Core CONSERVATION

Replastering Old Walls

Technical Bulletin

Older vs Newer Buildings

Older and newer buildings have been built very differently.

Older buildings have been designed and built to be *water permeable*. Being built from breathable materials, it allows for a large percentage of the moisture to freely evaporate.

Newer buildings, on the other hand, have been built *watertight*, using modern non-permeable materials (including plastics), designed to keep moisture out.

Mixing old and new materials, often has a detrimental effect on old buildings, leading to the rapid decay of the historic fabric, for the following reasons:

1. **Moisture**: the fabric of old walls often contains significant amounts of moisture. These can originate from multiple sources such as the *ground* (rising damp, water splashback) or the *air* (rain, driving rain, sea-spray etc.).

2. **Salts**: water dillutes existing salts in the environment and moves them into the building fabric. When moisture evaporates salts crystallize and expand in volume (5-10 times), leading to the cracking and crumbling of the masonry. Most common sources of salts are *rising damp* (salts absorbed from the ground), *leaks/water ingress* (trickling water moves salts around, often to the surface), *chimney soot* (which contains very high amounts of salts) as well as *the air* (in form of sea spray, salty winds, or pollution from cars or nearby factories – these salts are washed by rain into the wall fabric).

3. **Non-breathable materials**: the natural degradation of the old building fabric due to moisture and salts is further **aggravated** by the use of modern non-breathable materials (e.g. *cement plasters*, *foams*, *plastic paints* etc.) primarily designed for newer buildings. These, in older buildings hinder evaporation and the accumulating moisture severely damages the wall fabric long-term. Removing these does *not necessarily solve* all dampness problems, but *restoring breathability often results in a significant improvement*.

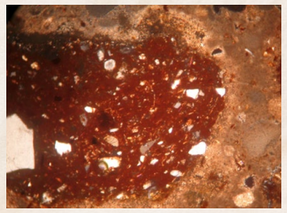
Crystallizing salts are one of the most important causes behind the *ongoing decay* of masonry and the *premature breakdown of plastering*. Their effect must be understood and "managed" using the right (traditional) renovation materials.

The Right Solution

The ideal renovating material for old, damp and salty walls is a lime plastering system that satisfies the following requirements:

- **Breathable**: to let *water vapors pass through freely* preventing the accumulation of moisture.
- **Resistant to salts**: salts are the primary reason behind the premature breakdown of lime plasters. A good lime plaster should be *able to cope with all salts* without being damaged by them.
- **Not too hard**: so it *won't damage the underlying softer building fabric* but resistant enough to withstand some water pressure.
- **Long lasting**: have a long service life.

All this can be achieved with a historic lime plaster of which origins stretch back to **ancient Rome**. Being outstanding architects and builders, the Romans have discovered that by adding **volcanic soils and other minerals** to lime, they can significantly alter its properties, especially its *mechanical strength*, its resilience *to water and salts* – while *retaining its breathability*.



Mixing lime putty with volcanic minerals (pozzolans) can make lime renders waterproof while retaining their breathability

The materials most commonly added to lime were ***natural pozzolans*** *(volcanic soils or rock fragments)* and ***cocciopesto*** *(milled bricks or terracotta fragments)*. These reacted chemically with the free lime, forming *water and salt-resistant compounds*. Such mortars were able to *harden quicker* not only *in the presence of water* but even *underwater* in the total absence of air, and they are known as **pozzolanic mortars**.

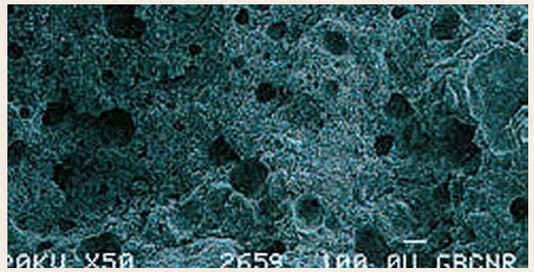
It is important to understand that **the degree of porosity and breathability of lime plasters is primarily determined by the properties of lime** and not by its hydraulic additives, an important factor being the firing temperature of lime. By firing limestone at low temperatures (at around 850-900 °C), the *breathability of lime is retained*, while the carefully selected natural hydraulic additives make the mortar *salt resistant and waterproof*. These are different from today's NHL mortars, whose much higher firing temperatures (~1200 °C) impair their breathability.

These lime mortars have been extensively used by the Romans in very demanding environments including ***sewers, ports, spas and aqueducts***. They have also been widely used in *Venice*, well suiting to the humid and aggressive environment of the Venetian lagoon.

Plastering Schedule

For a long-lasting, building-friendly renovation of any old wall subject to dampness and salts, the following plastering schedule is recommended:

1. **Roman salt-resistant lime base coat** [10 mm]: the importance of this coat can't be overstated. **The presence of a salt-resistant lime base coat increases the longevity of the plastering by about 10 times**.



Scanning electron microscope image of the Rinzaffo MGN base coat showing its unique micropore structure

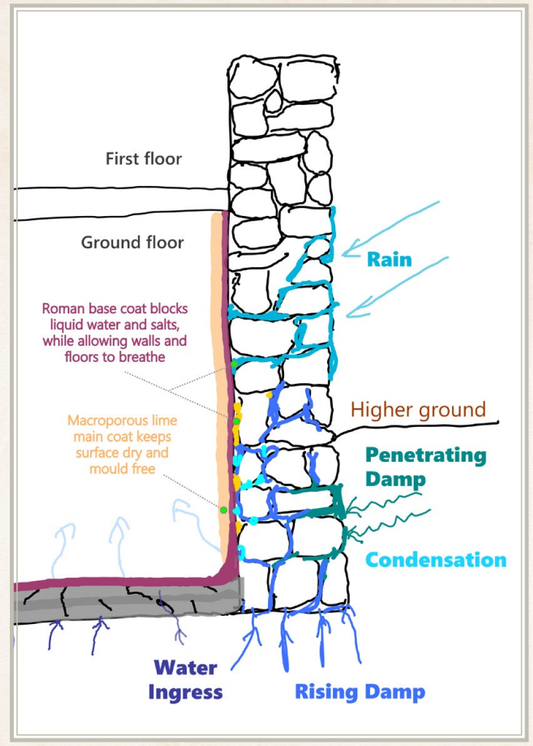
Rinzaffo MGN is a microporous breathable waterproof and salt-resistant lime base coat. Its main role is to prevent the migration of salts into subsequent layers, causing the premature breakdown of the plaster. It has been developed in 1980 in Venice as a specialized solution to the problem of rising damp and salts, however its origins stretch back to ancient Roman times.

The base coat's internal pore structural is formulated in a way to block liquid water and salt molecules, while letting water vapours through – facilitating evaporation.

2. **Main lime coat** [15-20 mm]: Calcina Bianca MGN is a premixed lime plaster based on the highest purity aerial lime (over 90% calcium hydroxide), a bit of natural hydraulic lime and washed river sands without impurities.

If the **thermal insulation** of the walls also needs to be addressed or improved, the main lime coat can be swapped with a dedicated *lime thermal insulating plaster*, such as Termointonacco 2020, which is about *15-20 times better thermal insulator* than a normal lime plaster.

3. **Lime finishing coat** [3-4 mm]: Calcina Fine MGN is a premixed white lime finishing plaster based on the highest purity air lime (min. 90% calcium hydroxide).



Most common moisture sources affecting old walls

Application

1. Preparation of the wall fabric

Hack off the old plaster, remove all loose parts and foreign materials (wood, tar, metals etc.). Wash the surface throughly to remove all loose debris and residues. Before applying the plaster, wet the surface.

2. Applying the Salt-resistant Base Coat

Pour the contents of the package into the mixer adding **clean tap water only**. **Do not add any additives or other materials** (e.g. cement, gypsum etc.) **to the mix**. Mix it for about 3-5 minutes until a homogeneous, creamy paste is obtained. Do not overwork it.

On freestanding walls apply a 7-10 mm coat (not less than 5 mm), covering the whole surface, **leaving no gaps**. For areas undeground or subject to water pressure areas apply 2 coats, with a fiberglass mesh in-between. Wait 24 hrs between subsequent coats.

Darker spots of the first coat denote areas of insufficient thickness of the plaster. Patch them up with additonal Rinzaffo before applying the main coat.

Dark patches: insufficient thickness

Uniform color indicates good coverage

3. Applying the Main Coat

After the base coat has dried, apply a first coat of the traditional macroporous main lime coat (such as **Calcina Bianca MGN**, **Sanacolor 2000 MGN, Cocciopesto MGN** etc.).

Apply the product in layers of max 15 mm; with a recommended thickness of at least 15 mm for interior and 20 mm for exterior surfaces. If greater thickness is desired, apply additional coats in 10 mm increments, waiting for the superficial maturation of the previous layer.

If the plaster has to be finished in a single layer, wait for the first initial setting of the plaster, then apply a thin coat of finish with a trowel. For a smoother finish: compress and smoothen the surface with a stainless-steel trowel. For a coarser finish: use a sponge float.

Plastered surfaces must be protected from rain and excessive moisture until the surface has completely dried (3 - 10 days depending on weather conditions).

4. Applying the Finishing Coat

Apply the finishing coat in 1 or 2 layers of about 2 mm each and level it with a stainless steel trowel.

Paint the surfaces with breathable mineral- or lime-based paints. Do not use synthetic emulsion paints.

Common Renovation Mistakes

Here are the most common renovation mistakes in replastering / renovating old walls.

- **Using modern materials**: "sealing" the wall with various waterproofing materials such as *plastic membranes* or *cementitious slurries* is the wrong approach as moisture keeps accumulating behind these coats, leading to future dampness problems.
- **No salt-resistant base coat**: regular lime plasters won't last in humid, salty environments. Use special lime mixes that *can cope with the salts*.
- **Not addressing rising damp**: restoring breathability does not solve rising damp, which can continue in the background. Once salts fill up the lime pores, regular lime plasters start crumbling and walls eventually need to be replastered. A magnetic DPC can solve the underlying problem.

Please contact us with any questions

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