



GENERAL GUIDANCE FOR CARRYING OUT THE WORKS

Recommended specifications and working methods:

Characteristics of repair mortars should always be based on a holistic evaluation of the building which can then lead to the determination of performance requirements for the specific situation. Performance requirements cover a range of issues such as performance of the mortar in use, its ease of use, and compatibility with original and/or other surviving historic materials. There may, in some cases, be a conflict between specific requirements and judgment will be required in achieving a final specification. To determine if new materials will be compatible with surviving historic materials, information on both old and new materials must be available. Analysis of original/surviving historic mortars should be carried out to provide relevant information on their constituents and performance. Technical information and performance data available for new materials can then be evaluated against information on existing materials.

Issues to consider include:

Performance in use

The hardened mortar should have:-

- Adequate vapour permeability.
- An appropriate degree of capillarity for the proposed use.
- A water absorption rate not significantly greater than the host substrate.
- A modulus of elasticity which reflects the built condition and scale of the works.
- Sufficient tensile strength to suit the construction requirements.
- Compressive strength to suit the construction requirements (usually quite low).
- Bond strength sufficient to achieve a good wind and watertight bond, never greater than the host masonry, nor so feeble as to result in separation of mortar, leading to capillary ingress of water at masonry/mortar interface.

Ease of use

- The fresh mortar should have appropriate workability characteristics to allow the work to be undertaken correctly.
- The mortar should remain workable for a sufficient length of time to allow appropriate finishing.
- The mortar should achieve an adequate degree of frost resistance at a sufficiently early age to avoid potential freeze/thaw risk.
- Requirements for protection and curing should be taken into account at the specification stage.

Compatibility with original historic materials

- The hardened mortar should have a vapour permeability similar to, or greater than, that of adjacent historic materials.
- The hardened mortar should be visually compatible with surviving mortars and/or with the original appearance of the construction.
- Where practicable the new mortar should reflect the historic integrity of the original materials and methods of construction.

Using lime for traditional building repairs:

The use of lime mortar in traditional construction includes wall cores, in joints and on the face of walls assists in the exclusion of driving rain by 'mopping up' free water before it can penetrate to the wall interior and encouraging re-evaporation to the outside. On the other hand harder more dense materials such as cement, when used in conjunction with softer stone can accelerate the decay of the stone. This decay is increased due to the fact that the mortar allows for little or no movement of moisture through the joints, and therefore the moisture movement is concentrated in the stone immediately adjacent to the mortar joints, secondly, the setting process of cement based mortars results in the production of potentially damaging salts. It is the interaction of these two factors that can be detrimental to the fabric of sandstone in particular.

Removing loose cement based re-pointing and decayed lime mortar:

- Carefully rake out (not cut out) mortar to a minimum depth of at least twice that of the joint width.
- If original mortar survives to this depth work back to a sound mortar face at the back of the joint.
- Use only hand tools such as plasterers small tools, half hacksaw blades, specially made steel hooks, etc. and avoid damage to stone arises and widening of joints.
- Do not use chisels to remove mortar from the joints of dressed work. Do not use power tools to remove decayed or friable mortars. Retain any pinning stones for replacement as pointing proceeds.
- Thoroughly clean out all beds and joints wash out and allow excess moisture to dry off.

Pinnings:

- For repointing open joints in rubble masonry, an adequate supply of suitable pinning stones should be readily to hand.
- In traditional construction pinnings were often chippings or dressings from the main building stone, and were frequently buried within the joint or concealed by pointing. As far as possible pinnings to match the building stone should be used.
- Any down takings can be split and used for pinnings

Preparation of stonework:

- All loose and friable material must be removed prior to placing new mortar. Lime re-pointing requires a sound surface to adhere to. A stiff bristled brush should be suitable for clearing stone surfaces of unwanted material.

Vegetation and root removal:

- Where deep rooted vegetation occurs, it is important to remove all root growth.
- For small areas or biological growth or 'greening' of the masonry due to dampness, these areas should be cleaned using clean potable water and a stiff bristle brush.
- Wash with tap water and a soft to medium nylon or natural bristle brush. If necessary a green range masonry biocide should be applied following cleaning to delay the recolonisation of the growth
- Refer to Historic Scotland's Technical Advice Note No10 for further information or for use of surface biocides for larger areas

Repointing rubble stonework

Rubble masonry

- Preparation of the wall surfaces generally should include thorough cleaning down and removal of all loose material, dust etc, and thorough wetting the day before starting work. Before applying mortar all surfaces need to be well dampened, but not running with water.
- Joints and voids to be filled should be clean, free from dust etc and slightly dampened. Where the building stone is dense and impervious, take care to only dampen the back of the joint, leaving the joints free from sitting water (otherwise this will deplete the bond between mortar and stone). Decayed lime mortars should be carefully scraped back until a sound base is reached.
- Where deep voids are found, these should be filled with mortar and packed and tamped with pinnings to tightly fill the joint and compress mortar back into the depths of the masonry. Adequate compacting of the mortar is essential for long term performance.
- Press mortar firmly into the joint using a pointing key or small tool chosen to suit the width of the joint, and avoiding spreading of mortar or staining on the masonry faces. Fill and compact mortar, gently hammering in small pinnings (if necessary), to force the mortar well back into the cavity and to reduce the volume of mortar present in one place.
- Bring the mortar well forward slightly beyond the finished pointing surface and allow to stiffen up before finishing the surface.
- Keep the mortar slightly damp and work back any initial shrinkage cracking as necessary.
- When mortar has stiffened up firmly compact and compress the material back into the joints by beating with a stiff bristle brush, eliminating any shrinkage cracking and leaving an open textured surface that will encourage carbonation. Joints should be flush with the stonework and not recessed.
- The initial hydraulic set should take place within a few days, but carbonation (the reintroduction of carbon dioxide into the mortar) may take weeks or months.
- It is important to maintain slightly moist conditions for the lime mortar for around a week to ten days to allow for curing of the mortar. Work should be protected from rapid drying by lightly spraying with clean water, and should be protected with damp hessian to maintain a moist environment for curing.

Repointing Ashlar Joints

- In many cases, the joints are so narrow that the original pointing remains, although the arrises have weathered or been decayed back from the wall face slightly. Where this is the case DO NOT remove existing pointing. Only re-point open joints. Do not remove sound mortar.
- Where decayed, carefully remove existing pointing to a depth of at least 20mm (if possible) using hand tools such as plasterers' small tools, half hacksaw blades or specially made steel hooks. Avoid damage to the arrises of the sandstone or widening the joints. Do not use chisels to cut out mortar from ashlar joints.

Remove all dust and debris from the joints. For all repointing ensure that the joints and adjacent surfaces are slightly damp but not wet.

- Prevent staining to adjacent masonry by using strong carpet tape (or similar) along the edges of the stone.
- Press the repointing mortar firmly into the joint using a suitable narrow pointing key or, for very fine joints, the edge of a blade chosen to suit the width of the joint. Fill and compact the joints thoroughly, ensuring that the mortar is pressed well into the full depth of the joint and thoroughly compacted using the edge of a blade within the joint.
- Bring the mortar forward to the line of the masonry surface and allow to stiffen up.
- When mortar has stiffened up firmly compact and compress the material back into the joint by beating with a stiff bristle brush, eliminating any shrinkage cracking and finish the surfaces of the joints by lightly scraping with a wooden spatula or similar.
- Where arises of the stones are eroded finish the surface of the joints slightly back within the joint to retain the line of the original joint width.

Curing lime-based materials:

- Good site practice is essential to the use of traditional mortars. Ideally, lime work should be undertaken during the lime season, from around April to September. Work undertaken out with this period carries with it, an increased likelihood of frost damage. Good site practice is essential to the use of traditional mortars.
- To achieve their optimum long term performance lime mortars require adequate protection until they are fully cured (as do cement mortars). Provision should be made for protection of the new lime work from rapid drying (wind or sun) and from rain and frost for the first week to ten days, and it should not be exposed to freezing whilst the mortar is damp or uncarbonated. Close covering and protection after work is completed, will be required until the work has sufficiently gained strength. Work carried out during, or immediately before periods of frost will be vulnerable to loss of finish, more so in areas affected by dampness as a result defective roof or ground drainage.
- Ensure newly placed mortars are not subject to rapid drying (this will require the provision of fully effective protection from wind as well as sun) and maintain the surface in a slightly moist but not wet condition for around ten days. (Misting from a backpack pressure spray would be suitable). Lime mortar should be allowed to dry from the depth of the material before the surface is dry. Where cracking occurs, and action taken whilst the mortar is still green, it should be wetted, then pressed back to ensure it is tightly knitted to the background and surrounding work, and then lightly scraped. If cracking is evident after 4 days, such work should be cut out and replaced.
- Adequate protection can usually be achieved by the provision of full scaffold, carried to a sufficient height and fully clad with wind / debris netting or reinforced sheeting, supplemented as necessary by a close covering of hessian and polythene sheeted panels placed against the face of the new work at night. Provision should be made for protection of the top lift at the wall head to exclude rain from the face of the wall and where rainwater goods are removed temporary rainwater disposal must be arranged.

Protection and general site practice:

When working with lime mortars it is especially important to observe a high standard of site practice: -

- Materials must be accurately batched and thoroughly mixed.
- The substrate must be clear of loose and decayed mortar and well washed down before placing new mortar.
- Control of suction between the background and new mortar is essential and the masonry should be dampened down sufficiently to prevent rapid suction but not to the extent that additional water becomes incorporated in the new mortar.
- Joints should be well pinned out and the surface of the mortar should not be overworked.
- Lime mortars must be adequately and appropriately cured.