



Lime Rendering

A Guide to Materials and Methods

(This document also uses some information from South Somerset District Council and Old House Store)

Background

Lime renders were traditionally applied to give protection to walls built of poor quality rubble stone or porous brick or to cob (monolithic clay subsoil) walls protection from winds and weathering from rain or frost. They help by acting like a sponge, absorbing rainfall then allowing it to evaporate rather than soak into the wall. Most cottages and houses built of rubble stone would have been rendered originally and they tend to suffer from penetrating damp if the lime render is removed or replaced with a cement rich render. Lime render is vapour permeable, like a gortex jacket they allow vapour out but do not let liquid water in. Cement Render is not vapour permeable, so if there are any issues of moisture in the walls then the moisture cannot escape. Thus eventually causing damp inside the building and rotting of wooden lintels and in the case of cob, the straw binder that strengthens the structure.

There is a very wide range of types of lime rendering. Rubble walls of many vernacular buildings were often treated with just a single coat of render, amounting to not much more than a very full, flush pointing (pointing is the mortar between stones). Such a render is thicker in the hollows and very thin over the stone faces. There was no attempt to create a flat surface so the undulations of the wall and even some of the stones themselves were not concealed. For a smarter finish or on more prestigious buildings the aim would be for a more uniform render achieved by applying a scratch coat to fill the hollows and take up some of the unevenness followed by one or two more coats which were worked to a flatter surface. Sometimes joint lines were ruled into the damp top coat to create the illusion of ashlar stone, but a common finish for many houses and cottages was a rough-cast where the final coat consisted of a mortar slurry containing coarse

grit, applied by throwing from a special trowel. For interiors a fairly smooth surface could be obtained using a coarse render mix, but for top quality internal plastering the final coat would be richer in lime and polished up to a smooth, closed finish.

Renders and plasters can be applied to a variety of backgrounds including earth based cob (which should nearly always be rendered), stone and brick. Plaster is also applied to wooden laths for ceilings and internal partitions.

By carefully selecting appropriate aggregates it is possible to match existing renders and successfully repair failed patches without the need for complete re-rendering. Hollow or detached plaster can sometimes be consolidated and saved and further advice should be sought before replacing it, especially if it is very old.

Sand/Aggregate.

Sand can be very varied in quality. For backing coats you are looking for a coarse sand. For top coat work you are looking for a “plastering” or 50/50 sand. In some places it is possible to find a lovely sharp but fine sand that is very white in colour. If you can find it use it as it is lovely. Try to avoid the use of soft round sand (often called builders sand) for anything but the very last few millimetres. Also avoid poor quality coarse sand which is a mix of large 5mm plus rounded stones and very fine sand. This is often sold as a coarse or 50/50 sand but is a horror to use as the large stones “pop” when the surface is worked and the strength of the resulting mortar will be very poor.

Lime types

There are two types of lime for making renders and “plasters”, hydraulic and non-hydraulic (otherwise known as soft lime or air drying lime). Hydraulic comes as a dry powder and is graded by strength from “feeble” to “eminently” hydraulic, standardised as NHL (Natural Hydraulic Lime) grades, the standard strengths being 2, 3.5 and 5. 2 is the softest and for use on soft/porous stone and cob. 3.5 is the standard for stone and brick and 5 is used for very exposed or damp environments and can also set under water. All these grades are much softer than cement. Non hydraulic sets by

absorbing CO2 from the air while hydraulic needs water to assist setting (so care must be taken to keep the render damped while it sets, both to avoid cracking from rapid contraction as water evaporates, but also to set with strength.

Preparing the wall

For stone and brick any hollow or decayed render should be hacked off and any loose pointing should be raked out and replaced prior to rendering. Brush the wall to remove loose material. Do not rake out pointing to provide a key. Do not use plastering bead on corners as this will give a modern appearance. Do not use chicken wire or metal lath to form a key as it can cause stress in the render due to differential thermal movements and can lead to large-scale failure, especially when it rusts. Traditionally coarse animal hair was used to create strength in the render/plaster and is still used extensively. A modern approach is to use glass fibre in the mix which creates the same strength without the risk of the hair rotting, especially in very damp situations. Also available is glass fibre mesh, of a variety of mesh sizes from 10mm squares (coarse backing work and exterior) down to 2 or 3mm for top coat work internally. The mesh comes on metre wide rolls and is placed "In coat" so not nailed to the background but worked into the wet render before another layer placed on top to seal it in.

For plastering onto existing wooden laths check that they are firmly fixed and free of lumps of old plaster. New laths should ideally be riven oak or chestnut. Sawn laths are inferior as they are smoother and weaker than those split along the natural grain of the wood. Laths should be fixed so that the distance between them is approximately 8-10mm. This allows the right amount of space for the plaster to be pushed between the laths and flop over to form a key. Do not apply preservative treatments to either old or new laths as they can introduce harmful salts into the plasterwork. Metal lath is sometimes used internally instead of timber laths as it is quicker to fix and cheaper, but it is harder to plaster onto as it is slippery and the sharp edges may cut into and weaken the plaster key. Plenty of hair in the mix is essential. Timber laths should be thoroughly dampened before plastering.

For masonry and cob, thoroughly wet the wall with clean water using a hose-pipe or sprayer. The more porous the background the more water will be required. Allow the water to soak in a bit then spray again, and repeat until the surface layers of the wall are thoroughly damp. When the render is applied the wall should be damp but without water

glistening on the surface. Some people say you can begin to use a float to apply render at this point however I would always advocate doing a harled (thrown) coat onto the masonry or cob first. Use a coarse sand, and the mix should be “soupy” so that you just dip the harling trowel into the mix before flicking onto the wall. This harl coat (which is in effect the same as a final roughcast finish) should be allowed to set well before the next coats are applied. If it is rushed then the render will delaminate early on and the render will always be weak as a result.

Mixing plaster and render

A basic lime render or plaster can be made using the same ingredients and mixed in the same way as a pointing mortar. A coarse sand can still give a smooth finish suitable for most vernacular buildings although the mix should be slightly richer in lime than a standard pointing mix, say one part of lime to two-and-a-half or three parts of sand. Do not be tempted to use a soft, fine, sand - you will just end up with lot of cracks, although it is worth noting you can use a fine sand if it is worked into the still unset surface of a coarse mix.

The mix will need to be slightly wetter than for pointing but it should be slightly stiffer than its modern cement or gypsum counterpart. Once you start plastering you will soon discover whether your mix is the right consistency: too thick and it will be virtually impossible to apply it smoothly and get it to stick to the wall; too thin and it will go on beautifully then slump, sag or drop off.

Whether you mix your own or buy ready mixed lime render or plaster it is a good idea to ensure that the lime putty used is at least three months old. This will ensure that the lime is thoroughly slaked. If the lime is younger than this any unslaked particles in the mix may slake some time after plastering causing a small eruption or ‘lime blow’. Many practitioners advocate the use of six month old putty for plastering, but few suppliers stock it. You can easily age your own by buying in advance and allowing to sit, lime putty doesn’t go off if kept moist.

Hair or glass fibre in the mix. When plastering onto lath it is essential to add hair to the mix to help in forming a key of plaster between the laths. Whilst it is not essential to use a haired mix for other backgrounds it can help to reduce shrinkage. Hair should be added to the mix just before use. Do not add hair to coarse stuff that is to be stored for more

than about six weeks as the hair may rot if left in damp lime mortar for a long time. Glass fibre can be used in that situation as it won't rot. The hair should be gradually teased into the mix so that it is well distributed and does not form clumps (often referred to as 'dead mice' or "beards"). As a rule add 4 Kg of hair per cubic metre of mortar for work on laths. For the second coat halve the quantity of hair. To check whether there is sufficient hair in the mix, scoop a dollop of mix into a gauging trowel, tap the underside of the trowel smartly against a hard edge so that the blob flattens and the surplus mortar falls off the edge of the trowel. There should be a fringe of hair at 1-2mm intervals around the edge of the trowel.

Applying Render

There are many different ways to apply render depending on the type of finish required, the type of lime used and the preference and experience of the person applying it. The following should give you an idea of some of the common procedures but is by no means the final word.

Rendering or plastering is not something that can be easily taught without a practical demonstration, but if you have already done some plastering or can get someone to show you how, there are several guidelines that will help you to use lime render successfully.

Lime renders shrink as the water in them evaporates. This can be minimised by using a well graded aggregate, by ensuring that the wall is well wetted before you start and by applying the render in thin coats of no more than half an inch. It also helps if the mix is as dry as possible but obviously it has to be wet enough to be workable and if you observe the other points you can get away with a slightly wetter mix which is easier to use.

Daub out

If there are deep hollows in the surface of the wall “daub them out” first using lime mortar and small bits of stone or tile, and allow this to firm up for say 12 hours (dependant on conditions) before applying the first coat of render. There may be no need to try to create an absolutely smooth flat surface as on most old buildings lime render and plaster looks best if it follows the contours of the wall. Battens or plumb line and pads can be used to create a flat level surface. However additional a smooth finish can be achieved by working the surface well when still damp and by working fine sand and lime putty into the finish in the final stages.

Lime renders must be applied using as much pressure as possible to force the mortar into the surface crevices or between the laths to form a close contact between mortar and backing. For masonry walls, whilst it is possible to apply render using either a gauging trowel or a plasterers trowel the best result is achieved by throwing the mortar on from a trowel. This technique ensures the best bond between the mortar and the wall, expels any air in the mix and ensures that the mortar is well compacted. If you use a float or gauging trowel it is very difficult to apply the render with equal pressure all over the wall: it will tend to be under more pressure over the high spots and under less pressure in hollows and therefore more likely to drop off. Throwing render sounds difficult but it is surprisingly easy particularly for the scratch coat or dubbing-out coat, and involves less physical effort than using a trowel. This is particularly important if you are not used to plastering on a regular basis. It doesn't matter if the first coat goes on rather unevenly as you can remove any excess mortar by running the edge of a trowel over the surface to cut off the rough bits. Just remember to protect windows, rainwater goods and any other areas that you do not want covered with lime mortar, including yourself, particularly your eyes (a covered bucket of clean water with a dash of white vinegar should be kept close at hand to neutralize the alkaline lime on hands and in eyes). If you prefer to trowel the mix on you may find it easier to apply the mortar using a gauging trowel rather than a plasterers trowel as it is better for getting into the hollows and maintaining an even pressure over the entire wall. In the early stages you can also use hands to apply the render, particularly when daubing out. But used heavy duty rubber gloves such as black marigolds.

Once you have applied the scratch coat and got a fairly flat surface, subsequent coats can be applied successfully using a trowel, although it is still easier to throw it on.

Tyrolean rendering machines which splatter mortar onto the wall do not achieve the necessary level of compaction of the mortar as it hits the wall and are not suitable for the main application of traditional lime renders.

For plastering onto wooden laths a plasterers trowel is suitable, but you must apply the plaster with enough pressure to force the mix between the laths so that it can flop over behind the laths and form the key.

Use a clean tarpaulin or sheet of polythene to protect the floor or ground along the foot of the wall, often thin cut strips of board are best . You will then be able to scoop up and re-use any mortar that doesn't stick to the wall first time. If you simply cannot get the mortar to stick try re-wetting the wall or experiment with a slightly wetter mix

As you apply the render do not try to smooth the surface by stroking with a steel trowel or float. Working the surface of the wet mortar with a steel tool will draw the lime to the surface creating a lime-rich layer over a weak, lime-depleted layer which can lead to premature failure of the render. Simply apply with one stroke, pushing hard or throw it on. If there are high spots or ridges hold the edge of the trowel or float against the wall and draw it across the surface. This will cut off the rough bits and leave a good open texture. Poly or wood floats rather than metal should be used except right at the start, for speed in application, and right at the end, for final closing of the finish.

As the mortar starts to firm up it may develop cracks, although cracking will be minimized if the points about wetting and consistency of mix are observed, and hydraulic lime tends to suffer less from shrinkage and cracking. Cracks in the base coats can be left but can also be pushed in with the nose of a wooden float, the plaster and will be covered by subsequent coats. However, you must make sure that the cracks are due to shrinkage and not because the coat is peeling away from the backing; push the coat gently to check that it is firm against the backing.

Create a key for the second coat by scoring the surface in a pattern of diamonds or horizontal ripples using a lath scratcher. Do not use the edge of a trowel as this will create too fine a groove to provide a good key. Some practitioners advocate throwing on the scratch coat and leaving it rough to provide the key for the next coat, but this depends on being able to throw the mortar on reasonably evenly in the first place or it will be almost impossible to render over it if there are huge humps and hollows. It is vital to take time and trouble over creating a good key as the adhesion of subsequent coats depends on it. Do not be tempted to miss areas in awkward places or at junctions with architraving or ceilings. Do not scour or float a scratch coat on laths. as this may damage the nibs.

There are two schools of thought regarding when to apply the second coat. Some practitioners advocate applying the second and subsequent coats whilst the previous coat is still 'green' or 'leather hard', that is after it has firmed up sufficiently to resist indentation with a thumb but is still soft enough to scratch with a finger nail and is still damp. This varies according to drying conditions. For internal plaster it may be anything up to a week or so between coats. This method requires less dampening of the surface before application of the second coat and may achieve a better bond between coats. However, there is a risk that there might be further shrinkage in the base coat after the second coat has been applied, and it will take a lot longer for the undercoats to fully carbonate and achieve full strength.

The alternative approach is to allow the base coat to dry out slowly and start to carbonate. The work should be protected from drying out too quickly by covering with damp hessian for at least one week, and often for two to three weeks (according to conditions and particularly in the use of the slower setting non hydraulic lime). By this stage carbonation will have started (but not be very far advanced in non-hydraulic) and there should be no further shrinkage in the base coat. The base coat needs to be thoroughly dampened down before applying the next coat. This method is more dependent on a good mechanical key between the coats, and requires a longer period for completion of the work than the first method.

In the second coat cracks should be closed up by scouring the surface with a wood or plastic float using a circular or "Mobius" horizontal figure of 8 movement and pushing hard to consolidate the coat. This will also enforce the bond

between the coats and remove the high spots creating a flatter surface ready for the next coat. You may need to do this several times until the mortar is firm and no further cracks develop. The importance of this scouring and consolidation process for the success of lime rendering cannot be over emphasised. It must be done thoroughly no matter how wrist-breaking it may be.

Timing is also vitally important. For non-hydraulic lime the mortar must be firm enough that the scouring will not just re-work the mortar, but not so firm that the cracks cannot be closed up. This can be anything from several hours to several days depending on conditions. Always ensure that the previous coat is damp before applying the next one. If applying a fairly fine top coat, keying of the previous coat is best carried out using a comb scratcher or a devil float which creates a finer key than a lath scratcher. If the keying is too coarse it may well result in cracking of the top coat along the lines of the key because the render will be comparatively much thicker in these places.

The final appearance depends on the type of mortar used for the top coat and the tools used to finish it. Scouring with a wood float will result in a fairly open texture suitable for the majority of external renders on vernacular buildings. For internal plastering a combination of wood and sponge floats and a plasterers trowel can be used to create a smooth polished finish. Marble floats with very flexible metal blade are great for this. A traditional type of external render finish for simple cottages and farmhouses is known as roughcast. A slurry of mortar containing some quite coarse particles of gravel is thrown onto the top coat of render from a dashing trowel. This creates a rough texture with a large surface area which helps in allowing the wall to breathe, but requires some expertise to avoid a mess.

Advice on finishing coat

My preferred approach to achieve a smooth finish is to “back trowel” the penultimate surface with the edge of stiff metal float to give a fine but open surface. Apply the finish coat of fine sand and lime with a steel but do not work with steel, once the lime is on, change to a poly float but do not overwork. Leave for between 30 mins to several hours depending on temp, humidity and previous wetting. You can use a sponge or a latex cellular tiling float to wet and work the surface,

keep washing and wetting the sponge as you go. Then while the lime is sheened with moisture work over with a polyfloat to smooth and then finally a steel (flexible marbling) float to close the surface. You can also (even when using hydraulic inside) have a bucket of lime putty and use that to “butter” the surface as you work the finish. If the surface gets too wet then wait for a while and come back to it. If cracks appear then mist the surface before attempting any working of the surface as it is easy to flake off the top coat. Sometimes you might do a two stage final coat especially if the underlying lime has dried for some time, even with heavy wetting it will draw more moisture from the top layer. This 2 stage is achieved by laying up the whole wall with a coat and then immediately going back to the start and applying a very wet coat very thinly over the top. This gives sufficient moisture in the very top to work the surface to a fine finish without dragging. A good garden pump sprayer, the 5 or 7 litre kind with a “lance” sprayer is invaluable at this stage to carefully wet the wall exactly where it is needed. Once the surface is finished the wall should be misted every hour or two and then the next day to ensure even drying and, if using hydraulic lime which needs water for the chemical set, enough moisture for the lime to set properly. Shut doors and windows to avoid an over drying breeze during this stage.

The work must be protected to prevent rapid drying. Both hydraulic and non-hydraulic limes must be kept slightly damp but at the same time air must be allowed to circulate. If using polythene or tarpaulin it should be fixed so that there is a gap between it and the wall. Remember that water will drain down through the render under gravity so the upper parts of a wall will start to dry out faster than the lower parts and you may need to spray these areas more frequently. Frost can be a particular hazard to a young render as it can cause damage weeks after the render was applied, especially if preceded by heavy rainfall. It is a fallacy to believe that by using hydraulic lime or a pozzolanic additive you can "beat the frost". It is only the initial setting which takes place by hydraulic reaction and the mortar still requires a long period of time to carbonate and strengthen. If hard frost is forecast within a couple of months of application then ideally the render should be protected by hanging polythene, bubble wrap or hessian over it, although on most buildings this may be impossible. A render which survives its first winter unscathed is more likely to wear well subsequently.

Repairing Render

If patches of render have fallen off cut back the edges to sound plaster. The best tool for this is a craft knife. You can cut

back using a bolster chisel but you risk loosening adjacent plaster. Ensure that the edges of the patch are cut square to provide a key for the new mortar, and eliminate feather edging.

Where render is cracked or hollow it may be possible to consolidate and save it and further advice should be sought before hacking it off, especially if it is believed to be very old. However if it is beyond repair or not worth saving hack it off, cutting back round the edges to sound plaster.

Rake out any loose pointing in the wall behind and repoint roughly. Brush out loose dust and apply the render in thin coats following the guidance above and taking care to ensure that it is well pushed in beneath the undercut edges of existing plaster. Apply the final coat with a neat butt joint between the old and new and with a slight bulge in the middle of the patch so that the final consolidation will create a flat patch, flush with the surrounding render. Do not feather the edge of the patch over the surrounding plaster. Push back and consolidate the patch with a wood float. In the final finishing a sponge can also be used to merge. For small patches it is best to use miniature wooden floats which can be made by fixing a small handle to a short piece of batten and rounding off the edges with sandpaper.

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