Timber construction in Spain

Holzhausbau in Spanien

La construction de maisons bois en Espagne

Juan Queipo de Llano
Eduardo Torroja Institute for Construction Science
Madrid, Spanien

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1. Introduction

In Spain, as in many other european countries, timber construction has been traditionaly used. In fact, a lot of heritage buildings are constructed with wood. So we cannot say wood is a new or unknown material at all. However, in the last century the use of concrete and steel changed this situation, pushing timber construction into the background.

In 1999, the spanish Building Act (Ley de Ordenación de la Edificación, known as LOE) established some requirements for the building process. One of these requirements was the obligation for the developer to have an insurance for each work. The insurance companies then imposed a project and construction supervision in order to give this insurance. The problem was that this supervision relied entirely in the building regulations, not allowing common and well known practices that weren't regulated in Spain. One example of this is the wood construction. As there were no structural rules for this type of construction, timber was considered an innovative material, making it dificult to use.

2. The Spanish Technical Building Code

In 2006 the new spanish Building Code was approved. The Spanish Technical Building Code is the normative framework that establishes the safety and habitability requirements of buildings set out in the Building Act (LOE). To promote innovation and technological development, the Building Code has adopted the most modern international approach to building norms: Performance-Based Codes.

The Building Code is dependent on the Architecture and Housing Policy Directorate General of the Ministry for Housing, with the cooperation of the Eduardo Torroja Construction Sciences Institute (IETcc) which belongs to the Higher Council for Scientific Research (CSIC).

2.1. Performance-based approach

To date, building norms in most countries have traditionally been of a prescriptive nature (establishing accepted procedure or technical guides). Such prescriptive codes can work as an impediment to innovation and to technological development and can pose technical barriers, so they are not acceptable in the international context.

Accordingly, as an alternative to prescriptive codes, what is needed is an approach based on the concept of performance or objectives, in which objectives and the means of achieving them are clearly stated, without implying an obligation to use particular procedures or solutions.

Performance means the objectively identifiable qualitative or quantitative characteristics of the building which help determine its aptitude to fulfil the different functions for which it was designed.

This approach is particularly important concerning timber construction, as it sets a new scenario where all materials are equally considered and have to demonstrate their performance.

2.2. Structural safety

The Building Code includes a document for structural safety of wood structures. This resolves the big problem we talked about in the introduction about the objections of insurance companies concerning wood construction. This document is based on the eurocode of timber construction with some adaptations for Spain.

Figure 1: Spanish documento for structural safety of wood constructions

The objective of this document is to place wood structures in an analogous situation to other structural materials in the regulations context.

2.3. Safety in case of fire

The two more importatn aspects of safety in case of fire concerning wood are fire reaction and fire resistance, both stated in the document about safety in case of fire. The approach in fire resistance is again the one in the eurocode for timber structures.

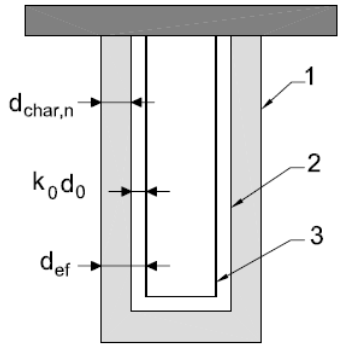


Figure 2: Fire resistance calculations for timber structures

2.4. Energy conservation

This aspect is absolutely performance-based so wood elements can easily demonstrate the fulfillment. The code establishes limits to the loss of energy through the building envelope. The performance of an element can be calculated knowing its thermal conductivity.

2.5. Protection from noise

This is probably the most dificult performance to demonstrate. The 2006 building code introduces big differences from the previous regulations. Now, the performance is the real sound transmision betwen two spaces, including side transmisions (before that, the code required only laboratory tests). To make it easier, the code includes a simplified approach based on the individual laboratory performance of all the elements involved in the sound transmission. Regretably, this simplified method cannot be used with wood. The Eduardo Torroja Institute is working in this issue to allow a simplified method to be used with wood construction.

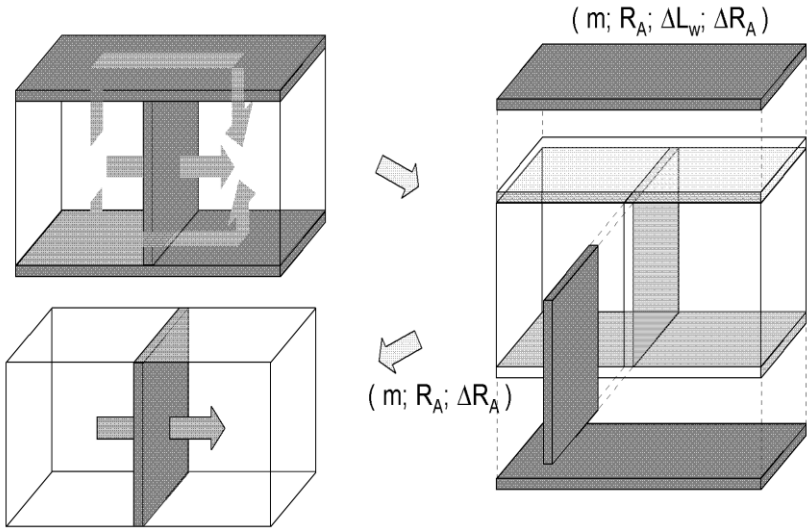


Figure 3: Simplified method for protection from noise

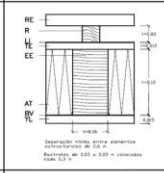
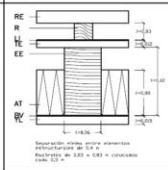
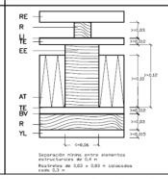
2.6. Complementary documents

Apart from the Building Code documents, the public administration has published other official but not mandatory documents to complete the regulation framework. One of these documents is a construction elements catalog that indicates all the performances of different constructive solutions.

4.2.15 Fachada de entramado estructural con madera, con cámara de aire ventilada

FACHADA de entramado estructural de madera
CON CÁMARA DE AIRE VENTILADA

EE	Elemento estructural de madera
RE	Revestimiento exterior. Elemento con una masa por unidad de superficie ≥9,45 kg/m²
TE	Tablero estructural
BV	Barrera de vapor [1]
LM	Lámina impermeable [6]
AT	Aislante, lana mineral
R	Rastrel de madera [2]
YL	Placa de yeso laminado

Código	Planta (mm)	Aislante espesor (mm)	HS GI	HE U [5] (W/m²K)	HR R_A (dBA)	HR $R_{A,t}$ (dBA)	HR m (kg/m²)
F 15.1 [3]		120	5	0,33	46	42	43,9
F 15.2 [4]		80	5	0,41	45	41	45,4
		100	5	0,35	45	41	46
		120	5	0,33	46	42	46,6
F 15.3 [4]		100	5	0,32	47	42	52,1

[1] Barrera de vapor sólo necesaria en el caso de que se requiera para evitar condensaciones intersticiales en el elemento
[2] Rastreles de 30x30 mm colocados cada 300 mm
[3] Separación mínima entre elementos estructurales de 600 mm
[4] Separación mínima entre elementos estructurales de 400 mm
[5] Valores de transmitancia térmica obtenidos para λ=0,035 (W/mK)
[6] La lámina impermeable debe ser una barrera resistente a la penetración al agua clase W1 y permeable al vapor de agua, que cumpla con UNE-EN 13.859-2: 2006 "Láminas flexibles para impermeabilización. Definiciones y características de las láminas auxiliares. Parte 2: Láminas auxiliares para muros".

Figure 4: Construction elements catalog

In this catalog users can look up for sound or energy performance of different solutions, including wood solutions.

3. Other actions

Apart from the regulatory frameworrk, the Eduardo Torroja Institute participates in other very interesting initiatives to promote wood construction in Spain in colaboration with *Maderia. Sociedad Española de la Madera*, a technical asociation involving manufacturers, researchers, universities, etc. The objective of these initiatives is to improve the knowledge about wood construction in architects, constructors, etc. because one of the main problems we have detected is the lack of knowledge.

3.1. Guides

One of the results of this colaboration is the publication of some guides aimed to help in the design and construction process. At the moment there are four published and one is about to be published briefly. The topics of this documents are Basic concepts of wood construction, Wood products for construction, Wood behaviour in case of fire, Construction control and maintenance, Unions, etc.

3.2. Aulamadera

Aulamadera is a formative action organized by the Eduardo Torroja Institute of Construction Sciences and the project "Maderia. Construction". Aulamadera brings together the efforts of a large number of wood manufacturers, material specialists, technology centers and research institutes, geared towards the dissemination of the rules, features and best wood construction practices among prescribers and users.

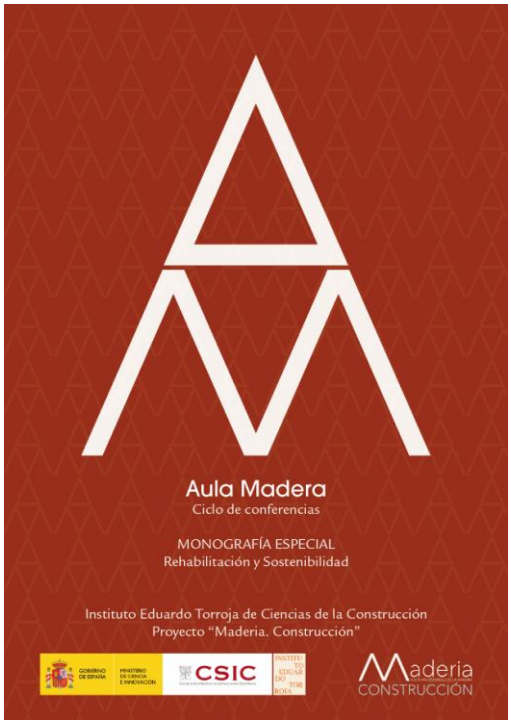


Figure 5: Aulamadera flyer