

Asi Shalom

Conservation and Restoration consultant to the Israeli National Park and Antiquities Authorities

St. Astier NHL 5 plasters and mortars
for high salt saturated historical buildings.

Overview

Israel is a small country with at least four differing climates, varying topography and geology and a built heritage starting at the first dwellings of Man on his way out of Africa until the times of the late Ottoman Empire.

Careful examination and study of excavated sites and abandoned historical ruins reveal that ancient Man, no matter of the Historic Period, built his shelters and dwellings with full understanding and reliance on Nature instead of modern Man's total reliance on energy.

The conservation of exposed sites and abandoned ruins imposes the full understanding of the peculiar building's philosophies and techniques alongside the comprehension of the Natural, as well as Modern age, decay process affecting the sites.

All exposed sites and buildings, which no longer support human activity and no longer receive on-going maintenance are on an irreversible decay process.



Armenian Historic Building, Jaffa, Mediterranean Coast

Project: typical porous beach stone suffering from sea salts soaked into walls during long periods of abandonment of building.



An Historic British Police Building, Be'er Sheva, Historic Quarter

Project: typical soft clay-limestone suffering from salts rising from ground.

Plastering:

The suggested plaster mix is not easy to apply since it is heavy and not easily workable.

We double out deeper areas first, inserting if necessary pinning materials and bring the area to the required level. The next layers are manually pressed in and worked slightly with a wood or polyurethane float into at not more than 1 cm at the time. The surface is left very rough and small lacunae are left arbitrarily throughout the surface. Since the NHL 5 sets quickly in our climate we can apply another layer the following day. This procedure is followed until the completion of the work.

If the client wish to have a smooth finished surface for aesthetic reasons, a skim coat of 2-3mm is added. This coat is made of 1 part NHL 5 to 4 parts of rough grain graded quartz sand. No pigments are used.



Conclusion:

In all cases, the salts contained in the wall have been able to migrate to the surface without any damage to the joints or plasters and easily brushed off.

An efficient, pure lime mortar has done the job that so many other products claim to do at a much greater expense and with, in numerous occasions, poor results.



Composition of the macro-porous St. Astier NHL 5 system

St. Astier NHL 5 1 part to 4 parts aggregate/sand

Aggregate/sand is composed of:

85-90% sharp hard limestone/dolomite aggregate up to 2 mm.

10-15% rough grain graded quartz sand above 2mm.

Application of macro-porous mortars

Pointing:

We noticed that the fine textured lime pointing acts as a capillary sponge drawing moisture into the core of the wall and into the soft, unstable stone. With the moisture movement we have the soluble salts which move faster through the weak limestone/porous beach stone, crystallize during changes in their relative humidity, causing decay and damage.

For that reason we apply the NHL 5 system mentioned above as a drainage system allowing moisture to move in but more importantly move out of the wall to the surface. Allowing free movement keeps the moisture in the pointing mortar and the joints and not in the unstable stone. The final surface of the worked joint is left rough and not polished smooth.

The macro-porous system, having a minimum thickness of 5-6 cm. in the joints contains voids that allow the salts, on their way to the surface, to crystallize and eventually move again to the surface without producing an heave effect which causes cracking and deterioration of joints, plaster mortars and weak masonry.



Step by step approach

- Understanding the monument's original building techniques and materials.
- Assessment of the type and extent of the salt damage, the decay process and the probable causes.
- Elimination of all surrounding causes which directly affect the salt movements.
- Dismantling of salt affected, existing pointing and plasters.



- Desalination with a poultice containing methylcellulose and distilled water for 2-3 days,



- Application of 5-6 cm. deep pointing and 2-3 layers of 1 cm. thick plaster composed of the NHL 5 macro-porous system.
- Monitoring during the change of seasons.



Exposure to salt movement

A major factor and cause of plaster, mortar and soft stone decay, as well as a problem in the modern reconstruction of ruins into livable buildings, is the movement of entrapped salts in the building's walls, floors and foundations.

Different types of salts that have been soaked into the buildings from rising dampness, salty earth or seashore environment and modern Man's use (leaking sewer lines, modern cements etc..) can migrate or crystallize when their relative humidity is altered by weather conditions. Such crystallization, if failing to happen at the surface, causes failure and decay in all types of plasters, mortars and soft stone.



Jaffa Project: damage done by salts soaked from sea and modern cement plasters.



Be'er Sheva Project: damage done by rising salts from ground and application of modern cement plasters.

Conservation of salt saturated monuments

All our attempts to stop the salt movements in the walls and floors or to block and prevent salts from reaching the surface and crystallizing along the way have failed.

We have now managed to reduce damage due to salt movement by preventing dampness from reaching walls and floors and by adopting repair mortars that will allow these movements.

In the past three years we have been using a St. Astier NHL 5 mortar and plaster macro-porous system. This system allows the salts to pass through the core of the walls, the breathable plasters and pointing mortar and to crystallize on the surface without damaging the mortar, plaster or soft stone.

The choice of St. Astier NHL binders is due to the absence or only traces of soluble salts and alkali. Also of major relevance is the soundness value of these products, showing an expansion below 1mm due to the constantly efficient slaking, ensuring that no quick lime is present in the finished product.

Some products have a soundness/expansion of 4mm or more and this would cause failures due to the expansion heave in addition to the heave exercised by the salts already present.