



**Sladki Vrh  
(Slovenia)**

**23 % energy saving**  
**Total living expenses lower than before renovation**  
**All users have chosen for energy saving measures**

**Project data**

Location, address:	Sladki vrh 5c;
Region:	Maribor
Surroundings:	East of the country;
Climate:	Continental
Heating degree days:	3200
Year of construction and renovation:	1982 (constructed); 2004 (renovated)
Typology:	Apartment building
No of dwellings:	50 dwellings
Total floor area:	3342
Owner:	Various private owners
Architect and Builder:	Žižek Rupert s.p.
Costs of energy saving measures:	Façade € 47.000, windows ~ € 45.000
Renovation financed by:	The owners, state subsidy



Figure 1: Apartment building on Sladki Vrh 5c after renovation

**Renovation concept**

**Key renovation features**

- Insulation of facade
- High efficiency insulation glazing and frames

## State-of-the-art

### Before renovation

Constructions [U-values:  $W/m^2K$ ]

- Non-insulated facades [1,4]
- Windows (double glazing, wood frame) [2,7]<sup>1</sup>

### After renovation

Constructions [U-values:  $W/m^2K$ ]

- Insulation of facades [0,36]
- Replaced windows 30% [1,3]

## Energy saving and monitoring

Energy consumption before renovation:  
KWh/m<sup>2</sup>: 114

Energy consumption after renovation:  
KWh/m<sup>2</sup>: 89  
Percentage saving<sup>2</sup>: 23%

## Additional information

- The building was designed and built in the period when there was no regulation and no requirements regarding the thermal insulation and energy efficiency in buildings. The building codes related to brick structures resulted in U values of approx. 1,4 [ $W/m^2K$ ] for outer wall and the window technology normally applied in that time (double glazed cast windows) resulted in U values of approx. 2,7 [ $W/m^2K$ ] with normally high air leakage.
- The recommended measures were the following:
  - thermal insulation of the outer walls and
  - replacement of existing windows with energy efficient windows.

## Lessons learned and conclusions

- The project would not have succeeded without co-operation and of course without financial contribution of the occupants and state subsidy. The benefit for the occupants is manifested through lower heating costs and higher level of thermal comfort.

## References

[1] Building management: Franci Perko s.p.

<sup>1</sup> Total U-value of glazing and the window frame

<sup>2</sup> Compared to the situation before renovation