MIXES

Natural hydraulic lime or non-hydraulic lime putty based mortar must be used when repointing an historic building. Cement should not be added to lime based mortars.

Non-hydraulic lime is produced from pure limestone-the type quarried in Derbyshire. Hydraulic lime is produced from limestone containing clay. Of the two types, lime putty mortar is the more permeable, while hydraulic lime is stronger and has a quicker set.

Hydraulic Lime Mortar-Hydraulic lime is available in various degrees of strength depending on where the lime is produced. Hydraulic lime sets quickly without exposure to air and will even set under water. Some of the hydraulic limes from overseas can be as impermeable as cement and less suited for use on historic buildings.

The following classification of hydraulic limes is based upon the speed at which they set under water.

Feebly hydraulic lime	- NHL 2
Moderately hydraulic lime	- NHL 3.5
Eminently or very hydraulic lime	- NHL 5

Feebly and moderately hydraulic types are more suited to conservation work. Manufacturer's advice should always be sought prior to use. However, a typical mix is a feebly or moderately hydraulic lime in the following ratio:

Lime	:	**Aggregate**
1	:	3

The exposure of the joint and the nature of the stone also need to be taken into consideration when choosing a mortar.

Lime Putty Mortar The longer the lime putty mortar matures before use, the better it becomes. Lime putty cures on contact with air and so it must be stored in an airtight container.

Lime putty mortar can be purchased pre-mixed (coarse stuff) or can be mixed on site to the following ratios:

Lime Putty	:	**Aggregate**
1	:	3

If used externally this mix is likely to require a pozzolanic additive (see materials section) to ensure that the mortar hardens. The lime putty option also requires more care when used externally, as it takes longer to harden and is more susceptible to frost damage.

Dry Hydrated Lime (Bag Lime) A mortar made using dry hydrated lime is inferior to the two alternatives above. The setting properties of the lime will have been impaired by carbonisation during manufacture and such a mix will need cement to form an adequate set.

APPEARANCE

The colour of sand/aggregate used in the mix will determine the final colour of the mortar and it should match the colour of the stone. The aggregate should be white or buff in colour, never red.

To get the best results, stone dust (of the appropriate type) can be used as part of the aggregate. This is particularly important when pointing limestone buildings to ensure the joint colour is grey rather than yellow.

Mortar mixes should be agreed with the Conservation Architect / Officers prior to any repointing on a listed building. It may also be appropriate to prepare sample panels to determine the most appropriate mix.

Further information can be obtained from:

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PEAK DISTRICT NATIONAL PARK AUTHORITY

Conserving your Historic Building

Repointing your Building

The wrong ..... and right way

If pointing problems are neglected then a wall can become unstable. More than any other building operation, pointing is frequently misapplied or badly done. A properly pointed wall will remain problem free for many years.

PEAK DISTRICT NATIONAL PARK AUTHORITY

DO I NEED TO REPOINT?

Repointing is only needed where mortar has become so loose, powdery, decayed or eroded that water has started to penetrate joints.

If the mortar is firm, or so hard it needs to be chiselled out, then it should be left in place as removal could damage the masonry.

The repointing of delicate ashlar joints is not generally recommended. The joints are often so narrow that pointing is unnecessary and if done may spoil the overall appearance of the stonework.

If damp is present in a building but the pointing is sound, then repointing may be a waste of time and money. In such cases, further investigation should be sought to establish and minimise the cause of the damp.

PREPARATION OF THE JOINTS

Joints should be carefully raked out manually to a depth between one and a half or twice the width of the joint. A bent spike, hoof pick or quirk are suitable raking out tools. However, great care must be taken to keep the edges of the stone intact and joints should never be widened.

If the joints are very fine a mason's saw or hacksaw blade can be used for raking out. Power tools should never be used. The difficulty of controlling the cut means the masonry becomes disfigured and the joints are widened.

When raking out is complete all loose material should be brushed and/or gently washed out of the joints. Masonry should be dampened prior to pointing to prevent new mortar drying out too quickly thus avoiding shrinkage cracking.

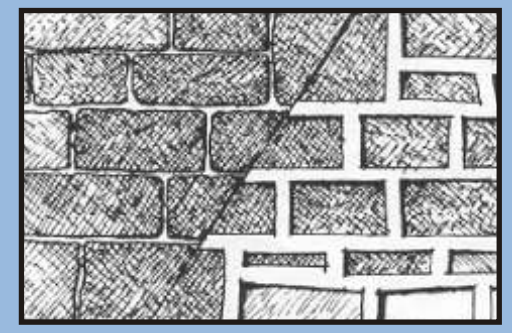
METHOD

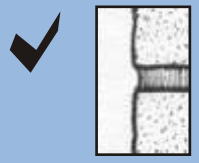
Work should not be carried out when there is danger of frost or heavy rain. The importance of allowing lime-based mortar to dry slowly cannot be over emphasised. Mortar should therefore be adequately protected during its initial hardening by means of damp hessian. Where there is a risk of frost this should be supplemented with plastic sheeting.

The mortar should be rammed as far back as possible into the joint with a pointing tool and left slightly recessed or flush.

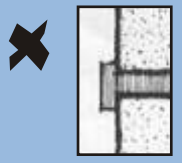
When the mortar starts to harden, the joint should be brushed with a stiff bristle brush (not steel wire) or rubbed with some sacking to expose the aggregate.

COURSED STONEWORK





Flush or slightly recessed



Prominent strap pointing

RUBBLE STONEWORK

Slightly recessed joints, emphasise the shape of the stones

Mortar smeared over the face of the stones produces a half rendered effect

Joints should never be struck, finished proud of the masonry (strap) or feathered over the edges of the masonry as these details damage the wall and appearance. Where the masonry is eroded, the face of the mortar should be kept back to the original thickness of the joint. At the end of each day the mortar should be dampened with water unless there is a risk of frost.

CHOICE OF MORTAR

Most modern mortar mixes are based on cement and sand. This produces a hard mortar that can be harmful to masonry. Cement mortar is impervious to water, so moisture in the stonework is unable to escape through the joint. Water therefore becomes trapped, causing damp in the wall and damage to the face of the stone.

Never copy such pointing even when the building is being partially repointed. It is best to repoint using sympathetic methods and techniques even if the building is left with different types of pointing for a time.

Mortar should always be weaker than the stone around it. Traditionally, mortar was made of lime and sand, ash or stone dust.

Lime based mortars have many advantages over cement mortar mixes. They are more flexible, longer lasting, less harmful to the stone and are more breathable.

MATERIALS

Lime - there are three types: lime putty (also known as non-hydraulic or fat lime); hydraulic lime; and dry hydrated (or bag) lime (see mixes section). A list of lime putty and hydraulic lime suppliers is available on request.

Aggregate - should be clean, well washed, matched against the existing mortar and have a range of particle sizes appropriate to the size of the joint. Wider joints demand a higher proportion of sharp sand (or grit), over building sand.

Other types of aggregate such as limestone dust can also be added to give the correct colour or texture match, provided that the overall proportion of the mix remains the same.

Water - should be clean with minimal amounts added during mixing.

Pozzolanic Additives - these help non-hydraulic limes to set, such additives include brick dust, PFA (pulverised fuel ash), volcanic ash and two forms of fired china clay - metakaolin and HTI powder (high temperature insulation).