THE TOLEDO GATE IN CIUDAD REAL, SPAIN. AN APPLIED CASE STUDY OF THE SEVILLE CHARTER

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Abstract:

In 2009, an agreement between the Town Hall of Ciudad Real and the Caja Madrid Foundation permitted the start of preliminary studies at the Toledo Gate, the last remains of the city walls, in order to document, analyze and evaluate the pathologies affecting the fabric throughout time and to carry out the archaeological excavation of the remains preserved in the area.

As a result of this excavation several construction elements were brought to light and permitted to verify their role within the gate and the rest of the walls when compared with the existing archival information.

At the same time, as a usual part of the intervention methodology of the Caja Madrid Foundation, communication and dissemination actions were promoted. In this case the virtual reconstruction of the gate and the whole city walls was considered as a fundamental part of this campaign in order to raise awareness among the citizens towards a monument that has remained in the shadow for the last century.

This paper, thus, seeks to highlight how the principles of the Seville Charter have been used as main guidelines during the virtual reconstruction process that followed the archaeological excavation, to guarantee the scientific rigor, criteria and transmission to the public that should lead to a process of historical and cultural value for society.

1. PREFACE

The Seville Charter document, recently approved in the city that provided it with its name[1], outlines the principles of archaeological virtual reconstruction. In these terms, the aims defined by the Charter are aligned with those of the Caja Madrid Foundation, applied in the restoration projects promoted by this non-profit institution all over Spain. That is to say, the methodology principles, the criteria and the rigor followed in the so called "Cultural Restoration Projects" carried out by this foundation, can be perfectly identified and matched with the ideas highlighted as fundamental basis by the Charter of Virtual Archaeology.

In this regard, the purpose of this paper is to explain and demonstrate how one of this projects, the restoration of the Toledo Gate in Ciudad Real (Spain), is currently following the principles of the Charter in its different phases, specifically in the virtual reconstruction of the monument. This project, at the time that this paper is presented, is still ongoing, so it is foreseen that further developments in the historical, artistic and constructive knowledge of the monument may happen, thanks to the research and work of the multidisciplinary team. This paper, thus, will highlight only the results obtained up to the present time.

[1] This Charter was officially approved during the III International Congress *Arqueologica 2.0*, held in Seville (Spain) in June 2011.

2. THE TOLEDO GATE IN CIUDAD REAL, AN APPLIED CASE STUDY FOR THE SEVILLE CHARTER

The Toledo Gate in Ciudad Real is the only existing remains of the city walls that surrounded the urban medieval settlement of the 13th century, created by royal order of Alfonso the 11th, King of Castille.

At the beginning of the 20th century these walls were demolished for the most part, in order to permit the city to grow without the physical barrier of the walls. This action left the Toledo Gate as a completely disconnected element now used as a roundabout to regulate traffic at one of the main entrance points to the city (Figure 1).

Figure 1. The Toledo Gate and the city walls at the beginning of the 20th century and nowadays as a roundabout

In 2009, as a result of an agreement with the City Town Hall to restore the gate and improve the urban surroundings of the monument, the Caja Madrid Foundation started a series of preliminary studies and works in order to set the main objectives of the project. In this regard, the excavation of the gate surroundings and the terrace of the monument were considered essential. At the same time, the excavation had to be supported by a historical and archival research that provided information about important historical and constructive facts, later ratified through the results of the excavation. Chemical analysis of the stone and mortars as well as a series of salt and humidity cartographies were also key studies to determine the level of decay of the historic fabrics and the need and level of intervention that would be necessary during the project.

Contemporarily, dissemination and awareness actions were considered crucial in order to increase the response of society towards a cultural heritage that had been completely isolated and neglected. So, in this regard, a virtual reconstruction of the gate was commissioned and developed by Balawat, a specialized 3D model and multimedia company. The purpose of this model was to be the vehicle for all the data that the different studies would provide throughout the project duration so as to transmit all this information to the public and start creating consciousness and awareness among the citizens and tourists towards the importance of preserving and knowing the archaeological remains of the city.

3. COORDINATING AN INTERDISCIPLINARY WORKING TEAM

It was important to create from the very beginning a multidisciplinary team of experts that could interact providing feedback to the project (archaeologists, architects, historians, restorers, geologists, chemists, IT experts, designers, 3D modelers, and others). A key issue was to ensure interaction between them during the process, as this actually permitted everybody to share information, provide different points of view, exchange ideas, promote discussion, seek for solutions between the different experts and to make final decisions according to the discussions. The coordination of these technical sessions was lead by the Caja Madrid Foundation, and they would usually take place every few weeks according to the development of the different studies, ensuring the interdisciplinary principle defended by the Charter, which certainly has helped to provide a scientific and rigorous approach to the project (figure 2).

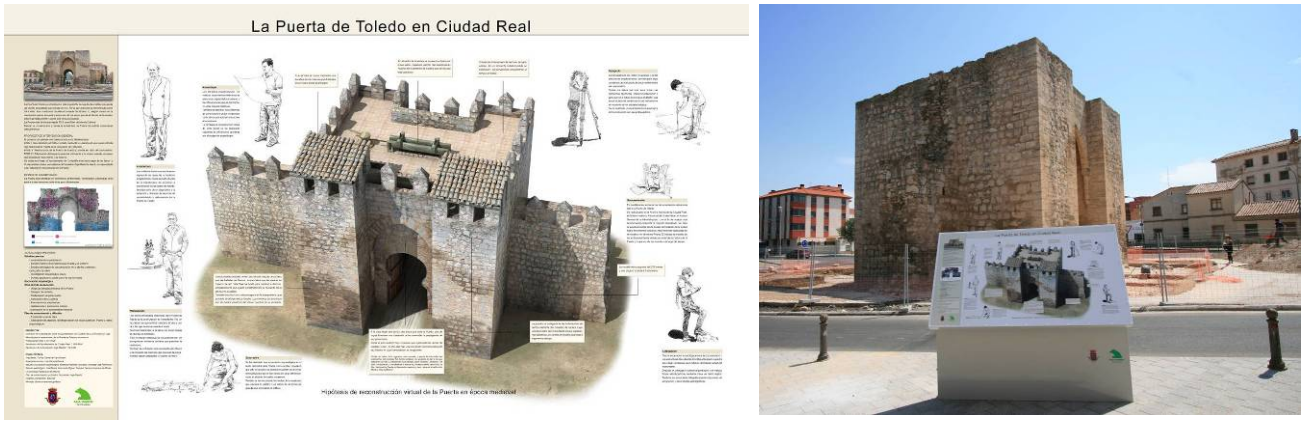

Figure 2. Informative panel displayed on site with the reconstruction model of the Toledo Gate in the 17th century emphasizing the multidisciplinary team that has been in charge of the different studies

4. THE ARCHAEOLOGICAL EXCAVATION, BASIS FOR THE VIRTUAL RECONSTRUCTION

The most important preliminary study was the archaeological excavation of the gate, as well as the surroundings and the roof, in order to provide clues about the ancient construction, the function, the urban development around the gate, the relationship between the gate itself, the towers, and parts of the walls demolished in the early 50's of the past century.

The Archeological interventions taken place in the surroundings of the Toledo Gate uncovered a series of structures and stratigraphic deposits that have provided an approach of the sequence of historical events, of this defense, related to the fight for the reign since Alonso the 10th until present times.

From an evaluative point of view, structures are differentiated with industrial ethnographic importance (Phase III) and structures of historical value, belonging to the medieval stages (Stages Ia and Ib) and modern (Phase II).

Related to the ethnographic assets, emphasis was placed on the remains of the *Charcas del Arrogante* (Arrogante's pools), whose existence has been attested in several documentary sources. They are located in the outside area of the Wall and Gate, attached to the East and West canvases. It refers to two rectangular structures formed by a surrounding low masonry wall of 30 centimeters tall and a quartzite pavement. The two pools were connected by a ceramic pipe that maintained the same water level between them. It was located at the lower level of the different contemporary transit floors of the Gate.

The main role of *Charcas del Arrogante* was to store in winter a daily thin sheet of water to obtain ice that was transported to the snow wells in the city for preservation and later marketing. These structures were redeemed in last century's late twenties, during the execution of the project to remodel the Gate. The objective of the project was to improve the traffic surrounding the Toledo Gate, and to end with the damage and alterations caused by humidity in the monument.

In the indoor area, discoveries were highlighted of several levels of chronological pavements and the remaining of the foundations of the *fielato*[2], construction that was attached to the East side of The Gate.

The structures of historical and archeological relevance belong to the sections of the basement of the ancient wall built during the reign of *Alfonso X El Sabio*, after the foundation of the *Ciudad Real* (Royal City). (Phase Ia). It refers to rough stone foundations formed by large carved stones joined with high strength mortar. During the reign of *Alfonso XI*, it takes place a remodeling of this sector of the Gate, in order to build a larger and more monumental new one (Phase Ib). To this stage belong the foundations of the Toledo Gate, in part discovered during the excavation. While doing this project, both the possible previous Gate and parts of the Wall, were demolish in order to attach the actual Toledo Gate.

[2] The *fielato* were offices located in the population's access to control the entries of goods and charge the corresponding consumers rights.

In order to give more consistency and monumentality, two pieces of Wall were built on both sides of the Toledo Gate, joined to the old mud wall. The remaining of these pieces of masonry and lime, after being restores in several occasions, still are standing. In contrast, the pieces of mud wall were demolished at the end of the second decade of the twentieth century during the execution of the before mentioned project, except for the basements, which remained hidden until our intervention.

On the other hand, the leveling layer of the superior floor of the Gate has been manually excavated. The separation of this material, has led us to distinguish the superior original interface of the building and also distinguish the different modern interventions in the crowing of the perimeter wall surrounding the building. Most noticeable is the presence of foundations with levels of collapsed roofs and ashen deposits that can be interpreted as structures for guard services. It is probable that similar structures existed in both sides of the Northern part of the Gate. However, in the Northwest corner, just a ground level and low-powered carbons have been preserved.

With everything said before, it is believed that the archeological excavation has allowed the project team to know important construction aspects of the early stages of the monument and, there for, the Ciudad Real's walls. Also, thanks to the stratigraphical and functional analysis of the different elements of the building, a reconstructive hypothesis of the original Gate was begun that has permitted proposals to be established. The one exhibited in this paper corresponds to a hypothetical vision that the Gate presented in the 17th century, when the upper body would disappear and the towers of the Gate would be two independent guard services.

Figure 5. Archaeological survey of the terrace during the excavation

5. ANALYZING THE FINAL PURPOSE OF THE PROJECT

The Caja Madrid Foundation promotes dissemination of Cultural Restoration Projects to cover the lack of means and funding that usually occurs when lead by public institutions. In this case, apart from the tangible restoration of the monument, the project seeks to improve the intangible approach to the monument through the use of the virtual reconstruction of the gate. Nowadays the gate has lost every connection with other elements of the city. The wall memories, if any, only survive through mere street and square names[3] along the ring that surrounds the city following the original trace of the ancient medieval walls.

In this context, the situation of the gate had been reduced to be a forgotten historical element isolated with no chances to transmit and enhance the important historical past of these remains for the city and its development.

Through the 3D model and the use of multimedia applications that permit the linking of every kind of data, all the information collected and generated during the preliminary studies as individual and isolated units can be transmitted to the public creating links between the different clusters of information, generating a complex net of knowledge about the monument that will permit the users a rapid access to the specific information they may request.

The team has, at every step of the process, kept an integrated management in order to achieve and ensure that the public will obtain a whole perception of every concept regarding the gate (history, construction, function, conservation, etc.). This system will be maintained for the future of the monument thanks to the commitment of the Town Hall to take over the management and conservation of the gate once the project is over, and to keep the gate open and accessible physically and intellectually to the public, through the means provided by the project, that will consider the importance of making them sustainable for the future management of the gate and its surroundings.

6. THE REAL AND THE VIRTUAL AT THE TOLEDO GATE

An important issue of this virtual reconstruction project is the existence of a real restoration project going on at the same time. So in this case we have the chance to compare and present different features of the virtual 3D model with reality. The virtual reconstruction permits the analysis of different hypothesis with a higher interaction with the information, with no limits in terms of proposals and suggestions that the real gate would never permit following the classical restoration charters. At the same time, reality provides the experience that the virtual will never be able to match. The virtual will never be as rich in terms of perception as the real and physical visit to the gate, even if the 3D model is impressive and may obtain amazing levels of photorealism. But these differences and discrepancies may be read as a huge potential for the project as the first (the virtual) complements the second (the real) and vice versa.

If we analyze the monument in terms of accessibility through the real and virtual, with these two levels of access the project is providing not only physical approach, but also the access to the intangible values of the gate through the virtual reconstruction period. Such intangible values include the historical context, the walled city of Ciudad Real in the Middle Ages, the development of the urban settlement and the life indoors, the function of the different parts of the walls, the entrance to the city and its way to control and permit the access and departure, the decay of the role of the walls as a protection system and its until the final demolition, etc.

In addition to the virtual and physical projects there is a third parallel project that seeks to integrate the surrounding urban area to the gate, permitting the people to approach the monument through a boulevard. This project, as part of the recovery of the gate will integrate information regarding the gate and the walls in situ, to permit the people to understand the context of the gate, the walls that surrounded the medieval city, the history and the last works carried out in the monument.

[3] Some of the names that can still be read along the circulation ring around the historic centre are: “Plaza de la Puerta de Santa María“, “Plaza de la Puerta de Alarcos“, Ronda de Calatrava, Ronda de la Mata and others.

7. THE REAL AND THE HYPOTHETICAL IN THE RECONSTRUCTION

As mentioned above, one of the potentials of the virtual reconstruction is that it is an open information system that permits different reconstruction solutions for certain aspects of the model. The most essential issue considered was the identification of what is real and scientifically based and what is hypothetical in the 3D model. This permits to finish the virtual object as a whole, that is to say, invented, and, in this particular case, what levels of invention have been reached for the different parts of the virtual reconstruction. For instance, in the case of the Toledo Gate, a first solution was given in the virtual model using crenellations to finish the walls in the upper part, as it appeared in historic photographs made in the 1950's. The recent excavation carried out on the terrace revealed that there was a second level for the guard and to operate the spiked gate mechanisms, so the walls of the gate would have to be originally much higher. This means, consequently, that the crenellations were an invention introduced around the 50`s when the second storey of the gate disappeared. This feature was easily changed in the model, updating the information available prior to the excavation with the most recent scientific data provided by the historical and archaeological studies (Figure 6).

Figure 6. Different reconstruction hypothesis used to determine the crowning of the gate

8. A SCIENTIFIC PROCESS AT DIFFERENT SCALES

The scientific rigor of the method followed for the creation of the virtual reconstruction model can be set at different levels. There has been a rigorous historical research from the beginning, followed by the archaeological excavation of the site and a constant teamwork that has provided different feedback to the project development from multiple disciplines. This corpus of information has provided a complete scientific basis for the virtual reconstruction model. Nevertheless, there have been difficulties to establish the time phases for the virtual reconstruction, given current funding of the project. Actually there has been a debate about the historical phases that should be displayed in the virtual reconstruction. In this case the intention was not that much to show a specific historical phase or constructive state, but to make understandable both the main archaeological remains and the way the building could be understood as a complete functional and constructive structure, completed as a whole.

Another important feature was the creation of the surroundings, the atmosphere and ambience that surround the gate, which may entail considering the rest of the city and the territory.

It is important to highlight that, before this project there were no previous visualization experiences of the gate and walls of the city, so this experience has opened a new way to understand the cultural heritage of the city of Ciudad Real.

The 3D model produced should be considered as an open information system for other researchers, and for future studies about the gate. In this regard, the methodology of the cultural restoration project ensures that

every step given in the process will be documented and made available through different means to the public and other researchers (Figure 7).

Figure 7. Integration and management of photogrammetric, archaeological and conservation data in the 3D reconstruction model of the Toledo Gate

In general, all the information regarding the project will be available through the website of the Caja Madrid Foundation (www.fundacioncajamadrid.es), providing all the documentation regarding the preliminary studies, the archaeological excavation report, the restoration project, the worksite reports containing the decisions made during the intervention, the communication and dissemination plan actions and, of course, the virtual model that permits a visual approach to the monument and to all the information related to it..

The most challenging part of the project will be to make the information available on site, for the public that visit the gate and want to learn about the monument. For this purpose the virtual reconstruction model will be an excellent mean to provide, interconnect, classify and display different levels of information and explain the works carried out with the different professionals involved and their role within the project.

9. TRAINING AND EVALUATION

In terms of training and evaluation, this virtual reconstruction project does not consider these as main goals. The virtual reconstruction of the gate and its surroundings has been considered as a professional work commissioned to Balawat, a company specialized in this kind of work, that shares the methodology followed by the Foundation and has ratified the principles of the Charter.

Balawat has been working for twelve years with archaeologists from different settlements. During the development of many projects the company has noticed that Archaeology as a science needs new 3D modeling communication tools for its development. Photorealistic virtual reconstructions are only a part of the possibilities of computer applications. We can use other procedures in order to communicate this science both to archaeologists and general public.

In this regard, that is the basis of the Seville Charter: virtual Archaeology has to serve Archaeology. So, Balawat tries to find tools to communicate the technical aspects of Archaeology. For instance, it is possible to integrate archaeological plans, texts, virtual reconstructions and multimedia archives working in a unique and intuitive presentation, managing and substituting the huge amount of data that is managed by archaeologists.

Furthermore, the transmission of this type of technical information to the visiting public is considered key. An important part of this public is people interested not only in the historical recovery of archaeological remains, but also in the way archaeologists think and interpret this remains, and even, the way graphic designers have come to communicate them in the end.

In terms of assessment, Caja Madrid Foundation regularly evaluates its own projects, especially in case of virtual reconstructions, even if not yet in Ciudad Real. The results in other cases, developed in collaboration

with other scientific institutions for dissemination purposes have demonstrated that this kind of products, are highly appreciated by the public[4].

For the time being, the best demonstration of the success of this initiative developed in Ciudad Real may be observed on site, where people stop everyday in front of the panels with the virtual reconstruction of the gate and explain to children or discuss between them the solutions given and the information displayed. This information may even remind them of facts related to the walls buried in their memories much like the monument (Figure 8).

Figure 8. Informative panel containing the recreation of the historic centre of Ciudad Real within the walls and the public interest this initiative is producing

9. CONCLUSIONS

In conclusion, the case of the Toledo Gate can be considered as an example of application of the Seville Charter in virtual archaeology. The scale of the monument and the methodology followed during the recovery of this medieval gate has all of the elements that permit an explanation of all the principles of the Seville Charter.

This charter guided work on the virtual reconstruction of the Toledo Gate, creating a model that facilitates communication between experts and the public. This leads to a better appreciation, understanding and awareness of cultural heritage that may prevent future loss of other remains at risk.

[4] In February 2011, the Metropolitan Chapter of the Cathedral of Seville and the Caja Madrid Foundation organized the exhibition "*Aedificare, Evangelizare, Servare*. Five centuries of architecture in the Cathedral of Seville". Almost an 80% of the exhibition visitors indicated at the final satisfaction questionnaire that the most interesting part of the exhibition were the videos displayed and among them by a huge difference, the virtual reconstruction of the ancient mosque transformed into cathedral, realized by the School of Arabic Studies at the Spanish National Research Council (EEA-CSIC). This fact demonstrates the high impact that this kind of products produce in the public, due to its strong visual qualities and the recreation of the historical atmosphere that nowadays cannot be reproduced any longer on site.