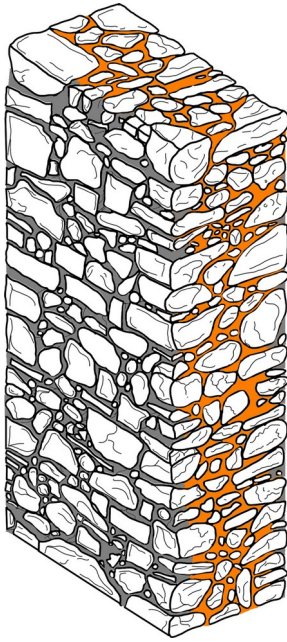


Restoration of ancient rubble masonry walls through injection of mixture with high mechanical strength and low content of water-soluble salts

LV51_SA_EN_R2-0517



APPLICATION DATA SHEET

Restoration of ancient rubble masonry walls through injection of mixture with high mechanical strength and low content of water-soluble salts by:

1. preparation of the substrate;
2. drilling;
3. sealing of the injectors and internal cleaning of the masonry;
4. injection.

1) PREPARATION OF THE SUBSTRATE

If necessary, skive mortar joints that appear to be degraded in mixed-material walls, stone, tuff or clay-bricks, and possibly carry out the masonry hydro-washing in order to obtain a healthy and compact substrate free from flimsy or detaching parts, salt efflorescence, dust and mold. Grout all lesions and cracks. If the masonry is plastered, check the perfect adherence of the plaster to the surfaces to avoid bagging where the injected product could stagnate. In the case of exposed masonry, make the grouting of the joints with a suitable mortar from the **Limepor** line (consult our Technical Office).

If a new plaster is to be made, apply a first layer of rough coat of approx. 5 mm.

2) DRILLING

Horizontal drilling in correspondence with the mortar joints with rotating diamond probes, so as to avoid dangerous vibrations. The holes should be on average 4¹ per m², with a diameter of 20-22 mm, to guarantee a homogeneous soaking of the masonry, and should be downwards-inclined.

They will have to be performed in staggered rows with a distance of 10 cm between two rows of holes. The depth of the holes must be equal to 2/3 of the wall and never less than 10 cm. For walls over 60 cm thick, it is advisable to drill the holes on both sides of the masonry.

3) SEALING OF THE INJECTORS AND INTERNAL CLEANING OF THE MASONRY

Positioning and sealing in the perforations performed, with appropriate masonry mortar of the **Limepor** line, of threaded pipes used as injectors.

The day before the injection, wash the masonry internally with water under slight pressure through the copper injectors previously positioned proceeding from the top downwards. Thanks to masonry washing, debris and dust created during the drilling phase can be removed, in order to avoid that their presence limits the adherence of the mixture; moreover, by saturating the masonry, it does not absorb part of the water contained in the material injected. This absorption can alter the hydration process. The washing operation also highlights any escape routes for the mixture that have not been identified and previously sealed.

4) INJECTION

Injection with suitable manual or electrical equipment, until the masonry is completely saturated, of **Limepor 100**. The mixture will be introduced into the masonry by pressure injection²: the mixture penetrates through the holes

¹ To determine the exact location and geometry of the holes (diameter, depth and inclination) it is important to determine the radius of action of the hole, i.e. the maximum distance from the hole reachable by the mixture. To do this, a main hole in the masonry, from which the mixture will be introduced, and a series of other holes at different distances are drilled. During the injection the holes from which the mixture is released are closed until the process is interrupted. The distance of the last filled hole from the main hole provides the desired radius of action. Once this value is determined, it is a good idea to distribute the holes on the vertexes of equilateral triangles whose side is equal to the double, so as to involve a larger area. Better results are achieved with a high number of small diameter holes rather than a few large ones; the diameter can vary between 10 and 30 cm depending on the type of mixture injected. Finally, given that generally the procedure is performed only on one face of the wall, the depth of the hole must be between 2/3 and 3/4 of the thickness and never less than 10 cm, giving the hole an upwards slope.

² If the masonry is in a state so damaged that it cannot withstand overpressure or perforations, the gravity injection method can be applied: the mixture is injected from above through cracks or cavities created, removing deteriorated material; this method does not allow

equipped with injectors connected to a hydraulic or compressed air pump, that pushes it until it diffuses into the wall at a pressure adequate to the dimensions of the cracks and to the type of mixture.

The introduction generally takes place starting from the lower lateral areas and then continues towards the centre; the operation must then be repeated for the upper layers up to the top. The pressure exerted to inject the mixture is very important: insufficient pressure does not allow, in fact, to completely fill the voids, while a high pressure can damage the masonry and trap air bubbles that prevent the mixture from saturating the voids.

The optimal value is determined by attempts starting from values of 1 atm and then gradually increasing up to a maximum limit of 6 atm, applied only in special cases.

The masonry can be considered saturated when the mortar leaves the injector immediately above the injection one.

Consider the consumption rate of material provided in the Technical Data Sheet.

Once the injection work is complete, remove all the injectors and fill the holes with appropriate mortar and prepare the masonry for any subsequent interventions.

the occlusion of all the voids but only the larger gaps.