Steel Farm

by Mark Siddall / 2016-04-25 15:14:17 / International / 9566 / EN

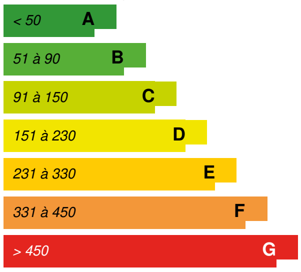
Primary energy need :

85 kWhpe/m^2.year

(Calculation method : Other)

ENERGY CONSUMPTION

Economical building *Building*



Energy-intensive building

Building Type : Isolated or semi-detached house
Construction Year : 2013
Delivery year : 2013
Address 1 - street : NE47 8JP WHITFIELD, United Kingdom
Climate zone : [Cfb] Marine Mild Winter, warm summer, no dry season.

Net Floor Area : 151 m^2 SHON
Construction/refurbishment cost : 1 567 €
Number of Dwelling : 1 Dwelling
Cost/m2 : 10.38 €/m^2

Certifications :

Proposed by :

General information

Steel Farm is located near Hexham in the North Pennine Area of Outstanding Natural Beauty (ANOB). Built using traditional construction technology it is the first Certified Passivhaus in Northumberland.

As organic farmers they owned a plot of land where they dreamt of building a comfortable, low energy home that could accommodate them in their old age and minimise their impact upon the environment. They longed to build their own sustainable low energy home so that family could come and stay. (In the winter of 2011 Trevor and Judith Gospel were renting a small, gloomy bothy. That bitterly cold winter they found that the inside of their fridge was warmer than the living room.)

The remote rural location, limited access to utility mains, and onerous planning restrictions incurred significant costs and strongly influenced design. A number of conditions imposed by the local planning department increased costs and nearly prevented the Gospel's from building their dream home. The house features a solar thermal system for domestic hot water and a reed bed system for the treatment of foul waste water. AECB Water Standards informed the design also.

Delicate negotiations were undertaken to demonstrate the value that the project had to offer the local and regional economy, and the environment. They also saw the removal of a requirement to provide tabling and two chimneys. Ultimately all of these criteria were fulfilled without compromising the client's desire to achieve the Passivhaus standards of performance.

Planning permission was received in September 2011. Construction commenced in June 2012 and was completed in February 2013.

Trevor and Judith now live in their spacious new, home. The walls are washed with natural daylight and the windows frame views of the rolling hills (allowing surveillance of the livestock). The lights are rarely used.

A three part documentary series about the project is available at www.PassivhausSecrets.co.uk

See more details about this project

http://www.PassivhausSecrets.co.uk

Stakeholders

Stakeholders

Function : Designer

LEAP

Mark Siddall

http://www.leap4.it

Architect and Passivhaus Designer

Type of market

Realization

If you had to do it again?

Definitely train the site trades before starting on site. We did and risk was reduced significantly.

Building users opinion

Trevor Gospel "The construction of our new home has been a real adventure; challenging at times but, all in all, well worth the wait. Both Mark and Joe have met and exceeded our expectations. We had a limited budget and stuck to it. I don't think that we could have been in safer hands."

Judith Gospel "In our old accommodation, a winter or two ago, 2011 I think, we measured the temperature of the fridge and the living room. At one point it was warmer in the fridge! More than the savings in the energy bills and the reduced environmental impact, we are enjoying the comfort of our new home."

Energy

Energy consumption

Primary energy need : 85,00 kWhpe/m^2.year

Primary energy need for standard building : 220,00 kWhpe/m^2.year

Calculation method : Other

CEEB : 0.0862

Breakdown for energy consumption : Space Heating Demand 14 kWh/m2.yr
DHW 35 kWh/m2.yr

Envelope performance

Envelope U-Value : 0,10 W.m^{-2}.K^{-1}

More information :
Wall0.1 W/m2K

Roof0.08 W/m2K
Floor0.11 W/m2K
Windows (uninstalled)0.76
Window g-value0.5

Building Compactness Coefficient : 3,20

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

Air Tightness Value : 0,32

Users' control system opinion : A digital programmable room stat is used. Radiators are fitted with thermostatic valves.

In practice the digital programmable room stat has proven to be more complex that was desirable.
As the dwelling is a Passivhaus, and space heating demand is already minimised, controlled can be simplified even further. In future a simple seasonal On-Off switch will be used (On from September, Off from March).

More information

The precise amount of electrical energy used by the house can not be determined because the electric meter is used for the whole farm.

Real final energy consumption

Real final energy consumption/m2 : 24,00 kWhfe/m^2.year

Real final energy consumption/functional unit : 3 649,00 kWhfe/m^2.year

Year of the real energy consumption : 2 014

Renewables & systems

Systems

Heating system :

- Condensing gas boiler

Hot water system :

- Condensing gas boiler
- Solar Thermal

Cooling system :

- No cooling system

Ventilation system :

- Double flow heat exchanger

Renewable systems :

- Solar Thermal

Renewable energy production : 40,00 %

Solutions enhancing nature free gains :
Solar gains optimised and balanced against overheating risks. Internal gains minimised.

Smart Building

BMS :
Complexity avoided. Simple controls used where possible.

Environment

Urban environment

Rural location. As an opperational farm house the dwelling is accessed by car. Public transport is not available. The site is located near Hexham, Northumberland. North East England.

Land plot area : 1 250,00 m^2

Built-up area : 15,00 %

Products

Product

Paul Novus MVHR (supplied by Green Building Store)

PAUL

Green Building Store

http://greenbuildingstore.co.uk/

Product category : Génie climatique, électricité / Ventilation, rafraîchissement

mechanical ventilation with heat recovery

Passivhaus Certified

Costs

Construction and exploitation costs

Total cost of the building : 307 350 €

Energy bill

Forecasted energy bill/year : 367,00 €

Real energy cost/m2 : 2.43

Real energy cost/Dwelling : 367

Health and comfort

Water management

Rainwater butts used externally.

AECB Water Efficiency Standards were adopted as the basis for minimising mains water, domestic hot water demand and overheating risks.

Low flow fittings, a compact services plan, a microbore plumbing system was utilised so as to minimise the volume of dead legs (< 1.0 litres), and the storage cylinder was superinsulated (100mm compared to standard 50mm.)

Indoor Air quality

Hygienic ventilation (0.3 - 0.4 air changes per hour).
30 m3.h/person

Comfort

Health & comfort : Measured Performance:

Average temperature over the Year 20.3C

Winter:
oAverage Whole House Internal Temperature 18.5C
oAverage External Temperature 5C

Summer:
oAverage Maximum Internal Temperature 23C, Average Maximum External Temperature 15C,
oAverage Maximum Internal Temperature 24.7C, Average Maximum External Temperature 23C

Calculated indoor CO2 concentration :
Calculated household average <1000ppm

Calculated thermal comfort : 20C during winter. 0% >25C during summer.
Measured thermal comfort : Refer to Health & Comfort above.

Acoustic comfort : Noise levels from MVHR designed to be < 25 dB(A) in habitable rooms and < 35 dB(A) in non-habitable rooms

Carbon

GHG emissions

GHG in use : 15,70 $KgCO_2/m^2$/year

Methodology used :
PHPP calculations used to estimate energy use and carbon emissions

Building lifetime : 100,00 year(s)

Contest

Reasons for participating in the competition(s)

About the Passivhaus Standard:

The term “PassivHaus” refers to a specific building construction standard with excellent comfort conditions during summer and winter. Such buildings reduce space heating by 90% and total energy consumption by 75-80% compared to UK Building Regulations and achieve a comparable reduction in carbon emissions. The Passivhaus Standard was developed in the early 1990’s by Professor Wolfgang Feist and Professor Bo Adamson and then launched in 1996.

The Passivhaus Standard, the worlds leading quality assurance standard for low energy building, is over 20 years old and there are now reported to be more than 50,000 Passivhaus buildings globally – including houses, apartments, schools, offices, sports halls and gymnasiums, sheltered accommodation and care homes, hospitals and medical centres.

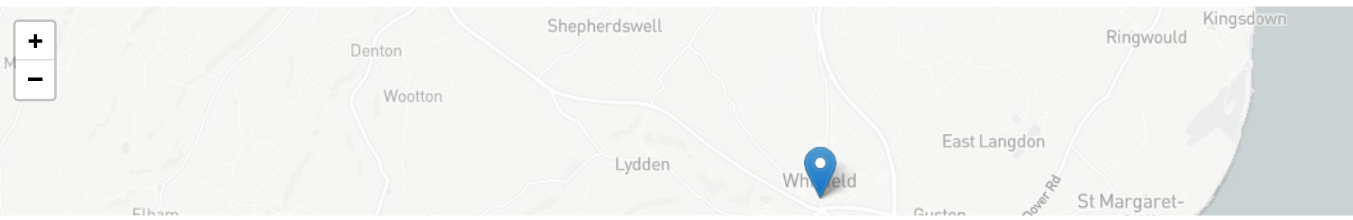
The exemplary performance of Passivhaus Standard has been documented extensively through ongoing scientific research. In parallel research has revealed that there is a significant gap between the theoretical performance of sustainable low energy dwellings and the actual delivered performance. This often means carbon emissions savings are not being delivered in practice. Recent papers, including a paper prepared by the architet of Steel Farm (http://www.mdpi.com/2071-1050/8/1/97/pdf), demonstrate that houses build to the Passivhaus Standard are capable of closing the performance gap.

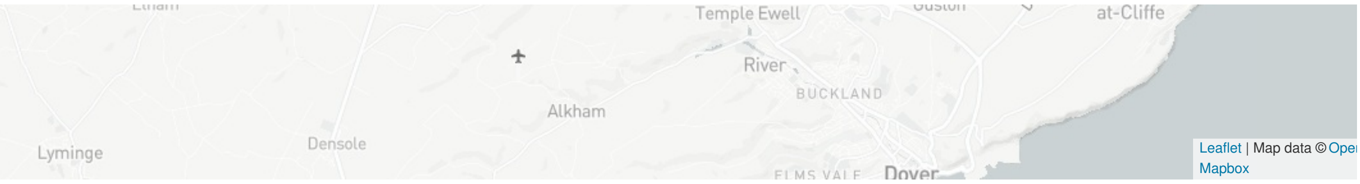
Even more about information about the performance gap and how it may be closed can be found at www.BuildingPerformanceEvaluation.co.uk

Building candidate in the category

Energy & Temperate Climates

Users' Choice Award





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