

DESCRIPTION OF LIME MORTAR

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Lime mortars have been used since time immemorial. With lime mortars all our buildings, prior to the advent of modern cement after 1915, have been built. The survival of most of these buildings for hundred and even thousands of years is a testimony to the durability of lime mortars.

Lime is produced by burning limestone (CaCO_3) at temperatures below 1250°C traditionally in vertical kilns loaded from above and for a period of up to 48 hours. The material extracted from the furnaces is Quick Lime (CaO), typically in lumps. These, when in contact with water, exothermically disintegrate into smaller pieces varying from friable chunks to very fine particles. The process of water addition is called Slaking, hence a slaked lime is quick lime that has been hydrated or Hydrated Lime. If necessary the slaked lime is ground, once cooled down, into fine powder and bagged.

During the burning the limestone (CaCO_3) loses CO_2 , hence the quick lime has the symbol of CaO . When exposed to air, some CO_2 is reabsorbed, reconstituting CaCO_3 or limestone. This process is called carbonation and its result is the hardening of the lime. In a mortar the lime has bound together the aggregates and by hardening produced the hardening of the mortar, normally expressed as Compressive Strength. Carbonation is a slow process and in damp or wet environments, is impeded by the moisture patina which forms over lime mortar surfaces obstructing the contact with air. (Lime mortars which are not hardened are very susceptible to adverse weather conditions and, in cold climates, can be easily damaged by frost.

If the limestone being burned contains hydraulic components (hydraulicity is the property of hardening in contact with water) such as silica (SiO_2), alumina (Al_2O_3) and ferrites (Fe_2O_3) these will in total or part combine with the CaO forming Calcium Silicates, Calcium Aluminates and Calcium Ferrites. These combined elements harden in contact with water, producing Hydraulic Limes. (Mortar made with hydraulic limes will harden quicker than air lime mortars and will have a better performance in cold climates.

Today we are charged with the responsibility of ensuring the survival of our historical and vernacular built heritage through careful and considered conservation, restoration and renovation. All too often buildings are repaired with inappropriate materials and poor skills. Many are the subject of interventions that in time lead to their total loss. Others are simply changed out of all recognition. In most cases, the mortar used for repairs, restoration or conservation contains cement. In these buildings, the use of cement mortars promote condensation build up, salt reactions and, generally, drastically affects the long term survival of the building. **Historic Masonry Repair for Brick and Stone Homes**