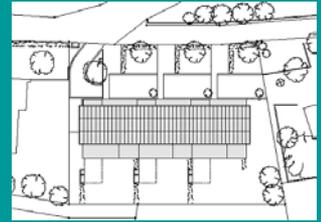
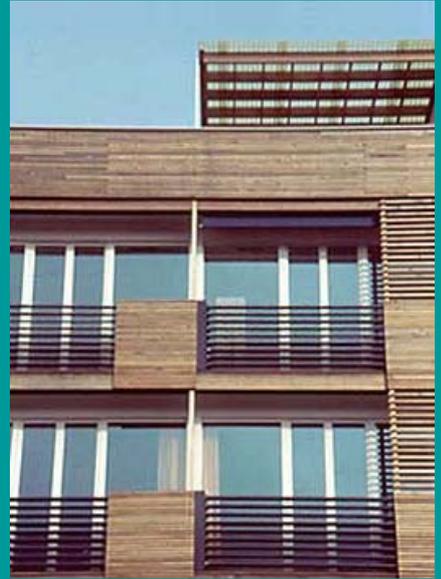
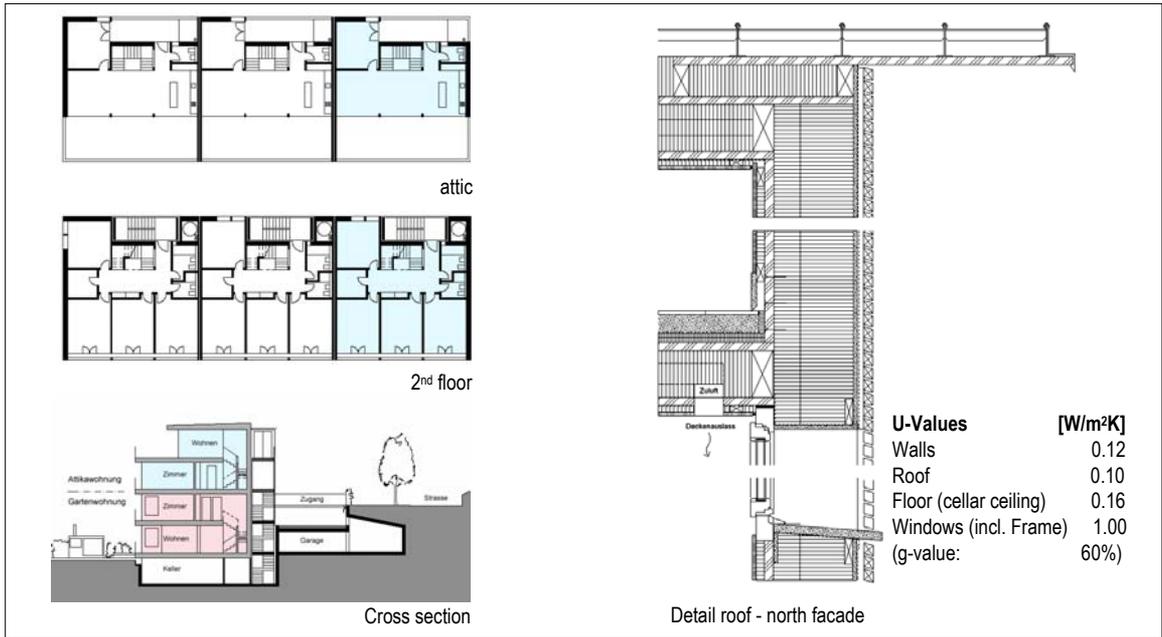


# Sunny Woods Zurich, Switzerland





## 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 m<sup>2</sup>), 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

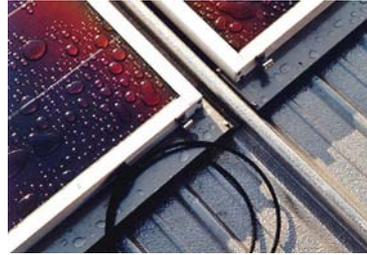
Triple glazing, solarglas, krypton.

### Floor

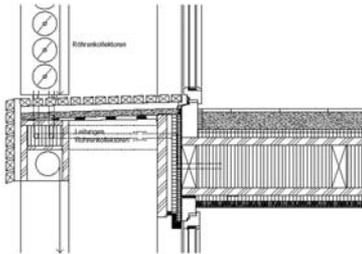
Natural stone paving tiles, levelling cement grout, PE foil, acoustical insulation, glued wooden block panels, wooden block framing, mineral wool, glued wooden block panels, metal spring hangers, mineral wool, gypsum board, sound deadening foil, gypsum board.



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 m<sup>2</sup> vacuum collectors serve as the balcony railing, the storage tank contains 1400 l (combined domestic hot water and space heating).

#### *Photovoltaics*

201.6 m<sup>2</sup> 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/m<sup>2</sup>a

Energy source:

solar thermal system, electricity

- calculated -

*Domestic hot water* 8.4 kWh/m<sup>2</sup>a

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](http://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](http://www.fabrisolar.ch), [www.flumroc.ch/photovoltaik](http://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

### **Contact person**

Beat Kämpfen, architect ([info@kaempfen.com](mailto:info@kaempfen.com))  
Daniela Enz, AEU GmbH ([daniela.enz@aeu.ch](mailto:daniela.enz@aeu.ch))

### **Literature and links**

[www.kaempfen.com](http://www.kaempfen.com)