Passivhaus in Spain – current situation

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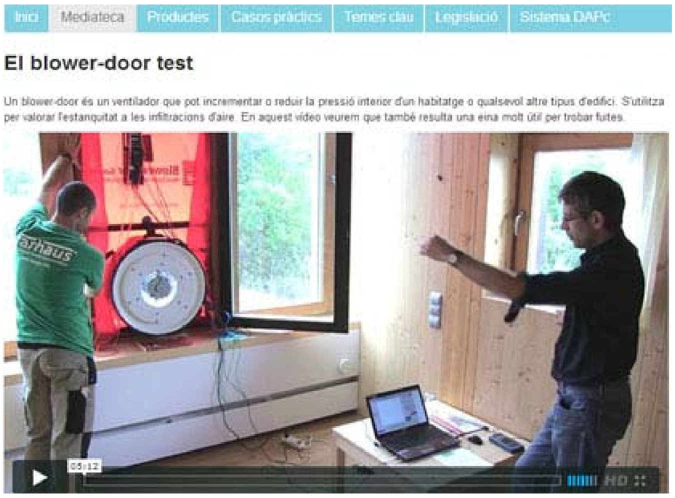
After four years of dissemination work in the Spanish Passivhaus Platform PEP (Plataforma de Edificación Passivhaus), the PH-standard is now known by a large number of architects and civil engineers south of the Pyrenees.

PEP has now about 150 members, and recently translated PHPP into Spanish (in summer 2012). Their main activity focuses on the organization of the yearly PH-conference, with more than 250 participants each year, and the delivery of technical symposiums, about 4 times a year.



Besides this institution, ENERGIEHAUS, a private firm of architects specialized in PH, is holding CPE-courses (Certified PH Expert) twice a year since 2011, as well as organizing the official PH-exam of the PHI. It's worth noting that besides PH, there are no alternative building standards in Spain related to energy efficiency. The public administration hasn't yet understood the advantages of Passivhaus, and still thinks that the energy labeling based on the old EPBD-framework is enough to reach the demanding goals of the new EPBD-recast legislation (nZEB-buildings by 2020).

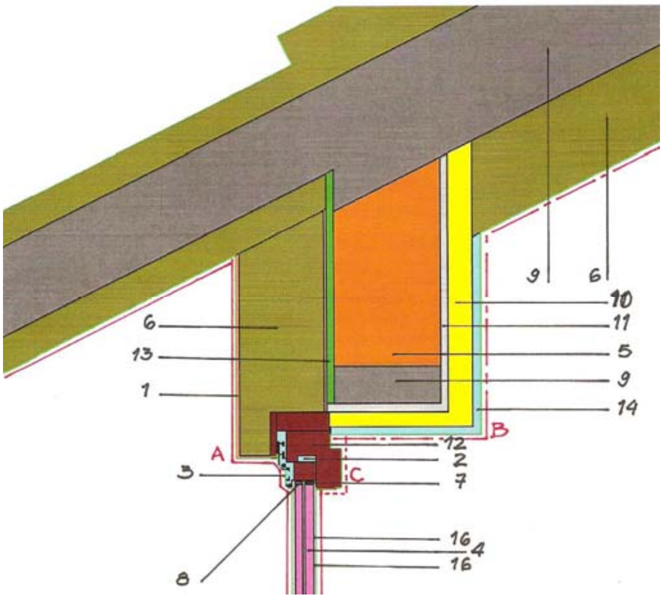
At the time of writing, there are three PH certified buildings, all of which are detached family houses. Two buildings have been certified in 2011 (in Navarra and Andalucía), and the last one recently in the Basque Country.

I will expose briefly 4 examples of residential buildings which are on the way to achieving Passivhaus certification. Energiehaus is managing these certification processes, hopefully to a happy end. The story of each building shows in a pictorial way, how the standard is adapted to the specific Spanish "Method of Construction".

Casa JADE in Jungitu – Vitoria (Basque Country)
Architects: Clim – Estudio de Arquitectura
Building Developer: Construcciones Urrutia

This dwelling has been developed by a bigger Spanish contractor, normally involved in large residential developments. The idea of testing the PH-standard in a small scale building was undertaken, to learn step by step the specific technical challenges of the PH-standard. Mistakes in the design or in the execution phase are less dramatic than in a large scale building. Unusually high levels of insulation on walls and roofs led to special solutions (e.g. the separation of one part of the insulation above, and the other part under the massive concrete roof slab). For the optimal installation of the windows in the insulation layer, the window installer went to northern Italy to learn from his Italian colleagues trained in PH-window installation. For the joints between concrete beams and concrete brick walls, the contractor installed natural rubber seals to assure air tightness as much as possible. The active heating demand is delivered by a simple Pellet stove, installed in the living room. There are no radiators in the dwelling. The heat is distributed directly by the stove, and indirectly via the ventilation system. Active cooling is not needed in the temperate summers of this northern region of Spain. The building has been recently equipped with a series of data-loggers to monitor energy use in winter and summer.

Besides these new features, the Blower Door test has given excellent results (0.23/h at 50pa). This can be explained due to the highly motivated team of architects, building engineers, contractor and executive firms. The family moved into the dwelling in summer 2012, and is very happy about the comfort in the building. Aditional capital costs of the house are about 15% higher than standard build, which will need reducing in the future.



Calculation of comfort and hygiene conditions with a finite element calculation tool – source: I.Echeandía

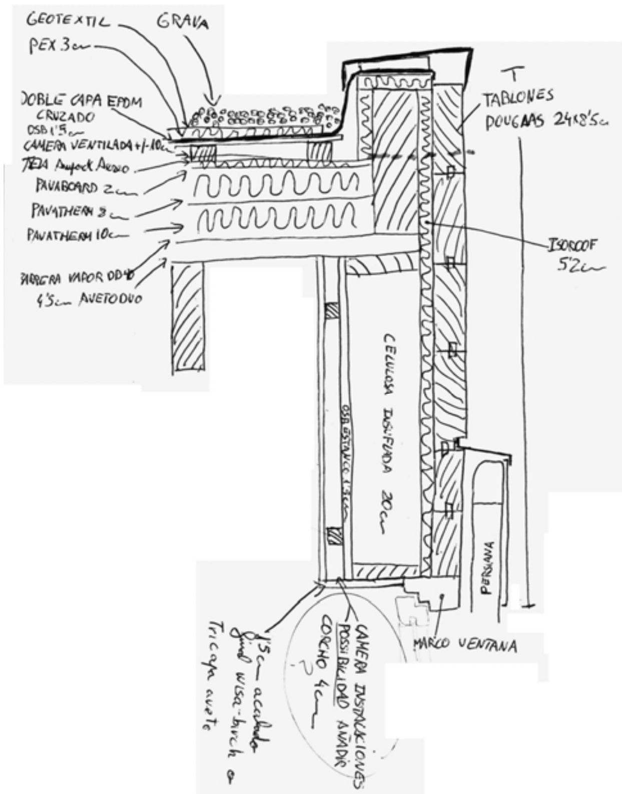
Joints with rubber seal – source: M.Wassouf

Instalation of etix- insulation – source: M.Wassouf

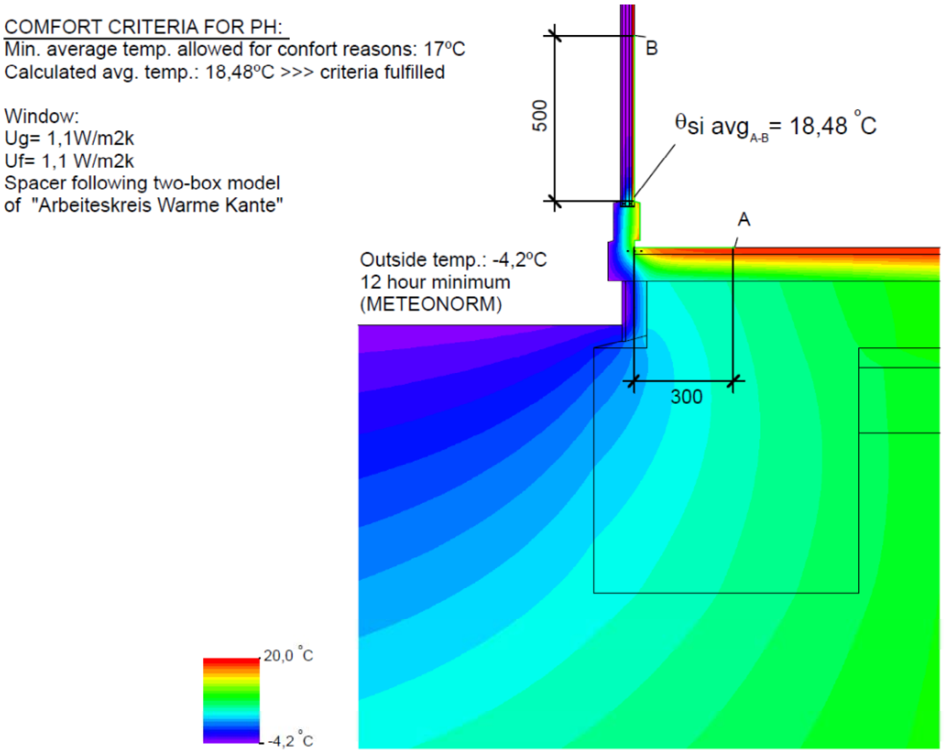
Casa Farhaus in Castellterçol
Architect: Jordi Fargas Soler
Building Developer: Farhaus

A carpenter specialized in PH-construction wanted to live himself also in a Passive House. His house is currently in certification phase. The first summer proved the correct operability of the dwelling in hot summer conditions (the house is about 50 km in the north of Barcelona). No air conditioning is necessary to maintain comfort conditions, due to cold summer nights in this site, about 600 meters over sea level. The peculiarity of this construction is the utilization of windows which don't fit with the official PH-definition of window-transmittance (Uw max. 0,8W/m2k), so ENERGIEHAUS had to justify the solution by thermal bridge calculation with flixino to show that there are no moisture problems in the critical details, and also to prove that the average temperature in the coldest day meets the comfort criterion of ISO-EN-7730 (not below 17ºC). This building will hopefully confirm our hypothesis that Passive Houses are a very reasonable solution also for hot and humid regions as the Mediterranean cost, as there are still a lot to do to convince architects and engineers in this region about the feasibility of PH-standard in this region.

Simple and compact volume of casa Farhaus – source: A.Fargas



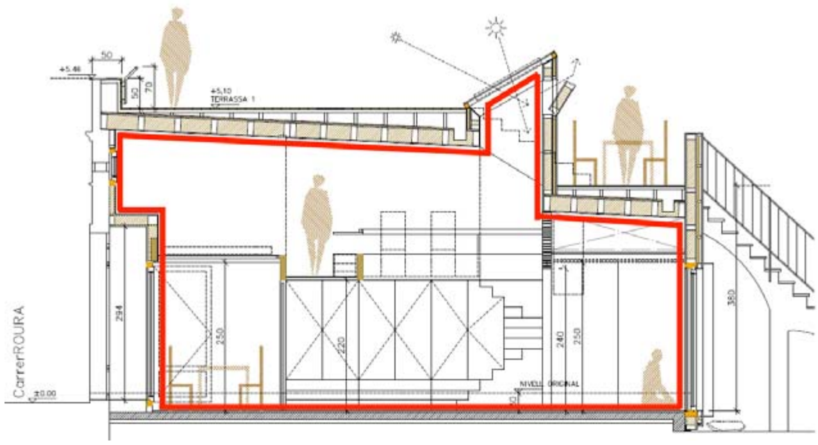
Constructive detail: wall to roof– source: A.Fargas



Comfort-criteria: Temperatures of the lower window profile, calculated with flixino – source: Energiehaus

Casa MZ in Barcelona
Architect: Calderon-Folch-Sarsanedas
Building Developer: M. Folch

This case shows once again the challenge to renovate an existent building toward Passive House. The dwelling is part of a terraced house built in the early 20th century, which was characterized by a very bad energy performance before renovation (about 171 kWh/m2a for heating demand according to PHPP calculations). We reached the factor 10 renovation standard, as the actual heating demand is now 17 kWh/m2a. This result was possible due to a special effort realized by the architect to improve the building quality as much as possible, maintaining a low budget for the works. Natural materials, for example, a wooden structure and windows or lamb wool as insulation material, give additional value to this project. The certification in PH-standard has not been achieved with this wonderful project, as the Blower Door test couldn't reach the magic 1.0 air change rate at 50 Pascal (EnerPhit).
We've learned that this result is only achievable in retrofitting object with a flexible execution schedule and experienced contractors, which are still difficult to find in Spain.



Section of the dwelling with indication of the airtight layer – source: M.Folch and M.Wassouf

Wall layers showing the complexity of airtight-thinking in this renovation case – source: M.Folch

Casa EntreEncinas in Asturias
Architect: Duquezamora arquitectos
Building Developer: EntreEncinas Promociones Bioclimáticos

This dwelling has been constructed in northern Spain, near to the Atlantic Sea. The owner wanted a Passive House combined with natural materials to ensure a very low life cycle impact of the building. Walls and roof consist of massive CLT-wooden boards, which didn't guarantee the airtightness of the building, so this level has been defined by an additional water vapor retarder in the outside of the CLT structure (which is the inside finishing layer of walls and roof). A glassed gallery orientated to south operates as an additional heat capturing space for winter use. This space will be open during summer. A very big sliding window connects the gallery with the living room, and gave us some good trouble to reach the 0.6 goal, which finally has been achieved after adjustment of the opening. The gallery itself has not been simulated in PHPP, so the real behavior will very probably be better than the calculated balance. Summer comfort is achieved due to mild temperatures in summer, so overheating for this building is not an issue.

Wooden structure of the building – source: A.Zamora

Airtight layer of the building – source: A.Zamora

Building with the solar gallery facing to south – source: M.Wassouf