

# ARMOLIME IR

## SALT-RESISTANT HYDRAULIC LIME-POZZOLAN BINDER

*For consolidation injections in old masonry structures*



**ARMOLIME IR** is a ready-to-use natural hydraulic binder based on lime and pozzolan. When mixed with water, it produces injection grouts suitable for strengthening old masonry structures.

Thanks to its high fluidity, **ARMOLIME IR** can be easily injected into building materials, even with low permeability. **ARMOLIME IR** is resistant to salts and compatible with the materials originally used in the construction of historic masonry. It is shrinkage-free and guarantees effective adhesion and filling of the masonry structure.

### ADVANTAGES

- ✓ **High fluidity with variable rheology:** with ARMOLIME IR it is possible to change the water-to-binder ratio and easily adjust the consistency from fluid to super fluid to obtain grouts that can ideally be injected in any substrate.
- ✓ **Chemical-physical compatibility with existing masonry:** the grouts prepared with ARMOLIME IR, once hardened, have elastic modulus, porosity and mechanical characteristics that make them compatible with the masonry structures and mortars based on lime, lime-pozzolan or hydraulic lime originally used in the construction of the buildings.
- ✓ **Adequate mechanical strength:** ARMOLIME IR mechanical strength increases slowly until reaching the values that can normally be found in old masonry structures; this prevents localised stress concentrations that could lead to static deterioration phenomena.
- ✓ **Easy to inject with improved cohesive properties:** thanks to the RHEOCONTROL TECHNOLOGY, ARMOLIME I allows to prepare fluid, cohesive and bleeding-free grouts that can easily be injected through materials featuring low permeability (core-and-veneer masonry, loose material, crevices, etc.).
- ✓ **Anti-fouling action:** the exclusive formulation of ARMOLIME IR develops an anti-fouling action which controls colonisation and development of roots and biological growth on the masonry structures treated.

### USES

- ✓ **ARMOLIME IR** is specially developed for strengthening and consolidating old deteriorated masonry by injection.
- ✓ **ARMOLIME IR** improves homogeneity and restores the load-bearing capacity of the masonry.
- ✓ Strengthening occurs when cracks are sealed, and cohesion of mortar joints is restored and bond strength between mortar and masonry is achieved.



## HOW IT WORKS

- ▶ The **high fluidity** of the grout prepared with **ARMOLIME IR** allows to permeate through masonry structures of any type, including core-and-veneer walls. The high cohesion capacity of the material and the absence of shrinkage prevent any discontinuity at the masonry-injected grout interface, an irregularity that can affect the effectiveness of the consolidating action.
- ▶ During setting and hardening, **ARMOLIME IR** does not form compounds that can react with the sulphates present in the masonry. The said chemical reactions are triggered by the simultaneous presence of moisture and sulphate salts in the masonry and lead to efflorescence of salts (deposited upon evaporation of the water wicked by capillary action) and/or of gypsum (used as binder either in the original construction or in subsequent restoration works). Under these conditions, the injected hydraulic binder can react with the sulphates and result in the formation of two expansive compounds, i.e. ettringite and thaumasite. Decay phenomena of this kind have been reported after injections made with grouts based on traditional hydraulic binders – either cementitious or not – which have led to serious structural damage of the consolidated structure such as bowing and cracking.
- ▶ **ARMOLIME IR** develops its mechanical strength slowly until reaching those values that can be normally found in ancient masonry structures, thus preventing localised stress that can trigger other deterioration phenomena. Using materials with high mechanical strength and high modulus of elasticity creates zones with different stiffness inside the masonry, with the least resistant exposed to increased stress. Under such conditions, also hygrothermal stresses can generate different dimensional expansion in the masonry and the injected binder and create stress, again to the detriment of less resistant materials.
- ▶ **ARMOLIME IR** hardens slowly and gradually. The formation of the hydraulic compound, the calcium silicate hydrate (C-S-H), occurs with an extremely reduced release of the heat of reaction which prevents phenomena of differential thermal expansion.

## HOW TO USE THE PRODUCT

### SUBSTRATE CLEANING

- ▶ Remove any loose or poorly adherent parts from the surface to be treated, taking care not to damage the structures.
- ▶ Remove marks, efflorescence or soaked-in stains of grease, oil, paint, lime, dust, dirt, etc.
- ▶ Remove any previous repairs, if irreparably damaged or deteriorated.

### SUBSTRATE PREPARATION

- ▶ Before any **interventions on masonry and vaults**, brush and de-dust the surface. Fill any cracks and fractures with ARMOLIME TA or TS to prevent the grout from flowing out after injection. Do this operation 24-48 hours before injection.
- ▶ If the **substrate** is **deteriorated**, remove the damaged layer by bush hammering, chiselling or pressure washing (the latter avoids damage to the substrate and is recommended for large surface areas) until obtaining a sound, compact substrate.
- ▶ **Drill the grid pattern.** Injection holes shall be arranged in a quincunx grid pattern spaced at intervals of 50 to 100 cm, and can be drilled on one side of the structure or both depending on the texture, thickness and conditions of the masonry to be consolidated. It can be useful to insert the packers in existing cracks to allow the grout to penetrate at full depth in the masonry.
- ▶ **Inject water to wet the surface until saturation.** This procedure, to be carried out 24 hours before work, prevents the substrate from absorbing the water of the mix, which may lead to cracking and reduce the bond strength of the mortar. This operation also makes it possible to remove any residues caused by substrate cleaning and hole drilling, and to detect water leaks and identify damage.

## MORTAR PREPARATION

- ▶ **ARMOLIME IR** shall be mixed using a low-speed mixer by pouring water according to the recommended mixing ratio, that is 6-8 litres of water every 20kg bag. Slowly add the product and mix for at least 4-5 minutes until a smooth, lump-free consistency is achieved. Verify that the entire product has been properly mixed and there is no powder left on the walls or at the bottom of the container.



### HOT WEATHER PRECAUTIONS

- ▶ Store **ARMOLIME IR** in the shade.
- ▶ Carry out work in the early hours of the morning, interrupting work when the sun is strongest: it is better to resume work in the late afternoon, providing the substrate has been kept continuously wet for at least 6 hours before work begins again.



### COLD WEATHER PRECAUTIONS

- ▶ Store **ARMOLIME IR** in a heated environment, if possible.
- ▶ Do not use the product at temperatures below 5°C.
- ▶ Start working in the later hours of the morning.
- ▶ Ensure the substrate is not frozen.

## MORTAR APPLICATION

Inject **ARMOLIME IR** at a pressure suitable for the masonry (max 0.2 MPa). Begin injection at the lowest ports and work upwards to fill all the voids in the masonry.

## CONSUMPTION

The amount of product necessary for an effective consolidation of the whole masonry depends on the nature and percentage of voids of the substrate. It is therefore recommended to carry out some preliminary test injections in the substrate.

## PACKAGING AND STORAGE

**ARMOLIME IR** is packed in 20 kg bags.

If properly stored in a sheltered, dry place in its original container, the product maintains its properties for 12 months.



## SPECIFICATION ITEM



**Type of work:** mass consolidation of masonry by injection of hydraulic lime-pozzolan grouts.

**Specification :** consolidation injection of stone or rubble stone masonry or mixed brick and stone masonry using grouts based on hydraulic limes and pozzolan with breathability, fluidity and mechanical strength properties which are compatible with the masonry to be injected like Armolime IR by DRACO Italiana S.p.A. Injection shall be carried out at controlled, variable pressure until grout appears at the port above the injected port.

## PRODUCT CHARACTERISTICS

APPEARANCE	Grey / beige powder
MAXIMUM AGGREGATE SIZE - EN 1015-1	< 100 µm
CHLORIDE CONTENT - EN 1015-17	< 0.1 %

## APPLICATION SPECIFICATIONS

MIXING WATER	30-40%
BULK DENSITY (PLASTIC CONSISTENCY) - EN 1015-6	approx. 1.95 kg/m <sup>3</sup> .
APPLICATION TEMPERATURE	+5 to +35°C
FLUIDITY OF GROUT - EN 445	Marsh cone emptying: 25-30 s. (initial)
WORKABLE LIFE OF FRESH MORTAR - EN 1015-9	approx. 80 min.
CONSUMPTION	approx. 1.50 - 1.60 kg/dm <sup>3</sup> (of void to be filled)

## PERFORMANCE CHARACTERISTICS

### GUARANTEED PERFORMANCE MASONRY MORTAR - UNI EN 998-2

PERFORMANCE CHARACTERISTIC	TEST METHOD	REQUIREMENTS ACCORDING TO EN 998-2	PRODUCT PERFORMANCE
COMPRESSIVE STRENGTH	EN 1015-11	Classes from M1 to Md	M10
BOND STRENGTH (INITIAL SHEAR STRENGTH)	EN 998-2	Tabulated value	0.15 N/mm <sup>2</sup>
WATER ABSORPTION DUE TO CAPILLARY ACTION	EN 1015-18	Declared value	≤ 0.5 kg/m <sup>2</sup> min <sup>0.5</sup>
WATER VAPOUR PERMEABILITY COEFFICIENT	EN 1745	Tabulated value	15-35 µ
THERMAL CONDUCTIVITY	EN 1745	Declared value	( $\lambda_{10,dry}$ ) 0.76 W/mK
REACTION TO FIRE	EN 13501-1	Euroclass	A1

#### Legal notes - SLCMP version of 01.03.2017

Draco Italiana s.p.a. has adopted the parameters indicated in this data sheet and the related standards for the calculation of the values and technical data contained herein.

Customers shall verify that this data sheet and the values indicated herein apply to their product batch and have not been superseded by later editions. If in doubt, verify that the sheet corresponds to the one available on the website [www.draco-edilizia.it](http://www.draco-edilizia.it) at the time the sales contract was executed and/or by previously contacting the Technical Department.

Any suggestions on the use of the Products provided by our personnel either orally or in writing upon the Customer's request do not constitute additional obligations to the purchase contract and do not imply a contractual obligation for the company. They are based on our experience and limited to the current state of practical and/or scientific knowledge. They are not binding for the client or for the installer. It is the Customer's responsibility to test our products and verify they are suitable for the type of application and use envisaged.