



**Science,
Technology** and
Cultural Heritage

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ABSTRACT: The aim of the paper is to provide a unitary framework of the complex operating process that is at the base of a restoration project of monuments and historical sites, in its theoretical, methodological and technical basis. On the strength of an overview of some case studies, an operative methodology that involves all phases of the project (documentary research, historical and evolutionary analysis, survey, diagnosis, structural rehabilitation and architectural restoration) is proposed and discussed. The themes are not confined to a defined subject area but open to different connections and allow to propose the refurbish on Cultural Heritage, with actions of knowledge, research, analysis and design. The restoration project has an articulate development whose borders must be defined every time in relation to many factors, such as the architectural typology, the building characteristics, the state of conservation. In a restorative view, which implies static consolidation projects, reintegration and musealization of ruins, and conservation and new plans, it is essential to act with an integrated restoration. It is based on recovering of the historical, architectural, and scenic components to restore the monument's interaction with the contemporary and urban architecture.

1 INTRODUCTION

The restoration project has a complex development. Its borders can not be defined exactly, but they should be researched according to the architectural type, the knowledge of materials, the construction requirements and the new functions, as well (Torsello, 2005).

The paper aims to give an overview of projects in which the restoration rules are applied always in harmony with the built heritage, also using contemporary forms. The possibilities are endless because any action has precise features that restrict the design choices and recognize the accuracy of the final project (Carbonara, 2007). The historical authenticity must be respected; the restoration should be suitable to built heritage and based on a historical research; at the same time, it should also be functional and expressive from the archaeological point of view. This is the only way to ensure the quality and the correctness of the intervention.

In the past, restoration, between theory and practice, fluctuated between several opposing ideas: the French architect Viollet Le Duc sustained the building completeness and the stylistic unity; he advocated the reconstruction of the missing parts and the elimination of the added elements; the English art critic John Ruskin affirmed the preservation of the building's authenticity, refusing any form of intervention. While in Italy Camillo Boito rejected the monument falsification and declared that the only suitable approach was to make new intervention identifiable as a modern addition: this theoretical approach is known as the "philological restoration".

According to the theory of the Italian engineer Gustavo Giovannoni, in the "scientific restoration" all phases of the monument's history had to be respected. Therefore, the ancient monuments should have been restored and not reconstructed. Indeed, the Cesare Brandi's theory as-

served that the conservation had to guarantee the aesthetic and historical identity of the monument.

Nowadays, the aim of a restoration project is to preserve the material consistency of the buildings through new actions which allow to hand down them to the future. The architectural conservation defines the process to preserve the (historical and material) integrity of the built heritage through interventions carefully planned. The purpose of the restoration is to bring back the lost shape of the monument, to safeguard its integrity and to plan the maintenance actions that retains the efficiency of the monument (Masini, 2005).

For these reasons, the restoration project of cultural heritage shows the gap between conservation and enhancement, between integration and completion, between conservation and structural improvement and between conservation and transformation, as well. This paper analyzes the restoration project of 5 monuments, emphasizing criteria and techniques adopted in each case.

2 THE RUINS BETWEEN CONSERVATION AND ENHANCEMENT

The ruins are on the borderline between the immortality of the materials and the degenerative effects of time. The project on the ruins can not propose a renovation through a reconstruction of its original shape, because this would produce a "fake" that removes the historical dimension of the architecture: the main purpose of a restoration must respect the monument in its historical development (Manieri, 2006).

So, the projects must be clear, the new solutions must be recognizable, reversible and designed to be highly flexible. The characteristics of the original structure must be integrated with the new architectural elements. This is the approach used in the projects below described.

2.1 *Balvano Castle*¹

The first case study is the fortified village of Balvano, located in north-west of Basilicata. It is an example of defence system built between 10th-11th century.

The Castle is located on a rocky spur emerging about 80 m. The Castle has undergone several renovation and restoration interventions. Today the Castle is a ruin, completely abandoned.

After the identification of the degradation and instability, a choice of suitable interventions has been defined to stop the phenomena of deterioration. Interventions of reinforcement, conservation and innovation have also been considered. The project aims to replace the image of the Castle in the modern way through new functions. A hypothesis of a new use of the Castle involves the design of an integrated element added to the primitive structure, in accordance with the fundamental principles of conservation and enhancement of the medieval Castle.

The restoration and recovery projects are divided into two main types. Each one corresponds to an element of the fortification. For the older building a conservative and static reinforcement is made through small and recognizable additions. The Castle is transformed into a Fashion Academy (Fig. 1).

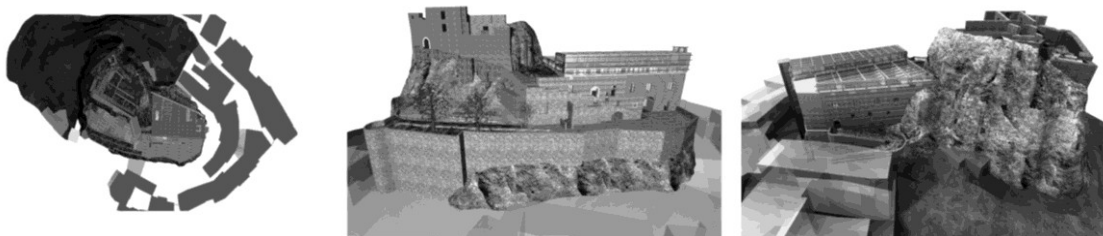


Figure 1. 3D model. Balvano Castle (Potenza, Basilicata)

¹ This project of Balvano Castle is an extract of the thesis "Il Castello di Balvano: una nuova identità per un monumento abbandonato" written by Manuela Scavone, co-author of the paper

A new element realized using modern materials (such as steel and glass) has been assembled to the timber frame to bring the surrounding landscape inside the Castle. The glass roof is configured as a glass box that incorporates the static structure of building. This new use is possible thanks to the large availability of space and good flexibility of the solution, compatible and respectful of the ruins: the ancient and irregular forms are opposed to linearity and geometry of the "new" ones.

2.2 *Accio Tower*

The second project is related to Accio Tower (Basilicata), part of an articulated defence system built to control the territory. It is a Norman Tower, with a massive wall structure and divided into many overlapping levels. The Tower is affected by instability: in fact the collapse of the western façade has weakened the resistance of the remaining structures.

The purpose is to keep the historical value of the Tower, to repair its structural parts and reducing the material degradation. According to these considerations, the following explanation of the project shows a reversible and recognizable intervention for the safety of the structure, in order to allow future actions on the architecture as well as to show the sign of the past.

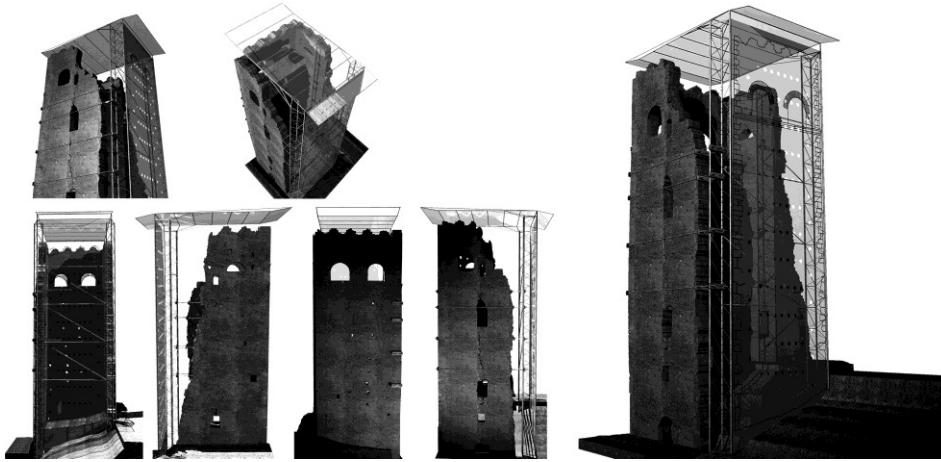


Figura 2. 3D model. The Accio Tower (Matera, Basilicata)

The interventions leave the architectural structure in ruins (Fig. 2). It is proposed the restoration of the three façades, renouncing to rebuild the top and the collapsed face. However, the disconnected masonry and the heterogeneity of the materials make necessary the application of strengthening tie roads positioned in strategic points in order to avoid further collapses.

The tie roads are connected to a light metal structure (aluminium), that consists of a mesh of triangulate elements in order to transfer the stresses to the vertical frameworks. Furthermore, this structure in aluminium has a multi-purpose use, such as support for the lighting and the anchoring of the completion panels of different materials (such as glass, wood, plastic, textile, etc). The shape of the collapsed façade is drawn on these panels in order to visualize the original image.

3 THE GAP BETWEEN INTEGRATION AND COMPLETION

The project of integration of an architecture achieves a replacement of the missing parts with new ones, distinguishable from the original, so that the restoration does not falsify the artistic or historic evidence. This approach represents a traditional way of maintenance, based on replacing the decayed or collapsed elements with identical, but recognizable, new ones. The reconstruction and integration works are only acceptable if carried out on the basis of detailed documentation, essential for the building knowledge.

3.1 *St. Leone Church*

The Church is between a historical village and the ancient walls of the castle's ruins. It was partially destroyed by a major earthquake, in 1980, and then partially demolished. The Church, built along a longitudinal axis, has the church tower attached to the façade and the large dome closes the presbytery. Currently, it is in an evident state of abandon and decay. There are isolated and widespread fissures, the floor is collapsed and there is no roof, demolished after the earthquake.

The restoration project aims to identify the parts of the Church compatible for the reconstruction and to make recognizable the restoration intervention (compared to the original parts).

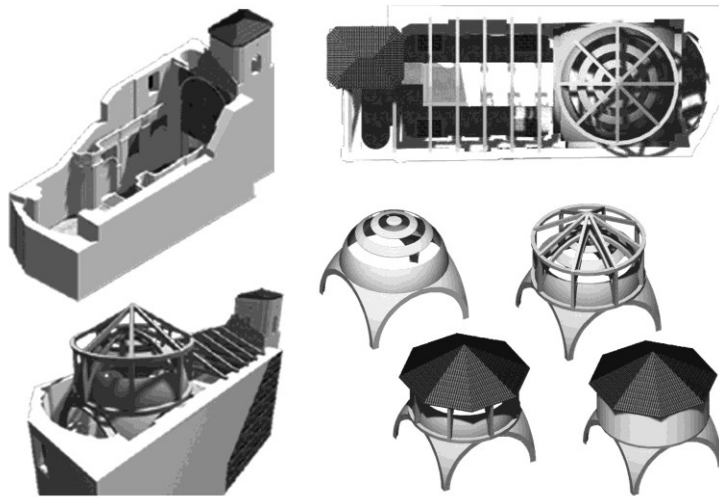


Figure 3. 3D model. St. Leone Church (Salerno, Campania)

Although the project adds a dome-shaped structure and several vertical diaphragms, it allows a reprocessing of the original shape of the Church (Fig. 3). The project solves the static problems, creates suggestive museum locations and preserves the harmony between the Church and the surrounding landscape.

4 STRUCTURAL IMPROVEMENT AND SAFETY

The projects improves the structural safety and preserves the architectural quality of the elements as well (Carbonara, 2007). Any interventions aim to preserve the existing matter, without affecting its overall image. In case of several damages, the most common solution is the reconstruction of entire parts of the buildings. In exceptional cases, strengthening members (such as iron tie rods, plates and buttresses) must be added. This section provides a general description of the study case showing a methods to improve the structural behaviour.

4.1 *Vetrano Grange*

The Vetrano Grange is a rural construction. The tower of 14 m could be the first building built at the end of the 11th century. The oldest part could be from the same century. It is a square block, located behind the church. At the end of the 17th century, the building was abandoned. Now it is in a state of decay (Fig. 4).

The project does not seek an original stylistic reconstruction; in fact the vaults were built with contemporary techniques using corten steel and combining new forms and the existing environment.



Figure 4. Vetrano Grange (Matera, Basilicata)

The additional elements are recognizable from the existing base because of the use of different materials, so that the "old" and the "new" are discernible and don't deceive the observer. For the strengthening of the not collapsed vaults, the use of FRP (Fiber Reinforced Polymers) is considered.

5 THE REUSE BETWEEN CONSERVATION AND TRANSFORMATION

Each building has a different predisposition to be transformed; in fact, the reuse of a monument depends on how it is disposed to be converted. This predisposition is related to two factors: (a) the architectural typology and (b) the new use. Indeed, many typologies of monuments can be converted in many new uses, due to their wide spaces and the flexibility of the project. (Dezzi Bardeschi, 2008).

The aim is not to refurbish the antique but to create something new about geometry and chromatism, without neglecting its historical background. The project would recall the old architectural divisions and rhythms, the spatial hierarchies, the ancient traces, not to give back the "facies" (features) of historical form, but to recover the original structure, activating its suggestions.

5.1 *Brindisi di Montagna Castle*

The Norman Castle is a ruins of an ancient medieval fortification, situated on an impressive rock. In the 13th century, the fortified structure presented a complex and organic lookout and defense system (such as an observation tower, a fortified tower and a lower structure). The earthquake of 1456 severely damaged the Castle and in 1999 a violent blasts of wind caused the collapse of the walls.

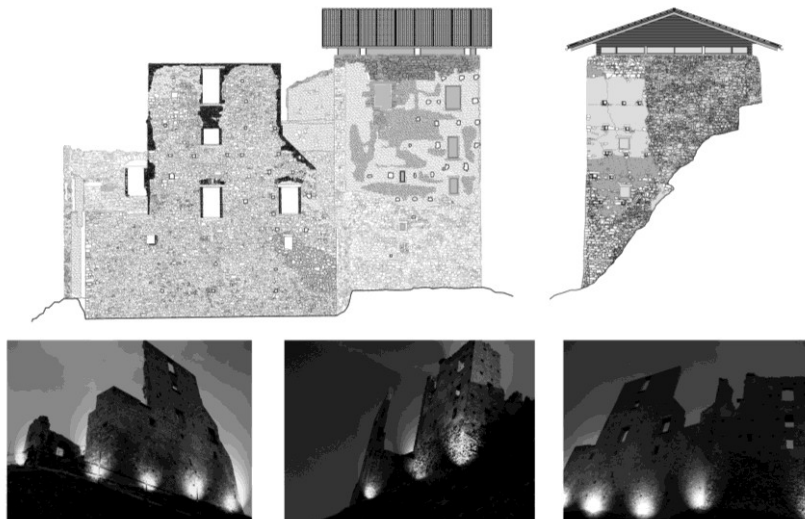


Figure 5. Brindisi di Montagna Castle (Potenza, Basilicata)

The aim is to increase the value of the building, through non-invasive actions. The first step of the project is the reinforcement of the existing walls through a work of "scuci-cuci" (method of patching) of the stone elements compromised by time and atmospheric agents.

The second step involves the removal of the embankment within the walls of the fortified tower, in order to have a new base for the foundations of the new structure in steel (Fig.5). This structure is built on three levels connected by a steel staircase and is closed by a timber truss supporting the roof. All these actions of structural reinforcement of the walls facilitate visitor access and provide a new panoramic viewpoint overlooking the site and the landscape. The architectural and technological choices respect the existing complex and create a balanced dialogue between the original and the innovative parts.

6 CONCLUSIONS

The approaches to restoration project propose the constant care of the architectural object, that is the central point of the theoretical considerations and practical efforts.

The suggested actions are always between conservation and restoration; the reconstruction, integration and completion could be acceptable only if based on a new project drawn on the knowledge of the ancient. The paper examines a topic that is a part of the contemporary debate of conservations and is related to several monuments and architectural complexes that are in state of decay or that have not a social function or economic value.

From a perspective of preservation of the cultural heritage, many approaches are presented: the elimination of the additions; the recovery of the large structures of the buildings; the respect for materials and analysis of modern construction techniques; the design of structural and static reinforcement and the definition of the spaces required by the new use.

Minimalistic works have been proposed, which does not affect the structures, unless needed for safety reasons, but rather they allow to use all these monuments in its current condition, showing the signs of time and human activities. This is an experience that suggests a possible new policy for managing the cultural heritage.

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