

INFORM

INFORMATION FOR HISTORIC BUILDING OWNERS

Repointing Ashlar Masonry



HISTORIC SCOTLAND
ALBA AOSMHOR

Introduction

This INFORM focuses on the practical considerations of repointing ashlar masonry with lime mortar, including surface preparation and mortar application, and also gives a brief overview of the nature and history of ashlar masonry in Scotland.

Although a fairly inconspicuous feature of an ashlar masonry façade, pointing mortar provides a building with its ability to ‘breathe’. Absorption and evaporation of rainwater from the pointing mortar ensures that the core of the building stays dry, and prevents deterioration of the masonry. Repointing ashlar masonry, when required, is a vital part of building maintenance that helps ensure longevity of the building.

A brief history of ashlar masonry

The technique of building with large, regular-sized square-edged stone blocks – ‘ashlar’ – was brought to Scotland by the Romans. The technique fell into disuse but was later revived with the coming of the great monastic orders from the 11th century onwards, used in the construction of their great abbeys and associated building ranges. On the defensive front, the use of ashlar in Scotland’s medieval castles was relegated to the creation of dressed stone surrounds to doors, windows, corners and other structural or ornamental features (Fig. 1). However, in more peaceful times, by the 17th and early 18th centuries, it was being used more extensively to create fine dressed stone façades of the great country mansions such as Kinross, Duff and Hopetoun, and rich merchants’ houses in towns and cities.

Although well-established by this pedigree, it was only from the mid-19th century when stone quarrying and working techniques became more mechanised and economic that it became possible to build domestic dwellings that incorporated ashlar façades (Fig. 2). Found equally on city tenements, villas, and rural farmhouses, this approach to building lasted into the early decades of the 20th century.



Fig. 1 Example of ashlar masonry with letters shown in relief.



Fig. 2 Ashlar buildings became common in Scottish towns and cities during the 19th century.

The nature of ashlar

Due to Scotland's geological diversity, a wide range of stone types have been used in the construction of traditional ashlar buildings although, in most parts of the country, the use of sandstone predominates.

Rough stone blocks extracted from the quarry were carefully cut into masonry units of precise dimensions and given tooled or smooth polished external faces. Edges were cut square and true so that each block could fit precisely with its neighbour when set into the wall. Courses of stones cut to exactly the same height, in random lengths, were laid with a 'broken bond' so that the middle of the blocks on the next course sat directly above the vertical joint on the underlying course, giving the wall maximum load-bearing strength.

The surface finish of buildings with ashlar walling differs from that of rubble walling. The precise shape and size of ashlar blocks results in the formation of very fine joints. Unlike those in rubble walling that typically exceed 10mm in width, the joints and beds in ashlar masonry generally only amount to a maximum of a few millimetres as a result of the accuracy in block cutting in Georgian times (Fig. 3). During this period, the exposed face of the ashlar block may also have been adorned with a chamfer, which created the illusion of V-shaped joints when the blocks were put together (Fig. 4), or tooled to produce decorative patterns.

Water vapour diffusion through lime mortar joints is an important part of how traditional, mass masonry buildings handle rain water; this process is sometimes referred to as 'breathability'. Where the breathability



Fig. 3 Fine joints on a tooled ashlar façade.

of a building is compromised, there can be a number of negative consequences, these include masonry deterioration, internal damp and rotting timbers. The most common cause of such problems is the use of impermeable mortars and/or coatings, the most widespread of which is cement (Figs. 5 and 6).

Cement is a hard, impermeable material that is inherently incompatible with porous stone masonry. Although the impermeable nature of the material should, in theory, keep water out of a building, the fine hairline cracks that form as it sets act as capillaries, drawing moisture into the building (Fig. 7). The inability of the material to ‘breathe’ prevents this moisture from escaping, causing it to build-up and, over time, impose stresses on the masonry that can lead to accelerated stone deterioration.

Practical considerations

The care and attention which was exercised during the original construction process needs to be recognised when repointing work is carried out to ashlar masonry. The precision required to repoint ashlar correctly demands a great deal of time and skill and should not be underestimated.



Fig. 4 Chamfered ashlar masonry.

Prior to commencing work, a survey of the existing pointing mortar should be undertaken to assess the extent to which repointing is required. Repointing of an entire façade may not always be necessary if only part of the original mortar has decayed; mortar that is sound and has no signs of deterioration should be left in place. ‘Patch’ repointing to selected areas is often all that is required, and using a mortar mix similar to the original can help maintain an even appearance. Other situations can emerge where complete façade repointing is essential, for example, where the effects of weathering on softer sandstones has resulted in widespread façade erosion.

It is essential that the repointing mortar is compatible with the existing masonry so as not to cause any, otherwise avoidable, masonry deterioration. Cement-based mortars are typically unsuitable for repointing ashlar. If at some time in the building’s past, cementitious pointing, often as superficial over-pointing (Fig. 8), has been applied, this can sometimes be removed by carefully picking it off without causing additional damage to the stone. Where any existing cementitious pointing material is still sound, or resistant to removal, it will be necessary to evaluate the likely damage that could be caused by leaving it in place, against the

damage which would be caused by its removal. Sometimes the best option is to leave sound existing cement mortar in place and accept its current appearance. Regular inspection can help identify if the cement starts causing damage to the masonry, and when its removal becomes more effective than leaving it in place.

Repointing with lime mortar must be carried out in appropriate weather conditions; lime work should not be carried out in temperatures below 5°C. Mortar should be protected from frost, heavy rain, direct sunlight and strong winds using hessian (or other appropriate)

sheeting. In warm, dry conditions, hessian should be regularly misted with water. Neglecting to adhere to these aftercare precautions can result in the failure of the mortar due to frost damage or rapid drying.

Preparing ashlar for repointing

Care must be taken, and the appropriate tools used, in the preparation of ashlar for repointing if damage is to be avoided. Decayed mortar should be removed ('raked out') by carefully picking it out with a thin steel hook, or by easing the redundant



Fig. 5 Projecting cement pointing causing stone deterioration (© I. Maxwell).



Fig. 6 Cement coating smeared on stone. The fine original joints can be seen where the superficial cement pointing has failed and detached causing considerable damage to the masonry.



Fig. 7 Cement coating over ashlar showing crazed cracking over the surface.



Fig. 8 Superficial over-pointing of stone with cement mortar.



Fig. 9 Damage caused through the use of inappropriate power tools for removal of pointing mortar (© I. Maxwell).

material out by means of a handheld hacksaw blade inserted into the joint and gently pulled forward. It is generally not advisable to use power tools to cut out the decayed or loose mortar from the fine joints due to the risk of damage to the stone (Fig. 9), although, when used by a highly skilled operative good results can be achieved. Traditional hand tools such as chisels can equally cause damage as these simply do not provide the precision required for the fine joints in ashlar masonry.

Open joints should be flushed out with a low pressure jet of clean water to remove all traces of dust and debris that might prevent the new mortar from bonding with the stone. Additionally, damping down the stone before application of the mortar prevents the mortar from drying too quickly. Before applying the mortar, it is advisable to tape over the stones' arrises (edges) with heavy duty sticky-

backed tape, or similar material, to protect the adjacent stones against staining and mechanical damage during repointing (Fig. 10). Care should be exercised in the choice of tape as some brands can leave an adhesive residue on the stone's surface that can be difficult to remove (Fig. 11). Before work starts, the chosen tape should be tested in a discrete location to determine if this will happen.

Repointing ashlar

Due to the fineness of ashlar joints, mortars made using coarse sands, typically used for pointing rubble masonry, are not suitable for pointing ashlar. Ashlar pointing mortar was historically made using lime putty and whiting (crushed chalk) with a little linseed oil – a mix that is still used today.

Repointing mortar should not be spread over the face of ashlar masonry, but carefully limited in its application to the thickness of the joints surrounding each block. To assist with the process of inserting this mix into the joints a small quantity of natural (horse) hair can be added into the mortar before use. If the mortar also needs to include fine sand or stone dust as an aggregate (for matching to the original pointing mortar), the particle size should be no larger than one third of the minimum joint width. Analysis can be carried out on the original mortar to provide information on the constituents if matching is required.

Lime mortar can be inserted into the narrow ashlar joints in three ways – by using a suitably dimensioned thin tool that easily fits into the joints (Fig. 12), such as a pointing key or steel blade, by pressing in the mortar from the face of the stone, or by careful injection using a proprietary tool. Each technique

has advantages and disadvantages, and a combination of techniques may be required on one job. The techniques used will depend, to a large extent, on the preferred 'tried and tested' working methods and the level of craft skill of those working on the job. Whichever system is employed, it is important to ensure that an adequate depth of mortar is inserted into the joint – a minimum of 30 to 40mm is usually advisable.

As the mortar starts to set it should be tamped back with the tip of a bristle brush to eliminate any shrinkage cracks. Once it has firmed up sufficiently, the mortar surface can be finished by lightly scraping with a small wooden spatula or similar instrument. Where protective tape has been used, this should only be removed once the mortar is sufficiently dry but before it becomes hard; this allows any disruption to the mortar caused by the removal of the tape to be easily pressed back into place.



Fig. 10 Taping around joints to prevent staining and damage of stone (© I. Maxwell).

Care should be taken to avoid spilling any of the new mortar onto the underlying stone faces. This can cause staining that is difficult to remove. Permanent staining is less likely to occur if the mortar is of the right consistency, and if the stone surfaces are dampened before pointing work starts. Any accidental spillage or smearing should be washed off immediately with a fine jet of clean water, but this could be avoided in the first place by setting some temporary protection in place below the work area to contain any spillages.

Ashlar walling was frequently constructed with slightly tapered blocks to assist in achieving very fine joints on the face. As a result, the vertical joints, and sometimes the horizontal joints, may be considerably wider within the depth of the wall. If this is the case, it may be necessary to place a backing or plugging of waxed string or similar material, or a wedge of hair mixed with lime mortar, to prevent the new mortar from disappearing endlessly into the depth of the wall.

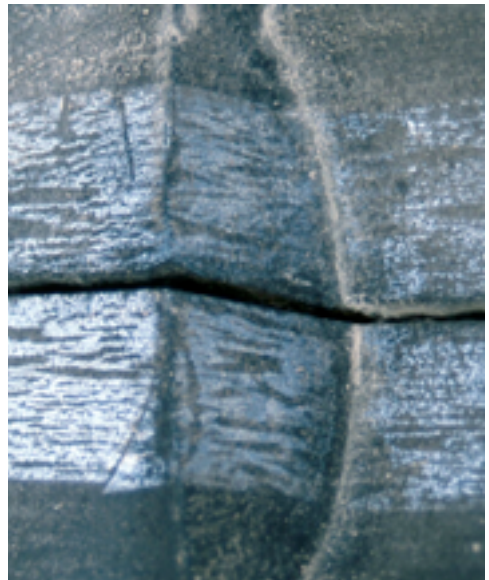


Fig. 11 Residue left on stone surface from sticky tape (© I. Maxwell).



Fig. 12 Repointing ashlar using a fine pointing key.

Conclusion

Lime mortars play an important role in traditional buildings, helping them to 'breathe' by dispersing the moisture absorbed during periods of rainfall. Ensuring that ashlar repointing is carried out using appropriate materials and techniques will reduce the chances of moisture penetrating the masonry, and the associated negative impacts such as masonry deterioration, damp interiors and rotting timbers, that can otherwise arise.

Further reading and contacts

Historic Scotland Conservation Directorate (technical advice)

E: hs.conservaiongroup@scotland.gsi.gov.uk
www.historic-scotland.gov.uk/conservation

Historic Scotland Heritage Management (planning/listed building matters)

E: hs_heritage_management@scotland.gsi.gov.uk

Scottish Lime Centre Trust

Charlestown Workshops, Charlestown,
Fife, KY11 3EN
T: 01383 872 722 www.scotlime.org
E: info@scotlime.org

Building Limes Forum

Glasite Meeting House, 33 Barony Street,
Edinburgh, EH3 6NX
E: admin@buildinglimesforum.org.uk
www.buildinglimesforum.org.uk

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HISTORIC SCOTLAND
ALBA AOSMHOR

Principal author: Ingvál Maxwell and Dr Clare Torney
Published by Historic Scotland 2008, revised March 2014
Historic Scotland, Longmore House, Salisbury Place, Edinburgh EH9 1SH
Tel: 0131 668 8600 Fax: 0131 668 8669
www.historic-scotland.gov.uk email: hs.conservaiongroup@scotland.gsi.gov.uk

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