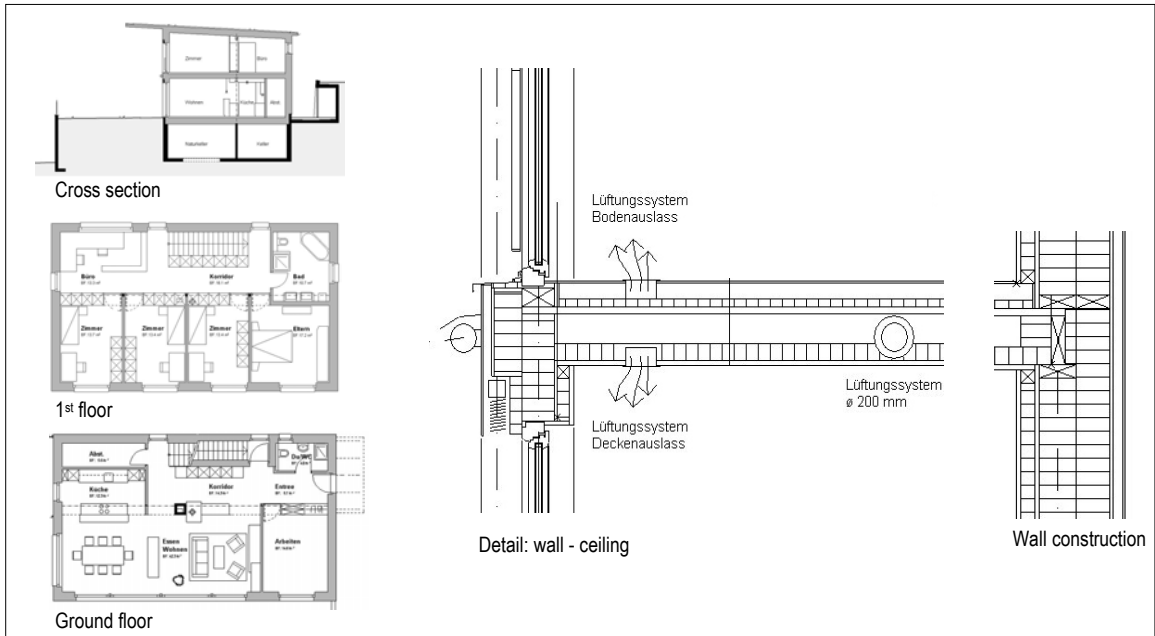


# Buttisholz, Switzerland





## The project

The first Minergie-P<sup>1</sup> certified building in the canton of Lucerne (CH) was built by the Swiss architect Norbert Aregger in 2003. The building is located in the small rural village Buttisholz, 20 minutes away from the city centre. It is a privately built single family house situated on a south-west facing slope.

The ample separation from neighbours and hillside site afford good daylight and optimal conditions for passive solar use.

The house is characterised by its compactness, a large roof overhang and large windows on the south side where all main rooms are situated.

The heated floor area SIA<sup>2</sup> amounts to 257 m<sup>2</sup> (including exterior walls). The ground floor contains a spacious living area with an open kitchen and a wood stove as well as a workroom. All rooms have direct access to the terrace. On the first floor there are four bedrooms and an open working space.

<sup>1</sup> Swiss equivalent to the "Passivhaus" standard

<sup>2</sup> Swiss Society of Engineers & Architects

## Objectives

The objective of this project is to minimise the energy consumption of the building while providing a living space with highest comfort and quality. The building is planned as a complete system including all necessary energy measures for a passive house.

## Building construction

### Roof (50 cm)

Wooden planking, vapor barrier, insulation (30cm polyurethane) with double-sided Al foil, water-tight barrier (2 layers), protective felt, humus substrate (extensive planting).

### Wall (46 cm)

Wooden lightweight construction, 36 cm mineral wool, back-vented fiber-cement exterior skin.

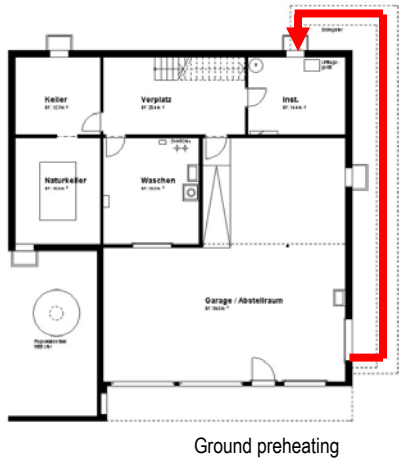
### Floor (23.8 cm)

Cork, cement leveling grout, separating foil, acoustic insulation (4cm), 3-layered wooden sheet, ribs, mineral wool ( 8 cm), 3-layered wooden sheet.

### Windows

Wooden-metal frames with triple glazing.

U-Values	[W/m <sup>2</sup> K]
Roof	0.071
Walls	0.146
Floor	0.124
Windows	0.8
Glas	0.7
(g-value:	65%)



Solar thermal collectors and weather sensor on the roof



Heat exchanger

## Technical systems

*Ground pipe preheating of ventilation air*  
2 PE-pipes 160mm diameter, length: 43m

### *Mechanical ventilation system*

The supply air from the ground pipe is further tempered by heat recovered from the exhaust air via a counterflow heat exchanger: 260 m<sup>3</sup>/h (100 Pa), 3-step operation.

### *Heating*

Heat is distributed by the fresh air supply, heated with the heat exchanger. There is a wood stove backup heating: 80% efficiency, 11 kW, 6-8 hours burn time.

### *Solar thermal system*

4.5 m<sup>2</sup> collectors with an efficiency of 80% cover the domestic hot water demand with 71%. The remaining coverage of 29% is assured by an electrical back-up.  
The Boiler contains 400l and has a maximal temperature of 97°C.

### *Controls*

The project is prevented from overheating by sensor-controlled sun shading.

### *Extras*

The green roof and a rainwater cistern are two additional ecological elements in the project

## Energy performance

The Buttisholz project fulfills the new Swiss MINERGIE @-P standard. This standard is comparable to the German Passivhaus Standard.

A MINERGIE@-P certified building uses around 10% of the energy of a conventionally built house in Switzerland.

*Space and ventilation heating* 13.3 kWh/m<sup>2</sup>a  
Energy source:  
Electricity, wood stove backup  
- calculated -

*Domestic hot water* 13.7 kWh/m<sup>2</sup>a  
Energy source:  
Solar thermal system 71%, electricity 39%  
- calculated -

*Pressurisation test* 0.3 h<sup>-1</sup>  
- monitored -

*Maximal heating power* 10.0 W/m<sup>2</sup>  
- calculated -



Open working space on the upper floor



Living room



View from the south-east

### **Innovative products**

#### *Building envelope*

Window: Optiwin wooden-metal window (certified "Passivhaus" – window), 1.A Hunkeler, [www.optiwin.ch](http://www.optiwin.ch), <http://www.1a-hunkeler.ch>

#### *Ventilation*

Heat recovery unit: Confoair G90, J.E.Storkair, <http://www.jestorkair.nl/>

#### *Controls*

Solar and shade control: Tebis components, Hager, <http://www.hager.de/tebis/>

#### *DHW*

Solar collectors: Rüesch Minisol, type BR 400, Rüesch, <http://www.rueschsolar.ch>

### **Project team**

#### *Architect*

Norbert Aregger, Buttisholz

#### *Timber construction engineer*

P. Jung, Ing für Holzbau GmbH, Rain

#### *Heating ventilation sanitary planner*

Grüter AG, Schenkon

#### *Controler engineering*

E. Häller, Elektrotechnik, Buttisholz

#### *Civil engineer*

Weilenmann u. Blättler AG, Buttisholz

### **Contact person**

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### **Literature and links**

[www.aregger-architekt.ch](http://www.aregger-architekt.ch)