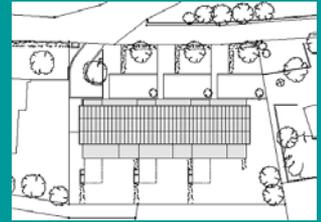
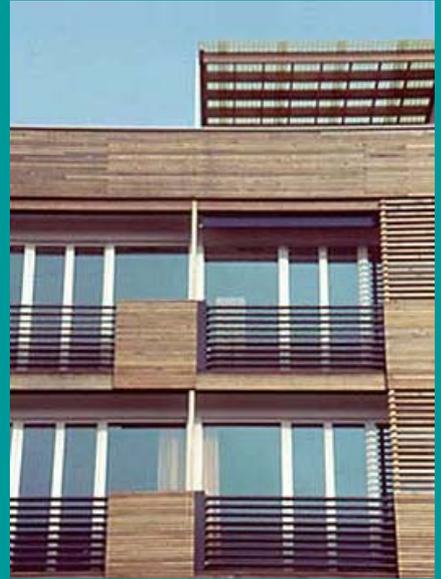
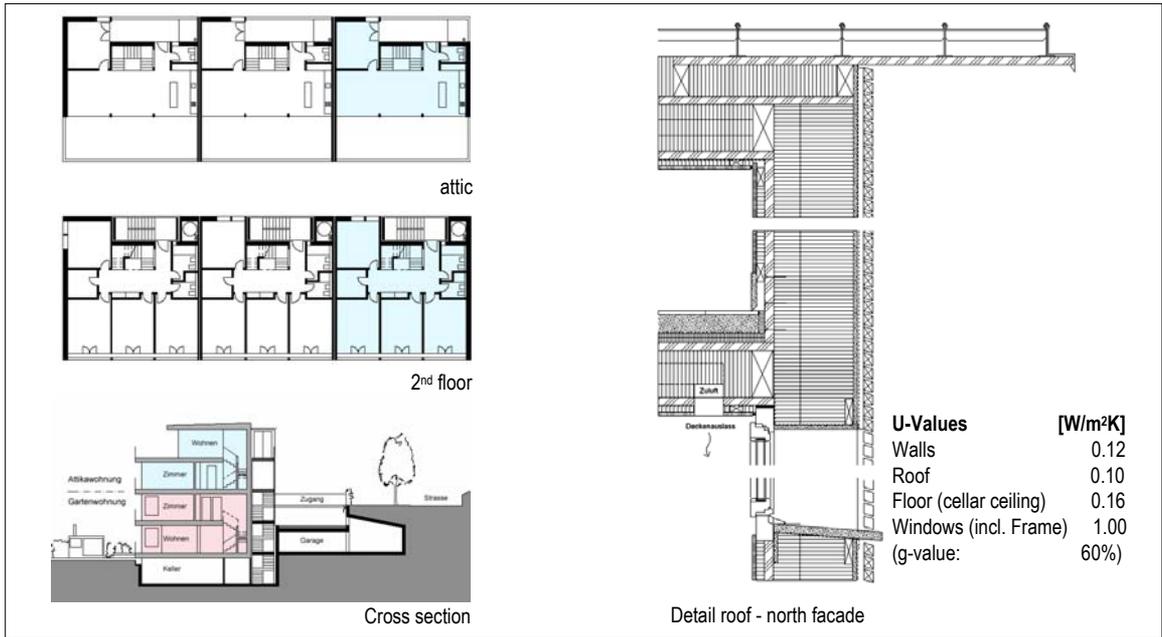


Sunny Woods Zurich, Switzerland





The project

The Passivhaus *Sunny Woods* was built in 2000/2001 by the Swiss architect Beat Kämpfen. The name of the building explains its concept. The six-family dwelling is located on a south facing hill close to the woods in a residential area of Zurich. Solar energy and wooden construction were the themes of the design.

The building consists of six spacious (200 m²), legally and technically almost autonomous maisonette units with an elevated standard and price. The lower units have a small garden, upper units have a large roof terrace. Each dwelling has the character of a single family house and is directly accessible from the street with a level difference of half a storey up or down.

Parking is available in the underground garage.

Objectives

"Sunny Woods", winner of both Swiss and European solar prizes, is the first apartment building in Switzerland designed to achieve an annual zero energy balance. The project is based on passive-solar design combined with the following technical features:

- Highly insulated, airtight building envelope
- Minimised thermal bridges
- Energy efficient windows
- Efficient ventilation with heat recovery and ground preheating
- PV-roof, grid connected thin film solar cells
- Vacuum collectors for dhw and heating
- Efficient appliances

Building construction

The walls, ceiling and flat roof are of wooden frame lightweight construction. The entire envelope is free of thermal bridges. Cellar, underground parking and the staircase for the exterior access are built in concrete.

Roof

Back-vented PV panels, back-vented aluminum sheet metal roof, sloped mineral wool, glued wooden block panels, wooden block framing, mineral wool, glued wooden block panels, moisture barrier, wooden furring strips, gypsum board.

Wall

Gypsum board, wooden furring strips, with mineral wool in between, moisture barrier, glued wooden block panels, wooden block framing, mineral wool, wooden composite panels, moisture barrier, wind barrier, larch battens, cedar siding.

Windows

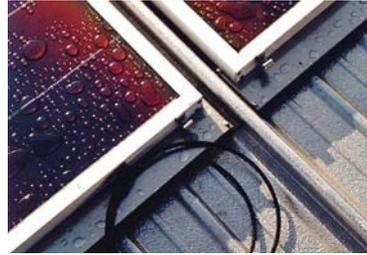
Triple glazing, solarglas, krypton.

Floor

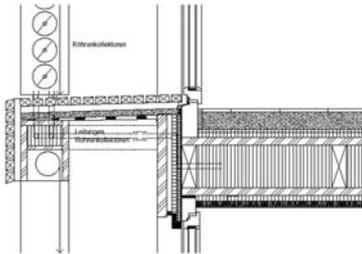
Natural stone paving tiles, levelling cement grout, PE foil, acoustical insulation, glued wooden block panels, wooden block framing, mineral wool, glued wooden block panels, metal spring hangers, mineral wool, gypsum board, sound deadening foil, gypsum board.



South facade with vacuum collectors as balcony railing



Photovoltaic: (thin film silicon cells)



Detail ceiling - south façade with collectors



PV installation on the roof

Technical systems (per living unit)

Ground pipe preheating of ventilation air

2 PE-pipes 150mm diameter, 30m length.

Mechanical ventilation

The supply air from the ground pipe is further tempered by heat recovered from the exhaust air via a cross counterflow heat exchanger.

Heating

Heat is distributed by the fresh air supply, heated with a water-air heat exchanger supplied by the solar collectors or heat pump. There are radiators in the bathrooms.

Solar thermal system

6 m² vacuum collectors serve as the balcony railing, the storage tank contains 1400 l (combined domestic hot water and space heating).

Photovoltaics

201.6 m² grid connected, thin film silicon cells, 80 - 100% coverage of annual domestic electricity and electricity for domestic hot water and space heating back-up demand.

Financing

-Swiss Federal Office of Energy:

Pilot- and demonstration project

"Passivhaus" and "Photovoltaik"

-Electric power company of Zurich:

Stromsparfonds

Costs and benefits

A big part of the additional costs of *Sunny Woods* compared to other buildings was due to the photovoltaics installation on the roof. The heating system with extra costs of around 30-40% and the system autonomy for each apartment increased costs as well. For the homebuyers, however, having an individual technical system was very attractive.

Everything considered, the pure construction costs exceeded the costs of a conventional building by around 5 %.

Energy performance

Space and ventilation heating 14.7 kWh/m²a

Energy source:

solar thermal system, electricity

- calculated -

Domestic hot water 8.4 kWh/m²a

Energy source:

solar thermal system, electricity

- calculated -



Living room



Entrance north facade

Innovative products

Building envelope

Walls: Wooden block panels, Pius Schuler AG
www.pius-schuler.ch

Space heating and DHW Solar

Vacuum collectors: B. Schweizer Energie AG,
Chnübächli 36, CH-8197 Rafz

Electricity Solar PV

Unisolar-Baekert standard photovoltaic panels à 32
Wp (amorphous silicone triple thin film cells),
Fabrisolar AG,
www.fabrisolar.ch, www.flumroc.ch/photovoltaik

Project team

Architect / site engineer

Beat Kämpfen, Kämpfen Bau GmbH, Zurich

Energy planning and domestic technique

Naef Energietechnik, Zürich
Ganz Installationen AG, Volketswil

Timber construction engineering

Makiol + Wiederkehr, Beinwil am See

Concrete engineering

Federer & Partner, Zurich

Simulations air heating system

Air Flow consulting, Dr. Alois Schälín, Zurich

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Literature and links

www.kaempfen.com