III.06

Traditional Portuguese Techniques for Application and Maintenance of Historic Renders

Paulina Faria¹, Martha Tavares², Marluci Menezes², Maria do Rosário Veiga² and Goreti Margalha³

¹ Polytechnic Institute of Setubal, Portugal, paulina.faria@estbarreiro.ips.pt
² National Laboratory for Civil Engineering, Portugal, marthal@lnec.pt; marluci@lnec.pt, rveiga@lnec.pt
³ Municipalty of Beja, goreti.margalha@cm-beja.pt

Abstract The Portuguese architectonic heritage is mostly composed of old buildings needing intervention, especially on exterior renders, plasters and finishes. Preventive and conservative interventions are preferred in order to avoid the extraction of historical elements that are representative of the artistic and the inventive character of past generations. Subsequently it is necessary to use efficient, compatible and viable repair methodologies which are adapted to the situation. In order to adapt such methodologies to the historic renders and masonries and to improve the compatibility of conservation actions and to increase the link between modern conservation work and traditional techniques and communities, it is fundamental to gather and analyze traditional techniques, tools and materials for render application, decoration and protection. A review of traditional application and maintenance techniques, materials and tools that have been used to produce, protect and decorate historic renders are presented and their importance and viability are discussed, in order to contribute to the development of a methodology for conservative intervention on historic renders.

1 Introduction

The urban image of many Portuguese historical localities is changing quickly, due primarily to uncontrolled renovation practices and to a lack of heritage culture concerning the old urban districts. There is currently a degree of ignorance towards the cultural and technical value of old exterior renders, plasters and
finishes which creates difficulties within the subsequent decision making process and the adoption of adequate conservation and restoration techniques.

Many elements of the Old Portuguese architectonic heritage are in a state of decay due to natural ageing and a lack of maintenance. The old building façades are mostly based on mortar renders, plaster work and paintings [1] and represent a great diversity of styles. Renders and wall surface finishes have the double function of protecting in-wall materials (often poor materials) and improving their appearance; often being used to simulate richer materials like stone. The aesthetic appearance and the capacity to protect the wall from external actions such as rain, wind, chemical or biological agents, are therefore very important. Renders and finishes also serve the purpose of allowing the exchange of moisture between the building and the environment to occur.

To meet requirements and to avoid the loss of important historic representations of past generations, preventive and conservative interventions must be programmed. Therefore it is necessary to use efficient, compatible and viable repair methodologies that are adapted to each situation.

Scientific knowledge about materials and skilled restorers are important contributors in the conservation of monuments and classified buildings. However, concerning the vernacular heritage, it is necessary to study in-situ the techniques used in each region and to involve the inhabitants in the conservation practice through the re-appropriation of traditional techniques preserved by the people.

The study of the techniques used to produce the renders and finishes of old buildings requires further development and a more methodological systematization for the techniques, materials and tools used in order to complement existing work in this field [1-3].

To allow the adaption of repair methodologies, to improve the compatibility of conservation actions and to increase the link between conservationists and communities in Portugal, the traditional techniques, tools and materials for render application, decoration and protection should be systematically gathered and analyzed.

## 2 Materials

Over time a close relationship has been established between landscape and construction; thus the materials used contribute to the definition of the urban landscape and establish a link between territories and buildings. The knowledge of the renders’ constituents is a step towards the construction of a dynamic between heritage conservation and restoration.

The following information, regarding the materials traditionally used in Portuguese renderings and façade finishes, has been sourced from oral history.

- **Earth** – A variety of earth was used in mortar, often mixed with a small amount of air-lime (Fig. 1, 2). If the earth was very rich in clay, some sand was
added. Earth mortars were less expensive than lime mortars, being collected rather than purchased, but they were also less durable. Ochre and other coloured earth was frequently used as a natural pigment. The search for and choice of the coloured earth and clay required experience.

- **Air-lime** - Lime was traditionally the preferential binder for mortars, plasters and paints. Issues like water and biological protection inherent to the use of lime were underlined [1-5]. The preparation techniques of air-lime (stone extraction, burning and hydration) were commonly known by lime producers [6-9], builders, plasterers and the population in general. This was often due to the constant re-application of limewash that was usually an important social activity of many communities, as regular maintenance of the dwellings.

- **Sand, water, additives, and admixtures** - Sands used in mortars were carefully chosen by plasterers and master builders whose knowledge was the accumulation of many generations of craftsmen. Coarse sands were used in the internal layers and finer sands were used within the finishing layers; such sands were often sourced from local creek beds [2]. Pozzolanic additives were sometimes used to increase the hydraulicity and durability of the mortar as well as to provide colour [2]. Other products could be added in order to improve a mortar’s behavior; for example stone dust was used to increase the compactness of external mortar layers and vegetable fibers or animal hair were used to increase the resistance to cracking.

- **Pigments** – Earth, such as ochre with goethite, was used as a natural inorganic pigment providing hues of yellow, green and red. Such inhomogeneous material was collected by women, who worked in the fields, from oxidised environments near marshlands or water sources. Prior to use the earth was disaggregated, any herbs were eliminated and particles were wetted to dissociate grains before being dried, milled and sieved. The domestic tradition and knowledge of natural pigment extraction is now almost lost in Portugal [10,11].

### 3 Tools

Many of the tools used were made by the artisans themselves, to suit their individual needs and their specialized work. They were passed from father to son, or master to apprentice and were customised for each type of task, each being designated by a popular or regional name. They differed from modern tools by being crafted from natural, more flexible basic materials, and by being more diverse in shape and nature; of the trowel there were many different types in use including the brick layers trowel, gauging trowel, bucket trowel, dashing trowel, pointing trowel, float trowel, laying-on trowel and finishing trowel or smoother; some of which were specific to a particular area of work. Other tools in use
included a scraper, spatula, putty knife, hawk, plaster scarifier, rake, comb scratcher and a variety of paint brushes (Fig. 3) [2, 7, 8, 12].

Fig. 1. Different types and colours of aggregates.  
Fig. 2. A lime-earth mortar mix.  
Fig. 3. Finishing application tools.

4 Historic rendering and finishing techniques

The selection and preparation of the constituents and the execution and application of mortars and paints was first carried out by trial and error with the acquired knowledge being transmitted through generations of craftsmen. As a result they possessed a profound knowledge and understanding of the available resources and the processes involved in the production and application of the material.

4.1 Mortars

Calcitic lime and dolomitic lime were used extensively in Portuguese mortars. Dolomitic lime was less pure, cheaper and darker (due to the presence of iron in the chemical composition) than calcitic lime. It was mainly used in masonry mortar, but occasionally for renders which in general were composed of calcitic lime; finishing plaster and lime paints were also calcitic in nature [4, 5, 13-16]. When money was a problem, lime was not purchased and mortars and paints were made with clay (or lime-earth mixtures). However, earth mortars and earth paints were recognized by the artisans as poorer, less durable solutions than those based in lime [2, 17].

The proportions between the mortar constituents were empirical but carefully adjusted by the master builder in accordance with the weather and application conditions.

The render was applied in multiple layers, with a pause between each layer to allow it to set. The first layer contained coarse aggregates, sometimes with broken brick or stone for initial wall surface regularization; the following layers were thinner, with selected finer aggregates and a lower percentage of clay [8]; the last layer was usually very thin, prepared with lime putty and low percentage of a very fine sand or stone dust.
4.2 Finishing techniques

The old buildings of Portugal used relief renders, plasters and decorative paintings to decorate their dwelling façades. In times when resources were scarce, such architectonic coatings would be made of basic materials resembling more expensive materials. Such coatings would also be used to transform and upgrade pre-existing buildings.

The architectonic decorations were often associated with particular areas of a building, such as the top of an exterior wall, the eaves, talons, gargoyles, spans, window and door frames. A bricklayer would smooth and prepare the surface before the master plasterer would lay and shape the mortar or plaster and apply a finish. Common finishing techniques are as follows:

- **Barramento or finish stucco coats** - The finish stucco consists of multiple thin layers of lime putty with additions of brick or stone dust, which could be coloured by adding a pigment to the outermost layer. The stucco was applied with a wood trowel allowing the absorption of excess water, or more commonly with a flexible metallic trowel [1, 3].

- **Sgraffito and graffito** - The sgraffito technique was produced by revealing the interior surface layer of an application, in accordance with a specific pattern or design, by extracting parts of the exterior layer of the render [17, 18]. The drawings were marked on the surface with wood or paper card moulds which belonged to the artistic repertoire of the master plasterer. The motif relief was generally marked with pigments and a pounce bag. The under layer was pigmented or differentiated with the presence of selected aggregates and turned visible when the upper layer was eliminated inside the marked motifs, with specific tools [1, 3, 18]. Such decorative mural techniques were usually executed within specific zones of a dwelling, for example the top of exterior walls and window and door frames (Fig. 4). The sgraffited motifs generally express nature, geometry or personal emblems and the complexity of the drawing, execution, application of plaster work and applied pigments in the under layer, all serve as a testimony to the skill of the master plasterer.

- **Relief mortar works** - Relief mortar works were executed over a freshly rendered surface or were fixed onto a façade. These carefully prepared mortars usually consisted of lime and a specially selected aggregate. Wooden moulds were used and part of the exterior layer was extracted to define the re-entrant relief. When salient reliefs were produced, decorative motifs could be moulded and fixed over the façade. This last type of application is similar to the sgraffito technique (Fig. 5) but the relief motifs used are much thicker.

- **Simulations of stone and other decorative paintings** - Fake coatings were used to simulate the application of more expensive materials or homogeneous stone – like marble, breccia or even brick (Figs. 6, 7) [1, 17]. They could be executed over a surface of less noble stone, masonry, render or finish stucco coat. Other techniques such as graffito or sgraffito were also used to simulate
The use of a variety of drawings, paintings, and perspectives allowed diverse visualizations to be produced. The complexity of the design, execution and surface polish often served to define the master plasterer and his family. Often masters, like artistic painters, would leave a signature mark (sometimes their name) in a hidden place on the painted surface.

---

**Rough cast finish to simulate stone (marmorite)** - In Portugal the rough cast finish of a façade to simulate stone was created by washing a freshly mortared surface (which was applied over a regularization render (Fig. 8)) to reveal selected aggregates [19]. It was mainly used between 1950-1970 and was popular during the Estado Novo administration. It was a resistant and durable finish, which could endure many years without maintenance. The traditional mortar for rough cast finishing was a very rich mortar based on air-lime or, in later periods, on hydraulic lime or cement; stone dust and aggregates of different colours and dimensions (pebbles of different stones or sometimes glass) were also included. The mortar could be pigmented or naturally coloured by the aggregates.

---

**4.3 Limewash and other paintings**

Limewash, white or coloured, is commonly used in the South of Portugal (Fig. 9); it has been popular since the 18th century due to its affordability and easy application as well as its antiseptic and antibacterial properties [1]. The limewash was applied either over a render or directly onto the masonry. The lime paints used for limewashes could be coloured by inorganic pigments to assure compatibility with the lime. With careful maintenance traditional lime paints can be preserved for years [2]. A centuries old tradition in the regions of Southern Portugal, is the annual restoration of the limewash. Commonly performed in May (due to the mild temperature and lack of rain), the limewash would be over-painted with a mixture of slaked lime diluted with water. More than a conservative intervention, it was also a social practice, followed by generation after generation, with specific materials (lime wash, eventually natural pigments and/or animal fat products), particular tools (traditional brushes) and technologies...
(number of coats, direction of the brush). These practices were upheld mainly by the women who would traditionally keep a portion of aged lime putty in a container to apply whenever small maintenance interventions were needed [1, 2, 10].

![Fig. 7. Simulation of stone masonry.](image1)
![Fig. 8. Rough cast finishing to simulate stone.](image2)
![Fig. 9. A Limewash surface finish.](image3)

5 Gathering traditional techniques as a tool for conservation

As referred by Menezes and Tavares [20, 21], one of the key difficulties in the preservation of historical renders and finishes is the loss of technical information regarding traditional techniques, materials and tools. The knowledge of those techniques permits a better choice of conservation technology and works to promote the re-appropriation of those techniques by the population.

The gathering and registration of relevant information is crucial within conservation practice. Such knowledge is often in the hands of elderly artisans; thus, the systematic gathering of this knowledge can also contribute to the social inclusion of these artisans within a community. In parallel, this information gathering can be framed by a work plan within a specific formation, where the artisans can be involved as transmitting agents of a specific know-how. This can be very attractive to younger professionals, contributing to the improvement of their skills and integration. On the other hand, information gathering can be linked to a systematic registration of the involved instruments which can be combined with the techniques, methodologies, materials and extraction locations [20, 21].

6 Final considerations

The diversity of construction materials and techniques is an issue of their cultural richness, contributing to the drawing of the characteristics of urban landscapes. However, the lack of sensitivity for heritage preservation, in particular in this case for historical renders and finishes, is a fragility of the policies of safeguarding urban and architectonic heritage. Additionally, there is a difficulty in the efficient reproduction of knowledge about the use of traditional materials and
techniques. The importance of the recuperation of technical memory should be stressed, namely in an artisan environment where information is scarce, considering the ageing of old masters and the disappearance of experience socially transmitted, together with uncontrolled renovation actions carried out on historical monuments and urban centres during the last few decades. The lack of education and training structures in this area sensed in Portugal is an equally important issue. That is why the establishment and diffusion of correct and viable conservation methodologies are so important.

Each region of the country followed different ways of constructing, specific details and particular ways of covering the walls. This is particularly true in what concerns vernacular heritage, where the communities were predominantly self sufficient and did not resort to external masters. Maintenance and conservative interventions should not tend to standardize this rich, diversified reality.

In order to adapt repair methodologies to the historic renders and masonries, to improve the compatibility of conservation actions, and to increase the link of conservation work with the traditional techniques and with communities, it is fundamental to collect and analyze traditional techniques, tools and materials for render application, decoration and protection [9].

With an interdisciplinary team, Project LIMECONTECH (Conservation and durability of historical renders, compatible techniques and materials) co-financed by the Foundation for Science and Technology of Portugal (PTDC/ECM/100234/2008) aims to contribute to the gathering, registration and preservation of Portuguese traditional techniques of exterior rendering and plastering, based on site surveys of privileged information in contexts of patrimonial richness of renders and finishes, and laboratory and in situ tests used to characterize materials and experiment with techniques.

7 References