Zeitschrift: IABSE reports = Rapports AIPC = IVBH Berichte
Band: 77 (1998)

Artikel: Mineral-wool based, glased curtain walling with solar energy use
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DOI: https://doi.org/10.5169/seals-58275

Mineral-Wool Based, Glased Curtain Walling with Solar Energy Use

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Summary

A new type of curtain walling for architectural design consisting of a rockwool insulation material laminated with a coloured felt and a glass cladding with open joints will be presented. Research results concerning the thermal bridge effect of a new facade mounting system and the achievable passive solar energy gains of a rockwool insulation are discussed.

1. Concept of curtain walling

For improved cost reduced architectural design of facades combined with passive solar energy gains three industrial partners, VEGLA Vereinigte Glazswerke GmbH, G+H Montage Fassadentechnik GmbH and G+H ISOVER AG, have developed a new ventilated glazed curtain walling. This curtain walling can be used for new building and for retrofit of multiple dwellings and office buildings to secure the necessary hygrothermal, acoustical and fire protecting performance of the facade. The external cladding is a single pane safety glazing which for design purposes can be printed with different half-dot pattern.

The facade mounting consist of single, thermally separated fasteners which are fixed to the wall through the horizontal open joints of the cladding. Behind the glazing rockwool boards with laminated coloured felt are glued or fixed using dowels. The coloured laminated felt offers in combination with the half-dot printed glass panels multiple design possibilities.

Beside the architectural aspects the new facade system allows to improve the insulating performance of the mineral wool insulation by use of passive solar gains.

2. Passive solar energy gains

The principle effect of achieving passive solar energy gains by the glazingand rockwool insulation material has been already observed by the Fraunhofer-Institute for Building Physics during a research project of the BMFT „Light transparent, energy gaining insulation system for building application LEGIS“ and shortly described.

Solar radiation falling through the glazing will penetrate some centimeter into the insulation material due to the fact that mineral wool forms a porous translucent material. The penetration depth of the radiation depends on fibre density, orientation and diameter as well on the surface composition. Inside the insulation the absorbed radiation is transformed to heat and gives the

effect of a counter heating during the heating season which significantly reduces the thermal losses of the facade.

Due to the effect that the effective transparency of the mineral wool is restricted and only a small amount of radiation is transmitted to the wall, the problem of overheating of the facade and building in summer is neglegible compared to high transparent insulation system. Therefore no need exists for costly shading devices and the new system can be applied to the whole facade.

3. Influence of thermal bridges

Beside the utilisation of polar radiation the new ventilated curtain walling has been optimised with respect to the thermal bridge effects of the facade mounting system. The effects can dramatically reduce the effectiveness of the thermal insulation of a ventilated facade has been shown in several recent research projects. For the new system therefore a thermally optimised fastener has been developed.

The computer simulation of the influence of the fastener composed to in situ measurements on a facade are given in this lecture.

4. Results

At a research building of the Fraunhofer-Institute for Building Physics Holzkirchen and at the G+H research building Ladenburg the new curtain walling are installed and outdoor measurements were made about 2 years.

Previous results of the obtained solar gains and the achieved reduction of the effective thermal transmittance U are shown in table 1.

U-value (calculated)	0,266 W/m^2
calculated mean density of heat flow rate (climatic data 18.3.-22.5 and 1.9.-10.12.1997)	3,81 W/m^2
measured mean density of heat flow rate (climatic data 18.3.-22.5 and 1.9.-10.12.1997)	2,33 W/m^2
effective U-value (climatic data 18.3.-22.5 and 1.9.10.12.1997)	0,163 W/m^2

Table 1

Further results of outdoor measurements on solar gains of the new curtain walling at the Fraunhofer-Institute for Building Physics Holzkirchen and at the G+H research building Ladenburg are presented and discussed with respect to the thermal bridge effects and the total energy balance of the system will be evaluated at the IABSE Colloquium.