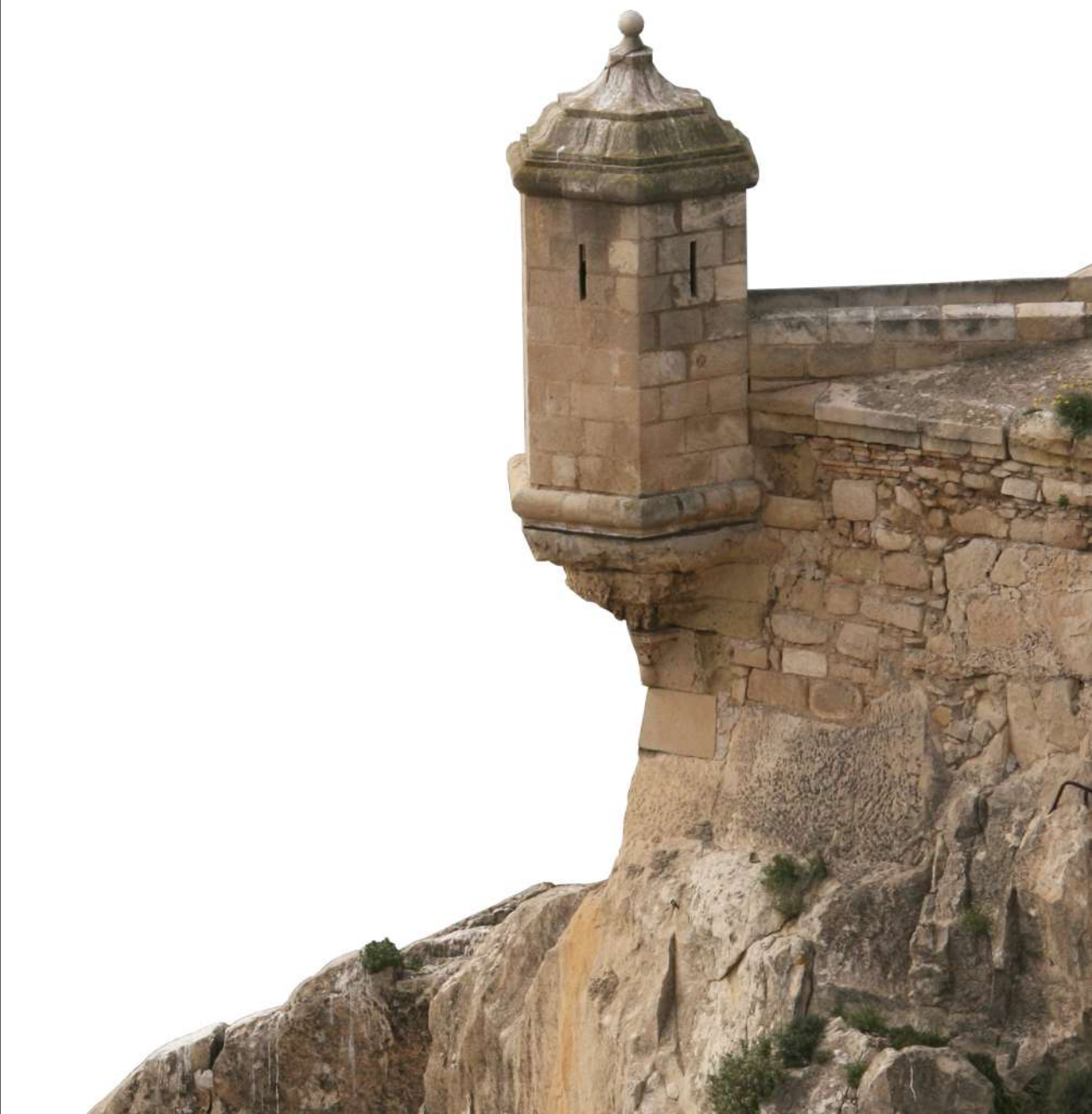
6 DEFENSIVE ARCHITECTURE OF THE MEDITERRANEAN
XV to XVIII Centuries

Ángel Benigno GONZÁLEZ AVILÉS (Ed.)



DEFENSIVE ARCHITECTURE OF THE MEDITERRANEAN

XV TO XVIII CENTURIES

Vol. VI

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DEFENSIVE ARCHITECTURE OF THE MEDITERRANEAN

XV TO XVIII CENTURIES

Vol. VI

Editor

Ángel Benigno González Avilés

Universidad de Alicante. Spain

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Note

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Este congreso está realizado bajo el marco del Proyecto I+D+i de título "TORRES DE VIGÍA Y DEFENSA DEL LITORAL VALENCIANO. Generación de metadatos y modelos 3D para su interpretación y efectiva puesta en valor" referencia HAR2013-41859-P, cuyo investigador principal es Pablo Rodríguez-Navarro. El proyecto está financiado dentro del Programa Estatal de Investigación Científica y Técnica de Excelencia, Subprograma Estatal de Generación de Conocimiento, del Ministerio de Economía y Competitividad (Gobierno de España).

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Preface

The FORTMED Congress celebrates its third edition in October 2017 in Alicante. From its beginning in Valencia and its later jump to Florence, the interest for the investigation on the fortified heritage has only been growing, as much in extension as in depth. After the launch of this congress by the research group of the Polythecnic University of Valencia ``Architectural Surveys´´, with extensive experience in the study of fortified towers of the Spanish Mediterranean, led by Pablo Rodríguez-Navarro with the collaboration of Teresa Gil Piqueras, the witness was collected by Giorgio Verdiani, Scientific Director of the Architectural Information Technology Lab (LIA), Università degli Studi di Firenze. Both editions had a large forum of researchers of different nationalities who shared their experiences in the study and intervention in fortified sets of the Modern Age. Historians, architects, engineers, archaeologists, geographers, cartographers and researchers from multiple disciplines exposed the fruits of their research, the lines they are designing for the near future, and a set of intervention projects in the fortified heritage.

In this third edition of the congress, the original idea has been to gather more inclusive, real and actualized data leading us to the level where research regarding this matter should be more readily available in the 21st century. The theme of the conference has been focused on western Mediterranean fortifications (Spain, France, Italy, Malta, Croatia, Albania, Greece, Turkey, Cyprus, Tunisia, Algeria and Morocco) dating from the 15th to the 18th centuries, including the rest of Mediterranean countries and the fortifications of this era that were built overseas (Cuba, Puerto Rico, Philippines, Panama, etc.). In this edition of Alicante has opted for a continuity in the thematic blocks, although some minor modifications have been introduced. Mainly the "Port and Fortification" line, due to the special interest of the Technology and Sustainability research group of the University of Alicante in the identification of the characteristics that distinguish the fortified set of the city of Alicante and the island of Tabarca. The debate produced by the different interventions of experts in fortified groups of coasts, and especially of the Mediterranean coast, is expected to be a clarifier of the proper elements of the Alicante heritage. The comparative analysis with other fortified settlements of the XVI-XVIII centuries, in their genesis and evolution, will help to contribute new values to the historical knowledge of the fortified heritage, and the way in which the intervention projects should be undertaken, both in their architectural conception, as well as of the uses that could be introduced and specific intervention techniques.

We hope that this new edition of the FORTMED congress will strengthen the bonds established between different researchers for a more effective collaboration in the knowledge, maintenance and intervention in the fortification heritage complexes. The interdisciplinarity that should be promoted in the master plans from the public administrations will certainly be reinforced with this type of events. The exchange of experiences, research results, and difficulties in interpreting the intrinsic values of each heritage element will undoubtedly be enriching. This is shown in many of the papers and communications presented at the congress, and included in these two books. Dive into the contents of more than 120 published works, peer-reviewed by members of the Scientific Committee, is an incomparable experience of the complexity that entails entering the soul of these architectural ensembles. It is a living architecture, often in daily use for cultural activities, playful, archival, etc., with very close and complex relationships with the urban plot or the landscape. Accessibility problems are

critical in the design of intervention strategies that strongly support the recovery of these patrimonial elements. In this sense, performances such as the mechanized accesses of the stairs of the Farm in Toledo, the architects José Antonio Martínez Lapeña and Elías Torres, or the elements projected in the walls of Pamplona, deserving in 2012 of the prize Europa Nostra, are worthy objects of reflection and approaches that shed light on this difficult task. Some of the communications presented reflect on how to deal with accessibility issues in other towns, including Alicante, such as Santa Barbara Castle and San Fernando Castle.

I would like to end by thanking Pablo Rodríguez-Navarro, President of FORTMED, for all the help he has given us in the pleasant task of organizing this congress. Thanks to Giorgio Verdiani, FORTMED chair of the last edition in Florence. Special thanks to the Vice-Rectorate of research of the University of Alicante for its constant support in the organization of the congress, and in the funding of the papers of the invited researchers. Thanks also to the Manuel Peláez Foundation and the Vice-Rectorate of Campus and Technology for their help in funding this event.

Finally, I would like to express my gratitude to all the authors of this publication for the quality of their contributions, their attitude in regard to the adequacy of the reviews and their patience throughout the editing process and registration. I also extend my gratitude to the Scientific Committee and the Organizing Committee for their selfless dedication and professionalism. It has been a pleasure to share with you all this year of intense work for the third edition of FORTMED in Alicante to become a reality. Special thanks to Ángel Benigno González Avilés, Secretary of the Congress, and Isabel Pérez Millán, for their good work and generous dedication. To Maribel Serrano and Asun Sempere, managers of the Department of Architectural Constructions of the University of Alicante. And Mateo Aires, who has worked as an intern in the many issues related to the management of the congress. It has been a pleasure to share this adventure with you.

Víctor Echarri Iribarren
FORTMED2017 Chair

Contributions

Built heritage research

Defensive Architecture of the Mediterranean. XV to XVIII centuries / Vol VI / González Avilés (Ed.)

The ruins of the Castle of Conti D'Aquino in Belcastro (Catanzaro, Italy). Conservation, reuse and accessibility

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Abstract

The castle of Belcastro (Catanzaro, Italy) is an interesting palimpsest of typologies, constructive and defence techniques, and also for repair and restoration, which documents the transformations of the fortification from the origin – probably the 13th century – up to the recent works of restoration. Built on the upper part of a small historical centre, the castle is the most important attraction and, with its massive *Donjon*, it overlooks the valley, characterizing a landscape which is rich in fortifications.

The essay traces the phases of the project of conservation promoted in 2005 by the local administration in collaboration with the University of Reggio Calabria. The main purpose of the project, which is now almost complete, is to integrate the technical tools and methods for conservation of the ancient structures with the strategies for the reuse of the fortification, fully respecting what remains of the original construction. By preserving all the traces of the past, the project enhances the history of the castle and, at the same time, tries to solve relevant problems of stability of the structures, particularly of the bailey, adopting reversible and non-invasive techniques for the reinforcement of the masonry. The same strategy is adopted to solve the difficult problem of accessibility to the *Donjon* with the use of removable elements.

Keywords: Belcastro, castle, conservation, accessibility

1. Introduction

In 2005, the local administration of Belcastro, in the province of Catanzaro (Calabria), thanks to regional funds, promoted a campaign for the study, conservation and reuse of the Castle of Conti D'Aquino. The initiative also involved the conservation of the Church of the SS. Annunziata which, together with the castle, can be considered the most important historical building of the little village (Mussari, Oteri, Todesco 2008)[1]. Today, only the medieval Donjon, built on a cliff, a later turret and part of the bailey remain. A wide parade ground, which circles the Donjon, and the little church of Saint Thomas are also part of the architectural complex.

The aim of the project, which has been agreed with the local administration[2], is the maximum protection of what remains of the original structures. For this reason, the limited funds were used to halt, or limit, the scattered degradation of building materials and structures due to protracted abandon and neglect. Some reversible and non-invasive techniques for the reinforcement of the masonry were adopted, also to prevent damage in case of earthquakes. The last part of the project regards the general

arrangement of the site and the accessibility of the Donjon.

This interesting experience was also the occasion to verify some theoretical issues of conservation, such as the problematic relationship between safety (both of people and structures) and respect for the authenticity of the complex, which can be considered an interesting palimpsest of construction and defensive techniques. A plan of intervention has been drawn up, where theoretical issues and technical choices matched.

2. Notes on the history of the castle

The origins of Belcastro are remote (Marafioti 1601, 215-217; Orlandi 1770, 163-168). The history of the ancient *Genitocastrum*, whose name was changed to *Belcastrum* by Roberto d'Angiò in 1331 (Camera 1860, 363), is related to the several feudal authorities which governed the little village over time (Martin 1999, 485-522). Among these, Falloc or Fallucca played an important role in the construction of the defensive system. They were Normans knights who ruled Belcastro from the beginning of the thirteenth-century to 1292. Then, the D'Aquino family succeeded, and obtained the title of Counts in 1331(Pellicano Castagna 1984a, 53-56). In this period, the medieval aspect of the fortress, whose denomination comes from the D'Aquino family, was defined.

Following a theory, which has still not found any confirmation, the castle of Belcastro could be one of the three fortress which Roberto il Guiscardo strengthened to hinder his nephew Abagelardo[3], who had settled near Santa Venerina (*«apud Sanctam Severinam, Calabriae urbem»*, Malaterra 1928, 59). However, historical sources do not explain where the three castles stood exactly; the castle destined to the Falloc family could be the one named Rocca Fallucca, near Catanzaro. The other two presumably stood close to Santa Severina. Although historians do not unanimously agree with this opinion (Severini Giordano 2014, 168), a new defensive structure, the "Castellaccio", was probably built in Belcastro in the same period of the construction of the Norman defensive system (11th- 12th century).

The Donjon of Belcastro is one of the most representative examples of both Norman defensive and residential structures in Calabria[4]. Unfortunately, due to the lack of historical evidence, the history of the construction of the castle is still unknown: the castle of Genitocastro is included in the list of the fortresses which Bertrand Artois, Captain of the militia of Carlo D'Angiò, had to defend in 1282[5]. It also was among the properties which the rebel Antonio Centelles was to return to Alfonso I in 1445[6]. Finally, the castle is quoted by Ferdinando of Aragon in a letter of 8 January 1460 where he suggests subtracting as much arms and ammunition as possible from the castle. He had an exact idea of the true quantity of arms within the castle as he had stayed there, «*in nostris felicis castris prope Belcastrum*»[7], at the end of 1459. In March 1489, also Alfonso, Duke of Calabria, was in Belcastro, but in the report of the visit there is no mention of the castle (Leostello 1883, 205).

From the analyses of the existing parts of the castle, it emerges that the Donjon was the principal element of the fortress. Before the realization of the external stairs, the access to the tower was possible through movable wooden elements which were connected to the ramp on the western internal wall. The location of the windows and the positioning of the holes where floor timbers were placed, suggest the presence of two different levels and an embattled roof-terrace. Instead, the spatial and structural organization of the underground part of the Donjon is still unknown. At the level of the main entrance, the traces of some underground spaces, probably used to store foodstuffs, are evident. However, as it was not possible to explore the basement of the tower, one can only suppose that at the base a water tank probably existed. Also the bailey, of which only few traces remain, is little known.

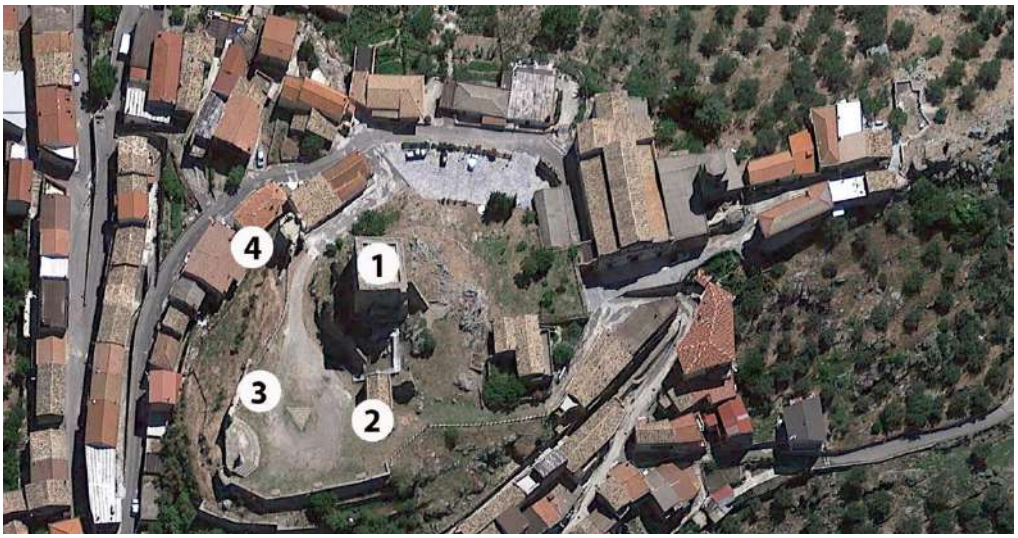


Fig. 1 Belcastro (Catanzaro), the architectural complex of the Castle of Conti D'Aquino: the Donjon (1), the Church of Saint Thomas (2); part of the Bailey (3), the turret (4) (google earth, June 2015, elaboration of the authors).

From a comparison with similar structures we understand that a previous enclosure was probably built all around the tower. Then, the fence was probably enlarged to include the parade ground, and the small church was dedicated to Saint Thomas (fig.1). Only scrupulous analyses, could confirm this theory.

The small tower at the entrance of the fortress was built later. It is characterized by two overlapping parts: the basement and higher block. The basement has a polygonal shape with battered face masonry which evokes the anti-towers of the Saint George rock of Castelnuovo in Naples and those of the castle of Venosa. This same typology of basement also characterizes the towers in the castle of Arena (Vibo Valentia), the Angevin tower of Castelcivita (Salerno) and the castle of Lettere (Naples). An elegant "redondone" separates the basement from the higher circular tower block. Traces of the crenellations, which possibly encircled the top of the small tower, are scarce.

A communication trench, which is not visible today, probably joined the upper part of the small tower and the bailey. Some elements, such as arrow slits, harquebusiers, large guns and machicolations, allow us to affirm that the small tower was built later than the Donjon. They also document a certain lack, in this area, in updating defensive techniques, after the development of military architecture, between 15th - 16th century. A vast opening, with an irregular structure, which is the result of the progressive ruin of the masonry all around a primitive window, can be seen in the middle of the only surviving part of the bailey.

From the limited traces surviving it is extremely difficult to suppose how the fortress was organized. The Donjon was probably the main shelter of the complex and the other parts of the castle were organized around it: the parade ground, bounded by the bailey, with the small tower at the entrance of the area, and maybe others similar along the border, of which there are no traces today. Some buildings probably stood in the parade ground and along the wall, together with the little church of Saint Thomas.

Bruno Mussari

Fig. 2 Belcastro (CZ), what remains of the bailey and the heart-shaped gap.

Fig. 3 Belcastro (CZ), the interior part of the Donjon. Ramps and walkways during the construction.

3. Theoretical issues and technical aspects in the project of conservation

The programme of interventions was organized in two parts: reinforcement of masonry and the reuse and enhancement of the entire site. The latter part of the project is now going to be completed, regarding accessibility to the Donjon.

As regards reinforcement of the masonry, the main problem was the structural stability of the small tower at the entrance of the site and, above all, of the remains of the bailey. While the Donjon was restored and strengthened in the 1990's, the masonry of the bailey showed structural damage due to abandonment and lack of maintenance. Erosion of the mortar, and the many gaps in the masonry, documented the protracted abandonment of the structures over time.

Therefore, interventions for mortar integration, reconstruction – where necessary – of parts lacking and protection of the top of the wall were planned. For all the integrations, compatible mortar was used, but different in colour and granulometry from the aggregates of the original. It was a minimally invasive yet difficult intervention, which also implied preventive training of the workers who did not have any practice with such kinds of work. The main purpose was not to alter the interesting stratification and information held by masonry, with the intervention.

Regarding the structural stability, the greatest difficulty was the vast hole in the remains of the bailey, caused by the progressive ruin of the masonry around the original opening. This discontinuity was on the verge of causing the collapse of the entire structure onto the houses below, with a high risk for people's safety. At the same time, the gap, whose shape over time was similar to a heart (fig. 2), had become the symbol of the little village, "u cori" ("the heart"), as people from Belcastro call it. They use it as a photographic set for every important familiar event and the image of the "pierced" wall also represents Belcastro abroad. Therefore, the project could not but consider the symbolic value of such a gap. It imposed an initial reflection on the significance of decay and on its double meaning (Oteri 2009; Oteri 2011): negative (when we intend it as a regressive phenomenon, which absolutely needs to be impeded) and positive (a symbolic element, the memory of significant historical events, and so on). This particular condition was the occasion to verify if the recovery of a "lacuna", even if realized with non-mimetic intentions, can always be considered the right solution or if an alternative way is possible, fully respecting the necessity to inhibit progressive decay of building materials and structures[8] (Treccani 1997). For this reason, all the invasive options dealing with the reconstruction of the "hole" had been rejected. Alternative solutions to support the masonry above the lacuna was studied.

The final solution, case of need, could help the structure to resist seismic stress. The intervention also involves preventive masonry reinforcement (mortar consolidation, targeted repairs of masonry, and so on).

Regarding the second aspect of the project, the fruition of the site, interventions for accessibility of the Donjon are now coming to an end. Some elements, such as the fence of the site, had the objective of delimiting the site, ensuring, at the same time, the safety of pedestrian paths and a better comprehension of the original plan of the fortress. Regarding accessibility of the Donjon, the main purpose was the historical building conservation, and thus, the project renounced designing accessibility for all visitors.

Considering the particular orographic condition of the site, accessibility for all would have involved a radical transformation. Looking at the question from another point of view, in the intention of the ancient builders, accessibility to the Donjon had to be inhibited for defensive reasons. This was considered a sufficient reason to design, in contradiction of the common practice, restricted accessibility to the main tower.

In particular, a system of ramps made up of a steel structure and wooden steps permits reaching the Donjon through the parade ground. Mediterranean plants, in part already existing, hide the vertical elements of the steel structure which have different heights due to the rough orography of the ground. A path organized of stairs and balconies, anchored to the massive masonry, permits crossing the Donjon from the ground floor to the plan of the original glacis (fig. 3).

Once this phase of the project is completed, the Donjon will again take on the function of special viewpoint, not for defensive reasons, as in the past, but to appreciate the splendid view of the neighbouring landscape, as far as the Ionian coast.

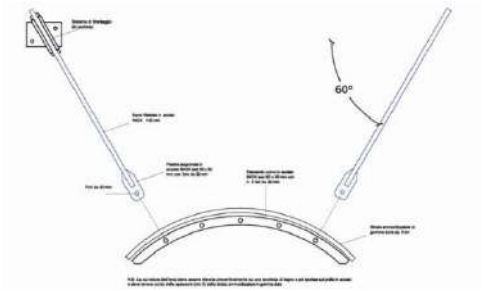
Annunziata Maria Oteri

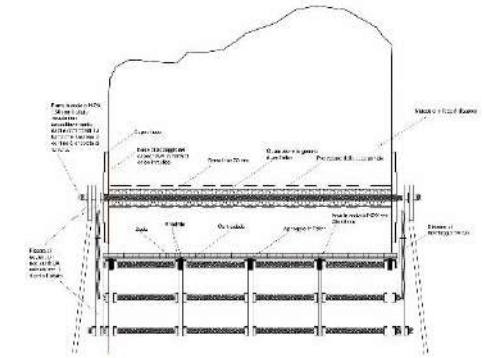
Fig. 4 Belcastro (CZ). The “heart” before the masonry reinforcement.

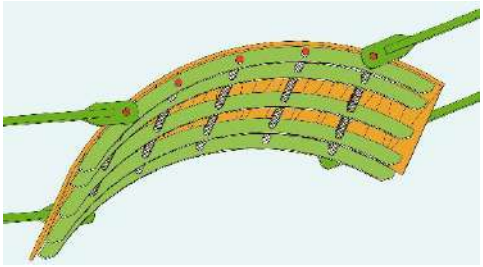
4. Technical and ethical aspects in the project for masonry reinforcement

Reinforcement of the masonry of the bailey offered the opportunity to study proper solutions both from the “ethical” and technical point of view.

All around the heart-shaped gap, the sack wall masonry- which usually characterizes medieval military architecture – was seriously damaged and its instability was a severe risk for people’s safety, in particular in the event of an earthquake. Due to the progressive erosion and loss of masonry building materials, possibly caused by the stealing of ornamental and functional elements over time, such as thresholds, piers and ashlars, it was not possible to even suppose the original shape of the lacking part of the masonry. The current quasi-arch, generated by the progressive collapse of the bailey, has ensured a reasonable state of tension in the part of masonry which was most exposed







Figg. 5-8 Belcastro (CZ). Design and scheme of the masonry supporting structure (drawings by F. Todesco).

to the risk of collapse[9]. However, due to the progressive lack in stone elements, the masonry over the arch appeared significantly debilitated (fig. 4). Before the intervention, many cracks were visible in both sides of the wall, which showed the instability of the upper part of the masonry. Lack of stone elements which shaped the opening and rain-washed mortar were the principal reasons of this instability. Furthermore, masonry presented a very heterogeneous structure, characterized by stones of very different shapes and dimensions and poor mortar. Hence, masonry resistance depended mostly on its weight. In order to preserve the architectural complex, the local Superintendency of Architectural and Environmental Heritage, imposed the adoption of passive systems for masonry reinforcement, which work, supporting masonry, only in case of need, for example during an earthquake. Consequently, a non-invasive intervention was studied which, at the same time, ensured the protection of buildings located under the ruins of the bailey and the conservation of the rest of the wall[10].

The idea to "suspend" the damaged masonry and anchor it to the stable part of the bailey was considered the most suitable. For this reason, a steel supporting structure was realized, paying attention to the perfect alignment the support and the part of masonry which had to be held up. To reduce possible alteration of the ruins, the existing putlog holes, which penetrate the wall, were used to anchor the tie-rods which hold up the supporting structure.

The supporting structure was realized assembling five stainless steel bars (60 x 20 millimetres) which had been curved following the radius of curvature of the discharging arch. They were also perforated to insert five stainless steel threaded bars, with nuts and anti-nuts, in order to perfectly adapt the supporting structure to the irregular surface of the arch intrados (figg. 5-8). The structure was then connected to four ties anchored to masonry extremities and also provided with a good system of stretching in correspondence to the bars located in the putlog holes. This system allowed to efficaciously

Fig. 9 Belcastro (CZ). The structure which supports the masonry above the heart-shaped gap.

stretch the supporting structure in correspondence to the four corners. An elastic membrane was placed between the supporting structure and the masonry.

Finally, to avoid building materials destroying the underlying buildings, in the event of masonry collapse, the extremities of the bars inserted in the putlog holes have been anchored to the ground with steel ropes. Doing so, possible out-of-plane failures of the wall, especially in the case of earthquake, could be avoided (fig. 9).

Fabio Todesco

Notes

[1] The two projects of conservation, financed by Calabria Region (P.I.T. n. 11- Valle del Crocchio), are part of a general programme of enhancement of Belcastro cultural heritage; see Mussari, Oteri, Todesco 2008.

[2] The authors, together with the engineer, Guido Bisceglie, were entrusted with the projects and direction of the works.

[3] Malaterra 1928, 59: «Porro dux, videns se minus in urbem proficere, consilio cum suis habito, tria castella firmavit: unum Hugoni Falloc, alterum Rainaldo de Simula ad urbem infestandam delegavit, tertium autem Herberto, fratri Hugonis, et Custinobardo, fratri dicti Rainaldi».

[9] Martorano 2004 [2009], 295-318. See also Martorano1999, 375-409; Cuteri 2003, 95-141.

[10] Santoro 1982, 17.

[11] Summonte 1675, 53.

[12] Messer1912, 393, 298, 310, 311-314.

[14] On the common idea that the “lacuna” should be considered a “lack” and, as a consequence, on the impossibility to look at it with a positive attitude, see Treccani 1997.

[15] This part of masonry includes the discharging arch which was over the original opening; the dimension of this element is 2.00x1.60x1.50 metres, the weight about ten tons.

[16] We preferred to leave any trace of masonry transformation over time due to changes in the use of the fortress (e.g. the holes in the wall where timber ceilings were located), but also traces of decay, only providing for the restoration of some detached elements and the repair of mortar joints.

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