

The Use of Lime in Historic Buildings

INTRODUCTION

Lime is the principal binder of most traditional mortars, plasters and renders. It tends to be neglected in modern building practice, but it is central to successful maintenance and repair of traditional buildings and their fabric. An understanding of lime is essential for anyone working on historic buildings.

Lime has had a long history of use for building in Britain. The Romans employed it in their construction operations and it was used extensively in mortars and surface finishes from then until the nineteenth century when patent cements, such as Portland Cement, were introduced. The use of lime declined in the twentieth century, but increasingly it has been recognised that hard, cement-rich mortars are unsuitable for use on old buildings, and lime is enjoying a revival. However, much of the skill and knowledge needed to use lime successfully had nearly died out so when lime began to be more widely demanded in conservation work there was often a lack of suitably experienced specifiers and skilled craftsmen. In fact, the practical techniques required for the use of lime can be mastered by anyone with good building skills or a craft aptitude, but what is essential for success when using lime is a thorough understanding of how the material works and the adoption of certain basic principles when using it.

Here we explain how lime works, why it is of such benefit in maintaining and repairing historic buildings and aims to give guidance in using lime. It may be useful to owners of historic buildings who lack the confidence to use lime themselves or who would like to know more about it before instructing a builder to use it. It may also be handy for builders who are unfamiliar with lime, and serve as a reminder for those who have not used it for years.

The advice given here will apply to many repair and maintenance problems encountered in historic buildings in, but does not cover every eventuality. If you have a special case, such as surviving medieval render, stonework with very fine joints or decorative plasterwork for example, or if you have any doubts you should seek further information before embarking on a project. The best way to learn about using lime is to have some form of practical demonstration or training. Many organisations, including ourselves, run practical courses and demonstrations. No responsibility can be accepted for unsuccessful work following advice given here.

APPLICATIONS

Lime is used in buildings in many different ways. Lime putty mixed with sand to form lime mortar can be used for bedding masonry and for pointing, rendering and plastering. For the very fine joints in ashlar masonry or gauged brickwork pure lime putty was sometimes used. Lime putty can be diluted in water to make limewash for painting both internal and external walls. A coloured limewash can be made by adding pigment.

Lime putty is mixed with carefully chosen aggregates (sands and stone dusts) to make repair mortars for damaged stonework. Lime also has valuable applications for specialist stone cleaning and conservation techniques.

WHY USE LIME MORTAR?

Traditional building construction is based on the use of relatively soft and porous materials such as stone, brick, timber and earth, together with a lime based mortar for bedding and plastering. These buildings usually have solid walls, with

no cavity, and are often built on insubstantial foundations. They are therefore liable to settlement and movement associated with seasonal changes in ground conditions. Lime mortar is softer and weaker than the stone or brick which it bonds and is therefore able to accommodate slight movements caused by settlement or temperature changes without significant cracking. Also, it is permeable and allows evaporation of rising and penetrating damp from within the wall. It is this permeability, or 'breathing', which helps to keep the building dry inside without a damp proof course or chemical treatments.

WHAT IS WRONG WITH CEMENT MORTAR?

Modern cement pointing is very different from lime mortar. It is hard and brittle, much less porous and sometimes completely water-proof. Its use on traditional masonry is damaging in several ways.

Cement pointing is harder than soft brick or stone and is too rigid to accommodate settlement or movement in the wall. When movement occurs the edges of the stone or brick are forced against the hard mortar spalling the masonry and cracking the mortar itself.

Further damage is caused by rainwater seeping into the cracks in the pointing and around the edges of the stones. Because the mortar is not permeable this moisture cannot evaporate from the mortar joint once rain stops. Instead it is forced to evaporate through the face of the brick or stone and soluble salts present in the water crystallise in the surface layers of the masonry leading to crumbling and decay. This is sometimes so severe that the entire face of the stone is lost and the hard cement pointing is left standing proud. Further rainwater is trapped and the decay continues. The concentration of trapped water in the masonry also increases its susceptibility to frost damage in winter.

In contrast soft lime mortar allows moisture movement and, being more porous than the masonry, encourages evaporation and salt deposition in the mortar joints. Thus it is the mortar which decays and not the stone or brick. It is much easier and cheaper to repoint a wall than to repair or replace damaged brick or stone, and there is less loss of important historic fabric.

Cement render causes slightly different problems. Hairline shrinkage cracks inevitably form in the surface of the render as it sets or afterwards by slight movement in the wall. Rainwater is drawn by capillary action into these cracks and then diffuses into the wall. Once inside the wall this moisture, together with any rising damp, is trapped as it cannot evaporate through the hard, impermeable render. Moisture levels start to build up in the wall and the moisture tends to diffuse towards the inner surface of the wall resulting in internal dampness and damage to plaster and decorations. So, strange as it may seem, applying a waterproof render can actually increase levels of damp inside the house. A porous lime render encourages evaporation of moisture from its surface, helping to minimise the effects of penetrating and rising damp.

HEALTH AND SAFETY

All lime and lime mortars are caustic and can dehydrate the skin. When using lime it is advisable to wear gloves, protective overalls and goggles and, if working with lime for prolonged periods, to protect exposed parts of the body with barrier cream. Goggles should always be worn if there is a risk of splashing from lime putty or lime wash. It is very easy to flick lime into your face when scooping lime putty or mortar out of a tub.

When using dry hydrated lime or quicklime goggles and a dust mask are essential to prevent the dust, which is particularly harmful, getting into the eyes and lungs.

Quicklime is extremely hazardous. It reacts very violently when it comes into contact with water, moisture or sweat, generating boiling hot temperatures. It should never be handled with bare hands or wet tools. When slaking quicklime protective clothing, gloves and goggles must be worn. Quicklime should be stored and slaked away from combustible materials. Do not slake your own quicklime unless you know exactly what you are doing.

When working with lime a supply of clean water should be close at hand and all lime on the skin should be washed off as soon as possible. Lime in the eye should be removed immediately and the eye washed out with clean water (preferably distilled) for at least 20 minutes. An eye wash bottle will make this easier. In any severe cases medical attention should be sought.