

# Family house in Zlin

## Description

This is an inherited brick house, with two independent apartments – the so-called "Bata half-house" – situated in the historic quarters of Zlin - Letna.



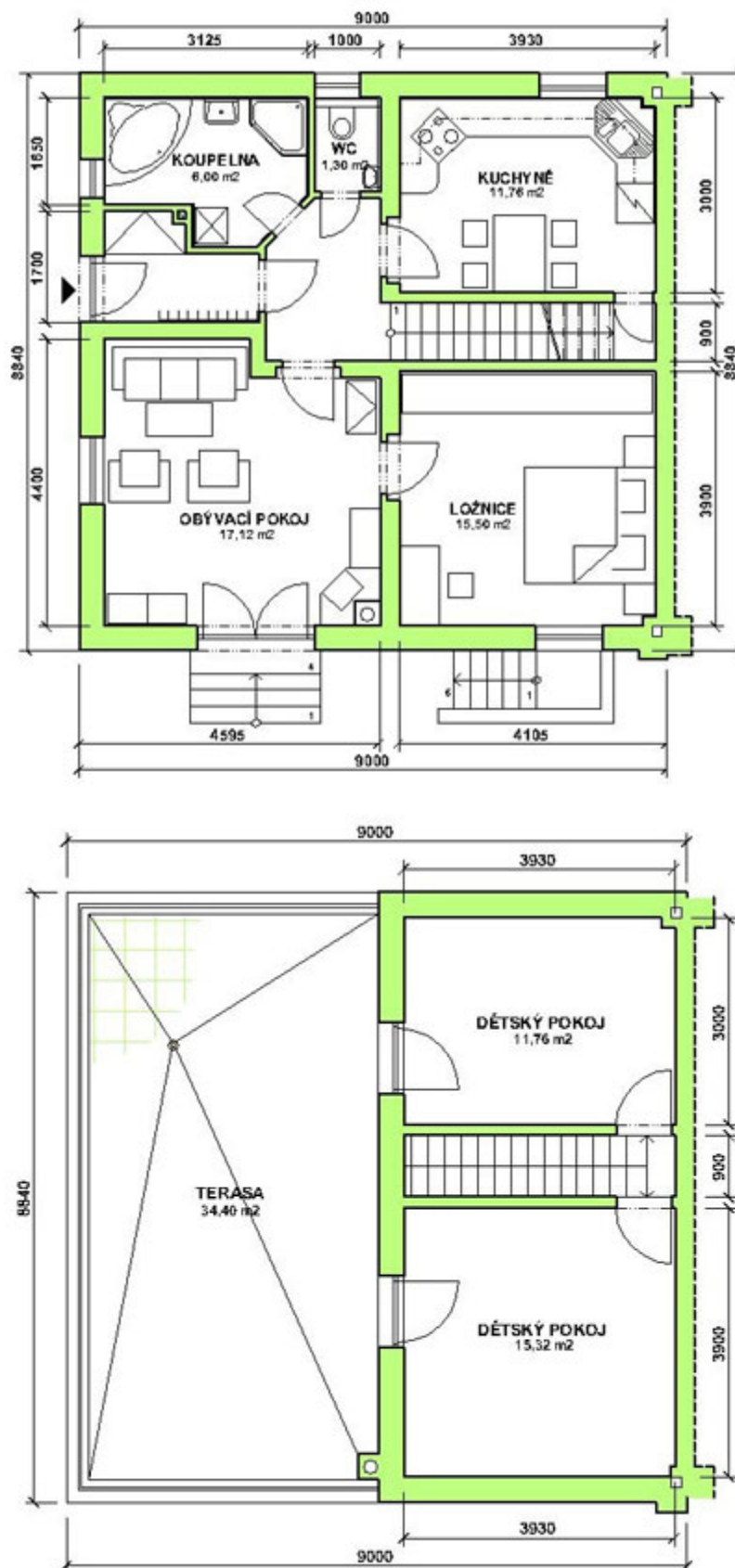
The building was reconstructed in 2005, including heating. A four-member family lives in the house.



## Technical parameters

This is a house with no cellar and two floors. The original building had peripheral walls built of full clay brick, only 30 cm thick. This is why the house jacketing was additionally heat-isolated with styrene foam boards, 8 cm thick. Windows are new, double plastic. On the first floor, there is the main entrance with tambour, corridor, kitchen, living room, bedroom, bathroom and toilet, on the second floor there are two children's rooms and a terrace. The total inhabited area (without the terrace) is 97,4 m<sup>2</sup>.

## Building layout



The heating system power consumption draft was based on an expertly estimation, without calculating heat losses. The total power consumption was estimated at 7,5 kW, which corresponds (with 97,4 m<sup>2</sup> surface) to 77 W/m<sup>2</sup> = ca 30,8 W/m<sup>3</sup> at mean full height of 2,5 m.

## House heating

The house is fully heated by large-area electric heating – floor and ceiling. The investor was afraid that large-area systems might not be able to heat the building sufficiently and therefore he prepared reserve outlets for additional convector heaters. However, the concerns proved unsubstantiated after two heating seasons, and the outlets remained unused.

Inhabited area	97,4 m <sup>2</sup>
Installed heating power consumption	7,5 kW
- heating mats ECOFLOOR	2,4 kW
- heating foils ECOFILM – floor	1,1 kW
- heating foils ECOFILM – ceiling	4,0 kW
Main house circuit breaker	3 x 25 A
House tariff	D45

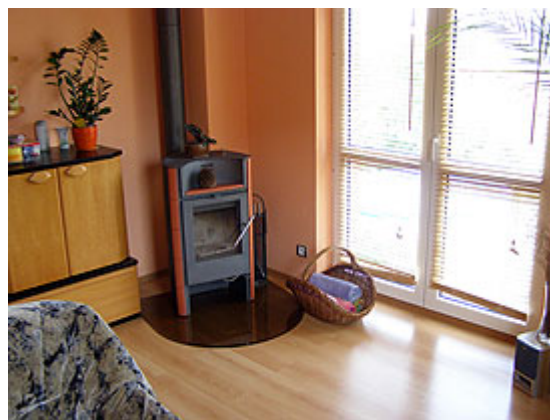
On the first floor there is a floor heating using heating cable circuits in all rooms with ceramic paving.



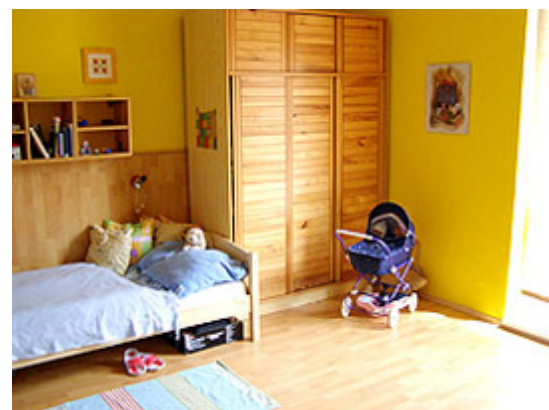
Kitchen, corridor and toilet are equipped only with floor heating; an electric heating ladder is mounted in the bathroom to dry towels. Ecofilm F heating foil with  $80 \text{ W/m}^2$  power consumption is installed under the laminate floor in the living room.



From the total area of the living room of  $17,12 \text{ m}^2$ , the heating foil is installed on  $15 \text{ m}^2$ , i.e. basically under the entire floor. Unfortunately, approx.  $5 \text{ m}^2$  of the heating surface is covered with furniture, and since the first floor is the coldest room – two walls are peripheral, with large windows and outside gallery above the ceiling construction, it is difficult to heat the room – at outside temperatures below  $-10^\circ\text{C}$  – to more than  $20^\circ\text{C}$ . This problem is most acutely felt in evening hours, when the activity of house inhabitants is minimal. Ideally, the lacking power should be amended by e.g. ceiling heating, but in this case, the owner chose a stove. The stove provides necessary heat comfort and creates a cozy atmosphere.

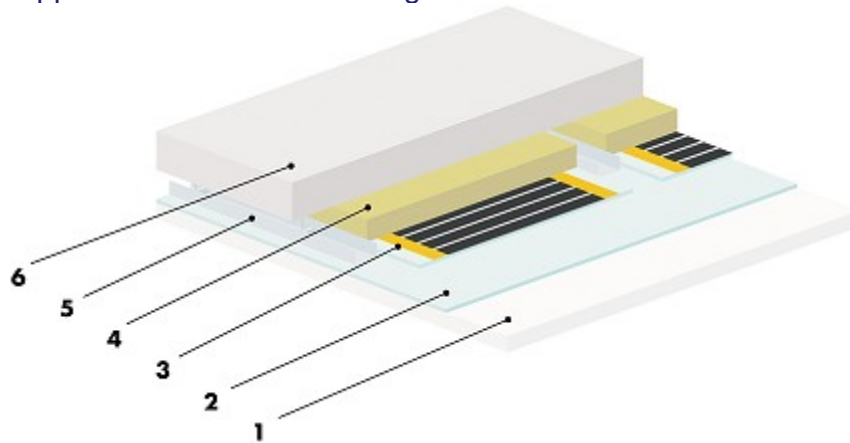


In the first floor bedroom and in both bedrooms for children on the second floor, Ecofilm C foils are installed in the ceiling plaster board construction as ceiling heating.



During designing and implementation, the investor was discouraged from using the ceiling heating, as both the architect and other concerned people expressed doubts regarding functioning of the system. However, the user is fully satisfied, and although both children's rooms are the coldest rooms in the building due to their positioning, the ceiling foil heats them quite easily.

The ceiling heating is still a neglected area, although it has several advantages compared to floor heating – it is possible to install higher power (140-200 W/m<sup>2</sup>) than in the floor (60-100 W/m<sup>2</sup>), because higher temperature (approx. 45°C), which would be unacceptable in floors, poses no problem. Also, larger effective surface is available compared to the floor, as there is usually no furniture on the ceiling. The ceiling heating is a good option for rooms where covering heat losses through floor heating is problematic – it was supposed to be to be the living room on the first floor in this building.



- 6) Ceiling construction
- 5) SDK carriers construction
- 4) Mineral wool insulation
- 3) ECOFILM C heating foil
- 2) Protective PE foil
- 1) SDK (plaster board) soffit

### Regulation

The entire system is regulated locally, i.e. an independent thermostat is installed in each room. This system provides lower user comfort than central regulation, but it was cheaper with regard to the size of the building.

### Heating system purchasing costs

One of the main reasons the investor chose the electric heating system was its low purchasing price compared to other systems. If you add its easy adjustability and comparable operation costs owing to a low tariff, also valid for other appliances, the decision was easy.

ECOFLOOR System	2.564 CZK
ECOFILM System	24.245 CZK
Regulation	7.400 CZK
<b>Total (VAT exclusive)</b>	<b>34.209 CZK</b>

## Operation costs

23.700,- CZK was invoiced for electricity in the year 2006. The price includes the entire power consumption for the household, i.e. heating, TUV heating, cooking, lighting and all electric appliances in the house. The following table shows, for comparison purposes, the consumption between 11/2006 and 04/2007.

Months	VT [kWhod]	NT [kWhod]	Energy consumption in VT	VT [CZK]	NT [CZK]
consumption in 11/06	31	1 062	2,8 %	66,20	1 964,70
consumption in 12/06	30	1 275	2,3 %	64,10	2 358,80
consumption in 01/07	35	1 158	2,9 %	74,70	2 142,30
consumption in 02/07	25	1 048	2,3 %	53,40	1 938,80
consumption in 03/07	28	1 036	2,6 %	59,80	1 916,60
consumption in 04/07	21	623	3,3 %	44,80	1 152,60
<b>Total</b>	<b>170</b>	<b>6 202</b>	<b>2,7 %</b>	<b>363,00</b>	<b>11 473,80</b>

The table reveals that with the high tariff (VT), only 2,7% of energy is consumed on average, and that the annual payment for electricity will again be between approx. 20 and 25 thousand CZK.

Period	Consumption in kWh		CZK including VAT
	NT (low tariff)	VT (high tariff)	
24.3.2007 - 1.4.2008	10 407,0	317,0	23 822
2.4.2008 - 1.4.2009	9 718.0	392,0	27 307
2.4.2009 - 15.3.2010	9 080.0	723,0	29 424
16.3.2010 - 4.3.2011	9 493.0	746,0	29 561
Exchange rate 24,98 CZK/€ (04/2008)			