



## Toftegården (Denmark)

**New roof top apartments**  
**Solar collectors, Covering of balconies**

### Project data

Location, address:	Toftegården, Herlev
Region:	Copenhagen
Surroundings:	Copenhagen
Climate:	Mild and humid
Heating degree days:	2906
Year of construction:	1950'ies (construction); 1990-1993 (renovation)
Typology:	Apartments
No of dwellings:	16 building blocks with 435 dwellings + 112 new roof top apartments
Total floor area:	
Owner:	H44 (Boligselskabet af 1944 I Herlev)
Architect and Builder:	KBI Consultants A/S, Technical University of Denmark, Enemærke & Petersen A/S
Costs of energy saving measures:	
Renovation financed by:	EU Thermie



### Objectives and Results

In the "Toftegården" renovation-project there has been a great focus on establishing new roof top apartments, where the apartments may not increase the total consumption of water and heat. As a part of the renovation, a further development of roof-space solar-collectors was established in two of the apartment-blocks, based on experience from the BO-90 project. One of the assumptions of establishing roof top apartments was that the existing heat-central and system of distributions should not be extended. Besides establishing new roof top apartments, it was also necessary to renovate all the balconies with a covering which was supplied with thermostatically controlled airing valves, to avoid too high temperatures in the summer period.

### Renovation concept

#### Key renovation features

- Use of passive solar heat
- Extra insulation of facades and ceilings
- Solar collectors as part of roof
- Water savings
- Extra insulation of new roof top apartments
- Covering of balconies

### **State-of-the-art**

#### **Before renovation**

*Constructions [U-values: W/m<sup>2</sup>K]*

*Installations*

#### **After renovation**

*Constructions [U-values: W/m<sup>2</sup>K]*

100 mm extra insulation

*Installations*

- Solar collectors (231 m<sup>2</sup> + 169 m<sup>2</sup>)
- Energy and water saving installations

### **Energy saving and monitoring**

#### **Additional information**

- Calculations showed that the planned energy efficient solutions would result in the same energy demand – even though the number of dwellings rose from 435 to 547.
- Balconies needed to be renovated and it was decided to cover the balconies with thermostatically controlled ventilation so high temperature in summer is avoided and ventilation in cold months minimised.
- In two housing blocks so called “roof-solar-collectors” which is made with transparent isolating plastic material at the west-surfaces. Under the surface a black fibre-cloth which absorbs the heat. By circulating air through the fibre-cloth the heat can be transported by an air/water heat exchanger to water circulation.

#### **Lessons learned and conclusions**

- The attics and facades of the mid-buildings have been reinsulated
- Renovation of the balconies
- Reinsulation of the new buildings
- Water-savings

#### **References**

- [1] Peder Vejsig Pedersen: “Solenergi og byøkologi” Ingeniøren|bøger 2002