TC.05
Performance and Repair Requirements for Repointing Mortars

Members of RILEM TC 203-RHM

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Abstract A brief overview is given of performance requirements for repointing mortars for historic masonry.

1 Introduction

This paper highlights aspects of the chapter on performance requirements for repointing mortars to be included in the forthcoming RILEM TC 203-RHM guide on repair mortars for historic masonry. Existing information on repointing is also available [e.g. 1-3].

Repointing is the (process of) filling of the outer part of an existing masonry mortar joint with a new mortar that may differ in composition from the existing bedding mortar. Repointing in historic masonry is usually carried out to replace deteriorated or damaged mortar in the outer part of masonry mortar joints. The depth of the pointing is usually 2 to 3 cm, but in special cases it may go up to 5 or 7 cm. For deeper repointing, structural assessment may be needed.

Repointing mortars for historic masonry are composed of a binder such as lime, an aggregate such as sand, and water which gives them initial plasticity. Additives or pigments may also be present.
Before repointing, the following initial preparatory work is recommended:

- A building condition assessment should include a thorough survey of the composition of the existing masonry and its condition (see paper ‘Repair mortars for historic masonry. From problem to intervention: a decision process’). The cause of material deterioration should be determined and any repair work to reduce the risk of mortar deterioration should be addressed prior to repointing.
- An evaluation of the type and severity of climatic exposure for each element of each building elevation will assist with the selection of suitable mortar mixes, and point to any needed remedial work to minimize moisture loads on the masonry.
- Look for (traces of) original and other historical pointing. Its colour and form can be a guideline for selecting the new repointing material. The composition of the old mortar could serve as a reference for deciding on the composition of the new mortar unless other factors such as poor durability require a change in composition. The old mortar found should be documented by means of photos, and where needed, by analysis of its components [4].

Repointing just to improve the appearance is not recommended. Selective repointing of deteriorated areas under a long-term maintenance program is the best approach, unless difficulty of access makes it more effective to repoint the whole structure (e.g. the need for expensive scaffolding). Selective repointing is also the best choice for thin mortar joints where removal of the existing mortar is difficult and is very likely to damage the masonry units. The same may apply to hard pointing mortars. Even though the mortar may be inappropriate, removal may cause more damage to the existing masonry units than leaving it in place.

2 Design and construction issues

Requirements to consider for repointing mortars include:

Conservation issues

- **Historic authenticity/compatibility**
  - repair mortar to be compatible with the existing masonry units and mortar, and/or with the original mortar.
  - collect basic data about the mortar ingredients for both the existing mortar and the repair mortar.
  - where required for historic authenticity, the mortar ingredients should be matched to the original where possible. This may not be easy to do because the original ingredients may no longer be available, the original mortar may have insufficient durability, or the original ingredients may be difficult to determine. Chemical reactions with other materials in the mortar or the
environment, as well as deterioration processes, may significantly change the original composition over the years.

- **Try to have a repointing mortar which can be removed without damage to the masonry units in future repair (reversibility)**
  - mortar no stronger than needed for structural and durability requirements.

### Aesthetic issues

- **Visual appearance**
  - assess colour (e.g. based on unweathered portion of existing mortar), texture and surface profile.

- **Not cause staining on the surface**
  - low risk of efflorescence or lime leaching (e.g. after repointing, avoid rapid drying, and provide temporary protection from rain).
  - no mortar staining on the masonry units resulting from the application of the mortar.

### Moisture issues

- **Resist moisture ingress and do not restrict drying**
  - apply an appropriate finish (profile) to the mortar joint to encourage the shedding of water.
  - low risk of cracks developing. This means negligible shrinkage, compatible thermal and moisture expansion properties, adequate deformation under load (elastic modulus), and good bond with the masonry units.
  - have a properly cleaned out mortar joint, well filled during repointing and adequate bond to the masonry unit to hold the repointing mortar within the joint.
  - appropriate porosity to allow drying of the wall.

### Service life

Service life not only depends on the mortar mix but also on how it is installed (workmanship) and cured, on the compatibility between the masonry unit and mortar, and on the severity of the environmental exposure, which in turn depends on weather, design, construction practice, operation, and maintenance.

- **Adequate service life of the pointing mortar (durable)**
  - Resistance to the expected environmental loads (e.g. freeze-thaw cycles, salts, wind erosion, acid rain, biological elements). For example, aggregate grading and air entrainment have an important influence on frost-resistance.

- **Repointing mortar will not have a negative effect on the durability of the existing masonry.**
  - repointing mortar should not cause stress concentrations in the wall.
  - mortar bond strength lower than the tensile strength of the masonry unit.
  - no damaging salts within the mortar.
  - promote drying; the mortar should have adequate moisture and soluble salt transfer properties.
• **Construction (execution) issues**

  ‘Successful performance of mortar repair work to historic masonry depends 50% on appropriate design and 50% on how well the work is executed on site’ [5].

  - Repair mortars should be practical in application (e.g. workmanship, quality control, requirements for curing conditions).
  - Having a contractor experienced in the conservation of older masonry is a vital step in ensuring successful repointing.
  - Mixing procedures will vary depending on the mortar binder.
  - Supervision and quality control are important! Low-strength repair mortars, often used for older masonry, are less forgiving of errors.

  For example, inspect at each stage of the pointing
  (1) after the joints are raked out to make sure they are clean and square.
  (2) inspect after any back pointing is completed. The remaining part of the joint to be pointed must be clean for the final pointing.
  (3) inspect after the final pointing. Check that there are no voids left behind the pointing. A screwdriver inserted at random locations is one way of checking.
  (4) make sure curing is carried out properly (e.g. hydraulic lime and lime/ Pozzolan mortars should preferably be damp cured for a minimum of seven days).

• **Maintenance issues**

  - For larger projects develop a maintenance guide documenting the evaluation of the masonry before the work started, the materials used for the work, and the installation practice. Recommendations on regular visual inspection for signs of deterioration should be provided, ideally in a checklist format.
  - Ensure prompt repair of water shedding elements (e.g. gutters, downspouts).

### 3 References

5. Comment (2008) John Cooke, Consulting Engineer, Ottawa, Canada