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ON SITE ARCHAEOLOGICAL MUSEUMS: TYPES OF PROTECTION

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ABSTRACT

The decision to preserve, in their original context, even the most fragile artefacts, such as floor and wall coverings, or to exhibit the delicate stratigraphic and unbaked clay manufactures, has favoured the spread of archaeological museums *in situ*, by interventions aimed at the preservation of archaeological remains. Archaeological museums represent a particular typology capable of relating history through its ruins. Therefore, it is not a museum having typological and functional characteristics that answer to codified museum-graphical and display rules. The arrangement and the public opening of the archaeological sites in recent years have been the object of discussions, debates and interdisciplinary collaborations. Making an archaeological site a museum means ensuring its preservation, valorizing it in its context, protecting it and, at the same time, creating the best conditions for its use by the community.

Today it's possible to distinguish different approaches in different Countries, dictated by different environmental and climatic conditions and by the specific characteristics of each site. This article develops a classification of types of protection for archaeological sites, for to understand the more or less effectiveness of the solution in some emblematic interventions, to preservation of the finds from weather (sun, rain, etc...). An example is represented by the site of Villa del Casale in Piazza Armerina in Sicily: its cover in translucent material, built in 1950, has caused a greenhouse effect and phenomena of condensation, with consequent damages to the pictures and mosaics. But, as far as trasparent covers are concerned, some examples have been realized in different Countries; they manage to combine well the demand of transparency of the envelope with the demand of preservation.

INTRODUCTION

The last decades have been characterized by the growth of a cultural debate on the issue of archaeological site preservation and by an increase of their cover interventions. Another element, in the last decades, is represented by the development and by the use of materials and innovative technologies for such covers.

These interventions can represent a risk to the preservation of the finds if not properly designed. The case of the cover of Villa del Casale in Piazza Armerina is very well-known: in 1957 a transparent and innovative material called *perspex* was used to cover the finds without developing an adequate microclimate study, as a consequence the pictures and the mosaics have undergone alteration. Today, there are many interventions across Europe characterized by the use of transparent or semi–transparent materials, oriented to assure recognition and reversibility to which we often refer. In order to estimate the effectiveness of these interventions, we proceeded to classify them; in particular, such classification distinguishes the various types of covers according to the type of protected space, the material used and the degree of climatic conditions control. Among these covers three case studies have been identified, different for type of protected space. They illustrate how it is now possible to work, reaching satisfactory results.

ON SITE ARCHAEOLOGICAL MUSEUMS

The firsts to take an interest in recovering ancient finds were the humanists of the Renaissance. In those times there was not an archaeological science or a methodology of excavation, common custom was to take away the movable remains and to detach the decorative parts, considered more valuable than others. It was a search of valuable and particular objects to be exhibit in private museums and at aristocratic houses, because the works were only admired from an aesthetic point of view. Even in the nineteenth century they drew material from the Colosseum to build palaces in the city; this was a common behaviour almost everywhere. There was not

awareness of the value of antiquities [1]. In Pompei, under the direction of architect La Vega, a new demand to show the public the areas of excavation in the best way was born; for this reason, while continuing to detach the decorations, archeologists devoted greater care of *on site* ancient structures and the work of maintenance began to acquire a prominent appearance.
In the end of the century, after the discovery of the stratigraphic method of excavation, it became possible to read the history of a site or a monument in depth and to figure out the ordered sequence of events that make up the story, from the birth to the different stages of life, until death. The *on site* conservation became the central problem of pompeian archeology. It was decided for the first time to leave intact the major monument complexes, reconstructing the covers and restoring *on site* peristyles, gardens and fountains, while the episodes of minor architecture were left without any protection. As time went by, this choice determined a difference in the state of preservation: the small shelters on tops of the wall paintings, in fact, such as the waterproofing of roofs, sometimes made with tiles and projecting cornices, did not prove sufficient protection.
The methods of *on site* preservation do not undergo significant changes in the first part of the twentieth century. They continued, in some cases, to philologically reconstruct the covers.
The only innovation is in the technology and in the materials used in the reconstruction of the covers. Until the 50s there are not evidences of real architectural protection covers, beside the reconstructions of some shelters and rare and more complex structures, like the glass roof on the *House of Neptune and Amphitrite* at Ercolano (Fig. 1). The solutions adopted to protect and make archaeological museum sites in Sicily during the years '50-60, results from a theoretical elaboration of the romain architect Franco Minissi, introduce for the first time the conception of a window for the museum exhibition of finds in a spatial dimension extended to archaeological site [2]. Minissi affirms that not movable pre-existing archaeological finds, should be preserved on site, as important as the movable ones, and interventions should therefore be able to satisfy all the needs of active conservation, just as the museum guarantees for their finds: if the find can not go to museum, the museum should go to find [3]. According to these needs, there is the problem of the protection of archaeological sites, always without the original protection of all architectural construction: the *cover* [4].
The interest in issues related to covers, in the areas of excavation resumes and intensifies, even in the international field, since the early 80s of last century, coinciding with the renewal of stratigraphic excavation techniques and with the birth of interest in material culture until then neglected. In Italy, the debate related to the covers recurred again after the earthquake of 1980 in the Vesuvian cities. In addition, the special funds allocation created new opportunities for intervention in this area, enabling new projects of reconstructing and improvement of archaeological monuments. On these approaches were based the firsts attempts of typological classification and distinction of the most suitable covers to protect the ancient architecture [2].

TYPES OF PROTECTION

In recent decades, in different archaeological European sites were realized solutions using the glass, now widely established as a characterizing feature of high regard and valuable buildings and structures. The research was focalized to the analysis of such transparent covers. The study has been structured according to the following phases:
1. *Identification of transparent covers on archaeological areas.* There was identified 20 archaeological sites in Europe that have got coverage build with transparent materials. These sites originate an index of the different covers realized across times.
2. *Cataloguing of covers builded with transparent materials.* We proceeded to cataloguing the above mentioned covers. The main purpose of this cataloguing is to increase the knowledges about the functionality of the different types of covers identified, by analyzing the features and checking the efficiency and adequacy to sites. In order to obtain all the necessary data, apart from a bibliographical research, all the parties (designers, manufacturers of glass components and systems, enterprises, museums, superintendences, etc.) involved in the realization of the analyzed european sites were contacted.

3. *Classification of covers.* Reposing on the collected data, the analyzed covers were classified according to: the type of protected area; the type of the adopted transparent material; the type of the applied microclimatic control. On the basis of the type of protected area, they have been identified three types of coverages:
- by shelter: without vertical closure;
- confined: with vertical closure;
- underground: hypogeous archaeological sites, obtained under the public space or in the basements of new buildings.

The spaces covered by *shelters* can be placed over some of the ruins, over a whole complex of finds or over an entire excavation area, or be anchored to an existing structure; they have the immediate aim to protect the archaeological remains from weather (rain, snow, etc..).
The *confined spaces* permit a physical and climatic separation of ruin from outside; they can distinguished in structures that completely enclose the ruins above the ground level and protective structures of underground excavations.
The *underground spaces* are obtained under the public space or in the basements of new buildings, which retain the archaeological remains, in order to make them visible to the public; This type of cover preserves the remains, maintaining unchanged the essential functions needed for a daily life of people.
Concerning to the materials, we distinguished the interventions by the use of: *structural glasses* (laminated tempered glass, laminated heat strengthened glass, laminated glass with tempered and strengthened plates); *heat-insulating glass* (laminated glass with an air gap, laminated glass with colored glass, laminated glass with silk-screened glass); *polycarbonate.*
With regard to microclimate, different roofing systems should have more than one type of control: *natural ventilation; shielding systems* (curtains, glass treatments, screened grills, etc.); *artificial ventilation system or air conditioning.*
The purpose of such classifications is to capture in some interventions the effectiveness of solutions, in particular towards the protection of finds from the solar radiations.

THE ROMAIN VILLA DEL CASALE AT PIAZZA ARMERINA

An emblematic case of cover is the *Villa del Casale* at Piazza Armerina (Figs. 2, 3). The villa, dating back to IV AD century, is one of the most important tribute of the Roman period; due to the good state of mosaics's preservation, it shows us a few moments in the life of the ancient Romans. The design for the cover of the finds (1957-63) at the time was placed under the supervision of a ministerial committee of experts chaired by Cesare Brandi, who gave the mandate to architect Minissi to found some solutions for *on site* mosaics preservation.
The constructive system of protective cover, today discarded and replaced by an opaque steel cover, with a roofing surface made of transparent *perspex* panels. The vertical enclosure were made partly by wavy surfaces, partly by lamellar surfaces (shutter type). The aim of this intervention was to ideally reconstruct the original space, allowing the visit of the complex avoiding the passage of the auditory on the mosaics, and isolating the finds from the weather, without removing them the maximum illumination [6].
At that time, the contribution of microclimate experts was not planned, because of a lack of knowledges. Firstly the interaction between environment and constructions was not considered.
Furthermore, the changes to the original design over the years, with the closure to the peristyle, reduced the ventilation of the spaces, originating the formation of a thermal environment that was not appropriate for the preservation of the finds, resulting in a mosaics's deterioration [7].
In addition, we have to consider the deterioration of the original material used for the cover, no longer transparent, but yellowed.

CURRENT EXAMPLES

Today the opening of archaeological sites are the result of interdisciplinary collaborations, discussions and debates. Many times these sites are situated in historical and artistic high value

complex, built with easily perishable materials: the fragility of mortar, plasters, floors, etc is well known. Several aspects are involved: protection, preservation, improvement of ruins, public use. The choice of cover must be carefully considered: it implies a reflection on his objective need and a determination of the costs of their construction and maintenance. Even the insert of a simple shelter is a considerable change that should not conflict with the conservation of a finds, considering them as a part of a historical authentic document. The solutions adopted must consider, apart the specificities of each excavation, even the environmental and climatic conditions of the area. The installation of protective structures:

-from the architectural point of view needs to be addressed by the criteria of restoration;
-from the museological point of view can not be separated from the respect of tangible and intangible qualities of the structure;
-from the structural point of view needs to ensure safety conditions, adopting appropriate supports and anchors, minimizing physical contact between the designed components and ancient constructions;
-from the physical point of view is necessary to exclude technical solutions that develop a microclimate condition which could generate harmful conditions to the finds.

The complex of the choices is very complex and articulate. Today there are new technologies, ever more efficient materials and more advanced software, that allow to evaluate the microclimatic conditions of the environment and to study the efficiency of different configurations before the realization of the covers.

In the field of transparent covers, differently to the case of Piazza Armerina, thanks to technological developments, in recent years were realized interventions able to balance transparency with envelope preservation. Between the classified covers, we identified three cases differentiated by type of protected area: the cover for *Juval Castle* (by shelter), the protective intervention of the ruins of a *Roman Limes Gate* at Dalkingen (confined space), the cover of ruins at *Plaça de l'Almoina* in Valençia (underground).

At Juval has been made a shelter (Figs. 4, 5), which formally takes the characteristics of ancient roof, but made of glass, that ensure the recognition of the intervention. The cover must protect the old walls from further collapses and make usable the space for the exhibition of sculptures. It was choosed a laminated glass cover, equipped with an inner sheet with slight colour to manage the solar radiations. From the microclimatic point of view, the cover does not completely closes the ruins, leaving additional storey and side openings which provide a natural ventilation.

At Dalkingen the cover consists of a laminated glass box that followes the old heights of the constructions (Figs. 6, 7): it is a confined space operant for the improvement and use of the ruins. A closed glass building would heat up so intensely in direct sunlight that it could not be used without thermal measures. From a microclimatic point of view, a ventilation expert's report showed the necessity to guarantee permanent transverse ventilation in the building, that allows maintenance of ideal climatic conditions for the finds. This is achieved by a circumferential ventilation shaft at the transition of the glazing to the ground and by glass ventilation dampers along the gable edge of the south façade. The inclination of the shelter building boosts the resulting chimney effect, as the hot air is dissipated at the highest point and thus no heat accumulation can develop below the roof. The indoor temperature at the height of two meters, was never higher than three celsius degrees over the outdoor temperature [8].

At Valençia the finds stand under the ground level and they can be observed from the square, trought a glass coverage surfaced by a thin coat of water, placed upon the ancient roman thermal baths (Figs. 8, 9). The transparent cover is made of glass selected for its load-bearing capacity (laminated glass).

With the aim to minimize the UV radiation that pass trought the glass coverage, in addition to the protection guaranted by the water coat, a specific filter was placed under the glass coverage.

To avoid the occurence of condensation problem under the glass coverage, was planned to mantain the temperature of the water coating higher than the outdoor one. But after the installation of all necessary items, we found that it was not necessary, because the air

conditioning system, placed inside the site, was able to avoid the condensation and manteining the correct degree of humidity. The preservation of the finds is guaranteed by a museum management: the areas are climatized constantly by an artificial air-water system to mantain the environmental values assigned by the technicians. The whole system is controlled by a purposely realized software. The museum works correctly by two years, without problem related to condensation and environmental parameters. From over two years the museum successfully operates, without any problems of condensation and maintenance of desired conditions.

RESULTS

Analizing the three examples, different for types of covered spaces, we should observe that for the preservation purpose, we are in front of different scenario:

1) the shelter, consisting of an open space system doesnt need an additional condition system to mantain the correct environmental parameters. The only shrewdness adopted was a little pigmentation of the coverage glass finalized to obtain a best shielding.
2) closed spaces: a natural ventilation system was specifically designed to mantain the correct environmetal conditions.
3) underground spaces: in this case, besides an anti-UV film and a water coating, was installed an artificial air-water system to mantain the microclimate environmental conditions.

Moreover, while the first two examples are found in Countries belonging to a temperate bioclimatic zone, the third example is relative to a site that is located at Valençia, characterized by hot and humid Mediterranean climate.

CONCLUSIONS

The insert of protective structures requires a careful architectural, technological and physical-technic planning. Indeed, it was found the presence of protective structures, both in Italy and abroad, that created problems after realization; those technical problems, resulting from design flaws of materials, arise from lack of consideration of microclimatic control and climatic characteristics of the archaeological area [5]. Half century after the contruction of Piazza Armerina's coverage, there are many examples of transparent coverage in Italy and Europe with different types of protection that are evolved into increasingly sophisticated and efficient forms and technologies. These interventions presuppose, for their success, the interdisciplinary collaboration of experts in various fields; among them the microclimatic control is a priority especially in the case of covers with transparent materials.

ACKNOWLEDGEMENTS

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FIGURES

Fig. 1 – House of Nettuno and Anfitrite at Ercolano, Italy.

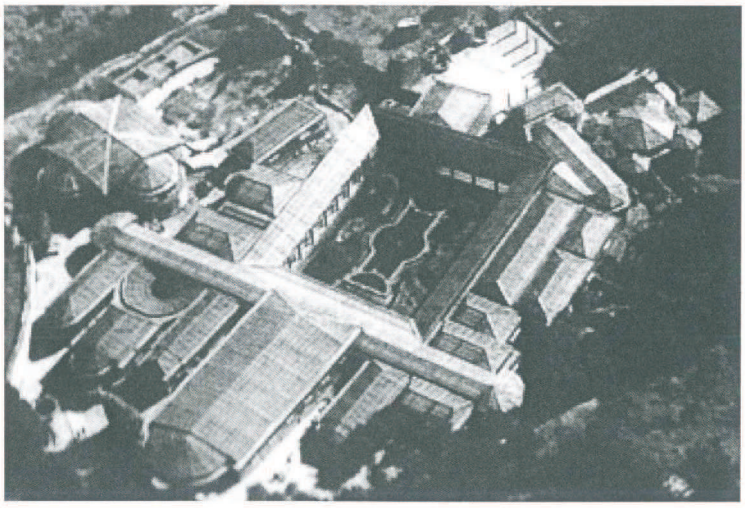


Fig. 2 – Villa del Casale at Piazza Armerina, Sicily (1957-63).

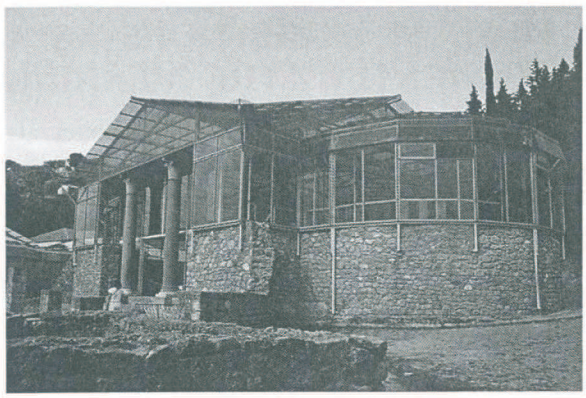
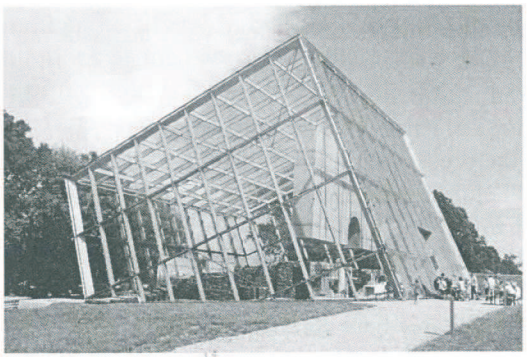
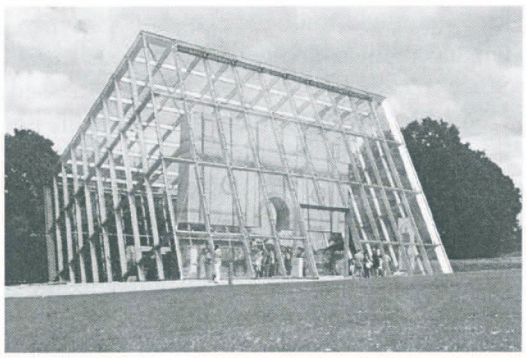


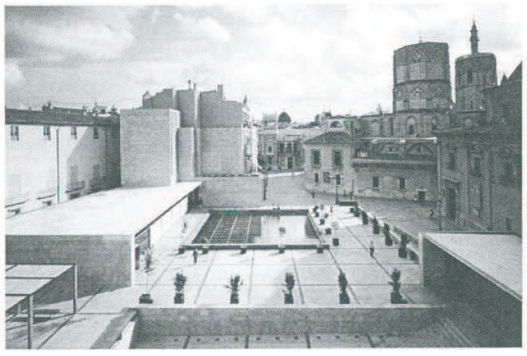
Fig. 3 – Villa del Casale at Piazza Armerina, Sicily (1957-63).

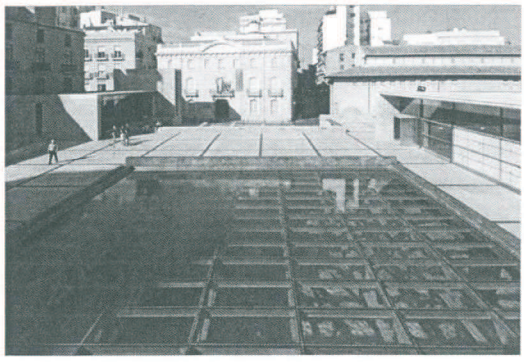
Figs. 4, 5 – Juval Castle, Itay (1997).





Figs. 6, 7 – Limes Gate at Dalkingen, Germany (2010).





Figs. 8, 9 – Plaça de l'Almoina, Spagna (2006).

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