Guidelines that is advisory only is marked with the abbreviation **(AO)**. Please refer to the Introduction section for background information on historic preservation designations and the project review process in the City of Newton.

Additional Guidelines addressing other historic preservation topics are available at City Hall and on the City's website at www.newtonma.gov. The NHC, HDC, and PDD are available to provide informational meetings or preliminary consultation with applicants prior to filing. For more information, questions regarding the application process, or to clarify whether a project requires review please contact the PDD at (617) 796-1120.

EXTERIOR MASONRY & STUCCO

Historically, a building's exterior masonry surface serves both visual and functional purposes. Visually, it is an important design feature that establishes the rhythm and scale of a building. Functionally, historic exterior masonry and concrete typically act as the principal load bearing system for the building, as well as its "skin", shedding water and deflecting sunlight and wind.

Historic exterior masonry:

- Acts as an important design feature, helping to define a building's architectural style
- Establishes a building's scale, mass and proportion
- Adds pattern and casts shadows on wall surfaces
- Acts as a principal element in the structural system
- Establishes a weather-tight enclosure, providing protection from rain, wind and sun

In the City of Newton, many prominent civic or institutional buildings are constructed of masonry. At residences, masonry and stucco can be a primary wall material or be used for foundations and chimneys at wood framed homes. Masonry landscape and retaining walls are also common in the City.

With proper maintenance, exterior masonry and stucco can last for centuries. However, if maintenance and repairs are not completed properly and in a timely manner, masonry and stucco can be severely damaged. Typical issues that cause deterioration are moisture penetration, freeze-thaw cycling, inappropriate painting and harsh or abrasive cleaning.

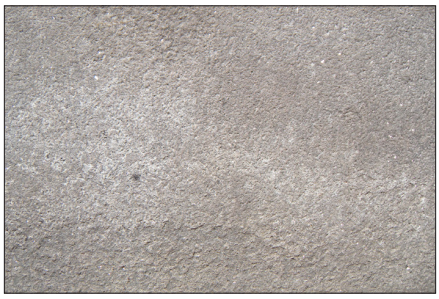
TYPES OF MASONRY AND STUCCO IN NEWTON

19th Century Brick - A soft, fired-clay, fairly regularly shaped building component; often with color and surface variations; used primarily in walls, piers, foundations, chimneys and exterior pavers.

20th Century Brick - A hard, dense, fired-clay, regularly shaped building component; sometimes with a glazed surface; used primarily in walls, piers, foundations, chimneys and exterior pavers.

Wire Cut Brick - A dense, fired-clay, regularly shaped building component; with a ridged surface; used primarily in 20th century building walls and chimneys.

Limestone - A sedimentary rock; used for building walls, window sills and lintels, ornamental stone trim, and sculpture.



Granite - A hard rock, consisting of small, yet visible, grains of minerals, which can be highly polished or textured; used for walls, piers, columns and street curbs; commonly in gray, black and pink.

Marble - Typically fine grained and able to be highly polished; it has a wide range of colors and patterns; used for steps and stoops, statuary and fine masonry.

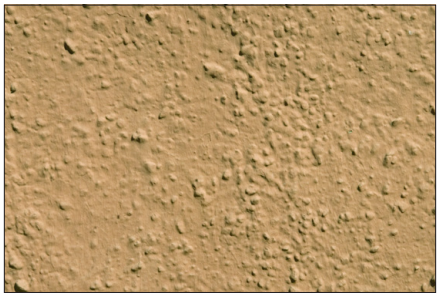
Brownstone - A reddish brown sandstone used as a building material, popular in the late 19th century.

Concrete Block - A structural building material made by mixing water, cement, sand and aggregate, placing the mix in forms and hardening; commonly used for foundations, walls and piers.

Textured Concrete Block - A structural building material made by mixing water, cement, sand and aggregate, placing it in forms and hardening it; used for foundations, walls and piers, popular in the early to mid 20th century.

Terra Cotta - Fired-clay, non-structural building components, often with colored glaze, used for decorative, ornate details and wall finishes.

Scored Stucco - Smooth finish with scoring to simulate stone joints.



Dash Finish Stucco - Textured finish with pronounced aggregate at the surface.

COMPONENTS OF MASONRY WALLS, FOUNDATIONS & PIERS

Masonry walls, foundations and piers were historically constructed of either bricks or stones, stacked on top of each other. The individual units were bonded by mortar, which served to hold the masonry units together and fill the gaps between them. Historically the masonry was load bearing, meaning it carried its own weight to the ground as well as the load of other building elements such as walls, floors and roofs.

BRICK

Brick is a common masonry material in Newton and can be found in some of the City's earliest buildings, as well as those constructed recently. Bricks are made by inserting clay into a mold and then firing or baking the brick at very high heat. The result is a standardized unit, generally 8" by 4" by 2-1/4" in size.

The color of brick can vary, but red is by far the most common. Other colors include yellow, orange and brown. The color is determined by the chemical and mineral content of the clay, and the temperature and conditions of the kiln or oven. Similar to the color, the strength or hardness of brick is determined by the clay ingredients and the firing method, but it is also affected by the way the brick is manufactured.

- Mud bricks, tend to be very soft and can be found on buildings and structures built during the 19th century. They were made by pressing wet clay into a wood or metal mold, historically by hand; the shaped clay was then dried and fired. In the process, small air pockets and impurities were trapped in the clay, and the bricks were often slightly irregularly shaped with holes or voids and rounded edges and corners. Because mud bricks are very soft, they were occasionally covered with stucco to protect them from the weather.
- Dry pressed bricks are similar to mud bricks except the clay used is drier, is pressed into the molds with greater force and fired longer. The result is a brick of medium hardness with sharp corners and edges. Dry pressed bricks gained in popularity in the second half of the 19th century.
- Extruded bricks were popularized in the early 20th century and are the hardest bricks. Unlike mud bricks and dry pressed bricks which tended to be made near the construction site, extruded bricks are typically made in large factories and shipped to the site. To make extruded bricks, very dry clay is forced through a form to create a long ribbon before being cut into individual bricks. With large-scale production it is easier to achieve higher quality control of the color and hardness.
- Veneer bricks are thin layers of extruded bricks, often about 1/4" thick, adhered to an underlying surface. Brick veneers have no structural capacity.

CONCRETE MASONRY UNITS

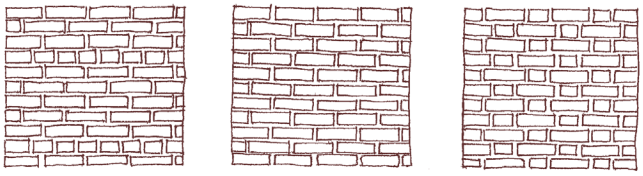
Concrete masonry units (CMUs), also known as concrete blocks, are similar to bricks in that they are formed structural elements. They are made by mixing water, cement, sand and aggregate, which is placed in forms to harden. The blocks are typically 8" by 8" by 16" in size and typically include voids. Similar to brick, they are typically stacked and bonded with mortar. They are most often laid in a running-bond pattern.

Concrete blocks can also be formed in decorative molds that create a rusticated appearance, sometimes known as Formstone. Decorative concrete block was popularized in the early-20th century and was most often used for secondary buildings such as garages, but can also be found as wood-framed building foundations.

STONE

The most common type of stone in Newton is random fieldstone. In addition, limestone detailing is often found at brick buildings, and some of Newton's buildings include granite and brownstone. Historically, stone walls and piers were weight bearing and constructed of individual stone units bonded with mortar. In the mid 20th century, stone veneers became popular. Stone veneers are thin slabs of masonry (typically marble or granite), "hung" on an underlying structural support system or applied to a wall surface with mortar in various patterns.

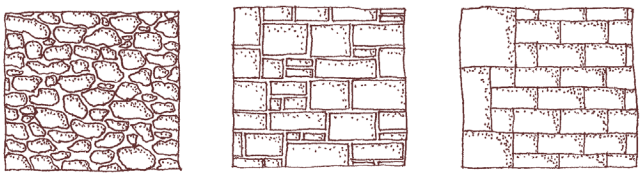
BRICK BONDING PATTERNS



Common Bond | Running Bond | Flemish Bond

The most frequently constructed brick pattern is common bond, which features stretcher courses with a header course every 6th row. Other familiar brick bonding patterns include running bond, comprised of only stretcher course, and Flemish bond, alternating stretchers and headers.

STONE BONDING PATTERNS



Uncoursed Fieldstone | Coursed Fieldstone | Coursed Cut Stone with Quoins

Uncoursed and coursed field stone are common foundation materials in Newton. There are fewer cases of cut stone walls. Quoins are large rectangular stones located at a building's outside corners. Historically, quoins were used in a variety of bonding patterns including fieldstone.

MORTAR

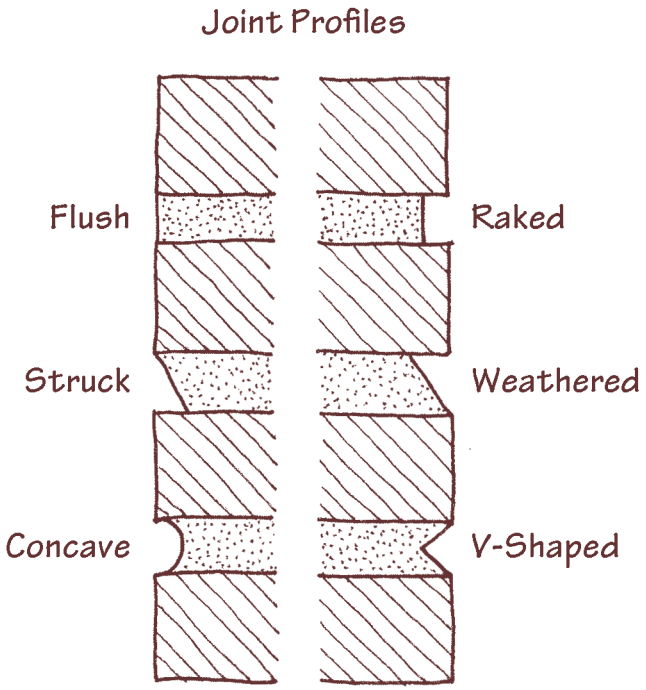
Historically, mortar was generally composed of a few ingredients: sand, lime and water, and possibly additives such as animal hair or oyster shells. Starting in the mid 19th century, a small amount of Portland cement was added into the mix to improve the workability and hasten the setting time. In the early 20th century, the amount of Portland cement in mortar was increased, resulting in harder mortar corresponding with the manufacturing of harder bricks and concrete block.

Sand is by far the largest component of mortar and defines its color, character and texture. Since masons would use products that were readily available, sand from historic mortars tended to have weathered, rounded edges and was available in a great variety of grain sizes and shades of white, grey and yellow. Most sand available today has sharper edges from being mechanically broken and is sieved into standard sizes. As a result, mixing sand colors and sizes might be needed to match historic mortar.

Lime and Portland Cement act as binders for the mortar. High lime mortar is soft, porous and varies little in volume with seasonal temperature fluctuations. Because lime is slightly water-soluble, high-lime mortars can be self-healing and reseal hairline cracks. By contrast, Portland cement can be extremely hard, is resistant to water movement, shrinks significantly upon setting and undergoes relatively large thermal movements. Portland cement is available in white or grey, and the two colors can be mixed to achieve a desired color. It is possible to add a small percentage of Portland cement to a high lime mixture to improve workability and plasticity. The proportion of Portland cement can generally be increased when repointing 20th century buildings or structures such as most of those found in Newton.

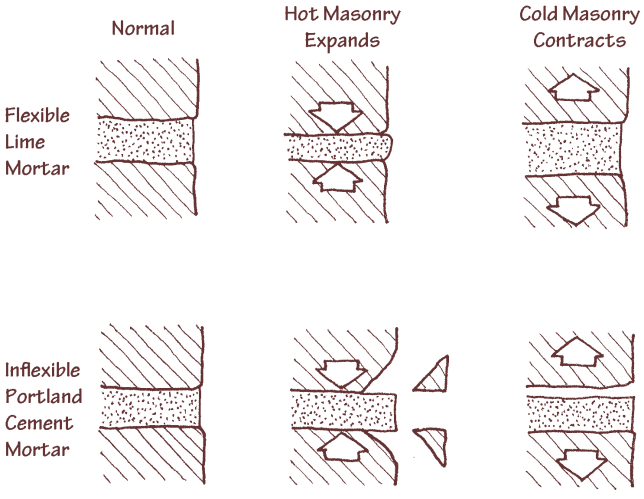
Water used in mortar needs to be clean and free of salts, harmful minerals and acid. If not, it can break down the mortar and adjacent masonry and discolor finished surfaces.

Historic Additives included shells, animal hair and clay particles. To duplicate the character of historic mortar, it might be necessary to include additives to match the original. (Refer to *Page 9* for mortar analysis information.) It should be noted that there are several types of chemical additives available today including those that increase or reduce the setting time or expand the recommended temperature installation ranges. The use of newer chemical additives is strongly discouraged unless they have been specifically tested over an extended period of time with similar historic materials to the proposed installation conditions (AO).



There are numerous joint profile types, with each producing different shadow lines and highlights. When repointing an area of masonry, it is important to tool mortar to match the existing joint profile for a consistent appearance.

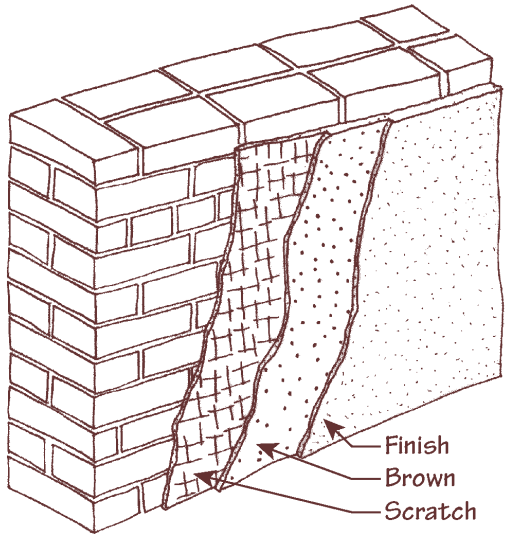
MORTAR HARDNESS & MASONRY



Temperature changes cause masonry units to expand when heated and contract when cold. The expansion and contraction of the masonry units results in compression and flexing of the adjacent mortar joints.

Lime based mortar is pliable and is more likely to compress and flex through temperature cycles. If properly installed, it should also be softer than the adjacent masonry.

Portland cement based mortars are significantly harder than lime based mortars and far less elastic. In addition, cement mortars tend to be substantially harder than historic masonry. When masonry units expand in warm temperatures and when heated by the sun, they press against the harder cement mortar and tend to spall at the edges. During colder temperatures, masonry units tend to pull away from mortar, resulting in open cracks that can allow moisture penetration.



Stucco was traditionally applied in three layers: the scratch coat; the brown coat; and the finish coat.

STUCCO

Stucco is a relatively inexpensive material that can provide a more finished appearance to brick, stone or wood framed buildings. In some cases, the surface was scored to look like stone. It acts as a weather repellent coating, protecting the building from the elements including rain, sunlight and wind, and can moderately increase its fire resistance. Stucco can also provide an insulating layer to a wall, reducing the passage of air.

In some cases, stucco was applied at the time of construction over softer hand-made brick as a protective coating. Scored stucco was also installed to give the appearance of cut stone and a fraction of the cost, particularly at Greek Revival buildings.

Beginning in the 20th century, stucco was applied on wood-framed buildings in revival styles of architecture. Depending on the style and period of construction of a building, the texture of the stucco varies widely, from a smooth finish to textured, troweled, and could be combined with wood half-timbering in Tudor Revival buildings.

Stucco was also applied on some buildings and structures, years after the original construction, as a remodeling material to vary the original appearance or to conceal deterioration.

The components of stucco are similar to pointing mortar and include sand, lime, Portland cement, water, and possible binders. In some cases, pigments were added to the mix, to alter the finished color.

STUCCO APPLICATION

Stucco is essentially a layer of mortar held in position by the bond formed with the underlying material. Historically at masonry walls, one of the best ways to achieve a bond was to "rake-out" the mortar joints about 1/2" to form a groove that holds the stucco in place. (Refer to Raked Joint at *Joint Profiles* Diagram, *Page 4*.)

When installed on masonry, stucco becomes an integral part of the wall when it sets. When stucco was installed historically on wood framed walls, the stucco was generally "hung" on strips of wood called lath that were nailed to wall studs. By the mid 20th century, metal lath replaced wood lath for stucco application on wood framed buildings. (Refer to illustration on *Page 9*.)

A stucco wall surface is generally about 1" thick and applied in the following 3 coats:

1. The **Scratch Coat** is approximately 3/8" thick and applied directly to the wall surface. It is forced into the raked joints or pushed into the lath to provide a strong bond. The surface of the scratch coat is deeply scored to allow bonding of the brown coat.
2. The **Brown Coat** is also approximately 3/8" thick and finished with a wood float for a smoother surface.
3. The **Finish Coat** is generally about 1/4" thick with the overall thickness being determined by the finish style

SYNTHETIC STUCCO (ALL)

The Exterior Insulation and Finish System, or EIFS, is a synthetic stucco system that was popularized in the United States in the late 20th century. It generally consists of 3 layers:

- An inner foam insulation board secured to the exterior wall surface, often with adhesive
- A middle polymer and cement base coat that is reinforced with glass fiber mesh
- An exterior textured finish coat

One of the significant problems with EIFS is that it does not "breathe" and can trap moisture within the wall thickness. This can lead to powdering or melting of softer masonry and rotting of wood sills and framing. If the problem persists, mold and mildew can develop in the building, providing a desirable home for termites.

Although the surface of EIFS can be finished to match many types of stucco, there are some differences. In larger areas of wall surface, EIFS is typically installed with control joints or grooves to allow the surface to expand and contract with temperature changes. These joints are typically not needed with lime based stucco and can result in odd wall patterns. Also, if properly installed, EIFS should not come in contact with roofing, wood trim or porch floors to reduce the possibility of moisture infiltration. Instead, these joints are often filled with sealant that can crack and eventually allow moisture to penetrate.

Because of the differences in the visual characteristics of EIFS from stucco and the potential to harm historic building fabric, the application of synthetic stucco or EIFS at any designated building or structure is not recommended.

TYPICAL CAUSES OF MASONRY PROBLEMS

The principal components of most unit masonry walls are stone, brick, terra cotta and concrete block. Mortar, which is located between the bricks, stones or blocks, bonds the individual units together, transfers the load through the masonry and provides a weather-tight seal at the exterior surface.

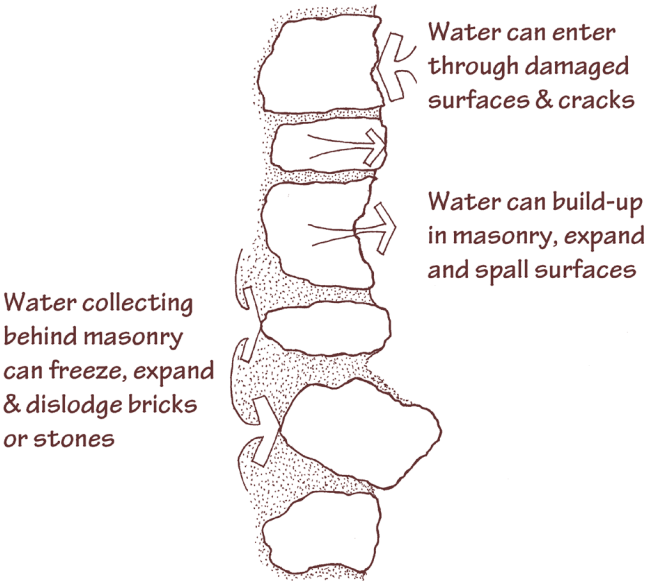
Many problems associated with historic masonry result from the failure to keep masonry mortar joints in good repair. Deteriorated mortar joints can allow water to penetrate the masonry and cause severe interior and exterior damage. There are five principal causes of mortar joint failures:

- **Weathering** of mortar occurs when rain, wind and pollution eat away at softer historic mortar over time. (Historic mortar was purposely softer to allow the masonry wall to expand and contract with seasonal temperature changes - *Refer to Mortar Hardness & Masonry, Page 4*.)
- **Uneven Settling** of masonry walls, hurricanes and seismic events may result in cracks along masonry joints or within masonry units.
- **Poor Original Design and Materials** can cause ongoing problems if the masonry and mortar are incompatible or inappropriate for their installation location, or if the masonry does not properly shed water.
- **Temperature Cycles** can cause deterioration in this climate, which is subject to extreme heat in the summer and cold temperatures in the winter. Temperature cycles can cause masonry and mortar to expand and contract at different rates, breaking the masonry's bond with the mortar. This situation can be much worse if moisture enters an open joint, potentially popping out the surface of the mortar and the masonry, resulting in spalling.
- **Insufficient Exterior Maintenance** refers to potential areas that might cause water to enter a masonry wall and contribute to its accelerated deterioration. Potential areas of concern are: poorly functioning gutters, downspouts and flashing; rising damp; standing water at foundations; water splashing back off hard surfaces, such as paving, onto walls; or water-entrapping vegetation such as ivy or shrubs on or near masonry walls.

DEFINITIONS

Efflorescence: Water-soluble salts leached out of masonry or concrete by capillary action and deposited on a surface by evaporation, usually as a white, powdery surface

Spalling: Chipping or flaking of masonry



Moisture can enter walls through various ways including mortar cracks, spalled surfaces, groundwater and interior conditions. Moisture and impurities in masonry walls can cause outward pressure and result in spalling, dislodging of masonry units and deteriorated mortar joints.

DETERIORATED MASONRY

Although historic mortar will generally deteriorate before stones or bricks, individual stones or bricks can suffer damage from a variety of causes including moisture infiltration, harsh chemicals, abrasive treatments, hard pointing mortar, differential settlement, biological growth and heavy pollution.

After a stone or brick has been installed and exposed to the elements for a length of time, it develops a protective layer or crust on its outer surface. This layer provides additional protection for the interior of the masonry unit from outside elements such as moisture and pollution. If the protective layer is compromised, damaged, or spalled, the unprotected and softer inner core is then exposed and the deterioration can accelerate, causing the surface to become powdery and scale off. Spalling generally results from the build-up of internal pressure in a wall and can be caused by:

- Freeze-thaw action of moisture that penetrates a masonry surface, freezes and expands
- Expansion of metal components within a wall such as window lintels and tie backs that become wet, rust and expand
- Efflorescence of salts or minerals on the wall surface or build-up of salts within the wall that crystallize and expand
- Differential settlement

The principal cause of most instances of spalling is the infiltration of water or moisture inside the masonry construction.

The storm water from the downspout has deteriorated the foundation's mortar and the bottom stone has been dislodged. It is recommended that water from the downspout be directed at least 3 feet away from the foundation and that the shrubs be trimmed or relocated away from the building.

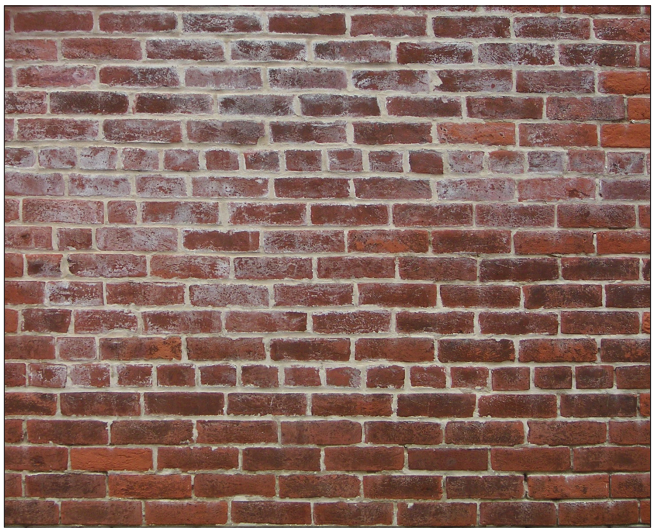
WHAT TO LOOK FOR (AO)

It is important to identify masonry problems as early as possible to minimize potential ongoing damage. This is particularly true for masonry that is exposed to a water source. Once water is permitted to penetrate a masonry wall, the deterioration will accelerate very quickly, becoming more severe and costly. Some of the signs of problems in masonry walls include:

- Disintegration of mortar more than 1/4" deep from masonry surface
- Cracks in mortar, or mortar bonds broken or pulled away from masonry
- Open mortar joints
- Loose bricks or stones
- Delaminating or surface erosion of bricks or stones
- Pitted surfaces from sandblasting and abrasive cleaning
- Damp walls, sometimes evident through the growth of moss or algae, and more commonly evident through efflorescence, which is typically visible as a white powdery substance on the wall surface
- Damaged interior plaster or finishes
- Rot of wood framing along masonry walls

Before attempting to repair masonry problems, it is strongly recommended that the cause of the problem be addressed. This would include repairing any outstanding exterior maintenance and drainage issues.

The brick infill area is clearly visible. The infill area uses bricks of a different size and color than the historic bricks and is outlined by a thicker mortar joint rather than being "keyed" into the adjacent brickwork. The bricks and mortar used in the infill areas should be the same size, color, texture, appearance, profile and hardness as the adjacent historic bricks. The repair should also be "toothed" into the adjacent brick to appear continuous with the wall surface.



The white, powdery surface on the brick is an example of efflorescence, where water-soluble salts leached out of the brick and mortar. Since the efflorescence is concentrated in the area of repointing, the likely cause is the replacement mortar.

Landscape walls are particularly susceptible to deterioration because of their high exposure to the elements. The green bloom on the surface of the bricks suggests a great deal of moisture in the wall.

The repointing mortar in this wall is likely harder that the bricks, containing too much Portland cement. The surface of the upper brick has spalled, exposing the softer interior of the core. The mortar is also beginning to crack and pop out of the lower joints.

DETERIORATED MORTAR

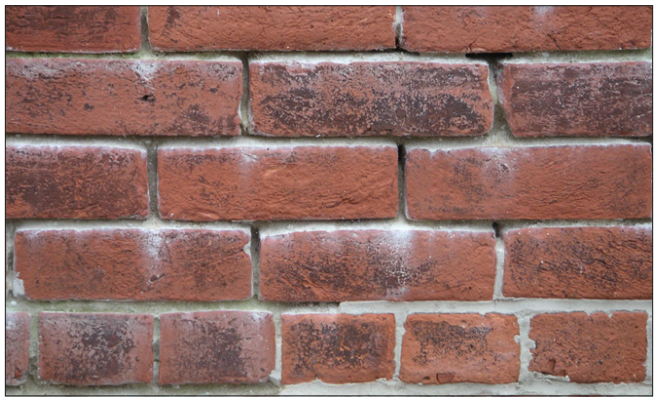
Historic mortar was mixed to be softer, or have less compressive strength, than the adjacent brick or stone. Because it is softer, the mortar acts as a cushion or sacrificial portion of the masonry surface as it expands and contracts through changes in temperature, moisture and differential settlement. If mortar is harder than the adjacent masonry, the stresses could be relieved through the individual stones and bricks. Cracking and spalling of the individual masonry units could occur, creating areas for potential moisture infiltration and potentially unstable or structurally compromised walls.

By design, mortar will typically deteriorate faster than brick or stone and require more frequent replacement, while the masonry remains relatively intact. Repointing is the process of removing deteriorated mortar from joints in a masonry wall and replacing it with new mortar. With the installation of the new joints, the visual and physical integrity of the masonry can be restored.

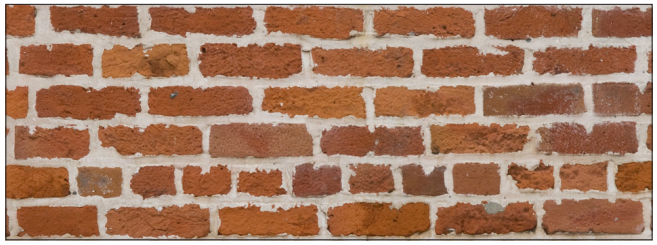
Repointing can be time consuming and expensive. It requires a great deal of hand labor by knowledgeable craftsmen to remove the existing mortar without damaging adjacent masonry, achieve the appropriate mortar mix and hardness, apply the mortar and tool it to match the historic joint style and appearance. Because of the associated costs, it is generally recommended that repointing projects be limited to areas of deterioration rather than an entire building. However, if properly completed, repointing work can last 50 to 100 years.

REPOINTING HISTORIC MASONRY (ALL)

To achieve the best results, repointing work is best completed when the temperature ranges between 40˚F and 90˚F for at least two days after the installation of the mortar to help the mortar bond to the masonry. Mortar should be of a similar composition to the historic mortar, including hardness, color, and texture. It should be placed in joints in layers of no more than 3/8" thick and allowed to harden before additional layers are added. The final layer should be tooled to match the historic joint profile. (Refer to *Page 4.*)



The mortar joints between the bricks has deteriorated, particularly at the vertical joints, increasing the potential for moisture infiltration. The area at the lower right corner of the photograph has been recently repointed and mortar has been smeared over the surface of the brick rather than tooled. To maintain the historic appearance, it is recommended that the replacement mortar match the historic in appearance, color, texture, hardness and joint profile.



This photograph illustrates an inappropriate repointing of historic brick. A saw was used to cut-out the joints during repointing, extending the vertical joints. In addition, both the vertical and horizontal joints have been widened.

HIRING A CONTRACTOR

- The repair, maintenance, installation and cleaning of masonry, stucco and concrete can be potentially dangerous work and should be left to professionals
- All masons are not necessarily experienced in all materials; choose a contractor with demonstrated experience in working with historic masonry, stucco or concrete
- Verify warranty for materials and labor
- Check references to understand how well a mason's work has held up
- Hold final payment, such as 25%-30% of the project cost, until all work has been properly completed

PATCHING STUCCO (ALL)

Similar to repointing mortar, stucco should be applied in moderate weather conditions, avoiding extreme heat, sun and freezing temperatures. The final appearance should duplicate the existing as closely as possible in strength, composition, color and texture. Successful patching of stucco surfaces generally requires the services of a skilled craftsman. Similar to stucco application, stucco repairs are applied in three coats. (Refer to *Stucco Application, Page 5*.) Similar to pointing mortar, if stucco patches are too hard, they could cause additional damage to the adjacent historic stucco surfaces or lead to the formation of cracks that can allow water migration into the wall.

When repairing stucco, hairline cracks can generally be filled with a thin slurry coat of the finish coat ingredients, while larger cracks need to be cut-out and prepared for a more extensive repair. Similarly, bulging wall surfaces need to be cut-out to a sound substrate. For the best appearance, the area to be patched should be squared off and terminated at a building joint or change in materials such as a window or door frame.

When applying stucco directly to a masonry wall, it is important to rake out the masonry joints to a sufficient depth to allow the stucco mortar to be bonded to the masonry and keyed into the joints. When applied to a wood framed building, the lath should be securely attached to the substrate. The use of metal lath at masonry buildings is strongly discouraged since it can be prone to rust and eventually lead to the spalling of the stucco surface.

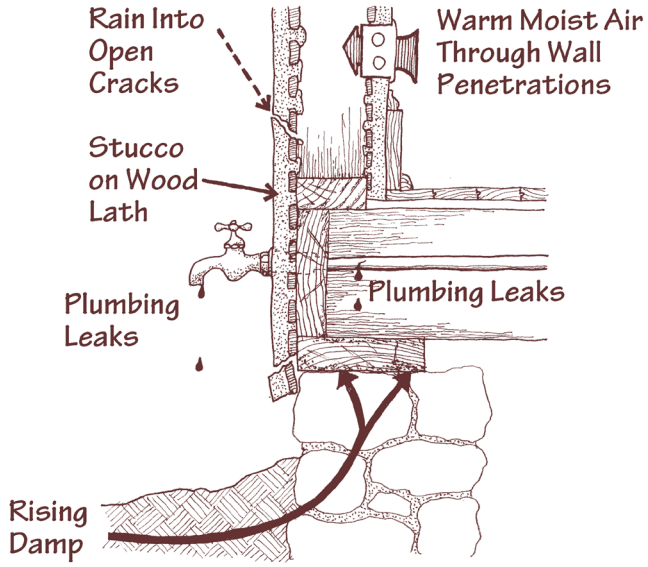
The peeling paint is likely incompatible with the stucco or caused by moisture. Loose and flaking paint should be removed and peeling cause determined before repainting.

PAINTING STUCCO (AO)

The NHC / HDC encourage the painting of stucco with lime based masonry paint. Similar to lime based mortar and stucco, lime based paint is “flexible” and “breathes.” By contrast, multiple coats of latex paint can act as a barrier, trapping moisture and eventually peeling.

Repaired stucco will often need to be repainted for a uniform appearance. When selecting paint, it is important that the new paint is compatible with earlier coats of paint and the stucco material, and applied following the manufacturer’s recommendations.

The crack from the window sill might be a sign of building settlement. Review wall for other signs of movement or settlement. Repair crack and apply a lime-based paint for a uniform appearance.



Rain and Precipitation *can enter the exterior envelope through damaged or cracked surfaces and crevices with adjacent materials including window and door frames.*

Rising Damp *is the migration of moisture from the soil into the building structure through capillary action. The soil adjacent to the foundation can become saturated through improper drainage from gutters and downspouts and vegetation planted adjacent to the foundation.*

Plumbing Leaks *include leaking bathroom fixtures, kitchen and laundry appliances, and both interior and underground piping.*

Condensation *occurs when warm moist air from kitchens, bathrooms and laundry facilities comes in contact with cold surfaces and changes to water droplets.*

MATCHING HISTORIC MORTAR & STUCCO (AO)

Most pre-mixed mortar available from hardware stores is generally inappropriate for historic masonry as it contains too much Portland cement and is too hard. The most exact method of matching historic mortar and stucco is to have it analyzed by a professional lab. The PDD Staff is also available to provide guidance based upon the type, location and condition of the masonry.

The rough texture and uneven surface suggest that an overly aggressive cleaning method was used. Stucco patches replace bricks and efflorescence, a powdery white substance, can be seen on the surface.

MASONRY CLEANING (AO)

Appropriate masonry, stucco and concrete cleaning can enhance the character and overall appearance of a building. However, improper cleaning of historic masonry can cause damage to the historic surfaces and cause more harm than good both physically and aesthetically. There are three principal reasons for cleaning historic masonry:

- Improve the appearance by removing dirt, pollen, stains, graffiti or paint
- Slow deterioration by removing deposits, salts, efflorescence, acids, ivy, algae, moss, mildew and pollutants that can damage masonry surfaces
- Clean select areas to match historic masonry or mortar or to assess surface condition

Masonry cleaning methods fall within three general categories:

- Low pressure water, with the possible use of gentle detergent and brushing
- Mechanical cleaning including sand blasting, power washing, grinding, sanding and wire brushing
- Chemical cleaning

Because of the potential damage to historic surfaces, cleaning should be completed using the gentlest means possible. In many cases, soaking the masonry, stucco and concrete with low pressure water can remove much of the surface dirt and deposits. If the soaking method is not successful, it might be necessary to add a non-ionic detergent or brush the wall surface with a natural bristle brush.

The use of mechanical methods, including abrasive blasting, power washing, sanding or grinding, can potentially remove decorative details and the protective surface of the masonry, stucco or concrete, resulting in an eroded surface and permanent damage. Abrasively cleaned masonry, stucco and concrete usually has a rougher surface that can hold additional dirt and be more difficult to clean in the future. Chemical based cleaners can etch, stain, bleach or erode masonry, stucco and concrete surfaces. Both mechanical and chemical cleaning methods can also make the masonry, stucco and concrete surfaces more porous and deteriorate mortar joints, allowing for increased moisture penetration.

The NHC / HDC encourage:

- Cleaning using the gentlest means possible
- Making sure mortar joints are sound and building is water-tight before water cleaning
- Using water without traces of iron or copper that can discolor masonry
- Conducting water cleaning a minimum of one month before freezing temperatures to minimize the potential for spalling
- Minimizing water pressure, generally no more than 100 psi, to reduce potential etching of masonry surfaces
- Using clean water without excessive salts, acids or minerals that can deposit on masonry surfaces
- Using non-ionic detergent and natural bristle brushes when water soaking is not successful

The NHC / HDC discourage:

- Using mechanical methods including sand blasting, grinding, sanding and wire brushing - these methods can damage the exterior and inappropriately change the visual appearance (ALL)
- Using chemical cleaning

In instances where a severe stain or graffiti is present, it might be necessary to use a chemical based cleaner in specific areas. Caution should be taken to test the effects of the proposed cleaner on a discrete area of the building before using it on a principal elevation. It is recommended that the most diluted possible concentration be used to minimize potential damage of the masonry surface. It should be noted that many chemical cleaners are hazardous and require special handling, collecting and appropriate disposal of the chemicals and rinse water.

The NHC / HDC encourage:

- Hiring a contractor with specialized knowledge of masonry cleaning when gentler cleaning methods are unsuccessful

MASONRY COATING (ALL)

Water repellent and waterproof coatings are generally applied to prevent water from entering a masonry wall, but tend to be unnecessary on weather-tight historic buildings. Water infiltration through masonry and concrete buildings is generally caused by other moisture related problems including open mortar joints, surface cracks or spalls and poor or deferred maintenance. In instances where the surface of the masonry has been severely compromised, (such as at sandblasted brick), the use of water repellent coatings might be appropriate.

Water Repellent Coatings, also referred to as "breathable" coatings, keep liquid from penetrating a surface but allow water vapor to escape. Many water repellent coatings are transparent or clear when applied, but might darken or discolor over time.

Waterproof Coatings seal surfaces and prevent liquid water and water vapor from permeating the surface. Generally, waterproof coatings are opaque or pigmented and include bituminous coatings and some elastomeric coatings and paint. Waterproof coatings can trap moisture inside of a wall and can intensify damage. Trapped moisture can freeze, expand and spall masonry and concrete surfaces.

The NHC / HDC discourage:

- Applying water repellent or waterproof coatings to weather-tight historic masonry or concrete unless it is below the surface of the surrounding grade

MASONRY PAINTING (AO)

If the exterior of the masonry surface has been compromised through previous sandblasting, moisture infiltration or the use of harsh chemicals, appropriate painting can provide a degree of protection. Proper application of a water repellent paint can prevent water from penetrating while allowing water vapor to escape.

Waterproof or inappropriate paint can trap moisture within a wall. Proper preparation is critical to a successful masonry or stucco painting project.

- Remove loose or flaking paint, mortar, masonry, stucco or concrete as well as ivy, algae, moss and mildew
- Complete items of deferred maintenance including repair of deteriorated gutters and downspouts
- Complete repointing, re-caulking and patching as needed
- Apply undercoat and paint appropriate for masonry application type, following manufacturer's recommendations for application

PAINT REMOVAL SAFETY

Caution should be used when removing paint since some paints include lead, requiring proper collection and disposal techniques. Please review the G*uidelines for Exterior Maintenance* for additional information.

REMOVING PAINT FROM MASONRY

When considering whether to remove paint from a masonry or stucco surface, it is important to assess whether stripping is appropriate. In some instances:

- The building might have been meant to be painted; less attractive, softer or more porous bricks, stones or concrete might have been painted to provide a water repellent protective layer
- Paint can mask later changes or additions

Reason to consider stripping paint:

- To reduce the long term maintenance requirements associated with repainting
- Paint might have been originally applied to mask other problems such as a dirty building
- If existing paint has failed, it might be necessary to strip it before repainting

Signs of failed paint include:

- Paint is badly chalking, flaking or peeling, possibly due to moisture penetration. It is important to find the cause of moisture and repair before repainting.
- If masonry, stucco or concrete has been "sealed" by excessive layers of paint or by waterproof coatings, the underlying masonry might not be able to "breathe" and dispel the internal moisture and salts. Eventually, pressure from moisture and salts can build up under paint layers and possibly cause the paint to peel and masonry, stucco or concrete to spall. (Refer to illustration on *Page 6*.)

If paint is stable, complete paint stripping might not be necessary. However, new paint should be compatible with previous paint layers for best adhesion.

The NHC / HDC encourage (ALL):

- Considering paint-removal appropriateness
- Removing paint using the gentlest means possible

The NHC / HDC discourage (ALL):

- Applying water repellent or waterproof coatings to intact masonry, including paint that can trap moisture and prevent the wall from "breathing"
- Applying waterproof coatings on masonry above the surface grade level
- Painting previously unpainted historic brick, stone, stucco, block and poured concrete because the paint can:
  - Damage the historic masonry
  - Alter the visual characteristic of the building and obscure the craftsmanship of the masonry including colors, texture, masonry and joint patterns
  - Be very difficult to remove from the masonry surface in the future

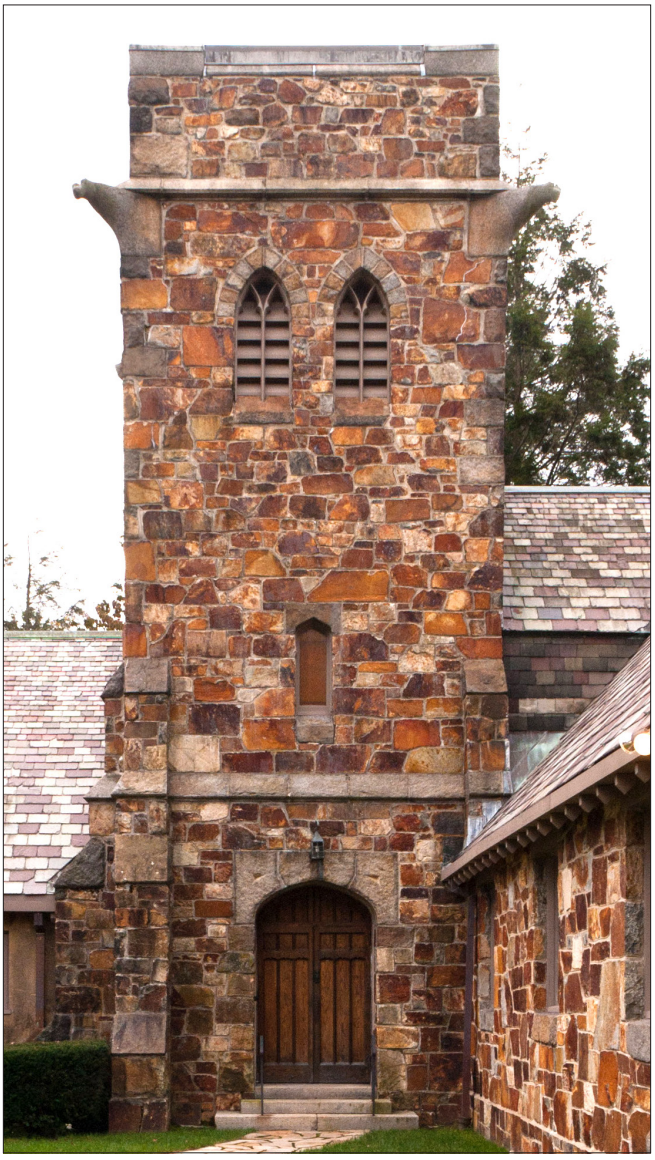
MASONRY, STUCCO & CONCRETE GUIDE

The NHC / HDC encourage:

- Replacement masonry, stucco and concrete that matches the historic in type, color, texture, size, shape, bonding pattern and compressive strength (ALL)
- Repointing mortar or stucco of the same hardness or softer than the original mortar or stucco and always softer than the original masonry - older buildings typically of high lime content with limited Portland cement (ALL)
- Using mortar, stucco and concrete that matches the appearance, color, texture, pattern, joint size and tooling of the historic mortar, stucco and concrete (ALL)
- Appropriately sized replacement masonry toothed into existing masonry and continuing the historic pattern (ALL)
- Maintaining historic wood half-timbering in Tudor Revival buildings and if replacement is required, installing matching wood timbering of similar dimension, profile and pattern as the historic material. Please refer to *Guidelines for Exterior Woodwork* for additional information regarding wood maintenance and painting (ALL).
- Carefully removing algae, moss, vines and other vegetation from masonry, stucco and concrete walls and removing shrubs from the building perimeter (AO)
- Completing masonry, stucco and concrete work in fair weather, for improved bonding and curing (AO)

The NHC / HDC discourage:

- Widening or extending the existing mortar joints or overlapping the new mortar over the masonry surface (ALL)
- Removal/covering of historic masonry surfaces or details (ALL)
- Removal of historic stucco from masonry surfaces exposing the soft, underlying brick to the elements (ALL)
- Installing stucco over brick, stone or wood framed buildings that were not intended to be stuccoed unless covering previously damaged masonry (ALL)
- Installing modern bricks for patching historic masonry, even if they are “antiqued”, since they are generally much harder and do not match the historic masonry (ALL)
- Using pre-mixed mortar that does not match the appearance of the historic mortar (ALL)
- Using pre-mixed mortar or stucco that contains a high percentage of Portland cement at softer or historic masonry or stucco installations, to maintain the historic appearance (ALL)
- Using power tools to remove existing mortar from joints since they can damage historic masonry - these methods can damage the exterior and inappropriately change the visual appearance (ALL)
- The use of modern chemical additives in mortar, stucco or concrete (ALL)
- Installing pointing mortar or stucco in a single layer greater than 3/8” deep (AO)



Masonry is a common building material for large-scale civic buildings in Newton. The First Church in Chestnut Hill, originally built in 1910, is constructed from uncoursed fieldstone in a decorative colored pattern.

The Guidelines project has been financed in part with Federal funds from the National Park Service, U.S. Department of the Interior, through the Massachusetts Historical Commission, Secretary of the Commonwealth William Francis Galvin, Chairman. However, the contents and opinions do not necessarily reflect the views or policies of the Department of the Interior, or the Massachusetts Historical Commission, nor does the mention of trade names or commercial products constitute endorsement or recommendation by the Department of the Interior, or the Massachusetts Historical Commission. This program receives Federal financial assistance for identification and protection of historic properties. Under Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, and the Age Discrimination Act of 1975, as amended, the U.S. Department of the Interior prohibits discrimination on the basis of race, color, national origin, disability or age in its federally assisted programs. If you believe you have been discriminated against in any program, activity, or facility as described above, or if you desire further information, please write to: Office for Equal Opportunity, National Park Service, 1849 C Street NW, Washington, DC 20240.