Ljubljana (Slovenia)

63% energy saving

Total living expenses lower than before renovation

Nearly all users have chosen for energy saving measures

Project data

Location, address:	Einspilerjeva 3
Region:	Ljubljana
Surroundings:	Central Slovenia
Climate:	Sub-Alpine
Heating degree days:	3300
Year of construction and renovation:	1965 (constructed); 1999 - 2003 (renovated)
Typology:	Apartment building
No of dwellings:	55 dwellings
Total floor area:	1893 m^2
Owner:	Various private owners
Architect and Builder:	
Realization team:	Srecko Skubic
Costs of energy saving measures:	€ 117.000
Renovation financed by:	The owners; subsidies

Figure 1: Apartment building Einspielerjeva 3 after and between renovation

Renovation concept

Key renovation features

- Insulation of facades
- insulation of roof
- High efficiency insulation glazing and frames

State-of-the-art

Before renovation

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

- Non-insulated facade [1,6]
- Non-insulated roof [2]
- Windows (double glazing, wood frame) [2,3] [1]

After renovation

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

- Insulation of facade [0,35]
- Insulation of roof [0,4]
- Replaced windows 40%(low-e + argon glazing) [1,4]

Figure 2: Apartment building Einspelerjeva 3 before renovation

Energy saving and monitoring

Energy consumption before renovation:
KWh/m^2: *252*

Energy consumption after renovation:
KWh/m^2: 92
Percentage saving[2]: 63%

Additional information

- The main reasons for the renovation have been insufficient maintenance state, bad quality window frames, further intention of the housing association to implement energy saving measures and to improve the esthetical view of façades.
- 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. 1,6 W/m^{2}K for outer wall and the window technology normally applied in that time (double glazed single frame windows) resulted in U values of approx. 2,3 W/m^{2}K with normally high air leakage.
- The recommended measures were the following:
  - thermal insulation of the outer walls and
  - exchange of existing windows with energy efficient windows,
  - roof insulation.

Lessons learned and conclusions

- The envelope measures enabled significant energy and costs savings. Users' awareness and living habits are expected to have additional positive effect on the savings.
- For the success of this project the co-operation of flat owners and users was essential. An investment in technical improvement of the building condition requires a high level of consensus and a considerable investment. The state subsidy for energy refurbishment was used to support the organisation and execution of works. The benefit for the occupants are lower heating costs, higher level of thermal comfort, improved aesthetic and overall value of the building.

References

[1] Building management company Practic d.o.o.

[1] Total U-value of glazing and the window frame
[2] Compared to the situation before renovation