

Resistance to Sea Water Tests Results for Pure Natural Hydraulic Limes

St Astier Natural Hydraulic Limes (NHL)

Due to the very low presence of aluminates and other components (gypsum, alkalis), St. Astier limes are suitable to be used in marine climates.

An extreme test has been conducted in our laboratories by using seawater instead of distilled water (ISO norms EN 459.2). The mortar was prepared with ISO sands and the current European Norm ratio of $>500\text{kg/m}^3$ of binder.

The sea water was simulated by using salt from the Red Sea (as used in sea water aquariums) at a ratio of 33gr.l-1. The proctors were cured in the same water for 7, 28 and 90 days.

The lime used was NHL 3.5 and the table below shows results in tensile and compressive strength compared with an identical mortar prepared with the usual water as per EU standards (EN 459-2).

Curing - Days	Seawater proctors		Standard proctors	
	TS	CS	TS	CS
	N/mm ²	N/mm ²	N/mm ²	N/mm ²
7	1.23	3.1	0.85	2.8
28	3.70	9.5	2.5	8.9
90	3.80	15.3	3.5	14.60

Note: the high compressive strength obtained is due to the EU norm standard mortar ratio which is near to 1:1.

The performances of the 2 mortars are similar at 90 days but the presence of sodium chloride accelerates the early hardening. The following was not noted:

1. Lime leaching.
2. Reaction of the Portlandite resulting from the hydration of C_2S that could produce calcium sulphates in the form of expansive Ettringite.
3. Possible formation of Brucite.
4. Substitution of the Tobermorite lime by magnesium, forming friable magnesium silicates.
5. Formation of Friedel salt (Calcium Chloro Aluminate)

The study is conducted to check the passive reaction in the presence of sea salt. It does not consider the possible presence of organic matter or other contaminants in the seawater.

For further Guidance, contact your St Astier Distributor.

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