

MASONRY



BAR Review Levels

These levels of review are applicable in most cases. Please note that during the administrative review process, Staff may determine that a project must be reviewed by the Board. Contact Staff at 703.746.3833 to confirm which level of review is required for your project.

NO BAR REVIEW	ADMINISTRATIVE (STAFF) REVIEW	BOARD REVIEW
Painting masonry that is currently painted	Repointing Paint removal and cleaning Repair or replacement of any masonry wall over 2 feet in height	Painting, staining, or limewashing unpainted masonry on any portion of a building Demolition of masonry over 25 square feet in area, including inappropriate repointing Application of sealants to masonry Application of stucco or other finishes to masonry

Introduction

Masonry building and garden walls are character-defining features that help define a property’s architectural style and age. In the 18th and early 19th centuries, many buildings in Alexandria were constructed with red bricks made from local clay. This early brick was laid with a mortar made with local sand, water, and lime. From the middle to the end of the 19th Century, advances in brick manufacturing led to the creation of stronger bricks and more experimentation with brick color, size, and shapes. It is common in all periods to find high-quality decorative face brick on the front and more common less expensive brick on the side and rear. Beginning around 1920, modern hard-fired bricks were laid with a rigid impervious mortar containing varying degrees of Portland cement. This ingredient was an important structural improvement for modern construction but its use on historic brick walls can irreversibly damage the brick and exacerbate moisture problems. Although brick is one of the most durable and historic building materials, it still requires appropriate care to ensure its longevity. Unpainted masonry is durable and low-maintenance, usually requiring repointing only every 75-100 years.

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The foundations of 18th Century buildings in Alexandria were typically constructed with Potomac River granite fieldstone. With rare exception, this stone was always installed below grade; where it is exposed today, it often indicates the original sidewalk elevation. A notable example of these stone foundations can be seen on the Ramsay House. The Carlyle House is the only building in Alexandria that was originally constructed of Aquia Creek sandstone, although it was later refinished with Indiana limestone in the 1970s. Sandstone and limestone were commonly used for stoops throughout the 18th and 19th Centuries. Precast concrete was not used as a building material until the early 20th Century.



The stone foundation of the 18th Century Ramsay House shows the original height before King Street was regraded.



The Carlyle House was originally constructed in the 18th Century with Aquia Creek sandstone.

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Guidelines

- o Stone repairs should match the density and porosity of the original stone.
- o Stone features that cannot be repaired should be replaced with matching genuine stone rather than cast stone.
- o Brick and stone should be installed to replicate the appearance of traditional load-bearing masonry.
- o Masonry that is not currently painted should generally not be painted, stained, or limewashed.
- o Appropriate repairs must be made to the masonry regardless of whether the wall is presently painted or not.
- o Before repointing a masonry wall, Staff will review a sample portion of the proposed work in the field to confirm that the appropriate tools and mortar were used and the masonry units were not damaged. See additional information section for more details on preparing a mock-up.
- o Any repointing should match the historic mortar in color, composition, texture, and joint profile.
- o Mortar should be softer than the masonry unit; only lime-based mortar is appropriate on masonry portions of buildings constructed before 1932 (Early buildings). See additional information section for more details on mortar types.
- o Mortar should only be removed using hand tools. The use of power tools is inappropriate for the removal of mortar on Early buildings.
- o Masonry should be cleaned using the gentlest means possible. Abrasive cleaning, including sandblasting, and high pressure powerwashing are inappropriate.

Additional Information

Preparing a Mock-up

A mock-up is required before repointing a masonry wall. Staff will evaluate the mock-up in the field to confirm that the appropriate tools and mortar were used and the masonry units were not damaged. The mock-up should match the historic mortar in color, composition, texture, and joint profile.

In masonry walls, mortar is intended to be softer and more porous than the adjacent masonry. The use of an incorrect mortar that is harder than the brick or stone units impedes their normal expansion and contraction. This can cause irreparable damage, resulting in the full or partial loss of the individual masonry units. Using incorrect mortar is considered a demolition. When repointing a historic masonry wall, a lime-based mortar should be used to prevent this damage. Only buildings constructed of hard-fired brick in the 20th Century or later can use a high percentage of Portland cement in the mortar mix without risking damage to the masonry units.

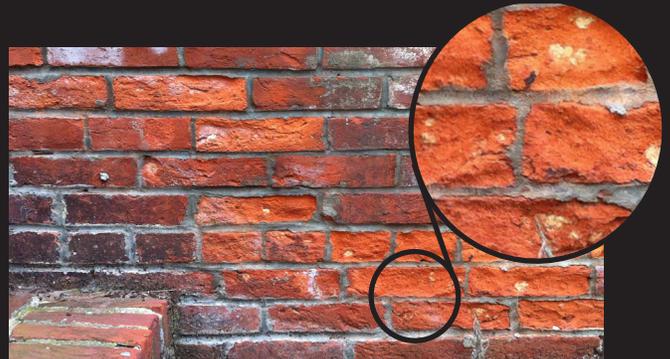
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Repointing should not take place if the temperature is less than 40 degrees Fahrenheit during application and curing. Additional mock-ups may be needed if the mortar is not correctly replicated. Allow extra time for this review so that mortar samples are dry enough to represent their final color. When repairing or replacing historic masonry surfaces, limit the repairs to the damaged areas only. It is often unnecessary and potentially damaging to repoint intact areas.



An example of a mock-up that Staff will evaluate. In this photo, sample B more closely matches the existing mortar in color and profile.



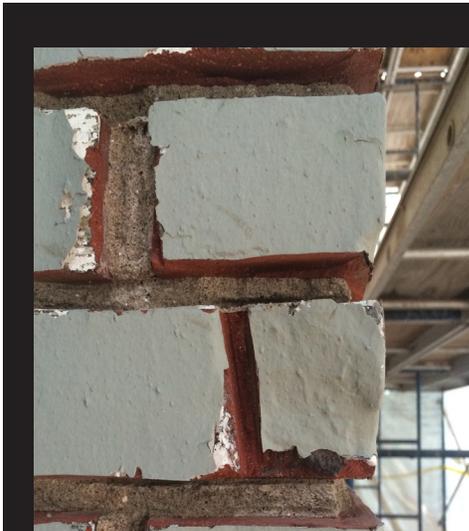
In this example, repointing with a Portland cement mortar has irreversibly damaged the historic brick, causing spalling. Spalling is when the hard-fired face of the brick breaks off due to an impermeable mortar joint.

Mortar Removal

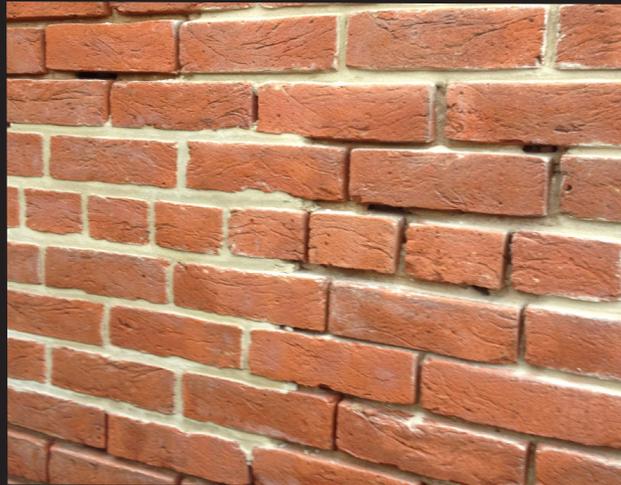
Power tools should only be used to remove mortar from horizontal joints by scoring the middle of the joint and using hand tools to remove the remaining mortar. Only hand tools should be used on horizontal joints less than 3/8 inches tall and on all vertical joints. Mortar should be removed to a depth of 2 and 1/2 times the height of the joint. Masonry damaged by improper mortar removal is considered a demolition.

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The result of using power tools on mortar joints - the grinders sliced off 1/4 inch sections of brick. The facade is irreversibly damaged, resulting in the loss of the original, handmade bricks. The aesthetic and historic character of the building is lost, as the joints are now twice the original width. In addition, the softer and more absorbant interior of the brick is exposed, leading to future deterioration.



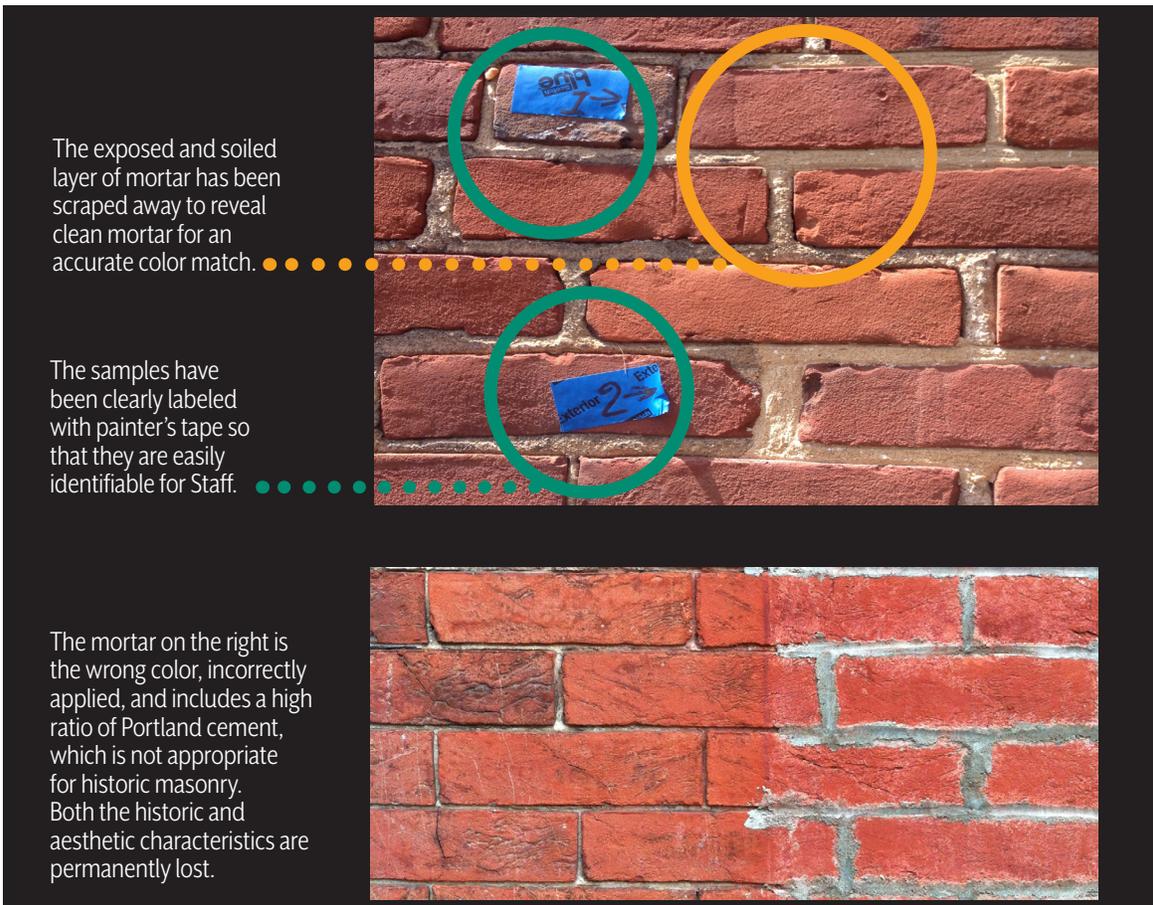
An example of appropriate mortar removal using hand chisels. The width of the original joint and the integrity of the brick are maintained.

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Color Matching

New mortar should match the color and texture of the original historic mortar. It may be necessary to look in a protected area where the original mortar has not been repointed, such as behind a shutter or under a cornice. If the wall was previously repointed, it may be necessary to scrape off the outer layer of mortar to reveal the historic mortar's color and texture. Subsequent property owners often choose to remove paint and therefore it is important to color match mortar on painted buildings as well.



The exposed and soiled layer of mortar has been scraped away to reveal clean mortar for an accurate color match.

The samples have been clearly labeled with painter's tape so that they are easily identifiable for Staff.

The mortar on the right is the wrong color, incorrectly applied, and includes a high ratio of Portland cement, which is not appropriate for historic masonry. Both the historic and aesthetic characteristics are permanently lost.

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Paint Removal and Masonry Cleaning

Improper paint removal or cleaning can irreversibly damage masonry. Harsh methods like sandblasting or power washing can remove the hard-fired brick surface, exposing the soft interior of the brick to weather. Milder abrasive cleaning methods like soda or media blasting may only be approved by Staff when a skilled architectural conservator has demonstrated it on a test patch to be the best and safest method. There are several environmentally friendly paint strippers available that can remove multiple layers of paint relatively easily. The use of a paint stripper usually requires the use of low pressure water to remove and neutralize the chemicals and paint residue. It is important that you consult with Staff on the proper water pressure (psi) to prevent mechanical damage to the masonry surface and avoid penetrating the masonry with the water and chemical residue, which can lead to interior damage or damage to the masonry. Control of water runoff and dust may require a separate permit from Transportation & Environmental Services.



The brick on the right side in the photo has been sandblasted, causing the outer hard fired layer to be removed and making it more susceptible to further damage and destroying its historic architectural character. The Board considers this demolition of the masonry.



Graffiti should be removed using the same gentle cleaning methods.

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Masonry Repairs

Masonry is often damaged due to water-related issues. Some common causes of water damage include interior water leaks, leaking air conditioning units, pipes, drains, clogged gutters and downspouts, and moisture caused by rising damp from below grade. Masonry can also be damaged by drilling holes into the masonry surface or using silicone glue. Anchors should always be installed in the mortar joint rather than the body of the masonry unit, and should be smaller than the mortar joint, if possible. Like mortar repairs, masonry repairs should use material matching in color and texture. Never use caulk to fill masonry holes.



Holes from previous signs.



Rising damp (water wicking from below) has caused the face of this early brick to crumble from the freeze-thaw cycle.

Sealants

Sealants are often marketed as water-repellent solutions for historic masonry. While many are advertised as “breathable,” they are seldom necessary and can even cause additional damage because they block the porosity of the brick and mortar, potentially trapping moisture.

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Mortar Ingredients and Types

Mortars have different ratios of sand, hydrated lime, and water, and sometimes cements and other additives:

Sand - Defines the color and texture of the mortar.

Water - Should be clean and free of salts or chemicals.

Lime - Acts as binder or “glue.” It can also affect the hardness and moisture permeability of the cured mortar.

Additives - Historic additives include oyster shells, clay particles, colorants, fly ash, pozzolans, and animal hair.

Cements - Many natural and factory-made cements, including Portland cement, were used in conjunction with lime after 1890. Portland cement is primarily found locally after the 1920s.

Buildings constructed before the 20th Century generally have a soft and porous brick, which is easily damaged by hard and brittle Portland cement. The mortar types that are appropriate on Early (pre-1932) masonry are: L, O, and K, depending on the location and exposure.

On Later (post-1931) masonry, type N mortar is appropriate.

VERY DURABLE:
granite, modern brick
(20th Century and later)

L

MODERATELY DURABLE:
limestone, molded brick

O

MINIMALLY DURABLE:
soft, handmade brick
(18th and early 19th Century)

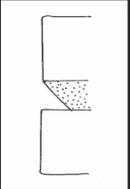
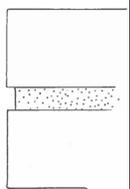
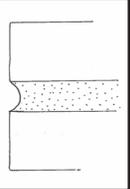
K

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Mortar Joint Profiles

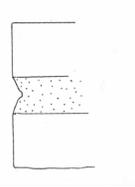
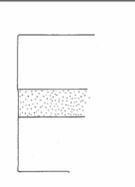
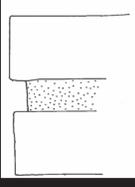
Mortar joints are the spaces between bricks that are filled with mortar. They can be made in a variety of different styles, called joint profiles. Any repointing done on a masonry wall should match the historic mortar joint profile.

		STRUCK JOINT 18th and 19th Centuries Used on secondary facades
		BUTTER JOINT Mid 19th Century Used on primary facades 3/16-inch lime putty
		CONCAVE JOINT 20th Century

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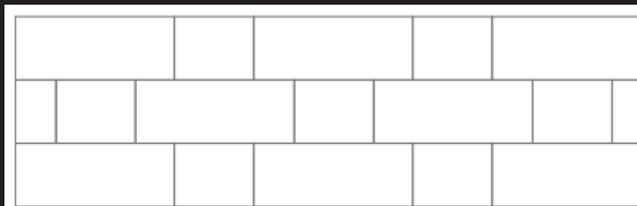
		GRAPEVINE JOINT 20th Century Colonial Revival structures
		FLUSH JOINT All years
		RAKED JOINT All years

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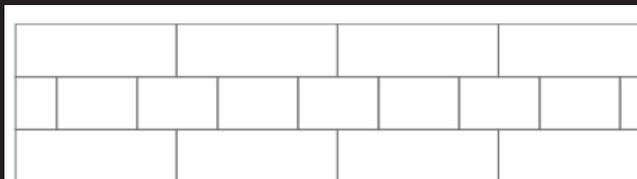
Brick Bond Patterns

Bonding is the term used for the pattern in which bricks are laid. Headers are bricks which are laid perpendicular to the face of a brick wall. Stretchers are bricks which are laid parallel to the face of a wall. The use of header brick declined as stronger brick and mortar became available. By using a combination of headers and stretchers, a wall not only gains strength but also the possibility of decorative patterns arises. Each row of bricks laid one upon another in a wall is referred to as a course.



FLEMISH BOND

Flemish bond was primarily used in the mid 18th Century in Virginia and was typically used on more “high-style” primary façade.

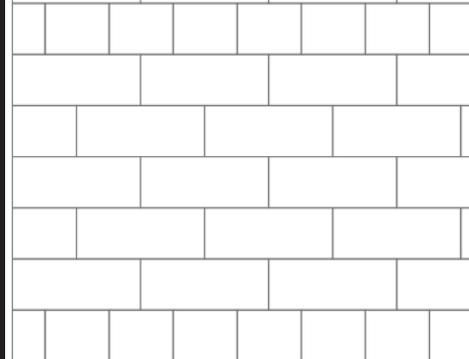


ENGLISH BOND

English bond was primarily used in the mid 18th Century in Virginia and was rarely used in Alexandria, typically used on foundations.

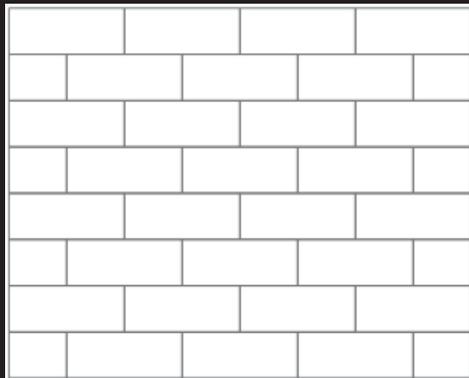
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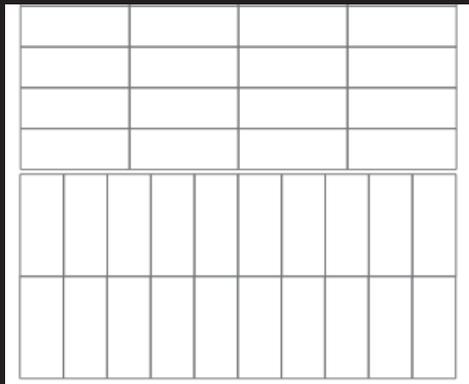
COMMON BOND

Common bond used a header course every 4th, 6th, or 7th courses and was used in Alexandria on secondary elevations from the 18th to early 20th Centuries.



RUNNING BOND

Running bond was first used in Alexandria on the primary façade of Greek Revival structures in the 1840s, and is the bond pattern most commonly used today.



STACK BOND

Stack bond was first used in the mid 20th Century. It is a non-structural bond, typically used in decorative applications such as veneers.

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Additional Resources

[Association for Preservation Technology International Bulletins on Mortar](#)

[National Park Service Preservation Brief #1: Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings](#)

[National Park Service Preservation Brief #2: Repointing Mortar Joints in Historic Buildings](#)

[National Park Service Preservation Brief #6: Dangers of Abrasive Cleaning to Historic Buildings](#)

[National Park Service Preservation Brief #38: Removing Graffiti from Historic Masonry](#)

[National Park Service Preservation Brief #42: The Maintenance, Repair and Replacement of Historic Cast Stone](#)

[U.S. Heritage Group](#)

[ASTM International](#)

[The Brick Industry Association](#)