TECHNICAL DATA SHEET **HIGH PURITY CALCIUM LIME** (EN 459-1)

Lime is one of the first bonding agents discovered by the man. There have been vestiges of its use in deposits with more than 10000 years of antiquity, and until the principles of century XX it will constitute the main bonding agent used in construction. Its use disappeared drastically with the discovery of the natural hydraulic lime and the Portland cement, to the end of century XIX. Due to their resistance and rigidity these have quickly replaced the lime in favor of a modern construction, more and more vertical. It is at the beginning of the 21st century that the effectiveness of the techniques with lime return to win interest, when it has been experimented that cement gives very bad results in restoration. Parallel to this there are tendencies towards an ecological, healthful habitat, respectful with the environment, where the lime, without a doubt, can play a very important role.

Raw materials:

High purity limes are obtained from limestone rocks whose content in impurities (argillaceous material) does not reach 5%. (From 5% of impurities, if these are of magnesium, it is called dolomitic lime with slightly hydraulic properties).

The pure the rock, the better qualities of plasticity will have the lime, being called GREASY LIME that one, coming from an almost pure calcium carbonate limestone.

Lime is a bonding agent that hardens by chemical reaction unlike the plaster that hardens by crystallization or the argillaceous earth that hardens by loss of water. The aerial lime comes from the decomposition by heat of limestone rocks, to temperatures over 900ºC to 1200ºC, which the carbonic anhydride is come off and it is obtained CALCIUM OXIDE: CaCO3 + heat = CO2 + CaO. Calcium oxide (CaO), is the state of the lime before beginning the process of slaking. We obtain hydrated lime or CALCIC HYDROXIDE (Ca (OH) 2, in powder-form) when it had been added the indispensable water to hydrate it. The volume of water is approximately a third to the weight of the lime and difficult to consider with exactitude, due to the heat that this reaction gives off and the differences that can have in the raw material (CaO + H2O = Ca (OH) 2 + heat). If the water used in the process is excessive we will obtain a lime putty (HYDRATE) of greasy aspect (the volume of water is approximately of one by one and a half times the weight of the lime).

With the GREASY LIME PUTTY (originating besides a correct calcination and slaking) one obtains a greater plasticity and better results of resistance than with quicklime (powder-lime), as a result of the difference of elaboration between both: First one gets processed with excess of water, that guarantees its complete transformation in calcium hydroxide. In addition the quality to the slaked lime putty does not suffer in the storage, on the contrary: The minimum period to be able to be used is of six months; whatever more years happen in rest, better properties it will have later, carbonating as well as possible when being used in renders, stuccos or mortars.

The cycle of the lime is completed and closed in work. The mortar, after being placed in the walls is acquiring, little by little, a progressive viscosity accompanied by a slight temperature rise and a loss of water (absorption of the support and evaporation) beginning next the CARBONATION, a process of hardening by means of carbonic anhydride absorption, for which it needs water or environmental humidity. This process can even last years and centuries, by means of which the lime returns to its state of origin, the calcium carbonate, transforming itself slowly into a block of stony consistency.

Generalisized applications y doses:

applications of greasy slaked lime putty (HIDRATE) in restoration an bio-constrution	dose of slaked lime	dose of arid (or other components)	refinement of the arid	dose of water
mortars	**1**	**3-3,5**	0-6mm	nothing or very little, according to humity present in the sand
renders (first layer)	**1**	**3-3,5**	0-6mm	nothing or very little, according to humity present in the sand
renders (second layer)	**1**	**2-2,5**	0-3mm	nothing or very little, according to humity present in the sand
stuccos	**1**	**1-2** (depending on refinement of the arid)	finer sand than that one of the previous layer or marble powder	nothing or very little, according to humity present in the sand and temperature of the atmosphere
Thick limewashes	**1**	(0,5-1)	(very fine marble powder)	**1 - 1,5** (1,5 - 2)
limewashes (painting)	**1**	**-**	**-**	**2**

Special mortar properties made with slaked lime:
The advantages of the lime on the cement are clear as far as the techniques that are explained next. For the stucco, sgrafitti and the "al fresco"-painting the process of slow hardening of the lime, its plasticity and its great retention of water are fundamental when realising a decoration, in addition cement mortars, bastards and eminently hydraulic limes can give flowerings due to their content in salts. The greater rigidity of the cement produces a render little flexible to the contractions and expansions of the wall, favoring the cracking of the same. The lime however offers a low retraction and adapts itself to the movements of the support. The lack of breathing is another great disadvantage of the cement, in addition he is incapable to regulate the environmental humidity and thermally he is unfavorable. Lime, when to carbonate (process that needs water), has a refreshing effect in summer (osmosis). In winter this process is inverse thus we can make use if its good heat insulation: lime mortars are 34% more insulating than highly hydraulic mortars (cement). The lime stuccos are highly able to breathe and to regulate humidity thus eliminating condensations and rheumatic problems. The lime is an aseptic material and apt for allergic. The carbonation process also is favorable at the time of extracting water of humid walls (drying of socles or humid cellars and capacity to maintain them droughts and free of destructive salts). It's suitable its use so in interiors as in exteriors (impermeability to rain), even in zones near the sea.

Precautions:

- Correct selection of arids, according to application.
- Good dosage water-bonding agent
- Avoid the fast drying in warm time (to shade with humid fabrics), the ideal time for outer-finishings is the spring and the autumn (in zones free of ice). In exteriors don't apply before frosts.
- Dampen the masonry or walls to render, don't dampen irregulary (hose).
- Use suitable tools and techniques to favor carbonation.
- Avoid aggressive atmospheres and non potable waters.
- **The slaked lime does not have adherent properties and therefore its fixation is mechanical to the hollows of the stone or the brick. If one is going to use it with a smooth wall, previously, it is necessary to prick it to create small holes in all the surface where "it takes hold".**

The water:
The water to obtain limewaters or to process mortars can be whatever it produces the nature, whenever it isn't dirty nor it contains salts. They will be the potable considered ones. The one of river is preferable to the one of sources and wells whenever it does not contain polluting spills. The water of the sea produces flowerings, diminishes the numbness of the lime, but it does not have influence on the solidity of mortars, that even can take a consistency equal or greater than with fresh water. The very pure waters, like those of rain, are not advisable because they give acid reactions. The waters to high temperatures accelerate carbonation of mortar, so to 30ºC it is accelerated and to 7ºC it is slowed down.

The arids:
The arids come from the natural or artificial disintegration of the rocks, that mixed with a bonding agent constitute mortars. Its function is the one to diminish the retraction of these, to favor carbonation (when increasing the porosity of the mix allows the air, that contains carbonic anhydride as well, to accede to the interior of the mortar), to stabilize its volume aside from equipping them with textures and color. The sands can be silíceas, limestone or argillaceous according to the dominant mineral. The dolomitic ones and those that contain impurities or are of marine origin are due to be avoided.
It has been verified that heterogenous sands contributes better results in the pore-simetric properties and durability.
Considering the chemical nature of the arids one could distinguish the following groups:
Siliceous sands: They are best by its hardness and persistence of chemical agents,
own characteristics of the quartz they contain.
Silicated sands: They come from feldspathic rocks.
Limestone sands: They are whiter than the previous ones.
Argillaceous sands: They can be the same silicic or silicatated ones contaminated by very dangerous clay impurities for the render.
Marly sands: The ones loaded with clay impurities.
Puzzolanic sands: They come from volcanic rocks and are very valued in Italy where they were used at the Roman time (they contribute a light hydraulicity to mortar).

In order to make a mortar it will be advisable that the grains are unequal and angular, do not contain humus, earth, mica, salt or clay, in this way we will secure a compact and resistant render.

Pay attention:
The market often offers dolomitic limes (impure thus not greasy limes), mixed and with chemical additives, or limes badly stored, partially carbonated, with low binding power. Unfortunately are also in the market so called slaked lime puttys, elaborated of calcium hydroxide in powder-form and with additives in form of plastifiants and organic stabilizers or hydrofugants, hydraulic additives, etc.
A good greasy lime does not need anything like this! In the manufacture of the limes that we sell they take care of all the details:
Excellent raw material: **Rocks with contents of 99.7% in calcium carbonate**.
Artisan elaboration (non industrial) conserving the office of the lime artisan: process of calcination in Arab furnaces and with firewood and correct slaking that does not alternate the qualities of the product.

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