THE BRICK INDUSTRY ASSOCIATION

TECHNICAL NOTES on Brick Construction

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Maintenance of Brick Masonry

Abstract: Even though one of the major advantages of brick masonry construction is durability, periodic inspections and maintenance are needed to maximize the life of brickwork in structures. This *Technical Note* discusses the elements of suggested inspection programs and describes specific maintenance procedures, including replacement of sealant joints, grouting of mortar joint faces, repointing of mortar joints, removal of plant growth, repair of weeps, replacement of brick, installation of a dampproof course, installation of flashing in existing walls and replacement of wall ties.

Key Words: anchors, cleaning, dampproof course, efflorescence, flashing, inspection, maintenance, moisture penetration, mortar, repointing, sealant, ties, weeps.

SUMMARY OF RECOMMENDATIONS:

General Inspection
- Perform periodic inspections, preferably each season
- Use binoculars, adjacent roof areas and balconies to permit close-range observation of conditions at upper floors
- Use Table 2, Brick Masonry Inspection Checklist, to document condition of brick masonry
- Supplement inspection checklist with photographs, sketches, and notes on floor plans or elevation drawings
- Use Table 3, Possible Causes of Masonry Distress, to assess observed brick masonry conditions

Water Penetration
- Investigate and determine moisture source(s) before attempting repairs to correct water penetration issues
- Scrutinize masonry with persistent efflorescence for unresolved water penetration issues

Sealant Replacement
- Remove and replace torn, deteriorated or inelastic sealants and backer rod
- Use appropriately sized backer rod or bond breaker tape

Mortar Joint Repair
- Determine if extent of cracking or deterioration warrants repair
- Where warranted, repoint or face-grout cracked or deteriorated mortar
- To formulate matching repointing mortar, consider testing existing mortar to determine original constituents and proportions
- For repointing, use prehydrated Type N, O or K mortar
- Install repointing mortar in multiple ¼-in. lifts, tooling each when “thumbprint hard”
- When selecting repointing mortar to match appearance of existing mortar, use mock-ups or sample panels

Brick Replacement
- Break damaged brick to assist with unit removal
- Cut and remove remaining mortar without damage to adjacent units
- When selecting new brick to match appearance of existing brick, use mock-ups or sample panels
- Butter surfaces of new and surrounding brick; point joints around new units after installation

Plant Removal
- Cut ivy and plant growth that contributes to moisture penetration or deterioration of brickwork; avoid pulling vines from wall
- Remove dried shoots with stiff fiber brush and detergent

Retrofit Weeps, Flashing and Ties
- When weeps are clogged, carefully open to ensure that existing flashing is not damaged
- When weeps do not exist, carefully drill new weeps to ensure that existing flashing is not damaged
- In cases of rising damp, consider replacing base flashing or installing a dampproof course
- Repair or replace damaged flashing in alternate 2 to 5 ft (610 mm to 1.52 m) sections; use temporary bracing to install longer sections
- When anchors or ties are damaged or missing, install remedial anchors and ties in accordance with manufacturer’s recommendations; conduct in situ testing in a mock-up to confirm performance

Coatings and Water Repellents
- Before considering application of external coatings, inspect masonry and correct all deficiencies

INTRODUCTION

This *Technical Note* discusses maintenance of brick masonry with an emphasis on preventing moisture penetration. All buildings are unique and may require different levels of maintenance over time. A given solution for one project may not remedy similar issues on all buildings. When maintenance is required, it is suggested that the repair method selected effectively suit the needs of the particular building and not be based solely on maintenance performed on other buildings. Consulting a design professional experienced in the repair of buildings may be beneficial to systematically identify sources or causes of deterioration or water penetration and to provide recommendations for maintenance repairs.

Generally, brickwork that is properly designed, detailed and constructed using good workmanship will require very little maintenance over time. However, other components incorporated in the brickwork, such as caps, copings, sills, lintels and sealant joints, may require periodic inspection and repair. Neglecting maintenance of these components may lead to deterioration of other elements in the wall.

Maintenance of buildings consists of three primary components: 1) conducting general periodic inspections to document the existing condition of the building components and to identify any potential performance issues with the exterior wall; 2) performing known regularly scheduled maintenance tasks; and 3) executing specific repairs to correct any performance issues identified during the inspection. This *Technical Note* addresses both general and specific maintenance procedures for brick masonry. A checklist is provided for general inspections, and specific repair techniques are described.

Structural issues are more involved than maintenance and are outside the scope of this *Technical Note*. Generally, such issues warrant an investigation performed by a professional engineer to determine the cause of the issue and to recommend the appropriate repair method. However, indications of structural issues can sometimes appear similar to conditions that require maintenance. Examples of observed conditions that are structural include but are not limited to cracks in brick masonry exceeding 0.075 in. (2 mm) in width, cracks through multiple brick units, cracks following a stepped or diagonal pattern, widespread spalled brick, accumulated rust on lintels or shelf angles, out-of-plane movement of brick masonry or other wall elements, and neutral or negative slope on masonry sills and water tables.

GENERAL INSPECTION

A thorough inspection and maintenance program may help extend the life of a building. It is a good idea to become familiar with the materials used in a building and how they perform over a given time period. Table 1 lists the estimated time before repairs may be necessary for various building materials. These times are based on brickwork in vertical applications, constructed of proper materials and good workmanship and exposed to normal weathering conditions in the United States. Sills, parapets, chimneys and copings that experience more severe exposures may require repairs at shorter intervals. Brick pavers are outside the scope of this *Technical Note*. Refer to the *Technical Note* 14 Series for information on maintenance of brick paving systems.

TABLE 1
Estimated Time for Repair

Material	Application	Estimated Time to Repair (Years)
Brick	Walls	100–150+
Sealant	Joints	5–20
Metal	Coping/flashing	20–75
Metal	Anchors & ties	15+
Mortar	Walls	50+
Plastic	Flashing	5–25
Paint	Finishes	3–5
Water Repellents	Walls	5–10
Stucco	Finishes	5–10

Periodic inspections should be performed to determine the condition of the various materials used on a building and whether repairs to those materials are necessary. These inspections can be performed monthly, yearly, biennially or on any schedule deemed appropriate and should include both the interior and exterior of the building. “Seasonal” inspection periods are recommended so that the behavior of building materials in various weather conditions can be observed. Documentation of each inspection should include comments, photographs and sketches to identify changes in materials, potential performance issues, and subsequent maintenance tasks or repairs. If possible, documenting conditions on floor plans or elevation drawings of the building can be helpful in identifying patterns of damage. Exterior surveys should be performed with binoculars to permit close-range observation of conditions on upper floors. Adjacent balconies or roof areas can also be used to observe portions of the facade that are difficult to see from the ground. Interior surveys should note stains or damage to finishes that may indicate potential water ingress.

Inspection records, including conditions and comments, should be kept to identify changes in materials, any performance issues and necessary repairs. When maintenance tasks or repairs are undertaken, documentation of the repairs should include before-and-after photographs. Both the inspection and repair records should be kept and referenced during future inspections to gauge when repairs were last completed and when repairs will become necessary. Table 2 is a checklist of conditions that may require maintenance or repair. It is not all-inclusive; however, it may establish a guideline for use during inspections.

TABLE 2
Brick Masonry Inspection Checklist

Location		Item or Condition	Building Elevation			
			North	South	East	West
Above grade	Masonry	Cracked units				
		Loose units				
		Spalled units				
		Hairline cracks in mortar				
		Deteriorated mortar joints				
		Missing or clogged weeps				
		Plant growth				
		Deteriorated/torn sealants				
		Out-of-plumb				
		Efflorescence				
		Stains				
		Water penetration				
	Flashing and counterflashing	Damaged				
		Open lap joints				
		Missing				
		Stains				
	Caps, copings and sills	Inadequate slope				
		Cracked units				
		Hairline cracks in mortar				
		Loose units				
		Open joints				
		Out-of-plumb				
		Drips needed				
Below grade	Foundation walls	Deteriorated mortar joints				
		Cracks				
		Separation from flooring				
		Inadequate drainage				
		Water penetration				
	Retaining walls	Spalled units				
		Deteriorated mortar joints				
		Cracks				
		Out-of-plumb				
		Dampness				
		Inadequate drainage				
	Other elements	Roof overhangs				
		Gutters/leaders				
		Seal at adjacent materials				
		Grade/drainage				

Conditions that may necessitate maintenance tasks or repair actions include efflorescence and other stains, spalling, deteriorating mortar joints, interior moisture damage and mold growth. Once one or more of these conditions becomes evident, the origin of the problem should be determined and action taken to correct both the cause and the visible effect of the condition. Table 3 lists various conditions affecting brickwork and their most probable causes. The items checked in the table represent each cause that should be considered when such conditions are observed in brick masonry.

TABLE 3
Possible Causes of Masonry Distress

Observed Condition	Potential Cause of Condition								
	Incompletely filled mortar joints (see TN7B)	Missing or clogged weeps	Plant growth	Deteriorated or torn sealant	Capillary rise	Missing or damaged flashing (see TN7 Series)	Differential movement (see TN18 Series)	Previous acid cleaning (see TN20)	Previous sandblasting
Cracked units	✓		✓				✓		
Spalled units	✓	✓		✓	✓	✓	✓		
Deteriorated mortar	✓	✓	✓		✓	✓	✓	✓	✓
Biological growth	✓	✓	✓	✓	✓	✓			
Efflorescence (see TN23 Series)	✓	✓		✓	✓	✓		✓	
Moisture-related stains	✓	✓		✓	✓	✓			
Corrosion of concealed materials	✓	✓		✓	✓	✓		✓	
Damaged interior finishes	✓	✓		✓	✓	✓	✓		

SPECIFIC MAINTENANCE

After investigating all possible contributors, the actual cause(s) of distress conditions may be determined through the process of elimination. Often the source will be self-evident, as with deteriorated and missing materials; however, in instances such as improper flashing or differential movement, the source may be hidden and determined only through building diagnostics. In any case, it is suggested to first visually inspect for a self-evident source before performing a more extensive investigation, as it may save time and money in detecting the cause. Such a process should always be followed if the condition involves water penetration. Once the source is determined, measures can be taken to effectively remedy the moisture penetration source and its effects on the brickwork.

Removing Efflorescence

Efflorescence consists of white deposits on the brick surface left when moisture carrying dissolved salts evaporates. *Technical Note* 23A discusses the causes of efflorescence in more detail and is an additional source of information regarding troubleshooting and removal of efflorescence.

Prior to cleaning efflorescence, potential water ingress issues in the area should be investigated and resolved; otherwise, the efflorescence will return. Any leaks should be repaired and the brickwork allowed to dry. Generally, efflorescence is water soluble and easily removed by natural weathering, by dry-brushing or by scrubbing with

a stiff fiber brush and water. Proprietary cleaners formulated specifically for use on brickwork are effective in removing heavy accumulations or stubborn efflorescence. For further information on removing efflorescence, refer to *Technical Note* 20.

Use solutions specifically manufactured to remove efflorescence from brickwork. Improper cleaning procedures such as insufficient prewetting, insufficient rinsing and strong chemical concentrations may cause additional staining, etched mortar joints and increase moisture penetration in brickwork. Stains caused by improper cleaning are not water soluble but can be removed by proprietary cleaners. To avoid improper applications of proprietary cleaners, it is imperative that the manufacturer's instructions be carefully followed.

All cleaning procedures should first be tried at different concentrations in an inconspicuous area to judge their effectiveness and potential harm to the brickwork prior to implementing at full scale. Additional recommendations and cleaning methods for brick masonry are presented in *Technical Note* 20. After cleaning, the mortar joints should be inspected. Repointing or grouting of the joints, as discussed later in this *Technical Note*, may be necessary.

Sealant Replacement

Missing or deteriorated sealants in and between brickwork and other materials such as windows, doorframes and expansion joints may be a source of moisture penetration. The sealant joints in these areas should be closely observed to identify areas where the sealant is missing or was installed but has deteriorated, torn or lost elasticity. Deteriorated sealants should be carefully removed and the opening cleaned of all existing sealant material. The clean joint should then be properly primed and filled with an appropriately sized backer rod (bond breaker tape if the joint is too small to accommodate a backer rod) and a full bead of high-quality, elastomeric sealant compatible with adjacent materials. Sealant manufacturers should be consulted for the applicability and suitability of their sealants for expansion joint applications. Manufacturers recommend three generic types of elastomeric sealants for use on brickwork: polyurethanes, silicones and polysulfides. For more information on sealants, refer to *Technical Note* 18A.

Mortar Joint Repair

Cracks of any size in masonry mortar can increase the potential for water penetration, However, the presence of cracks or deterioration in masonry mortar does not necessarily warrant immediate repair of the mortar joints. Many types of walls, such as cavity walls and veneer walls, are capable of managing increased moisture ingress through the exterior wythe due to minor cracks. Water penetration related to masonry cracks is more problematic for barrier or mass masonry wall construction. The location and number of cracks and deteriorated areas should be reviewed as part of the periodic inspections and correlated with any water leakage at the interior. When exterior cracks and deterioration correspond to uncontrolled water penetration, and other potential causes or contributions have been eliminated, repairing the mortar joints may be warranted.

Repairing cracked or deteriorated mortar joints will effectively reduce the amount of water that enters exterior masonry because the repair process restores the mortar integrity at the exterior face. While repairs may improve the existing bond between mortar and brick, they are unable to achieve the same level of bond performance established during original construction.

As previously stated, structural cracks in brickwork are beyond the scope of this *Technical Note*. These cracks often require professional investigation to determine the cause and appropriate method of repair. For photos and more information on various crack types, refer to *Technical Note* 18.

Two methods used to repair mortar joints are face grouting and repointing. While both have been used successfully, they are intended for different purposes and vary in performance. Repointing is generally recommended and is performed more often because the procedure is better suited to correct various types and severities of mortar joint deterioration compared with face grouting.

Face Grouting of Hairline Cracks. If mortar joints develop small "hairline" cracks, surface grouting may be an effective measure to fill them. The impact of surface grouting on brickwork aesthetics should be considered before work begins, as the appearance of the mortar joints will change, becoming slightly wider and less textured, as the aggregate will not be visible. A recommended grout mixture is 1 part portland cement, ⅓ part hydrated lime and 1⅓ parts fine sand (passing a No. 30 sieve). The joints to be grouted should be dampened. To ensure good bond, the brickwork must absorb all surface water. Clean water is added to the dry ingredients to obtain a fluid

Photo 1
Mortar Joints in Need of Repointing

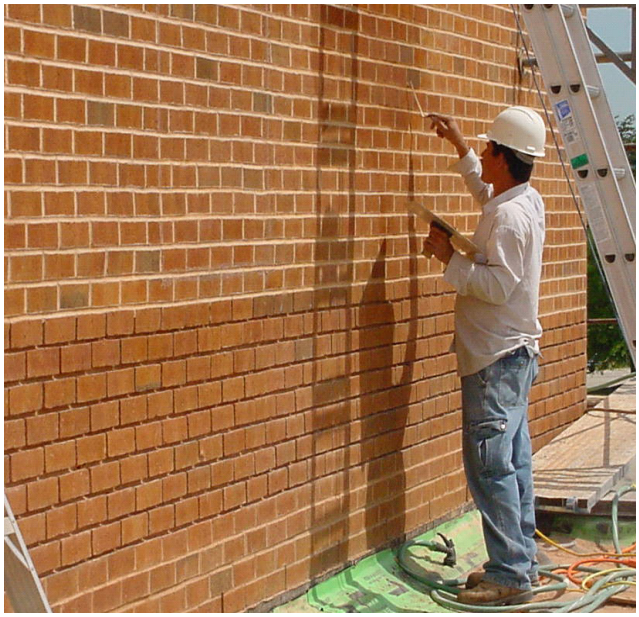


Photo 2
Repointing Mortar Joints

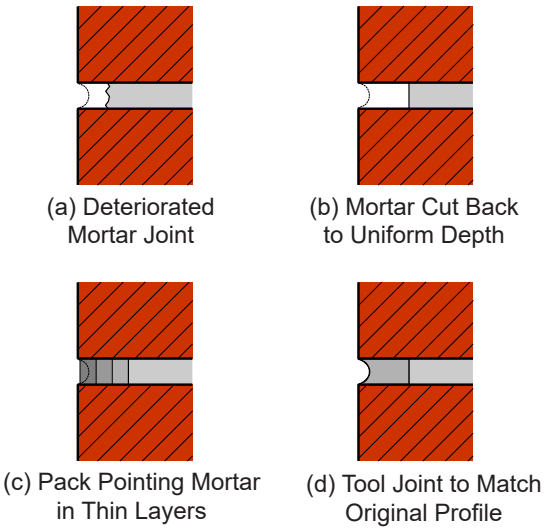


Figure 1
Repointing Mortar Joints

consistency. The grout mixture should be applied to the joints with a stiff fiber brush to force the grout into the cracks. Two coats are usually required to effectively reduce moisture penetration. Tooling the joints after the grout application may help compact and force the grout into the cracks. The use of a template or masking tape is recommended to keep the brick faces as clean as possible.

Repointing Mortar Joints. Moisture may penetrate brick masonry through unbonded, cracked or deteriorated mortar joints, as shown in Photo 1. Several conditions that require repointing include mortar erosion exceeding ¼ in. (6.4 mm), crumbling mortar, mortar with voids, hairline cracks in the mortar, and cracks between the brick and mortar. When this is the case, repointing (sometimes referred to as tuckpointing) is one of the most effective ways to reduce moisture penetration. Repointing is the process of removing damaged or deteriorated mortar to a uniform depth and placing new mortar in the joint, as shown in Photo 2 and Figure 1. Visual observation of the joints, along with light scraping using a metal tool, are common methods for determining areas where repointing may be necessary.

Prior to undertaking a repointing project, the following should be considered: 1) The potential for power tools to damage the brick surrounding the mortar being removed. 2) Repointing operations should be performed only by qualified and experienced repointing craftspeople. An individual who is an excellent mason may not be qualified for repointing. Skills should be tested and evaluated prior to the selection of the contractor. 3) When repointing for historic preservation purposes, refer to “Preservation Brief 2: Repointing Mortar Joints in Historic Masonry Buildings” [Ref. 9].

The deteriorated mortar should be removed, by means of a toothing chisel or a special pointer’s grinder, to a uniform depth (refer to Figure 1b) that is the minimum of twice the joint width, generally ¾ in. (19 mm), or until sound mortar is reached. Using a grinder to remove head joint mortar will not remove the full depth of material without damaging adjacent brick. The extra mortar left in the head joints must be removed by a chisel to achieve a uniform depth. Care must be taken not to damage the brick faces and edges. Thin “slivers” of mortar remaining on the brick must be removed in order to obtain good bond between the new repointing mortar and the brick. Remove all dust and debris from the joint by brushing, blowing with oil-free compressed air or rinsing with water.

Repointing mortar should be carefully selected and properly proportioned. For best results, the original mortar constituents and proportions should be duplicated. If the mortar type is unknown, then taking samples of the original mortar and sending them to a testing laboratory is recommended to help determine the ingredients, proportions and strength of the original mortar. The methods described in ASTM C1324, *Standard Test Method for Examination and Analysis of Hardened Masonry Mortar* [Ref. 1], are generally used to determine the mortar proportions. To avoid irreparable brick damage, the compressive strength of the repointing mortar must be equal to or lower than the compressive strength of the original mortar. It should be emphasized that using a mortar with higher compressive strength may significantly impair the surrounding brickwork. Stronger repointing mortar will increase the stress concentration on the brick/mortar interface and can lead to spalling of the brick face. Type N is generally recommended for modern applications; however, Type O is appropriate for situations where mortars with higher cement contents may be too strong for proper performance. Type K mortar is the weakest and is generally reserved for historic masonry applications. Proper proportions for Type K mortars are 1 part portland cement, 4 parts hydrated lime and 15 parts fine sand. Refer to *Technical Note* 8 for material proportions of Type N and Type O mortars.

The repointing mortar should be prehydrated to reduce excessive shrinkage. The proper prehydration process is as follows: All dry ingredients should be thoroughly mixed. Only enough clean water should be added to the dry mix to produce a damp consistency that will retain its shape when formed into a ball. The mortar should be mixed to this dampened condition 1 to 1½ hr before adding water for placement.

The joints to be repointed should be dampened, but to ensure a good bond, the brickwork must absorb all surface water before repointing mortar is placed. Water should be added to the prehydrated mortar to bring it to a workable consistency that is drier than conventional mortar. The mortar should be packed tightly into the joints in layers no more than ¼ in. (6.4 mm) thick, as shown in Figure 1c and tooled when “thumbprint hard.” The last layer of mortar should be tooled to match the original profile, as in Figure 1d. As it may be difficult to determine which joints allow moisture to penetrate, it is advisable to repoint all mortar joints in the affected wall area.

If only portions of the wall area are repointed, then the repointing mortar should match the color of the existing mortar. Coloring of the mortar with pigments may be required to match the original mortar color. Pigments should be metallic oxides and not organic chemicals. Coloring additives may be added to the mix in quantities not to exceed 10 percent by weight of the portland cement in the mix, with carbon black limited to 2 percent. When matching to existing mortar, compare the newly mixed samples with the existing mortar that has been wetted, and then compare fully dried samples to existing dry mortar. Multiple sample batches and/or custom pigment blends may be required to obtain a match.

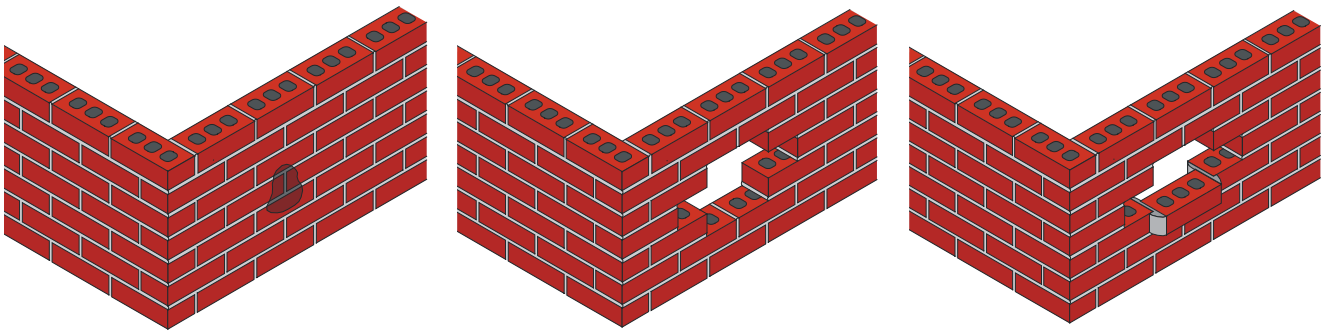
Replacement of Brick

Moisture will also penetrate through areas in the brick that are broken or heavily spalled. When this occurs, replacing the damaged units may be necessary. The procedure shown in Figure 2 is recommended for removing and replacing brick.

For ease of removal, a portion or all of the damaged brick units can be broken. Once the units are removed, the surrounding mortar should be carefully cut and chiseled in such a way as to avoid damaging adjacent brickwork, as shown in Figure 2b. Dust and debris in and surrounding the resulting opening should be carefully removed. If the units are located in the exterior wythe of a drainage wall, then care must be exercised to prevent debris from falling into the air space, which could block weeps and interfere with drainage.

The brick surfaces in the wall should be dampened before new units are placed, but the masonry should absorb all surface moisture to ensure a good bond. The appropriate surfaces of the surrounding brickwork and the replacement brick should be completely buttered with mortar. The replacement brick should be centered in the opening and pressed into position, as shown in Figure 2c. The excess mortar should then be removed with a trowel. Pointing around the replacement brick will help to ensure full head and bed joints. When the mortar becomes “thumbprint” hard, the joints should be tooled to match the original profile.

Mortar proportions are selected as discussed in the previous section, “Repointing Mortar Joints.” The new mortar should have similar physical properties to the existing mortar to ensure proper performance of both the new and existing brickwork. Using the wrong mortar may cause spalling and cracking in the existing brick masonry. Matching the existing mortar color is also important to blend the repaired area with the surrounding masonry.



(a) Damaged Brick

(b) Remove Brick and Mortar

(c) Butter Replacement Brick and Carefully Shove into Place

Figure 2
Replacement of Deteriorated Brick

Similarly, new replacement brick must match the aesthetic properties of the existing brick, like color, texture and size, as well as its physical properties. Locating matching brick may take considerable effort. To evaluate the accuracy of the match, the size, color and texture of the replacement brick should be compared with the existing brickwork by using a mock-up or sample panel. The brick in the sample panel should represent the full range of colors and textures of the brick selected and should be configured to match the appearance of the existing brickwork. For more information on sample panels and mock-ups, refer to *Technical Note* 7B.

Plant Removal

Certain types of plant growth may contribute to moisture penetration. For example, ivy shoots, sometimes referred to as “suckers,” penetrate voids in mortar and may conduct moisture into these voids. If this is the case, then ivy removal may be necessary.

To effectively remove ivy and similar plants, the vines should be carefully cut away from the wall. Avoid pulling the vines away from the wall, as this could damage the brickwork. After cutting the ivy, the shoots will remain. These shoots are embedded in the wall and should be left undisturbed until they dry, shrivel and turn dark. This usually takes two to three weeks. Care should be taken not to allow the suckers to rot and oxidize, as doing so can make them difficult to remove without damaging the wall surface. Once these shoots become dry, they can be removed with a stiff fiber brush and laundry detergent. Chemicals or acids should not be used to remove them, as this increases the risk of damaging or staining the wall.

To determine how the wall will appear once the ivy is removed, it is suggested that a small portion of the ivy (5 to 10 sq ft [0.5 to 1.0 m²]) be removed from an inconspicuous area first. It is important to inspect the condition and appearance of the exposed area for potential damage or staining of the brick masonry. Repointing of the mortar joints may be necessary if the mortar cracks or deteriorates when removing ivy.

Opening Weeps

Weeps should be inspected to ensure that they are appropriately spaced and not clogged, so that moisture within the walls is drained to the exterior. If the original weeps were not appropriately spaced, then drilling new supplemental weeps may be necessary. *Technical Note* 7 outlines suggested types and spacing of weeps. If weeps are clogged, then they can be cleaned out by probing with a thin dowel or stiff wire. When cleaning or installing weeps, care must be exercised to not damage the existing flashing located immediately below and behind the weeps. The use of a stopper to limit the depth of penetration of the probe or drill bit may be effective in reducing the possibility of damaging the vertical leg of the flashing in the drainage cavity.

Installation of a Dampproof Course

The movement of moisture up a wall through the brickwork by capillary action is referred to as rising damp. This condition appears as a rising water line or “tide mark” on the wall caused by the soluble salts in the groundwater. As a result, in order to reduce the potential for rising damp, a dampproof course should be installed.

Model building codes require the use of a dampproofing or waterproofing material on the surface of masonry walls located below grade and require base flashing to be installed within 10 in. (254 mm) of final grade. If these are omitted or improperly installed, then rising damp may occur. The insertion of a dampproof course at a level above the ground, but below the first floor, may stop the rising moisture.

There are various methods to install a retrofit dampproof course. One method involves injecting a synthetic chemical that forms a continuous dampproof barrier into an existing brick course. Holes are drilled into the course of brick, and the synthetic material is injected. Another method is the creation of an additional flashing level just above grade. One or more brick courses are removed, flashing is installed and the brick are replaced. Recommendations for brick removal and replacement are discussed in the preceding section. In situations with severe rising damp, excavation of the soil adjacent to the wall and installation of dampproofing or waterproofing materials to the wall surface may be required.

Installation of Flashing

Building codes require flashing to be designed and detailed to resist water penetration to the interior of the building. Flashing that has been omitted, damaged or improperly installed may permit moisture to penetrate to the building interior. If this is the case, then flashing can be repaired or replaced to correct uncontrolled water penetration related to the flashing system. The procedure is invasive, requiring the removal of brick, bracing the brick above, installing new flashing and replacing the removed brick units. Other methods may be used to address water penetration, but these are not necessarily long-term solutions and will not comply with the building code when flashing is missing. To install continuous flashing in existing walls, alternate sections of masonry in 2 to 5 ft (610 mm to 1.52 m) lengths should be removed. The flashing is installed in these sections, and the opening is filled with new brick and mortar as discussed under “Replacement of Brick”; refer to Photo 3. The replaced masonry should be properly cured (five to seven days) before the intermediate masonry sections or supports are removed. Alternately, temporary braces can be installed if longer sections of brickwork are removed; refer to Photo 4. After these braces are installed, the flashing can then be placed in these sections. The lengths of flashing should be lapped a minimum of 6 in. (152 mm) and the laps adhered and edges sealed with a sealant or adhesive compatible with the flashing material to function properly. See *Technical Note* 7 for other flashing installation recommendations.

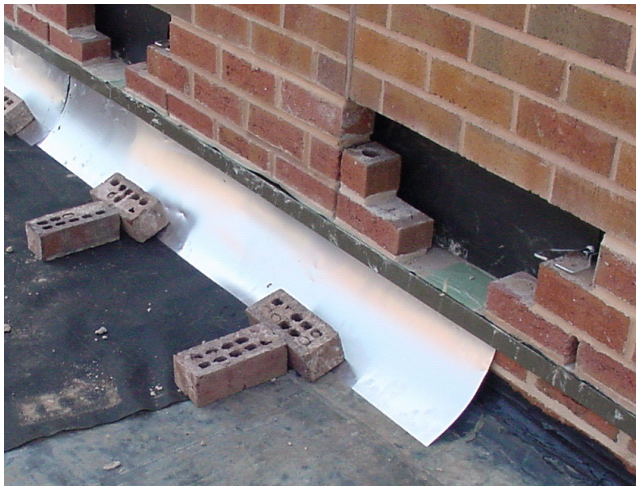


Photo 3
Flashing Installed in Alternating Sections

Photo 4
Flashing Installation Using Temporary Support

Installation of Wall Ties and Anchors

In instances where masonry walls have been constructed without a sufficient number of anchors or where the existing anchors have failed, proprietary “retrofit” anchors may be used to attach the wythes or veneer and transfer lateral loads. Installing retrofit anchors improves the stability of the masonry and reduces the potential for face cracking. Installation of most retrofit anchors involves drilling small holes in the masonry, usually in a mortar

joint, through which the anchors are attached to the substrate. Generally, mechanical expansion, helical screws, or grout- or epoxy-adhesive systems, shown in Figure 3, are used to make the connection.

Because the installation methods and limitations of each product are unique, consultation with the retrofit anchor manufacturer is essential to ensure proper application, detailing, installation, inspection and performance. Mock-up installations and in situ testing of installed anchors in the wall to be repaired should be required to confirm that the retrofit anchors will perform as expected.

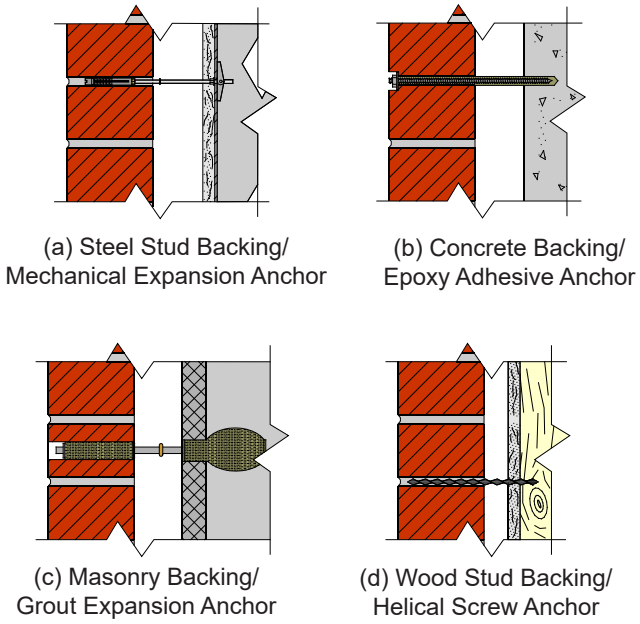


Figure 3
Masonry Reanchoring Systems

Coatings and Water Repellents

Brickwork that is properly designed, constructed and maintained can be expected to satisfactorily resist water penetration under normal exposures without the application of water repellents or other external coatings. Drainage-type walls, such as brick veneer walls or cavity walls, are designed to accommodate water penetration of the exterior brickwork without damage to the interior components of the wall system through its drainage system. There are some cases in which water repellent use may be warranted; however, use of external coatings on brick masonry should be considered only after completing repair and replacement of brick, mortar joints and other building elements, and careful consideration of the possible consequences. Although coatings are not required on properly designed, specified and constructed brick masonry, they may be used successfully to alter the appearance of a wall or to diminish the effects of certain deficiencies.

External coatings are most effective in reducing water penetration when their intended use corresponds with the nature of the existing water penetration problem. Application of a water repellent is generally not recommended on newly constructed brick veneer walls or cavity walls. However, water repellents may be used to correct minor deficiencies that remain after completion of repairs or to reduce the amount of water absorbed by barrier walls and masonry subject to extreme exposures, such as chimneys, parapets, copings and sills. Water repellents and coatings should not replace or be considered equivalent to essential, code-required details that resist water penetration, such as flashing and weeps. Use of coatings for reasons outside their intended application rarely reduces water penetration and may lead to more serious complications with the brickwork.

Only water repellents that permit evaporation and the passage of water vapor, such as siloxanes and silanes, should be used on exterior brickwork. Film-forming coatings should not be applied to exterior brickwork. *Technical Notes* 6 and 6A and manufacturers' literature should be consulted before any coating is applied to brickwork.

SUMMARY

This *Technical Note* has presented maintenance procedures for brick masonry. Routine periodic inspection of the building is suggested to determine the existing condition of the brickwork and adjacent materials. If distress is noted, then appropriate maintenance tasks should be performed. If the problem is moisture related, then the source of moisture should be determined and corrected before other repairs are initiated.

The information and suggestions contained in this Technical Note *are based on the available data and the combined experience of engineering staff and members of the Brick Industry Association.*

The information contained herein must be used in conjunction with good technical judgment and a basic understanding of the properties of brick masonry. Final decisions on the use of the information contained in this Technical Note *are not within the purview of the Brick Industry Association and must rest with the project architect, engineer and owner.*

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