Del Rio (1830) – Memoria sobre los conocimientos actuals de las materias propias para la formación de los morteros y argamasas calcáreas que se emplean en la construcción de las obras civiles e hidráulicas. Madrid. Real Academia de San Fernando. Translation NC.

Del Rio references a number of engineers and their writings upon lime mortars – Vitruvius, Berthier, Bruyere, Caudemberg, Raucourt, Petot and De La Faye. The text makes clear that he was heavily influenced by Vicat – with whole passages from Vicat delivered almost verbatim. He shares similar prejudice against pure limes and is in general pursuit of the hardest possible mortar, favouring the use of hydraulic limes in the air, as well as underwater and underground.

Quicklime is slaked by three different methods or procedures:

1. by aspersion - which is the ordinary method
2. by immersion
3. spontaneously.

One takes the quicklime as it leaves the kiln and one throws upon it a convenient quantity of water…The lime sinks and opens after a time with noise, and entirely cracks, gives off steam and becomes very hot and slightly caustic, and in very little time it is reduced to molecules so fine they form an impalpable powder; as well as producing great heat. Lime slaked in this manner is called, variously *molten lime; precipitated lime and most commonly slaked (switched off; extinguished) lime or dead lime*.

This procedure is the most commonly followed, moreover, **they abuse it extraordinarily, reducing it to the consistency of grout in a tank (or pit) from where they pass it to someone else with which to make the mortars, resulting in a white paste which, although very fine and sticky up to a point, nevertheless, it has not the same kind of ductility (workability) as the clays.**

During slaking with a surplus of water, fat lime sometimes melts to dryness in parts of the tank or pit, where the water has not run or has not been sufficient; if one throws more water too quickly upon these parts, it hisses like the quenching of a hot iron, indicating the burning *[others would say 'chilling']* of the lime, and they tell us, that this lime will then divide very poorly and remain permanently grainy. The colder is the water when you throw it, the more pronounced will be the effect, particularly with the fattier limes; when you want to obtain a very fine lime in paste to lime wash walls, it is essential to throw enough water at the beginning to effect the slake without the need to add more water during slaking….

Very fat limes only will break coarsely before immersion, and if they are left will divide on the ground but with difficulty to a fine powder: more than half remains in small fragments the size of a chickpea, and these fragments, once chilled, will remain for a long time without dissolving. To overcome this

difficulty first reduce the lump lime to the size of an egg and, above all, collect it immediately after the immersion in large pipes, barrels or troughs, as a result of which the heat will be concentrated and a large part of the water evaporates at the start and cannot escape but is absorbed by the same lime, and hereby it is divided (reduced) in a satisfactory manner…

Ordinary slaking is the one of the three that most divides the fat limes and the hydraulic limes of all kinds, due to its bringing the fusion to its highest degree; in second place and under the same conditions, spontaneous slaking is better for fat limes than for hydraulic and eminently hydraulic limes, and conversely in slaking by immersion.

Artificial pozzalans

Under this heading we understand clays, sands, the sammites and wastes conveniently calcined: iron scales, **peat** and coal ash and lastly the waste from potteries and brickworks.

This is the summary of the substances which concur (agree) with lime in the formation of calcareous mortars; moreover, these substances are generally composed of silica and alumina, but don't all behave in the same way: some unite well with fat limes, others with moderately or eminently hydraulic limes, and between these two 'alloys' some offer good resistance in the air, outdoors as well as to the action of water; some will at last lose all adhesion when submerged in water.

Among the rocks or earths essentially composed of silica and alumina, those are chosen which most easily transform: 1. clays; 2, brown or yellow schist sammites, which will form a clayey paste with water; 3. sands rich in clay; 4. various types of waste.

Fire is the agency employed and the conditions of transformation are: 1. that the material acquires enough cohesion without forming a paste with water; 2. that has the minimum specific gravity and the maximum porosity; 3. that which is most accesible to chemical agents, such as weak acids….

Choosing the method of slaking.

The nature of the lime and the ingredients employed determines the choice of slaking procedure. The facts lead us to these general observations:

4. That for all fat lime plasters, the order of preference of the three procedures is i) spontaneous slaking; ii) slaking by immersion; iii) ordinary extinction.
5. For all hydraulic or eminently hydraulic plasters and mortars, i) ordinary slaking; ii) immersion; iii) spontaneous extinction.

The difference in hardness which results from the employment of this or that slaking procedure is very variable; it arrives at its maximum with the fat limes

mixed with inert materials, and is almost imperceptible when these are mixed with very energetic pozzalans. Between these boundaries, the differences are subject to progressive variation according to the energy of the ingredients.