

The maintenance series

Limewash



Who is this information sheet for?

Owners, designers and contractors of heritage buildings. It includes:

- information and advice on limewash
- matters to consider when undertaking work to a heritage building that features limewash.

Overview

- Traditional limewash is used in many heritage buildings because of its good breathability.
- Different types of limewash have properties suited to different uses.
- Additives put in limewash will affect the substrate it is applied to, the finish or its performance.
- Modern, commercial 'limewash' does not perform as well as traditional limewash.

What is limewash?

- Limewash is a luminous, robust, flat chalky finish that can be applied to walls and ceilings.
- In its basic form, limewash is a mixture of water and slaked lime.
- It may be referred to as lime putty, slaked lime, hydrated lime, fat lime or non-hydraulic lime.
- Limewash may or may not have pigments.

Whitewash

- Limewash without pigments may be called whitewash.
- Whitewash can also refer to calcimine or distemper.

Why use limewash?

It is particularly important that old walls can 'breathe' to allow water to evaporate, as:

- walls may contain soluble salts that are hygroscopic, attracting water in humid weather
- masonry walls are porous and exchange air with the atmosphere when the temperature changes, in a sense, 'breathing out' as the wall warms up and 'breathing in' as it cools down.

Traditional limewashes have the highest 'breathing' capacity of all common coating materials.

Old walls should never be coated with water repellents or other products with the aim of sealing them, because the coating will trap moisture and cause damage.

Where to use limewash?

- Traditionally it was used as a final coat to other lime-based finishes, like plaster or render.
- It can be used internally and externally.
- It can be applied directly to masonry and brickwork.

Traditional versus modern commercial limewash

Limewash is often used to describe commercial paints that mimic the appearance of traditional limewash. Many consumers believe these are a traditional product, but they usually contain materials like modern acrylic paints without the breathing characteristics of traditional limewash.

These paints may be described as 'vapour permeable'. But unlike traditional limewash, they do not transmit moisture and salts and they may create an impermeable, damaging coat on the wall.

Information on binders in commercial limewash can be found in material safety data sheets (MSDS) that manufacturers are required to supply for products.

If a product is advertised as an 'improved version' it usually contains modern binders. If these are to be used, look for one that has a minimum proportion of acrylic resin or another organic polymer.

Making limewash from lime putty

If using colour:

- mix pigment with a little hot water to allow it to mix more easily with the putty
- cover and set aside.

Prepare the limewash by:

- placing a few trowelfuls of putty into a bucket and covering with about 75mm of water
- working it to a smooth paste
- adding more water until it is like thin cream, generally with about 15-20% lime
 - each lime will have different amounts of water
 - mixing should generally be done by eye rather than weight
 - add an egg-cupful of raw linseed oil if desired – see types of modified limewash below.
- pouring mixture through a sieve into a clean bucket to remove grit.

If using colour:

- stir in the pre-mixed pigment
- start with small samples to determine how much pigment is needed for the desired result.

Limewash will look darker in the bucket than on the wall. It can be difficult to colour match different batches, but this can add interest to the wall surface.

Often, pigments are added to the final layers only.

Making limewash from bag lime (or hydrated lime from a builders' merchant)

Mix water into lime gradually, beating well to get as thorough a mix as possible.

Applying limewash

Prepare the surface

- Brush or vacuum the surface to remove any loose particles or surface salts.
- A desalination method, such as a water captive rinsing system, should be used to reduce excessive salt accumulation on the surface.
- Spray the prepared surface with water to reduce suction and premature drying before carbonation can occur.
- Old limewash or lime plaster will need more damping down than less porous surfaces.

Apply the mixture

- Apply thinly and allow to dry out slowly.
- Use a scooping and swirling motion in the bucket to make sure the mix remains suspended and the lime doesn't sink to the bottom.
- Work in patterns to make sure the surface is covered.
- Apply liberally, working into the surface with strokes in many directions – up, down, diagonal.
- Brush it out and work to a wet edge.

Limewash is usually applied with a large brush. 'Limewash brushes' are readily available in shops.

It is important the limewash is thoroughly brushed out and worked to a wet edge. Each coat is affected by the suction of the underlying layer and subsequent layer(s).



Limewashing Queen's Magazine, Goat Island, Port Jackson, NSW

Photo: Jacqui Goddard

Limewash is semi-transparent when first applied, and then dries to form an opaque surface. Problems occur when people try to brush on a visible, thick layer as this is likely to craze and crack on drying.

A very fine surface can be achieved provided sieving is done carefully with several thin applications. This good-quality limewash will develop a strong finish and not brush off on clothes.

Additives

Oil, resin wax, polyvinyl acetate or cellulose are common additives. Binders can also be added to limewash, to:

- provide greater adhesion to an underlying paint layer
- create more flexibility in the material
- add variations in porosity.

Old recipes sometimes contain many different additives, including blood, salt and urine. The term 'modified limewash' is used to describe limewash with additives present.

Additives to limewash can affect:

- its porosity and permeability
- tolerance to UV light
- the general workability
- the adhesion to the substrate.

As such, it is important to carefully consider the likely effect limewash additives will have on the substrate and finish. It may be better to only use additives in the final coats, if used at all.

Health and safety

Working with lime is dangerous

Precautions must be taken to prevent contact with eyes and skin.

When working with lime, always wear:

- waterproof clothing and a cloth over the neck and mouth to protect the skin
- gloves and barrier cream to protect the hands and wrists
- safety glasses or goggles to protect eyes.

An eye bath or spray container with clean lukewarm water should be on hand to rinse any splashes. If limewash gets into eyes, rinse continuously for 20 minutes and seek medical assistance.

Quicklime, or calcium oxide (CaO)

- Is generally only available to tradespeople who have a demonstrated need for it.
- Is highly volatile and caustic.
- Can blind if it gets into the eyes.
- Must be kept dry if stored.
- Needs to be handled with extreme care.
- Combines vigorously with water to create a great amount of heat and spitting that will burn.

The lime cycle

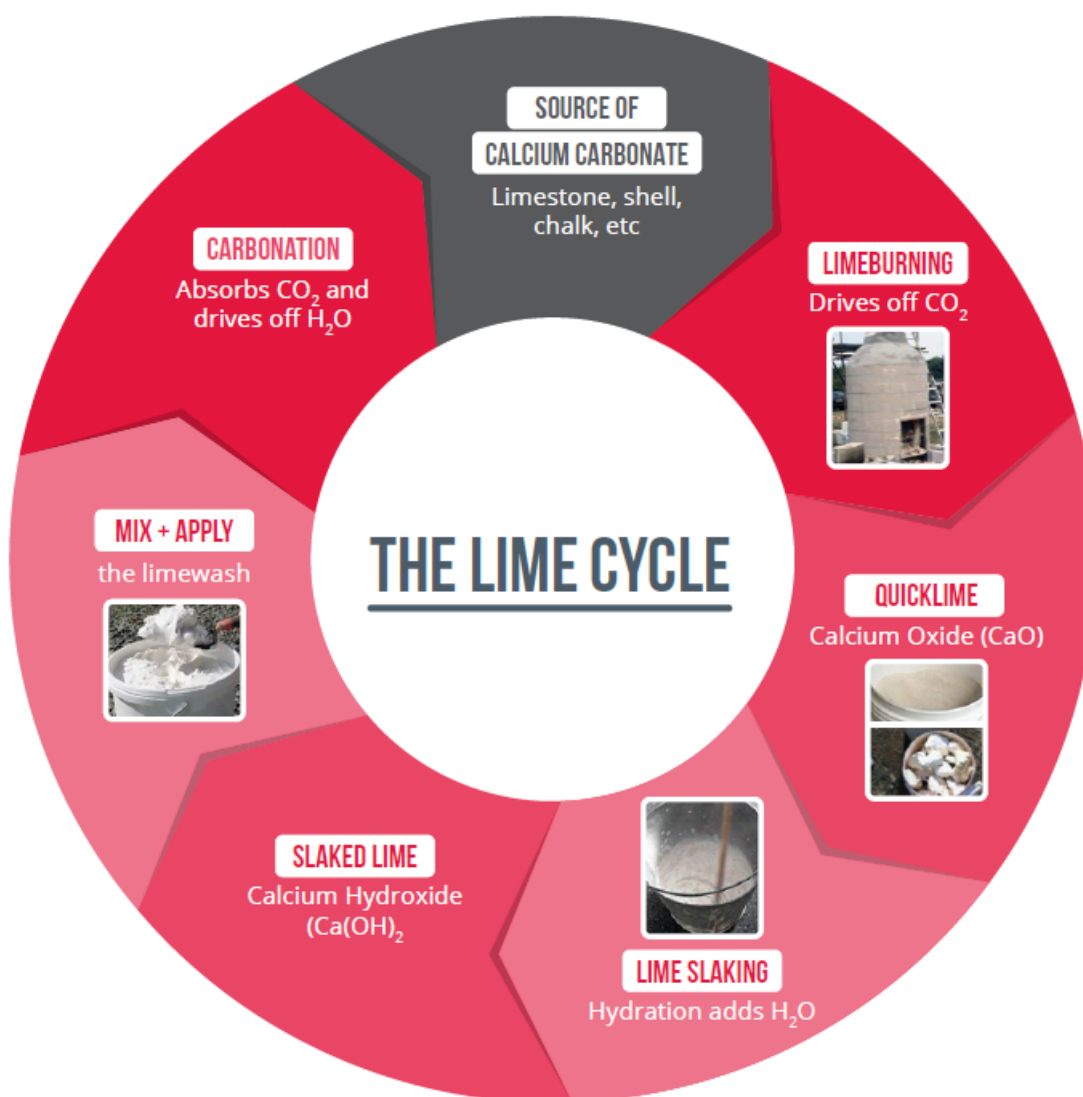
When lime is used in building, it:

- begins as some form of calcium carbonate (CaCO_3) such as limestone, shell, oyster shell, chalk or coral
- goes through a process of crushing and burning to form calcium oxide (CaO), or quicklime
- is then slaked with water to form calcium hydroxide (Ca(OH)_2) and mixed to form end products such as plaster, render, mortar or limewash
- then sets or carbonates and reverts to calcium carbonate (CaCO_3).

The end material has the same chemical make-up as the original material but in a different form.

The degree of impurities in the original calcium carbonate source will influence the final product.

During the cycle, lime can also be slaked with aggregate in a process known as ‘hot-mixing’.



The lime cycle allows the protective qualities of calcium carbonate to be applied to surfaces as a wash.

Photos: Jacqui Goddard

Hot-mixed lime

It was assumed that shell in rough mixes came from un-sieved sand, which led to a practice of adding shell-grit to mixes to match original mortars. But recently, it has been found that this came from unburnt hot-mix.

Hot-mixing is making lime directly from calcium oxide (or quicklime). Hot-mixing involves:

- adding just enough water for burnt quicklime to slake
- stirring in more water to achieve the desired consistency – typically, thick enough that a dipped brush does not drip.

Types of modified limewash

Tallow limewash

Tallow limewash contains rendered animal fat. It:

- is often used on external walls in exposed locations
- is incorporated during slaking process as heat melts fats enabling it to be evenly dispersed
- is less porous than other forms of limewash
- can prevent excessive water penetration
- can brush off on clothes
- can be substituted with other oils or waxes, such as linseed oil.

Casein limewash

Casein is a component of milk that reacts to lime forming calcium caseinate. It:

- is popular for internal use
- is more porous than calcium carbonate
- is susceptible to mould in its wet form so a biocide is often added
- improves the binding capacity of limewash and has good adhesion.

Hydraulic limewash

Hydraulic limewash is made by mixing hydraulic lime powder with water. It is desirable in wet conditions as it sets by chemical reaction rather than by air drying or carbonation.

Pigments

Pigments used in limewash must be alkali resistant. Many organically based pigments are destroyed by lime. Traditionally, natural earth pigments were used, as they were cheap and available.

Artists pigments can be used. Commercially available pigments labelled for use with cements can also be used with lime, but be aware of any additives.

Further information

Heritage Council of NSW (2004) [The maintenance series 7.1: Plaster finishes](#) [online document], Heritage NSW, accessed 18 February 2021.

Heritage Council of NSW (2004) [The maintenance series 7.2: Paint finishes](#) [online document], Heritage NSW, accessed 18 February 2021.

Society for the Protection Against Ancient Buildings (n.d) [Limewash](#) [SPAB website], Society for the Protection of Ancient Buildings, accessed 31 March 2021.

Young D (2020) [Lime mortars for the repair of masonry](#) [online document], Heritage Council of Victoria, accessed 18 March 2021.

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Young D (2008) [Salt attack and rising damp](#) [online document], Heritage Council of NSW; Heritage Victoria, Department of Planning and Community Development; South Australian Department for Environment and Heritage; Adelaide City Council, accessed 18 March 2021.

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