Promotion of Eco-building Technologies, small Polygeneration and Renewable Heating & Cooling Technologies for Buildings

ProEcoPolyNet Technology Profile

Influence of windows size on the energy balance of a low energy

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Description

This technology profile is based on the article of Mari-Louise Persson, Arne Roos and Maria Wall published in Energy and Buildings Volume 38, Issue 3 , March 2006, Pages 181-188

A generally accepted way of building passive houses has been to have small windows facing north and large windows to the south. This is to minimize losses on the north side while gaining as much solar heat as possible on the south. In spring 2001, 20 terraced houses were built outside Gothenburg, in southern Sweden, partly in this way. The indoor temperature is kept at a comfortable level by passive methods, using solar gains and internal gains from household appliances and occupants. Heat losses are very low, since the building envelope is well insulated and since modern coated triple-glazed windows have been installed.

Simulations were made to investigate how decreasing the window size facing south and increasing the window size facing north in these low energy houses would influence the energy consumption and maximum power needed to keep the indoor temperature between 23 and 26 °C. Different orientations have been investigated as well as the influence of window type.

DEROB-LTH was used for the simulations. The total floor area is 120 m², and the original window area is about 16% of this, which is more than what is recommended in the Swedish building regulations for sufficient lighting conditions. The south window area is much larger than the area facing north. In the simulations the house has been oriented in different directions to investigate how this influences the energy demands.

The simulations showed that the size of the energy efficient windows does not have a major influence on the heating demand in the winter, but is relevant for the cooling need in summer. Therefore it is possible to enlarge the window area facing north and get better lighting conditions

Implementation

The concept doesn't require any new technology, therefore it is ready for implementation immediately. Lighting integration and the use of daylight are worth studying for the concept.

Benefits

The simulations show that it is possible to have more flexibility in the planning of window areas in low energy buildings. This makes the passive house concept more attractive for architects and builders. By having higher flexibility in the window area there is also potential for improved housing quality and the integration of housing, working etc.

The results are valid for the Nordic Countries (around 60 deg. latitude). Applicability for more southern latitudes was not studied.

Beneficial for good lighting design of low-energy houses, compared to the more restricted spatial and window design of "solar" houses.

Obstacles

No specific obstacles. The concept seems widely applicable for low-energy apartment building in northern latitudes. One obstacle could be that sufficient enough windows aren't available if the demand rises fast. High quality selective, gas-filled triple-glazed windows (U-value < 1 for glazing) are expected for the concept

Market situation

No specific market restrictions. Test cases were made for terrace housing, the concept probably applies to detached houses and blocks of apartments as well.

Contact and further information

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