



A CASE STUDY IN INTERVENTION ON ORIGINAL SURFACES*

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Abstract

A new interest in preservation of mortars, plasters and decorative finishes on façades has emerged in certain European countries in the past thirty or forty years, with a view to understanding how they have evolved throughout history. In Portugal, this type of study is relatively new, but a growing interest in learning about the composition of original surfaces has been observed, and a number of Institutions have encouraged systematic application of conservation techniques in this area.

This paper discusses some methodologies used to assess the condition of original surfaces and the structural repairs carried out at a church in a small village in southern Portugal. The church dates back to the beginning of the 16th century, but it underwent significant alterations in the 17th, 18th and 19th centuries.

Key Words: render, water-colour, gypsum plaster, structural repair, lime

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1 A few principles for intervention in old buildings

One of the biggest difficulties in preserving old buildings is selecting the most important things to preserve and those that must be sacrificed. Hence, some essential questions should be asked:

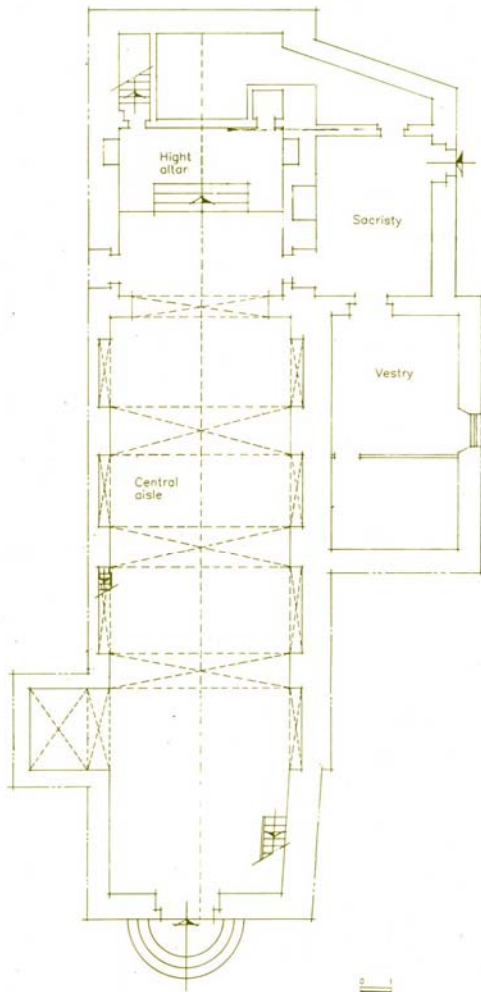
- What should be preserved?
- What period should be chosen?
- What materials and techniques should be used?
- What colour should be maintained?

These questions should be asked in order to give coherence to the preservation process. Buildings whose original appearance is still intact are rarely found. However, as far as finishes are concerned, original surfaces can often be found under several layers of later finishes. Knowing the importance of keeping this heritage and this memory from the past, makes it difficult to make a decision about the procedures in each case, or to know what to select.

The value of our heritage obliges us to defend each building as if it were unique. Based on a critical appreciation, a certain style or period can be traced through the preservation process. In some cases, it is difficult to conciliate preservation of the different eras with the uniformity that is necessary for reading of the building.

The church of Salvada is a preservation example in which a coherent restoration image was opted, trying to use original technologies and materials. However, contemporary repair materials and techniques had to be used to restore the building's structural stability.

2 Description of Church of Salvada



The church of Salvada is located in the region of the city of Beja, in the south of Portugal. It is a beautiful building that dates back to the early 16th century (Figure 1). This church underwent some changes in the 17th, 18th and 19th centuries (Falcão, 2003). A barrel vault covered the central aisle. The high altar has a cross vault. The sacristy and the vestry were a later amplifications that were proven by a hidden window. Both spaces are covered by vaulting. The vestry has a small solid brick vault, which is characteristic of the Alentejo region, and has the particularity of the bricks applied with the joints at the top faces. The whole building is structurally sound and the vaults are supported by very thick lateral walls. The oldest walls are made of stone blocks with lime mortar joints, and the sacristy and vestry have double faces of massive brick with stone and earth between the two faces.

The altars of the church are decorated with rococo-style golden carvings. The vaults are made of plaster and the paintings are lime-wash and frescoes. The vaults are decorated with gypsum plaster. On the walls of the church structure, a mural painting technique called “marble in a touch of rose” (plaster painted to imitate rose marble, where the painting included pieces of marble) was used where the stone limits are marked. Thorough analysis of these finishes revealed that they were painted on the surface of the dried plaster (secco painting).

Figure 1- Actual church plan

The great tradition of stone use in Portuguese monuments led to the use of polychrome decorations to imitate stone. In this church, the imitation was probably due to economic reasons. Wall plaster that tries to imitate marble is shown in Figure 2.

The wainscoting of the church structure must have been made in the past with the same decorative technique, but it was covered by a modern blue paint that impoverished the interior of the building.

The stratigraphy of the interior coatings showed that the whole church must have originally been decorated with frescoes that can be found on the walls and the vaults (Figure 3). These frescoes are still hidden under the multiple layers of later finishes. They were visibly damaged by a general peeling that became the basis for the present plaster coatings on the vaults and on secco paintings on the walls.

In the wooden altars, painted now in blue and gold, there is a hidden painting of stone and gilt-work (Figure 2).

3 Condition survey

The main causes of degradation were damaged rain-water drainage systems, broken tiles and proliferation of biological growth on the roofs (Figure 4). These problems resulted in serious water infiltration problems in the vaults, walls, plasters and decorative finishes (Figure 5).



Figure 4- Old roof building. The new tiles seen in this picture belongs to private building adjoining the church.

Multiple decorative pieces of gypsum plaster, the wood of the altars, and the access staircase to the choir had been attacked by xylophagous insects. Other problems that were identified included a modern blue paint at the baptismal font, the holy water font and the framing of the main door. Multiple lacunae were found in the plaster and wall paintings, resulting from installation of sound and light equipment.



Figure 2- Detail of the plaster walls and the wooden altars in the central aisle



Figure 3- Detail of fresco paintings discovered on the walls



Figure 5- Detail of the lacunae of gypsum plaster at the vault of central aisle

At that time, we saw slight cracks on the vaults and a slant on the sidewall of the vestry. These were caused by foundation problems, which led to serious damage in the small vault (Figures 6 and 7).



Figure 6- Structural damage on the exterior of the vestry vault



Figure 7- Detail in interior of the vestry vault

After the condition survey that described damages, two repair campaigns were carried out. The first campaign repaired the roof and interior vaults to stop water infiltration and restored vaults to provide structural safety for the building (early 90's). A second campaign repaired/ restored the interior of the building, namely, plasters, water-colour paintings and some wooden elements (2001/2002).

4 First intervention on building (early 90's)

The main work carried in this intervention was at the exterior of the building to repair church roofs, restore one vault and replace renders.

The ceramic tiles were completely removed from the roof. The extrados of the large vault and small vault were cleaned of loose materials and dust. In order to fill in the cracks and avoid development of new deficiencies similar to the ones already mentioned in the main barrel vault, an expanded steel mesh (20x25 mm) was applied. That mesh was overlaid at the junctions by a 50 mm layer of micro-concrete made from 1 part cement : 1 part sand : 2 parts gravel. After application of a synthetic roof-tile underlay to stop water infiltration, the roofing was reapplied, using similar ceramic tiles laid with lime-cement mortar. The original shape of the roof, with one accentuated inclination, was maintained (Figures 8 and 9).



Figure 8—Ceramic tiles placed over a synthetic under-roof



Figure 9- Detail of the roof edge finishing

The obvious loss of stability in the vestry's small vault required its structural reinforcement. Conservation of this kind of vault is very difficult because the necessary compression between bricks and in the small area of the tops of the bricks is lost. With the emergence of larger

cracks, structural stabilization was quite impossible. Therefore, the decision was made to restore the vault with new techniques and materials (Figure 10).

A 20x25 mm expanded steel mesh was applied on the interior and exterior faces of the vault, and fixed with clamps in a 0.40x0.40 m² pattern. The mesh was covered on the exterior by micro-concrete and on the interior by cement mortar as follows:

Exterior – micro-concrete

(1 cement: 1 river sand: 2 gravel), about 5 cm thick. To reduce load on the structure, we used a light inert material – expanded clay – mortar with a cement grout

Interior – cement mortar (1 part cement: 4 parts river sand), about 3 cm thick.

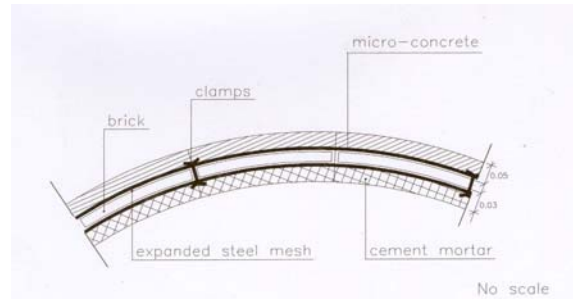


Figure 10- Schematic picture of the intervention at the vestry vault

The original vault remained between the micro-concrete and cement mortar like a sandwich. The mesh was spread 0.30 m down the inside lateral walls to guarantee connection between the walls and the vault. These techniques had previously been successfully applied to restore the vaults at the S. Francisco Convent in the city of Beja (Appleton,1994).

At that time of the first intervention, more than ten years ago, there was not so much information about renders. Due to its poor condition, we decided to replace the renders with hydraulic mortars. We thought that the addition of lime was enough to create the necessary compatibility between old and new materials.

So, the renders were replaced by lime and cement mortars, applied in two layers:

- 1st layer – 1 cement : 1 lime : 8 river sand
- 2nd layer – 1 cement : 1 lime : 8 fine sand

However, the use of cement in the exterior renders caused some compatibility problems after several years, namely the loss of limewash (Figure 11).



Figure 11- Main door of the church

5 Second intervention on building (2001/ 02)

This intervention focused on improving the aesthetic appearance of the church interior. The parish priest remembered that the last intervention occurred forty-five years ago. We tried to maintain a uniformity of style in the building, by keeping the current image, improving conservation aspects, and restoring stability, while revealing historical aspects.

The gypsum plaster decoration on the ceiling was deteriorated due to water infiltration over the years.

All the existing cracks on the church's structure were repaired with lime putty mortars. On the walls, a small amount of gypsum was added.

Areas with deficient adhesion were fixed using lime putty mortars, plaster and consolidating materials (one resin mixed with a small percentage of Plextol). Decorative plaster pieces that were missing from the central aisle's vault were replaced by using the existing pieces to create silicone molds. Missing pieces of gypsum plaster, namely in the flower work and in a statue of Saint John the Baptist represented by a lamb, were re-made based on the parish priest's memory and attached to the vault. All the pieces were made with lime putty and gypsum (Figure 12).

The whole church vault, after the damaged parts of the plaster was repaired, was painted in sky-blue tones using a mixture of two mineral pigments (cobalt blue and lapis lazuli). We tried to match the colour as closely as possible to the most ancient finish layers. A traditional lime putty was used (manufactured in the region) to repair the plaster. All vaults were painted with a blue lime wash except at the stucco decorations, which stayed white.



a) lime putty



b) water addition



c) gypsum addition



d) material mixture

Figure 12– Mixing of the lime putty for gypsum plaster pieces

We tried to remove the modern blue paint that was in the wainscot and consolidate the previous layers with watered lime, in order to keep the original plaster painting that has the appearance of grey marble. However, that work was not possible due to deficient cohesion of the original plaster and weak adhesion to the support. In addition, the original plaster paintings were visibly damaged (Figures 13 and 14). Hence, a lime putty-marble dust plaster was applied to the wall and the surface was painted to imitate the original surface (Figures 15 and 16). On the dried plaster, a black synthetic paint was dissolved in water for better penetration and a small percentage of arabic gum was applied to fix the colour. Imitation of the marble stone veins was achieved with the use of brushes and rags.



Figure 13- The appearance of wainscoting



Figure 14- The original plaster



Figure 15- New plaster made with lime putty mortar with marble dust



Figure 16- Secco painting to imitate the marble stone

In the interior of the church, the secco-painting area was covered with a micro-crystalline wax to achieve a light sheen quality after slight polishing, which imitated the marble stone (Figure 17).



Figure 17- Actual appearance of the church interior

In the vestry vault, gypsum components such as flower work, were restored. After removing several layers of lime from the walls, paintings were found. We decided to keep that decoration in the door frame and in the hand-washing basin because we didn't want to interfere with the global appearance of the church (Figures 18 and 19).



Figure 18- Interior aspect of the sacristy before the restoration



Figure 19- Appearance of the sacristy after restoring wall paintings

Other work was also carried out to restore the original features. Components of the wooden choir access stairway were replaced or repaired. The marble stones in the outside door framing, in the baptismal font and in the holy water font were cleaned with low-pressure water and a neutral detergent. In some of the areas, use of soft brushes and scalpels was necessary. The cleaning stage was concluded with the application of a micro-crystalline wax for protection.

6 Final remarks

The restoration campaign for the Salvada church gives the building a coherent global image and a light aspect. New materials and modern techniques present some disadvantages regarding preservation. New materials should not always be thought to have higher quality, because we sometimes know very little about their performance over time.

The first restoration campaign (early 90's) did not pay much attention to preservation philosophy when it came to the use of materials and techniques. Regarding the roof, however, ten years have passed since the first restoration campaign and the techniques have proven good enough to restore the building to good structural condition and stop water infiltration. Because exterior renders were replaced by unsuitable mortars, including cement-lime, some compatibility problems with the stonework emerged.

The second restoration campaign (2003) aimed to use traditional materials and techniques for finishes, that is, sand, gypsum and lime mortar without the addition of any cement. Although we found fresco paintings all over the church, we decided to maintain the actual aspect of the building and do what was necessary for its preservation.

Restoration is a critical intervention. Work on old buildings should aim at maintaining the original appearance, while respecting historical values and age. Old buildings are a historical legacy that we have inherited and we must try to preserve them as much as possible. However, due to the

difficult process of restoration, we sometimes have to decide what we want, how we can preserve it, and also have in mind what has to be restored and what can be sacrificed.

Also, it is essential for the general public, not only the specialists, to appreciate the need to preserve the legacy bequeathed to us all. All this work relies on a team that is concerned with meticulous preservation of the building. That is why the committed involvement of both the parish priest and the contractors is so important.

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Materials:

<u>First intervention on building (early 90's)</u>	<u>Second intervention on building (2001/ 02)</u>
Lime	Putty- lime
Cement	Gypsum
River sand	River sand
Gravel	Slight addition of resin- Plextol
Expanded clay	Arabic gum
Expanded steel mesh 20x25 mm and clamps	Mineral pigments (cobalt blue and lapis lazuli)
	Black synthetic pigment
	Dust marble
	Micro-crystalline wax
	Neutral detergent- Vulpex
	Silicone for moulds