ACTIVE HOUSE

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Summary

The aim of future construction is to consider the energy use during construction and in subsequent use of buildings, and to create an efficient building envelope with technology and design without compromising the highest standards of indoor comfort and health – at the same time as producing the lowest possible climate impact by using renewable energy sources and implementing the concept of climate payback.

Keywords: Active House, experimental demo-houses, energy efficiency, healthy indoor climate, minimum climate impact, renewable energy.

1 Model Home 2020

Today's challenges in buildings: In the EU today, we spend 90 % of our time indoors, in buildings that consume over 40 % of the total energy consumption. Up to 30 % of the building mass does not contribute to nor provide a healthy indoor climate.

Looking into a future perspective of how we construct and renovate buildings in the future, it is necessary to consider climate changes, the resource situation and the health of this and coming generations.

In order to find solutions to the challenges of climate change and livability, we need to examine a future model that addresses them as a holistic solution.

1.1 Active House

Active House responds to environmental and climatic changes via a holistic approach – and shows the way to future standards through experimentation. With its central focus on health and comfort active houses are designed and built to achieve a balance between three parameters: energy, indoor climate and environment.

For more information on Active House please visit www.activehouse.info

1.1.1 Six experiments

The vision and principles behind Model Home 2020 need to be developed and tested; so from 2008 to 2011, we will build six full-scale experimental demo-houses. They will all reflect and respond to three main principles – efficient energy design, high degree of livability and minimum climate impact – as well as the different climatic, cultural and architectural conditions of the countries in which they are built.

2 The experiments

The experiments will run for 6-12 months from completion, after which time they will be sold. VELUX and partners will continue to monitor the experiments with the new residents to learn how the houses perform in real life conditions.

2.1 Home for Life (DK), finished 2009

The principal architectural idea in Home for Life is to unite single-family house requirements to experience, functionality and energy consumption in an integrated design. It is the light incidence, the active facade, the relationship between in and out and the flexibility of the house that gives the high architectural quality.

Fig. 1 Home for Life (Aarhus, Denmark)

Fig. 2 Home for Life interior

2.1.1 Energy design

The total energy consumption is minimised and covered by renewable and CO2 neutral energy generated by the building itself.

Fig. 3 Energy design scheme

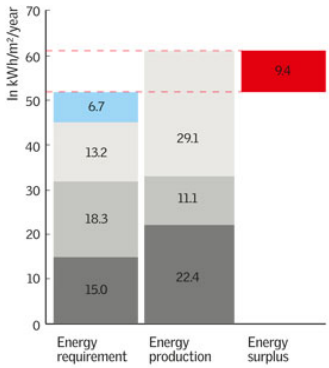

Fig. 4 Energy annual surplus is calculated at 9,4 kWh/m^2/year

2.1.2 Daylight

The use of daylight has been optimised to ensure the health and well-being of the residents as well as to minimise consumption of electric light during daytime. The window area amounts to 40% of the floor area.

2.1.3 Ventilation

There is generous provision of fresh air in Home for Life. In the summer, fresh air enters through natural ventilation controlled by a sensor in the house; this ensures that it is not ventilated more than necessary at the same time as maintaining a good indoor climate. In the winter, the air enters via the mechanical ventilation system with heat recovery.

2.2 Green Lighthouse (DK), finished 2009

The University of Copenhagen, The Danish University and Property Agency, the Municipality of Copenhagen, VELFAC and VELUX entered a strategic alliance to construct a new sustainable building with optimal balance between energy efficiency, architectural quality, healthy indoor climate and good daylight conditions. The building has facilities for the dean, professors and students of the Faculty of Science at the University of Copenhagen.

Fig. 5 The Green Lighthouse was also developed to be a showcase at the coming COP 15

Fig. 6 Working in daylit environments results in higher productivity

The purpose of the energy concept in Green Lighthouse is to make the house CO2 neutral. Green Lighthouse is a completely new experiment with an energy concept that consists of a combination of district heating, solar cells, solar heating and cooling, and seasonal storage.

2.3 Sunlighthouse (AUS), under construction

The house will be built on a sloping, shady plot with a lakeside view and will consist of typical Austrian materials combined with an innovative and energy-efficient design.

2.3.1 Energy design

The prime objective of Sunlighthouse was to reduce overall energy consumption, particularly primary energy, to a minimum without sacrificing living comfort.

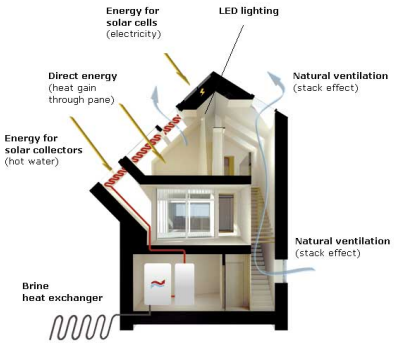

Fig. 7 Energy design scheme

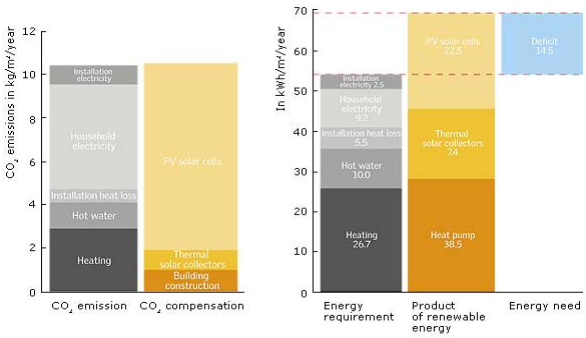

Fig. 8 Energy annual surplus is calculated at 14,5 kWh/m^2/year

2.3.2 Daylight

Donau-Universität Krems used a model of local sky conditions to arrive at an average daylight factor of at least 5 % for all living and working spaces to ensure balanced daylight levels throughout the two floors and to minimize the use of artificial light.

2.3.3 Ventilation

The house will have natural ventilation as primary type of ventilation, with heat recovery during winter and intelligent control of windows in spring, summer and autumn. No energy is used for cooling.

2.4 LichtAktiv Haus (DE), under construction

The house will be energy-renovated by utilising daylight and natural ventilation to improve indoor climate while making the building climate-friendly. The Wilhelmsburg Model Home 2020 is a typical representative of housing not only in Wilhelmsburg but also the rest of Germany, where half of the houses are between 30 and 60 years old, many of them in need of energy modernisation.

3 Sustainable living approach

The VELUX Group incorporates sustainability into buildings and has defined its conceptual thinking in the important and globally relevant issue of Sustainable Living. This is based on:

- Maximized energy efficiency and minimized CO2 emissions
- Visionary architecture combined with improved health, well-being and comfort for people
- Renewable energy sources with focus on thermal solar energy