

St Astier Hydraulic Limes Reduce the Risk of Sulphate Attack

A natural hydraulic lime is the product of burning and slaking limestone. In accordance with the proposed EU Norms St Astier hydraulic lime does not contain any additives such as pozzolans, air entrainers, ash or cement.

Limestone contains Silica but also contains Alumina, Iron, Magnesium, Manganese, Potassium and others. Burning this limestone will produce quick lime and will combine its chemical components in relation to the burning time and temperature. The ideal result would be to obtain a product containing the required value of combined Silica with the lowest presence of potentially damaging other components such as Tricalcium Aluminate (C_3A) and soluble Sulphates. Tricalcium Aluminate in contact with Sulphates and water will produce **Sulphate attack** starting approximately 3 years from the application of the mortar (See BS 5628).

Tricalcium Aluminate starts occurring when materials are burned at $900^{\circ}C$ (more rapidly at temperatures over $1100^{\circ}C$) and, as all hydraulic limes are burned between $900^{\circ}C$ and $1000^{\circ}C$, all hydraulic limes (and all ordinary cement) will contain this damaging component, varying from insignificant to high. Obviously the lower is the amount of these components contained in the raw material, the better will be the final product quality. St. Astier deposits are exceptionally low in Alumina and in Sulphates and as no addition of any kind is made (i.e. Gypsum), the resulting products are virtually free of Tricalcium Aluminates and soluble Sulphates.

Apart from the absence of soluble Sulphates and Tricalcium Aluminate, directly due to the chemical composition of the natural stone and the burning temperature, the sophisticated and controlled production process ensures the following:

1. That the correct amount of silica is combined in burning, to achieve the required strength and early setting ensuring a quick resistance to frost and rain damage. Excessive humidity or rainwater will not stop the hardening process as in putties or air limes. In rendering, jobs are completed efficiently and speedily, avoiding the builder to return and rework surfaces to eliminate early shrinking due to excessive amount of water in the lime used (as with putties). Furthermore the application season is extended to nearly the whole year and frost protection should be applied only for a short time when working below $5^{\circ}C$.
2. That efficient slaking produces the pulverisation of the lime (on average only about 30% of the slaked product requires further milling) to a very fine powder of about 0.08 mm. with **low bulk** density. Low density means large cost saving when mixes are made based on volume (for example on a 1:2 mix one needs only 305kg. of ML 3.5 per m^3 of mortar versus 675 kg. of putty or 725 kg. of cement).
3. That using the correct sand, NHL mortars will have approx. 30% voids (versus 5% in cement based mortars). Calcite forming during carbonation will obstruct some of the voids but cannot obstruct them all. This is the reason why NHL mortars, although water resistant, have excellent **vapour exchange qualities** (permeability) avoiding the risk of trapping condensation, so common when cement based mortars are used.

All St Astier NHL products retain a high percentage of available lime (15% to 45%). This explains their workability, their ability to accept re-working if required and the presence of self-healing properties.

5. Due to the natural colour of the limestone, the absence of additives and to the pureness of the Anthracite coal used in burning, the Colour of ML limes is nearly white (whiteness index from 67 to 76). This means that the natural colour of the sand used will be reproduced.
6. The natural strength factors and hydraulic properties of the ML powders means that there is no need to add pozzolanic materials or others to make a mortar, just add a well graded sand of a chosen colour. This results in easy mortar design, achieving the specified characteristics in a foolproof and time saving manner and extremely suitable for all restoration or new build requirement.

If you have any questions or queries please do not hesitate to contact Womersley's Limited on Tel 01924 400651 or call in at our workshop.