Abstract This article presents the restoration process performed within the Church of Santíssimo Sacramento (Blessed Sacrament) in Lisbon, namely covering the repair of damaged renderings on the walls inside the church. In this article, the various types of renderings found in the church are identified, the nature of the principal anomalies explained and the mortars and materials used are described as well as the restoration techniques applied to enable and ensure their proper conservation. The work presented is a part of the project for the restoration of the Convent of Santíssimo Sacramento – Restauro dos revestimentos da Igreja, Sacristia e Cripta, that in situ, Conservação de Bens Culturais, has developed for the MNE - Ministério dos Negócios Estrangeiros (Ministry of Foreign Affairs), and for the IGESPAR – Instituto de Gestão do Património Arquitectónico e Arqueológico (Institute for the Management of the Architectural and Archaeological Patrimony).

1 Introduction

Ancient renderings that cover the surface of historic buildings are fundamental elements of the character and beauty of edified constructions; for beyond their protective function, they also serve a relevant decorative role. They are both a statement of past traditions and a testimony of form and style.

In recognition of their technical, historic and aesthetic importance, these layers must be preserved for future appreciation. Their maintenance requires the
application of traditional construction methods as well as the usage of compatible restoration materials and techniques.

2 Historic and Artistic Contextualization

The Convent of Santíssimo Sacramento was built in the 17th century under the reign of Filipe II of Portugal, III of Spain (1578-1621). This was one of the most famous and important of the Dominican convents in Portugal during this century [1].

The Convent is located in Alcântara, Lisbon. It belonged to the Dominican order, who were particularly devoted to the cult of the Blessed Sacrament (Fig.1). Having been founded on the 20th of October 1605, the Convent became occupied by nuns in 1616; in 1620 the church was demolished, perhaps for its lack of size and magnitude, prior to being rebuilt in 1635 under the third and last reign of a Spanish King; Filipe III of Portugal (IV of Spain). It must be pointed out that the construction of convents characterised the Filipino period in Portugal; a period during which the power of the church was dominant [1].

The church of Santíssimo Sacramento exhibits a unique architectural style (due to its resemblance in plan to a Greek cross), when compared to other convents on the Iberian Peninsula. It is attributed to a Master Frei João de Vasconcellos, the architect of another Dominican Church in Lisbon (São Domingos de Benfica); it is not known for sure who the real author of the architectural plans was, however the church of Santíssimo Sacramento does share similar traits to the Convento das Bernardas Recolectas de Alcalá de Henares in Spain [1], highlighting the possibility that a Spanish architect may have had an influence in the project.

Fig. 1 External view of the Convent. Fig. 2 Plan of the Church.
The church, featuring a single nave and three altars facing east, was constructed using vaulted supports following a floor plan in the shape of a Greek cross contained within a square, which was lit by six lateral windows (Fig. 2).

The chapel, situated in the eastern arm of the Greek cross, was build upon a polygonal crypt or sacristy. This chapel housed an altar of gilded carved wood where the Blessed Sacrament’s tabernacle and monstrance was placed for reverence.

The church underwent several transformations. Initially the church reflected the influence of Juan de Herrera and his work in El Escorial which marked the trends of a new taste of austerity and pragmatism in Mannerist architecture during the Spanish reign of Portugal, in what we have coined as the first program (17th century); this included features such as simple, classic and pragmatic embellishments; the use of monumental structure; suppression of the choir; approximation of the high altar; and a unique nave. In this church, faux stone techniques still feature in vertical projections, namely lime mortar renderings with false joints imitating grey and off-white granite stone, a feature very common in Madrid; granite being the main stone used in El Escorial.

During the reign of D. João V (1689-1750), constructor of the famous Basilica of Mafra, this church underwent a massive re-decoration campaign, which we coined as the second program (18th century) (Fig. 3). Here, decorative renderings made with Stucco and plaster-work, still present in the domes and vaults, simulate various types of ornamental Portuguese stones, thus embellishing the architecture with great beauty, colour and scenic impact, much in the styling of the French influence of Louis XIV (Fig.4, 5, 6).
During the initial survey eleven different types of mortars were identified, corresponding to the various super-impositions of finishing layers applied during the different interventions the church was submitted to. Stone was never an option in Sacramento, even though the Lisbon area is rich in this material, with a wide range of colours available.

Faux finishes are decorative renderings based on the imitation of ‘noble’ materials such as certain rare and costly types of stone, using the application of paint and/or mortar to achieve the desired effect. These stuccoes offer a great architectural and compositional freedom to the builder, enhancing both the beauty and scenic impact of the site.

In Table 1 the present decorative renders within the church are described. Ongoing studies are pointing towards an important conclusion: in the seventeenth
century stuccoes were executed using mainly lime mortars, whereas in the eighteenth century gypsum was used as an additive with a lime to gypsum ratio of 4:1. However in the nineteenth century restoration campaigns, the differential between gypsum and lime had evolved to a 1:1 ratio.

Table 1 Overview of stuccoes of Sacramento

<table>
<thead>
<tr>
<th>Plaster</th>
<th>Identification</th>
<th>Localization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plaster 1</td>
<td>Ashlar-work imitating stone with faux joints</td>
<td>Faux ashlars by means of a corrugated surface and marking of the joint with exposed mortar. Large dimension aggregates of basaltic origin; Lime and charcoal powder paint over the corrugated area (ash colour); Lime barring over the faux joint. (2)</td>
</tr>
<tr>
<td>17th century</td>
<td>Ashlar-work imitating stone with decorative fresco painting.</td>
<td>Faux stone using volumetric lime render and a facing in equal parts of lime and plaster with faux marble imitation.</td>
</tr>
<tr>
<td>Plaster 2</td>
<td>Decorative stucco - Sculptured elements hand-carved in lime stucco and plaster facing at 4:1; paint and gold finishing. (2)</td>
<td>Decoration of the medallions and pendants.</td>
</tr>
<tr>
<td>18th century</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4 State of conservation

The interior renders and stuccoes were in a very bad condition; their state of conservation being poor, with the supporting structure beneath plainly visible in many areas; urgent restoration measures needed to be undertaken.
The principal cause of deterioration was an excessive accumulation of water coming from various sources and in various forms, most notably as rain-water infiltration, excessive humidity and condensation (Fig. 8).

The building’s abandonment for many years, and its usage as a warehouse and storage for military equipment largely contributed to its degradation, allowing for the accumulation of debris as well as rat and pigeon guano.

Beyond these, a number of other problems were identified, the greatest among them being the presence of oxidized metallic elements used in the fixation and support of the decorative elements in plaster; deterioration of these had resulted in fissures and fractures in, and the breakdown and detachment of the plasters. The presence of early restoration mortar containing Portland cement, was equally detected in various regions of the church, as were multiple paint-over’s covering most of the decorative renderings, thus hiding the beauty and form of the original decorative work and contributing to their aesthetic degradation and deterioration. In this way, the principal anomalies observed in the renderings were: saline efflorescence, loss of cohesion, loss of adherence, detachment, open gaps, generalized dirtiness, painting over and previous interventions (Fig. 9, 10, 12).
Section 5: Restoration tasks

Definition of the interventions necessary to the restoration and conservation of the decorative stuccoes, strictly followed the basic principles of conservation and restoration according to international literature on the matter [3, 4]. The purpose of the restoration was to re-establish the physical and aesthetic equilibrium of the renders, allowing for the future conservation of all the existing decorative elements, in keeping with its historic value and its technical, chromatic and stylistic expression.

Equally important was the choice of materials used, and the care taken to ensure their compatibility with the original renders. To acquire the knowledge of the actual constitution of the renderings on site, as well as the chemical cause for the anomalies, we asked the LNEC (Laboratório Nacional de Engenharia Civil) to perform tests on site and in the laboratory to determine the compositional materials, cause of alteration, and the techniques of execution of the renderings, so
that we may know and chose the best methodology with which to perform the task at hand [5, 6].

All the restoration was undertaken by professionals specialized in the various areas of conservation and restoration (mural painting, decorative painting, sculpture, wood-work, stained glass and stone-work), and the technical orientation taken on by IGESPAR. Table 2 describes the different stages of restoration.

**Table 2** Description of the treatments.

<table>
<thead>
<tr>
<th>Previous treatments.</th>
<th>Restoration Type of Intervention – Used materials and techniques</th>
<th>Photographs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graphic and Photographic logging.</td>
<td>Surface cleaning – dry cleaning with latex rubbers and soft brushes; wet cleaning with gel – carboxilmetilcelulose and sodium bicarbonate.</td>
<td><img src="image1.jpg" alt="Surface cleaning" /></td>
</tr>
<tr>
<td>Stratigraphic analysis to locate the different layers of renderings.</td>
<td>Consolidating over loss of adherence - Grouting with industrial lime mixture (PLM - I®).</td>
<td><img src="image2.jpg" alt="Consolidating" /></td>
</tr>
<tr>
<td>Testing on site, sample extraction, lab tests (performed by LNEC)</td>
<td>Treatments of oxidized elements – Elements destined to be restored rather than replaced were treated with a rust converter; elements that could not perform their function were removed due to excessive deterioration, and those that retained a function were replaced by fibreglass.</td>
<td><img src="image3.jpg" alt="Treatment of oxidized elements" /></td>
</tr>
<tr>
<td>Replacement mortar fabrication, for lab testing (with LNEC support)</td>
<td>Fixation of the pictorial layer – located with an acrylic copolymer - Acril 33® and Klucel G according to needs.</td>
<td><img src="image4.jpg" alt="Fixation of the pictorial layer" /></td>
</tr>
</tbody>
</table>
Removal of the juxtaposition of inadequate layers of whitewash and mortar – through mechanical means (chisels and mallets, scalpels, fibreglass pens and precision equipment in the areas with the most adherence, such as micro drills and vibrating pens).

Filling the gaps and restitution of the decorative elements with a new mortar composed of slaked lime, silica sand (washed and graded), with similar colour and texture to the original, according to previous tests.

Reconstruction and restitution of missing decorative gypsum plaster elements within the chapel.

Pictorial reintegration – by an ‘illusionist’ approach or special techniques such as rigattino using inorganic pigments with limewash.

*Fig. 14* Before restoration  
*Fig. 15* After restoration
6 Final considerations

Igreja do Santíssimo Sacramento is an excellent example of the diverse stylistic and decorative solutions used in Portuguese architecture over the course of time. The church shows a multiplicity of different technical possibilities for decorative renderings, namely faux stone renderings.

During the restoration process of the church’s renders, various distinct aesthetic solutions were discovered hidden beneath many coatings of gypsum layers and limewash. This kind of faux stone-work undoubtedly marks, with eloquence, a spatial, formal, technical and aesthetic transformation of the monument.

These renderings are architectural and artistic documentations that span various eras constituting a historic record of both the aesthetic values and technical solutions, due to the diversity of materials and techniques found in the restoration process. Their conservation will create a new critical language in the art history of monuments.

It should be mentioned that the accomplishment of this successful enterprise was only possible due to the multi-disciplinary collaboration of all the parties involved, without whom, none of it would be possible. The scientific knowledge gained through laboratory and on-site analysis of the mortars, and the studies and tests performed to find appropriate replacement mortars led to a proper definition of the conservation and restoration techniques appropriate to this site.

7 Acknowledgements

The authors would thankfully like to show their gratitude to IGESPAR, and the architects Irene Frazão and João Seabra, both responsible for the project.
8 References

4. ICOMOS (1964) The Venice charter
5. ICOMOS (1977) The Venice Charter under review, Ancara