Passive house in Burmerange (Luxembourg)

by Ralph Baden / 2018-05-30 10:41:59 / Luxembourg / 11495 / FR

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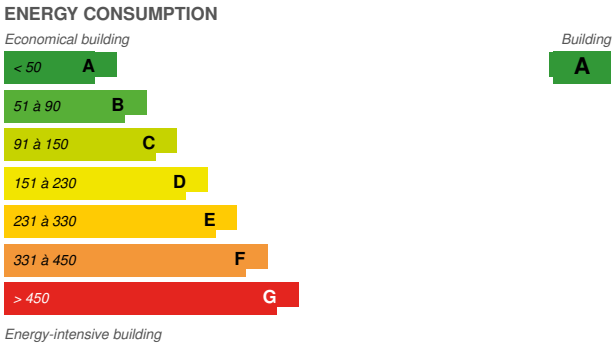
Primary energy need :

31 kWhep/m².an

(Calculation method : Other)



Building Type : Isolated or semi-detached house
Construction Year : 2014
Delivery year : 2016
Address 1 - street : 5675 BURMERANGE, Luxembourg
Climate zone : [Cfb] Marine Mild Winter, warm summer, no dry season.

Net Floor Area : 386 m² SRE
Construction/refurbishment cost : 1 €
Number of Dwelling : 1 Dwelling
Cost/m2 : 0 €/m²

General information

It is a passive single-family building equipped with geothermal energy, a smarthome function, a photovoltaic electric production unit but which has also been designed in a healthy way (reflection on chemical emissions, on the reduction of electromagnetic fields, on the radon problem) including the positive effects of construction materials: humidity regulation, absence of electrostatic effects, composition of indoor air ions.The construction was accompanied by a"baubiologe" health expert and an accredited laboratory which carried out preliminary chemical analyses of the materials to be used on the site.Chemical analyses (more than 150 different molecules), measurement of electromagnetic fields, measurement of radon, positive and negative ions, etc. were carried out after the building was completed to check the"health" aspect and the absence of disrupters. Continuous CO2, humidity or radon measurements have been made.In parallel, the project followed the passive design mode with in particular the calculation of the real energy consumption and the implementation of constructive details with absence of thermal bridges; this absence was verified during the winter season.The construction also serves as a pilot project and is described in detail in a 300-page book (French and German versions) currently under development. It has also been described in a two-hour documentary film (German and French versions) scheduled for release this fall 2018. More than fifty hours of raw film can be adapted to serve as specific training for many trades.

Data reliability

Assessor

Stakeholders

Contractor

Name : Privé

Construction Manager

Name : Beiler & François Architectes - depuis 2018: Beiler François Fritsch
Contact : contact@bffarchitectes.lu
http://bf-archi.lu - http://bffarchitectes.lu

Stakeholders

Function : Assistance to the Contracting Authority

Ralph Baden, biologiste diplômé, baubiologe - expert en construction "saine", responsable qualité de l'air intérieur au Ministère du développement durable/Ministère de l'Environnement

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"Health" advice - material analyses and measurements - indoor air quality controls

Contracting method

Separate batches

Owner approach of sustainability

An adept of contemporary green energy production technologies (photovoltaic electric production installation on the old house), eager to go further in the passive and fanatical concept of computer technologies applied to the building - hence the interest for the"smarthome"-, the master ofThis work became sensitive to the health/quality aspects of indoor air following health problems in her children, these problems were related to the poor indoor air quality of the old house (expert assessments, laboratory analyses), hence the desire to integrate the health aspects in the overall constructive concept and in a sustainable project perspective.

Architectural description

It is a passive single-family dwelling house under massive construction: concrete for load-bearing walls, insulating clay/perlite bricks for the other walls (with humidity regulation function), photovoltaic electrical production system, geothermal energy, underfloor heating, home automation system with braided armoured cables (reduction of electromagnetic fields, WiFi internet access transported by cable in each room and individually manageable by relay), solid wood interior joinery (doors, kitchen), mechanically fixed aluminium windows in order to reduce the risk of damage to the walls, etc;Avoid the use of polyurethane foam), chemically tested oiled parquet and parquet glue, use of biosourced insulation free of harmful substances, lime based interior coating (with moisture regulating function) and non-hazardous mineral paint.
All materials were analysed before use.

If you had to do it again?

Some choices in the trades would be different: mostly time and material quality problems, independent of the"health" aspect of the project.

Energy

Energy consumption

Primary energy need : 31,00 kWhep/m^2.an

Primary energy need for standard building : 125,00 kWhep/m^2.an

Calculation method : Other

CEEB : 94

Breakdown for energy consumption :

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More information :

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Envelope performance

More information :

-

Building Compactness Coefficient : 0,50

Indicator : EN 13829 - n50 » (en 1/h-1)

Air Tightness Value : 0,39

Blower Door intermediaire

Users' control system opinion :

Interesting potential in terms of energy savings, safety, but also in terms of health and minimisation of exposure to low and high frequency electromagnetic fields.
Limitations concerning the connection of the VMC which at the beginning was incompatible and consequently had to be replaced.

Blower Door final apres achevement du batiment

Renewables & systems

Systems

Heating system :

- Geothermal heat pump
- Low temperature floor heating

Hot water system :

- Heat pump

Cooling system :

- Geothermal heat pump

Ventilation system :

- Double flow heat exchanger

Renewable systems :

- Solar photovoltaic
- Heat Pump on geothermal probes

Renewable energy production : 37,00 %

East-west oriented photovoltaic installation to ensure a more balanced and smoothed electric production over the length of a day (although less important in absolute terms).

Solutions enhancing nature free gains :

-

Smart Building

BMS :

Remote control.
Central control terminal (kitchen)

Smartgrid :

-

Users' opinion on the Smart Building functions :

Environment

GHG emissions

Methodology used :

-

-

Life Cycle Analysis

-

Eco-design material :

Maximized use of eco-materials wherever possible: wood flooring, interior woodwork in solid wood, biosourced insulators, the whole having been analyzed beforehand to certify the absence of harmful substances within them.

Indoor Air quality

Use of materials and products free of harmful substances (previously analysed in the laboratory). Air and dust quality controls for over 150 distinct harmful substances including aromatic and aliphatic VOCs, halogenated derivatives, terpenes, glycol ethers, biocides and pyrethroids, organophosphorus and polybrominated flame retardants, PCBs, PAHs, phthalates and heavy metals. Comparison with the German specific guidance values (Arbeitsgemeinschaft Ökologischer Forschung - AGOEF), among the most severe in Europe.Concentrations found below detection limits and guidance values except for glycol ethers in a particular room from cleaning products used after construction.CO2 values measured over the long term with concentrations well below 1000 ppm (Pettenkofer), and mostly below 600 pp (cf. outdoor air 400-450 ppm).Formaldehyde concentrations below the detection limit of 10 µg/m3 in living room and bedrooms. Radon 67 Bq/m3 in the bedroom.No anomalies concerning high and low frequency electromagnetic fields: low frequency electric fields > 1 V/m, low frequency magnetic fields > 10 nT in sensitive areas (living room and bedrooms) and therefore far below the SBM-2105 orientation values (Baubiologischer Messtechnik Standard in Germany).

Comfort

Health & comfort : Improvement of the regulation of the relative humidity of the indoor air by the use of buffer materials such as clay bricks (Poroton), lime plasters without vitrifying paint, oiled and unglazed parquet.Window blinds are managed using smart technology.

Products

Product

Painting Verdello

Peintures Robin

http://www.verdello.lu/contact

http://www.verdello.lu

Product category : Second œuvre / Peinture, revêtements muraux

Ecological paint based on natural solvents, 100% biosourced.

Paint analysed by us for the absence of harmful substances that could emanate and contaminate the ambient air.

Briques Poroton

Wienerberger Poroton

Wienerberger

https://wienerberger.de/service/kontakt

https://wienerberger.de

Product category : Gros œuvre / Structure, maçonnerie, façade

Clay bricks used for non-load-bearing walls and partitions.

Interesting capacity of regulation of the interior hygrometry.

Wakol MS 290

Wakol

https://www.wakol.com

https://www.wakol.com

Product category : Second œuvre / Revêtements de sol

Glue used for parquet on underfloor heating and horizontal and vertical tiling.

Adhesive proposed by the parquet manufacturer, accepted by the tiler, without harmful emissions and without problems of implementation by the trades.

Colle analysr par laboratoire avant utilisation.

Poroton-T-Dünnbettmörtel

Wienerberger

https://wienerberger.de/service/kontakt

https://wienerberger.de

Product category : Gros œuvre / Structure, maçonnerie, façade

Heat insulating adhesive for insulating Poroton.

Is an integral part of the Poroton exterior wall system and prevents thermal bridges; powder product to mix with water on site; no preservatives.

Biologa NF 45

Biologa

www.biologa.de

http://biosol.de

Product category : Second œuvre / Peinture, revêtements muraux

Specific paint to reduce low frequency electric field emissions.

Application a little difficult because of the black color of the paint

Biosil

Keim

https://www.keim.com/de-ch/

https://www.keim.com/de-ch/

Product category : Second œuvre / Peinture, revêtements muraux

Paint tested beforehand in laboratory, without harmful emissions.

Paint that is suitable in shades not too dark (risk of clouds).

Haga-Bio-Plattenkleber

HAGA

https://www.haganatur.ch

https://www.haganatur.ch

Product category : Second œuvre / Revêtements de sol

Glue without harmful emissions, in powder form and without preservatives or fungicides.

Normal use.

Costs

Construction and exploitation costs

Global cost : 1,00 €

Renewable energy systems cost : 1,00 €

Global cost/Dwelling : 1

Total cost of the building : 1 €

Urban environment

The occupants are very satisfied. Children's health problems have disappeared (recurrent cough in the old house, due to proven exposure to organophosphate flame retardants from polyurethane insulation panels).

Land plot area

Land plot area : 1 097,00 m^2

Built-up area

Built-up area : 25,00 %

Parking spaces

Parking outside, on the surface.

Building Environnemental Quality

Building Environmental Quality

- indoor air quality and health
- comfort (visual, olfactive, thermal)
- energy efficiency
- renewable energies
- maintenance

Contest

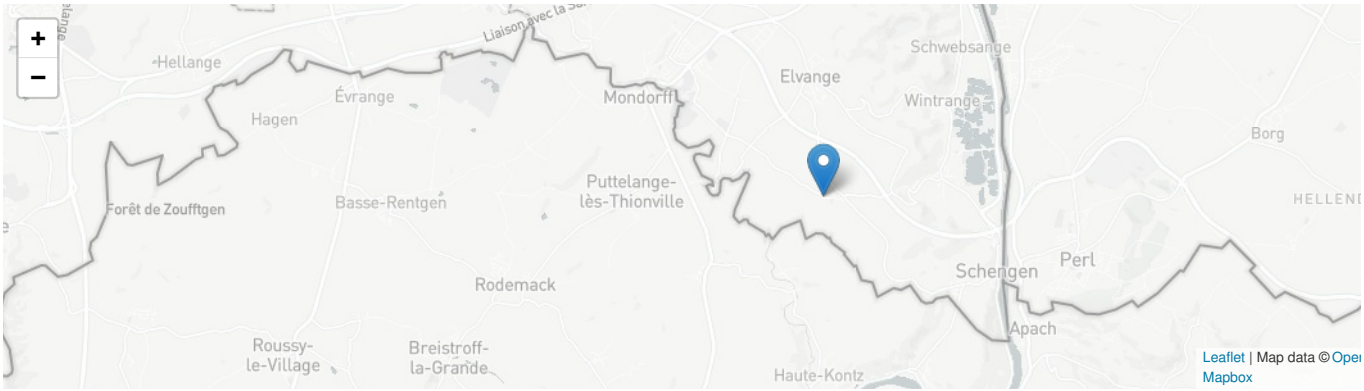
Reasons for participating in the competition(s)

-Rigorous integration of the concept of healthand well-being in parallel with the concept of passive construction,proving that"passive" and"health" are not in contradiction;
-Controls, analyses and measurements upon completion of construction;
-Production of teaching material (documentary film, book, specific documentaries);
-Contact with the owner-occupiersisestablished and maintained in order to allow long-term observation of theconstruction and validate the choices made.

Building candidate in the category

Santé & Confort

Coup de Cœur des Internautes



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