

The Low Energy House Zittau

Joachim Wilsdorf, Technische Hochschule Zittau
Hans Werner, Fraunhofer-Institut für Bauphysik Holzkirchen

Introduction

The reduction of the energy demand for central heating and hot water supply in residential buildings and the hereby resulting decrease of environmental pollution is a technological challenge of the near and further future and a main taste of the energy policy as well. Both the Technical University Zittau and the Fraunhofer-Institut für Bauphysik Holzkirchen and various other co-operating partners realize a prototype house based on a specific maximum energy demand for heating, according to which it meets the requirements of low energy houses of the future (Figure 1).

Technological Design of the House

Basic design

The building is a semi detached house (Figure 2) and is characterized by the following main components:

- high heat insulation for the basement, the exterior walls and the roof region;
- constructionally adapted heating systems guaranteeing at the same time a high standard of water heating;
- ventilation of the flats with heat recovery;
- maximum use of solar energy gain for heating and hot water supply;
- house design with compressed layout and a favorable surface/volume ratio of $0,60 \text{ m}^{-1}$.

Each semi detached house has one first and one second floor with together 177 m^2 dwelling area. Construction details are shown in Figure 2.

The different constructional and heating systems, based on a specific maximum energy demand of $20 - 30 \text{ kWh/m}^2\text{K}$, have been calculated by the special software "ENERBED 4.5" (based of the new CEN-standard).

House A

House A is characterized especially by

- lightweight construction brick work with outside special heat insulation,
- gasfired heating system, system coupled with hotwater plant,
- ventilation system with heat recovery from the waste gas of the gasfired system (cooling this below the dew point) and from the waste air,
- earth heat exchanger for the fresh air and
- solar collectors on the south roof (10 m^2).

House B

House B is characterized especially by

- construction elements made of polystyrene plates filled in between with foamed bio-concrete,
- electric fed warm water floor heating system,
- special solar collector roof with heat transfer to the basement working as a heat storage,
- ventilation systems with heat recovery and fresh air warming by the basement heat storage.

Research Objectives

The house will be equipped with a high level of instrumentation and control technology as well as acquisition and processing of measuring values being at the same time a research and training facility of the Technical University Zittau.

Main fields of research and development are:

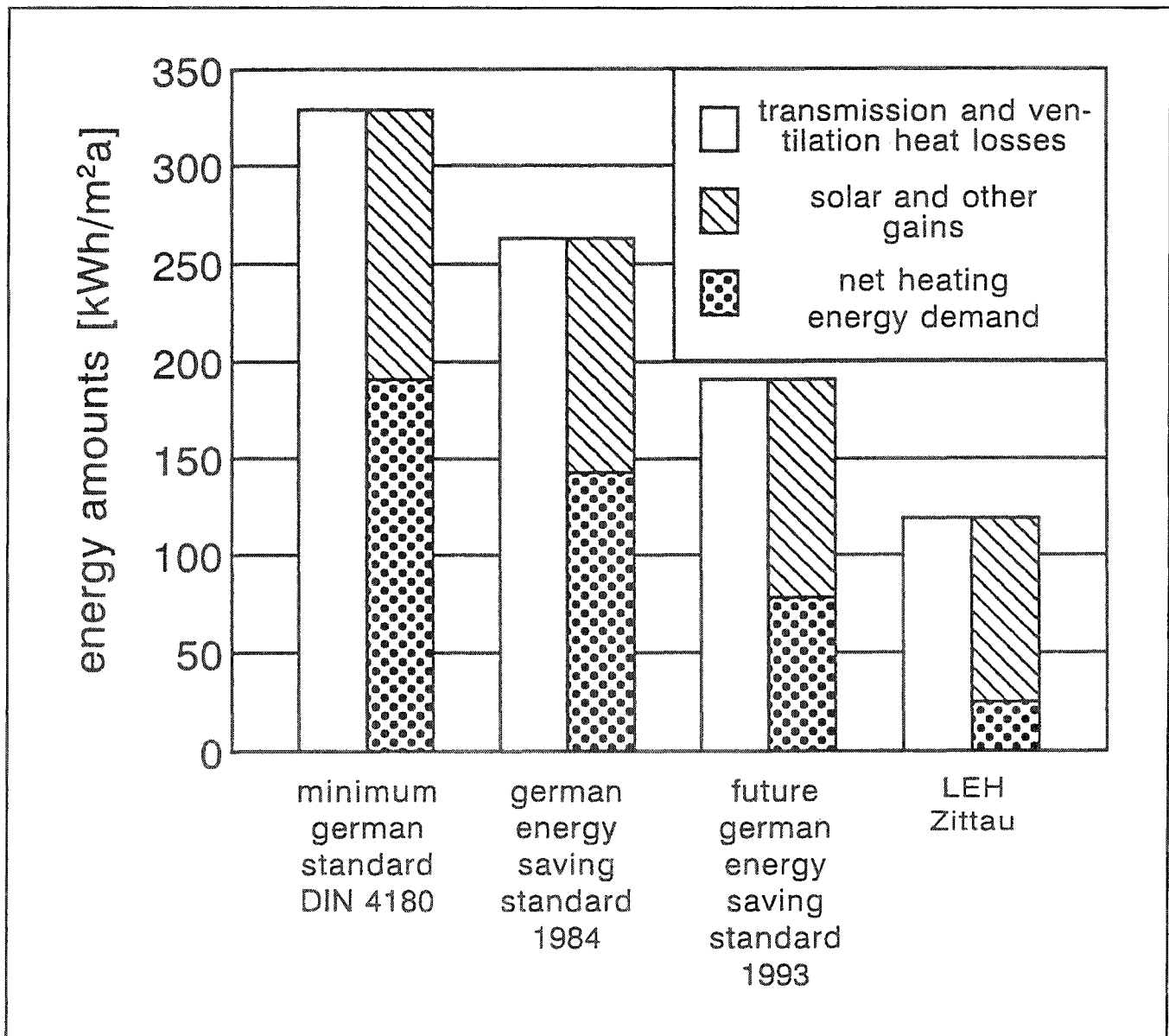


Figure 1. Net Energy Demand of Residential Buildings in Comparison with Low Energy House Zittau (LEH Zittau)

- interaction between the different building elements and other aspects such as solar gain, moisture, air movement, dwelling comfort and indoor air quality;
- theoretical investigations about the energetic balancing of low energy houses, validity of calculation methods and software for modelling of such or other building types;
- developing and testing of regulation systems in view of high energy efficiency and load management;
- continue the development of building and technical elements;
- investigations about the reduction of environmental pollution by low energy houses.

Conclusions

The paper will show that it is possible to construct with acceptable technical methods such residential buildings

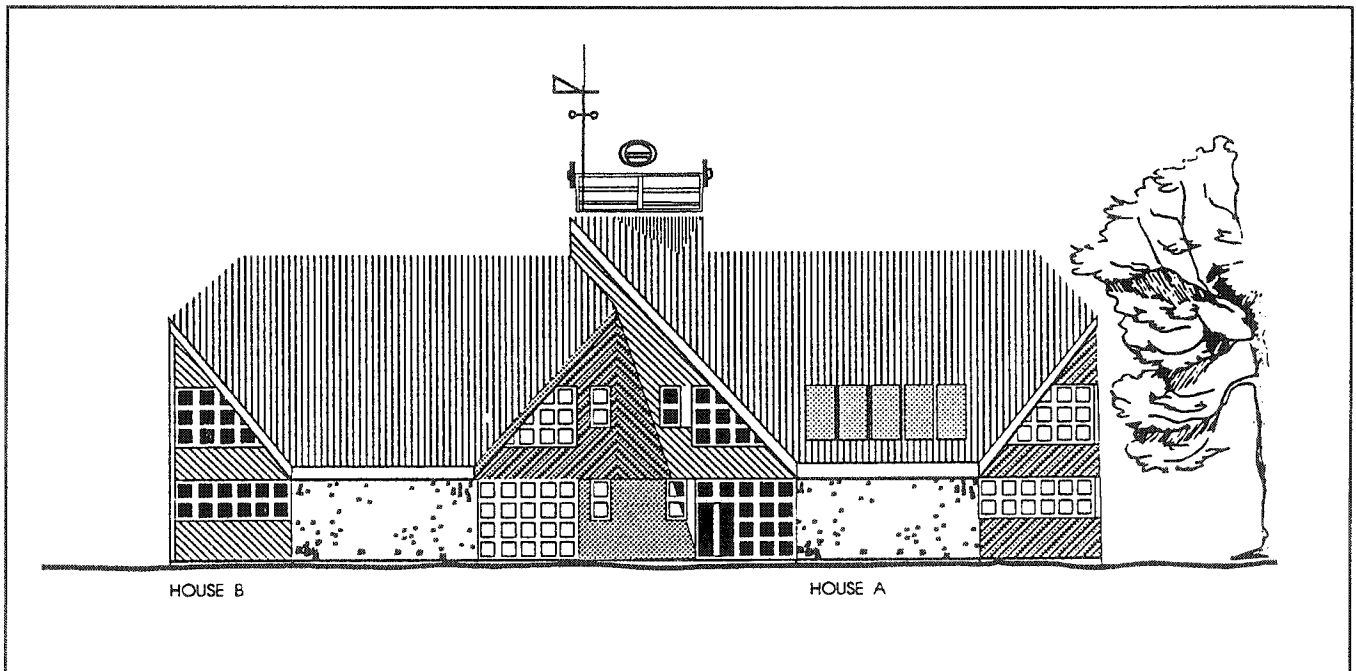


Figure 2. View of the South Side

which have an annual net energy demand of lower than 30 kWh/m²a, and offers a selection of technologies and the necessary work of research.

The "Low Energy House Zittau" as a prototype should also become the starting point for prospective and conscious methods of construction concerning energy demand and environmental protection in the European Region Saxony (Germany), Lower Silesia (Poland) and North Bohemia (Czechoslovakia).