

Earth plastering, analysis and specification for conservation, repair and restoration works in Malton, North Yorkshire

Earth or loam plasters are commonly found within the buildings of Malton and neighbouring villages. These formed part of a traditional two-coat plastering system deployed locally until at least the mid-Eighteenth century. A one-coat base of earth plaster was followed by a finish coat rich in both lime and hair.

Throughout the medieval period and all of the Seventeenth century locally, this pattern of internal plastering was applied within limestone and calcareous sandstone buildings the mortar of which was also loam. Even after lime bedding mortars became the norm locally for masonry (and particularly brick) structures, the use earth plasters locally persisted well into the C18.

The widespread survival of earth plasters in buildings of all status in Malton is an important element of the town's undoubted historic and cultural significance.

It is essential, therefore, that every effort is made to retain these mortars in situ wherever they are encountered; to repair them with like materials when necessary and to deploy plasters of similar character and composition during refurbishment and repair works as appropriate. Where harder, later plasters clearly less compatible with a mud-bound substrate have clearly displaced earlier earth plasters and are themselves failing or causing damage, consideration should be given to the reintroduction of earth plaster.

Even when wholesale failure of an earth plastering system has occurred (usually because of recent interventions with incompatible materials), and especially when the masonry substrate is itself bound with earth mortar, loam plaster should be used to replace it. The old plaster is easily recycled and reapplied.

The pattern of earth plasterwork locally:

The walls were pointed generally flush with earth mortar;

A basecoat of earth/loam plaster (with or without inclusions of hay) between 1/2" and 1 1/2" thick was applied to either masonry or riven lath. This was laid on with a float.

A finish coat of lime mortar rich in ox-hair was applied over this. This could be up to 8mm thick, but was typically around 4mm in thickness. This is typically thicker than a finish coat upon 3-coat lime plasterwork, but its composition was similar, if very rich in hair.

The base-coat contained hay (and sometimes also ox-hair) to reduce shrinkage and to improve tensile strength. Not all earth plasters observed in Malton contain hay, however, and slight shrinkage was not unusual.

Earth was likely sourced much as it would be today – opportunistically. Soil is always a valuable resource. Some, at least, will have been won during the excavation of footings and cellars/undercrofts. The latter are very common in Malton. It is a measure of its local importance for construction, however, that the first right and privilege of the burgesses of New Malton laid down in the medieval borough charter was that to ‘dig stone and earth for building and edification on either side of the town’.

Depending upon its source, the soil would have been more or less suitable and fit for purpose. The proportion and distribution of clays, silts and sand/aggregate in a soil will determine its characteristics and its utility for plastering. Clay content might range between 5% and 15%, with around 10% clay being optimum and typical in local plasters that have been analysed, producing a relatively strong and cohesive mortar. Most of the sand/aggregate observed in plasters locally has been limestone aggregate. This will be naturally occurring, not added. It is clear from the sheer variety of earth plasters locally that the soils were generally used as found, and improved only by the addition of hay.

Earth as a building material is eminently sustainable – it is carbon neutral and carries minimal embodied energy. It is also a significant contributor to healthy living – acting to effectively regulate the relative humidity levels of an interior, keeping these within healthy limits. Its durability and fitness for purpose is evidenced by its survival throughout Malton.

Sourcing:

Where the earth plaster has failed in situ: the lime top coat should be peeled away and set aside for disposal. The earth plaster may then be gathered from the wall and reused. It will be dry and lumpy and it will be necessary, therefore, to break it down, initially by stamping underfoot and then by submersion in water. This soaking should commence 24 hours before reuse. Preferably, mixing will be done in a pan/paddle mixer, but a drum mixer may be used. Water will be added until the mud is of a sloppy consistency – as wet as possible without its slumping upon laying up on the wall. If the material was especially sandy in situ, and was easily crushed to powder between the fingers, it may be necessary to add a small proportion of clay. Hay in the original mortar will be recycled along with the earth during this process, or may be added during mixing.

Localised repairs should be carried out in a soil of similar character and appearance to the original. Ideally, with the same material recycled. If this is not possible, an acceptable alternative to sourcing a similar material would be to use a pre-mixed clay plaster from Womersley Associates, with hemp added. This is softer and less cohesive than earth plasters typical locally, but is compatible and reliable, as well as being an honest repair.

New work and restoration, however, should be executed in a locally sourced sub-soil free of vegetable matter of similar character and composition to typical earth plasters in Malton, or in the building being worked upon. Test panels with and without added hay will demonstrate the suitability of the material as well as the necessity, or otherwise, of adding hay to the mix.

Application:

Walls should be dubbed out as necessary, with all open joints pointed flush with either an earth or a soft lime putty mortar, which should be allowed to cure.

Walls should be well brushed down using a stiff bristle brush.

Walls should be well moistened with a fine spray, avoiding water run off. This wetting should commence well ahead of plastering and be repeated regularly through the day before plastering begins and topped up shortly before the laying on of the base coat.

The earth should be well-prepared. It may be left outside exposed to the weather well before use and should be free from humus or other growing vegetable matter. All lumps should be broken down, by stamping or other means, and then submerged in water the day before use and left to soak overnight.

Mixing will be in a paddle mixer for preference. Earth mortar should be brought to a sloppy consistency at the same time as hay is added as necessary. Hay should be well distributed through the mortar and may comprise up to 20% of the mortar by volume.

Earth plaster should be applied with a wood or a steel float, as per lime mortar, in sweeping strokes, laid on, not overly compressed. Unlike for lime plastering, coats of 1" may be considered typical.

The surface was finished with follow-up strokes of an 'opened-up' trowel, which will leave drag marks from hay or larger aggregates across the surface. Scouring does not seem to have been common practice but should not be ruled out if minor shrinkage occurs.

No keying of the surface was carried out traditionally and should not, therefore, be done today.

Earth mortars may take a month or longer to dry, depending on the time of year.

Although the lime finish coat may be applied to a previously fully dried earth base coat, it should normally be applied before full drying of the base coat has occurred – as soon, indeed, as any shrinkage has occurred. This will reduce the need to rewet the surface, which can lead the earth surface to dissolve.

The lime finish coat will be 2 parts partly sieved Portland stone dust: 1 part putty lime. Goat or ox hair cut to roughly 1" lengths will be added as the mortar is mixed or knocked up for immediate use. As much hair will be added as will not compromise the workability of the mix. Typically, hair will comprise 15% of the mortar by volume (this equates to about 6 parts mortar to 1 part hair). The 'beard' that hangs from a trowel of this mortar will be dense and tightly spaced. Pre-mixed finish coat plasters supplied by either Womersleys Ltd or Chalk Hill Lime Products will be appropriate, but extra hair would need to be added to either. Pre-mixed plasters should only be ordered haired if the plaster is to be used immediately. If not, the mortars should be ordered without hair, this being added immediately before use.

This will be applied to a previously moistened surface somewhat more thickly than a typical finish coat to 3-coat lime plasterwork. Scouring and brushing (see excerpt from Miller attached) *will* be required, as per lime plaster finishing, to consolidate and level the surface and to take out any minor cracking or crazing. The quality of the finish required will determine the extent and frequency of this scouring, but two sequences will be the minimum at roughly 24 hour intervals.

There will be some advantage in 'feeding' the finished surface with one or two coats of limewash some several days or so after completion of the scouring process.

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