

# LEARNING BASED UPON PROJECTS OF ARCHITECTURAL CONSERVATION: FROM UNIVERSITY TO REAL LIFE

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## Abstract

The matter of Architectural Conservation is taught from 2006-2007 as a main matter of the 5<sup>th</sup> course of architectural studies of the Escuela Técnica Superior de Arquitectura of the Universidad Politécnica de Valencia. Up to date, the architectural studies did not have any specific information about architectural conservation field, despite restoration was one of the capabilities supposed to any architect. Given the clear incongruency between education and professional capability in this field, the introduction of a new compulsory matter called Architectural Conservation was considered necessary already in the former academic curriculum plan of 2002 and it was confirmed in the new academic curriculum plan of 2010. In the 45 assigned teaching hours, this matter tries to give the students the necessary capability in order to correctly develop a preliminary study of a historic building and organize critically and consciously an architectural restoration project, both absolutely necessary for their imminent professional career. For this reason, more than a half of these teaching hours are dedicated to develop methodological themes with a direct pragmatic application to a real case. This practical work proposed in the matter consists in the real development of the process of a preliminary study and restoration project of a historical building that the students themselves select from the real world. It is a real simulation of a preliminary study and project that the students, as future architects, will be able to have in their professional life. The election of the case, the direct learning on site directly applying the several types of studies and research methodologies and the critic approach to the project represent the three fundamental work phases that the students develop during the whole semester. Therefore, first, the election of the case must take into account several factors that may allow the feasibility of this exercise and its optimal profit: the building must be small or medium, not in use, in an advanced state of degradation, possibly with structural problems, preferably with exposed or as less as possible coated walls, in need of a functional rehabilitation, etc. Secondly, the students elaborate a preliminary study necessary to know the building with the depth and necessary preciseness in order to be able to propose the required intervention. The preliminary study will include following aspects: general description of the building and its placing, historic description, metrical survey, study of materials and constructive techniques, architectural stratigraphic studies, study of the degradation phenomena and mechanisms, study of the structural problems. Last, the students propose a first idea of the restoration project, paying special attention to the intervention criteria and the development of some aspects of the restoration that may have emerged during the preliminary study phase. The immediate applicability of the contents results in a very high percentage of success of approved students and very good marks in most of the cases. The students reach a very good proficiency that guarantees a sufficient level for their professional capability.

Keywords: architectural conservation, didactic methodology, project, active learning, participative learning.

## 1 INTRODUCTION

A subject called "Architectural conservation" is nowadays taught in the Escuela Técnica Superior de Arquitectura of the Universidad Politécnica de Valencia as a compulsory semester-subject of 4.5 credits (45 teaching hours) of which 3 credits (30 hours) of theory and 1.5 credits (15 hours) of practical training, both to take place in the classroom. The subject is being taught in the first semester of the 5<sup>th</sup> course and, although it is not yet officially under the Bologna Plan, it has been taught since 2006-2007 with a very practical, professional and applied-to-reality approach, as being students of the last year, they are very near to become full architects.

Under other capabilities, the architect has the possibility to work restoring historical and monumental buildings, cataloguing them, developing master plans for historical centers, etc... Paradoxically, none of these tasks was included in the successive Spanish official academic curricula up to the curriculum of 2002, as all the efforts and teaching were concentrated to new building projects and urban planning for new and expansion areas.

For all these reasons, Architectural Conservation was included in the curriculum of 2002 and, nevertheless the few available teaching hours, it has a important role in the preparation of the students as future professionals ready to adapt themselves to the increasing demand of this part of the profession.

## **2 THE SUBJECT “ARCHITECTURAL CONSERVATION”: THE APPROACH**

As professors in charge, we have organized the subject as much formative and efficient as possible, considering that the subject “Architectural Conservation” is the only possibility that the majority of the students of architecture of our school will have to learn anything about the discipline. The ambitious program imparted introduces the basic concepts and criteria and, at the same time, gives some rudiments for the practice of the profession. We also try to teach technical criteria on the subject as technology may change and evolve and the future professionals should distinguish not necessary a specific product but identifying and judging if a new appeared product answers correctly and compatibly to the physical and conceptual problems to be solved. After studying the subject, the future professionals should be able to approach and tackle any restoration project deeply.

First of all, theories and history of restoration are presented in order to give the students a basis to think and argue the decisions and criteria to be adopted in his practical project, with some smattering on the vocabulary of the discipline, and a quick panorama of the history of restoration up to the present in England, France, Italy, Austro-Hungarian Empire and Spain, all of them with illustrative examples. In parallel with this theory and history, a practical restoration project is requested from every group of students. This practical work is explained in following pages. The theory and practice work of the subject are developed simultaneously for a better understanding of the subject and the objectives of it. Some of the parts of this building survey have already been taught in other subjects during the architectural studies (History of Art and Architecture, Architectural Drawing, Construction, Structure Design...) but, unfortunately, they have not been focused on historical buildings and, above all, they have not been conceived as a part of an intertwined and throughout building survey. Besides, the restoration project as the last part of the practical work is also based upon the theory and history of restoration as the students are requested to argue critically and justify their chosen project linking it to historical precedents and criteria. [1]

## **3 TEACHING BASED UPON PROJECTS: PROPOSED METHODOLOGY**

### **3.1 The subject “Architectural Conservation”: teaching-learning methodology**

The methodology of teaching-learning applied in the subject is first based upon the analysis of the real competences required in the professional world in the specific case of architectural conservation. Secondly it is essential a methodology that may guarantee an active and participative learning, necessary ingredients to settle a long-term learning. Therefore, the project is chosen as an essential work tool developed autonomously by the group of students in order to encourage collaborative work, always under the supervision of professors and tutors. The proposed project is a mock-up of a real situation in which students must explore and work a practical problem applying interdisciplinary knowledge [2]. The project is considered as a fundamental strategy to make the students elaborate an individual and new study, encouraging their participation and implication and, at the same time, to develop an active learning through real situations that may appear in their professional practice. This practical work is developed both in individual sessions and teamwork in the classroom where the students receive assistance whenever they need it.

The evaluation is approached according to the methodology applied in the subject. First, the evaluation of the work is made in a continuous way through the semester so that the student finishes the subject with the practical work completed. Evaluations take place periodically and have a formative character given that the found lacks and mistakes are explained and commented with the group and proposals are made to improve the work.

### **3.2 Proposed practical work: description and objectives**

The main objective of the practical work consists in acquiring the necessary capacity in order to correctly develop a survey study and a restoration project for a historical building. The restoration project is based upon two fundamental pillars [3]:

1. The critic and conceptual ability linked to the theoretical and historic notions of the discipline of architectural conservation. This first ability allows the future professionals to use the critical corpus that the discipline has developed since its creation in the beginning of 19<sup>th</sup> century till nowadays in order to reason or argue the decisions of the project.
2. The ability to follow a survey and research methodology through several individual approach studies in order to reach the maximum level of knowledge of the building in its materials, artistic and cultural components. Given that the restoration project cannot separate from the building survey and its cultural component

The first and second ability are absolutely necessary and complement each other completely [4], given that the restoration project represents a complex process where the knowledge of the building in all its aspects –material, structural, cultural, functional, etc.- and the election of the most adequate interventions both from a functional or a structural point of view and from the aspect of material conservation is made through a critical analysis based upon the cultural criteria of the restoration field. Thus, choosing the intervention actions does not simply represent the election of some catalogue products from the market but a conscious and critical selection of the most suitable interventions for the real case.

Therefore, at the end of the subject, the students must be able to correctly approach a building survey, i.e., to develop adequately all the phases comprised in it and to be able to consider critically the restoration criteria for a historical building.

The work is made in groups in order to impulse the ability of collaborative working and, at the same time, to reduce the number of hours employed in every necessary task to develop the restoration project. First, it is necessary to choose a historical building easily accessible for the group that may have the necessary characteristics for developing the practical work (small or medium dimension, building not in use but accessible to the students, advanced degree of degradation, possible structural problems, need of functional updating, etc.). Secondly, a survey is developed in order to know the building as much as possible to make the restoration project. Last, a preliminary restoration project is made paying special attention to the restoration criteria and to some aspects of the intervention that may have emerged during the building survey.

## **4 PHASES OF DEVELOPMENT OF THE PRACTICAL WORK**

The practical work begins the first week in the classroom and it is gradually developed during the 14 weeks of the semester. The work is organized in 3 phases and each one is subdivided in several tasks:

Phase 1. First approach to the case-study

- 1.1. Choosing a case-study
- 1.2. Gathering historical information
- 1.3. General description of the building

Phase 2. Building survey

- 2.1. Geometric survey of the building
- 2.2. Study of materials and constructive techniques
- 2.3. Architectural stratigraphical analysis
- 2.4. Study of the degradation phenomena of materials
- 2.5. Study of structural pathologies

Phase 3. Restoration project

- 3.1. Conclusions of the building survey

- 3.2. Identification of the needs and possibilities to be developed in the project
- 3.3. Reflection of the cultural approach of the group students for the case-study
- 3.4. Analysis and descriptions of the intervention criteria
- 3.5. Definition of the objectives of the project
- 3.6. Preliminary lay-out of the project functional distribution and partitions
- 3.7. Definition of some important constructive details for implementing the restoration project.

During the 14 weeks of development of the practical work, the students have teaching hours dedicated to the work laboratories, where professors and tutors solve questions and doubts as well as guide the students in order to complete the proposed work tasks. These laboratories take place periodically and frequently so as to give each group of students enough support while developing the practical work. Professors and tutors are also available some consulting hours every week for possible questions and doubts.

#### 4.1 1st work phase: Preliminary approach to the case-study

The first work phase consists in a preliminary approach to the discipline. At the same time, students take contact with the reality of the architectural heritage in the present. Students, organized from the first day in groups of work, must find an adequate building in order to develop their practical work (task 1.1). They are normally small or medium-sized buildings (hermitages, chapels, little village-houses, laundries, defensive towers, windmills, etc.) that allow a global understanding of the problem. The group must identify one or more cases so that the tutor and professor may help to choose the case-study where there could be more to learn from. An important condition of the building to choose is to have free access for the students in every moment so that they may implement and enrich the collected data during the precedent work phases with new information and notes. Once definitively selected the case-study, the group of students must gather the general and specific information (task 1.2) referred to the building through researching the bibliography, consulting the municipal archives or interviewing the building's owner (Fig. 1). Last, collecting all the information from the first visit (photos, first sketches and notes) and the gathered documentation, they may be able to write a first description of the building as a preliminary approach to the construction and its problems (task 1.3).



#### 2.2\_ FUNCIONAMIENTO DEL MOLINO

En la parte superior, una acequia a 15 metros de altura, construida sobre la roca mediante vigas y tirantes de hierro, llevaba el agua del salto hasta el cubo, un depósito cilíndrico y estrecho de unos 12 metros de altura cuya función era generar la presión para hacer girar las muelas y almacenar el agua de la que podían disponer, pues se establecían turnos entre molineros y campesinos.

La "cocau", en la parte inferior, está totalmente excavada en la roca. Es el espacio donde se colocaban las muelas de aspas de madera que giraban impulsadas por el agua del depósito. Unos conductos llamados canaletes unían el cubo con cada una de las muelas, se accionaban mediante una tapa desde la planta superior para controlar el paso del agua y el funcionamiento del molino. La cocau del Molí del Salt fue ampliada para la conversión del molino en central eléctrica en 1899, pero conserva los espacios donde se encontraban las muelas y la salida del agua de vuelta al río a través de un espectacular arco de sillares de la época del molino harinero.

En la estancia inmediatamente superior, cubierta por una bóveda, se molía el grano. Los molinos hidráulicos de la Comunidad Valenciana eran del tipo con rueda horizontal. El dispositivo, originario de la Edad Media, contaba con 2 muelas de piedra, una fija y una móvil, conectada a las inferiores por un eje que le transmitía el movimiento. El grano se echaba por un agujero central, y al girar una muela sobre la otra se generaba la fricción que molía el grano, y producía la harina, que se recogía en el extremo de las ruedas.

La parte habitable del molino tenía una entrada independiente y se situaba sobre la sala de las muelas comunicada con ésta por una escalera de dos tramos. El molino y el molinero eran una referencia central en el mundo rural: cada familia llevaba al molino su cereal según sus necesidades y se producían su propio pan. En muchos casos era el propio molinero el que iba de casa en casa repartiendo la harina y recogiendo el grano, cobrándose el trabajo en harina.

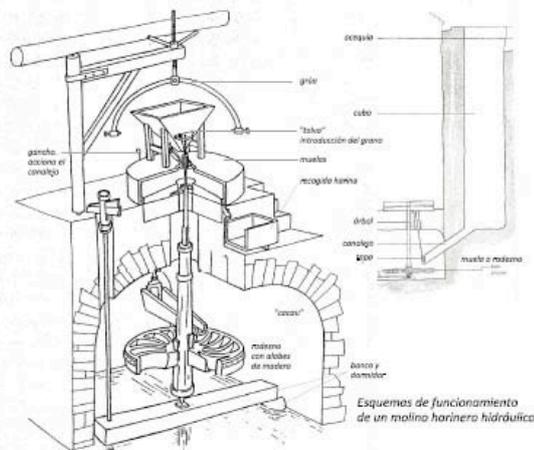


Fig 1. First approach to the building: study of the historical function. Practical work developed during the course 2010-2011 (Authors: L. Cambra, L. Gilabert, J.E. Gómez, S. Sanchís)

## 4.2 2nd work phase: Building survey

The second work phase previews the application of a rigorous methodology of studies to be done in the building in order to achieve the most complete knowledge of it. These tasks (formerly named from 2.1 to 2.5) require intensive dedication from the students as their development is only possible through training in the use of several tools that the students do not possess previously. They are for examples techniques to make the geometrical survey, materials and constructive techniques of the historical architecture, ways of making a structural analysis, tools to develop a stratigraphic analysis. Therefore, before beginning each one of these tasks the method of study is explained in detail for each task and a small practical exercise is developed in the classroom under the supervision of the professor. For example, in the geometrical survey, the professor explains in the classroom the several existing techniques to make a graphical survey, shows some practical cases and the students develop a small exercise called “project of graphical survey” (Fig. 2) where they must plan the survey that they need to develop for the case-study taking into account their available means (manuals, semi-instrumental, instrumental), the method to be applied (triangulation, laser point, laser scanner, etc.), the location of the building (if it is surrounded or covered by trees, if the ground is sloped...) and possible difficulties. Thus, the students already prepare in the classroom their own task having the possibility to ask the professor and tutors for help and advice before they begin the survey.

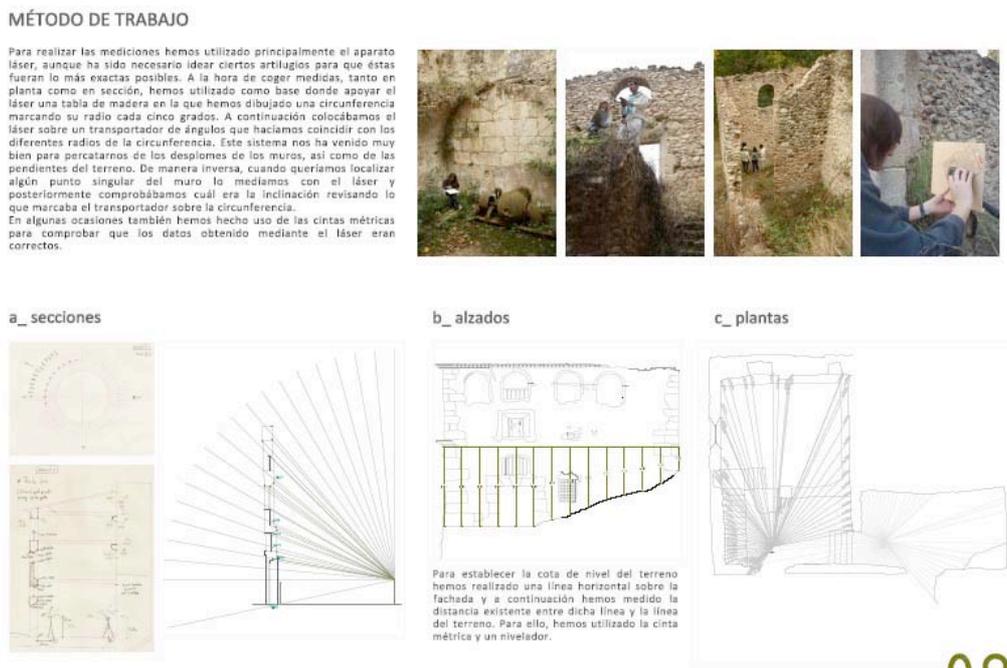


Fig. 2. Methodology used for the graphical survey of the building. Practical work developed during the course 2010-2011 (Authors: L. Cambra, L. Gilabert, J.E. Gómez, S. Sanchís)

Much in the same way, after a introduction lesson about the basic concepts of the method of stratigraphic analysis and its application to real case-studies, the students develop a small exercise in the classroom where they employ all the tools of the stratigraphic analysis, so that they may apply them autonomously in their case-study later (Fig. 3). This work phase requires a big effort and investment of time both from the students and the professors and tutors, because the students lack of enough knowledge and preparation to use the specific tools. In fact, the architectural curriculum does not preview any instrumental subject before arriving to Architectural Conservation, then requiring it to give the students all the basic tools and abilities in order to develop a restoration project. Nevertheless, the professional competences and capabilities have to be achieved within the five courses of architectural studies, forcing this subject of the fifth course to cover this existing gap. In order to correctly develop the subject and to guarantee an adequate relationship between the time employed by the students and the assigned credits to the subject, it would be necessary to take decisions directed to make up for these deficiencies either increasing the credits of the subject or teaching in previous courses some instrumental subjects directed to give the necessary tools to develop a restoration project.



Fig. 3. Stratigraphical study of the building's façade. Practical work developed during the course 2010-2011 (Authors: M.A. de la Torre, B. Ferrer, A. García, A. Marí, I. Reig, M.J. Reig, R. Sola, C. Villalonga)

### 4.3 3rd work phase: Restoration project

The third and last work phase represents the final synthesis between the acquired knowledge in the previous work phases and the learned critical ability through the study of the history and theory of the restoration that is taught parallel to the development of the practical work. The group of students must propose a restoration project that may integrate the needs and the possibilities of the building that they have identified during the building survey (needs of conservation, structural consolidation, functionality, decorum, etc.), the cultural basis and critical references of the group itself, the cultural, functional and economic requirements of the society and the owner, the technical aspect of the possible and available interventions (Fig. 4).

Among the basic criteria that a restoration project must respect in the present days, the professor Giovanni Carbonara [5] identifies: minimal intervention that preview only strictly needed interventions in order to achieve the proposed objectives; reversibility as a fundamental requisite that means that any intervention can be demolished afterwards without leaving any trace in the building; compatibility both chemical (between materials), constructive or structural, but also from functional between the new uses proposed for the building and the building itself as architectural heritage to be conserved; durability of the intervention in the materials, structures, etc.; authenticity as a guarantee of the conservation of the building as a document of the past; and expressive actuality that may allow to distinguish the intervention done from the existing building. The students must take into account these basic criteria when projecting their intervention in order to choose critically and justify the one most suitable to satisfy all these factors.



Fig. 4. Mock up of the space after restoration. Practical work developed during 2010-2011 (Autores: M.A. de la Torre, B. Ferrer, A. García, A. Marí, I. Reig, M.J. Reig, R. Sola, C. Villalonga)

## 5 CONCLUSIONS

The methodology of teaching-learning that has been introduced in this text has been developed according to the real needs of the architectural profession in a moment of change, revision and change. Architectural conservation offers the future professionals a wide range of work in the present world with a enormous economical crisis. Presently and possibly during the next years erecting new buildings is and will be paralyzed, while the architectural conservation field understood as restoration, reuse and conversion of the existing architecture as well as conservation of the built heritage, may offer a rational and sustainable way. Unfortunately isolated in the architectural curricula of Valencia and other schools of Spain, this subject aims to educate competent professionals that may face the contemporaneous world and its new challenges and requirements.

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