



## ROERMOND (The Netherlands)

**Gas consumption lowered by 50%**

**Lower total living expenses after renovation**

**Proved and very efficient energy saving measures**

### Project data

Location, address:	Beethovenstraat; complex Beethovenstaete; Componistenbuurt residential area
Region:	Limburg
Surroundings:	South-east of the country; less influence of the sea, low hilly landscape
Climate:	Mild and humid
Heating degree days:	2794 (KWA Bedrijfsadviseurs, www.kwa.nl)
Year of construction and renovation:	1970 (constructed); 2002 - 2004 (renovated)
Typology:	Apartment building
No of dwellings:	104 apartments
Total floor area:	9,840 m <sup>2</sup> (average of 95 m <sup>2</sup> per apartment)
Owner:	Wonen Zuid (housing association)
Architect and Builder:	Kern Architecten; BAM Woningbouw (builder); Essent Retail (energy advice)
Costs of energy saving measures:	Total costs of renovation: € 9,025,000 (incl. VAT); energy saving measures: 3,643,200 (heat recovery ventilation and boilers: € 1,820,000; window frames and glazing: € 1,773,200; Insulation of side façades: € 50,000)
Renovation financed by:	The owner; sale of a number of apartments; governmental subsidies (€ 70,000 total, incl. VAT)



Figuur 1: Renovated apartments in Roermond  
(Courtesy of the Wonen Zuid housing association)

### Objectives and Results

The main objective of the Wonen Zuid housing association has been to renovate the building in such a way that it can meet the occupancy, technical and energy requirements in coming 25 years. Another objective has been to differentiate the housing stock as for the rent and private ownership, to give the building a 'face-lift' and to increase the attractiveness of apartments to potential tenants in one of the poorest residential areas in the Netherlands.

All the objectives have been achieved, including remarkable gas consumption saving of 50%. This has been achieved by means of proved, but efficient technologies like low temperature heating, high efficiency boilers and an above-standard insulation of the whole building envelope.

### Renovation concept

#### Key renovation features

- Insulation of façades
- High efficiency insulation glazing and window frames
- Low temperature heating
- Balanced ventilation with heat recovery
- Individual heat consumption meters
- Individual high efficiency boilers

## State-of-the-art

### Before renovation

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

- Wooden window frames with bad sealing
- Single glazing [5.1]<sup>1</sup>
- Slightly insulated façade panels (2 cm insulation)
- Non-insulated side façades [2.8]
- Slightly insulated ground floor (2 cm insulation)

#### Installations

- Collective district heating with conventional efficiency
- Badly insulated transport pipes
- Individual open gas boilers for DHW
- Natural ventilation via circuit channels

### After renovation

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

- Insulation plastic window frames
- High efficiency glazing (HR++) [1.2]<sup>2</sup>
- Insulated façade panels [0.32]
- External side façades insulation [ $>0.32$ ]

#### Installations

- Individual high efficiency combi boilers for heating and DHW
- Low temperature heating
- Balanced ventilation system with heat recovery
- Individual heat consumption meters

## Energy saving and monitoring

Energy consumption before renovation:  
KWh/m<sup>2</sup>: 205 (gas only)  
Energy Index<sup>3</sup>: 1.43

Energy consumption after renovation:  
KWh/m<sup>2</sup>: 103 (gas only)  
Energy index: 0.51  
Percentage saving<sup>4</sup>: 50% on gas consumption  
The actual gas consumption after renovation corresponds with the calculated consumption of 1.000m<sup>3</sup> gas per year. The tenants have confirmed this.



Figures 2 and 3: Pipes and ducts in the hall; Demolition of the entrance and elevator shaft (Courtesy of the Wonen Zuid housing association)

## Additional information

- The building exterior has been aesthetically and technically out of date. There have been problems with leakages, old water and sewage pipes. Old wooden window frames had no sealing at all. During cold days, single glazing used to be covered by condensate, which worsened the indoor climate.
- The apartments used to be too warm for tenants. Because they could not regulate the heating systems, they used to open the windows, with heat losses as a consequence.
- During the project preparation, the housing association has asked the tenants to establish a tenant committee. Tenants have been involved in the project through an opinion survey, project discussions, information evenings and letters, laying of the foundation stone and a ceremonial opening.

## Lessons learned and conclusions

- In the planning and communication with tenants, the starting-point of the Wonen Zuid housing association has been: 'what do the tenants wish?' and not the energy saving. This has helped to persuade the tenants about the necessity of to be taken measures and involve them in the project. Tenants could decide about lifts, balconies and central or individual heating boilers. They have chosen for individual boilers, because like this, tenants have more influence on their energy consumption.
- The Wonen Zuid housing association had to teach the tenants how to manage the low temperature heating system. Tenants were used that after the thermostat has been set on a higher temperature, the conventional radiators became warmer immediately. However, in low temperature heating system, the temperature raises gradually, but tenants incline to set the thermostat at its maximum.
- Energy saving measures used in the renovation of the complex in Roermond are proved technologies, but can evidently achieve high energy saving if applied in a building with low energy performance.

## References

- [1] <http://www.senternovem.nl/kompas/woningbouw/praktijkvoorbeelden>  
[2] Personal and e-mail communication with Mr Ton Paffen, Wonen Zuid

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

<sup>2</sup> U-value of the glazing only

<sup>3</sup> Calculated by EPA - Energy performance Advice programme

<sup>4</sup> Compared to the situation before renovation