General Shale

Technical Bulletin

ENGINEERING SERVICES

Caring For Your New Brick Home

The clay brick units on your new home have been manufactured to meet the Severe Weathering (SW) Standards of the ASTM Specification, to be durable and long lasting and require very little maintenance. However, many of the associated components in the brickwork such as caulking, flashing, copings, sills and mortar joints do require periodic maintenance and inspection. Future improvements and modifications to your home such as landscaping and plantings, patio/paving additions, and grade changes can also affect the long term performance of the brick on your home.

One key thing to remember is to avoid allowing your brick to be saturated with water, especially if you live in a cold climate location. Brick that are allowed to be saturated with water can lead to a problem referred to as "spalling". Spalling is a condition where the face of the brick has separated from the rest of the body, usually 1/8" to 1/4" in depth. This delamination is the result of multiple cycles of freezing and thawing on a saturated brick. Soluble salts accelerate this process. When water saturates the pores of a brick and is then allowed to freeze, it exerts a tremendous amount of force (*think, pop bottle in the freezer*). Over time, the structure of the clay weakens and finally separates.

To help ensure the optimal performance of your brick we wish to advise you of the following:

- Lawn watering and irrigation systems should be adjusted so that water is not sprayed on masonry surfaces
- The use of rock salt or other de-icing chemicals can have a very adverse effect on all types of masonry and concrete and will eventually cause deterioration. Because salt lowers the melting temperature of ice, the wall my go through more freeze/thaw cycles. Avoid piling snow up against this wall.
- Brick are not designed to be buried below grade by soil or landscaping mulch. The wall cavity is meant to breathe through weep holes (open head joints) at the base of the wall. Unless 6" to 8" of washed sharp stone at sufficient depth is installed against the brickwork to allow the wall to breathe and drain, soil, mulch or other organic material should not be piled against it.
- Gutters and downspouts are meant to carry water away from the structure and downspouts should be of sufficient length to discharge water where it cannot pond, pool or otherwise saturate the base of walls.
- Porch walls are susceptible to increased water from ground sources as well as wash-over from porch caps. Regular porch maintenance should include caulk at all brick/concrete interfaces including the underside of the cap where it contacts the brick below. Also, caulk all control joints in the cap to prevent water from draining into brickwork below.
- Slag sand is a commonly available setting bed material for segmental concrete pavers. However, this material often contains elements that are harmful to masonry. Slag sand is not recommended, instead used a washed river sand or mason's sand.
- The International Residential Code requires 6" of slope away from a structure within the first 10 feet. Built-up landscaping can retain moisture and hold it against the brickwork.
- Chimneys are exposed to weather of all types at all times. When constructed properly, masonry chimneys are durable and functional. However regular inspection of the chimney should take place *bi-annually* and include inspection of brick/roof flashings and condition of the cap. For additional, information refer to the Technical Bulletin: Masonry Chimney Maintenance / Repair.

Caring For Your New Brick Home – Continued

References

For additional information we suggest consulting the following references:

1. "Maintenance of Brick Masonry." BIA Technical Notes on Brick Construction, December 2005
2. "Repointing (Tuck-pointing) Brick Masonry." BIA Brick Brief, July 2005
3. "Efflorescence Prevention and Control." BIA Brick Brief, August 2009
4. "Ivy on Brickwork." BIA Brick Brief, July 2005
5. "Masonry Chimney Maintenance / Repair." General Shale Technical Bulletin

References 1 thru 4 are available on the BIA website www.gobrick.org. Reference 5 can be found on general Shale's website www.generalshale.com.

If cleaning is required to remove mortar or construction dirt, the bucket and brush method of cleaning brick masonry, using cleaning agents recommended by General Shale Brick, is preferred. If other methods or materials are used, it is strongly suggested that they be tested for suitability on disposable panels or noncritical wall areas. This is especially important when pressure washing is used.

1. Keep the wall as clean as possible during construction in order to reduce the amount of cleaning needed later.
2. For best results, cleaning should be performed as soon as possible, but not until initial mortar set has occurred, (typically 2-5 days). The heavier mortar stains should be removed as completely as possible by mechanical means (paddles, scrapers, brushes, etc.) Cleaning should be completed before scaffolding is removed.
3. Select cleaning agent according to the following categories for General Shale brick:
    a. **Category A** brick may be cleaned with an all-purpose acidic commercial cleaning agent (at manufacturer's recommended concentration).
    b. **Category B** brick may be subject to metallic staining and discoloration if abusively cleaned with ordinary acidic cleaners. A buffered acidic cleaner is specifically formulated to minimize metallic staining and is recommended (at manufacturers recommended concentration).
    c. **Category C** brick have acid reactive coatings and may be subject to color range change if cleaned with acid-based cleaners. Non-acidic, detergent cleaners are recommended for removal of general construction dirt.
4. The brick category classification is indicated below on this card.
5. Test clean - Select an inconspicuous wall area to confirm method and cleaning agents are satisfactory. Make adjustments as indicated.
6. Pre-wet masonry - Thoroughly pre-wet wall area to be cleaned. The moisture absorbing capacity of the masonry must be satisfied before cleaners are applied.
7. Clean - Apply cleaning agent to masonry and scrub brick faces with stiff fiber brush.
8. Rinse - Before cleaning agents can dry or be absorbed into masonry, rinse cleaner, dissolved mortar and loosened dirt completely off the masonry wall.

NOTE: Additional brick cleaning information and guidelines for pressure washing methods can be found in the BIA (Brick Institute of America) Technical Note Number 20.

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 can extend the life of brickwork in structures. This *Technical Note* discusses the benefits and 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:

- Perform periodic inspections, preferably each season
- Determine moisture source before attempting repairs to correct moisture penetration
- Remove and replace torn, deteriorated or inelastic sealants
- When repairing mortar joints, surface grout hairline cracks and repoint damaged or deteriorating mortar joints
- Repoint with prehydrated Type N, O or K mortar, mixed drier than for conventional masonry work
- Remove ivy and plant growth that contributes to moisture penetration or deterioration of brickwork
- Exercise care in opening existing or drilling new weeps, to ensure that flashing is not damaged
- Install a dampproof course if missing or required
- Install remedial anchors and ties in accordance with manufacturer's recommendations
- Inspect masonry and correct all deficiencies before application of external coatings

INTRODUCTION

This *Technical Note* discusses maintenance of brick masonry with an emphasis on preventing moisture penetration. All buildings are unique and may experience different problems. A given solution may not remedy similar problems on all buildings. It is therefore suggested that a repair method which will effectively suit the particular needs of a building be selected when a problem occurs.

Generally, if brickwork is properly designed, detailed and constructed, it is very durable and requires little maintenance. However, many of the 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 may be broken into two general categories: 1) general inspection to identify potential problems with the performance of exterior walls; and 2) specific maintenance to correct problems which may develop. This *Technical Note* addresses both general and specific maintenance procedures. A checklist is provided for general inspections and specific repair techniques are described.

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 various building materials and the estimated time before repair may be needed, given normal exposure. These times are based on brickwork in vertical applications, constructed of proper materials and workmanship and exposed to normal weathering conditions in the United States. Sills, parapets, chimneys and copings which experience more severe exposures may require repairs at shorter intervals.

Periodic inspections should be performed to determine

TABLE 1
Estimated Time to Repair of Materials

Material	Use	Estimated Time to Repair (Years)
Brick	Walls	100+
Sealant	Joints	5-20
Metal	Coping/Flashing	20-75
Metal	Anchors & Ties	15+
Mortar	Walls	25+
Plastic	Flashing	5-25
Finishes		
Paint	Appearance	3-5
Water Repellents	Dampproofing	5-10
Stucco	Appearance	5-10

the condition of the various materials used on a building. These inspections can be performed monthly, yearly, biennially, or any time period deemed appropriate. "Seasonal" inspection periods are recommended so that the behavior of building materials in various weather conditions can be noted. Inspection records, including conditions and comments, should be kept to identify changes in materials, potential problems and needed repair. Table 2 is a suggested checklist of conditions that may require maintenance or repair. It is not all-inclusive; however, it may establish a guideline for use during inspections.

Conditions that may necessitate maintenance or repair actions include efflorescence, spalling, deteriorating mortar joints, interior moisture damage and mold. 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 visible effect of the condition. Table 3 lists various conditions affecting brickwork and their most probable sources. The items checked in the table represent each source that should be considered when such conditions are observed in brick masonry.

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/ Counter-flashing	Damaged				
		Open Lap Joints				
		Missing				
		Stains				
	Caps/ Copings/ Sills	Inadequate Slope				
		Cracked Units				
		Hairline Cracks in Mortar				
		Loose Joints				
		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				

SPECIFIC MAINTENANCE

After investigating all of the 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 the 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.

TABLE 3
Possible Sources and Effects of Masonry Distress

Observed Condition \ Potential Cause of Condition	Incompletely Filled Mortar Joints See *Technical Note* 7B	Missing/Clogged Weeps	Plant Growth	Deteriorated/Torn Sealants	Capillary Rise	Missing/Damaged Flashing See *Technical Notes* 7 Series	Differential Movement See *Technical Notes* 18 Series	Previous Acid Cleaning See *Technical Note* 20	Previous Sandblasting See *Technical Note* 20
Cracked Units	▪		▪				▪		
Spalled Units	▪	▪		▪	▪	▪	▪		
Deteriorated Mortar	▪	▪	▪		▪	▪	▪	▪	▪
Mildew/Algae Growth	▪	▪	▪	▪	▪	▪			
Efflorescence See TN 23 Series	▪	▪		▪	▪	▪		▪	
Moisture Related Stains	▪	▪		▪	▪	▪			
Corrosion of Backing Materials	▪	▪		▪	▪	▪		▪	
Damaged Interior Finshes	▪	▪		▪	▪	▪	▪		

Removing Efflorescence

Generally, efflorescence is water-soluble and easily removed by natural weathering or by scrubbing with a brush and water. Proprietary cleaners formulated specifically for use on brickwork are effective in removing stubborn efflorescence (see *Technical Note* 20).

Use solutions specifically manufactured to remove efflorescence from brickwork. Improper acid cleaning procedures such as insufficient prewetting, rinsing and strong acid 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.

All cleaning procedures should first be tried at different concentrations in an inconspicuous area to judge their effectiveness and potential harm to the brickwork. 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, door frames and expansion joints may be a source of moisture penetration. The sealant joints in these areas should be inspected closely to discover areas where the sealant is missing, or was installed but has deteriorated, torn or lost elasticity. Deteriorated sealants should be carefully cut out and the opening cleaned of all existing sealant material. The clean joint should then be properly primed and filled with a backer rod (bond breaker tape if the joint is too small to accommodate a backer rod) and a full bead of high-quality, elastic sealant compatible with adjacent materials.

Mortar Joint Repair

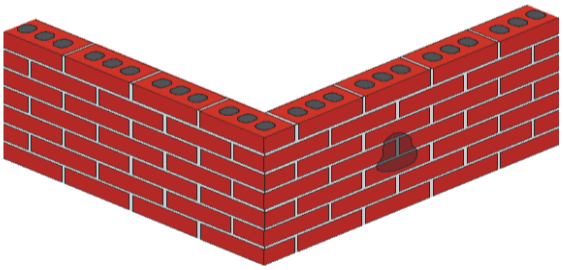
Repair of cracked or deteriorating mortar joints is very effective in reducing the amount of water that enters exterior masonry. Cracks in brickwork that are more than a few millimeters in width or that are suspected to have been caused by settlement or other structural problems (for example, cracks that continue through multiple brick units and mortar joints, or follow a stepped or diagonal pattern along mortar joint) are beyond the scope of this *Technical Note*. These cracks often require professional investigation to determine the cause and appropriate method of repair.

Grouting of Hairline Cracks. If the 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 somewhat. 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 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 may be effective in keeping the brick faces clean.

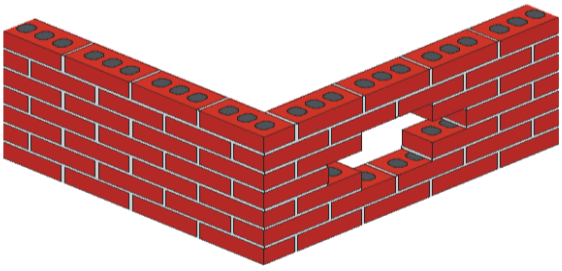
Repointing Mortar Joints. Moisture may penetrate mortar which has softened, deteriorated or developed visible

Table 2 – Modelling Summary

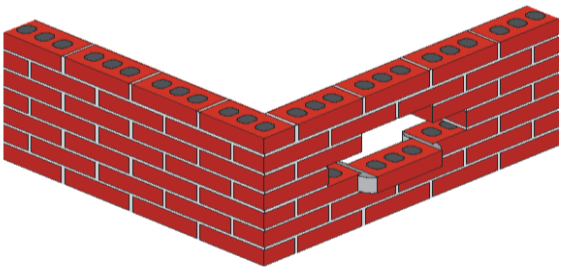
Case	Description	Location	Orientation	Climate	Initial Moisture Content (%)*	Final Moisture Content (%)*
1	LOXON Panel System with building paper and 7% OSB starting moisture content (See Figure 1)	Houston	North	Hot Typical Year	7	10.9
2	LOXON Panel System with building paper and 7% OSB starting moisture content (See Figure 1)	Chicago	North	Cold Typical Year	7	13.3
3	LOXON Panel System with building paper and 7% OSB starting moisture content (See Figure 1)	Lexington, KY	North	Cold Typical Year	7	13.1
4	LOXON Panel System with building paper and 7% OSB starting moisture content (See Figure 1)	Phoenix	North	Hot Typical Year	7	6.1
5	LOXON Panel System with building paper and 7% OSB starting moisture content (See Figure 1)	Winnipeg	North	Cold Typical Year	7	15.2
6	LOXON Panel System with spun bonded polyolefin house wrap and 7% OSB starting moisture content (See Figure 6)	Houston	North	Hot Typical Year	7	10.9
7	LOXON Panel System with spun bonded polyolefin house wrap and 7% OSB starting moisture content (See Figure 6)	Chicago	North	Cold Typical Year	7	13.3
8	LOXON Panel System with spun bonded polyolefin house wrap and 7% OSB starting moisture content (See Figure 6)	Lexington, KY	North	Cold Typical Year	7	13.1
9	LOXON Panel System with spun bonded polyolefin house wrap and 7% OSB starting moisture content (See Figure 6)	Phoenix	North	Hot Typical Year	7	6.1
10	LOXON Panel System with spun bonded polyolefin house wrap and 7% OSB starting moisture content (See Figure 6)	Winnipeg	North	Cold Typical Year	7	15.2



a) Damaged Brick



b) Remove Brick and Mortar



c) Butter Replacement Brick and Carefully Shove into Place

Figure 2
Replacement of Deteriorated Brick

are dried and compared to dry existing mortar.

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, ivy removal may be necessary.

To effectively remove ivy and similar plants, the vines should be carefully cut away from the wall. The vines should never be pulled from the wall as this could damage the brickwork. After cutting, the shoots will remain. These suckers should be left in the wall until they dry up and shrivel. This usually takes 2 to 3 weeks. Care should be taken not to allow the suckers to rot as this could make them difficult to remove. Once the shoots dry, the wall should be dampened and scrubbed with a stiff fiber brush and water. Laundry detergent or weed killer may be added to the water in small concentrations to aid in the removal of the shoots. If these additives are used, the wall must be thoroughly rinsed with clean water before and after scrubbing.

To determine how the wall will appear once the ivy is removed, it is suggested that a small portion of the ivy (5-10 ft² [0.5 to 1.0 m²]) be removed from an inconspicuous area first. Repointing of the mortar joints may be necessary if the mortar has cracked or deteriorated.

Opening Weeps

Weeps should be inspected to ensure that they are open and appropriately spaced so that moisture within the walls is able to escape to the exterior. If weeps are clogged, they can be cleaned out by probing with a thin dowel or stiff wire. If the weeps were not properly spaced, drilling new weeps may be necessary. *Technical Note 7* outlines suggested types and spacing of weeps.

Since weeps are placed directly above flashing, care must be exercised to not damage the flashing when probing or drilling. 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 flashing where it turns up inside of the brick wythe.

Replacement of Brick

Moisture may penetrate brick that are broken or heavily spalled. When this occurs, it may be necessary to replace the affected units. The procedure shown in Figure 2 is suggested for removing and replacing brick.

The mortar that surrounds the affected units should be cut out carefully to avoid damaging adjacent brickwork, as shown in Figure 2b. For ease of removal, the brick to be removed can be broken. Once the units are removed, all of the surrounding mortar should be carefully chiseled out, and all dust and debris should be swept out with a brush. If the units are located in the exterior wythe of a drainage wall, care must be exercised to prevent debris from falling into the air space, which could block weeps and interfere with moisture 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 buttered with mortar. The replacement brick should be centered in the opening and pressed into position, refer to Figure 2c. The excess mortar should 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 section on Repointing. Matching the existing mortar color is important to keep the replacement location from being different in appearance. Similarly, replacement brick must match the color, texture and size of the existing brick. Locating a matching brick may take considerable effort.

Installation of a Dampproof Course

Moisture may migrate upward through brickwork by capillary action. This condition appears as a rising water line or "tide mark" on the wall and is referred to as "rising damp".

Model building codes require the use of a dampproofing material on below grade masonry walls and flashing above grade. If these are omitted or improperly installed, 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. The installation procedure can take one of two forms. One form is the injection of 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. The other form of installation is the insertion of flashing through the brick wythe. One or more brick courses are removed, flashing is inserted, and the brick is replaced. Recommendations for brick removal and replacement are discussed in the following section.

Installation of Flashing

Flashing that has been omitted, damaged or improperly installed may permit moisture to penetrate to the building interior. If this is the case, a difficult procedure of removing brick, installing flashing and replacing the units may be required.

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 masonry replaced, refer to Photo 3. Alternately, temporary braces can be installed as longer sections of brickwork are removed, as shown in Photo 4. The flashing can then be placed in these sections. The lengths of flashing should be lapped a minimum of 6 in. (152 mm) and be completely sealed to function properly. See *Technical Note* 7 for other flashing installation recommendations. The opening is then filled as discussed under Replacement of Brick. The replaced masonry should be properly cured (5 to 7 days) before the intermediate masonry sections or supports are removed.

Photo 3
Flashing Installed in Alternating Sections

Photo 4
Flashing Installation Using Temporary Support

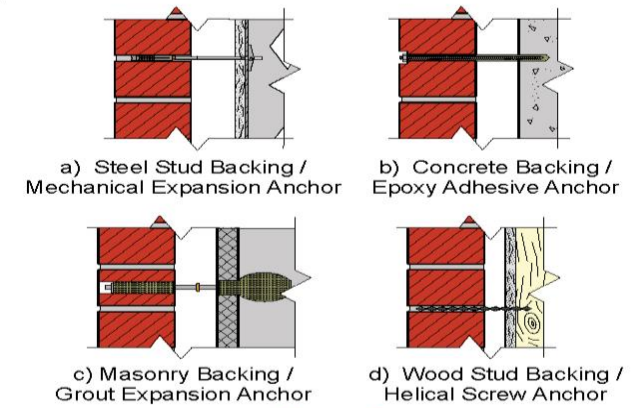


Figure 3
Masonry Re-Anchoring Systems

Installation of Wall Ties and Anchors

In instances where masonry walls have been constructed without a sufficient number of connectors or the existing connectors have failed, "retrofit" anchors may be used to attach the wythes or veneer and transfer lateral loads. Installing anchors in such a wall improves its strength and reduces the potential for 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, 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 manufacturer is essential to assure proper application, detailing, installation, inspection, and performance.

Coatings and Water Repellents

The 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. Properly designed and constructed brickwork can be expected to satisfactorily resist water penetration without the application of water repellents or external coatings. However, they may be used successfully to correct some deficiencies. For example, some coatings are helpful in reducing the amount of water absorbed by barrier walls and masonry subject to extreme exposures such as chimneys, parapets, copings and sills.

External coatings are most effective in reducing water penetration when their intended use corresponds with the nature of the existing water penetration problem. Water repellents and coatings should not be considered equivalent to essential, code-required details that resist water penetration. Use of coatings for reasons outside their intended application rarely reduces water penetration and may lead to more serious problems.

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 coating should not be applied to exterior brickwork. *Technical Notes* 6 and 6A and manufacturer's literature should be consulted before any coating is applied to brickwork.

SUMMARY

This *Technical Note* has presented maintenance procedures for brick masonry. Routine inspection of the building is suggested to determine the condition of the brickwork and related materials. If distress is noted, appropriate maintenance tasks should be performed. If the problem is moisture related, 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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THE BRICK INDUSTRY ASSOCIATION

Brick Brief

July 2005

REPOINTING (TUCKPOINTING) BRICK MASONRY

Introduction

The terms pointing, repointing and tuckpointing are often used interchangeably, which has led to confusion within the masonry industry. For years, the Brick Industry Association has used the term "tuck-pointing" to describe one form of maintenance of brick masonry. However, the meaning of tuckpointing may vary by geographical region, leading to conflicts regarding job specifications and expected repairs. Recently these terms have been defined in ASTM E 2260, Guide for Repointing (Tuckpointing) Historic Masonry, as follows:

Point - placing mortar into a properly prepared joint

Repointing - the process of removal of defective mortar from between masonry units and placement of fresh mortar.

ASTM E 2260 defines tuckpointing as synonymous with repointing, however the term also applies to an older practice of pointing masonry with a flush mortar joint that approximates the color of the masonry units and a mortar of contrasting color that is shaped into a thin strip, giving the appearance of a very thin mortar joint.

This *Brick Brief* covers the process that ASTM E 2260 defines as repointing. Thus the term repoint is used throughout to avoid confusion.

Why Repoint?

The longevity of mortar joints will vary with the exposure conditions and the mortar materials used. A lifespan exceeding 25 years is typical for mortar joints. The longevity of brick units, however, may well exceed 100 years. Consequently, occasional repair of the mortar joints may be necessary over the life of the brick masonry. The most common reason for repointing brick masonry is to improve water penetration resistance. Repointing deteriorated mortar joints is one of the most effective and permanent ways of decreasing water entry into brickwork. This is because a common means of water entry into a brick masonry wall is through debonded, cracked or deteriorated mortar joints.

What to Repoint

A critical step in the repointing operation is to identify wall areas that require repointing. This step is critical because only defective joints require repair. Repointing is very labor-intensive work and original mortar joints in good condition are preferable to repointed mortar joints. Conditions that require repointing include:

- mortar erosion exceeding $^1/_4$ in. (6.4 mm.)
- crumbling mortar
- mortar with voids
- hairline cracks in the mortar
- cracks between the brick and mortar.

Visual observation in combination with light scraping with a metal tool can detect cracked, spalled and friable mortar joints. This is the most common means of determining areas to be repointed. On older buildings, "cleaning" by low or moderate pressure water wash (not grit or chemical wash) may be required prior to evaluating the condition of existing mortar joints. Consult *Technical Note* 20 for proper water washing techniques. Care should be taken to not cause further damage to the brickwork when cleaning.

Repointing Mortar

The strength, composition and color of the existing mortar should be considered when selecting a repointing mortar.

Strength. To avoid irreparable brick damage, the compressive strength of the repointing mortar should be similar to or weaker than the compressive strength of the original mortar. Under load, a stronger repointing mortar will deform less than a weaker original mortar, causing the load to be concentrated on the thin strip of stronger repointing mortar. This stress concentration can lead to spalling of the brick face. The brick masonry is loaded by its self-weight and any externally applied loads present. In addition, the brick masonry is subjected to internal loads due to its thermal expansions and contractions and the shrinkage of the repointing mortar.

Matching compressive strengths of the original and the repointing mortar may be done by matching mortar material proportions. By petrographic or chemical analysis, it is possible to analyze a sample of the original mortar and determine proper proportions of components. ASTM C 1324, Standard Test Method for Examination and Analysis of Hardened Masonry Mortar, can be used to determine the mortar proportions. However, such testing is an added cost, typically only appropriate for historic structure repointing projects which are required to closely match existing conditions. Rather than extensive testing, simply considering the age of the building will give a strong indication of the main contents of the original mortar. For example, mortar containing portland cement was not used in brickwork until after the turn of the twentieth century. Until that time, a common lime and sand mortar in one to three proportions was clearly the most frequently used brick masonry mortar.

Composition. Typically, repointing mortar will be Type N, O or K mortar. The proportions of portland cement and lime for Types N and O mortars should be in accor-

THE BRICK INDUSTRY ASSOCIATION

Brick Brief

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EFFLORESCENCE PREVENTION AND CONTROL

Introduction

Efflorescence is a white, crystalline deposit on the surface of concrete or clay masonry that is comprised of water-soluble salts. Efflorescence begins when soluble salts and other compounds are dissolved in water, which becomes a salt solution. This salt solution migrates to the surface of masonry through the masonry units or the mortar. The water evaporates and leaves the salts on the surface of the masonry as efflorescence.

Since efflorescence appears on the face of the brickwork, it is often erroneously assumed to originate from the brick itself. Fired clay brick is rarely the source of efflorescing salts. Instead, it is much more common for efflorescence to be caused by the transfer of soluble salt from cement-based mortar, grout or concrete masonry that is in direct contact with the clay brick used in the wall. This is known because clay brick, unlike other building materials, can be tested to determine its potential to contribute to efflorescence. This test, found in ASTM C67, rates a clay brick as "non-effloresced" when it does not exhibit efflorescence after partial immersion in distilled water for seven days. When similar testing is conducted on a material containing cement, the material typically fails. Non-efflorescing brick are readily available throughout the United States.

Photo 1: New Building Bloom. This type of efflorescence may begin before construction is completed.

Efflorescence that occurs on brickwork less than a year old is often attributed to "new building bloom," as shown in Photo 1. In most cases, new building bloom will dissipate over time if the brickwork is allowed to dry after completion and if environmental factors such as wind and rain are given sufficient time to naturally clean the brickwork. Efflorescence that occurs a year or more after construction is complete is generally attributed to excessive water penetration or poor drainage.

While more information on how to deal with efflorescence can be found in *Technical Note* 23A, "Efflorescence – Causes and Prevention," this *Brick Brief* furnishes suggestions on how proper material selection, design and detailing and construction practices can help minimize its occurrence.

Material Selection

Architects and specifiers can refer to ASTM C1400, "Standard Guide for Reduction of Efflorescence Potential in New Masonry Walls," which provides guidance to reduce the possibility of efflorescence in new buildings. More importantly, it should be kept in mind that all mortar, grout and concrete masonry units contain cement with varying degrees of water-soluble alkalis (water-soluble compounds) — usually the principal contributors to efflorescence.

Cements high in alkaline content are more prone to produce efflorescence than cements of lower alkaline content. Consequently, low-alkali cement should be specified when available to minimize the potential of efflorescence and new building bloom as well.

Careful selection of other products can also help reduce efflorescence potential. Specifying potable water and clean, washed sand for mortar or grout is recommended. It is also recommended to choose building trim, such as caps, coping and sills, that are not made of materials that contain soluble salts, which can increase efflorescence potential over prolonged exposure to water washing over its surface.

Design and Detailing

While rainwater can penetrate all masonry walls to some degree, proper design can limit available moisture, which in turn helps to suppress the development of

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efflorescence. Design measures that help improve the resistance of brickwork to efflorescence include the following:

Air space. For more than 40 years, BIA has recommended drainage walls that incorporate an air space because they separate the exterior brickwork from other elements in a wall assembly (see Figure 1). The air space allows the water to drain down the back of the brick wythe and prevents the migration of salts from backing materials by isolating the brick wythe from the materials containing soluble compounds. The air space must be kept clean during construction to allow drainage and to prevent water from bridging the air space and transferring soluble salts from other sources.

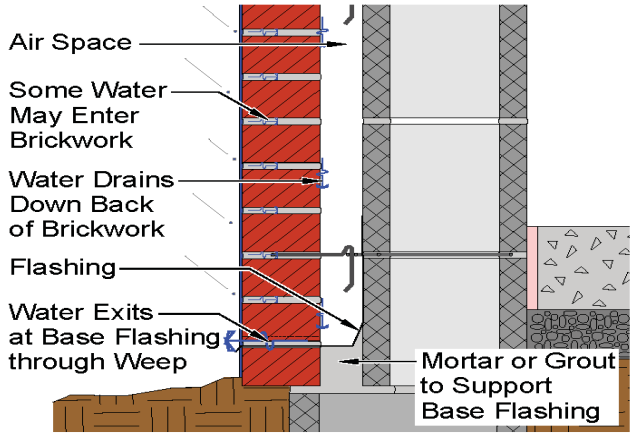

Figure 1: Drainage Wall Systems. BIA recommends the use of drainage wall systems, as shown above. BIA does *not* recommend the barrier strategy of filling a collar joint between masonry wythes because it places a source of salts in direct contact with the brickwork.

Flashing on trim. Trim materials are frequently used in locations most vulnerable to water penetration, such as caps, coping and sills under windows. These materials also may contain salts that contribute to efflorescence. To minimize efflorescence, buildings should include flashing or other materials to act as a capillary break, as well as a prevention of contact, between trim materials and the brickwork. Since moisture may still wash over trim material and collect water-soluble materials, the use of low-alkali materials can minimize efflorescence even more.

Waterproof below-grade masonry. Most groundwater contains a high concentration of soluble salts, which can accumulate in the masonry. To eliminate these salts as sources of efflorescence, BIA recommends waterproofing the masonry below grade and placing base flashing such that it drains water out of the wall a few courses above grade. Mortar or grout should be used to support the base flashing below the air space, as shown in Figure 1.

Construction Practices

Several steps can be taken to reduce the amount of water that accumulates in masonry materials during the construction process, including the following:

Storage of materials. All masonry units should be stored off the ground to avoid contact with rain or snow, groundwater or contamination by dirt and plant life. These materials should also be covered by a waterproof membrane to keep them dry.

Water. Clean, potable water free of salts and other materials should always be used.

Proper filling of mortar joints. Attention to both the complete filling of mortar joints intended to receive mortar, as well as keeping all cavities and air spaces clean and free of mortar droppings, is absolutely critical.

Covering unfinished brickwork. Unfinished brickwork should be covered with water-resistant membranes or tarps held in place by weights or ropes at the end of each workday. Otherwise, partially completed masonry walls exposed to rain and other elements can become saturated with water that can take weeks — if not months — to dry after the completion of the building.

Sealant joints. Joints between masonry and door and window frames, expansion joints and other locations where sealants are required should be treated with care since they are the most frequent sources of rain penetration into masonry.

Moving Forward

While the above-mentioned measures are helpful today, it should be noted the National Brick Research Center (NBRC), headquartered at Clemson University, has been developing a test method that consistently evaluates materials that potentially contribute to efflorescence by measuring soluble salts with ion chromatography. Ultimately, a set of guidelines can be used to select masonry materials, which will be very significant in helping to curtail the potential for efflorescence.

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THE BRICK INDUSTRY ASSOCIATION

Brick Brief

July 2005

IVY ON BRICKWORK

Introduction

Ivy growth on brickwork in some locales is common - especially on older brick masonry. Some would say that ivy and brickwork naturally go together. But while allowing ivy to grow on brickwork does impart some benefits, it can also be detrimental. This *Brick Brief* addresses the advantages and disadvantages of ivy growth and how to remove it if desired.

Ivy, Yes or No?

There is no single easy answer to this question. All of the facts must be considered in any evaluation of the beauty and desirability of ivy growing on brick masonry. Presuming that the wall is known to be well-built with quality materials, it can be expected to last hundreds of years. However, the growth of ivy on a wall, even if it is not removed by force or with chemicals, may shorten the life of a well-constructed wall. If the walls are not properly constructed of quality units, properly prepared mortar with well-tooled joints and good workmanship practices (all joints completely filled) the wall may be more susceptible to damage.

Disadvantages of Ivy:

- The tentacles and tendrils of some climbing ivy can, over a period of time, dislodge mortar and masonry units.
- The tendrils and plant growth may discolor the brickwork.
- Plant growth (ivy) on the face of brick masonry may tend to keep moisture entrapped and in contact with the masonry. This may lead to or contribute to efflorescence or staining of the wall.
- Ivy and other plant growth can also become a harbor for nesting insects, birds or other animal life and offer them easy access to the inside of the building.
- Removal is difficult at best and may damage the masonry.

Advantages of Ivy:

- Ivy reduces wall temperature, possibly reducing summer cooling costs.
- Ivy sheds rainwater, possibly reducing moisture contacting the wall.
- Aesthetically desirable in the opinion of some people individuals.

Proper maintenance of walls with growing vines includes keeping the vines trimmed around and away from windows, gutters, eaves, woodwork, and other decorations.

Removal of Ivy

Before deciding to remove ivy, several questions should be answered:

- What are the reasons for removing the ivy?
- Is the wall properly constructed of quality materials and good craftsmanship?
- What is the value, both aesthetically and ecologically speaking, of ivy on the wall?

If removal is considered, it should be attempted in a small area. Avoid pulling the vines away from the wall since this may damage the brick or mortar. Carefully cut away a few square feet of vine in an inconspicuous area and see how much the ivy has rooted into the brickwork. Also, inspect the exposed area for condition and appearance. Then visualize the prospective appearance of the wall with the vines cut away. Repointing or other repairs may be necessary if the ivy is removed. These issues should help you decide if de-vining is necessary or feasible.

If it is decided to remove the ivy, carefully cut it away close to the wall. There will be some remnants left on the wall. These are "suckers" embedded in the brickwork that previously attached and held the vines. **DO NOT** use chemicals or acids to try to remove them - since this increases the risk of damaging or staining the wall. The suckers should be left in place until they dry up and turn dark. They can then be removed with a stiff fiber brush and some laundry detergent. Do not wait too long because if the suckers rot and oxidize, they may become very hard and nearly impossible to remove without doing damage to the wall surface. Two or three weeks should be sufficient time.

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General Shale

Engineering Services

Masonry Chimney Maintenance / Repair

Technical Bulletin

Masonry chimneys can be a source for problems such as leaking, efflorescence, and spalling if proper construction details have not been utilized. The following guidelines include information a homeowner or builder can use to correct and repair common chimney problems.

A poor cap is probably the most common source of chimney problems. The cap should be closely inspected for cracks or other sources of water leakage. The best chimney cap is a poured concrete cap with a 1 ½" overhang and a drip notch. The detail for this type of cap is indicated in "Recommended Details Essential to Durable Brick Homes". These printed details are included on the package card attached to every cube of brick delivered to the site. A metal cap can also provide very effective weather protection and can be more economical than a concrete cap when used as a repair.

Corbel details can also be a potential source of water penetration. Corbels can act as ledges which allow water to accumulate and eventually work its way into the masonry. If the corbel details have exposed core holes the problem is further aggravated. A simple mortar bevel applied to the corbel can help eliminate this problem. For this repair Type S mortar is recommended.

Roofing counter flashing should be inspected for possible sources of leakage and caulked or repaired as required.

The chimney should also be inspected for unfilled mortar joints. Any holes or partially filled joints should be properly tuck pointed.

A chimney cricket should be installed as required by section 1003.20 of the IRC International Residential Code. The IRC Code requires a cricket when the chimney dimension parallel to the ridge line is greater than 30 inches and the chimney does not intersect the ridge line.

The application of a water repellent can also provide additional protection from leakage. If a water repellent is applied it is important that only a breathable Siloxane based material be used. One such product is Weather Seal Siloxane by ProSoCo, Inc. Acrylic sealers should not be used for any type of exterior application. Any repairs such as tuck pointing, corbel bevels, or chimney cap repairs must be completed before a water repellent is applied. To allow for maximum penetration the masonry must be completely dry before a water repellent is applied. All manufacturers should be closely followed. For additional information on water repellents you can contact ProSoCo, at 1-800-255-4255.

The following detail illustrates some of the repairs discussed above. If you have questions or require additional information contact the General Shale Engineering Department at (423) 282-4661.

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