# Larixhaus: straw bale and timber passive house

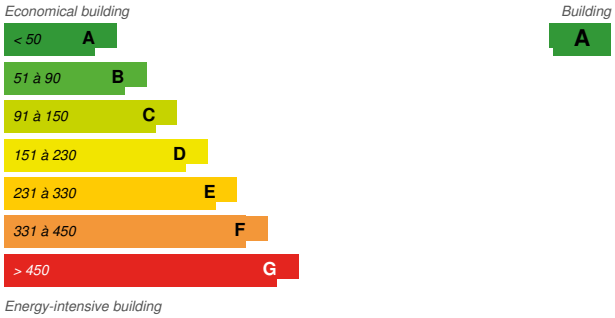
by Oliver Style / 2014-01-20 11:26:15 / España / 46668 / ES


**Primary energy need :**

**96** kWhpe/m².year

**(Calculation method : Primary energy needs )**

**ENERGY CONSUMPTION**




**Building Type** : Isolated or semi-detached house
**Construction Year** : 2013
**Delivery year** : 2013
**Address 1 - street** : C/Ponent 18 08178 COLLSUSPINA, España
**Climate zone** :

**Net Floor Area** : 94 m² Other
**Construction/refurbishment cost** : 113 800 €
**Cost/m2** : 1210.64 €/m²

**Certifications :**

## General information

Welcome to the first pre-fabricated straw bale passive house on the Iberian Peninsula. The Larixhaus is a single family home split over two floors, located in the town of Collsuspina, 70 km north of Barcelona, Catalonia, Spain.

The timber superstructure and external cladding is PEFC certified. Healthy indoor air quality is achieved by using non-toxic natural materials, with whole house ducted heat recovery ventilation. Embodied energy and CO2 emissions over the life cycle are minimised by prioritising the use of natural, non-toxic, renewable building materials.

Through careful bio-climatic design, thermal insulation with straw, an airtight envelope and triple glazed windows, the Larixhaus has a projected space heating demand (calculated with PHPP) of 15 kWh/m2.a, approximately 80% less than that required by the current Spanish Building Regulations. Summer comfort is achieved through the careful choice and orientation of opening areas with external shading devices on the southern façade.

Pre-fabrication allows for rapid on-site assembly, pre-installation of the airtight layer and window frames, with associated cost savings and near-zero on-site waste.

## See more details about this project

http://www.passivhausprojekte.de/index.php?lang=en#d_3874

## Data reliability

Assessor

# Stakeholders

## Stakeholders

Function : Thermal consultancy agency

Oliver Style, ProGETIC SCP

ostyle@progetic.com

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Function : Construction company

Oliver Style, Vicenç Fulcarà, ProGETIC SCP

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Function : Developer

Jordi Vinadé, Itziar Pagès

http://larixhaus.cat/

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Function : Construction Manager

Albert Fargas - FARHAUS

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Function : Designer

Nacho Martí Morera, Maria Molins, Oriol Martí

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Function :

Manuel García Barbero - KLIMARK

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http://www.klimark.com/

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Function : Others

Marc Garriga, Joan González

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Function : Other consultancy agency

Micheel Wassouff - ENERGIEHAUS [Blower Door Test]

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http://www.energiehaus.es/

## Contracting method

Maximum Guaranteed Price

## Owner approach of sustainability

The owners wanted to a home where natural materials (such as timber and straw), comfort and energy efficiency were given priority over architectural design and

floor area

## Architectural description

Simple and elegant, with a compact design and larch cladding finish that will weather over time.

## Building users opinion

The users are satisfied with the thermal comfort and energy efficiency of the home. Recently outdoor temperatures where reaching -3ºC, with indoor temperaturas remaining above 20ºC without active heating. They report that it is quiet and comfortable. Monitoring is planned to fully evaluate the thermal performance and air quality of the home.

# Energy

## Energy consumption

Primary energy need : 96,00 kWhpe/$m^2$.year

Primary energy need for standard building : 284,00 kWhpe/$m^2$.year

Calculation method : Primary energy needs

Final Energy : 55,00 kWhfe/$m^2$.year

Breakdown for energy consumption :
Space heating: 15 kWh/m2aHot tap water [DHW]: 7 kWh/m2aElectricity: 21 kWh/m2a

More information :
We are currently preparing operational energy consumption and indoor climate conditions monitoring. Informal qualitative feedback from the owners shows that they use the electric radiators in the ground floor bedrooms during approximately 30 minutes in the evening and morning on the coldest days/nights to maintain comfort.

## Envelope performance

Envelope U-Value : 0,21 $W.m^{-2}.K^{-1}$

More information :
Prefabricated structural timber system with straw bale infill insulation. Timber is thermally broken with cork insulation on the outside of the thermal envelope, positioned behind the wood fibre breather board and ventilated larch rain screen cladding void.
Cold bridges are avoided or reduced with analysis and modelling the design phase. Prefabrication allows for the installation of most of the air-tight layer and window frames, prior to on-site assembly, providing a speed and quality in the build phase.
Straw bales are 1200mm x 700mm x 400mm, positioned vertically in the timber frame super structure of the walls, with predominant fibre direction perpendicular to heat flow. Two straw bale roof cassettes with the bales positioned in the same direction as the walls provide a thermally efficient roofing system. Despite not meeting our environmental criteria, we decided that the most cost effective and thermally efficient solution for the floor slab was rigid polystyrene under the slab with perimeter insulation around the edge of the slab.
Triple glazing with two low-e coatings, argon gas filling and TGI warm spacers sitting in soft-wood timber frames thermally broken with cork reduces heat loss in winter and heat ingress in summer through openings.
We reached an impressive 0.32/h air change rate @50Pa on the first air-tightness test.
Fermacell plasterboard provides the final dry-lining finish, closing a 35mm service void behind. While providing limited thermal mass, the plasterboard was required by Spanish Building Regulations for fire protection. Gravel infill on the intermediate floor adds some thermal inertia, although with the air-tightness and thermal insulation specification, combined with careful opening size and orientation (modelled and tested in the design phase), the building's thermal mass was considered sufficient to maintain comfort with natural summer ventilation. Given the altitude, peak summer temperatures are lower than coastal Mediterranean regions, averaging 20ºC in July and August. We're keen to see the building´s summer performance, given frequent concerns in the low-energy building sector that super-insulated air tight buildings have a higher tendency of overheating.

Building Compactness Coefficient : 0,34

Indicator : n50

Air Tightness Value : 0,32

# Renewables & systems

## Systems

Heating system :

- Electric radiator
- Others

Hot water system :

- Heat pump

Cooling system :

- No cooling system

Ventilation system :

- Double flow heat exchanger

Renewable systems :

- Other, specify

Renewable energy production : 22,00 %

## Environment

### GHG emissions

GHG in use : 25,00 $KgCO_2/m^2$/year

Methodology used :
PHPP 7

Building lifetime : 100,00 year(s)

### Indoor Air quality

Good indoor air quality is achieved by using non-toxic natural materials, with whole-house ducted heat recovery ventilation during the winter, consisting of a Zehnder ComfoAir 350 Luxe PHI certified unit with sensible heat recovery, distribution in HDPE 90 mm pipes, complete F7 and G4 filters.
Natural single-sided, cross and stack ventilation is used in the spring, summer, and autumn months, according to outdoor air temperature, operated by users.

## Products

### Product

Zehnder ComfoAir 350

Zehnder

info@zehnder.es

http://www.zehnder.es/

Product category :

PHI Certified heat recovery ventilation unit with heat recovery efficiency of 90%
Comfort ventilation up to 370 $m^3/h$
Low power consumption with DC motors
Automatic 100% summer bypass
Frost protection function: efficient even at low temperatures
Optional integrated preheater and humidity control
Wireless remote control and filter replacement indicator

Theodoor 300 PLUS

Theodoor

georenova@georenova.com

http://www.georenova.com/

Product category :

Thermodynamic compact air-source heat pump for hot tap water [DHW]300 litre capacity0.88 electrical : 3.6 kW thermal COP = 3.75 @ air 15ºC / water 45ºC

## Costs

### Energy bill

Forecasted energy bill/year : 350,00 €

## Land plot area

Land plot area : 442,00 $m^2$

## Built-up area

Built-up area : 135,00 %

## Contest


Date Export : 20230312133434