



Best practice example No 3 from the Denmark



**Sundevedsgade
26 and 28
(Denmark)**

A total of 57% of savings on energy use

Extension of kitchens with integrated solar wall

PV integration, energy efficiency, heat recovery

Project data

Location, address:	Hedebygadekarreen, Sundevedsgade 26 and 28
Region:	Copenhagen
Surroundings:	Urban development area with large housing blocks.
Climate:	Mild and humid
Heating degree days:	2906
Year of construction and renovation:	1880 (construction); 1999 (renovated)
Typology:	Apartment building
No of dwellings:	21
Total floor area:	1.600
Owner:	The housing co-operative
Architect and Builder:	Architect group Copenhagen; The housing co-operative
Costs of energy saving measures:	6.700 Euro per housing unit (ex. VAT)
Renovation financed by:	The owner, Copenhagen municipality and the Danish government



Fig. 1: After renovation of Sundevedsgade 26-28

Objectives and Results

The Hedebygadekarreen project concerned all in all four apartment-blocks at Sundevedsgade 26 and 28, Sundvedsgade 14, Tøndergade 3-3a and Tøndergade 1. The renovation at Sundvedsgade 26 and 28 concerned hereby 21 apartments, where energy-saving measures were a great part of the renovation. One of the measures included that a solar heating system was applied on the roof for heating domestic hot water. Double windows with hard covering were replaced as well. Overall the project managed to succeed many energy-saving aims.

Renovation concept Key renovation features

- PV modules
- Solar heating system
- Heat recovery ventilation system
- Central placed radiators

State-of-the-art

Before renovation

Single windows

Installations

- Individual heating (electricity, gas, petroleum)

After renovation

Double windows

Installations

- Low temperature heating assisted by PV and Solar heating system. Heat recovery on ventilation air.

Energy saving and monitoring

Energy consumption before renovation: 150 kWh/m²

Energy consumption after renovation: 86 kWh/m²

Percentage saving: 57 %

A detailed monitoring program was realised.

Additional information

- PV-modules. 60 m² mains connected crystalline PV-modules from Gaia Solar have been mounted on the two original stair turrets. Preheating of the air in the stair turrets cools the back of the PV-modules and in this way the transmission loss between the stairs and the apartments is reduced.
- Solar heating system. On the roof there is a solar heating system from Batec Solar Heating that heats the domestic hot water. The total area is 35 m².
- Heat recovery. In the attic there are two high efficient counter flow heat recovery units from EcoVent, which covers 10 apartments each.
- Central placing of radiators gives saving on investment costs.
- Solar energy optimised sun spaces with overheating protection
- Heat recovery of the ventilation air has in this way reduced the heat loss of approx. 20 kW; equal to approx. 20 W per m² heated area.
- 82 DKK/m² has been saved by use of a solution with centrally placed versus conventionally placed radiators. In a 70 m² apartment this is equal to a total saving of the investments of 5,700 DKK, which are primary coming from the use of centrally placed riser pipes.
- The renovation project was part of a large urban ecology demonstration project which also included the following buildings:

Lessons learned and conclusions

The Hedebygade housing block renovation is the largest urban ecology project in Denmark. A special contribution of 5,3 MEuro was given from the ministry of housing. Besides funding from European Green Cities, EU-project (see: www.europeangreencities.com)

- The total water consumption is even lower then the 10 % reduction which was the aim of the project. The monitored months even show a reduction of 65 % comparing to the average. Due to the low total water consumption also the energy needed for hot water is reduced. Therefore the energy consumption for DHW is also reduce approximately 65 % comparing to the average.
- The solar heating system performs very well. The differences between the predicted values and the monitored values can partly be explained by the good weather in this period.
- The electricity consumption turned out to be higher then predicted. This can be due to the fact that the laundry machines for common use are installed in the monitored network. Excessive use of these machines can lead to this high electricity use. Also the ventilation system and pumps use electricity. It would be nice to monitor the electricity use only for the technical installation. Unfortunately this has not been done.

References

- [1] SBS Byfornyelse and Cenergia Energy Consultants: "Byøkologisk byfornyelse på Vesterbro – 3 ejendomme med lavenergi- og solenergianvendelse i praksis" Energistyrelsens j.nr. 51191/94-0025, March 2000
- [2] www.europeangreencities.com
- [3] www.ecobuilding.dk
- [4] "Solenergi og Byøkologi", by Peder Vejsig, 1st edition 2002