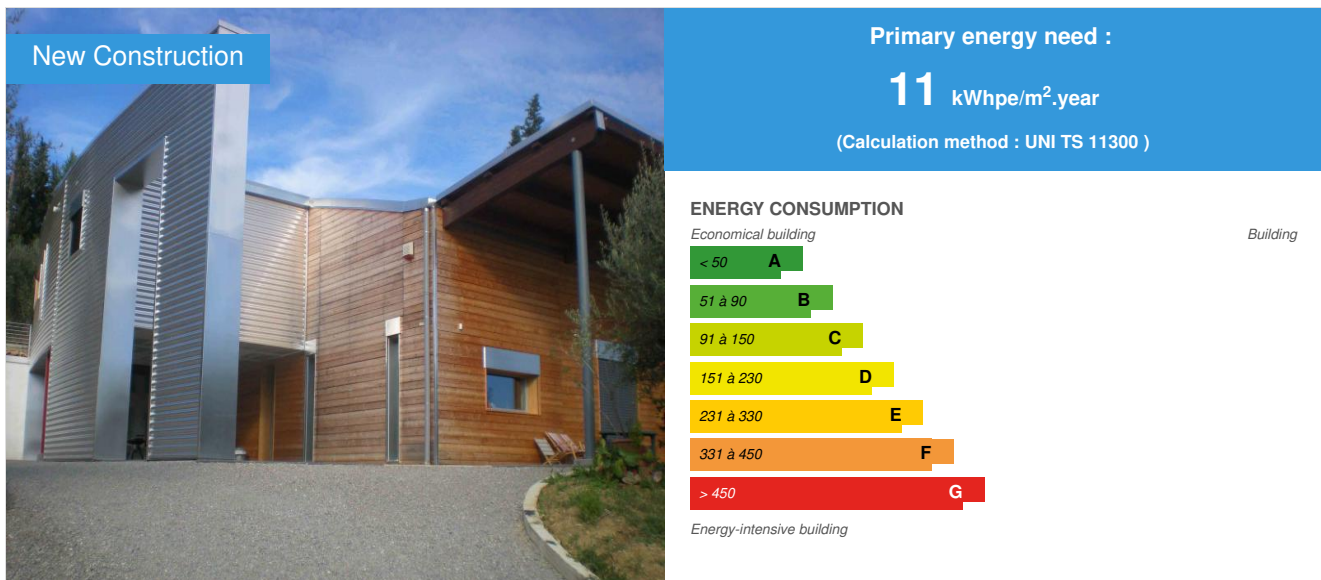


## Sustainable Passive House Fontana

by Francesco Masciarelli / 2014-02-27 16:25:39 / International / 4830 / EN



**Building Type** : Isolated or semi-detached house  
**Construction Year** : 2009  
**Delivery year** : 2009  
**Address 1 - street** : Via Colli della Farnesina 15/E 06132 PERUGIA, Italy  
**Climate zone** : [Csa] Interior Mediterranean - Mild with dry, hot summer.

**Net Floor Area** : 248 m<sup>2</sup> Useful area (it)  
**Construction/refurbishment cost** : 100 €  
**Cost/m2** : 0.4 €/m<sup>2</sup>

**Certifications :**



### General informations

A Passivhaus construction in central Italy, a temperate zone categorized as having cold winters and hot summers, that provides energy savings and reduces environmental footprint in a region where the technological requirements are burdened by the obligation to mitigate risk from high seismic activity. The structure consists in a light and flexible steel and wood beam frame with reinforced concrete dividing walls arranged inside the thermally insulated core that provide additional mass contributing to the passive thermal accumulation. This complex structure guarantees the stability of the building and minimizes kinetic energy resulting from seismic activity contemporary reducing the risk of damages to the airtight envelope. The project is based on the Passivhaus standard to optimize energy consumption, and relying on the Life Cycle Assessment (LCA) method to minimize the impact on the environment. The philosophy of the project. Conceptual: by reference to the use of the golden proportion or ratio as a base for the architectonic geometry of the building, and to the use of the principles of Feng Shui. Architectural: by reference to the use of contemporary and non-vernacular indoor and outdoor design and materials. Environmental: by reference to the use of natural (such as wood, wood wool, aluminum, steel and glass) and/or recycled/recyclable materials, water cycle management, preservation of the permeability of the external surroundings, relocation of centenarian olive trees, reuse of the digging material. Ecological: by reference to the use of a solo

ventilation system with heat recovery and subsoil heat exchanger both for heating and cooling, with a small contribution of a heat pump, passive strategies such as winter solar gain, summer solar protection, thermal solar system for domestic hot water (more than 80%), and photovoltaic panels to achieve energy independence with the use of solely self-produced renewable energy sources and such a main contribution to a real "close to zero" building end life environmental impact.

## See more details about this project

[http://www.passivhausprojekte.de/index.php?lang=en#k\\_2929](http://www.passivhausprojekte.de/index.php?lang=en#k_2929)

## Stakeholders

### Stakeholders

Function : Others

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### Contracting method

General Contractor

### Type of market

Realization

## Energy

### Energy consumption

Primary energy need : 11,00 kWhpe/m<sup>2</sup>.year

Primary energy need for standard building : 75,31 kWhpe/m<sup>2</sup>.year

Calculation method : UNI TS 11300

### Envelope performance

Envelope U-Value : 0,19 W.m<sup>-2</sup>.K<sup>-1</sup>

More information :

Exterior wall

Plasterboard, 25 mm [0,6 W/(mK)]

Air, 140 mm [0,759 W/(mK)]

OSB board, 18 mm [0,13 W/(mK)]

Insulation fiberboard, 280 mm [0,038 W/(mK)]

Wood, 24 mm [0,13 W/(mK)]

Airtightening layer, 3 mm

U-value = 0.119 W/(m<sup>2</sup>K)

Basement floor / floor slab

Gres paving, 14 mm [1,0 W/(mK)]

Concrete slab, 70 mm [1,8 W/(mK)]

Polystyrene Styrodur CS 30/35, 180 mm [0,033 W/(mK)]

Insulated concrete slab, 30 mm [0,093 W/(mK)]

Concrete slab, 50 mm [1,28 W/(mK)]

Insulation, 10mm [0,039 W/(mK)]

ribbed slab, 380 mm [1,655 W/(mK)]

Concrete slab, 100 mm [1,28 W/(mK)]

U-value = 0.151 W/(m<sup>2</sup>K)

Roof

Wood, 22 mm [0,13 W/(mK)]

Air tightening layer, 3 mm

insulation wood fiber, 280 mm [0,038 W/(mK)]

insulation fiberboard, 20 mm [0,046 W/(mK)]

U-value = 0.119 W/(m<sup>2</sup>K)

Windows

U w-value = 0.95 W/(m<sup>2</sup>K)

Glazing

different triple glazing

with two low-e-coatings and krypton filling

Spacer: inox spacer

Manufacturer: Saint Gobain

average

U g-value = 0.6 W/(m<sup>2</sup>K)

g -value = 51 %

Building Compactness Coefficient : 0,67

Indicator : n50

Air Tightness Value : 0,44

## Real final energy consumption

Final Energy : 50,00 kWh/m<sup>2</sup>.year

## Renewables & systems

### Systems

Heating system :

- Heat pump
- Others
- Others

Hot water system :

- Heat pump
- Solar Thermal

Cooling system :

- Reversible heat pump
- Others
- Others

Ventilation system :

- Nocturnal ventilation
- Free-cooling
- Double flow heat exchanger

Renewable systems :

- Solar photovoltaic
- Solar Thermal
- Other, specify
- No renewable energy systems

Renewable energy production : 100,00 %

[↗](#) Double flow cross heat exchanger integrated with Subsoil Heat Exchanger

### Smart Building

BMS :

Building main performances management and control, for energy consumption reduction and indoor quality living and security increasing

Smartgrid :

Heating and cooling management and data control, electric load control, lighting solutions control, security control, PV production monitoring

## Environment

### Urban environment

Bus stop approx 100 m.

Land plot area : 1 700,00 m<sup>2</sup>

Built-up area : 20,00 %

## Products

### Product

Double flow cross heat exchanger integrated with Subsoil Heat Exchanger with Subsoil Heat Exchanger

Product category :

Ventilation for supply and extract air with heat recovery and subsoil heat exchanger for pre-heating and pre-cooling the intake air

## Health and comfort

### Life Cycle Analysis

Contribution assessment: comparison between two end-of-life scenarios, in terms of GER (a) and GWP100 (b)

Material impact on GHG emissions :

319

Material impact on energy consumption : 225,00 kWhEP

### Water management

Consumption of harvested rainwater : 150,00 m<sup>3</sup>

Drinking water consumption reduction and reuse of rainwater for water closet and wash machine.

Rainwater container capacity approx 25 m<sup>3</sup>.

### Indoor Air quality

Double flow air ventilation system, integrated with Subsoil Heat Exchanger, with three layers of filter.

The air exchange, the minimization of thermal bridges and the removal of constructive imperfections, the the use of natural materials, contributes to reach a high level of indoor air quality, optimizes the thermo-hydrometric indoor performances and reduces the risks of the presence of air pollutants.

## Carbon

### GHG emissions

GHG in use : -9,29 KgCO<sub>2</sub>/m<sup>2</sup>/year

Methodology used :

EPD 2007, Eco-indicator 99. In the utilization phase, occupants' energy consumptions and maintenance of materials for a lifetime of 70 years were taken into account.

GHG before use : 16,04 KgCO<sub>2</sub> /m<sup>2</sup>

Building lifetime : 70,00 year(s)

GHG Cradle to Grave : 358,40 KgCO<sub>2</sub> /m<sup>2</sup>

EPD 2007 and Eco-indicator 99. The first one includes the characterization stage and the evaluation is carried out on six damage categories: Gross Energy Requirement (GER), Non-Renewable Energy consumption (NRE), Global Warming (GWP), Eutrophication (EP),





Date Export : 20230309003458