

TECHNICAL DATA SHEET NATURAL HYDRAULIC LIME (EN 459-1)

Raw materials:

Natural hydraulic lime is a hydraulic binder in powder-form, partially hydrated, that is obtained calcining limestones that contain between 15 and 20% of clay and other impurities, correctly denominated marls. During the calcination (aprox. 1200°C, lower firing temperature than Portland cement) calcium reacts in the kiln with the clay minerals to produce silicates, aluminates and ferro-aluminates that enable the hydraulic lime to set faster than quicklime or slaked 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 ECO-BUILDING:

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 are free of additives and have a low index of radiation.

Technical qualities of our natural hydraulic limes, with CE certification:	NHL 5 (eminently hydraulic)	NHL 3,5 (moderately hydraulic)	NHL 3,5 blanca (moderately hydraulic)	NHL 2 (feebly hydraulic)
Mechanical characteristics				
Compressive strenght 7 days	2,0 MPa (minimum) 5,1 MPa (medium)	1,78 MPa (medium)	2,02 MPa (medium)	
Compressive strenght 28 days	5 MPa (minimum) 8,1 MPa (medium)	3,5 MPa (minimum) 5,41 MPa (medium)	3,5 MPa (minimum) 5,79 MPa (medium)	2 MPa (minimum) 3,42 MPa (medium)
Compressive strenght 90 days	10 MPa (minimum) 11,5 MPa (medium)			
Compressive strenght 180 days	12 MPa (minimum) 13,2 MPa (medium)			
Resistance to the flexion 7 days	0,9 MPa (minimum)			
Resistance to the flexion 28 days	1,3 MPa (minimum)			
Resistance to the flexion 90 days	2,5 MPa (minimum)			
Resistance to the flexion 180 days	3,5 MPa (minimum)			
Start of setting	>= 60 minutes 78 min (medium)	108 min (medium)	229 min (medium)	410 min (medium)
Remainder	12,8% (medium) < 15%	5,2% (medium) < 15%	0,4% (v. medium) < 15%	< 15%
Physical characteristics				
Rejection to 90 µ in %	14,4	5,3	0,4	0,8
Rejection to 120 µ in %		0,8	0,0	0,1
Refinement Blaine	>= 6.500 cm2/g 7.882 cm2/ g (medium)	7.684 cm2/g (medium)	11.677 cm2/g (medium)	12.796 cm2/g (medium)
Expansión	0,8 mm (medium)	0,5 mm (medium)	0,1 mm (medium)	0,1 mm (medium)
Apparent density	0,83 kg/ dm3	0,751 kg/ dm3	0,563 kg/ dm3	0,61 kg/dm3
Specific weight	2,75 g/ cm3 (medium)	2,68 g/ cm3 (medium)	2,66 g/ cm3 (medium)	2,62 g/cm3 (medium)
Free water	0,55% (medium)	0,51% (medium)	0,56% (medium)	0,71% (medium)
Chemical characteristics				
SO3	2,6 % (medium)	1,62% (medium)	1,86 (medium)	0,91% (medium)
Free lime	10,2% (medium)	17,5% (medium)	25,7% (medium)	25,7% (medium)

Precautions in its application:

- Good dosage in relation water - binder
- Avoid the fast drying with warm weather (shade and to damp in the first 72 hours)
- 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 for our natural hydraulic limes	classes of natural hydraulic lime appropriate according to application	doses	
		natural hydraulic lime	sand, gravel or others
Cyclopean foundations y lime concretes (arid 0-25 mm).	NHL 5	1	4,5
Mortars and lime concretes with arids of 0-15 mm (floor slabs, mortars for masonry and containing walls with natural stone).	NHL 5		4 - 4,5
Masonry with bricks with arids of 0-5 mm (loam-stones, Cannabric, cotto bricks, Termoarcilla, ...) and flat natural stone	NHL 5 (NHL 3,5, NHL3,5 white o NHL2 for visible or colored joints and low- resistance bricks. Better insulation qualities than NHL5 lime).		4
Renders and plasters: Eco-building, restoration and recovery of the architectonic patrimony, rehabilitation of rural houses and cave annexed houses.	NHL 3,5 (NHL3,5 white o NHL2 for clearer renders and plasters, with optimum thermal properties)		4
Plasters with clear sands or coloured ones with pigments. Very fine plasters.	NHL 3,5 blanca NHL 2		3 - 4
Stuccos with sifted sand or marble powder. Patchwork with tiles or flat stones (with very fine sand or marble powder).	NHL 3,5 blanca NHL2		2 - 3
Light, insulating mortars (for floor bases, compacted walls, vaults, cupolas, insulating renders, insulation mortars for roofs).	NHL 5 (higher mechanical strenght) NHL 3,5 y NHL 3,5 white (for optimum thermal properties and lightness and in combination with coloured sands and pigments)		3 - 4
Settlement of Arab roofing tiles , ceramic floor tiles, of stoneware or natural stone (in exteriors and interiors).	NHL 5; NHL3,5		3 - 4
Stabilization of earth for construction (the accomplishment of tests with different doses is recommendable)	NHL5 (sandy earth) NHL3,5 white or NHL2 (earth rich in clay)		+/- 5%

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