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Rigour, methodology and use, success in heritage conservation: The tower of the St. Mary Magdalene`s church.

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Abstract
The church of Santa María Magdalena of Matapozuelos (Valladolid) from the sixteenth century, made of Mudejar masonry brickwork combines late Gothic with Renaissance elements, is a Cultural Interest Asset. Its prominent tower is the object of this project. It was proposed the tower is restored to its original monumental value and condition, giving it a new life. The most significant change has been the installation of a fixed staircase extending the existing one to access the bell tower and upper levels, allowing controlled access for visitors and creating a more open and bright interior space, giving it a more functional sense, without losing the permeability of the bell tower. The research begins with the previous studies: historical, archaeological, petrological, photogrammetric and architectural, justifying the action theoretically. This led to the use of traditional methods and materials from the surrounding area in order to preserve the vernacular heritage: the tejar brickwork, the wood in the floorboards and woodwork (specifically elm wood), the vault cladding and the lime rendering of the walls, are highlighted. The problems were identified by classifying them according to their degree of complexity and a project diagnosis was made that served to take the necessary measures for their restoration. Three levels of intervention are established according to their volume of affection, three action groups are proposed according to the nature of the objective to fulfil, and three actions are qualified according to the contribution to the building to be preserved: repair, replacement or addition. This time of methodological study makes us achieve an exhaustive knowledge and a sensory closeness to the building, which makes us "feel it inside": History in architecture is important when it becomes blood. (Ignazio Gardella. Verona 1991. Conference: "My first 90 years in Architecture").

Keywords: *restoration, methodology, recovery, historical heritage.*

1. Introduction

Vernacular architecture can be defined as a type of local or regional construction, in which historical materials and resources of the geographical area where the construction will be built are used. Many architectural typologies built using traditional methods are different from those elsewhere in the world, becoming means of creating a distinct identity.

It is a continuous process that includes the necessary changes and continuous adaptation in response to limitations or social advances, technical and environmental.

As an illustrative example of vernacular architecture, the success story of the restoration of the tower of the Santa María Magdalena`s church in Matapozuelos (Valladolid) from the sixteenth century is exposed (Fig. 1).

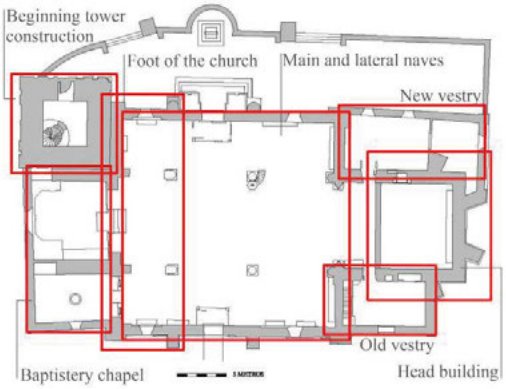

Fig. 1. Church plant with historical references.

This church underwent numerous transformations throughout its history between the transition from late Gothic, with Renaissance decorative and structural elements. Fig. 2 shows, in summary, the different parts built in its different stages.

STAGE	PHASE	MILESTONE
I. FINAL GOTHIC	1.1. Construction of the head of the church	1544
	II.1. Main and lateral naves	1563-1567
II. CLASSICISM	II.2. Old vestry	1594
	II.3. Construction of the choir	1597
	III.1. Beginning of the new tower construction	1596
III. BAROQUE	III.2. Baptistery chapel	1742
	III.3. New vestry	1754

Fig. 2. Main transition stages of the church

Its architecture was transformed according to the needs of its time and adapting to the requirements of the local people, around their main function: worship. But without forgetting other processional and ritual needs, representative and collective.

For the original construction materials found directly in nature were used, some of which, such as *tejar bricks* require a simple transformation process. The basic construction materials that were used were the limestone of Campaspero, pine and elm wood, *tejar bricks* with different types of brickwork depending on the period (Mudejar, classicist) and the areas in the work (walls, roofs), the arabic tile with construction techniques according to each period and the needs of the time and place.

Materials such as lime mortar and construction techniques such as the semicircular arches of the holes used in the church are repeated throughout the history of construction.

Its walls were built with plinth of rectangular ashlars of white limestone of Campaspero and the rest of exposed brick.

In the restoration carried out in 2012, the intervention on the imposing tower located at the foot of the Epistle nave, made of solid *tejar bricks* and the roadway with stonework had a preponderant role.

Fig. 3. 1. View of the exterior of the old tower. 2. View of the interior of the old tower with the holes for the bells.

Formerly to the construction of the original tower, another tower had been built. The tower was knocked down due to structural problems and some elements that were not demolished, still remain (Fig. 3).

Alongside the aforementioned remains the current tower was erected, changing the previous symmetrical typology, by one where the tower is not located on the axis of the church.

The main constructive objective of the restoration of the tower was to reaffirm its value and characteristics according to its monumental condition, and on the other hand to solve the serious conservation problems due to water, wind and the nests of the storks that were causing great deterioration.

The aim of this work, was also, to a lesser extent, to improve the north facade and the atrium of the church.

Focusing on the bell tower restoration, in addition to the exterior condition, served to give an additional functionality to the interior, offering the building a new, clean and functional. face unknown until then.

A spiral staircase was incorporated into the tower that extends the existing restorated, to allow access to the last two levels, without losing the permeability of the bell tower when it is observed from the exterior. This serves for the visits of tourists to the bell tower and at the same time, gives access to the gallery, now a viewpoint of the landscape of the dotted moorlands fields of Castilla.

The intervention on the interior of the tower, enhances its space, opening up blinded openings, eliminating failed additions, and reconstructing original forms and finishes. A more open and luminous space is created, giving it a cleaner and more functional feel.

This restoration achieves a greater perception of sensations of the building and its beauty, and improves its maintenance, preventing future deterioration. Prior to the start of the work, historical, archaeological, petrological and photogrammetric research, carried out, which served as a basis for understanding the building, and thus for finding the best architectural solutions. An architectural analysis of the state of the building, was also carried out.

2. Previous studies

Previous studies served to know the gradual construction process of the church during almost three centuries. The anthropic actions define the evolution of the building itself that was leaving its mark on its walls through repairs, reforms and additions.

First of all, studied historical notes (Urrea, 1977; Madoz, 1870; Arévalo, 1987) and previous technical reports (Carbayo, 2009), were studied. Archival documentation about the church and old photographs were collected that valuablely aided decision-making regarding the restoration.

Then the archaeological study (Harris, 1989; Caballero Zoreda, 1966; Mannoni, 1976) was carried out using the Harris system to know the order of the deposition of the strata and the creation of intervention surfaces. A historical study was also carried out (Heras, 1975; Bustamante, 1983; García, 1960; Urrea, 1987). Both were supported by the company AICARA, Archaeology and Cultural Heritage. A survey of the walls most affected by the weather was made in order to characterize the coatings of the building and its damage. From the stratigraphy reading of the walls, the different constructive periods were obtained in which repairs or additions were made to the walls. In addition, they carried out twelve manual tastings on the North facade due to the problems of humidity and detachment of materials. It was detected that one of the most deteriorated points of the tower was in the octagonal top and in the protruding elements.

The studies of inorganic materials (petrologic) that were carried out by the companies GEA and TECNUM, aim to support the project's approach of a comprehensive intervention of a conservative type. In addition, twelve manual inspections were carried out on the north façade due to problems of damp and detachment of materials. From this study a characterization of the materials used in the

execution (bricks, adobe, stones, mud, alterable and mixed materials) was obtained, which allowed to know the architectural evolution that it had over time.

From the analysis of the architectural pathologies, it can be seen that the horizontal structure of the body of the tower is made up of vaults on which honeycomb bonds rested and which served as a support for the floor slabs. This structure was also very deteriorated. It was also observed that in the area of the chancel and the nave the brick walls had different heights which showed that alterations had been carried out over time in order to increase their size and thus be able to accommodate the faithful inside. The old sacristy was built at the time of the old tower with walls built using the traditional technique of mixed brick and rammed earth. It was found that one of the most deteriorated points of the tower were the octagonal top and the protruding elements.

With all this work, the pathologies that were present in the area of the work were determined, as well as the causes that generated them, such as the presence of soluble salts and damp.

Suggestions for intervention were made, such as using the same materials or replacing them with stone, mortars and ceramics compatible with the existing ones, respecting the dimensions.

In short, the problems were identified and classified according to their degree of complexity and a project diagnosis was carried out which served to take the necessary measures for their restoration. This determined the use of traditional methods and materials from the surrounding area, thus preserveing the vernacular heritage. The use of granite and quertzite from the rivers basin that meet in Matapozuelos (Adaja and Eresma), is a geographical identity.

3. Tower building system

The tower was built with load-bearing *tejar brick* walls with putlog holes, without intervening walls of rammed earth. The distance between bricks ranges from three to five cm. filled with mortar. Figure one shows the construction system of masonry wall with scaffolding. This will become evident in the subsequent action.

In certain interior finishes the walls were covered with a layer of lime plaster. With the previous analysis of reading of walls in the church, different types of grayish and whitish mortars of poor quality have been detected. In an area of exterior walls, the presence of iron slags (linked to the passage of the railway through Matapozuelos) has been detected, and a third layer of thick mortar that ended up causing problems of disintegration to the bricks

The levels of the tower shaft were built with vaults on which the wooden floor was laid on honeycomb bond. The rest of the floors were wooden slabs with boarding.

The main dome and the small dome were composed of solid *tejar brick* and over it and as a covering material the brick arranged flat overlapped with conformation of curved flat tile in its lower part, giving a slamate appearance.

4. Analysis and diagnosis of problems

It is the most damaged of the building by the passage of time and lack of maintenance. The greatest damages are in the octagonal bodies, and cornice of the floor of the first terrace. Rainwater and inclement weather have ruined brick walls, while the action of the birds ruins mainly those of stone and ornamental elements.

The free discharge from water above the stone bases of the balustrades, causes all the joints of the stone overhang to be washed.

The main problem is the lack of localized drainage function, flights and imposts, and big gutters, whose purpose is to prevent runoff.

The disfigurement of voids is another action of water.

The rest of the brick walls has a better appearance, only harmed by biogenic stains mainly.

This external damage are complemented on the inside by the loss of woody materials and the accumulation of bird droppings, which accelerates the process of loss: affected floors, slabs and beams are an example of this.

The maintenance and repair work is practically heroic, and therefore the proliferation of nests (in some cases twenty one stork nests have been counted) and birds, as well as the existence of leaks, are increasingly numerous.

It should be noted the good condition in which the existing spiral staircase is located, with little loss of material. However, it only leads well to the base of the plank that is on the third level, deconfiguring in the last section to the board itself, and leaving others seven metres and two levels without comfortable access without risk.

In the execution project, all these pathologies by construction systems were described in detail, and as well as the restoration work had to be focused, mainly on the tower´s octagonal tops and the protruding elements.

5. Objective and proposal

It is intended to carry out the necessary works for the recovery of an optimal state to the tower of the church of Santa María Magdalena, and for its enhancement.

The main action is the recovery of the walls, ornaments and the cleaning and sanitization of all the degraded areas of the tower and above all facilitate the access for visitors to the upper levels as well as facilitate maintenance.

The proposal was based mainly on a mimetic restoration using materials highly present in the con-structive tradition of this geographical area. These building materials and systems include *tejar brickwork*, wooden floorboards and elm woodwork, the vault cladding, and the lime rendering on walls that coexist with the striking appearance of the *tejar brickwork* in walls, cornices, imposts, window sills, spandrels and roofs. Constructive solutions for technical improvement are also provided, which support the proposals for use and maintenance.

Highlight the prolongation of the staircase as the most significant contribution by the interior that serves to facilitate the ascending route passing from the dark ground floor to the clarity of the upper levels with the largest number of openings. The ascent through the shaft of the tower is made with breaks on the two intermediate floors and ends with two final stops: the first, interior, in the bell tower; and the second, exterior, in the perimeter gallery.

The project is conditioned by the budgetary possibilities and adjusts to them, undertaking very specific parts of the church, leaving others also necessary.

5.1. Levels of intervention

To achieve the objective, three levels of intervention are proposed:

- Major repairs aimed at putting its functionality into use: it is the tower, as a body of bells and symbol. Hence the interest in the use of bells, staircases, and above all its octagonal top: good use is the best way to maintain a building.
- Shallower interventions that mainly affect the image of the building and ensure that it never suffers major losses and damages. This mainly concerns what is to be undertaken on the entrance facade: protection of north-facing side.
- Collateral work, of punctual conditioning and accessibility: it is about levelling the access staircase, as well as the improvement of the installations.

In order to achieve the objectives proposed above, and taking into account the intervention criteria, the actions to be taken are mainly aimed at achieving the following:

5.2. Performances

- Recovery of the masonry, ornaments and lines of architecture: it is about reconstruction of masonry, replacement of lost elements, and ultimately the putting in correct constructive state of all the elements, being in the most degraded areas (two last octagonal bodies, and in the lines of architecture) where these actions are concentrated.

- Protection against agents that degrade the tower:
a) avoid the stay and nesting of birds with sloping sills, carpentry that allows the ventilation of the interior, in those holes of the shaft of the tower, more hidden, that do not affect the visual permeability; and with mesh in the finishing ones, which do need that transparency.
b) prevent the access of water to the interior and facilitate the evacuation and waterproofing, on terraces, on window sills, cornices and coamings.

- Facilitating access and maintenance: improvement of the areas for acces and vertical travel, and their extension towards the furthest levels with the main aim of carriying out maintenance work in a comfortable and safe way, which will guarantee their use and therefore the achievement of its purposes.

5.3. Detailed analysis of the actions

Each part of the constructive intervention was analysed in order to classify them according to their contribution to the previous building: repair, replacement or addition. In this way, the nature of each constructive contribution to the singular building, which will last over time, is recorded in the project.

6. Execution of the work and unforeseen events

The work begins with the installation of scaffolding and auxiliary resources that allowed access and visualization of all points of the tower. In this way, as if it were a photographic zoom, the initial vision with which the project had been drafted was increased, and the severity of the pathologies seen until then from afar, and even new ones, which due to the inaccessibility of the points could not be appreciated before, was verified. It was also found that certain elements did not fulfil the functions that were expected. Significant loss of material was centred on cornices, imposts, spandrels, balustrades and pinnacles, and this loss was particularly accentuated, especially in the octagonal finial, and the cornice on the terrace level.

The biggest of the new problems encountered was the breakage of the small dome of the lantern and the top of the stone pinnacle of the top where the weather vane is located. In order to successfully repair it, the origin of the breakage was analysed, and the cause was diagnosed as being wind whipping the weather vane and the lightning rod cable, which, in a tense manner, descended through the small dome and the lantern, transmitting horizontal movements to the pinnacle.

The restoration process began with the selective cleaning of the masonry, the sanitized of the deteriorated joints, and later with the particularised grouting according to the facade plans, the replacement of the missing ceramic pieces (new pieces made by hand and according to size), and the repositioning and reintegration of all the balustrades, pinnacles and finishes.

The roof of the dome is was subject to a detailed restoration and cleaning program. This included the sanitisation and removal of lime scale from roof tiles, stone elements and cornice details with minimum degradation. All added materials, such as Portland mortars or deteriorated metal elements, are chopped and removed. It is noteworthy that two ceramic pieces with unique markings were discovered on its summit: one with the full name of Machuca, and two others with handprints, as signatures of the author or authors of the work. (Fig. 4).

This brings architecture closer to human feeling, naturally recording the people who build them.

Fig. 4. Footprints and signature found at the top of the tower.

Fig. 5. Comparison of the previous state and the renovated state. Summary images of the final state.

7. Conclusions

The spirit of the project is to return the lost prominence to the tower of the Santa María Magdalena`s church, in Matapozuelos (Valladolid), turning it again into an architectural attraction of singular beauty and majesty that can be admired by the visitor both outside and inside. The objective is complemented by a new use: the possibility of climbing the tower to enjoy an unparalleled panoramic view of the environment, simultaneous with temporary exhibitions that will accompany it on its ascent.

In short, it is an example of how the techniques, rigour and methodology implicit in a restoration are more noticeable if the program allows the public to bring the place to life.

At all times the care and protection of our vernacular heritage has prevailed through the use of both materials and traditional construction techniques present in the geographical area, which positively reverts to the development of the local activity.

After eight years of its completion, the project has achieved the expected results: as for the pathologies that the building presented, they have not become visible again, so they have managed to solve the conservation problems and return harmony to this genuine example of regional architecture, with balanced repairs and minimal impact on its historical materiality. As for its new use and point of view, the increase in visitors has been exponential. It is noteworthy that the project obtained the recognition "Special Mention of Restoration" in 2021 of the fifth Edition of the European Prize for Intervention in Architectural Heritage, and which the jury described as *an intervention that allows the discovery of an interior part of the building through the possibility of accessing the tower, which, in turn, offers a new use: the enjoyment of an unparalleled panoramic view of the enviroment. In short, this work exemplifies how the techniques, rigour and methodology implicit in a restoration are more appreciable if the program allows the public to bring the place to life.*

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