A multidisciplinary approach to the sustainable restoration of historical buildings: the case study of the ex-convent San Francesco in Piazza Armerina, Italy

Tiziana Basiricò1; Katia B. Fazio2
1University of Enna, Faculty of Engineering and Architecture, Enna, Italy; 2Association of Engineers, Enna, Italy

1. Multidisciplinary approach to restoration “by necessity”
Recent Italian and European restoration interventions on heritage buildings, damaged by unexpected disasters, underline the need, increasingly shared, of multidisciplinary approach to the intervention responding to the new regulatory requirements without altering their “cultural value”.
One of the most debated issues of these type of restorations, called “by necessity”, is the rebuilding of parts, more or less extensive, often compromising the building’s static integrity.
In particular, there are two debated lines of thought: the “non-intervention” methodology that leaves the building in a state of ruin, transforming it into memory of the disastrous event or the “intervention” methodology with all the possible actions that it can take.
One possible intervention is the restoration of the original in the form and with the same consisting materials (“where it was and how it was”). Another possible intervention concerns the use of new materials and techniques to be clearly distinguishable from the original.
The main objective of the research, whose partial results are presented in this paper, is to demonstrate the opportunity to deal with a multi-disciplinary approach the complex issues related to the restoration of cultural heritage. The case study chosen is the ex-convent of San Francesco in Piazza Armerina, an historical town in the province of Enna, best known for the archaeological presence of roman “Villa del Casale”.
The research was conducted according to the approach of needs assessment/performance analysis of the restoration. A detailed analysis was carried out through archival and instrumental research that returned the historical and technological aspects and, as well as the evolution and transformation of the construction in time.
Both the historical analysis and diagnostic tests allowed the evaluation of the residual and potential performance, the existing constraints and the framework of the new requirements, to establish priorities and objectives of the intervention project.

1.1. Historical analysis and state of preservation
The historical analysis allowed us to establish the inviolable cultural and architectural features in the restoration project of the building, subject of various transformations and stratifications over the centuries, and sadly in need of substantial structural interventions.
The building complex of recognized cultural value, consisting of the church of S. Francesco and the homonymous monastery, is located in an urban context of high architectural quality, thanks to its proximity to the former Bishop’s
Palace of seventeenth century, nowadays a Diocesan Museum, and the Cathedral, dedicated to Holy Mary of Victories (XVII cent.).
The current plan of the architectural complex is derived from a series of expansions during the centuries.
The original part of the monastery dates back to 1392, when King Martino and Queen Mary donated to the Franciscan friars the existing castle, the “Castrum Regiae”, along with a money compensation in exchange of the area of their convent (probably built between 1292 and 1318) just to build there the new castle (nowadays the Aragonese castle) (Fig.1).
At first, the monks adapted the various spaces and the Regia church to their needs without many changes. The first configuration of the convent “L-shaped” is visible from the incision of the seventeenth century (Fig.2) showing the situation before the construction of the church of San Francesco, with its magnificent bell tower, the enlargement of the convent in the west and the construction of the quadrangle cloister, porch along the four sides, which the southern side encompasses throughout its length one wall of the old castle (Fig.3), and ornated “... with beautiful silica stone columns and huge reservoir of water in the center”, dated according to the historian A. Roccella between 1605 and 1644.
Towards the end of the century a long building was added to the north, on whose facade on Cavour street stands a balcony in local stone made by Gagini’s school. At the same time probably new buildings above the arcades north and east adjacent to the church of San Francesco were built. After the unification of Italy and the known laws of expropriation of ecclesiastical property, the monastery became the property of the City and was transformed into a city Hospital named “Michele Chiello.”
Con i necessari interventi di adeguamento a struttura ospedaliera l’intero edificio subisce radicali modifiche ed adattamenti come la costruzione sul finire del secolo XIX di un nuovo padiglione sul lato ovest del convento destinato a tubercolosario e denominato “Reparto di Pietra”, come si evince dall’iscrizione sul prospetto, in onore del benefattore Avv. Gaetano Di Pietra.
The building, because of the necessary interventions to adapt the structure to the hospital, underwent radical changes and adaptations among which the construction at the end of the nineteenth century of a new pavilion on the west side of the convent, destined to tuberculosis therapy and named “Di Pietra” ward, as the inscription on the front shows, in honor of the benefactor Mr. Gaetano Di Pietra.

At the same time the body of the building above the south porch, visible in the photograph of the ‘20s (Fig.4), probably was built, using floors in iron and bricks also leading to the realization of a long balcony on the south porch and an overhang enlarging the terrace in front of the tuberculosis pavilion on the west side of the porch.

In September 1939 the administration of the Chiello Civil Hospital made application for sale to the administration of the cathedral (Fabbriceria) for the building, then called the “Old Fatebenefratelli Hospital”, adjacent to the Chiello hospital. The administration of the Cathedral decided not to sell the property but to give it in perpetual lease.

But only in the 50s the old hospital was demolished to build a new large building, with a rectangular plan, adjacent to the south side of the cloister.

The design of this building follows the floor plan of a draft drawn up in 1885 for the construction of the building of the “Fidecommissoria” of the Cathedral of Piazza Armerina, as reported in the documents preserved in the archives of the Cathedral.

The closing of the south porch probably dates back to this period (Fig.5), to make an emergency room, and the reconstruction of the floor above this porch also encompassing the balcony as well as the construction of new buildings outside of the west part.

With these latest changes to enlarge the spaces needed for hospital activities, the convent, especially the cloister, changed the original shape and intended use (Fig.6).
By the end of the seventies, the building appeared unsuitable to accommodate new and more modern health services and in 2000 it was abandoned exposing it to slow and progressive deterioration and vandalism. In particular, the act of vandalism of 2005 concerning the theft of four capitals, with the destruction of the columns, led to the inexorable collapse of some of the arches and the overlying vaults. The drums of the damaged monolithic columns and the capitals were found and are currently deposited waiting for their relocation. Some provisional measures were immediately undertaken to prevent further collapses (Figs.7-8). But now, after more than eight years, the problem of reconstruction is still actual.
1.2. Diagnostic-constructive analysis

The state of preservation of the building is somewhat compromised. In particular, the cloister is the part of the building with more failures, and just for this, it was investigated.

Some instrumental investigations were performed in order to know the materials and construction techniques of the vaults, arches and columns to be able to predict the most suitable type of reconstructive intervention. In particular, the diagnostic phase focused on thermographic investigations, which allowed us to identify hidden structural elements and led to a series of subsequent specific investigations, and endoscopy investigations that allowed to go back and redraw the exact stratigraphy of the vaults.

These structures of small thickness made principally of gypsum and this material was used both as a binder and as aggregates called “gessotti”. The gypsum, in fact, was one of the “base” materials used in ancient buildings as available on site.

This simple construction technique foresees the vault’s load bearing capacity to the binding capacity of the gypsum and the monolithic structure permitting the use of thicknesses of about 10 cm in the keystone.

The effects of the forces generated by the various vaults were limited on one side by the actions of mutual contrast exercised by drawn alongside vaults and on the other by the tie-beams.

In particular, the vaults of the Western and the South porch are currently unloaded thanks to the upper slab of iron and bricks, made for the construction of the tuberculosis building.

By analyzing thermographies, some iron joists on the arches of the north and east arcade were discovered (Figs.9-10). This discovery led to carry out a detailed investigation by the removal of a portion of the plaster that confirmed the findings by means of thermography, namely the presence of longitudinal rods and some brackets (Fig.11).

Through the intersection of diagnostic analysis data and historical data, the realization of these beams can be traced back to the construction upon the northern and the eastern porch and in relation to the structure to the need to
better distribute the loads of the above elevations on the arches and in particular to create a tie-beam that could unload any tensile forces on the arches due to the new loads in the building walls.

2. Intervention guidelines for the reconfiguration of the cloister

The proposed project is one of the so-called restoration “of necessity”, i.e. intervention on damaged architectural heritage by exceptional events, such as earthquakes, or even, as in the case study, events following vandalism. This research focused on the study of the possible reconstruction of the vaults, the arches and the columns due to the need to protect this cultural heritage, but also to stop current process of irreversible destruction (Figs. 13-14).

At the same time the proposed intervention also includes a reconfiguration of the cloister through the demolition of all structures incompatible with the historical and architectural value of the building (valued by means of historical analysis).

In order to return to the configuration of the convent at its highlight of the articulated construction history, i.e., the one dating back to the seventeenth and nineteenth century, it was planned the demolition of added constructed parts upon the porch built in the second half of the twentieth century with incompatible construction techniques.

The project also foresees the demolition of the compartments in the ground floor closing the south porch, the rehabilitation of the beam and the recovery of iron and bricks slabs.

With regard to the vaults, arches and columns it is scheduled to undergo reconstruction and static proportionate consolidation on the acceptable limit of seismic risk and the architectural character of the building resulting in the improvement of the seismic performance.

As for the remaining parts it was planned to consolidate the vaults and arches and tensioning of the tie-beam, as well as cleaning of the columns.

Often, unfortunately in “restoration by need” some interventions to rebuild provoked more damage of the disaster, completely distorting the readability of the original techniques and morphology of the various technical elements and
causing future decays.
The proposed project is intended to ensure a continuation of life without reconstruction the existing vaults, capitals and columns “in style”, hiding the actual intervention, solution widely used in current practice. The intervention also does not want to propose contemporary technological solutions that can significantly change the static and aesthetic equilibrium of the building.
In order to highlight the new intervention, different solutions, tending to design a differed structure from the original elements not for geometric shape but for the quality of the used materials, were analyzed. The chosen intervention is placed in an intermediate situation between the extreme conservatives and promoters of integration of the “new” in ancient.
The intervention, in particular, proposes the use of traditional materials and techniques, such as the bricks and mortar of gypsum for the vaults and lime mortars for the columns, but different from the original ones declaring the contemporaneity of the action, based on the principle that damage due to the eventual disastrous event and the subsequent restoration become part of the history of the building.
In particular, the reconstruction of the part of collapsed vault is designed through the realization of a rib, modeled on the existing vaults, which will allow the integration of the missing elements of the arches and the construction of the collapsed vault with bricks so-called “pantofoli” (of reduced thickness) placed in work with gypsum mortar, thus reconfiguring and rebalancing the vault.
In addition, portions of the remaining vault will be reinforced with injections of fluid gypsum mortar, which penetrates between the “gessotti,” and with a cast of gypsum mortar that will well merge with the new and the existing parts. The choice of the gypsum mortar for the reconstruction of the vault was due to the desire to use homogeneous material with the original and to use expansive material that gives load capacity at the vault.
Of course, these interventions will be carried out from the extrados of the vault through the elimination of any existing layers and through the displacement of some existing brick slab of floors above the vaults.
Regarding the columns and the capitals, found in good conditions, the intervention involves the junction of several pieces of the columns and capitals with a stainless steel bar (1 cm in diameter) through the realization of a small central hole in the various pieces and the junction of parts with expansive mortar compatible with the stones of the columns.
As for the missing capitals, the intervention involves the construction of a ca-

Fig.13 - Detail of the floor above the vaults; Fig.14 - The Western porch partially collapsed
pital in natural stone material that reflects the volume of the existing one but without any decorative detail (Fig.15).

Finally, it was expected the power-up of all the tie-beams and the restoration of missing ones.

The lines of action proposed demonstrate the ability to perform, without particular problems in the preservation of the historical, ancient structural elements using traditional materials without the use of cement or realizing invasive and dissonant structures for the ancient built.

Notes
1 Recognition of cultural interest in art. 10 of Legislative Decree no. 42/2004 and subsequent amendments by Decree of Department of Cultural, Environmental and PI of the Sicilian Region n. 6904 of 02.07.2008.
2 Acknowledgements for the architect Salvatore Carmelo Conoscenti and arch. Francesco La Morella for documentation kindly provided.
3 Year in which Pope Giovanni XXII authorized the Order of Franciscan friars to buy land for the construction of the convent.
4 Roccella Alceste, *Storia di Piazza dalla sua fondazione al 1878*, unpublished manuscript.
5 Report of the project of the restauration of convent of San Francisco (ex Chiello hospital) of Piazza Armerina to be allocated to the Diocesan, Bishop and the Clergy House written by the architect Francesco La Morella and Engineer Maurizio Marino.

References