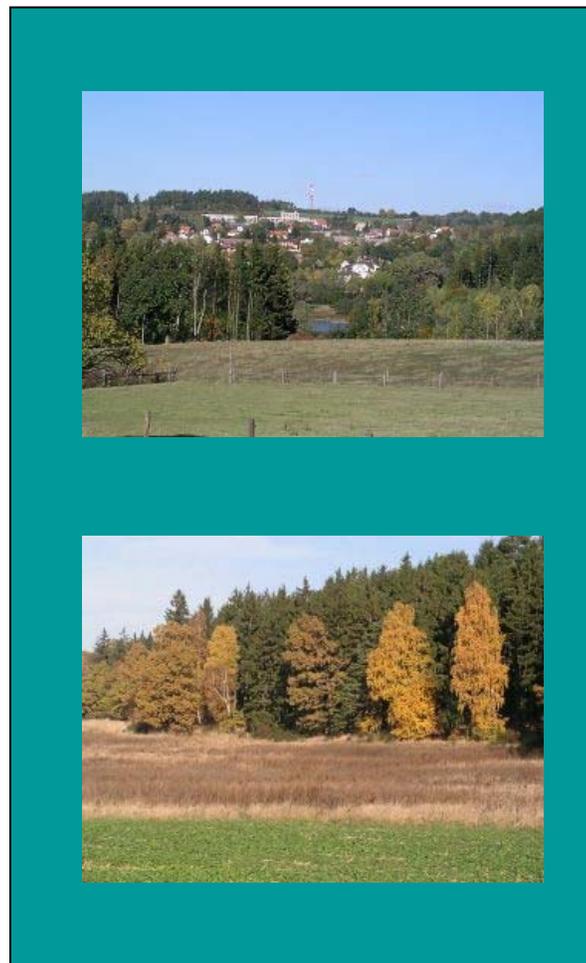
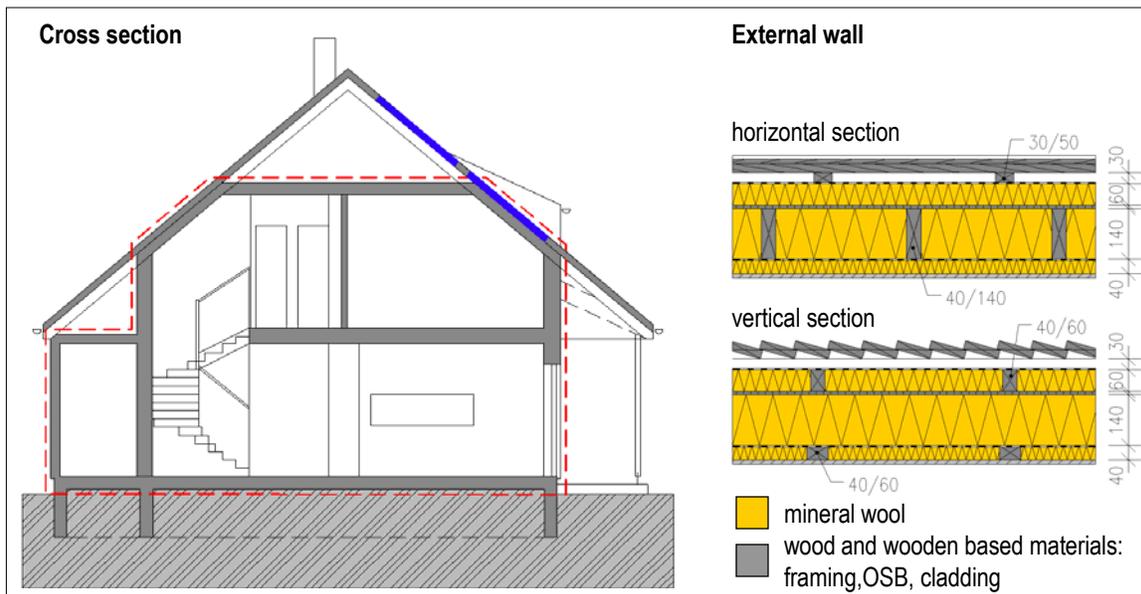


# House W - demonstration house in the Czech Republic





### Basic information

House W is a private built single family wooden-based house, with two floors, without cellar.

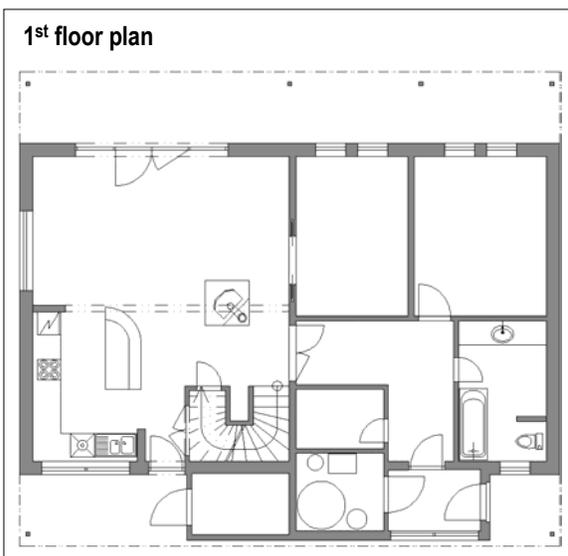
Location: 15 km south of Prague, near Velké Popovice

Built-in volume 691,0 m<sup>3</sup>  
 Floor area: 190,4 m<sup>2</sup>  
 Living area: 129,5 m<sup>2</sup>

Construction time: June to November 2003

### Objectives

Using a minimum amount of materials and total primary energy from non-renewable sources was the leading idea of the project. The house should reach the low-energy house level with usually accepted costs for standard housing. Both of these facts have led to a wooden-based construction with simple form, energy effective building envelope and use of several components typical for passive houses. The U-values of the building envelope are close to those recommended by ČSN 730540-2 (2002) Thermal Protection of Buildings, Part 2: Requirements.



### Building construction

Wooden frame construction was completed with OSB-boards from the exterior site of the framing, thermal insulation from mineral wool and wooden cladding. Polyethylene foil was used as water-vapour barrier. The air-permeability was measured during the constructing period to prevent air leakages.

U-values:  
 External wall U = 0,19 Wm<sup>-2</sup>K<sup>-1</sup>  
 Roof U = 0,17 Wm<sup>-2</sup>K<sup>-1</sup>  
 Ceiling (loft) U = 0,14 Wm<sup>-2</sup>K<sup>-1</sup>  
 Floor U = 0,25 Wm<sup>-2</sup>K<sup>-1</sup>  
 Windows U = 1,39-1,68 Wm<sup>-2</sup>K<sup>-1</sup>  
 (glazing 1,1 Wm<sup>-2</sup>K<sup>-1</sup>)

### Technical systems

- warm air heating, mechanical ventilation with heat recovery
- earth heat exchanger, 21 m in length, 2 m deep
- roof integrated solar collectors 8,4 m<sup>2</sup>
- integrated heat storage (IZT) 950 litres water, heated by solar system and electricity, secures hot water at time of use (no separate hot water storage needed)
- wood stove 7 kW (max.), intermittent operation

### Energy performance

Specific (calculated) heat use for heating is 44,4 kWh/(m<sup>2</sup> year) - approximately 1/3 of required value. This value does not include gains from earth heat exchanger.

Boundary conditions for calculation: efficiency of heat recovery 75%, air exchange 150 m<sup>3</sup> per hour when taking into account full occupancy by 5 people.

### Energy balance

The energy balance (heating+hot water) of a reference building with identical geometry that fulfils the energy requirement (1) and the realised house W (2,3) is shown below. A corresponds to heat use for heating, B heat use for hot water, C represents system losses. Red arrows show non-renewable energy use.

### Monitoring

The repeated measurement of air permeability together with infrared thermography was performed. Monitoring of energy parameters in the first two years of operation is in progress. A computer-operated measurement unit was installed in the technical room of the house.

### Costs

The investment costs were very close to the costs for standard housing in the region. Additional costs are caused due to larger amount of thermal insulation (35 thousand CZK), for the solar heating system (175 thousand CZK), for the warm air heating system including integrated heat storage, all ducts and installations (250 thousand CZK). The saved costs are for conventional heating: gas ducts, gas boiler, chimney (together 323 thousand CZK).

Finally: the extra costs compared to the virtual reference house in this particular case are only 137 thousand CZK (approximately 4% of total investment costs). The simple pay-back time is about 13 years.

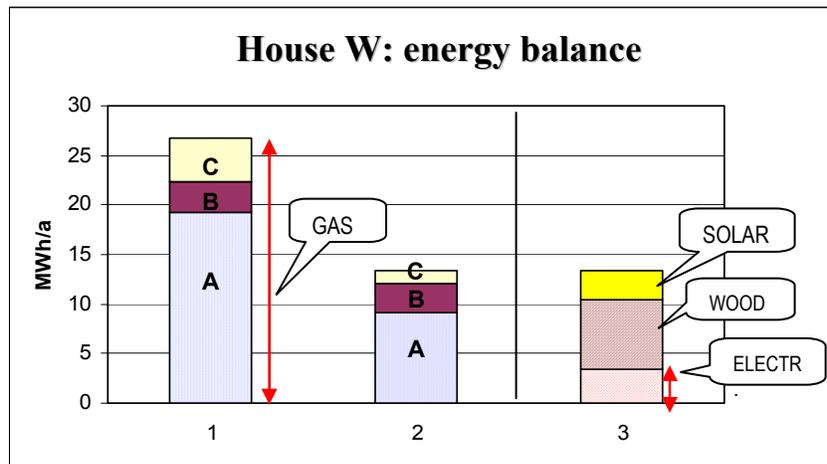
### Planning tools

Energy use was calculated according to ČSN EN 832. More detailed computer simulations will be performed later to analyze the measured data, especially to study the real contribution of the solar heating system.

### Marketing strategy

The marketing strategy for this type of house might follow the strategy for marketing wooden houses in general.

There is a large potential for the wood house sector in the Czech Republic as a significant capacity for quality timber does exist there. Market penetration depends mainly on to what extent „a wooden concept“ can penetrate regional tradition and mentality.

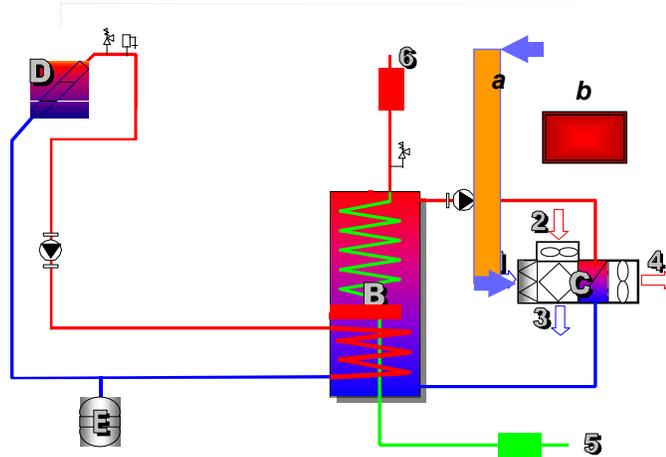


Legend to the scheme:

- B integrated heat storage
  - a earth heat exchanger
- C warm air heating with heat recovery
  - b small wood stove (independent)
- D solar collectors (roof integrated)
- E expansion vessel

- 1 fresh air
- 2 interior air
- 3 outlet air
- 4 warmed-up fresh air
- 5 drinking water
- 6 hot water

**Scheme of energy supply**



The design principles of the house were published several times (using web and journals), presented and discussed at expert seminars and conferences in 2003-2004.

Investor:

Preliminary design study and energy concept:

Detail planning and realization:

Thermal insulation:

Heating/Ventilation:

Solar system:

Monitoring:

Information:

Weger Family

Jan Tywoniak, Martin Šenberger

PENATUS s.r.o., Zlatníky

ROCKWOOL, a.s., Praha

ATREA, s.r.o., Jablonec n.N.

REFLEX CZ s.r.o. and ATON s.r.o., Praha

Czech Technical University in Prague, Group for Sustainable Housing (Jan Tywoniak et al.), cooperation AHLBORN CZ. s.r.o., Praha

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