

Architectural Fire Protection Learning: the ETSAUN Case.

Keywords: Fire Safety, Architecture, Learning.

Field of Interest: (Building Design); Topic of Interest: (Seismic and fire safety of buildings, infrastructures, construction site and emergencies management).

Main paper focus: (General Framework); Paper Content Classification: (Practical).

Abstract.

Fire protection is a main parameter in the design of buildings, although it is often neglected in the Schools of Architecture because is being considered an “engineering thing”.

In Spain, the education system provides a minimum dedication for this matter, but in the case that will be presented in the paper, it has been taken to a higher level. This is because fire protection is provided in three courses as we described in the article.

This article will show the teaching itinerary in Architecture Studies Degrees explaining the dynamics of each of the three courses in which students are trained in fire protection, illustrated with real examples of work from the students themselves.

We anticipate here that in the first year, students learn the theory, its impact on the Project; in the second year of learning, they relate it to the project at hand; and in the third, this time independently, consolidate learning in a complex project that takes place over two semesters. This teaching experience includes also the description from developing apps for smartphones, to the students practices of fire protection in the Laboratory.

Far away from the opportunity of research and specialization that Fire Safety provides for future architects and construction engineers, it must be taken into account that Fire Safety it is not a limitation, Fire Safety becomes more real the architectural project.

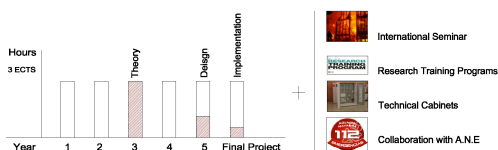


Fig.1. Graphical abstract: Building Services studies and their relation with Fire Protection learning.

1. Introduction

Future architects' academic career goes through three stages: theory knowledge, design and integration learning, and implementation in the personal final project.

In this common learning environment, students have the possibility of going to the specific International Seminar, help in laboratory teaching, research as professor assistant students in the Research Training Program in Fire Safety or even work in supervised practices in the Navarra Emergency Agency.

This profile, not just as a designer, but as a vitruvian architect must be understood within the demanding program of the Spanish architect [1].

2. Methodology

As occurs in other Schools of Architecture in Spain, at the School of Architecture of the Universidad de Navarra, the learning process is based on Projects. And in accordance with this didactic process, training in Fire Safety does not have a lead role, but still must be considered as a fundamental element in an architectural project.

In this article, we will show the curricula of our Architecture Degrees and explain the dynamics of each of the three academic courses in which the students receive training in fire protection, with examples from the work of the student¹.

To start with, we must say that, in their first academic year, the students learn the theory, with no involvement in the project; in the second, they link the theory with the project they are working on; and in the third, they independently consolidate their learning in a complex project which is developed over two four-month terms.

3. Antecedents

If we observe the list of technical subjects on the 2010-2011 study plans of the oldest Schools of Architecture in Spain, we see that a broad range of installations are taught² [Table 1].

Table 1: The most common technical subjects in Spanish Architecture Schools. Source: Schools' websites.

	Electricity	Fire Safety	HVAC	Lightning	Plumbing
Barcelona					
La Coruña					
Las Palmas					
Madrid					
Navarra					
Sevilla					
Valencia					
Valladolid					

The absence of a specific subject on Fire Safety in some of the schools in the chart is remarkable, although it must be said that the teaching of Fire Safety is not simply part of the Building Services subject, but is also included in other subjects such as Construction and Structures. We must also remember that in Spain the study plans for Architecture have been greatly modified over the last few years.

At present, teaching on Fire Safety is usually merely an explanation of the current laws on building, the basic document of Fire Safety in the Spanish Technical Building Code. However, teaching on this subject should not be a mere explanation, nor should it only be part of the Installations subject, but indeed other subjects, even Projects, should be involved [2].

4. Third academic year: Learning

This is the first academic contact the students have with Fire Safety; the objective is that they should finish the year with a clear idea of what fire is and how it can be controlled, together with understanding of the most common tool for Fire Safety design in constructions in Spain, the Technical Building Code and its use.

How is this instruction carried out? Basically in lectures on the theory, and written practice every two weeks, all of which are designed for success in the final examination, composed of resolving the problem of a building, set by the professor, so it will observe the current legislation by incorporating the necessary exits, staircases, signs, equipment...

Moreover, since academic year 2011-2012, the School has a practice cabinet so that the students can handle the elements which make up a fire protection installation, such as sensors, controls or a fire switchboard.



Fig 2. Fire Safety Technical Cabinet.

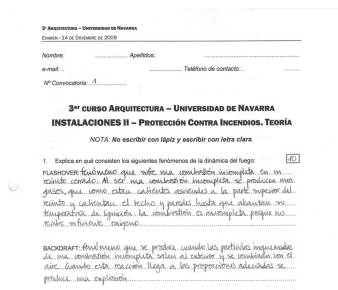
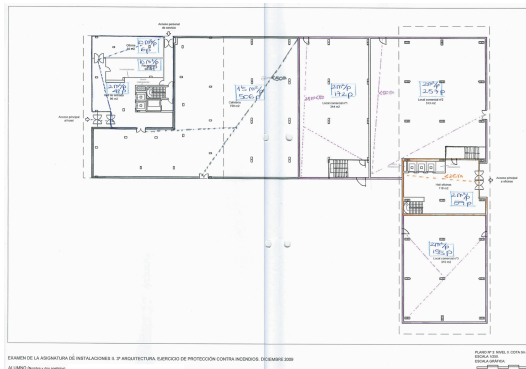


Fig 3. 3rd level. Student final exam example. Written answers.



EXAMEN DE LA ASIGNATURA DE INSTALACIONES II. P. ARQUITECTURA. SERVICIO DE PROTECCIÓN CONTRA INCENDIOS. SOLUCIÓN 008
 ALVARO DEL ROSAL

Fig 4. 3rd level. Student final example. Floor plan solution.

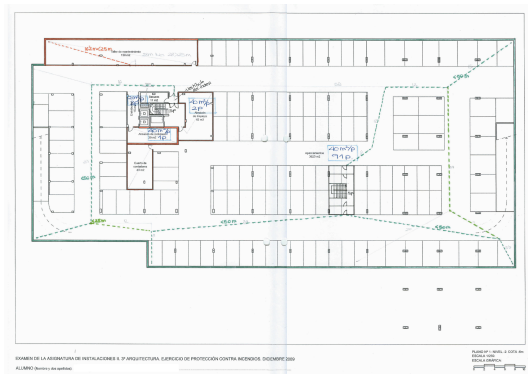


Fig 5. 3rd level. Student final example. Parking solution.

5. Fifth academic year: integration

The second year in which Fire Safety is taught coincides with the fifth academic year. This course is out of the ordinary; there are very few similar courses in other schools of architecture, particularly concerning the work done on technical subjects.

There are approximately 140 students, divided into 4 workshops, this is, 35 students per workshop.

During the four-month period the student must develop a project, and in this of each of these workshops develops a project (a multi-family dwelling, a commercial building, a swimming-pool, an office building...) with two Project professors as tutors, one from the School itself and the other an internationally prestigious professional architect [3].

Moreover, the students have three technical subjects: Structure Design, Constructive Design and Installation Design which includes Fire Safety Design; indeed, there is one professor for Fire Safety and another for the remaining Building Services. Thus we have a group of 35 students with 2+1+1+2 professors to tutor the projects from a multi-disciplinary perspective.

Given the relevance of Fire Safety for the project, the students hand in a specific mid-term preliminary presentation, with the location of the main elements such as evacuation routes, the lay-out of staircases and exits, and smoke control.

At the end of the four-month term, they complete the previous presentation with the development in a building of the effects of Fire Protection. In this case, we must highlight that the degree of detail even includes the wiring system for a sensor or the emergency lighting, elements for which, obviously, the pricing information must be given, as the work must be a realistic as possible.

The same process is followed in the second term with a different project.

Fig. 8. 5th level final work. Nuria Tomás. See the integration of all the security and fire safety elements, with the other Building Services elements, and the own architectural project.

6. End-of-Studies Project: an approach to the reality of the profession.

The end-of-studies project means carry out a complete architectural project during a full academic year. This project, made up of plans (often over 100), report, estimate and specifications, means the academic approach of the student to real architectural work and, as it could not be otherwise, must take into account the legislation which affects it on the issues of accessibility, structure calculation, loss of heat through roofing... and Fire Safety.

The percentage of the documentation referring to Fire Safety in an average project may be between 5 and 10% of the total.

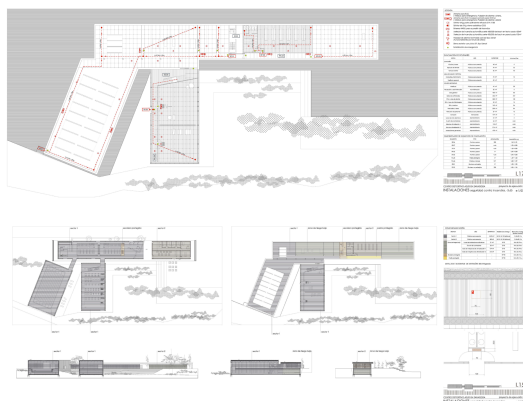


Fig. 9 /Fig 10. Example of End-of-Studies Project. Author: Ainara Mutuberría.

7. Conclusions

This is not an example of design research, nor is intended. In fact, none of the steps explained could be considered an innovation, but it is obvious the extent of the courses is intense, and this intensity in a School of Architecture becomes the innovation itself.

The effective integration of the 'pure' architectural project and Fire Safety, demand –in our opinion– the maturity of learning which appears over these three years.

Going beyond the opportunities for research and specialization that Fire Safety offers to future architects and construction engineers, we must bear in mind that it is not restrictive; in fact, Fire Safety adds to the reality of the architectural project. The choice of this dynamics for learning has, moreover, set the norms for the research line currently in use at the School, which covers everything to do with protection against fires in construction and has two PhD theses underway together with a Research Training Program in Fire Safety.

8. List of References

- [1] Monedero, J. – *Enseñanza y práctica profesional de la arquitectura en Europa y Estados Unidos*, Colegio Oficial de Arquitectos de Cataluña, 2002.
- [2] Mambrilla, N.; Martín-Gómez, C. – *El Dónde y el Cuándo de la investigación en la Protección Contra Incendios*, Proceedings of 4th International Meeting on Architectural and Urbanism Research, Valencia, Spain, June, 2011.
- [3] *Memoria de Proyectos*, Journal published by the School of Architecture of Universidad de Navarra.

9. Acknowledgments

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Students who have provide their graphical works.

¹ This article does not refer to Building Engineering courses which are given in the School, although it can be specify that they share the teaching base.

² This article refers only to Spain. For further information on international equivalents, other sources should be consulted. See e.g. S.I. Lawson, Higher education in fire technology, reprinted from I.F.E. Quarterly. Home Office, Scottish Home and Health Department and the Central Office of Information. 1972; Teaching Fire Prevention, printed in England for Her Majesty's Stationery Office by The Curwen Press, London.

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