



AMSTERDAM (The Netherlands)

40% energy saving for space and DHW heating
Total living expenses after renovation stayed the same
Solar MT space and DHW heating, PV, heat pump, BMS, sun lounges...

Project data

Location, address:	Kruitberg apartment building in the Bijlmermeer residential area
Region:	Noord Holland
Surroundings:	Densely built city quarter
Climate:	Mild and humid
Heating degree days:	2675 (KWA Bedrijfsadviseurs, www.kwa.nl)
Year of construction and renovation:	Around 1972 (constructed); 2003 - 2004 (renovated)
Typology:	Apartment building
No of dwellings:	328 existing and 27 newly built dwellings and company premises (2.000m ²)
Total floor area:	27,880m ² (328 apartments with average floor area of 85m ²)
Owner:	Woningstichting Rochdale (housing association)
Architect and Builder:	Kovos Architecten en Ingenieursbureau; W/E adviseurs duurzaam bouwen; Technisch Buro Metapart (installation); J.M. Deurwaarder Bouwgroep
Costs of energy saving measures:	Average of € 8,250 per existing flat (incl. VAT; out of which 4,100 € subsidies)
Renovation financed by:	The owner; rent increase, apartments sale, EU and governmental subsidies



Figure 1: Renovated apartments in Amsterdam
(Courtesy of the Woningstichting Rochdale)

Objectives and Results

The Rochdale housing association and the project partners have succeeded in fulfilling the following project objectives: to lower the energy consumption for space and domestic hot water heating by 40%, to demonstrate the use of renewable energy technologies on large scale as well as a number of innovative technologies, to guarantee that the total living expenses for tenants would not increase, transform the building architecturally and to improve existing dwellings and social conditions.

The project has shown that, with great ambition and effort, it is possible to go beyond standard renovation and realise a challenging innovative renovation concept.

The renovation of the Kruitberg apartment building is a part of the Regen-Link, an international project supported by the European commission.

Renovation concept

Key renovation features

- Insulation
- High efficiency glazing
- Balconies as sun lounges
- Collective solar space and DHW heating
- PV modules
- Heat pump
- Middle temperature heating
- Individual meters
- Optimizing of regulation system
- BMS - Building management system

State-of-the-art

Before renovation

Constructions [*U-values: W/m²K*]

- Non-insulated ground floor
- Insulated façades [0,85]
- Limited roof insulation [1,82]
- Double glazing

Installations

- Collective district heating and DHW supply combined with a central boiler
- Collective mechanical exhaust without heat Recovery
- Constant flow extract fan
- Natural ventilation air supply

After renovation

Constructions [*U-values: W/m²K*]

- Insulation of ground floor [0,32]
- Insulation of façade [0,32 and 0,40]
- Insulation of roof [0,32]
- High efficiency glazing for side and top flats (HR++) [1,1]¹
- Balconies of 35 flats closed with glazing

Installations

- 720 m² solar collectors for space and DHW heating, after-heating by high efficiency boilers
- 200 m² PV modules in side façade and parapet
- Heat pump based on ventilation air
- Middle temperature heating (70°C/40°C)
- Individual meters (heating and DHW)
- Flow limitation for hot DHW
- Optimizing of the regulation system
- BMS - Building Management System
- Constant flow rate ventilation grids for 35 flats

Energy saving and monitoring

Energy consumption before renovation:

KWh/m²: unknown
Energy Index²: unknown

Energy consumption after renovation:

KWh/m²: unknown
Energy Index: unknown
Percentage saving³: 40% (space and DHW heating)



Figures 2 and 3: Renovation in progress and the renovated front façade. (Courtesy of the Woningstichting Rochdale)

Additional information

- In the Bijlmermeer residential area, every apartment building is being renovated and there are energy saving measures applied. Only in the Kruitberg, additional energy saving measures have been taken.
- The middle temperature space heating (radiators and convector heaters) uses heat from solar collectors and after-heating by a high-efficiency boiler up to the temperature of 70°C.
- Next to energy saving and comfort measures, kitchens and sanitary facilities have been renewed.
- Before, the heating and domestic (hot) water have been measured collectively and discounted per number of persons living in individual flats. Installation of individual meters for heating and domestic hot water shall raise the tenants awareness and encourage the energy saving.
- Each apartment building in the Bijlmermeer has a tenants committee. This committee has involved tenants from the beginning through information meetings. Furthermore, a test dwelling has been established.
- During renovation, tenants stayed in their apartments and had to cope with the renovation nuisance for three weeks or they could also move in so-called "flex apartments".

Lessons learned and conclusions

- Because of multicultural population, information meetings were carried out in Dutch and English and renovation agreements, closed with each household, has been written in Dutch, English and Spanish. The effort to communicate with tenants, making good agreements and compensation measures has contributed to the project acceptance and the final success.

References

- [1] <http://www.senternovem.nl>
[2] Communication with Mr Frederik Kunst, Woningstichting Rochdale
[3] W/E Consultants: Final Technical report; 31 December 2003

¹ U-value of the glazing only

² Calculated by EPA - Energy performance Advice programme

³ Compared to the situation before renovation