Winter Working

Because few craftspeople working with lime in the UK earn sufficiently in the spring, summer and autumn to be able to cease doing so in December, January and February, and because the weather in the UK during these months is rarely sufficiently cold to force the issue, winter working is the norm. In New England and Canada, where the climate is more predictably cold, masons tend to do other things in the depths of winter, such as logging, if they can. When working with cement in these regions, sand is heated before mixing, and heated scaffolds may be made available, as happens on occasion in the UK, too.

In the UK, it was ever thus – building accounts show a tendency for major projects to begin in March and for available indoor work to be carried out during the winter – though this may have as much to do with the shortness of the days than the weather, it being possible to work fewer hours outdoors than in. 25 years of masons' daybooks from the Newburgh Estate in North Yorkshire shows little distinction in the nature of their work, whether this is being done in winter or summer. House-building is begun in November in some years and continues unabated into the spring or summer months. Uniquely, in 1881, much of their time in January and into February was spent 'shovelling snow', but this year remains one of the worst winters on record, with temperatures in York of 21 degrees C. Frontinus, the Roman engineer, says, perhaps surprisingly, that in Italy,

"The suitable time for masonry work is from April 1 to November 1, but with this restriction, that the work would be best interrupted during the hottest part of the summer, because moderate weather is necessary for the masonry properly to absorb the mortar, and to solidify into one compact mass; for excessive heat of the sun is no less destructive than frost to masonry."

Some in the UK will be heard to say that limework should only be carried out whilst the swallows are with us; others that limework is best done between the clock changes.

It is frequently asserted these days that only cement or NHL binders allow for winter working, and that fat limes do not, whilst Burnell, in 1857, stated that the perils of summer working were worse and that lime work was best done in the winter, when the danger of their drying out too fast was less.

Vicat maintained that it took 2 or even 3 years for fat or less than energetically hydraulic limes to become frost durable – a view that most masons in his time would doubtless have considered ridiculous.

A strange UK Government press release appeared across the UK in 1888:

Newspaper Cutting (Dereham Times): GOOD NEWS FOR SOME WORKERS. 1888.
Hitherto British bricklayers have been on the verge of poverty all through that part of the winter when frosts have been keen. They supposed that whoever else worked, they needs must be idle. Now, however, we learn on the authority of our Consul General in Norway that this all comes of our workers being too conservative in following the methods which satisfied their fathers and forefathers. Norwegian bricklayers rather prefer winter work, because the walls built then dry quicker and better. The advantage is simply the result of using, on dry bricks, unslaked lime as mortar, and preparing the mortar in small quantities immediately before it is used. The remedy for idleness is so plain and simple that it ought to commend itself both to British masters and men,"

its strangeness laying mainly in the notion that British masons did not themselves use hot mixed mortars at this time, and that the secret of winter working with lime

was unknown to them.

The more salient point, then and now, is that people only work outdoors in the depths of winter, in the UK and elsewhere, when their need to earn a living leaves them with no choice.

Winter working with air limes, whether hot mixed or not, is entirely feasible in the UK, but it requires common sense and flexibility, as well as an assiduous attention to the weather forecast. Hot mixed lime mortars, typically used hot during the winter, offer advantages over other limes, however.

The primary protection required is that which avoids the feeding of more water, rain or snow, into the body of a wall under construction.

The initial and on-going set of an air lime mortar is very sensitive to the relative humidity of the air, which can slow the set in summer as much as in the winter. Indeed, the lower relative humidity often associated with cold or even freezing weather can even allow a more rapid setting up in winter than in summer, whilst the lower average temperatures can prevent any risk of the mortars drying too fast, which may have been Burnell's point.

The author is less likely to protect winter limework than that done in the summer, with protection in the summer only usually essential during hot, dry weather when the work is in full sun. High humidity in the summer usually means that protection of new work is unnecessary.

It is very rare for freshly emplaced lime pointing to freeze – and even less likely for building mortars to do so – lest rainfall can gain access to the top of an unfinished, un-coped wall under construction. In practical tests, it has been our experience that even if new lime pointing freezes, it may lose a millimetre or so to delamination, but will then set up normally. This is not the general experience with NHLs, which will typically fail to full depth on receipt of a hard frost, and have to be removed.

"Bricklaying in Frosty Weather

There is no recognised time or period of the year in which bricklaying should be suspended on account of frost; this is a matter that is determined by the weather and by local custom. Generally speaking, in England work continues throughout the winter, the only protection being a scaffold board, laid on the top course; but sometimes sacking is laid over the upper courses when the work is left for the night. If a hard frost sets in, the work may be suspended until the frost breaks; but in Sweden and Norway building operations are not so readily interrupted, as **sugar** is added to the mortar in order to lessen the liability to freezing. In the United States and Canada brickwork in cement mortar is continued in frosty weather by using **hot water** for mixing the mortar…."(Adams H 1906)

Once placed, a hot mixed or putty lime mortar should require no further wetting, indeed, to begin setting up, it needs to shed water by either suction from the host fabric or by evaporation. Carbonation will not begin until the moisture content of the mortar – or within the pores – falls to around 5%, and carbonation will continue so long as there is a moisture content of 0.7%, which suggests that the common habit of dampening emplaced mortars is a fool's errand – at least in the case of fat lime mortars – so long as the mortar does not dry out too fast. A hot mixed, lime rich mortar used hot will lose a greater proportion of its water by evaporation and stiffen sooner, taking itself beyond the reach of the frost sooner, whilst also enjoying a pore structure that is relatively resistant to the ready formation of the ice crystals that will pierce these pores and compromise the performance of the mortar – again, unlike NHLs, which have a pore size distribution more attractive to such ice crystals

(Wiggins). The need for ongoing hydration of NHL mortars, in both winter and summer, will exacerbate the frost vulnerability of these mortars in winter, confounding the notion that the use of NHLs – and not fat limes – is essential for winter working. The need for hydration is reduced in winter, due to 'background hydration' from the elements, but it is rarely no longer necessary, especially upon a properly detailed building. (HE research indicates that NHLs set better in the winter than in the summer, a phenomenon explained by greater accidental hydration in wetter winters, especially in the west of the UK which is subject to more wind-driven rainfall than elsewhere).

The first serious discussion of the need for mortars to be protected occurs at the end of the 19thC, as the use of hydraulic materials for above-ground construction was becoming more common. Such protection was recommended, along with regular wetting, to prevent the mortars from drying too fast. Protection from frost is barely, if ever, mentioned – the assumption being that masons everywhere had always known this risk and had long-adapted their working practices accordingly.

Protection has been the norm during the lime revival – of NHL mortars because of their known tendency to dry too fast, and of putty lime mortars, for similar reasons, brought on unknowingly by their general leanness, having at least half as much lime content as a traditional lime mortar. The more air lime there is in a mix, the less protection against over-rapid drying out will be necessary, but the slower will be the carbonation.

Hot mixed air limes used upon already damp or saturated fabric in the winter will often – although not always – stiffen, and then simply sit, awaiting the opportunity for carbonation to begin at the face. They are porous in this state, and so will begin to dry out the fabric quite quickly, but without themselves setting up. If the fabric was especially wet, these mortars might be more vulnerable to frost, and should be protected somewhat.

Applied to unsaturated fabric, they will stiffen readily, even in winter, and will case-harden (carbonate at the face) as readily, unless subject to driving rain. Protection is unlikely to be necessary.

Lime rich hot mixed mortars have a high water retentivity as well as an eminently cohesive internal bond – it is very rare for lime to leech out of even freshly placed mortars, even when these are sprayed or subject to heavy rain.

In winter, then, jobs or projects should be selected to minimize any risk, if possible. If a wall to be repointed is south-facing during freezing weather, it will be warmed by the sun; a north wall would not be.