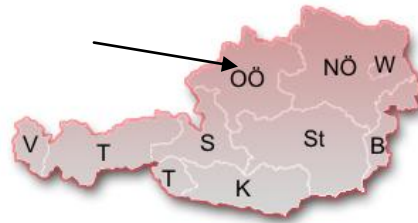




El-Education  
Best practice example No 10 from Austria



**LINZ**  
**(Austria)**

**66 % energy saving**

**Large renovation project with 184 apartments**

**Innovative planning approach**

### **Project data**

Location, address:	Glimpfingerstr. 103-113, Müller Gutenbrunnstr. 6-8, Weinheberstr. 3-17, 4020 Linz
Region:	Upper Austria
Surroundings:	North of the country, low hilly landscape
Climate:	Continental climate
Heating degree days:	3530
Year of construction and renovation:	1971 (constructed); 2003-2005 (renovated)
Typology:	Apartment building
No of dwellings:	184
Total floor area:	14,676.52
Owner:	Wohnungsanlagen GesmbH WAG (social housing association)
Architect and Builder:	Poppe Prehal (architect) and WAG (builder)
Costs of energy saving measures:	4,900,000 (incl. VAT)
Renovation financed by:	Loan and reserves by social housing association, subsidies from Regional Government



**Figure 1:** One of the buildings after renovation

### **Objectives and Results**

The main objective of the renovation project was to increase the living quality, to achieve significant energy savings and a value increase of the property.

The architect and builder wanted to install a ventilation system. To see how such a ventilation system works in practice, they installed "testing systems" in two apartments. With the mechanical ventilation system, the calculated energy performance indicator would have been 31 kWh/m<sup>2</sup>,a – corresponding to an energy saving of 75 %!

As the tenants were too worried about the disturbances during the construction phase, the ventilation system was not realised. However, due to the other measures, energy savings of 66 % were achieved!

### **Renovation concept**

#### **Key renovation features**

- Insulation of the façade
- Insulation of the ceilings
- Improvement of the windows
- Enlargement of the balconies
- Installation of lifts in all buildings with 4 floors
- New valves
- Planning of a photovoltaic plant
- Planning of a decentralised ventilation system with heat recovery

## State-of-the-art

### Before renovation

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

- Non-insulated top ceiling [0.81]
- Non-insulated ground floor [1.35]
- Non-insulated façades [1.21]
- Windows [2.46]

#### Installations

- District heating

### After renovation

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

- Insulation of top ceiling [0.13]
- Insulation of ground floor [0.29]
- Insulation of façades [0.21]
- Windows [1.21]

#### Installations

- District heating
- New valves
- Installation of lifts in each building with 4 floors
- Enlargement of the balconies

## Energy saving and monitoring

#### Energy consumption before renovation:

kWh/m<sup>2</sup>: will be added later  
Energy Performance Indicator 122 kWh/m<sup>2</sup>,a

#### Energy consumption after renovation:

kWh/m<sup>2</sup>: will be added later  
Energy Performance Indicator 41 kWh/m<sup>2</sup>,a  
Percentage saving 66 %



Figure 2: One of the Buildings after renovation

## Additional information

- The planning of the renovation project included the installation of a ventilation system with heat recovery. The installation of a decentralised ventilation system was not realised, as the tenants were too worried about the disturbances during the construction phase.
- Even if the measures were not realised in this project, it was worth trying, because the experience will be used for other projects.

## Lessons learned and conclusions

- The social housing association WAG already runs renovation projects of buildings for 20 years, where they always tried to bring in new aspects and ideas or to use innovative products.
- Measures like the installation of lifts, the enlargement of balconies or the thermal renovation of a building are accepted very positively by the tenants.
- If measures need to be implemented inside the apartments however, this turns out very difficult and often must be limited to a minimum requirement. Such measures are best done with a change of the occupants.

## References

- [1] Wohnungsanlagen Gesellschaft m.b.H., Mörlikeweg 6, 4026 Linz, Tel.: +43-732-3338-0, [info@wag.at](mailto:info@wag.at), [www.wag.at](http://www.wag.at)