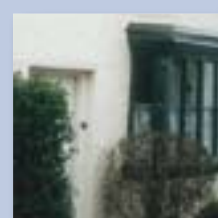


A TECHNICAL ADVICE LEAFLET ON THE USE OF

Lime Render

on Historic Buildings in South Gloucestershire

This leaflet is one of a series of non-statutory guidance notes produced by South Gloucestershire Council in support of its Local Plan policies relating to historic buildings.



Contents

page

2 Introduction

3 What goes in to a lime render?

- Lime
 1. Non-hydraulic lime
 2. Hydraulic lime
- Aggregate
- Hair
- Other traditional additives

5 What should NOT be included in a lime render?

- Cement
- Waterproofing materials

6 Render mix

6 Application

7 Rough cast finish

7 Lining out

8 Details

8 Problems setting

9 Render failure

9 Repairs

- Surface preparation
- Patch repairs

10 Finish-paint/colour

11 Permissions required

11 Further information

11 Contact Information

This leaflet gives general advice on the use of lime render on historic buildings. It is not intended as a comprehensive guide or specification. Each property requires individual consideration. Prior to using lime render on an historic building contact South Gloucestershire Council's Conservation department and seek independent professional advice.

Introduction

Render was originally used to provide a protective covering to stone or brickwork. Many rubble stone buildings in South Gloucestershire were originally lime-rendered, and/or lime-washed and render is a distinctive local feature which should be retained.

There are a wide variety of traditional render finishes. Render used on traditional vernacular buildings could consist of just a single layer, not much more than a very full dubbing out coat, used purely as a method of weatherproofing. Buildings of greater architectural pretensions were often finished with a smooth 'stucco' render, consisting of several different layers.

The final coat was often lined out with the aim of appearing like very fine stone ashlar.

The most common traditional render finish in the South Gloucestershire area is rough cast. This has a rough-textured finish derived from the final coat of aggregate (*rough stuff*) which was traditionally thrown onto the surface. Rough cast is not the same as pebble-dash, which is a modern, cement-based form of render. Rough cast is a lime-based render and should never be replaced by pebbledash

Historic buildings do not have a 'shelf life'. If there are no inherent faults and they are regularly maintained and repaired using appropriate materials, they can be preserved indefinitely. The appropriate use of traditional lime renders and mortars on historic buildings contributes to their preservation, and helps to maintain the historic character and local distinctiveness of an area.



What goes into a lime render

Lime

Lime is used instead of cement as the binding agent for the render. Lime is a staple of historic building construction and is used in renders, mortars and internal plasterwork. Due to its caustic properties, it requires careful handling, however once a lime render has set it is very durable.

The benefits of using lime are that it allows for moisture to evaporate, and can accommodate limited movement without cracking. Its slower set also allows for greater workability.

Lime render allows a traditional building to 'breathe' in the way that it was designed

Building lime is traditionally made by burning chalk or limestone in a kiln, to produce quicklime. Water is then added to the quicklime and once enough water has been added a lime putty will be formed. The process of adding water to quicklime to produce lime putty is known as slaking. Slaking is a dangerous process but fortunately lime is now available in a prepared form and no longer has to be slaked on site.



There are two types of lime available:

1. **Non-hydraulic or fat lime.** This is the most widely used form of lime, particularly for pointing and internal plasterwork. Non-hydraulic lime stiffens and eventually hardens by reacting with carbon dioxide; a process known as carbonation. Non-hydraulic lime is most commonly available as lime putty, which is supplied to site covered by a thin film of water in air tight tubs, to minimize the risk of carbonation. It will not set under water.

Most builders merchants supply a dry form of non-hydraulic lime which can be used like lime putty if allowed to soak in water for a while, (*a minimum of 48 hours is advised*). Known as 'dry-hydrated' lime or 'bag lime', it is generally considered to be inferior to lime putty, as it can have been stored for a very long period of time, and an unknown proportion will have reacted with carbon dioxide by the time it reaches the site. Good quality, non-hydraulic lime putty is superior to dry-hydrated lime and should be used wherever possible.



Lime putty should be at least three months old before use, and continues to improve with age (*if stored correctly*). Lime putty is available from an increasing number of specialist lime suppliers and is also stocked by large builders merchants.

2. **Hydraulic lime.** This will set under water because of a chemical reaction with clay or silica occurring with the lime. It is harder than non-hydraulic lime, and can be too hard to use on some soft stones, so the strength should be carefully checked before use. Hydraulic lime is usually supplied as bagged (*dry*) lime.

Modern bagged hydraulic limes, marketed as 'natural hydraulic limes' (*NHL*), are classified in three ascending numerical grades of compressive strength at 28 days, expressed in Newtons per millimetre squared, as NHL 2, NHL 3.5 and NHL 5. These grades are broadly equivalent to the old classification of 'feebly', 'moderately' and 'eminently' hydraulic limes respectively. Unlike cement, they maintain good water vapour permeability and the ability to accommodate movement).

Aggregate

Lime is mixed with an aggregate to produce render. The aggregate mix will vary according to the wall but will normally include sand which is well graded, well washed, and sufficiently 'sharp' to work with the lime to provide a good mix. Well-graded sand for an external render will usually contain a range of particles from fine to coarse, with sharp, not rounded edges. This allows the render to achieve a proper 'grip'. For coarser render coats, small pebbles and stones are usually mixed in with the sand. It is important that sand and stones are clean and kept clean on site. Impurities and clay content in sand can cause problems with a render set and marine and dredged sands should always be washed before use.

Hair

Animal hair has traditionally been used as a binding agent within base coats of external renders as well as internal plasterwork. It helps add flexibility to the coat and reduces shrinkage. Once hair is added to a mortar it should ideally be used immediately.

Other traditional additives

Traditional additives to assist setting included brick dust and china clay and are known as pozzolans. Their performance can be unpredictable and may cause a render to fail by precipitating too fast a set.

A number of specialists can now provide ready mixed lime mortars. These are usually supplied in tubs or plastic sacks and can be stored indefinitely if protected from the frosts. Special mixes incorporating particular sands or hair can be made on request.

What should NOT be included in a traditional lime render

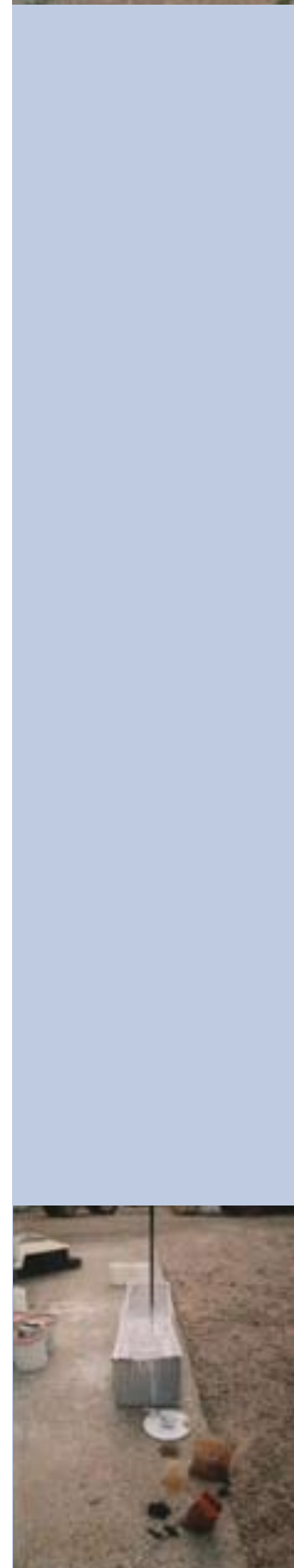
Cement

Small quantities of cement should never be added to lime render mixes to help the render set. Cement will restrict the movement of moisture from the building and not allow it to 'breathe'. This can lead to the stone or brick becoming saturated with water and decaying. Most of the stone used in the South Gloucestershire area is soft, and even a weak cement mix will be too hard. If a quick set is required, it will always be better to use a weak hydraulic lime.

Cement should not be used in renders for traditional buildings

Waterproofing materials

Many mixes for modern renders include a waterproofing agent. Traditional renders use a different technology, allowing walls to dry out by the transfer of moisture through the lime-faced walls. Modern waterproofing agents inhibit the transfer of moisture and should not be used for traditional building work.



Render mix

Traditional renders are made up of a number of layers:

- a) Laying-on coats (*usually 2 or more*)
- b) Butter coat (*1, not always used*)
- c) Finishing coat

Traditional render mixes vary, but are normally in the range of 2 lime: 5 sand/ aggregate for the laying on coats and 1 lime:3 aggregate for the finishing coat. The layers should be made weaker as they are built up - i.e. they should have a higher aggregate content - and normally becomes less thick, with a finer aggregate. (*except with roughcast*)

The number of coats and recommended strength would depend on the substrate and the level of exposure.

Application

Once the wall surface is prepared it should be made wet - but not soaked - to ensure that moisture is not drawn out of the applied render, so that it does not dry out too fast.

The first laying-on coat is then applied to a depth of about 9-16mm. This coat is then scored to provide a key for the next layer, and covered with damp hessian, (*not plastic sheeting which prevents drying*) to protect the render from excessive heat or frost to allow a gradual set. Sometimes the first laying-on coat is more like dubbing out, but this depends on the situation. There are also different approaches to the way in which the coat is scored to provide a key for the next layer.

The next coat should not be applied until the whole depth of the first laying-on coat has been allowed to 'cure' or set. Drying times for the undercoat should be approximately 2 days in summer and 7 or more in winter. Sometimes a render will be sprayed with water after application to stop it from drying out too fast.

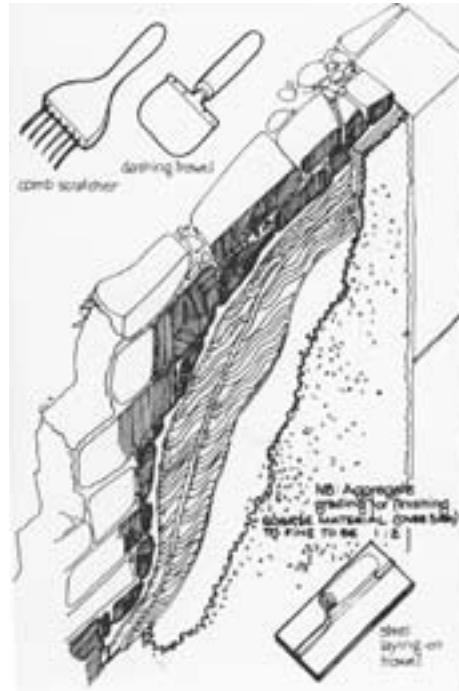
The number of laying-on coats will vary according to the wall and type of building, but should normally be finished by a finer butter coat, which prepares the surface for the top coat. The butter coat should have a finer aggregate and be less thick than the laying-on coats. If the aggregate is very fine then addition of animal hair may be used to stop crazing. The butter coat should be around 9mm thick.

The finishing coat should normally only be a few millimetres thick (*3-9mm*), of a 1 lime:3 aggregate mix. It is normally finished with a wooden or plastic float to make sure that it is properly compacted and to give a fairly smooth surface finish.



Rough cast finish

For a traditional roughcast finish the laying-on/base coats will be applied in the same way as a smooth render, however coarse aggregate is mixed with wet lime binder for the final coat. The lime mix is thrown - or flicked - from the dashing trowel onto the wall, and not pre-mixed and spread. This 'flicking' gives the render a distinctive appearance and allows for the aggregate to be properly compacted, but it has to be thrown quite hard to make sure that this happens. Historically, bundles of twigs were used to apply the finish coat. As large an area as possible should be covered with each throw. Bunching of aggregate should not be spread with a trowel, but removed and re-thrown.



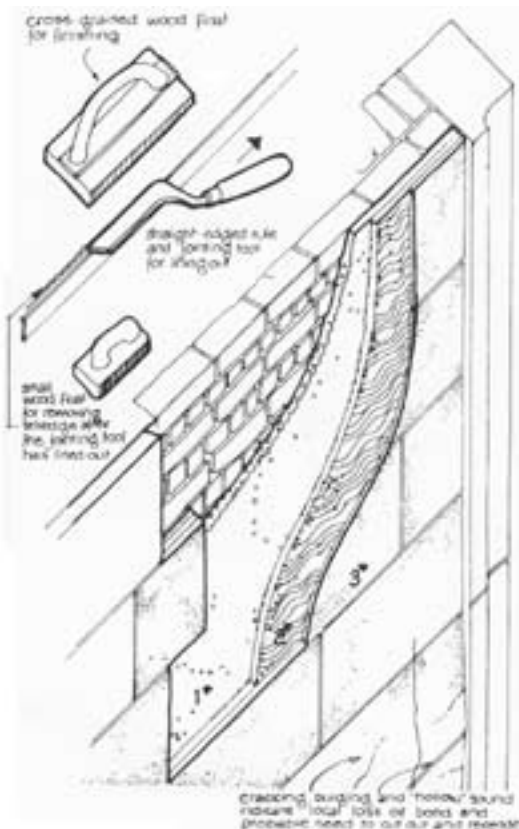
Drawing reproduced by kind permission of John Ashurst

A rough cast render should always be weaker than the substrate (*building material*) to which it is applied.

Roughcast is an important feature of the South Gloucestershire area. It has particularly good weathering properties, because its large surface area encourages evaporation

Lining-out

Lining-out is the method of running very fine lines across a smooth render to create the illusion of finely jointed stone ashlar. Render should only be lined-out where there is previous evidence for it. Lining out should exactly follow the pattern of the original and be indented to appear like mortar joints, not just scored with a trowel. There are also a small number of buildings within South Gloucestershire with historic lined out roughcast render.



Drawing reproduced by kind permission of John Ashurst

Details

Lime renders are traditionally swept over window heads without weathering details. Corners should be formed by hand without the use of metal or plastic angle pieces or beading. Corner stones – or quoins – and header arches over windows or doors are not normally expressed separately from the rest of the render surface unless the quoins are pronounced.

Problems setting

Unlike gypsum plasters, lime is layered in coats, and render is likely to fail if the individual coats have not 'cured' (*carbonated*) properly. There is no failsafe method of applying lime render, but practice and working in good weather conditions will help considerably. Frosts should always be avoided as the cold temperature will significantly reduce the ability of the render to carbonate (*set*). The mortar will only become strong once it carbonates. In freezing conditions the render may take a month or more to carbonate, and can therefore fail.

Spraying new render coats with water in hot or dry weather will help to avoid too fast a set, as will protecting the wall with damp hessian. Remember too that if the coat is too thick it may cure unevenly. Any voids in the underlying stonework should therefore be filled before rendering starts.



Stone quoins correctly pronounced from render



Render correctly swept over the head of the window



Render incorrectly pronounced beyond stone quoins



Stone quoins incorrectly expressed separately from the render. The render should be swept over the corners of the building, with no quoins.

Render failure

If a render has failed it is important to identify the cause and resolve the problem before repairs are undertaken. Likely causes of failure include:

1. Poor building maintenance

Where failing rainwater goods or flashings, for example, have allowed a wall to become saturated.

2. Too hard a render

Where a hard cement render has been used, this will not accommodate movement or allow moisture out, and can cause the render to shear away from the wall in patches, or sections.

3. Poor detailing

Where metal beads have been used but have rusted and thrown the render off.



An example of cement render which has sheared away from the stonework, allowing water penetration and the growth of vegetation within the voids of the walling stone.

Repairs

Surface preparation

Where repairs are proposed, all 'blown' sections should be cut back to sound material. Sound render should not be forced off the wall as it can permanently damage the wall below. Once all sections of loose render have been removed the wall should be cleaned and any plant growth or loose material removed by hand. An adequate key should be provided and all hollows in the background dubbed out.

Patch repairs

If the remaining render is sound it may be preferable to patch-repair. If patch repairs are proposed, the sound render should be undercut to allow the new section to bond, and to minimise difference in movement between the sections.



Finish - paint/colour

Traditional renders took the colour of the local earths through their aggregates. If local aggregate is no longer available, pigments can be used in the mix to match local colouring. Natural earth pigments include a wide variety of ochres such as sienna, burnt sienna, umbers and yellow ochre. It is important to finish renders in a traditional colour, and avoid unnatural, modern colours or over colouring.

Lime in the render will cause some artificially produced pigments to discolour, or even turn black and sample panels should always be prepared.

Lime-based renders are usually protected by coats of breathable finishes, the most common of which is limewash. This is a weak suspension of pigment in a lime solution where the lime provides the binding agent. Once painted onto the surface of a wall, it will set, and protect the underlying render. Commercially-produced limewashes are available.

External limewashes traditionally included tallow or raw linseed oil to provide some degree of weatherproofing, but without stopping all transfer of moisture. Pigments were traditionally added to the limewash to give a range of coloured finishes. Lime suppliers and some decorator merchants will be able to advise on appropriate additives and can supply limewash and colourwashes in ready mixed form.

External quality limewash should be applied as a final coat

It is not advisable to use plastic or cement-based paint finishes. These will reduce the ability of the render to breath and can undo the benefits of using a lime render.

Whilst micro-porous paints will allow the render to be more breathable than a weatherproof paint finish, they do not have the same slight colour variation that gives life to a traditional limewash.

Make sure that render is painted with a 'breathable' finish such as a traditional limewash.

It is important to finish renders in a traditional colour, and avoid unnatural, modern paint colours.



Permissions required

Rendering can affect the character and appearance of a building. If your building is listed, you will probably need to apply for Listed Building Consent to re-render. Contact the Council's Conservation Team for further advice.

Planning permission may also be required for rendering buildings within a conservation area.

If in doubt it is best to contact the South Gloucestershire Planning Contact Centre on 01454 868004.

A sample panel of render may also have been required as a condition of consent. Remember to allow enough time for this to be prepared and inspected before work starts on site.



Sample panel of render

South

Summary

- ▶ **Lime render allows a traditional building to 'breathe' in the way that it was designed.**
- ▶ **Cement should not be used in renders for traditional buildings.**
- ▶ **Roughcast is an important feature of the South Gloucestershire area.**
- ▶ **Rough cast is a lime-based render and should never be replaced by pebbledash.**
- ▶ **Never try to use lime render when there is a risk of frost as the colder the climate the slower the render will carbonate (set). In freezing conditions the render may take a month or more to carbonate, and can therefore fail.**
- ▶ **Covering a newly rendered wall with damp hessian will help protect it from drying out too fast in hot weather.**
- ▶ **Before starting to render check that the wall is in good repair and has been pre-wetted.**
- ▶ **Lime render should be painted with a 'breathable' finish such as a traditional, external quality limewash.**

Further information

The Society for the Protection of Ancient Buildings (S.P.A.B) publishes a series of technical advisory leaflets - including a number relating to lime in buildings - and provides specialist technical advice to its members. Tel: 0207 377 1644. It also has a useful website at www.spab.org.uk

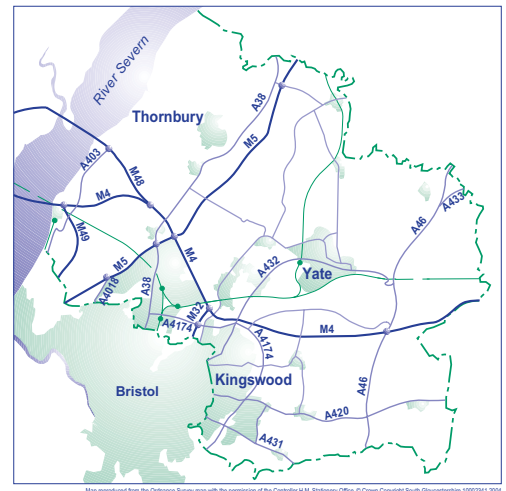
English Heritage's free technical advisory leaflets are available from www.english-heritage.org.uk. Publications can be ordered on 0870 333 1181.

A number of companies also run lime training days for professionals, contractors or home owners. The Council's Conservation Officers should be able to advise on local courses.

Contact Information

The Council's Conservation Officers can be contacted on 01454 863464/ 863465/ 863578. Further information is available from the Council's website at www.southglos.gov.uk

The Council's Conservation Officers can advise on specialists who supply lime products, including internal lime plasters, external lime renders, and paints and finishing products including limewashes.



This information can be made available in other languages, in large print, Braille or on audio tape.

Please phone 01454 868004 if you need any of these or any other help to access Council services.

For more information about this publication contact 01454 863467

Produced by South Gloucestershire Council
Design + Print Services
ref: 5010/12/09

Printed by South Gloucestershire
printed on recycled paper
75% Post Consumer Waste

Date of Publication December 2009

www.southglos.gov.uk