

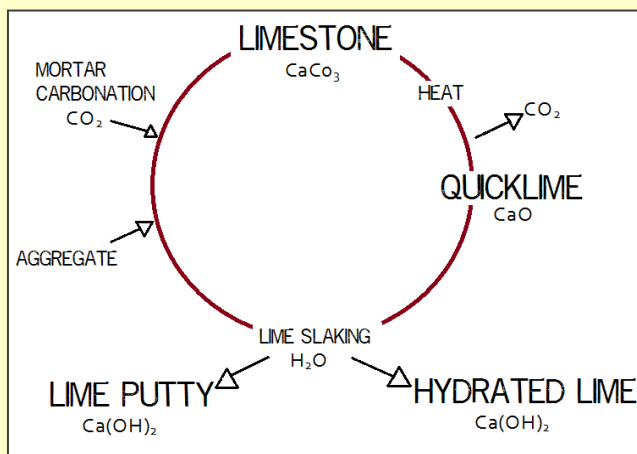
## A History of Lime and it's Uses

Lime has been used as a building material for thousands of years, the Egyptian Pyramids, the Colosseum in Rome and The Great Wall of China all boast lime mortar cement. Yet, since the invention and widespread use of Portland cement from the mid 1800s, lime has faded into obscurity and few people know how to correctly use lime. This guide is a short introduction to this forgotten building material: how it's made, how to use it and why lime is an attractive alternative to cement, modern plasters, and paints.

## What is Lime?

'Lime' refers to Quicklime and is made through heating Limestone (Calcium Carbonate) at high temperatures in a kiln. The Lime (Calcium Oxide) produced can then be rehydrated to form Hydrated Lime (a powdery substance), or 'slaked' and matured for 2 -3 months in an excess of water to create Lime Putty (which has a similar texture to toothpaste) – both of these products can be bought from traders and form the basis of lime plasters, mortars and washes. During the heating process, Carbon Dioxide is emitted, but this is reabsorbed when the lime materials slowly dry, set and harden. The re-absorption of Carbon Dioxide completes the 'lime cycle' and makes using lime environmentally friendly and sustainable.

## The Lime Cycle



Depending on the purity of the Limestone used, types of lime can be produced with varying properties and strengths. Pure Limestone produces **Non-Hydraulic Lime** (Termed 'CL' by European standards), meaning that it won't set under water. This is ideal to use inside

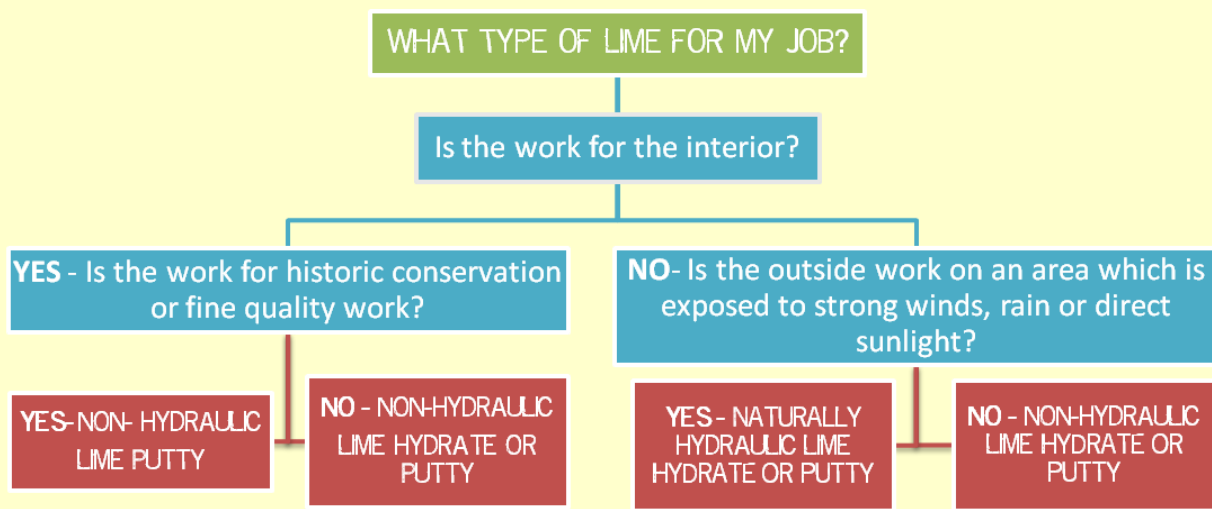
the home for plasters and decorations, but does not suit outside work unless you can guarantee fine summer weather for many weeks. However, limestone with clay particles produces **Naturally Hydraulic Lime (NHL)**, which can set (like concrete) in the presence of water due to the presence of silicates in the clay and this is classified into three different strengths: 2, 3.5 and 5.

Non-Hydraulic Lime can also have particles artificially added to quicken the drying time and make the lime hydraulic - these are termed HL or NHL-Z.

## Why Use Lime?

But why use lime at all? Indeed, lime products do take a long time to make, apply and dry. However, the benefits using lime in your home (whether it is old or new) outweigh these negative aspects. In addition to being carbon neutral, lime products have the following additional benefits:

- **Breathability** – lime finishes allow the building to breathe and prevent damage caused by trapped moisture.
- **Sustainability** – Lime mortar and plasters are often softer than surrounding masonry, meaning that the lime will deteriorate and take structural strain, not the stonework, prolonging the life of masonry units, which can be reused.
- **Durability** – if applied correctly, lime can last up to 200 years without needing to be replaced
- **Anti – Bacterial**: The alkaline properties of lime are naturally bacteria repellent
- **Aesthetic Appeal** – lime plasters, mortars, and paints are unique, change with the weather and have a beautiful matt finish which alters with changing light conditions



## How to Use Lime

When deciding the type of lime suitable for your job, it is important to understand that “The more hydraulic a lime, the greater its strength, but the lower its permeability and flexibility” (SPAB) so the right balance needs to be struck. Another factor to take into consideration is to use a type of lime that is historically appropriate for your building or surrounding area.

One of the main points to consider is that slaked lime in any form (hydrated powder or putty) can cause mild caustic burns and so hand and eye protection must be worn. Lime putty and lime hydrate can be made in the home environment, but this can be highly dangerous for a non-professional and so Lime is readily available from many building suppliers. Once you have obtained the slaked lime, various aggregates can be added depending on the designated use of the lime. How to make up the slaked lime and apply the lime correctly for each use is described below.

## Do's and Don'ts

When applying lime, **DO**:

- Make sure to mix the lime with the aggregate thoroughly
- Follow manufacturer's instructions and allow ample drying time
- Use only lime putty that has been matured for 2-3 months or more
- Mix Hydraulic lime hydrate with water for 20 minutes to make it the right consistency

**DON'T:**

- Use lime in areas exposed to strong sunlight, heavy wind or rain or in frost conditions
- Apply lime when the temperature is less than 5°C or exceeds 30°C
- Use a dehumidifier to speed up drying time, as this will result in uneven drying and damage to the lime structure

## Lime Mortars

Lime mortars can be prepared from Lime putty's or hydrates. To make the lime hydrate into a lime putty, it must be soaked in clean water for at least 24 hours. The putty can then be mixed with an aggregate in a 1:3 lime:aggregate ratio. The aggregate (usually a sharp, well graded sand) used should match the original mortar colour and texture as close as possible, if used on an historic home. You can use any equipment to mix lime mortar, but it is essential that the aggregate and lime are thoroughly mixed so that the mortar has a good workability and performance.

## Lime Plasters

A basic lime plaster can be made up in the same way as a lime mortar, however, the mix should be richer in lime, with a 1:2.5 lime:aggregate ratio. Additionally, the aggregate used can be tailored, with fine graded sands used for a smoother finish. Interior plasters are typically applied in two – three coats. Before applying the plaster, the wall should be uniformly damp - this can be done with a household plant sprayer. The first coat is used as a base and once applied, a diamond pattern 2mm deep should be marked into the surface. This will take approximately 2 weeks to dry. The next coat should be no thicker than 10mm, and the finishing coat should be no thicker than 5mm. You can tell when each coat is dry by pressing the pad of your thumb into the wall, if there is no indent, the plaster has initially hardened.

## Limewashes

Limewash is created by diluting lime putty with water to the consistency of milk. This should be applied to clean, damp walls in one continuous application. Colour can be added to the limewash through the addition of natural pigments which are available to buy. However, colour matching is difficult and so enough limewash should be made to cover the entire area. Limewashes are suitable for indoors and outside areas and should be renewed every five years