Grønneparken (Denmark)

15% savings on heat

Price level as – and better as traditional external reinsulation

Ventilation heat recovery, Solar wall, Solar collectors

Project data

Location, address:	Grønneparken, Nykøbing Sjælland
Region:	Sealand
Surroundings:	Social housing area in the city
Climate:	Continental and cold
Heating degree days:	2906
Year of construction and renovation:	1960 (construction); 1995/2005 (renovation)
Typology:	Apartment
No of dwellings:	36 , 2 housing blocks
Total floor area:	2.880 m^2
Owner:	Housing association Præstevænget
Architect and Builder:	Michael Madsen & Susanne Juul Petersen architects, SolarVent; Housing association Præstevænget
Costs of energy saving measures:	4.700 Euro per apartment
Renovation financed by:	Danish Energy Agency and housing association

Fig.1: Grønneparken, before and after renovation

Objectives and Results

The purpose of this project was to re-develop energy-saving steps. There has been accomplished a development-work concerning solar-walls for renovation of concrete. The development-work was carried through with design groups, and leaded to a design of solar-walls which naturally fits in a renovation-progress.
The result of the project has shown that solar-walls can be carried through in a price-level with, or better than, the traditional exterior reinsulation. Beside that, the solar-walls can typically cover 15% of the room-heat-requirement.

Renovation concept

Key renovation features

- 40 m^2 ventilated solar wall
- Combined pebble bed store and solar wall tested
- Solar DHW heating
- Solar wall and heat pack – phase change material tested
- PV operated exhaust ventilation tested
- Low energy windows
- Extra insulation

State-of-the-art

Before renovation	After renovation
Installations	*Installations* • Solar collectors for DHW • Solar-walls • Heat pac

Energy saving and monitoring

The yearly performances measured for the tested south oriented solar walls are 70-210 kWh/m^2.
Since the temperature difference between the inlet air (45 C) and the exhausted air from the bathroom (22 C) is around 23 C the energy contribution to the apartment from the solar wall is calculated to approximately 700 W.

Additional information

1. phase:
For 8 apartments a combined HRV system and solar wall in combination with a pebble bed store was tested.

Many ideas for the ventilation were suggested. All tenants rejected the possibility of having air channels in the living room. The solution chosen was therefore to establish a partly PV driven exhaust ventilation from the kitchen which makes low pressure in the building which will suck in fresh air from the solar-wall which will run through the apartment towards the exhaust channel in the kitchen. The opening from the solar-wall be controlled manually.


Fig. 2: Heat pac cans

2. phase:

- The pre-heated air from the solar walls is supplied into the north side rooms
- In some of the solar walls “heat pack” heat accumulating cans are used which changes phase at 29° C from solid to liquid, which makes it able to absorb comparatively much heat. Using Heat pacs makes it possible to chance a light solar wall into a heavy wall and thereby make use of the accumulation effect at times with much sun and then give the heat back to the ventilated wall. Other related goods using Heat packs are:
  - No maintenance
  - No use of Freon
  - Low costs
  - Easy to install

Lessons learned and conclusions

- The yearly output for the tested south-facing solar-walls lays in the interval 70-210 kWh/m²
- 2 of the apartment blocks have been renovated with solar-energy-solutions, hereby use of solar-walls
- Difficulties with finishing the project regarding measurements and reporting

References

- "Solenergi og Byøkologi" (Ingeniøren / bøger 2002), by Peder Vejsig Pedersen
- "Grønneparken- Nykøbing Sjælland - Billig solvægsløsning med varmeoverførsel til nordvendte rum", by Michael Madsen & Susanne Juul Petersen – Arkitekter M.a.a., Cenergia Energy Consultants, October 2005