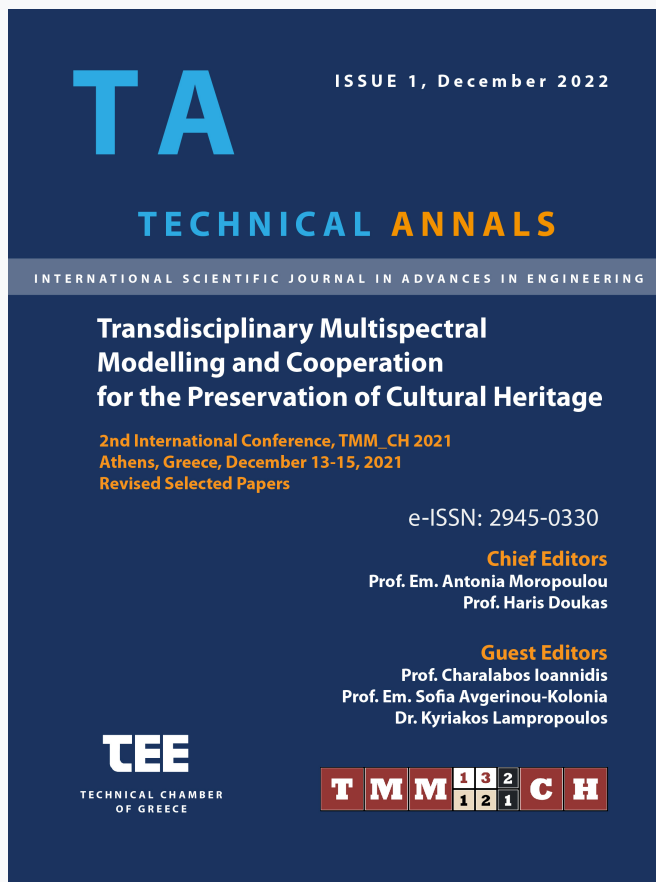


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Innovative experiences in teaching conservation. Involving communities' interests on preservation topics by fast investigations and social media dissemination

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Abstract. Since 2019, the authors carried out a didactical experience through the Preservation Studio workshop in the historical center of Vimercate, a town in the north east area of Milan, implementing a convention agreement between the Municipality and the Atheneum. The convention was arranged in order to set the relationship between the three academic courses of the Politecnico di Milano and the administration of Vimercate, supporting the teaching staff by providing accessibility to various services and some public properties located in the city center. Thanks to this kind of agreement, the courses could be supported in their activities by document centers, public associations and the members of the local community, while the teaching staff offered a constant sharing of the main activities by social media and periodical disseminations through public lectures. After maturing several years of didactical workshops on the main buildings of the historical center of Vimercate, this paper shows the results collected with the studios: the active class strategies, the on-site survey campaigns, the evolution of the results observed by year after year inspections, ND testing activities and local community involvement. The impact coming from the researches developed by the preservation classes and specific in depth studies realized by graduation thesis showed an increasing participation of the community to the topics connected to the city center: from conservation policies to future uses, historical buildings reached the attention of the people through the development of a new sensibility and perception of new values associated to the local architectural heritage.

Keywords: Vimercate, Villa Sottocasa, thermography, dissemination, living-lab.

1 Introduction

This paper discusses the issues collected by the teaching activities carried out by the coordinated courses of Preservation Studio carried out with the students of the first year master degree in Architecture. The preservation course is characterized by a workshop that provides to the students the opportunity to get in touch with the several degree of complexity offered by historical buildings. The conservation design is the final goal of a long analysis process and the preservation workshop gives the chance to train the class through the different steps required by historic, geometric, material and pathological characterizations. The organization of the workshop in Vimercate, 25 km from Milan, was recently supported by an agreement between the ABC Dept. of Politecnico di Milano and the municipality of Vimercate. The convention gives the opportunity to organize three preservation studios in parallel on different buildings of the city center, in order to enrich the studies on the city and its architectural heritage. The administration provides the accessibility to the public buildings, the local museum, the local public archives, while the results obtained by the courses are shared with the municipality. In addition, the teaching staff is involved into local initiatives for presenting the works matured at the end of each academic year.

This paper draws a balance of the last 3 years workshops carried out by the authors with other colleagues in the city center of Vimercate [1] within the Architectural Preservation Studio, an academic

course formed by two integrated subjects: conservation of historical buildings and advanced survey techniques. The studio is addressed to the first year students of the master degree in Architecture – Built Environment – Interiors of the School Architecture – Urban Planning – Construction Engineering of Politecnico di Milano. The course is supplied in English language for international students. The attenders are composed by a consistent percentage of Italian students, whereas the foreigners come from Asia, in particular from China, Turkey, Iran and India, from Eastern Europe and sometimes from Latin America. The heterogeneity of the class offers the opportunity to set a first peer to peer confrontation among the students and their personal academic background by applying some active classroom strategies. Respect to the students that had their bachelor in Italy, where courses on the history of architecture and on the theory of conservation are supplied in architectural schools, these topics are not always considered abroad. Thus, the work in the class is initially organized for setting the bases of the conservation principles according to the Italian tradition, compared to other approaches that are diffused in other geographical areas.

International classes testify the cultural relativity of the judgement applied to architectural heritage, according to the personal background of each student. Among the various ideas on the role of conservation referred to cultural heritage, or to the enhancement of historical sites, the main differences on the meaning of preservation are depending to the definition of the concept of time. This is defined as a progressive linear development of events, according to the western culture, founded on a tradition coming from Greek philosophy and Enlightenment, but in eastern culture it is intended as a cycle, where the events are characterized by the periodical repetition recalling the idea of the eternal birth-death circular process. The different definition given to the time influences the tangible and intangible values attributed to the historical buildings, changing the goals attributed to the conservation design.

An important grounding for the discussion is offered by the international standards: the shared principles for setting the conservation interventions on historical buildings represent a vision of the issue that is overpassing cultural differences. ICOMOS charters, in particular, represent a set of principles summarizing the main issues matured along the time by important experts, a sort of resetting for the entire class that can achieve a new view of the problem connected to architectural heritage. International associations of experts and transnational standardization groups offer also detailed contributions on the technical interventions set for specific steps of the conservation design. The translations of Cesare Brandi's theory and critic on restoration, the ICOMOS documents collecting the definitions of the decays, the diffusion of damage atlas and expert systems for the analysis of the state of conservation of the historical buildings are all valid examples of the diffusion of several devices for guiding the interventions by using a shared language and a shared methodology all over the world.

The educational experience offered by a technical university like Politecnico di Milano is founded on the elaboration of different analysis on the historical building addressed to a complementary study of the geometrical, material and historical characteristics of the historical building. The workshop is organized on a specific case study that offers the possibility to train the students on different aspects in order to refine their ability in considering the geometrical organization of the spaces, the used building technologies, the historical evolution of the complex, its state of conservation, its tangible and intangible values according to the final proposal for the reuse project.

The on-site workshop of the coordinated Preservation studios took into consideration a selection of historical buildings located in Vimercate, a town not too far from Milan, characterized by an historical center documented from the Roman age that underwent several transformations and is still characterized by noble palaces dated back to the XVIII centuries, surrounded by buildings belonging to different historical periods. The authors proposed a research on some of these buildings that lasted more than two years and the main results achieved during the academic workshops are presented in this paper.

2 The impact of the on-site workshop analyses carried out in Vimercate

The idea of a coordination among three studios on the same subject started in 2015 and anticipated the innovative teaching strategy now called digital twin lab. The three Preservation courses were organized on three different historic complexes identified in the historical center of Vimercate. This town is characterized by an interesting urban environment, with ancient churches, historical palaces now converted, or partially reused for public purposes. The center conserves the street pattern of the medieval structure of the town, actually deriving from the structure of the first Roman settlement, and several buildings are still occupying the sites of documented ancient nucleus.

Along the academic years, different researches were carried out by the coordinated workshops orga-

nized in Vimercate and the main topics can be summarized as follow:

- The S. Antonio Oratory and its stratigraphic interpretation.
- The disappeared defensive system of the center, with the monumental gates.
- The stratigraphic analysis of the medieval fortified bridge.
- The mensiochronological analysis of the bricks used for different buildings of the center [2]
- The relationships between the public streets and the facades of the historical building in the center.
- Some analyses of the ancient quarters of the center.
- The study of the reuse of the ancient hospital of the town, a large quarter hosting some historical buildings realized on the previous medieval settlement.
- The complex of Villa Banfi and the rests of the previous existing St. Francis convent.
- The researches on different topics of the main palaces of the center: Villa Sottocasa, the residence of one of the main influent family of the town, renewed along the XIX century, but founded on previous existing XV century structures, and Palazzo Trotti, the incomplete residence of the feudatory family of the town.

Some of the researches were used as base-study for developing graduation thesis. Actually, a master degree work was developed on a GIS system applied on Vimercate city center with the aim of enhancing the knowledge of the characteristics of the historical buildings and their characteristics, from historical, geometrical and technological point of view.

Among the others, one of the most evident impact obtained by the workshops is the constant control of the evolution of worsening conditions analyzed on the buildings selected for the on-site activities. Villa Sottocasa, a large monumental complex, partially converted into the local museum of the territory and partially in a semi-misuse condition, offers an interesting example for evaluating the results provided by the courses. It has been very useful, also to make students learn, to compare pictures from different times, showing the development of crack patterns, raising dampness and surface decays on mural paintings in the interiors. The students got the opportunity to focus on the analysis of single points, framing their interpretations in the understanding of the issues related to the whole building and its poor management model, but also in the progress of the recognition of values [4], as also historical and artistic knowledge has been deepened, increasing the awareness of the palimpsest of periods, which contributed to make the Villa what it is.

The example was therefore perfect to teach the complexity of architectural conservation as a discipline, then also as a lab, in which getting acquainted with scientific investigations and heritage management issues.

3 Fast investigations for materials and decays control

The workshop activity proposes a consolidated praxis that introduces the students to the use of advanced survey techniques: digital photogrammetry and laser scanner for the acquisition of dense point cloud. This is a fundamental step for the realization of some models of the assigned building and a useful training for combining traditional surveys obtained by direct measuring with innovative strategies. In parallel, the students start the classification of the materials observed on the surfaces of the building and focus on the interpretation of the building technologies that are composing the different structures. After these analyses, the students, organized in workgroups, have to detect and classify alterations and decays observed on materials and structures. As a support for these kind of analyses, thermography is carried out on some of the most representative portions of the building in order to investigate peculiar aspects of the main structures [3].

Thermovision is a completely non-destructive test allowing the characterization of large areas of a building by a thermocamera, a device set for the acquisition of the infrared emissions from the framed surfaces. The survey of the thermal radiations is influenced by the thermal conductivity (the capability to transmit the heat) and the heating capacity (the capability to hold the heat) of the material. In conservation field, thermovision is used to observe the features of structural elements hidden by rendering or plaster. The information provided by thermographic tests can reveal the geometry of the masonry components and also the presence of defects such as discontinuities, detachments and lack of materials. The analysis of the thermal data consists in the interpretation of the function of surface temperature versus cooling time for selected areas which were previously heated naturally or artificially. Building elements composed by different materials (such as historic masonry or ceiling systems), when a heating transi-

tion is present, will show a different distribution of temperatures due to their different capability in transmitting and holding heat. The acquisition of thermal images by an infrared camera allows the evaluation of temporal changes of the surface temperature distribution, in order to recognize the characteristics of the structure.

The thermographic tests applied in Villa Sottocasa constitute a valid example for qualifying the most extended decays on the facades (fig. 1). The technique can provide also a useful monitoring of the conditions of the parts of the building, like the wing hosting the museum of the territory, already restored.

Thermovision is also used for identifying moisture contents into masonry elements and interpreting the nature of the structures (fig. 2). In Villa Sottocasa, thermovision clarified that several vaulted systems are realized with a light timbering structure. Applied into another building, Trotti Palace, seat of the Municipality, thermographic tests revealed a hidden structure: a masonry arch inserted into a wall (fig. 3) as reinforcing system of a massive vertical wall built over an underlying barrel vault that could not face its vertical load without the risk of serious deformations.

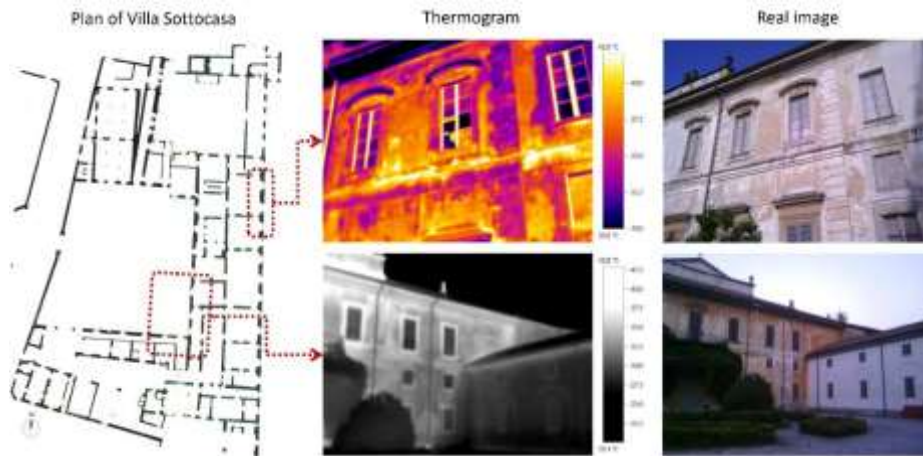


Fig. 1. Examples of thermographic tests carried out in Villa Sottocasa

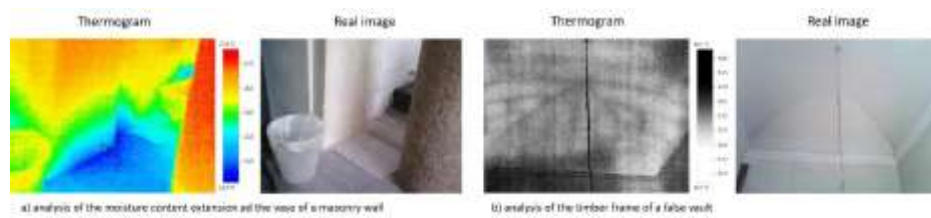


Fig. 2. Examples of different analyses carried out by thermographic tests: a) moisture extension and b) false vault timbering frame.

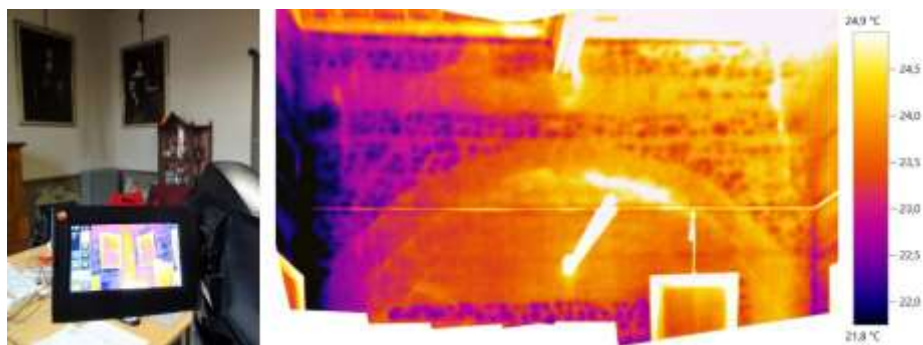


Fig. 3. Visualization of a hidden arch through thermograms mosaication.

Thanks to the fast characterizations obtained by thermographic investigations, those areas revealing peculiar problems, such as moisture contents, or peculiar aspects, like change in the hidden structure, in some cases were also further investigated by using other testing techniques, like radar (fig. 4), showing to the students the complementary use of non-destructive methods.

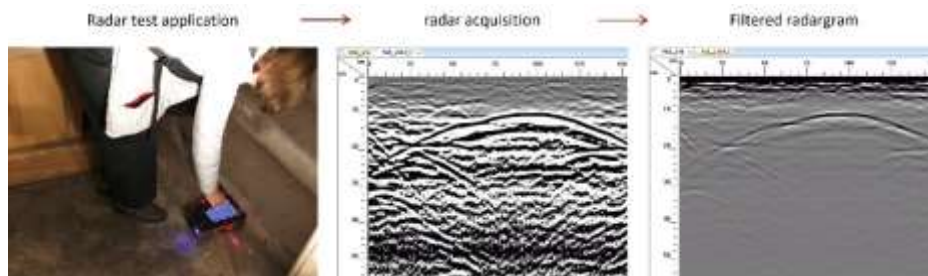


Fig. 4. Example of radar test applied for studying the extrados of a vault.

4 Community involvement by innovative didactical strategies: Vimercate Living Lab

The social media page of the coordinated preservation studios (fig. 5) was created for encouraging the contact of the students with the local people living and working in the historical center of Vimercate. It was used by the students for sharing their work activity during the on-site workshop and for describing the methodology followed during the different phases of the analyses. Also the teaching staff promoted the activities of the course by this website with the aim to activate the local population in order to catch their interest towards the history of the site and to stimulate cross-relationships among people that could provide information and proofs about the buildings assigned for the various workshops.



Fig. 5. Example of the posts used on Vimercate Living Lab webpage for promoting the activities of the workshops.

One interesting result was immediately obtained when a resident of Vimercate recognized one of the monumental rooms of Trotti Palace where he worked several years before, during the 70s of the previous century, bringing an important testimony of a strengthening intervention that was here carried out. Information about the restoration works on the decorations of the palace, carried out during the 90s, are present in the public archive of the municipality. Other documents about recent interventions are still in the technical office of the Municipality and were not yet considered by the course. Thanks to the social media page of the studios, an important testimony about the consolidation of a floor, characterized by a serious damage, was finally achieved. The worker of the construction company wrote some information in the chat of the Vimercate Living Lab site and was invited to speak to the students. He described in detail the solution that was adopted in a sector of the palace for substituting the compromised timbering system of the first floor, without modifying the decorated planking constituting the ceiling of the room at the ground floor. With the aim of preserving the original thickness of the wooden floor, a resistant diaphragm was realized by inserting a corrugated sheet steel, over the planks forming the decorated ceiling of a room at the ground floor (fig. 6).

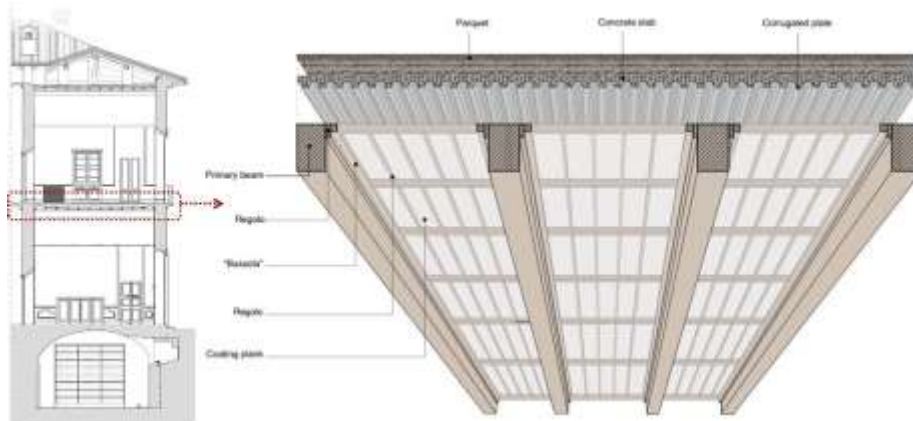


Fig. 6. Interpretation of a consolidated flooring system on the basis of the oral proofs provided by a member of Vimercate Living Lab social media.

5 Conclusions

In 2020 Vimercate workshops became one of the field-tests for the reflections on the recovery strategies for Heritage sector after the pandemic crisis: a very important topic[5], on which several scientific contributions are appearing in the various National contexts.

The experience of teaching and learning during the pandemic crisis has been definitely challenging [6], forcing to exploit the knowledge background and the digital tools in order to keep alive at least some of the characteristics of these on-site laboratories. Therefore, even if the trip to Vimercate were restricted or cancelled, the supply of point-clouds, surveys and pictures to students enabled them to emulate the process of detecting, understanding, modeling the problems, proposing remedial actions and long-term strategies. On the other hand, social media platforms became a field, in which interactions with the local communities was still possible.

At the moment, it is impossible to be confident about the results. On one hand, the use of digital twins allowed to carry on teaching, with most of its contents, in spite of the restrictions; on the other hand, it is difficult to believe that this digital, that is mostly visual, experience could substitute the real taste of the direct five-senses exploration of the historic site. Nevertheless, it is very important to capitalize the making of this method, also for the purpose of enabling sharing workflows among teammates. The obvious conclusion is that an important goal of next steps will be the implementation of digital techniques to increase the value of the reality. In the alternative between Virtual Reality and Augmented Reality, the point of keeping Architecture over the limits of visual approaches is crucial. Students should learn that Architecture can't be understood only by images, nor by 3D models, but by use. That's why, working on site shall ever be a mandatory part, as well as today the implementation of digital tools is a mandatory part as well, and the two approaches need the most interoperable integration.

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