



lime



what is it?

Various types of lime are used in building as mortars, renders, plasters, slurries and washes. All are made from limestone, which is a sedimentary rock made from the dead bodies of sea creatures that produce calcium carbonate (coral, shellfish, some planktons). Most limestone was laid down in the Cretaceous period (60-150 million years ago).

Chalk is limestone made from very small white particles.

Non-hydraulic lime or quicklime is the purest form, made from rocks containing at least 95% calcium carbonate: limestone is burnt and CO₂ is driven off to produce calcium oxide ($\text{CaCO}_3 - \text{CO}_2 \rightarrow \text{CaO}$).

Hydrated lime or 'bag lime' from builders' merchants is calcium oxide slaked with a precise amount of water, which is driven off by the heat of the reaction, leaving a powder.

Hydraulic lime is produced from limestone containing clay, and has the added benefit of being able to set underwater.

From the Romans to the mid-18th century, cement was lime plus volcanic ash or other additives. Modern Portland cements date from around WW1.



Quicklime being slaked in an old bath: the lime is added to the water, not water to lime, as it could cause an explosion. The ratio of water:lime is 3:1. To ensure that all the lime is slaked, rake the mixture for 10 minutes. There's a violent reaction, and heat and steam is given off. When cool, the lime putty can be stored in plastic buckets indefinitely as long as there's a layer of water on top.



Applying a lime render to an external wall with a float.

what are the benefits?

Environmental benefits

Carbon neutral: lime, like cement, gives off CO₂ (the main greenhouse gas) during its manufacture. However, it re-absorbs CO₂ when it sets, and cement does not.

Lime is recyclable and biodegradable.

Limestone is burnt at around 900°C compared to around 1300°C for cement. This saves on fuel consumption and emissions of pollution and greenhouse gases.

CO₂ emissions in the manufacture of lime are 20% less than for cement.

Lime is less dense than cement, which saves on transport fuel.

Lime mortars allow bricks to be recycled as you can get the mortar off, unlike cement.

Cements contain heavy metals which are put into the air on burning: lime doesn't.

Lime is an important part of any 'natural house' – involving timber, straw-bales, lime and earth, all of which are natural, healthy and biodegradable.

Other benefits

Lime is breathable, so any water that enters a structure through a crack, can escape. This isn't the case with cement.

Lime is soft and flexible, so if a building moves slightly it won't crack like cement, and let water in.

With cement mortars, the only way moisture can escape is through the brick, which can begin to erode away.

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Quicklime is different from ordinary 'bag lime' that you buy from a builder's merchants. It is calcium carbonate (limestone or chalk) which is burnt, driving off CO₂ to leave calcium oxide.

what can I do?

It is interesting to go through whole process, and to slake your own quicklime. It can be dangerous though, as a lot of heat is given off in the reaction.

After slaking your quicklime, and allowing it to cool, you are left with lime putty, which is the basic constituent of lime mortar, render, plaster and limewash.

Quicklime is around £8 plus VAT per 25kg bag, which represents a price of around £2.50 for 25kg of lime putty if you slake it yourself.

This is cheaper than cement.

Mortar: one bucket of lime putty to four of sharp sand. The older the mortar the better – it can be kept in airtight bags, and 'knocked up' when needed.

Exterior render: one part lime putty to three parts sharp sand. Ideally, spray the wall with a weak limewash the day before to provide a key. 2 coats are applied with a trowel or by hand (wearing rubber gloves).

Limewash: one part lime putty, 2 parts water. Can add pigments. Can apply up to 6 coats (one a day) – coats of limewash can be applied very quickly.

Interior plaster: first coat 1 part lime putty, 3 parts sharp sand, plus horse-hair, to bind the plaster. 2nd. coat 1 part lime putty, 3 parts silver sand (washed and finer), with horse-hair again, cut into 20mm lengths.

resources

- lowimpact.org/lime for more information, links & books, including:
- Nigel Copsey, *Hot Mixed Lime and Traditional Mortars*
- Stafford Holmes & Michael Wingate, *Building with Lime: a practical introduction*
- Hunt & Suhr, *Old House Handbook: a Practical Guide to Care & Repair*
- Weissman & Bryce, *Clay and lime renders, plasters and paints: A how-to guide to using natural finishes*
- buildinglimesforum.org.uk - network of lime enthusiasts, plus journal
- dirtcheapbuilder.com/allaboutlime.html - loads of books and videos on natural building
- britishlime.org – British Lime Association
- spab.org.uk/advice, Soc. for the Preservation of Ancient Bldgs – free, independent advice



Lime rendering a straw-bale play-house: one part lime putty is mixed with 3 parts sharp sand. The walls are sprayed with water first; apply two coats, and allow each to dry slowly by covering with wet sacking.

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