Match Mortars

Brick Stone Pointing

and stone

Restoration

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At Match Mortars our aim is to help home owners understand the problem and offer them the solution.

If you own a sandstone building and you have decaying sandstone you will find the problem causing the decay in these pages.

INTRODUCTION

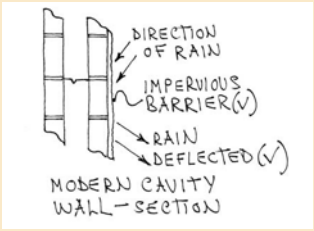
You will find handy advice for the guidance of property owners when commissioning repairs to traditional sandstone buildings. A little background information on construction types is helpful so that the reader can understand why cement mortar is not appropriate for sandstone walls. The Advice Note starts with an explanation of wall types before moving on to discuss appropriate, and inappropriate, repairs.

WHAT IS SANDSTONE?

Sandstone is a sedimentary rock created by the depositing of layers of minerals over a long period of time. The layers were then compacted together resulting in the solid material that is referred to as sandstone. A good way to visualise a block of sandstone is as a thick book that has been laid on its back.

Sandstones vary in their mineral composition and in their physical characteristics. Sandstones tend to be rich in clay-based minerals. Cement mortar can accelerate the rate at which they decay another variable characteristic of sandstones is their density. All sandstones contain a network of pores, the amount, size and distribution of which varies from one type to the next. Most local sandstones have very little pore space so they rely on the joints to allow moisture to evaporate from their surfaces.

WALL CONSTRUCTION AND WEATHERPROOFING



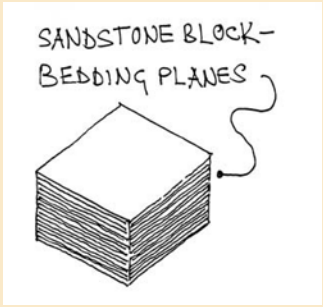
Up until around the beginning of the 20th century, most walls were built using a technique called mass wall construction. Mass walls are solid throughout their depth and have an average thickness of around 550 millimetres, or 22 inches. A mass wall is designed to absorb rainwater, hold it within the outer part of the wall, and then release it to the atmosphere as vapour after the rain stops. Most local sandstones have very little pore space so most of the evaporation is through the mortar joints. Bear this in mind in the section on mortar types. Modern, cavity walls consist of an inner and an outer wall with a gap in between them. The two walls are held together with metal fixings known as 'ties' This type of wall is now used almost universally in modern house construction. A cavity wall is designed to keep water out by presenting an impervious barrier to the weather. It is for that reason dense bricks and renders are used on the outside face of the building so that water cannot get into the interior of the building. As a safeguard, the ties on cavity walls have a detail known as a 'drip' in the middle to prevent any water that gets past the outer wall from travelling across the cavity. Mass walls can be described as flexible and absorbent. Cavity walls tend to be inflexible and impervious. Neither of these comments should be regarded as adverse; they just describe how the two wall types behave. These differences can also be used to distinguish lime mortars from cement mortars, the next topic of discussion.

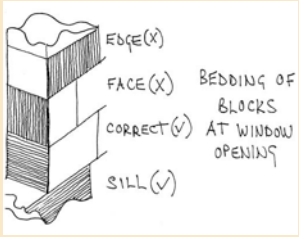
MORTARS

Mortar consists of two components - aggregate which is made up of sand particles, and a material to bind the aggregate together. Lime as a binder for mortars has been in use for thousands of years and was in general use until the beginning of the 20th century. The aggregate for lime mortars should generally be in a range of sizes and should be sharp and angular. Ordinary Builder's Sand is unlikely to be suitable as the aggregate for adding to lime in order to make mortar. For the purposes of this discussion it is sufficient to mention how lime mortar handles moisture. A mass wall absorbs water, holds the water within the wall, and then releases it back to the atmosphere. The small size and number of pore spaces in local sandstones means they rely on the mortar joints to allow the free passage of moisture to the atmosphere. Lime mortar is ideal for this purpose and in the case of a mass wall it is essential. Anything that prevents the joints from breathing leads to the characteristic powdering and breakdown of local sandstone. One of the main causes of decay is cement mortar for reasons we shall discuss next. Before doing so it is worth mentioning the inherent flexibility of lime mortars. Mass walls expand and contract in response to temperature changes, ground movement and changes in moisture content. Lime mortar is a flexible material that can accommodate expansion and contraction without cracking. Walls built from cement mortar usually need expansion joints to accommodate movement. Cement mortar sets rapidly to create a dense, impervious material. This is ideal for cavity walls that rely on physically keeping out the rain. In a mass wall, where the mortar joints are crucial as evaporation routes, the use of dense cement mortar is not advisable. Cement mortar is also less flexible than lime mortar so it cracks if subjected to excessive movement. The physical properties of cement mortar allow water to enter through these cracks where it is trapped and is then unable to evaporate easily. Cement mortar is a good material when used for the correct purpose but it was never meant for mass walls where moisture absorption and evaporation is an essential aspect of the technology. In effect, applying cement mortar to a mass wall is to use the material for a purpose for which it was not designed.

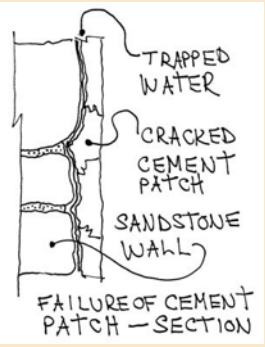
DEFECTS

A block of sandstone might be thought of as a book lying on its back - the layers of sediment can be likened to the individual pages in the book. Look at a sandstone wall - these layers, or bedding planes, are often clearly visible In construction, the bedding planes should usually run at a right angle to any load that is placed upon the block. Think of the book analogy and the reasons become clear. The load placed upon the 'book' presses the 'pages' together instead of causing them to buckle and split apart. Unfortunately, local sandstone blocks are often too shallow in depth to allow them to be 'correctly bedded'. It is common to see blocks laid incorrectly, either 'face bedded' or 'edge bedded', most often on deep blocks around openings and at the corners of buildings. Stonemasons refer to this as 'on cant' and it causes delaminating of the block as the individual layers separate from one another. Usually, a thin layer of stone detaches itself from the surface of the block of masonry.

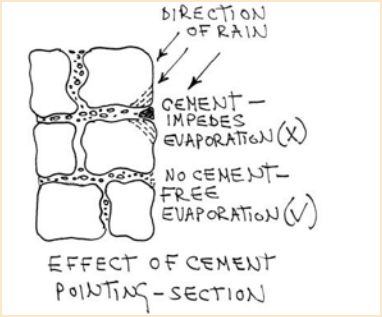




'Contour scaling' appears similar to delaminating masonry but it has different causes. It also takes the form of a thin layer detaching itself from the surface of the block. However, the layer runs at right angles to the bedding planes and it was probably caused by the action of water on the claybased minerals in local sandstones. Polished ashlar walls are particularly prone to contour scaling because water tends to have less surface area from which to evaporate and the joints, which are crucial as evaporation routes, are very thin which restricts the rate of evaporation. A common method of repairing delaminating and contour scaling masonry is to 'face up' the defective block with cement mortar. That is not advisable for several reasons: The cement mortar does not replace the load-bearing material that has been lost. Structural failure requires structural repairs, not facing up in cement mortar. The different rate of expansion and contraction between the cement mortar and the sandstone will eventually lead to the two materials separating, a phenomenon referred to as 'bossing' The use of adhesives is sometimes used to strengthen the bond but this often leads to the cement mortar patch pulling part of the sandstone off instead. Water gets trapped behind the cement mortar and accelerates the rate at which the surrounding sandstone decays. If pieces of cement mortar break loose they fall to the ground which causes a hazard to persons directly underneath the building.



Other defects include pieces of sandstone falling away from the underside of cornices, lintels and other blocks that project from the wall. Facing up in cement mortar is a common response but, for the reasons just described, it is not a proper repair. It is also common to find cement mortar used for pointing on sandstone walls. As with cement mortar facing, its undesirable effects are only too evident. Its use leads to the same problems of failure of the cement mortar, trapping of water within the wall and further damage to the sandstone itself. Look at any sandstone wall where there is evidence of surface decay and it will become clear that many have been pointed with cement mortar. The damage that cement mortar facing and pointing can cause is made much worse in areas that are subject to repeated washing with water. If the wall is faced or pointed with cement mortar, the rate of decay increases significantly. The clay minerals expand and contract repeatedly leading to increased delaminating of incorrectly bedded blocks and contour scaling of blocks that are correctly bedded. When the temperature drops to freezing point any water trapped in the wall freezes and expands causing further damage, commonly around the area where the sandstone and the cement mortar meet. In walls where cement facing and pointing is extensive, water can build up inside the wall and fungal decay can develop in the internal timbers of the building. All of this is caused by dense cement mortar blocking the free evaporation of moisture from the wall because the wall cannot breathe in the way it was designed to do.



Cement mortar facing and pointing can make a wall less thermally efficient than one built with lime mortar only because water can be trapped rather than evaporating away. Water is an efficient conductor of heat so prolonged wetting of mass walls covered in cement mortar will reduce the thermal efficiency of the building. A brief word about clay bricks is necessary. Many chimneys, and some traditional buildings, are built from soft, and porous, clay bricks. These structures absorb and evaporate moisture so they will react adversely to the application of cement mortar facing and pointing. When clay bricks are pointed with cement mortar, sometimes the face of individual bricks bursts off, or ‘spalls’. It is mistakenly assumed that the brick is too soft but the brick structure had probably performed perfectly well for decades, and longer, until it was pointed or faced in cement mortar.

The advice in this brochure also applies to free-standing garden walls as well as the walls of buildings.

The solution
Sandstone pointing with lime mortar.

Masonry walls need to be maintained and repaired, just as roofs and rainwater goods do. Where walls are solid, without a cavity, keeping them in good repair is necessary for the interior to remain functional and dry. Pointing is the most common repair, and often one of the most poorly executed.

The two main reasons for lime-pointing repairs are:

- The original lime pointing has decayed over time and needs to be replaced. This may be the result of gradual decay through weathering, or failure as a result of poor maintenance. Blocked gutters or overflow pipes, for example, lead to damp masonry and can result in frost damage.
- The masonry has been re-pointed with a cement-based (or other inappropriate) mortar at an earlier date, which is causing problems to the building and/or the adjacent masonry and must be replaced with a more appropriate

The solution;
Sandstone surface repair with lithomex.

This specialist material is pre-mixed to British standards under heritage guidelines for historic stone masonry repair. Stone repair mortar is a blend of natural minerals and aggregates in a natural hydraulic lime binder. It contains no cement therefore your repairs will be totally breathable and vapour permeable. The mortar mix is suitable for most types of sandstone and limestone but we can arrange to manufacture the mortar to match specific stone at additional cost if you supply us with a sample. The aggregates and mineral content will be varied to match the texture and colour of the stone sample you provide.

For specialist advice about this material and natural stonework issue, please make an enquiry to wwwmatchmortars.co.uk We'll be interested to hear about your stone repair project and we can offer you friendly, expert advice with a FREE estimate.

With Lithomex (see below) this what can be created;
The appearance of natural stone.

Lithomex comes in a variety of natural colours,
which can be matched to your existing colour of stone.
Whether sandstone granite or clay brick.

(For more information on this product please visit our website www.matchmortars.co.uk)

GLOSSARY

Aggregate: The material added to cement or lime to make mortar.

Ashlar: A type of wall built from blocks with very thin joints. Usually the face of the block is smooth.

Bedding plane: Individual layers of sediment in a block of sandstone.

Binder: Material used to bind the aggregate together in order to make mortar.

Bossing: Separating of the surface layer from the main area of the wall.

Cant: (usually 'built on cant') A term used to describe a block that is incorrectly bedded.

Contour scaling: The detaching of thin layers of sandstone from individual blocks. 'Contour scales' run at right angles to the bedding planes and should not be confused with the different phenomenon of 'delamination'.

Delamination: Often mistakenly referred to as 'scaling'. Delamination is the separation of the bedding planes from one another.

Facing Up: Applying patches of cement mortar over sandstone. Joints: The point where individual blocks are joined together. Horizontal joints are often referred to as the 'bed joints' - vertical joints are called the 'perpends'

Needle gun: A compressed air tool that is used for de-scaling sandstone. Very aggressive and requires formal approval from Angus Council on listed buildings and buildings in conservation areas. The use of a needle gun is not recommended.

Pointing: Filling mortar joints with mortar. Usually describes replacing defective/missing areas of mortar.

Pointing Key: A standard pointing trowel is fine for general building work but a special pointing 'key' that varies in width, depending on the width of the joint is required for traditional building repairs.

Pore Structure: The size and number of pores in a block of sandstone. The porosity is measured by individual pore size and as a percentage of the overall volume of the material.

Quoins: Pronounced 'coins' - The blocks at the corners of a wall.

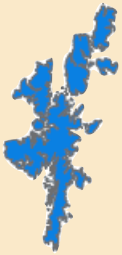
Rybats: Pronounced 'rye - bats' - The blocks that form the margins of an opening, particularly windows. Also referred to as 'inband and outband' and 'long and short work'. The long vertical stones sometimes used to form margins to openings are not called rybats but 'jamb stones'

Slaistering: Where mortar is smeared over the face of the wall. It is a bad technique on ashlar walls and on walls built from regularly sized blocks with regularly sized joints but is traditionally used on rubble walls. Sometimes termed 'harl pointing'

Spalling: Often used incorrectly to describe contour scaling, delaminating or general powdering of the masonry surface. True spalling is usually caused by water freezing while in the wall which then causes small areas of masonry to burst off. Spalling is uncommon on local sandstone because they tend to be very dense but common on clay brick walls and chimneys if the bricks are porous.

Stugging: The finish on a sandstone block that looks like a series of small indentations. This is one of the commonest types of surface finishes on sandstone walls in Angus.

FREE ESTIMATES THROUGHOUT SCOTLAND



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