SCOTTISH LIME CENTRE TRUST

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Generic specifications for lime mortar

This document includes specifications which can provide guidance on mortar mixes for replacement mortars as part of repairs in the Inverkeithing Heritage Regeneration Building Grant Scheme. It is advisable that any building professional or contractor using these guidelines consult with SLCT prior to their use to confirm that they would perform adequately for their intended use and weather conditions at time of placement.

All specifications below rely on being used in the lime season (April to September) with a temperature of 5ºC and rising. See associated document on general guidance for lime works for curing regimes etc. Winter working requires different working practices and specifications; if repairs are to be carried out in unfavourable conditions or during winter, contact SLCT for revised guidance.

Specifications/guidance included in this document:

- Rubble pointing (general walling)
- Ashlar pointing (and tight joints of brickwork)
- Chimney haunching

Rubble joints

Wider joints of random rubble, squared rubble or squared snecked rubble is often repointed in cement and while this is not an appropriate material for repointing stone, an assessment must be made whether removing it will cause more damage than leaving it place. If there are clear water ingress or damp issues internally, the stone surrounding the pointing is showing signs of decay or the mortar itself has failed, then it must be removed. Carefully use hand tools to rake out the joints to a sound backing, or roughly twice the width of the joint i.e. a 15mm joint should be raked out to at least 30mm. All pinning stones should be retained when raking out.

To clean down the wall, pre-wet the entire area before washing out each joint, chasing out debris with a hosepipe. Pre-dampening is to avoid staining of the wall from debris. Always work top down.

Allow wall to dry, but not completely before pointing can proceed. A fine mist of water prior to any application of lime mortar to a porous background is recommended. The substrate must be damp but not wet with running water. For impervious units, pre-dampening to the joints only is required; if the units themselves have standing water, chase water with compressed air.

Where impervious stone units are mixed amongst sandstone, prepare the wall for sandstone and individually check the impervious units. Use the same mortar mix throughout. However, if the wall is solely made up of impervious units, a more robust mortar may be required to allow a quicker set. Consult with SLCT before proceeding with pointing to impervious stone units such as dolerite/whinstone.

If joints are excessively wide or there are large areas of mortar, it is recommended to using pinning stones (off cuts of stone, brick or pieces of slate) to pack out the mortar.

Allow to cure with protection suitable for the weather conditions. This may be damp or dry hessian, tarpaulins for rain, or no protection if weather is fair. See guidance on lime works for curing regime.

Using any of the specifications or information contained within this report for any other purpose other than that stated in the brief will affect your professional liability.

Scottish Lime Centre Trust
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Re-pointing ashlar (tightly jointed) stone or brickwork

Tightly jointed masonry should not be re-pointed unless there is evidence of water penetration or clearly open joints.

It can be very difficult to re-point tightly jointed masonry because of the sheer physical limitations of the size of the joints. Because of this, operatives are often responsible for poor cutting out work resulting in unsightly irreparable damage to the arises (i.e. over widening joints).

Loose mortar should be carefully raked out of fine joints using a tool such as a hand-held hacksaw blade.

Mechanical removal of defective mortar can be particularly damaging, and is too risky to be used in most situations unless the work is carried out by a skilled tradesman. Fine bladed oscillating tools may be used to cut out mortar where defective, but rotary tools such as grinders should not be used. The use of bolsters or quirks for cutting out mortar joints should be avoided on historic ashlar work or fine jointed brickwork.

Protective tape should be applied either side of the joints of fine ashlar work before mortar is pushed into place. The vertical joints almost always require greater amounts of filling than the bed joints (due to the lack of compaction and filling as part of the building process).

In re-pointing fine jointed masonry, the mortar face should be brought out to the edge of the stone, taking care not to smear the face. Mortar is normally inserted into fine joints by pressing it into place with a fine pointing key, flexible blade or spatula. The mortar needs to be firmly inserted to the back of the joint with the thin edge of a blade or very small keys when working on very fine joints. The finish to the joint should match the original. Where arises have been enlarged over time by weathering or other decay mechanisms, the mortar face should be kept back to the original width of the joint and slightly angled or weather struck (after calculating the risk of forming a ledge for collecting water has been assessed).

Mortar Material

Proprietary dry ashlar mixes based on feebly hydraulic limes, stone dust and crushed chalk
Supplied in dry powder or in plastic buckets with re-usable airtight lids.
Ready for site mixing with clean drinking water.

Background/Substrate

Generally, natural stone (ashlar blocks) or rubbing bricks, for building, or existing masonry for re-pointing.
The background should be clean and free from loose or friable material, well washed to remove dust.
Dampen high suction units. (Do not dampen very low suction materials such as granite).

Application (replacement units)

Laying sawn six sided blocks (after hand dressing to reduce risk of forming capillary breaks) or rubbing brick

Butter on to beds and perpendicular ends a full bed of mortar, firmly pressed into place to slightly more than the desired bed thickness and lay next block firmly in place to line and level by tapping firmly and repeatedly. Excess mortar will squeeze out. Leave excess in place for several hours.

Laying single faced masonry units

Lay a ribbon of ashlar mortar (approximately 25mm in width on the leading edge of the ashlar faced unit and a bed or normal coarse stuff to bed the irregular meeting faces. Tap down the stone to line and level, excess ashlar mortar will squeeze out. Leave excess in place for several hours.

Mixing

The materials are firstly mixed dry to fully combine all the ingredients and just sufficient water is added to make the material into a dough like consistency.

For true ashlar, a good double handful size lump of the mortar has a thimble full of boiled linseed oil added and kneaded into the mix until it leaves the hands clean and is fully plastic. (Disposable or rubber gloves are usually worn for this process). The mortar should be used within 24 hours, if being stored for more than an hour it should be wrapped in polythene to keep it moist.

Because it is feebly hydraulic the mortar sets slowly but positively and on final set and full carbonation resembles hard chalk, matching exactly traditional ashlar jointing.

Consumption:

1000 linear metres of bed joints, at 2mm thick, and 100 mm on bed requires 200 litres of mortar. Re-pointing 1000 linear metres of 2mm thick joints at a depth of 10mm: 20 litres of mortar are required.

Re-haunching a chimney pot

Where chimney pots display cracked or missing mortar in the haunching (mortar) that secures their position, carefully chip away the old perished mortar down to its housing;

Using a modified hydraulic lime mortar or eminently hydraulic lime with water repellant and concrete sand, in a ratio of 1 part binder to 2.5 parts sand;

Place the mortar into the recessed housing and mount the chimney can in place;

Mortar around the chimney can making sure the profile is such that it encourages water run-off (and not ponding);

Provide sufficient protection such that the mortar does not dry out for the first 72 hours, or be disrupted by rainfall. Note image below uses both hessian and tarpaulins depending on conditions to mitigate rain, lower temperatures, wind and direct sunlight. Protection can be left off if conditions are fair to avoid sweating of the mortar. See associated document on general guidance on lime works for curing regimes.

Finished haunching should look like the above

Recommended mortar mixes:
The following specifications capture all the various requirements in terms of mortar mixes and application and curing regimes to be adopted.

Mortar type	For pointing rubble walls internally
Purpose:	To finish joints to plane, level and texture.
Masonry unit preparation:	Dampen individual units as required. Do not kill suction.
Mortar:	NHL 2 naturally hydraulic lime and local sharp Concrete Sand (use NHL 3.5 if walls are totally saturated)
Ratio:	(nominally by volume) 1 part binder to 2.5 parts sand
Mixing:	Add just enough water to achieve a stiff but workable consistency for bedding such that the mortar supports the masonry units without squeezing out unduly.
Application:	Apply in small volumes no thicker than 20mm with pieces of slate to ensure the voids are tightly packed. Leave surface flush with masonry and open textured. Timing of finishing joints is critical to avoid bringing fines to the surface.
Curing:	Cure with light misting with clean potable water such that the mortar does not fully dry at any time within the first three days, except where the walls may be damp, not wet, in which case the work should be covered only to avoid rapid drying on the face. Keep all work covered and ensure the top of the wall is under cover capable of protecting it from direct rainfall during the time when the site is unoccupied or when work is halted because of rain. Working in wet weather on an open wall head will not be permitted.

Mortar Type	Ashlar pointing to fine joints; 3mm and down
Purpose:	To provide a suitable medium for joint filling and finishing to the correct plane and texture. *(General masonry, away from water other than normal rainfall requires only good curing and protection during and immediately after placing, proper suction control and prevention of rapid moisture loss is essential to ensure full hydration takes place within fresh mortar).*
Masonry unit preparation:	Dampen individual units as required. Do not kill suction.
Mortar:	Pre-mixed ashlar stuff, based on NHL 2 and chalk; use fine sand where joints are wider
Ratio:	(nominally by volume) 1 part binder to 1 part crushed chalk
Mixing:	*Recommended to buy pre-mixed* *(Note with pre-mixed pre-bagged mortar, the supplier will state the water addition per Kilo of mortar to achieve the desired consistency)*
Application:	Protective tape should be applied either side of the joints of fine ashlar work before mortar is pushed into place. The vertical joints almost always require greater amounts of filling than the bed joints (due to the lack of compaction and filling as part of the building process). The mortar face should be brought out to the edge of the stone, taking care not to smear the face. Mortar is inserted into fine joints by pressing it into place with a flexible blade or spatula. The mortar needs to be firmly inserted to the back of the joint with the thin edge of a blade or very small keys when working on very fine joints. The finish to the joint should match the original. Where arises have been enlarged over time by weathering or other decay mechanisms, the mortar face should be kept back to the original width of the joint and slightly angled or weather struck (after calculating the risk of forming a ledge for collecting water has been assessed).
Curing:	Cure with light misting with clean potable water such that the mortar does not fully dry at any time within the first three days, except where the walls may be damp, not wet, in which case the work should be covered only to avoid rapid drying on the face. Keep all work covered and ensure the top of the wall is under cover capable of protecting it from direct rainfall during the time when the site is unoccupied or when work is halted because of rain. Working in wet weather on an open wall head will not be permitted.

Specification for chimney haunching

Mortar:	HL 5 Hourdex hydraulic lime and local sharp Concrete Sand Or NHL 5 and sharp concrete sand with ligophob dosed at 100g per 25kg of binder, or USD additive dosed at 1kg per full bag of binder.
Ratio:	(nominally by volume) 1 part binder : 2.5 parts any sharp concrete sand 80 litres of sand per full bag of binder (HL 5 and NHL 5), or 5 builders buckets of sand filled to the top and lightly tamped down
Mixing:	Add just enough water to achieve a stiff consistency for forming the haunching. Overly wet mixes may bleed or leach, where the masonry units offer no suction, if this occurs a poor bond to the masonry will result too.
Application:	By hand ensuring the haunching is finished at an angle that will shed water. Leave the mortar work to become 'leather' hard before beating back with a churn brush to ensure good compaction and bond with the masonry units.
Curing:	Cure with light misting with clean potable water such that the mortar does not fully dry out at any time within the first 4-5 days where ambient temperatures are 15^0C average and where protection is provided in circumstances where there is a risk of temperature fall. Should the average temperature drop by say 5^0C allow a further 3-4 days curing.