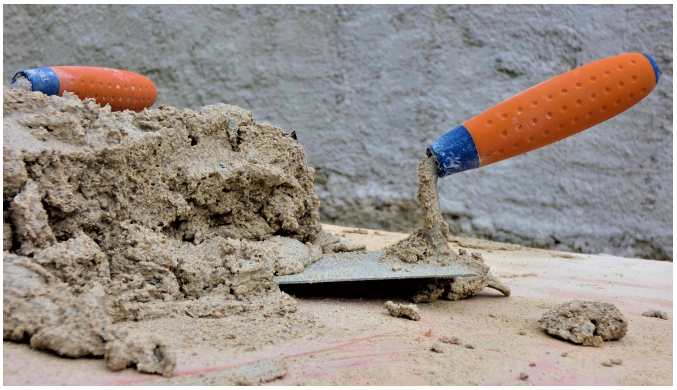
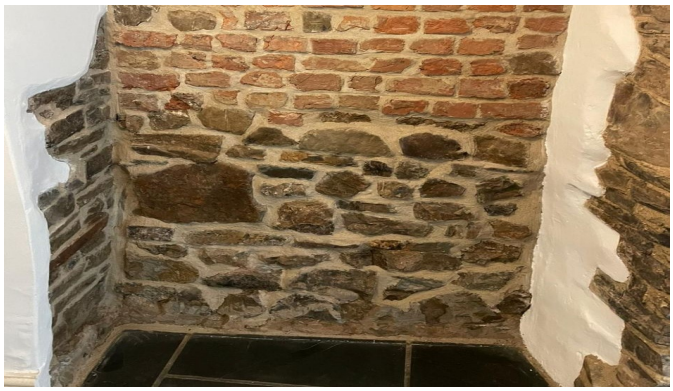
A Practical Guide to

Traditional Building Maintenance

Cob and stone repairs, lime pointing, lime rendering and plastering, dealing with dampness and decorating sympathetically





MIKE WYE

THE SUSTAINABLE BUILDING AND DECORATING SPECIALISTS

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MATERIAL SUPPLY

The materials mentioned in this guide are either manufactured or supplied by Mike Wye Ltd. Most material are available from stock and can be delivered anywhere in the UK. From a small parcel to full articulated lorry deliveries, call our friendly and knowledgeable team on 01409 281644 to discuss your needs. Details of all our products and prices can be found via our website www.mikewye.co.uk.

	**Lime putty** is the oldest form of lime and can be used to create limewash, plasters, mortars and fine decorative plasters. It is supplied in easy to handle plastic tubs for customers to make into their own usable finished product. Lime putty literally lasts indefinitely when stored correctly and improves with age. Lime putty mixes usually benefit from making a couple of weeks before use and storing away before knocking up again on the day of use. We can advise on the best sands if you intend to go down this route.
	**Pre-mixed lime putty mortars and plasters** can be supplied in a range of sizes from 20kg tubs up to 1,000kg dumpy bags. Once animal hair has been added the hair has a fairly short time span and should ideally be used within a month of being mixed. External lime putty mortars benefit from the addition of a pozzolan, a traditional accelerator, to protect from adverse weather - particularly frost.
	The **paints, oils and waxes** we supply are healthier for your home, the environment and for you. Choose from an extensive range of breathable paints for internal and external use including silicate masonry paint, limewash, clay paint and stand oil paint. We also stock a wide range of oils, waxes and stains for furniture, floors and joinery.
	**Natural hydraulic limes** are created by burning limestones containing natural impurities. They are supplied in powder form in convenient 25kg or 20kg bags to be mixed on site with sand and water. Natural hydraulic limes are available in three standard strengths: NHL2, NHL3.5 and NHL5.
	We stock a range of **natural building products** ranging from oak lintels, sawn and riven lath, wood wool boards, reed boards and cob blocks to complement and restore traditional buildings.
	**Natural and sustainable insulation** such as cork render/plaster, cork boards, sheepswool, cellulose fibre, wood fibre boards and foam glass aggregate, can be supplied to help create a healthy and warm building.
	**Tools** are available for all aspects of traditional building works from trowels to paint brushes. We also supply tool packs which cover a wide range of applications.

Introduction

Prior to the 20th century building techniques and materials were very different from those employed today. Traditional properties need to "breathe" to allow moisture inherent in a solid wall construction without a damp proof course to evaporate from the external stonework or render. Many old buildings are constructed from materials such as brick, cob and stone which are relatively porous and often of lower strength. Lime putty mortars were normally used for bedding and plastering. Lime mortar is a relatively softer mortar and therefore it is able to withstand and accommodate a certain amount of movement that comes with settlement and seasonal changes in ground conditions. Lime mortar is porous and allows moisture to evaporate, helping the building to manage moisture and minimise problems associated with dampness.

On the other hand the cement-rich repairs used by many general builders are often very damaging to the structure resulting in:

- a tendency to crack rather than accommodate movement;
- water entering the structure via cracks becoming trapped, creating damp conditions;
- a tendency for renders to separate from the wall, increasing water ingress.

These problems are often compounded by the use of modern acrylic paints which contribute in trapping moisture in the walls.

Which Lime to Use

Pure lime putties set by carbonation where the lime binder (calcium dihydroxide) reacts with carbon dioxide from the air to form calcium carbonate. Mortars and plasters based on pure limes are suitable for internal work or sheltered conditions where hydraulicity and frost resistance are not necessary. They offer maximum breathability and their lower compressive strengths can be an advantage in accommodating stress and movement.

From the time of the Romans, lime mortars for building or external rendering had added ingredients to increase their compressive strength, improve frost resistance and enable them to set in the presence of water (hydraulic). Originally these additives were volcanic ashes discovered in the vicinity of the Italian town Pozzuoli - hence the term 'pozzolan'. The degree of hydraulicity isdetermined by the type and volume of pozzolans present which will affect many characteristics such as; compressive strength, speed of set in the presence of water and vapour permeability.

Many original forms of hydraulic lime were in fact a combination of pure lime putty and pozzolan that can still be replicated closely today. These mixes are generally used on traditional properties in the UK to render and point externally, or internally on damp or underground surfaces that require a hydraulic set due to the presence of moisture. Substitute materials have long been used instead of volcanic ash, hence any burnt clay that reacts with a pure lime to create a hydraulic set isreferred to as a pozzolan.. Mike Wye Ltd supply Argical M1000 for this purpose.

Powdered natural hydraulic lime was introduced much later in the 19thcentury when limestone was discovered with natural impurities that, when burnt, mimicked the effect of pozzolans used by the Romans. This is perhaps more like a weaker, early form of OPC (Ordinary Portland Cement) that has a chemical set once water is added to it.
Care should be given to selecting the most appropriate natural hydraulic lime as they are supplied in three standard grades which are designated; NHL2, NHL3.5 and NHL5. These numbers refer to the minimum strengths after laborarory testing at 28 days in Newtons per mm².
The actual range of strengths are:
2-7 N/mm² (NHL2), 3.5-10 N/mm² (NHL3.5), and 5-15 N/mm² (NHL5).
The actual strengths from different manufactures can vary widely within these bands and note that the three grades overlap one another which can cause some confusion! In general:

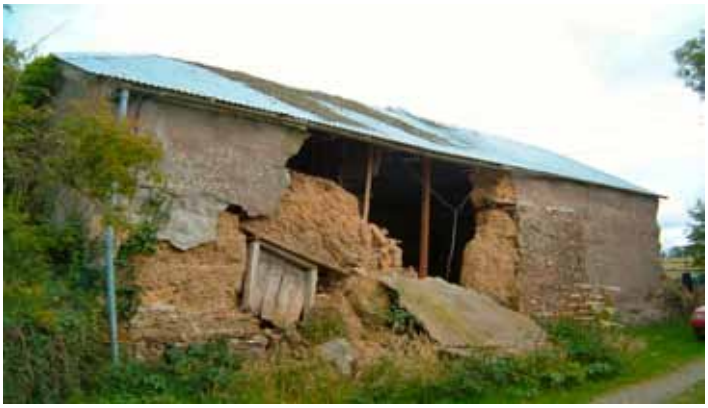
- NHL5 is used for strength or very exposed workssuch as Limecrete floors, chimney flaunching or coping tiles
- NHL3.5 is used for external bedding and pointing and renders on sound, solid masonry
- NHL2 is used for internal plasters or very sheltered external work

Our Technical Sales team can advise on the correct selection of lime for your project.

Practical Considerations

When specifying a lime mortar, consider:

- Purpose - is it for bedding, pointing, rendering, plastering, limecrete floor?
- Substrate - its strength, durability, porosity, water vapour permeability
- Environmental Conditions - is the property or elevation exposed (coastal, high ground etc.)?
- Conservation - do you need to match the existing mortar for colour, aesthetics to suit?
- Cost - if you are able to choose between the types of lime then saving money will be important (provided it does not have a detrimental impact on the property!).



An example of what can happen with inappropriate maintenance and materials

Dampness in Older Buildings

It is necessary to try and identify the cause of dampness before making a decision on the best course of action. Issues such as water table level, soil drainage, external ground levels (compared to the internal levels), inappropriate external renders or pointing mortars, acrylic masonry paints, porous substrates (e.g. brick and some stone types), maintenance of rainwater goods such as guttering, dew point/humidity in the rooms, poor air circulation and ventilation, damp proofing membranes, floor coverings, and more besides all play a part, together with the degree of exposure to the weather. It is vital that you understand all the issues having an effect on the building and what the results might be if certain actions are taken.

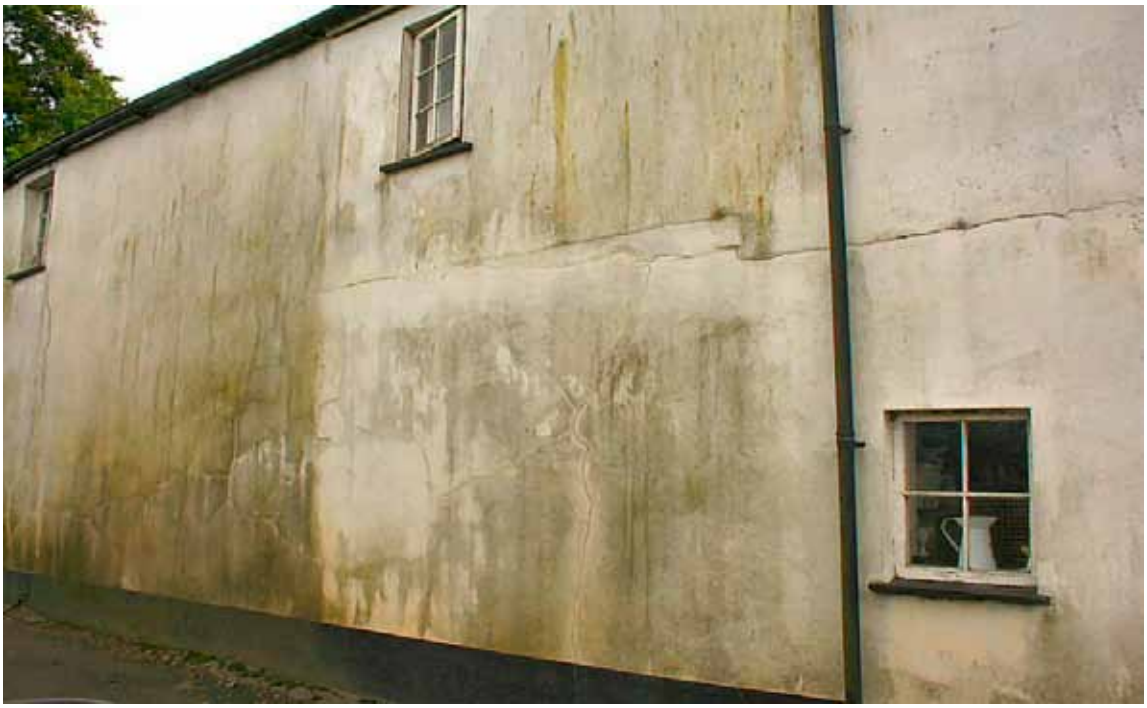
Moisture in old buildings goes with the territory to some respect but it's still important to know whether it's a result of penetrating rain, rising moisture, condensation or some combination of these.

If you have penetrating moisture then you may have to consider whether the stone or brick has become excessively porous or if any pointing or render is failing or made from inappropriate materials. Walls may be relatively thin so extra protection might be needed outside in the form of render or slate hanging, for example. Lime mortars used for pointing and rendering can be more porous than a cement render depending on the proportions of sand to binder, but this can be a mixed blessing on a permanently saturated westerly wall.
Limewash was often used to help resist penetrating rain and were often mixed with oils, tallow or other ingredients to reduce water penetration. Silicate paint systems are a more durable alternative to limewash that offer excellent breathability and a more protective, uniform finish and transparent, breathable water repellent solutions can be used to keep water at bay without changing the physical appearance of the surface.

This image shows a cob and stone wall with cement render.

Damp is entering the cracked external render and into the building.

The horizontal crack is caused by a concrete block extension and differential movement in different materials.



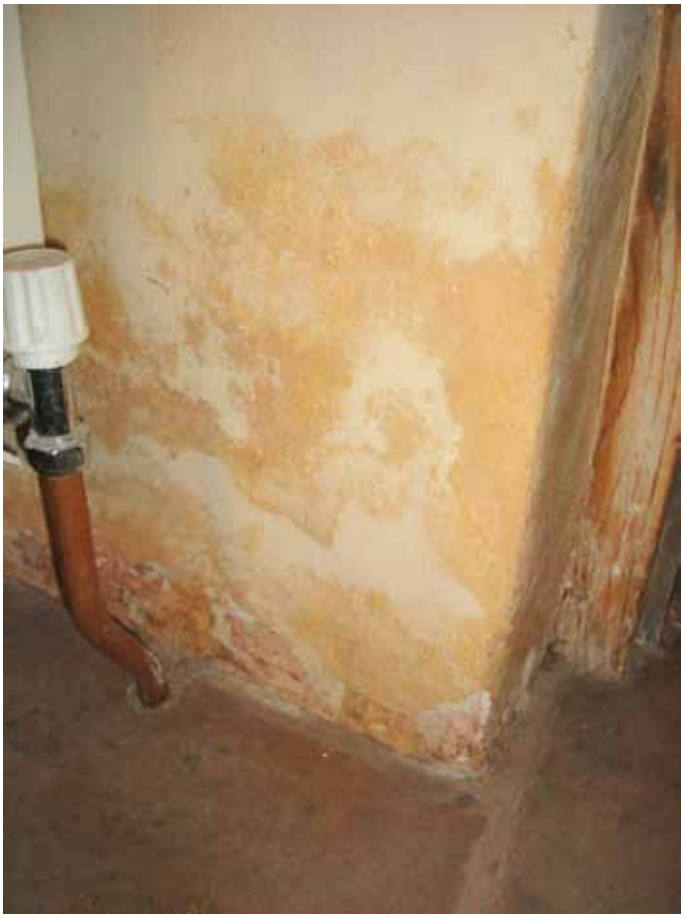
If rising damp is identified, this is usually caused by factors such as a high water table, high external ground level, or inappropriate external renders and paints. In many types of stone wall damp proof injection treatment can be a total waste of time and money as it's laregly ineffective when used in an irregular bedding mortar in order to try and create a solid barrier to moisture. Where it does work to create a barrier in substrates such as brick, it can concentrate any rising water in vulnerable areas such as timber joists, window seats, sills or occasionally electric sockets. It is important to assess the condition of external renders and paints to see weather lime mortars and appropriate paint finishes would help the building to breathe.

Many damp proof installers insist on removing internal plaster to a height of 1–1.5 m and putting on a cementitious waterproofing plaster system which can mask whether the injection actually works. In time you may get a tide mark as the tanking drives moisture ever higher (above the tanked level) causing structural damage to timber fixings such as joists, window seats, sole plates in partition walls and studs for plaster lath.

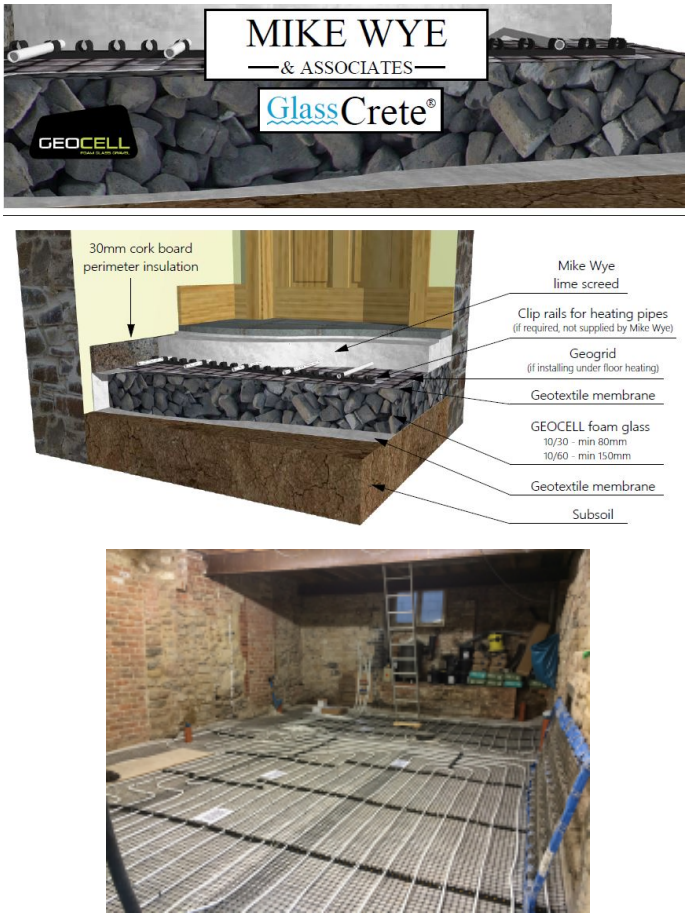
If you have condensation this can be caused by a number of factors such as inappropriate modern plasters, colder walls as a result of penetrating or rising damp, poor insulation or poor ventilation.

Salts may also be present due to being drawn up by ground water or from the existing substrate and mortars. This can be a vicious cycle as the condensation can be absorbed, lowering the wall temperature which increases the likelihood of condensation forming....and so on.
A lime plastered wall can be particularly beneficial in reducing condensation internally as lime has the ability to regulate moisture and reduce problems caused by condensation (known as hygroscopic properties). These, combined with a functional breathable paint finish, can help significantly.

Whilst pozzolans can be used in lime plasters to help them set in damp conditions it may not be suitable to consider this alone if you have an area which is permanently saturated. It's best to look for the cause and take appropriate action often considering the easiest and cheapest solutions first. If the problem is serious enough, it may be necessary to consider having moisture readings taken in the centre of the wall but this can be a disruptive and expensive option.



Typical problems that may occur when the floor has been sealed and the outside render is a hard cement covered with a modern non-breathing masonry paint.



Glasscrete incorporating GEOCELL foam glass can help maintain the balance of a functional, breathable floor.

Our modern way of living is a big contributing factor to the cause of dampness. Showers, washing machines, cooking, some forms of heating and even the simple act of breathing (approximately 2.5 litres of water vapour per person per day) are all sources of water vapour that potentially contribute to condensation. Without the draughts through windows, doors and open fireplaces, the modern trend of sealing all gaps, without suitable ventilation, can keep moisture trapped within the building. This can lead to condensation and mould forming on cold surfaces.

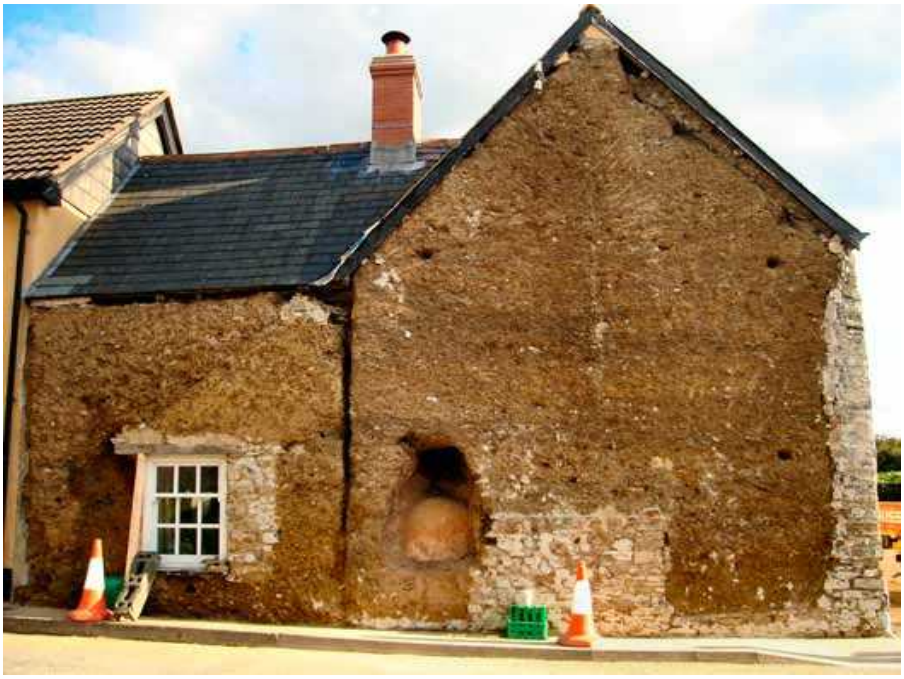
Improving ventilation, either naturally or mechanically, can significantly reduce or eliminate condensations and the physical signs (such as black mould) that we tend to associate with it. Simply opening windows regularly to allow air flow can help minimise condensation and air exchange ventilation systems and extractor fans in humid rooms, such as the bathroom or kitchen, should be considered.

Some people turn to extra insulation on the inside of external walls to avoid condensation problems. Insulating the walls may help reduce or remove condensation but incorrect application and materials may result in problems transferred to another area where there weren't any damp problems in the first place. By preventing warmth being absorbed by walls, this will reduce the temperature of the wall and can therefore allow condensation or mould to form where the adjacent, uninsulated walls were previously absorbing enough warmth not to have condensation problems!

Consult an appropriate specialist before undertaking work on a traditional building.
If the building is listed, always discuss proposals with your Conservation Officer.

Cob Building - A Rich Tradition

Building with earth has been a popular and relatively inexpensive method throughout the ages. Devon and the surrounding counties in particular has a rich tradition of cob buildings based on mixing sub-soil with straw and aggregate. There is an old Devon saying that "all cob needs is a good hat and a strong pair of boots" - the hat was traditionally the thatched roof which protected the cob from above, and a stone plinth usually provided the boots as a solid, strong base.



When repairs become necessary it's important to work with sympathetic materials and techniques to ensure an aesthetically pleasing and long lasting result.

The first priority is to identify the cause of any cracking or damage.

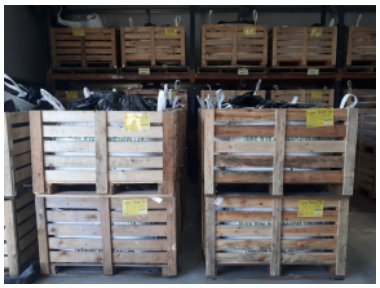
Consider some of the following questions:
- How old is the damage?
- Are the walls decorated and if so when, and what with?
- Can you or your neighbours recall any history of structural movement?
- Has the damage occured since alterations to the building (extensions, patios, new roof, doors or windows)?
- How severe is it? - Cob can often show cracks and defects because old buildings gradually move on shallow foundations. Recent movement is of more concern than an old defect.

If the cracks are located around doors and windows the damage is likely to have arisen from changing stress loadings or rotten timber lintels. Movement in an elevation wall is often revealed by bulges along its length, internal gaps with partition walls, floor joist movement becoming visible.

Movement in a gable wall can be a problem if the crack widens significantly as it goes up the wall.
Unfortunately modern cement renders, plasters, masonry paints and emulsions conspire to trap moisture in the wall and damp cob can lead to structural problems.
Once the moisture level exceeds about 10-12% the strength of the cob drops dramatically. Don't be misled by damp-proofing firms using surface moisture meters - condensation and absorbant salts can both give high meter readings in what are essentially dry walls. The moisture needs to be measured in the centre of the wall by taking a core reading.
Modern concrete floors containing damp proof membranes can also contribute to the movement of moisture sideways into adjacent walls.

Rebuilding and repairing cob structures with cob blocks offer advantages over masonry and aerated blocks:

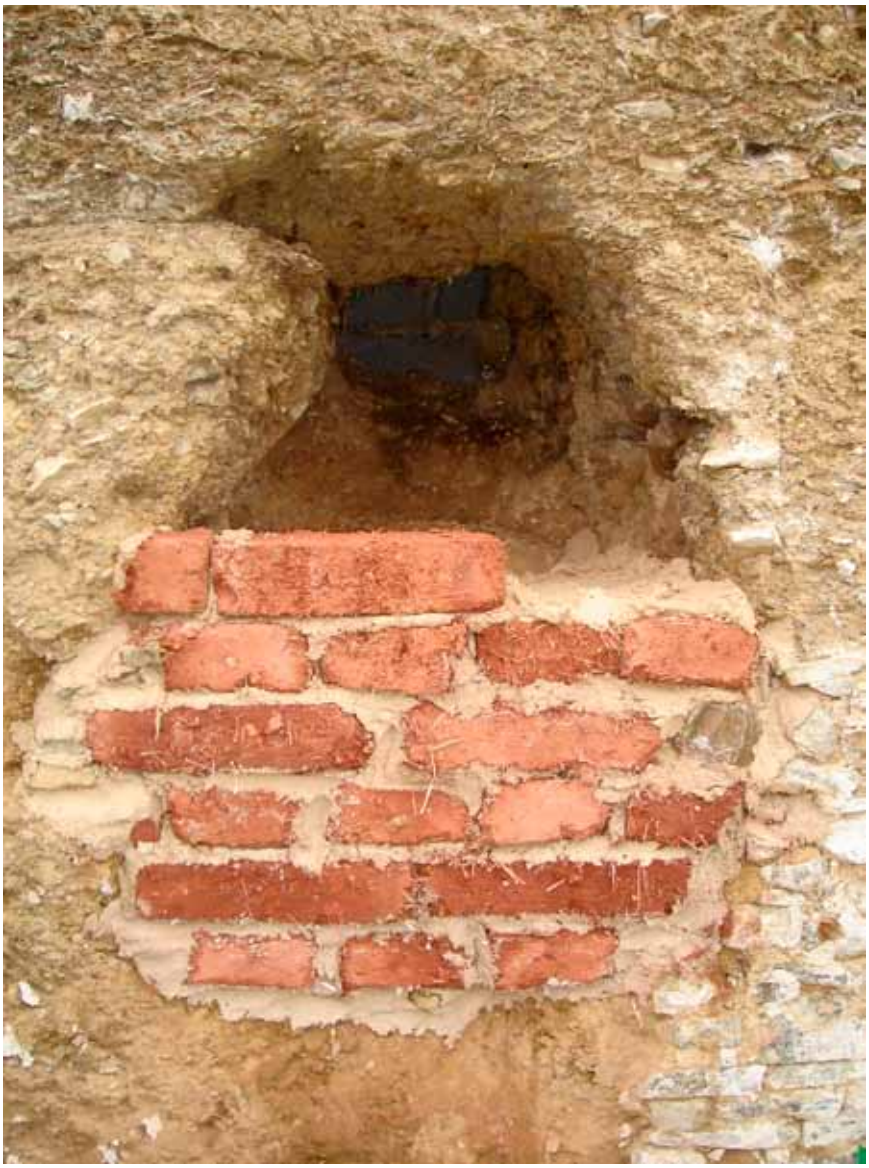
- They will match the existing structure for porosity and density, allowing moisture to move in a similar way.
- They won't introduce hot or cold spots where differential thermal movement can cause renders and plasters to crack.
- They have a similar compressive strength to the original cob and can therefore accommodate general movement better without detaching from the original structure.
- They allow recycling of material with savings in energy consumption.
- Cob blocks and bricks are ready dried and won't shrink away from adjoining surfaces.



Before starting any work ask yourself; 'do I need planning permission and listed building consent?'. Once anyconditions and permission have been dealt with, work may begin:

1. Preparation
When using traditional cob blocks for repair it's important to ensure that they are a close match to the original cob (such as the traditional Devon cob we supply) and are bedded on flat surfaces as far as possible. Damaged and unsound cob in adjoining surfaces must be pared back. Differing methods have been suggested of getting a mechanical fixing to the adjoining surfaces. As well as chasing the blocks into adjoining cob, stainless steel helifix ties can be driven into the existing cob and bedded in the joints of the repair.

2. Damping
It is very important to control suction from the cob. Both the surfaces of adjoining cob and the cob blocks and bricks must be dampened with a light spray of clean water before use.



3. Bedding mortars
The aim of the bedding mortar is to spread the load evenly onto the block and it should be kept to a minimum thickness. The mortar can be a weak mix of earth/lime/sand mix of varying proportions dependent on whether the cob blocks are to be exposed and weathered to match or rendered or plastered. In the latter case a coarse sand/lime putty mix will be suitable. These mixes are intended to be of similar strength and porosity as the blocks.

4. Materials
We recommend that all renders and plasters should be lime putty based materials as these offer the best breathability and flexibility, working sympathetically with the cob.

5. Protection
Please note that great care should be taken not to apply lime mortars when there is a risk of frost due to ice crystals forming within the mortar causing damage and failure. Carbonation takes at approximately one month for each millimetre of thickness - therefore it could take over 20 months before lime mortar has fully carbonated to a depth of 20 mm.
We advise an increase in the volume of pozzolan gauged into a mix later in the year and that work should be suitably protected irrespective of the time of year.

6. Quantities
- A cob block measures approximately 90mm x 220mm x 440mm.
- A cubic metre of wall rebuild will require approximately 90 cob blocks.
- 1 tonne of ready mixed unhaired lime mortar will lay around 150 cob blocks, depending on the shape of the repair and the thickness of the bedding joints.

It's also possible to put up shuttering and tamp down a drier mix of cob, but this method is generally slower as only a couple of feet can be rebuilt at a time, as each layer must have enough time to dry.

Larger problems may need to be tackled differently. The need for buttresses, tie-bars and underpinning is best discussed with an expert familiar with cob.

Safety
Limes are caustic. Always wear eye protection and protective gloves and clothing and follow the safety instructions on the labels. Our advice and information are given in good faith. It's important that users satisfy themselves that they've chosen an appropriate product and have a suitably skilled workforce

Rebuilding a Stone Wall

The size of the job and whether it is a listed property will impact the questions below which should be checked with your local council:

- Do I need planning permission and listed building consent?
- Do I need Building Regulations approval?
- What size foundations are necessary?

It goes without saying that the requirements for repairs to an existing wall will differ from a new wall separating your patio from the neighbour. The type of stone or brick used will affect the strength of mortar in which to bed them. Prior to 1919 most walls were of traditional solid construction and masonry bedded in lime mortars, often with earth (subsoil) mixed in as well. Rebuilding and repairing with lime mortars offers a number of advantages:

* they will match the existing structure for porosity and density, allowing moisture to move in a similar way.
* they can accommodate general movement better than a hard mortar.
* soluble salts will be less likely to crystallise in the stone or brick faces.
* they will match existing walls aesthetically.
* an NHL based lime mortar may be preferable if a quicker set is needed.

Preparation

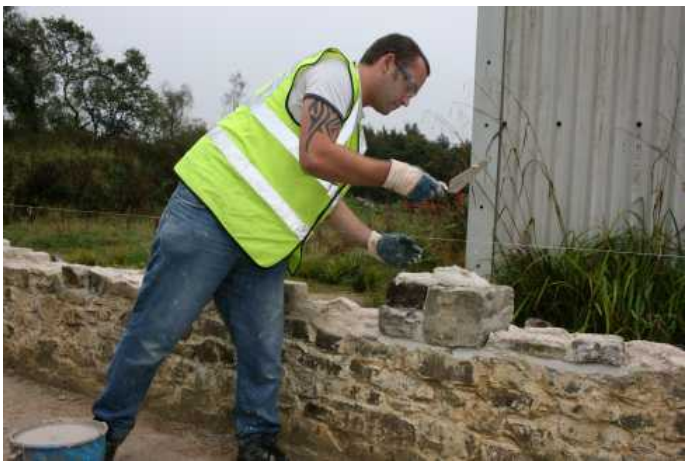
Try to source stone from a local quarry to match the existing masonry. Take a sample along to the quarry if you're not sure. You can usually purchase two size ranges; 4"-6" and 6"-9".

For the bedding mortar, use a volumetric mix of 3 parts well graded sharp sand in the region of 0-5 mm to 1 part mature lime putty. This will need to be mixed at least one week in advance or for convenience can be purchased as a pre-mix in manageable tubs or bulk bags for larger areas.

Traditional lime mixes gain strength from carbonation by absorbing carbon dioxide from the air. In damp, frost prone or very exposed situations it is advisable to include a natural additive to a lime mortar to increase its compressive strength and frost resistance. Traditionally, volcanic ash or brick dust were added as forms of setting agents called pozzolans. We use a calcined clay called Argical at a volume gauge of 10 -20% depending on the degree of exposure. It won't give an overnight set but will slowly begin to add extra compressive strength to the mortar after a couple of weeks.

Building

If you're a novice, position a stone first to make sure it looks right and you have got the best face showing. Stagger the joints so there isn't a vertical joint running continuously up the wall



Premixing

All pure lime putty mortars benefit from being pre-mixed then "knocked up" again prior to use to plasticise them - this reduces shrinkage in the mortar. Natural hydraulic limes (NHL) benefit from premixing by an hour then mixing again just prior to use.

Application

Use a mortar bed just thick enough to spread the load evenly, finishing just beyond the front face and then trimming flush with the edge of the gauging trowel. Use a through stone that can tie together the entire thickness of the wall or thereabouts, one every square metre of wall face, pinning the wall together from both faces. The mortar shouldn't dry out too quickly - protect from sun, wind and rain with damp hessian cloth. Protect from rain if necessary. Build up to a maximum of 1 metre high at a time and then let the lime mortar cure for 2 to 3 days. When dry, apply a stiff brush to the mortar joints to expose the aggregate.

Protection

Please note that great care should be taken not to apply lime mortars when there is a risk of frost damage due to ice crystals forming within the lime mortar. It is important to prevent frost crystals forming within the mortar soon after application. Carbonation takes at least a month for each millimetre of thickness, therefore it may take over 20 months before lime mortar has carbonated to a depth of 20 mm. It may be necessary to increase the amount of Argical added depending on the time of year and exposure. It is important to ensure complete weather protection of the work at all times of the year.

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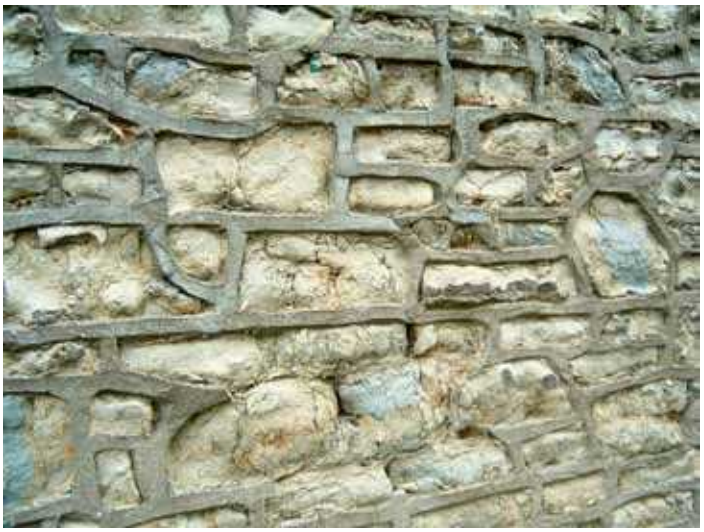
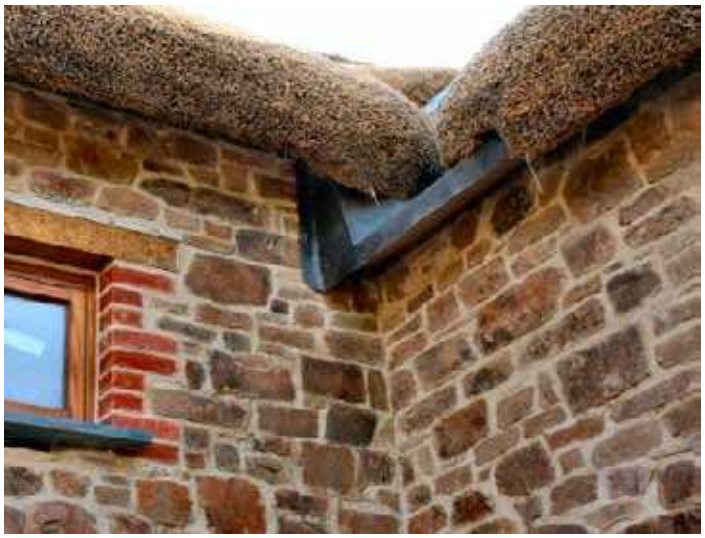
Lime Pointing

Lime putty mortars and those made with natural hydraulic lime (NHL) offer advantages over cement based mortars. They are generally a softer, more porous material allowing moisture to evaporate from the joints rather than being forced through the masonry where harder, denser mortars are used. This will help to lower moisture levels in the wall and reduce the build up of soluble salts in the stone face. As with all lime putty based materials the best outcome requires patience and careful control of drying and suction. The reward being an aethetically pleasing, long lasting mortar.

	
Damage caused by inappropriate, hard cement pointing	Correct lime pointing of a stone rubble wall

Preparation
Any existing defective pointing must be raked out to a depth usually equal to twice the width of the joint, but not less than 20 mm. The back of the joint should be roughly square in profile. The use of a plugging chisel ensures that the stones or bricks aren't forced apart.

Damping
The joints must be dampened with clean water, with enough time left for the stone or brick faces to dry to prevent smearing. The mortar should be as dry as it is practicable to point with. This allows maximum compaction in the joint, reduces shrinkage cracking and reduces the tendency to smear on the stone faces.

Premixing
All pure lime putty mortars benefit from being pre-mixed and then "knocked up" again prior to use to plasticise them - this reduces shrinkage in the mortar.

Gauging
We suggest a 3:1 mix of coarse sharp well graded sand to mature lime putty by volume. Externally it is advisable to add a pozzolan to the lime mortar to increase its compressive strength and frost resistance. It won't create an overnight set but will slowly begin to add a little extra compressive strength to the mortar after a couple of weeks. Alternatively, an NHL mortar may be used.

Pointing
Start at the top of a wall to allow for cleaning up and spraying to continue. Use a pointing key or metal spatula and push the mortar in from a hawk. Joints deeper than 20 mm will need an initial dubbing out as shrinkage can occur otherwise. Finish flush or rebate a little if the joints have widened with age or for personal preference as rebating highlights the stone more.

Brushing
When the mortar is "green hard" (firm enough to brush without smearing but still maliable enough to work), brush or tamp the joints with a churn brush to enhance the aggregate and give a coarser texture to the pointing.

Protection
External pointing should be mist sprayed to control drying and protected from direct sun and wind. In winter it should be protected from rain and frost. Hessian cloth is recommended.

Quantities
20 kg of lime putty mortar will point 2-3 square metres of stonework or 1- 1.5 square metres of brickwork based on a 10mm joint and 20mm depth.

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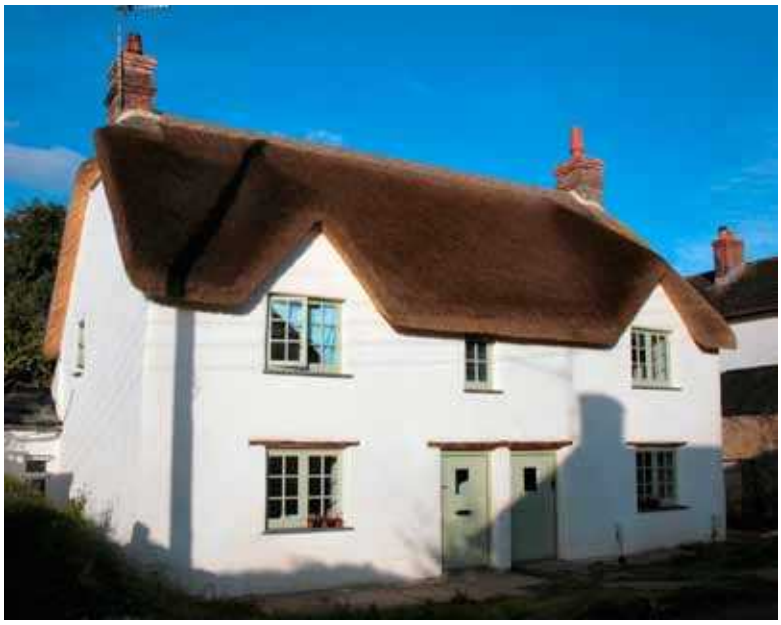
Lime Rendering

Many older properties can suffer from damp problems, cracking or hollow render and flaking paint. It can be difficult to pin down the causes and there is often conflicting advice to contend with even before taking the plunge with expensive repairs or damp treatment.
Before the twentieth century building techniques and materials were very different from those employed today. Traditional properties need to “breathe” to allow moisture inherent in a solid wall construction to evaporate from the external stonework or render.
Lime Putty was the base product widely used to produce mortar, plaster and limewash for traditional buildings.
Lime putty mortars offer advantages over cement based mortars for the external rendering of these properties, especially when decorated with a breathable paint such as limewash.



- Their porosity allows the structure to breathe.
- They can accommodate general movement better.
- Their self healing nature reduces cracking problems.

In contrast to breathable lime materials, too many traditional buildings are often repaired and renovated using harder and impermeable materials designed for modern buildings of completely different construction methods. The result can aggrevate or be the direct cause of problems associated with damp walls and buildings.

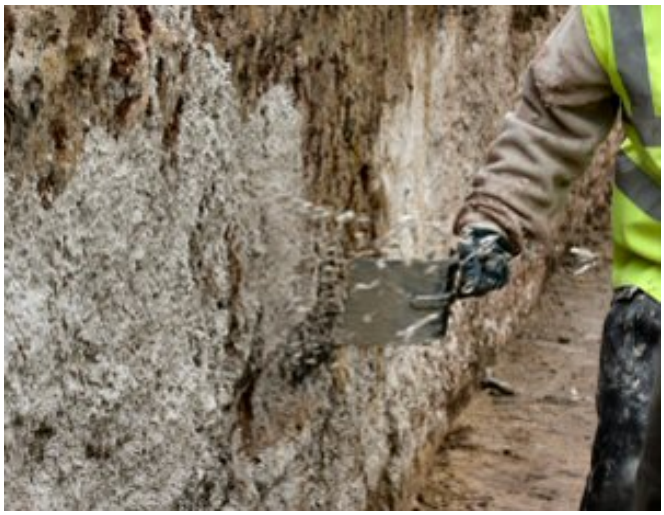
In particular, hard cement renders and many masonry paints fail to allow the moisture that is continually being sucked up from the ground to evaporate very easily to the outside. This can result in damp, cold walls, condensation, flaking paint, rotten skirting boards, joists and other timber fittings, increased heating bills and a never ending battle to hold back the dampness from the inside. Chemical damp course injections, tanking and even drylining are common prescriptions wherever the “professional” has failed to understand the basic requirements of a traditional property. In the worst case scenario the combination of sealing the external and internal walls leads to a dramatic rise in the moisture levels in the wall causing severe damage to earth and timber framed structures.

Some helpful guidelines to rendering are set out below

1. Try and establish the nature of the existing render and paint. Get as many opinions as possible on the causes of any dampness problems and other, possibly cheaper solutions.
2. Before commencing work on a listed building ensure that you have the necessary consent.
3. If you’re using a builder, see their previous work and talk to the clients. If undertaking the work yourself attending a practical course can be of enormous benefit.

Typical render specification

1. Ensure that appropriate scaffolding is in place and the worksite safe for workers and public.
2. Take off the existing render, except any existing sound lime mortars, taking care not to damage the structure. Look out for very thick patches of render that are effectively load bearing. It may be preferable to render on top rather than risk rebuilding an area.
3. Dub out any deep holes in the wall with a haired lime mortar, rebuilding defects with cob blocks, bricks or stone as appropriate.
4. Treat wooden lintels with Timber Treat and Woodbead and counter batten with oak lath if rendering over them.
5. Apply one hand harled coat of Secil Consolidation Mortar to provide a key to the wall.
6. Apply sufficient coats of haired lime mortar to smooth the contours of the wall as required. With a suitable animal hair in the mortar coats can be applied up to 15-18 mm. The hair reduces any slumping whilst applying and shrinkage cracking whilst curing. Each backing is keyed with a scratch comb.
7. Apply a top coat of floated unhaired lime mortar at 8-10 mm.
8. Decorate with SecilTEK Silicate Primer and Silicate Paint or traditional limewash.

	
Harling coat	Haired lime mortar scratch coat

Damping
It is very important to control suction from the wall by light spraying with clean water half an hour before applying each coat (especially cob and porous brick). In warm weather it may be necessary to spray each coat afterward.

Protection
Please note that great care should be taken not to apply lime mortars when there is a risk of frost damage due to ice crystals forming within the lime mortar. It is important to prevent frost crystals forming within the mortar soon after application. Carbonation takes at least a month for each millimetre of thickness, therefore it may take over 20 months before lime mortar has carbonated to a depth of 20 mm. It may be necessary to increase the amount of Argical added depending on the time of year and exposure. It is important to ensure complete weather protection of the work at all times of the year.

Materials
Lime putty mortars gain added strength by carbonating over many months with atmospheric carbon dioxide. Whilst pure lime putty mortars are suitable inside or for sheltered locations, it's recommended that for exposed elevations each coat of lime mortar has the pozzolan such as Argical added. These are burnt clays that react with the lime to give harder more frost resistant renders and historically ranged from volcanic ash, crushed bricks and other forms of burnt clay.

Curing
All coats need to be given a few days to harden before subsequent coats are applied. To test whether a coat is 'green hard' the surface should be resistant to a fingernail. Many factors will influence the timing such as the season, exposure of wall and the thickness of the coat but it's normal to expect a couple of days for the harled coat to harden and perhaps 4-6 days for each of the thicker coats.

Painting
It is important that lime renders are not totally sealed with an inappropriate paint. Limewash is a very traditional decorating product which requires a minimum of four coats on to the final coat of render.
Silicate paint systems are a more durable alternative to limewash that offer excellent breathability and a more protective, uniform finish.

Conclusions
The best time to carry out external work is late spring so the lime has the whole summer to harden and carbonate. Lime mortars are easy to use and can readily be applied by the enthusiastic amateur given a little tuition and guidance. Although, the work needs to be carried out correctly, the beauty of the traditional building is that it rarely looks right when everything is straight and perfect, so the DIY owner can begin work comfortable in the knowledge that a certain amount of 'character' would not look out of place.

Safety
Limes are caustic. Always wear eye protection and protective gloves and clothing and follow the safety instructions on the labels. Our advice and information are given in good faith. It's important that users satisfy themselves that they've chosen an appropriate product and have a suitably skilled workforce.

Lime Plastering

Lime putty plasters offer advantages over cement based mortars and pure gypsum plasters for the internal plastering of traditional properties:

- their porosity allows the structure to "breathe".
- they can accommodate general movement better.
- their self-healing nature reduces cracking problems.
- they can reduce condensation problems.

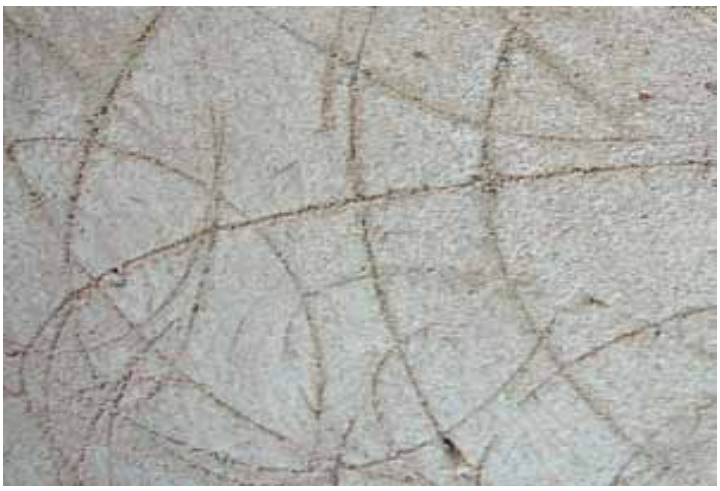
As with all lime putty based materials the best outcome requires patience and careful control of drying and suction, the reward being an aesthetically pleasing, long lasting plaster. We also supply a range of clay plasters for use in traditional properties and new build. They are designed to be used over cob, clay boards and reed mat and include a range of self-coloured finishing plasters that don't require painting.

Preparation

Any existing plaster must be removed, except any sound lime mortars. Care must obviously be taken to ensure that the structure isn't damaged. Look out for very thick patches of plaster that are effectively load bearing. It may be necessary to plaster on top rather than risk rebuilding an area.

Damping

It is very important to control suction from the background material (substrate) by spraying with clean water before applying each coat of plaster, especially onto cob or porous brick.



Devil float coat

Premixing

All pure lime putty skimming plasters benefit from being pre-mixed for a minimum of a couple of weeks and then "knocked up" again prior to use to plasticise them - this reduces shrinkage in the plaster.

Example Specification

- dub out any deep holes in the wall with a haired lime putty mortar, rebuilding defects with 'like for like' materials.
- treat wooden lintels with preservative and counter batten with oak lath.
- apply one hand harled coat of Secil Consolidation Mortar to provide a key to cob, stone or brick.
- apply sufficient coats of haired lime mortar up to 15-18 mm thick to level the contours of the wall.
- 8-10 mm float coat of unhaired lime putty mortar, floated with a wood float and then 'devil' floated to give a key.
- 3 mm top coat of our Heritage Plaster skim (preferably applied in two passes). For a super fine finish, apply an additional 1 mm top coat of Regency Lime Plaster.

Gauging

If there is a high residual level of moisture in a wall that cannot be eradicated (e.g a high external ground level) it may be necessary to sandwich a waterproof barrier between the coats of lime mortar. We supply a waterproofing slurry for this purpose. Backing coats of lime mortar can be gauged with 10% of Argical by volume to get a hydraulic set, this being especially important for the harled coat.

Plaster Skim
Our finest Regency or Heritage lime plasters are ideal for a thin skim over a wide variety of backgrounds such as plasterboard, blocks and mixtures of old and new plaster, old paint etc. For plasterboard it will be necessary to tape and plaster the joints and then prime with Bayosan DG27 before applying a thin coat of Heritage lime putty plaster followed by a final coat of Regency lime plaster for the finest of finishes.

Quantities
Example Specification:
1. 3 mm harl coat of Secil Consolidation Mortar. 5 kg/m²
2. 12-15 mm scratch coat of Haired Lime Mortar. 30 kg/m²
3. 8-10 mm float coat of Unhaired Lime Mortar. 20 kg/m²
4. 3 mm Heritage Lime Plaster. 6 kg/m²
5. Optional 1 mm top coat of Regency Lime Plaster. 2 kg/m²

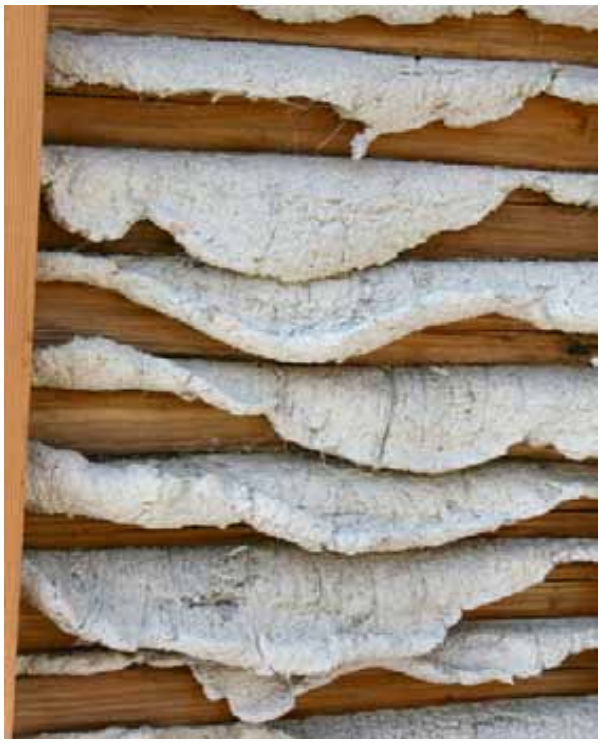
Safety
Limes are caustic. Always wear eye protection and protective gloves and clothing and follow the safety instructions on the labels. Our advice and information are given in good faith. It's important that users satisfy themselves that they've chosen an appropriate product and have a suitably skilled workforce**.**

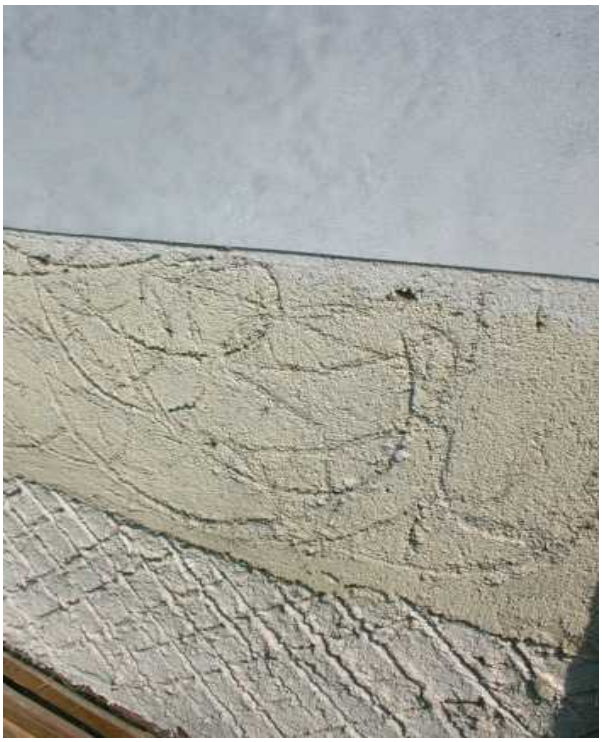
Lime Plastering on Lath

Types of Lath
Traditional timber laths were commonly riven oak or chestnut. These are laths that have been split along the grain of the wood by hand. They are generally irregular in shape, width and thickness with a textured surface that provides extra key. Laths varied between 1 1/4" to 1 1/2" (31 - 37mm) in width and were around 1/4 " thick. The main key is formed by the lime plaster being squeezed between the lath by the trowelling action. Backing coats of lime plaster were typically haired to help the plaster keys stay in place whilst drying and curing occurs.

By the end of the 19th century sawn lath produced by machinery was also much in evidence. This is much more uniform in nature and has a smoother surface giving less key to the mortar. Hence the key formed by the plaster squeezed between the lath is of even greater importance. Sawn laths are generally a little narrower at around an inch (25mm). Timber laths were generally spaced out by around 1/4" to 3/8", and a lath on its edge was used to set the spacing.

During the 20th century, expanded metal lath (EML) began to supercede timber lath both in new work and often in renovation work as well, being cheaper to buy and quicker to fix. Lime plasters stick less easily to EML and there was also a move towards using harder cementitious plasters and gypsums. Many of these developments were out of keeping with the properties for which they were specified but also introduced their own problems due to their relative lack of breathability.


Haired lime mortar scratch coat pushed through a lath wall


3 coat lime plaster build up on traditional lath

Preparation
It is recommended to moisten new lath with water before fixing to avoid swelling when wet mortar is applied. It is also important to control suction from dry, already fixed timber lath by lightly spraying with clean water 30 minutes before the first coat and allow the water to be absorbed.

Premixing
All traditional lime putty plasters benefit from being pre-mixed for a minimum of a couple of weeks and then "knocked up" again prior to use to plasticise them - this reduces shrinkage in the plaster. Do not do this for hydraulic mortars.

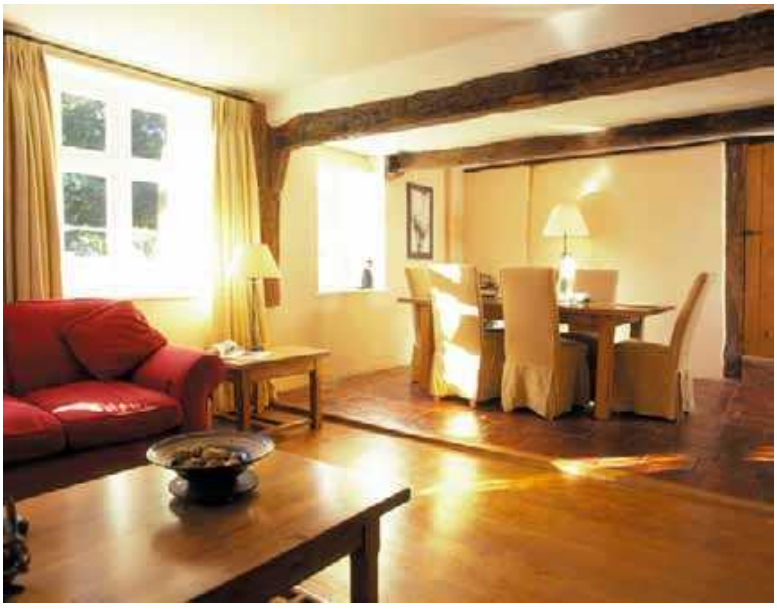
Example Specification

- Apply a 10-15 mm scratch coat of haired lime mortar, leaving approximately 8 mm on the surface of the lath. Do not over-trowel the scratch coat otherwise it can result in additional plaster lost through the lath. For ceiling lath and plaster we recommend and scratch of of extra haired lime mortar (double the amount of fibres). Key this coat with a scratch comb or lath scratcher and leave to dry and cure until green hard. A lime mortar or plaster is green hard when it can only be marked with a metal tool. This is likely to take 5-10 days.
- Apply an 8-10 mm float coat of unhaired lime mortar to straighten the surface as required. Key with a devil float to leave a light scratch ready for the lime plaster skim. This is likely to take 5-10 days.
- Trowel a total of 3 mm Heritage Lime Plaster top coat, ideally applied in two passes for the best finish. An optional additional 1 mm of Regency Lime Plaster can be applied for a super smooth finish, closer to that of gypsum plasters.

Gauging
Where it is a ceiling that is being plastered and there is a floor above that will be walked on, it is essential that sufficient time is left for the plaster coats to carbonate to gain enough strength to minimise damage before using the room above.

This is especially true if there is any play in the joists that cannot be eradicated or if works are being undertaken above e.g. fixing floorboards. We would strongly recommend that the first scratch coat contains extra hair and that it is gauged with 10% NHL5 by volume to get an earlier set.

Floorboards should be screwed rather than nailed down to minimise vibration and stress on the plaster keys.



This shows a lath ceiling finished with an emulsion breathable paint.

Quantities
Example Specification:
1. 12-15 mm scratch coat of Haired or Extra Haired Lime Mortar. 30 kg/m²
2. 8-10 mm float coat of Unhaired Lime Mortar. 20 kg/m²
3. 3 mm Heritage Lime Plaster. 6 kg/m²
4. Optional 1 mm top coat of Regency Lime Plaster. 2 kg/m²

Safety
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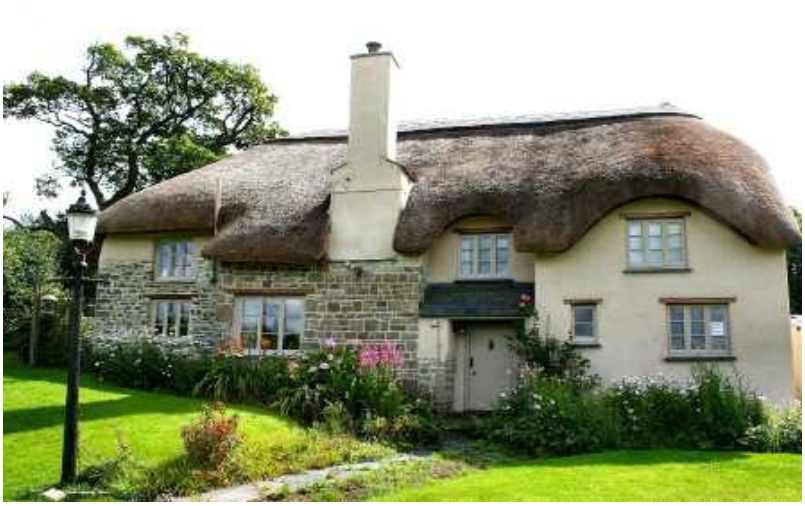
Limewash & Silicate Paint

The use of breathable paints is essential in traditional, solid wall constructions which may contain moisture from a range of sources. Trapping this moisture in the walls with film-forming acrylic paints can cause serious structural and dampness problems.



LIMEWASH is an ancient decorating material often used on traditional buildings as it allows the structure to 'breathe' Limewash allows naturally occuring moisture to permeate through rather than trapping it in the walls like some modern masonry paints can.

It has a unique, ultra-matt finish and helps consolidate and improve the surface of both old and new plaster physically and visually. Limewash paints they shade in depth of colour to reflect the dampness of the background material.

Mike Wye Limewash is prepared from the finest quality mature lime putty, water and a small amount of linseed oil to improve water-shedding properties. It is available naturally as white, or natural pigments are added to provide a wide range of pre-mixed colours.

Preparation
The surface to be limewashed should be brushed and washed free of any loose particles, dust, dirt, lichen etc. If there is mould growth the surface should be treated with a fungicide wash.

Damping
It is important to damp dry surfaces with clean water before each coat. This prevents the water in the limewash from being sucked from the background too quickly. This can result in powdering or a streaky appearance.

First Coat
Whisk the limewash thoroughly before each application. Use a large masonry or emulsion brush to apply the limewash. Don't be tempted to apply it too thickly as it can result in crazing when dry. Remember it's a wash and will look transparent on application but will dry opaque. Coloured limewash dries much lighter than its wet colour.

Subsequent coats
A minimum of 4 coats are recommended on new external lime render, 3 coats on new internal lime plaster. Ideally leave each coat to cure for a day before applying the next coat. Follow the same procedure of dampening the walls and whisking the limewash before each application. Protect external limewash from the weather if necessary.

Quantities
A litre of limewash will cover 3-6 m² per coat, depending on the smoothness and porosity of the surface.

SILICATE PAINTS were designed at the behest of King Ludwig I of Bavaria in the late 18th Century. Ludwig commissioned a paint that looked and worked like limewash but was more durable in the harsh winter climate. The small pore size of silicate paint allows high water vapour permeability (breathability) while at the same time not allowing the larger rainwater molecules to penetrate.

Silicate Paint is typically applied as a system of 1 coat primer and 2 coats paint.

Like limewash, silicate paint soaks into the mineral substrate. In addition to this, potassium silicate (waterglass) reacts chemically to form a microcrystaline bond – a process known as silicification.

SecilTEK Silicate Masonry Paint has a number of advantages over other masonry paints and washes:
- Highly breathable paint: allowing water vapour to escape from the structure whilst being resistant to rain.
- Unaffected by UV light: conventional acrylic paints can become brittle over time.
- Very durable: a life expectancy of 15+ years if applied correctly onto a suitable surface.
- Resistant to airborne pollutants and acid rain.
- Suitable for a wide range of substrates including lime and cement renders, gypsum plasters and stonework.
- The solvent is water rather than petrochemical – so virtually no VOCs emitted.
- Scrubbable: ideal for high-traffic areas.
- Available in over 2,000 colours (colour matches available to many RAL, NCS and BS4800 colour codes)

Quantities
A litre of SecilTEK Silicate Paint will cover 4-8 m² per coat, depending on the smoothness and porosity of the surface.

Safety
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