MUD MORTARS IN MASONRY CONSTRUCTION

The use of mud mortars in the Middle-East and central Asia, as well as in the Anasazi and other native American cultures of the south-western USA is well-documented. Mud mortars, as well as structures of rammed or lump earth construction, are very commonly found in formerly Moorish Spain.
Much less well-documented, or even much noticed, it seems, is the extensive historical use of mud mortars in the UK. Where mud mortar is noted in this context, it tends to be ascribed to a mysterious leeching away of previously present lime binder, or else to the poverty of the builders, and/or the scarcity of readily available lime.

In the course of masonry repair work around England over the years I have frequently encountered earth inside the walls of stone buildings, whether in slate or granite barns in Cornwall, or in the gable walls of late medieval farmhouses in Somerset. The bedding mortar of Marwell’s cottage in Radipole, Dorset was very clearly mud; the stone, limestone quarried close to the house itself.

Since 2004, I have been working in Malton, North Yorkshire, as well as in Andalucia. As a result, half-forgotten questions about these occasional encounters with mud in the past – which had seemed more like charming idiosyncracies than widespread craft practice – have come to occupy my mind much more. My recent experience has prompted me to reassess my attitude toward mud mortars and their use, as well as to wonder why so little notice has been taken of them by the wider conservation community in this country.
Malton was a significant Roman garrison town. It became an important Norman market town, its economy dominated by the local Gilbertine Priory, which seems to have generated considerable wealth. Malton stands on oolitic limestone and calcareous sandstone in equal measure. The Romans quarried the limestone, and most of the older buildings in the town—many of them dating, at least in part, to the 12th/13th Century, are built with the same Malton oolite limestone. The churches, all of them Norman, utilize a finer grain limestone, amenable to carving, quarried some 4 miles from the town at Hildenley. From the later medieval period onwards, the calcareous sandstone was used more than the limestone by masons locally, along with the Hildenley limestone. There were lime-kilns just without the boundaries of the medieval borough, as well as ready river transport along the Derwent.

And yet, for all this abundance of raw material, until at least the middle of the C18, masons locally were using mud mortars. They used lime mortars as well: the medieval undercrofts along Yorkersgate have walls of squared rubble limestone bedded in mud mortar. The dressed limestone voussoirs of the vaults, however, are bound with a lime mortar, comprised of lime and limestone dust only, with no sand added. Masonry throughout the town comprises limestone bedded in mud mortar. Even early brickwork is laid in mud mortar.
Typically, the stone buildings were faced on the outside with squared limestone ashlar (much of it quite likely recycled from roman buildings locally) with rubblestone interior wyths. The buildings were of high status. York House, for example, is built with mud mortar.
Internally, these buildings were then plastered with earth plaster, in a single coat up to 40 mm thick; a thin, haired lime finish coat applied over, and limewashed. There is some evidence that limewash was applied in earlier times directly to the earth plaster. Earth plaster was always left ‘off the float’, with a smooth finish, rich in fines, even when it was intended as a scratch coat.

These methods have proved remarkably durable and the materials have proved themselves eminently fit for purpose. They have delivered maximum breathability and vapour permeability, as well as ample flexibility to the structure. Compression has been maximised during the course of construction, stone-to-stone contact being not uncommon in places in the rubble-stone sections of the walls. It is as if the builders themselves were little-distanced from the principles of dry-stone walling, even taking reassurance from the softness of the mortar, and concentrating upon the considered placement of stones, not relying too heavily upon the mortar for structural integrity or confidence in their work.

Earth plasters have very rarely failed and have been added to over the years by people oblivious to their existence, especially during 18th and 19th Century refurbishments. Only when thoroughly impervious modern materials have been laid over them have they begun to fail.

Stone walls constructed with mud mortar (typically 25” in section) display little or no deflection or separation cracking and mud-bound brickwork remains as sound as the day it was built. Except where the breathability of the walls has been compromised by the application of opc mortars inside or out, the walls are universally ‘dry’, they are never damp.

Simple disaggregation tests of these mud mortars and earth plasters shows them to consist of little more than local soil, used as found. They contain between 5–10% clay and their main aggregate is crushed limestone, which was likely not added but simply present in the soil, with some sand and silt. The earth plasters can contain pieces of twig, stone, ears of barley and straw, although straw is more often absent. Daubs I have encountered on the Somerset levels contain a high proportion of straw. The Malton material would seem to derive its properties much more from the character of the local geology than from any significant human intervention.
I have had occasion to re-use failed earth plasters on several projects locally and can vouch for their utility as well as their ease of, and pleasure to use, which exceeds that of more familiar lime plasters. Significant voids can be filled with the re-wetted earth plaster, which shows no tendency to shrink at all, even in contact with timber. At most, where the original mortar had shrunk when first applied in the past, and which shrinkage has contributed to its failure, I have added a little more sharp sand and a little mineralised hemp before reapplying it.
Mud bedding and jointing mortar is encountered on the outside faces of buildings across town where lime mortar pointing has fallen or eroded away. In situations where they have been exposed over a long period through lack of maintenance, they have endured remarkably well, and have eroded little, even when quite wet. Mud mortars would seem to raise serious issues regarding the compatibility of repair mortars, where routinely used lime mortars might be considered to be too hard and inflexible. Many of these buildings have been more recently repointed with wholly inappropriate opc mortars. Lime mortar pointing would seem also to have loosened and detached, however. Is this repointing work? Given the likely age of the buildings, even the lime pointing would seem unlikely to be contemporary with the mud mortar. It is difficult to know what the original exterior finish was—were the buildings earth rendered upon completion, outside as well as in? Was the exterior finish as inside—earth, with a finish coat of haired lime plaster (Husthwaite eg); or were the walls lime rendered? Were they simply limewashed earth? When the stonework was left exposed, was the mud mortar also, or was the face of the building pointed with a lime mortar before limewashing?

29 Yorkersgate is a limestone building over a segmental-vaulted undercroft. It is my belief that the majority of the building is contemporary with the undercroft and that this may date from the 13th Century. An extension was added to the south side, probably in the 17th Century. The south wall of the original building within the extension has a straw-laced mud mortar, with haired-lime finish coat. Whilst it is entirely possible that this was an interior decoration of the wall after the addition, it seems equally possible that this was the exterior finish of the earlier structure at the time the extension was built. Few rendered elevations survive in Malton, although it is probable that the majority of stone elevations were originally rendered (and were intended to be rendered) by their builders. Many-layered remnants of limewash survive on some C17 limestone ashlar elevations in the town. It is very likely that the masons who built these houses understood the limitations of the Malton oolite they were using and its vulnerability to decay. It is as likely in my mind that they had an intuitive understanding of the need for compatibility of materials—particularly for compatibility between bedding and pointing/plastering mortars. I personally suspect, therefore, that the majority of earth-mortared stone structures in Malton were originally either lime-washed or rendered with earth-plasters, with a thin finish coat of soft, haired lime render and that, either through natural failure or fashion, these finishes were lost during the 18th and 19th Centuries.

In Husthwaite, some 20 miles from Malton, recent repair works to earth panels between timber-framing seemed to add weight to this hypothesis.
The panels were failing because of the application in recent times of hard cement render. Beneath this, however, the original exterior finish had been 2–3” earth plaster (very lean in clay (5%) and coarse aggregate) beneath 5mm of haired lime plaster. The earth had been laid onto robust riven oak lath which formed the backing to the interior plaster surface, which was of earth also.

I would anticipate that the use of earth mortar was very common throughout Yorkshire and beyond. It has been instructive to me, working in Vermont, USA as I do most summers, that masons locally, who seem generally to have retained much 17th Century British craft practice that has been lost in Britain itself, refer to mortar generally as ‘mud’. If nothing else, this suggests to me that at the time of the earlier settlement of the eastern seaboard of North America, mud was much more commonly the stuff of everyday mason’s experience in England than we imagine it to have been today.

From the evident quality of their workmanship, masons in Malton, at least, were highly skilled from the early medieval period onwards, with a deep understanding of their materials. Old Malton Priory would be one of the finest Early English Churches nationally had more than a much–altered fragment of it survived into the modern period.
Whether in recently uncovered limestone ashlar tunnels; in the many vaulted undercrofts (whether ribbed or plain) that hide beneath the pavements of the town, barely noticed, or in the fabric of outwardly 17th or 18th century town-houses, the workmanship of generations of Malton masons survives, and its quality resounds here as much as in the more obvious and acknowledged monuments of their craft: the churches or grander houses of the town. Throughout this period, these masons chose to use mud mortar in the majority of their work.

In conjunction with the Fitzwilliam Estate, custodians of so many old and historic buildings in the town, my research is on-going.

Hi Matthew, a long time since we spoke or corresponded, I guess--how are you?

I am sitting in Lincoln, Nebraska, writing down my thoughts about mud mortars, and wonder if you would be interested in an article on the subject for SPAB News?

More specifically, I am drawing together my ruminations on the subject over the last 12 months which I have spent working in Malton, North Yorkshire. Although I am temporarily in Nebraska, I will be back in Malton in January before heading to Vermont as usual in the summer. I kind of think I will be mainly in Malton for the rest of my life--there being so much interesting and exciting work to be done in the town. I hope that one day we might change the name to Spatown, since I am filling it with tile repairs and seem to have before me the opportunity to transform the character of the place and, hopefully, to make it a regional exemplar of good
conservation practice. The majority of the medieval town site is owned by the Fitzwilliam Estate, which, if nothing else, allows us to develop a strategic and holistic approach. That a very large amount of medieval fabric survives in the town seems to have gone largely unnoticed until I began nosing around in the course of my various work for the Estate. In the last year, however, I have identified 6 vaulted undercrofts (one of which houses what I am sure is a medieval butchers 'work-shop' and cold storage area, as well as the stone surround of the original shop-front (all underground now), as well as an associated tunnel some 150 feet long, 3 ft wide and at least 4 1/2 ft high the entrance to which had been blocked in the early C19. I am convinced that the building above another stone vault (with beautiful long-blocked stone stair to the floor above) is contemporary with the vault itself. The inner skin of the gable wall is built of finely dressed limestone ashlar, some stones of which are 42" long, all laid to 1/8 " joints. It is all very exciting stuff, and I am slowly unravelling the evolution of significant parts of the town, convinced that much of it is very largely of pre-16th Century construction. I am in the early stages of recording and surveying as much of the building stock within the boundaries of the old town wall as possible, as well as working on alot of these buildings also. All of which endeavour the estate is very supportive of.

Anyway, all of that by way of introduction to the fact that throughout the town I am finding that the mortar that was being used was mud, and that the most common interior plaster is also of earth. Even bricks were laid in mud. It seems that this was the stuff of mortar in town at least until the mid–C18. What has really made me sit up and think about this is the fact that limestone was so abundant and available, and yet the masons—who were clearly highly accomplished—chose to use mud. It has proved eminently fit for purpose. I have, of course, encountered mud mortar before (the masonry Marwells cottage was bedded in mud, and I found it often enough in Cornwall and Somerset, as well as in Spain), but had maybe not given it enough attention. I have spent alot of time surfing the net on the subject and looking through conservation texts, but I find little or no reference to the use of mud mortar (or its proper conservation) in the UK. I suspect its use has been too often dismissed in people's minds for whatever reason, put down to scarcity or poverty, even to the fact that lime that was present has leeched away over time (though quite how just the lime could do this, and to full depth, beats me, I have to say).

I would like to start a debate is I guess what I'm saying, and see no more satisfying or appropriate forum to do this than in the pages of SPAB news. Should I email you a copy for your consideration?

Best wishes, Nigel.