



## LIME RENDER & WHY BUILDINGS NEED TO BREATHE

KEIM MINERAL PAINTS

# THE NEED FOR BUILDINGS TO BREATHE

Before the twentieth century, building techniques and materials were very different from those used today and it is important that traditional properties are able to 'breathe', to allow moisture inherent in a solid wall construction to evaporate from the external stonework or render. Many older buildings suffer from damp problems, cracking or hollow render and flaking paint caused by trapped moisture.

It is important that materials used for repair and redecoration are suitable for use on older, traditional buildings. Hard cement renders and many masonry paints do not allow the moisture that is continually being absorbed into the building to evaporate easily. This can result in damp, cold walls, condensation, flaking paint, rotten joists and other timber fittings, increased heating bills and dampness on the internal walls. Chemical damp course injections, tanking and

even dry lining are often proposed as solutions but they do not address the basic requirement of an older building and its need to breathe. The combination of sealing the external and internal walls can lead to a dramatic rise in the moisture levels in the wall, causing severe damage to the structure.



# LIME BASED MATERIALS

Lime is the base product widely used to produce mortars, plasters and limewashes for traditional buildings. Lime has distinct advantages over cement based alternatives for external rendering of traditional properties. Lime is less dense and more vapour permeable than cement based materials and does not trap water in the substrate which is the leading cause of decay in all buildings. Lime materials accommodate general movement better than harder cement based alternatives and are closer in strength to many of the types of stone and brick used in traditional construction and therefore do not exacerbate their deterioration.

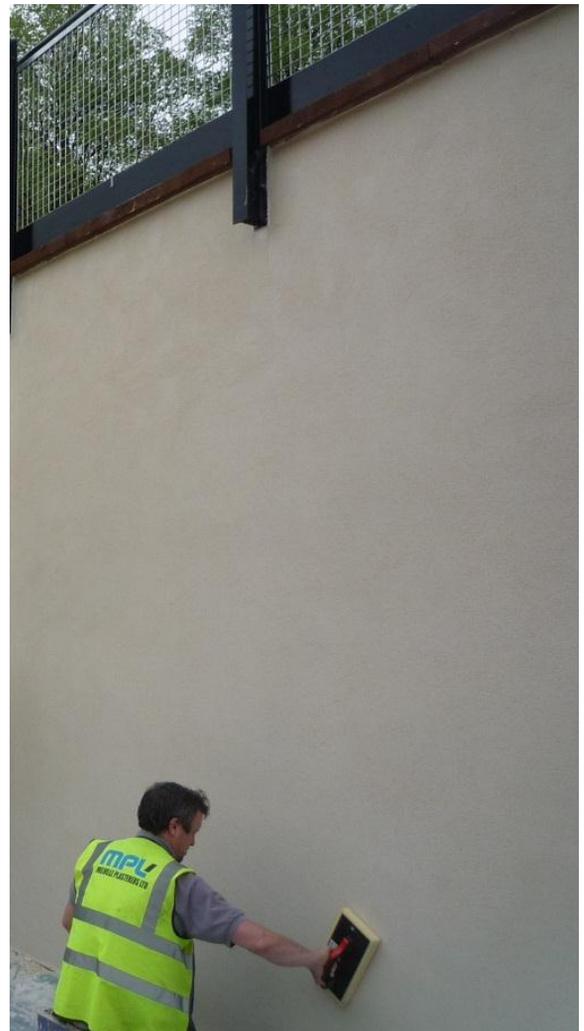
Instead of using lime materials, many traditional buildings are repaired and renovated using harder, impermeable materials designed for modern buildings which use completely different construction methods. The result is often worsened damp problems. The simple advantage of using a lime render is that it allows the walls to diffuse any water vapour that penetrates into them, referred to as the free passage of moisture vapour.



# MODERN USE OF LIME MATERIALS

Whilst lime is commonly accepted for use onto older and more traditional buildings, it still has its place in new build construction and as new technologies are employed they can create a versatile and modern equivalent to conventional cement renders.

Products such as Fibrelime, which is a traditional plaster mix with improved modern fibres for durability, and KEIM Universal Render, which is a hydrated lime mix with excellent flexibility and breathability, mean that it is possible to enjoy the look, feel and durability of a traditional render finish with a more durable modern performance.



# DECORATING LIME BASED MATERIALS

The role of an external coating is to decorate and enhance the appearance of a building. The chosen materials should also provide protection to the underlying substrate not only from varying climate conditions but also from potentially harmful environmental pollution.

As lime renders are so porous, any coating must allow for the free passage of moisture vapour from the substrate, whilst at the same time preventing the ingress of moisture. As already identified, if this does not happen then moisture can become trapped within the masonry which increases the risk of damage from frost, due to the expansion and contraction of the moisture as it freezes and thaws. The paint coatings

themselves can also fail if the substrate is continually damp as blisters can form which result in flaking and peeling coatings. Problems may also occur in very damp substrates caused by the migration of soluble salts which can crystallise, damaging the masonry under the force that this crystallisation creates within the pores.



# CHOOSING THE RIGHT COATING

Selecting the right material to achieve a protective and permeable coating is paramount. It is useful to understand how different coating systems work. In simple terms a coating either sticks to the surface to which it is applied, creating a film, or it soaks into the substrate in a physical or chemical manner.

## MODERN MASONRY & INTERNAL EMULSION PAINTS

Many modern masonry paints and internal emulsion paints simply stick to underlying material and are usually manufactured from organic polymers and petrochemicals, which form a skin, or film, that has permeability lower than that of the underlying material. They typically have negligible breathability, causing problems with trapped moisture for both the substrate and coatings. In addition to the potential substrate damage, unsightly, peeling and flaking paint coatings significantly reduce the protection of the coating and can result in even more water being able to penetrate into the substrate.

Organic based paint systems also fail due to the action of UV light from solar radiation which causes degradation of the coating. This initially results in a loss of colour and then eventually embrittlement of the paint, causing cracking and failure.

One of the other concerns is due to the high alkalinity of a lime render, applying an acidic, acrylic based paint system can cause a reaction, called 'Saponification' where moisture in the substrate causes the acid and alkali to react to each other producing a waxy/soapy substance which rapidly deteriorates the paint coatings.



## LIMEWASH

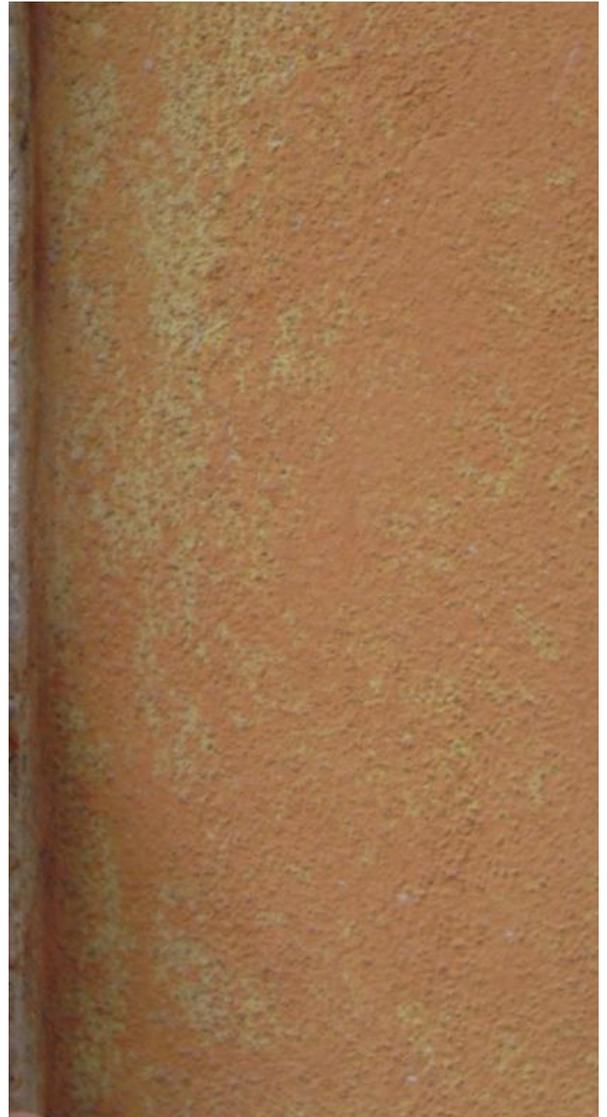
Limewash is a traditional coating which provides a breathable, decorative finish that soaks into the underlying material to which it is applied. The material is primarily composed of slaked lime (calcium hydroxide) sometimes with other organic additives. As a coating for lime-based render, limestone and stucco, limewash is in many ways comparable in nature to that of the underlying material, with similar porosity, alkalinity (pH value) and coefficient of thermal expansion. In the past, periodic redecoration of building facades with limewashes every few years was common-place and based upon availability of raw materials and experience of local contractors.

The increase in pollution since the industrial revolution, especially acid rain, causes very rapid degradation of external limewash facades. Limewash typically provides protection for the surface as a 'sacrificial' coating, in that it is destroyed more rapidly than the material below.

One other concern with limewash is its ability to shed driven rain water, especially in our changing climate of persistent rainfall, this can lead to excess water ingress in some buildings.

(Research by Orsi-Contini 2012)

Limewash is most commonly used for historic buildings which are rendered or constructed of limestone masonry, cob or wattle and daub, where there is a need to maintain the historic appearance and where it is accepted that regular maintenance and re-application will be required.

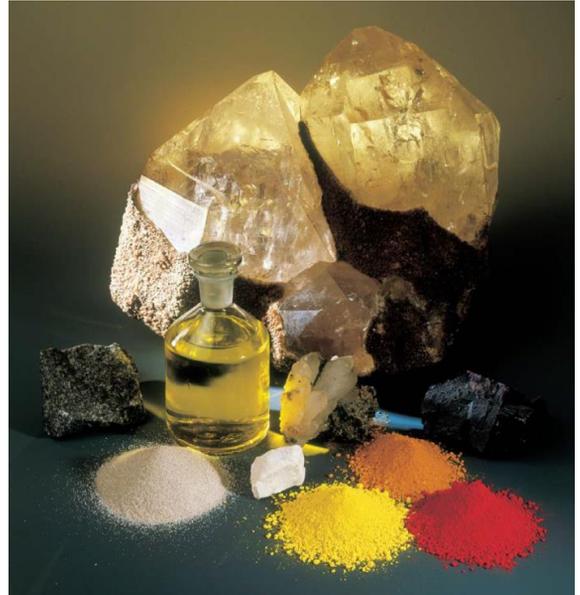


## KEIM MINERAL PAINTS

Silicate paints, such as KEIM Mineral Paints, bond in a similar way to limewash, by soaking into the surface. In addition the potassium silicate binder of the mineral paint chemically reacts with the substrate to form an insoluble microcrystalline silicate bond. The microcrystalline structure has a pore size that allows the free passage of vapour, but the pores are small enough to prevent the ingress of driven rain. KEIM Mineral Paints provide an integral, water resistant, breathable protective and decorative finish.

KEIM Mineral Paints are made with natural silicate fillers and earth oxide colour pigments that are unaffected by the action of UV degradation.

The microcrystalline structure is comparable to that of the mineral structure to which it is applied and it has a comparable coefficient of thermal expansion. The insoluble silicates formed in the chemical reaction are resistant to strong acid and alkali attack.



**KEIM Mineral Paints penetrate the surface and chemically bond, rather than being merely a surface coating**



# COMPARISON: PROTECTION & VAPOUR PERMEABILITY

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Independent tests have been carried out by one of our customers, who specialises in lime render. Sample panels of lime render were used- one unpainted, one coated with a traditional lime wash, one with a conventional acrylic paint and the fourth with KEIM Granital.

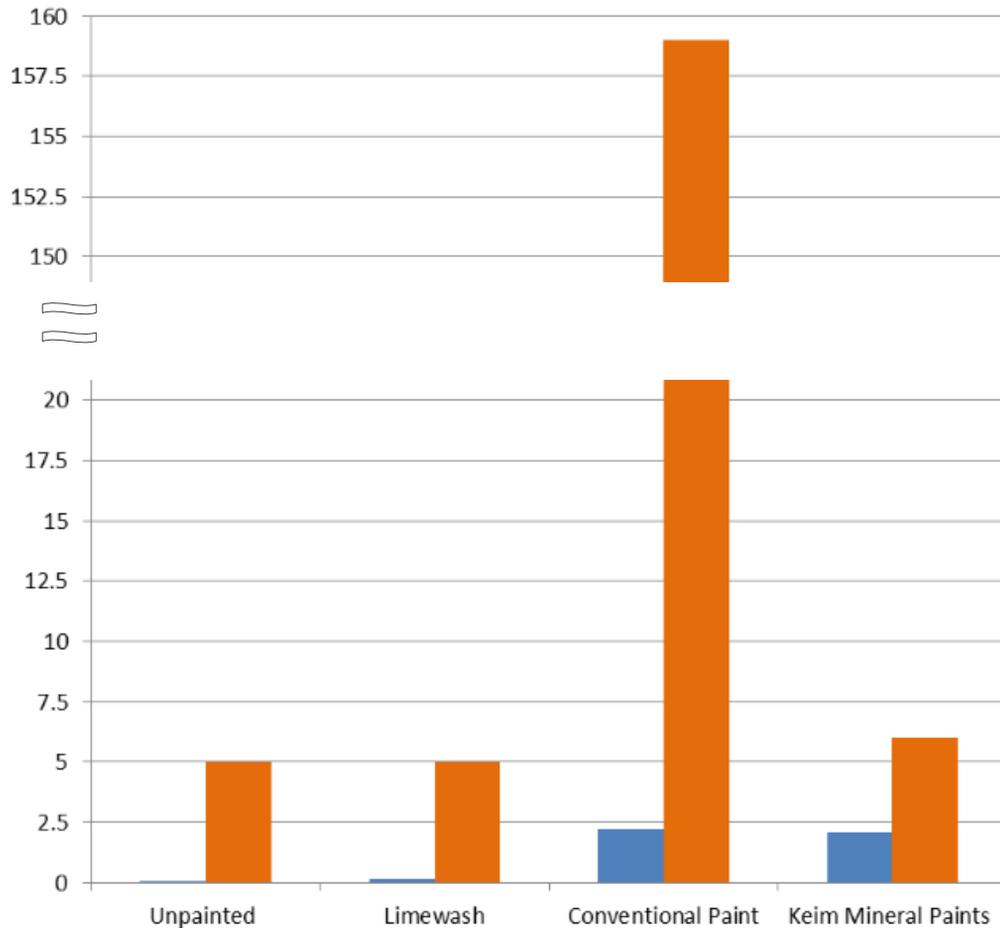
The samples were completely submerged into water and the time measured for them to saturate by water penetration. The samples were then allowed to dry out and the time measured for the moisture to evaporate and allow the surface to completely dry (back to the original starting weight).

The results show, that as expected, the unpainted surface saturated instantly as it had no protection, highlighting why protective coatings can be so important. The sample however was able to dry out quickly as there was no restriction on the breathability. The limewash sample saturated nearly as quickly as the unpainted sample demonstrating that limewash offers very little protection, but, again as with the unpainted sample, it does not impede the drying out process. The acrylic paint took much longer to saturate as the paint gives protection to the surface, but took over 159 hours to dry out showing how impermeable the coating is and how long moisture can remain trapped in the substrate if it is not able to breathe out.

The KEIM Granital (exterior mineral paint) samples demonstrated that the mineral paint provided a high degree of surface protection, similar to a conventional paint, but still allowed the surface to breathe and dry out quickly, similar to the uncoated/limewash samples, avoiding potential damage which can be caused by prolonged substrate saturation.

(Results Overleaf)

# RESULTS OF THE PERMEABILITY TESTING



■ Time to saturate (Higher the result the more protection given to the substrate) in hrs



■ Time to dry out (Lower the result the less potential damage caused to the substrate by elevated moisture levels) in hrs

# THE IDEAL SOLUTION

As a breathable protective coating, KEIM Mineral Paints offer an excellent alternative to both conventional masonry paints and limewash, and can provide for much longer life expectancies than either system. Typically limewashes require maintenance every few years and film-forming paint systems every 5-10 years.

For historic buildings the need to provide the most durable long-term protection will often be the prime consideration, particularly where scaffolding will be required for maintenance. There are documented examples of KEIM Mineral Paints systems performing well on lime based render facades in Germany, Switzerland and Norway

In the example right, KEIM Soldalit and KEIM Design Lasur were used at Hannington Hall, Oxford. The finish is ideal for the lime rendered substrate but also available in a colourwash finish which can replicate a limewash type effect for periods in excess of 100 years.

For further information and assistance about KEIM Mineral Paints please contact the sales office on 01952 231250 or [info@keimpaints.co.uk](mailto:info@keimpaints.co.uk).





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