

City of Windsor Historic Masonry Repair Guidelines

Applicability

The City of Windsor Historic Masonry Guidelines is intended to provide direction and a standard for all historic masonry regardless if the property is recognized on the Windsor Municipal Heritage Register.

- All historic masonry restoration/repointing projects that are to be funded by any City financial incentives are required to follow these standards
- All heritage alteration permit applications under the *Ontario Heritage Act* will be required to follow these standards

Historic Mortars

Historic masonry units and mortar differentiate from contemporary kinds in their composition. Prior to around 1930s, traditional mortars were commonly composed of sand and lime putty/slaked lime and historic additives. By the 1930s, there was greater introduction of hydraulic cement and Portland Cement into mortar mixes.

Historic Mortar Components:

- Sand- Rounded and natural sand salt-free sand are preferred for visual similarity and plasticity as opposed to manufactured sand, and the sand should be free from impurities.
- Lime- High- lime mortar can reseal hairline cracks. Type S and SA is suitable for repointing project
- Portland cement- should never be used in isolation as it is often harder than masonry units, causing damage, and will crack the from settlement and temperature fluctuations.
- Air-Entraining additives (between 10%-16%) may be used in severe weather exposure to improve resistance
- Water- should be potable, clean and free of salts or acids
- Historic Additives- appearance of mortar may be replicated by addition of small quantities of shell, partially burned lime, animal hair or particles of clay (TBC with City staff)
- Modern Bonding agents are not permitted

Pre-blended lime mortar can generally be used unless a custom blend is required.

Key Factors for repointing

The best practices for repointing would be to match the following components:

- Compressive strength of new mortar to be lower or equal to historic mortar, and softer than the masonry units
- New mortar to be as vapour permeable/porous as historic mortar, and even more porous than masonry units
- Sand (colour and texture would likely match well if new sand matches historic sand well)
- Colour and Texture
- Pointing Style

Compressive Strength

Choosing new mortar with the appropriate compressive strength will avoid creating stresses caused by normal expansion, contraction, settlement or moisture migration on bricks which could result in cracking and spalling.

1. Compressive strength can only be validated through laboratory test. An approximate method for testing hardness on the field is through the use of the Mohs scale. ⁴
2. Where additional testing has not been conducted, the following general rules are to be followed:
 - Brick (moulded) structures constructed prior to 1930s, are to use a Type O mortar (350 psi) or less compressive strength mortar
 - Brick (moulded) structures constructed 1930s and beyond can use a Type N mortar (750 psi) or less compressive strength mortar
 - Mortars for other masonry types not mentioned are subject to confirmation with City Staff
3. Exceptions may apply for buildings that are designated under Part IV of the *Ontario Heritage Act* or structures deemed to be of exceptional/outstanding heritage significance. These structures may be required to undergo mortar analysis and compressive strength testing.

Vapour Permeability

High lime mortars are more permeable than denser cement mortars, and allows moisture to migrate through the mortar joints rather than the masonry units. If moisture evaporates from the masonry unit instead of the mortar joints, it could result in efflorescence or subflorescence which could result in spalling and damage to the masonry units.

Sand, Colour and Texture

Sand makes up the major composition of historic mortars. Matching the sand colours and grain size from a historic mortar sample is a major step to matching the mortar colour.

Chemically pure mineral oxides may be permitted to assist in colour match. These pigments have to be alkali-proof and sunfast to prevent bleaching and fading. Proportion of pigment used should not exceed 5 percent of the mortar mix so as not to weaken the mortar.

Pointing Style

Pointing style affects the appearance of the historic masonry and generally the original historic pointing style should be used in re-pointing. Mortar joint styles include concave, v-joint, raked, weather, struck, flush, flush and rodded, beaded, grapevine, extruded/squeezed, and tuckpointing, etc. Where the original pointing style has contributed to early deterioration, an alternate pointing style can be finalized with city staff.

Execution of Work

Structures that are outstanding in design value or of exceptional significance may be required to undergo a laboratory mortar analysis to provide information on the original ingredients to improve mortar match. Otherwise, repointing should follow these general steps:

1. Conduct visual examination of unweathered samples of mortar from various locations by breaking samples with a mallet and blowing away powdery lime or cement, and examining remainder sand with a magnifying glass to note the colour and size of grain. Consider the compressive strength of the mortar.
2. Prepare joint by removing deteriorated mortar to a minimum depth of 2-2.5 times the width of joint with clean cut to ensure adequate bonding before repointing. Do not use power saws and grinders for removal. Rinse joints with water after to remove particles and dust.
3. Repoint only when the wall temperature is between 5°C (40°F) – 25°C (77°F) to avoid excessive evaporation of water from the mortar or freezing.
4. Prepare mortar proportion by measuring dry ingredients by volume and mixing thoroughly before adding water. Use within 30 minutes.
5. A test panel at an inconspicuous spot (3' by 3') may be required, inspected and approved by city staff
6. Fill joint with compacted successive layers (1/4" or 1cm) to control rate of drying and strengthen bond. Finish with original pointing style unless it has contributed to early deterioration, then an alternate pointing style can be finalized with city staff.
7. Clean excess mortar with natural bristle/nylon brush. Never use metal bristle brushes on historic masonry. The mortar on freshly repointed wall should be fully hardened before cleaning. Efflorescence may be removed by brushing with stiff-bristle brush (not metal).
8. Above-roof (ie. chimneys and parapets) repairs should be done before roof repairs are undertaken
9. Limit work to areas of deterioration

Water-Repellent Coating/Sealers & Waterproof coatings

Generally, if a historic structure is kept watertight there is no need for water-repellent coatings. This coating/sealer may limit the flow of moisture through the wall, retain the moisture and cause deterioration to the masonry walls. Use of such coating may be appropriate only to provide solution for a specific problem for extremely porous buildings that have dried out completely in selected areas.

Waterproof coating should not be used on historic masonry, as it could intensify damage of the masonry from water being unable to escape. Exception to its use would be for example as a last resort to below-grade exterior foundation walls to prevent water entering into interior basement walls.

Cleaning

Cleaning should be conducted with the gentlest means possible to minimize damage to the masonry. Except for when stains, graffiti, dirt or pollutants are damaging the masonry, it may be more desirable to do as little cleaning as possible and to repaint where necessary instead of removing the paint.

1. Water Cleaning

In general, water cleaning (soaking, water washing, water washing with detergent, and steam/hot-pressurized water cleaning) are gentler methods of cleaning which are the recommended methods. Power washing/ water blasting, or high-pressure water cleaning is abrasive and can damage softer stones/bricks.

2. Chemical cleaners

Acids, alkalines, and organic compounds remove dirt and stains while organic solvents and alkaline paint removals can remove paint and graffiti.

Acid-based cleaners are used for non-acid sensitive masonry (generally granite, sandstones, slate, unglazed brick, unglazed architectural terra cotta, cast stone, and concrete), while alkaline cleaners are used for acid-sensitive masonry (limestone, marble, calcareous sandstone, glazed brick and glazed architectural terra cotta, and polished granite).

Removal of paint on historically painted structures may not be appropriate. In some cases, retaining the paint may be better for the long-term preservation of the masonry. Paint removals usually requires application by brush, roller or spray, then finished with a water rinse.

Test the chemical cleaner in an inconspicuous spot before using it and do not use hydrofluoric acid or hydrochloric (muriatic) acid, or sodium hydroxide (caustic soda or lye) and ammonium bifluoride.

3. Poulticing

Poulticing (using absorbent material or clay medium) can be used to draw out stains and graffiti which have penetrated into the masonry. The affected area should always be thoroughly rinsed out after poulticing.

4. Abrasive and Mechanical Cleaning

Sandblasting (or the use of other materials for abrading the surface under pressure), grit Blasters, grinders, and sanding discs use are not permitted on historic masonry as these methods of cleaning damages both the masonry units and mortar joints.

Also note the following:

- Note the temperature conditions to avoid cleaning methods that involve water during freezing periods.
- Clean from the bottom to the top of surfaces to reduce staining from the cleaning.

References/Sources:

1. National Park Service, Preservation Briefs- Repointing Mortar Joints in Historic Masonry Buildings
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2. National Park Service, Preservation Briefs- Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings
 - <https://www.nps.gov/tps/how-to-preserve/briefs/1-cleaning-water-repellent.htm>
3. National Park Service, Preservation Briefs- Dangers of Abrasive Cleaning to Historic Buildings
 - <https://www.nps.gov/tps/how-to-preserve/briefs/6-dangers-abrasive-cleaning.htm>
4. 9th Canadian Masonry Symposium, FIELD TECHNIQUES FOR MORTAR REPLICATION
 - http://canadamasonrydesigncentre.com/download/9th_symposium/MORTAR02.pdf
5. Ontario Heritage Trust- Repointing Historical Masonry Structure
 - https://www.heritagetrust.on.ca/user_assets/documents/TCS-001-Repointing-historic-masonry-structures-ENG.pdf
6. City of Kingston- Policy on Masonry Restoration in Heritage Buildings
 - <https://www.cityofkingston.ca/documents/10180/20847/Policy+-+Masonry+Restoration+in+Heritage+Buildings/c2d8d166-e0b3-4a2a-8079-f359b418bc46>
7. City of Hamilton- Masonry Restoration Guidelines
 - <https://d3fpllf1m7bbt3.cloudfront.net/sites/default/files/media/browser/2018-11-06/coh-masonry-restoration-guidelines.pdf>
8. Region of Waterloo- Practical Conservation Guide for Heritage Properties- Masonry
 - <https://www.regionofwaterloo.ca/en/exploring-the-region/resources/Documents/PracticalGuideMasonry-access.pdf>