

## TECHNICAL DATA SHEET **NATURAL HYDRAULIC LIME** EN 459-1:2010

### Raw materials:

Natural hydraulic lime is a hydraulic binder in powder-form, partially hydrated, that is obtained calcining natural limestones that contain between 15 and 20% of clay and other impurities, correctly denominated marls. During the calcination (with aprox. 1200°C = lower firing temperature than Portland cement) calcium reacts in the kiln with the clay minerals to produce silicates, aluminates and ferric-aluminates that enable the hydraulic lime to set faster than hydrated lime and without exposure to air (including under water). Any unreacted calcium is transformed into calcium hydroxide. This part of the lime reacts non-hydraulic, precise water or environmental humidity and carbon dioxide gas of the air, and is responsible for the progressive resistance of the natural hydraulic lime. It varies according to its hydraulic index.

### Special mortar properties made with natural hydraulic lime, beneficial for RESTORATION AND GREENBUILDING:

Great plasticity (therefore easy to progress), fort adhesion in diverse materials and surfaces, great capacity of water retention, low tendency of cracking (low modulus of elasticity), good durability, good water-impermeability, permeability to water steam, allows buildings to breathe (the less hydraulic the most) and has a good aspect. Lime mortars are up to 34% more insulating than those of cement. **Natural Hydraulic Limes (EN459-1:2010)** are **free of additives** and have a low index of radiation.

| <b>Technical characteristics of our Natural hydraulic limes (NHL), with CE certification:</b> | <b>NHL 5</b><br>(eminently hydraulic)<br><br>beige<br>(sac 25 kg)<br><br>(updated 07/12) | <b>NHL 3,5</b><br>(moderately hydraulic)<br><br>clear grey<br>(sac 35 kg)<br><br>(updated 07/12) | <b>NHL 3,5</b><br>(moderately hydraulic)<br><br>clear beige<br>(sac 25 kg)<br><br>(updated 07/12) | <b>NHL 3,5 white</b><br>(moderately hydraulic)<br>Whiteness:<br>Y=76,7<br>(sac 35 kg)<br><br>(updated 07/12) | <b>NHL 2</b><br>(feebly hydraulic)<br><br>Whiteness:<br>Y=72,9<br>(sac 25 kg)<br><br>(updated 07/12) |
|---|--|--|---|--|--|
| <b>Mechanical characteristics</b>   |  |  |   |  |  |
| Compressive strenght<br>7 days  | 4 MPa (medium)   | 1,78 MPa<br>(medium)   | 2,9 MPa<br>(medium)   | 2,02 MPa<br>(medium)   |  |
| Compressive strenght<br>28 days   | <b>5 MPa</b><br>(mínimum)<br>7,1 MPa<br>(medium)   | <b>3,5 MPa</b><br>(minimum)<br>4,47 MPa<br>(medium)  | <b>3,5 MPa</b><br>(minimum)<br>6 MPa (medium)   | <b>3,5 MPa</b><br>(minimum)<br>4,85 MPa<br>(medium)  | <b>2 MPa</b><br>(minimum)<br>4,57 MPa<br>(medium)  |
| Start of setting  | 195 min<br>(medium)  | 170 min<br>(medium)  |   | 366 min (medium))  | 849 min<br>(medium)  |
| Remainder   | < 15%  | 5,2% (medium)<br>< 15%   | < 15%   | 0,4% (medium)<br>< 15%   | < 15%  |
| Penetration   | 14 mm  |  |   |  |  |
| <b>Physical characteristics</b>   |  |  |   |  |  |
| Rejection to 90 µ in %  | 9  | 7  | 7,2   | 0,6  | 2,2  |
| Rejection to 200 µ in %   | 1,5  | 1,1  | 1,1   | 0,0  | 0,1  |
| Refinement Blaine   | 9.400 cm2/ g<br>(medium)   | 9.601 cm2/g<br>(medium)  | 9.000 cm2/g<br>(médium)   | 12.820 cm2/g<br>(medium)   | 13.295 cm2/g<br>(medium)   |
| Expansión   | 0,5 mm (medium)  | 0,3 mm (medium)  | 0,3 mm (medium)   | 0,0 mm (medium)  | 0,0 mm (medium)  |
| Apparent density  | 0,65 kg/ dm3   | 0,751 kg/ dm3  | 0,65 kg/ dm3  | 0,68 kg/ dm3   | 0,607 kg/dm3   |
| Specific weight   | 2,7 g/ cm3<br>(medium)   | 2,5 g/ cm3<br>(medium)   | 2,7 g/ cm3<br>(medium)  | 2,49 g/ cm3<br>(medium)  | 2,49 g/cm3<br>(medium)   |
| Free water  | 0,6% (medium)  | 0,72% (medium)   | 1,2% (medium)   | 0,93% (medium)   | 0,43% (medium)   |
| <b>Chemical characteristics</b>   |  |  |   |  |  |
| SO <sub>3</sub>   | 1,44 % (medium)  | 0,75% (medium)   | 1,2% (medium)   | 0,99 (medium)  | 0,98% (medium)   |
| Free lime   | 18,8% (medium)   | 18,8% (medium)   | 25,9% (medium)  | 28,5% (medium)   | 28,4% (medium)   |
| CaSO <sub>4</sub>   | <1%  |  |   |  |  |
| C <sub>3</sub> S  | nd   |  |   |  |  |
| C <sub>3</sub> A  | <1%  |  |   |  |  |
| K o KO <sub>2</sub>   | <0,55  |  |   |  |  |
| Na o NA <sub>2</sub> O  | <0,1%  |  |   |  |  |
| CaO   | 0  |  |   |  |  |
| <b>Additions</b>  | <b>0</b>   | <b>0</b>   | <b>0</b>  | <b>0</b>   | <b>0</b>   |
| Active clay   | c. 25%   |  |   |  |  |
| Loss on ignition  | 16%  |  |   |  |  |

**Precautions in its application:**

- Good dosage in relation water - binder
- Avoid the fast drying with warm weather (shade and damp in the first 72 hours or more)
- Damp masonry and walls to render and to plaster

**Contraindications:**

- Works in very cold time (< 3°C) or very warm time (> 30°C)
- Aggressive ambients

**Arids:**

The silica and limestone sands of artificial crushing of rocks or river are preferable. Last they must be sufficiently angular and those are avoided that contain clay. Also the beach sands are avoided because they are fine of grain and without little edges and could contain alkaline salts.

| application range<br>for our natural hydraulic limes   | classes of natural hydraulic lime<br>appropriate according to<br>application   | doses                        |                                 |
|--|--|------------------------------|---------------------------------|
|  |  | natural<br>hydraulic<br>lime | sand,<br>gravel<br>or<br>others |
| <b>Cyclopean foundations y lime concretes</b><br>(arid 0-25 mm).   | NHL 5  | 1                            | 4,5                             |
| <b>Mortars and lime concretes</b> with arids of 0-15 mm (floor slabs, mortars for masonry and containing walls with natural stone).                              | NHL 5  |                              | 4 - 4,5                         |
| <b>Masonry with bricks</b> with arids of 0-5 mm (loam-stones, Cannabric, cotto bricks, Termoarcilla, ... ) and flat natural stone                                | NHL 5<br>(NHL 3,5, NHL3,5 white o NHL2 for visible or colored joints and low-resistance bricks. Better insulation qualities than NHL5 lime).                     |                              | 4                               |
| <b>Renderers and plasters:</b><br>Eco-building, restoration and recovery of the architectonic patrimony, rehabilitation of rural houses and cave annexed houses. | NHL 3,5<br>(NHL3,5 white o NHL2 for clearer renderers and plasters, with optimum thermal properties)   |                              | 4                               |
| <b>Plasters</b> with clear sands or coloured ones with pigments. Very fine plasters.   | NHL 3,5 white<br>NHL 2   |                              | 4 - 4,5                         |
| <b>Stuccos</b> with sifted sand or marble powder.<br><b>Patchwork</b> with tiles or flat stones (with very fine sand or marble powder).                          | NHL 3,5 white<br>NHL2  |                              | 3-4                             |
| <b>Light, insulating mortars</b><br>(for floor bases, compacted walls, vaults, cupolas, insulating renderers, insulation mortars for roofs).                     | NHL 5 (higher mechanical strength)<br>NHL 3,5 y NHL 3,5 white (for optimum thermal properties and lightness and in combination with coloured sands and pigments) |                              | 2,5 - 3                         |
| <b>Settlement of Arab roofing tiles</b> , ceramic floor tiles, of stoneware or natural stone (in exteriors and interiors).                                       | NHL 5; NHL3,5; NHL3,5 white  |                              | 3 - 4                           |
| <b>Stabilization of earth for construction</b> (the accomplishment of tests with different doses is recommendable)   | NHL5 or NHL3,5<br>NHL3,5 white or NHL2<br>depending on type of soil  |                              | 5-10%                           |