



City of Kingston

Policies and Procedures

Effective Apr. 2013

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Policy on Masonry Restoration in Heritage Buildings	Revision No.	N/A
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1.0 Purpose

This policy is intended to guide the restoration of masonry in both public and private heritage buildings in the City. This policy would provide for guidance in reviewing applications for alteration under the *Ontario Heritage Act* and also in providing advice to landowners who need assistance in dealing with masonry maintenance issues.

2.0 Revision History

This is an update to the Council-approved "2003 Guidelines for the Conservation of Historic Masonry".

3.0 Application

The City of Kingston is well known for its built heritage, especially historic buildings constructed in local limestone and, to a lesser extent, clay brick. This historic masonry requires maintenance that is quite different than what is normally required for modern masonry. The intent of this policy is to describe common repair requirements and to provide best practices to complete these repairs on both public and private properties.

There are many masonry conservation issues that are beyond the scope of this discussion. Historic practices such as lime based stuccoes or renders over wood lath or masonry, were common and require special care.

4.0 General Provisions

Masonry commonly deteriorates when exposed to severe weather and generally, this deterioration is focused in the masonry joints surrounding the stone or brick units. Other influences, such as faulty eavestroughs or downspouts, or the lack thereof, can accelerate

deterioration by focusing leaking water or roof run-off to areas of the masonry, resulting in freeze-thaw damage and bulging due to frost heave when this saturation is excessive and ongoing. Differential structural settlement and cyclic frost heave can result in staggered cracks through the mortar joints and, cracking in the joints and stone units can also develop as a result of thermally induced movements. As a first step in considering a repair program, it is therefore necessary to understand the causes of deterioration, and an effective repair program may need to not only be directed to the repair of the masonry, but more importantly, address the source of the deterioration.

4.1 Re-pointing

Typically, the most commonly required repair work undertaken on historic masonry is called pointing. This relates to the mortar surrounding the stones or bricks (the masonry units), its deterioration (cracked, flaking, or missing) and the ability of the joint to seal the masonry against water penetration, and support the stone or brick units. It is rarely necessary that an entire wall or building requires pointing all at one time. This is also sometimes difficult to do since the interfaces between existing and new mortar are often compromised by the pointing work and, as a result, lead to a shortened service life for this interface area.

The process involves removing the old mortar, usually to a depth of twice the width of the mortar joint, or more, until sound mortar is reached and then filling the joint with new mortar. Where the joints are less than 15 mm in width, the minimum depth of removal should be 25 mm to ensure that there will be adequate re-pointing mortar depth.

In some cases, deterioration of the back-up masonry may be to the point where the mortar encountered during removal is of sand-like consistency and may in fact be missing. When this is encountered, or when masonry units are found to be loose or displaced, the services of a structural engineer or conservation specialist experienced in this kind of work should be obtained to determine if a greater intervention is required and whether or not structural stability is an issue.

To minimize the risk of damage to the masonry units (bricks or stones) the process of “cutting out” should only be done with either hand tools or pneumatic tools that are made and sized for the task. The joint should then be cleaned of dust and other loose material, then thoroughly wetted (but not to the point that standing water is present) before the new mortar is placed. Tools such as rotary saws or any type of power grinder or wheel should not be used for cutting out because of the risk of irreversibly damaging the masonry units unless the tool is shown to be designed for the task.

It should be noted that ashlar, defined as accurately squared stone blocks laid in even courses and fitted with joints that are usually under 3mm. (1/8”) in width, require great skill to repair and pose special problems when fastening railings or signs, for example.

4.2 Recommended Mortar

The most appropriate mortar for historic masonry, which typically used lime-based mortars for the original construction, is one which includes lime and white non-staining Portland cement constituents. This is different from Portland cement mortars normally used in modern construction.

The intent is to use a mortar that is slightly softer and more porous than the masonry unit itself – as such the mortar becomes the vulnerable part of the matrix and will break before the masonry unit. Other advantages to mortars containing lime include a tolerance of slight movement and ability to self-heal. Portland cement based mortars should not be used exclusively because they are hard and inclined to more readily crack due to settlement and thermal induced movements. White Portland cement is used because the more common grey Portland cement contains soluble salts that can result in efflorescence (chalky salt deposits) and possible damage to the masonry due to the salt formation, which is prone to expand. For typical walling constructed of Kingston limestone, the mortar mix is usually 1 part white Portland cement, 1 part lime putty or hydrated lime and, 6 parts aggregate (sand), which is referred to as a 1:1:6 mix. Depending on the application, the mix must be adjusted to suit the masonry material and/or exposure, for instance, for old clay brick the lime content is usually increased to a 1:2:9 ratio.

Where the masonry has high exposure to the weather, air entrainment (infusion) of the mortar is an important factor in improving the resistance to deterioration. An air content of 15% to 17% is recommended. For more details on selecting an appropriate mortar for your masonry type and exposure conditions, reference should be made to CSA Standard A179.

4.3 Recommended Mortar Profile

The profile of the joint should not necessarily replicate the existing profile. Raised profiles, back struck and plastered joints can in fact lead to early deterioration of the mortar and should be avoided. Generally, a re-pointed joint should be slightly recessed back from the arrises (edges) of the masonry units. After the initial set, the mortar should be compacted by use of a dowel or short stout bristle brush, with the latter also producing a textured finish by exposing the aggregate. Excess mortar should be kept off the face of the brick or stone to avoid staining.

4.4 Recommended Aggregate

The selection of the right aggregate is also critical to the long-term performance of the mortar and colour of the joint. The aggregate should be a clean, sharp sand with a full range of particle size from fines to 3 mm. (1/8") in size, unlike the uniform fine sand commonly sold as brick sand (the proper gradation of sand to be used is provided in CSA Standard A179). Sources of sand should also be from quarries that are certified to not have alkali reactive aggregates.

It is also important to record the mortar mix used and note the source of the aggregate to ensure an easy match for future work.

4.5 Recommended Method of Colour Matching Masonry

The desired colour of the mortar should be achieved through the colour of the selected sand. However, pigments can be used to obtain the desired colour, but these can often result in short and/or long term mottling/splotchiness of the colour, so it is recommended that these be well tested before they are used extensively.

4.6 Curing New Masonry

It is important to properly cure the mortar to achieve the desired strength. This is achieved by misting the mortar and protecting it from wind and sun to avoid premature drying and resultant shrinking and cracking. The use of wet burlap and white plastic coverings is recommended. The mortar should be placed about one month before the risk of freezing.

4.7 Recommended Method of Cleaning Masonry

Historic masonry rarely requires cleaning to help stop decay. Patinas of age, formed as a result of exposure to the elements, are what make historic buildings look historic. Indeed some cleaning processes, such as that commonly referred to as “sand blasting”, can irreversibly damage historic masonry. When cleaning is required, to remove graffiti, paint or rust stains for example, the most gentle and environmentally friendly means possible should be identified by first testing in a discreet area. There are a variety of substances that can be ‘blasted’. Chopped corn husks, for instance, are less abrasive than sand. Sand should never be used on brick units as it can remove the protective fire hardened surface which will lead to a total deterioration of the whole brick.

4.8 Recommended Method of Attaching Items to Masonry

When it is necessary to fasten items such as signs, railings, etc., to masonry, care must be exercised. To avoid irreversible damage to the brick or stone the fasteners should typically be located in the masonry joint and not in the masonry unit itself. Ferrous metal, especially mild steel, can corrode and stain and exert enough force to cause masonry to split. It is recommended, therefore, that fasteners are best made from non-corroding stainless steel set in either lead or nylon expansion anchors.

4.9 Recommended Approach when Stones are Cracked

Kingston limestone will often crack vertically perpendicular across the bedding planes. When these cracks are few in number and only a hair wide, they typically pose no risk. However, if the symptoms are beyond that, then a specialist with experience in historic masonry should be consulted. To keep water out, fine cracks under 3 mm. (1/8”) across can be filled with a lime paste or injected with hydraulic lime; if wider, mortar and/or an appropriate sealant can be used and then monitored over future months for movement. If the stone is shattered it may have to be removed and replaced. If it is a significant stone with limited cracking, it may be possible to remove it, repair it, and to reinstall it. Under no circumstances should the cracks be enlarged by grinding and buttered over with epoxy.

6.0 Implementation

6.1 Advisory Assistance

In the Kingston area there are consultants, architects, engineers and trades people who have extensive experience conserving historic masonry. Staff can assist landowners with finding someone who can assist with the masonry restoration.

7.0 Regulatory Requirements

Consulting with the City's Planning and Development Department is required before proceeding with any work on a structure that is designated under the *Ontario Heritage Act*. Extensive restoration will need to be approved by the Municipal Heritage Committee. To confirm if a property is designated under the *Ontario Heritage Act*, Heritage staff can be contacted at 613-546-4291 x1844 or at heritage@cityofkingston.ca.

For more information visit the Ontario Ministry of Tourism, Culture and Sport web site at www.culture.gov.on.ca or Parks Canada's Standards and Guidelines for the Conservation of Historic Places in Canada publication at www.historicplaces.ca

8.0 Review Period

This policy shall be reviewed when changes to the CSA standard are revised, or if either staff or the Municipal Heritage Committee deem it necessary to update the policy.