



Traneparken, Hvalsø, Denmark

Project summary

Energy concept: Insulation, ventilation, control, PV-system

Background for the renovation – reasons

The buildings had to be renovated because they were worn down. The overall intentions were to:

- Renovate buildings because it was needed – especially the concrete external walls
- Improve energy conditions (insulation – windows – doors)
- Improve indoor climate
- Improve flats by adding and external balcony
- Improve the outdoor areas



2 of the 3 blocks at Traneparken. The one on the left not yet renovated – the other after renovation.

Site:	Traneparken 2-20 4330 Hvalsø, Denmark
Altitude	47 m
Heating degree days:	2906 (base temp. 17 ° C)
Cooling degree days:	0
Owner:	Hvalsø Boligselskab
Architect:	ARKIPLUS 1969
Engineer:	Sigfried Lorentzen Rådgivende Ingeniørfirma

Building description /typology

- 3 blocks of prefabricated concrete sandwich element buildings
- Built: 1969
- General information: Energy label E
- Gross heated floor area: 5293 m²

Contact person: Flemming Østergaard,
Building Association Zealand

Important dates: Renovation start:
November 1, 2011.
End of the renovation:
October 1, 2012

Date completed: Dec. 23, 2013

Building envelope, heating, ventilation, cooling and lighting systems before the energy renovation

Description of building (building situation, building system, renovation needs and renovation options.

Traneparken consists of 3 multistory blocks of flats situated in the village Hvalsø, 55 km west of Copenhagen. Each block has 3 stories and altogether 66 flats. The residents are an average part of the Danish population – except for 48 % being singles (rather small apartments). However – there is a rather big change of residents every year in Traneparken.

Building envelope

The buildings are typical 1960- buildings made of prefabricated enforced sandwich concrete elements with approx. 50 mm insulation.

Between the windows are panel walls which were insulated with approx. 6 mm insulation.

Floor insulation to basement was approx. 45 mm. The roof was insulated with approx. 190 mm. Windows were double glazed with U-value 1.8.

Heating, ventilation, cooling and lighting systems before retrofit

The buildings are heated by district heating let into the basement of block A to a 200 kW plate heat-exchanger.

From there it is distributed to the 3 blocks.

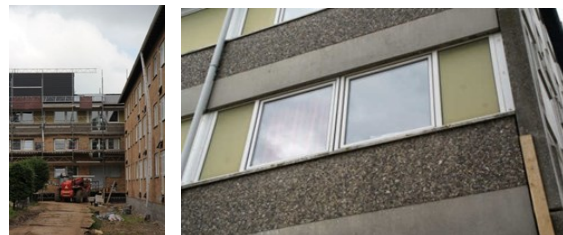
There are pre-insulated domestic hot water tanks in each block. Altogether there are eight 300 liter tanks.

The flats are ventilated by a mechanical exhaust air system from bathroom, toilets and kitchens.

Light: There are energy-saving-bulbs in all indoor lights on the staircases. It is equipped with automatic switch-off controls based on presence detectors. Outdoor light has automatic daylight switch-off.

The buildings seem rather “grey and boring” with problems from facades, windows, roofs, etc. The indoor climate was bad and the energy consumption was unacceptable large.

It was the intention that the renovation will make Traneparken more attractive for existing and new residents.



Facades – before and after:

Element (only block A)	Area, m ²	U-value before renovation, W/Km ²	U-value after renovation, W/Km ²
Exterior walls	486	0.66	0.15
Floor over basement	361	0.66	0.66
Panel Wall	106	0,7	0,11
Windows, doors	205	2,4	0.8
Roof	333	0,2	0.09

Energy renovation features

Energy saving concept

The goal was to renovate the buildings because they were worn down, so the overall intention was to:

- Renovate buildings because it was needed - the concrete external walls were weakened by deterioration. At the same time external balconies should be added to improve the flats.
- Reduce the energy consumption
- Improve indoor climate
- **Building**
- The exterior walls have been renovated: Supplementary thermal insulation is added to the outside of the exterior walls. The external insulation is continued to the base of the house to reduce thermal bridges. Cost: 12.5 million DKK (incl. VAT)
- The roofs are renovated and insulated. Cost: 4.2 million DKK (incl. VAT)
- The windows and doors are replaced with 3 layers low-energy windows. Cost: 0,85 million DKK (incl. VAT, excl. installation).

Systems

Heating: Nothing changed

Ventilation: The flats are now ventilated by a balanced mechanical ventilation system with heat recovery. Exhaust air from bathroom, toilets and kitchens and supply air to the living rooms.

Lighting: No changes of the lighting - it is already up to date.

Element (only block A)	after renovation
Exterior walls	Plus 190 mm insulation plus exterior solid standard bricks Now: 240 mm
Filling panels between windows	Plus 285 mm insulation plus exterior solid standard bricks Now: 330 mm
Windows, doors	3-layer low-energy windows with aluminium – wood frame
Roof	Plus 250 mm Now: 435 mm

Renewable energy systems

Solar panels are installed for electricity production.



Achieved Energy Savings, CO₂ reductions and Life Cycle Costs

Energy consumption for heating and hot water before and after renovation:

Calculated energy consumption:

before renovation:	728 MWh/year
after renovation:	502 MWh/year
calculated savings:	226 MWh/year

Actual energy consumption measured over a 12 months period:

before renovation 2011 - 2012	736 MWh
after renovation 2012 - 2013	506 MWh
actual savings:	230 MWh

Calculated energy savings and PV production

Energy savings by reduced heat loss from the building envelope is 120 MWh/year.
Energy savings by reduced ventilation loss is 106 MWh/year.

Total annual energy savings : 226 MWh/year.

Increased running costs for the ventilation system: 100.000 DKK/year.

PV electricity production: 30.000 kWh/year = 60.000 DKK/year (~ electricity consumption in the common laundry).

Actual production from PV:
1st year of operation: 38159 kWh.

Renovation Costs

Craftsmen	38 million DKK	7525 DKK/m ²
Consultants	11.3 million Dkk	2238 DKK/m ²
Total	49.3 million DKK	9762 DKK/m ²
NPV	n/a yet	n/a yet



Non energy benefits: More beautiful buildings – better ventilation and balconies



Overall improvements, experiences and lessons learned

Energy

Savings: 226 MWh/year.

PV production: 30 MWh/year

Indoor climate technical improvements

The indoor climate was improved due to:

- mechanical balanced ventilation with heat recovery and a carefully adjusted supply temperature
- Less heat loss and draught through walls, windows and doors

Economics

It was important for the economy that the buildings needed renovation because of beginning deterioration. Therefore a large part of the renovation could be financed from funding available for improving the present situation – a Danish fund for social housing was used for this purpose: “Landsbyggefonden”.

Decision process – barriers that were overcome

In social housing projects in Denmark a majority of the tenants has to agree on the decision. This means very much information, many meetings etc.

Non-energy benefits

The renovation has resulted in:

- New balconies
- New green surroundings
- Ventilation – better indoor climate

Economic consequences for the tenants

Rent before: 698 DKK/m²/year

Rent after: 786 DKK/m²/year

Increase: **88 DKK/m²/year**

Energy savings: 226 MWh/year

Energy price: 700 DKK/MWh

Savings: 226 x 700=158.200 DKK
 = **31 DKK/m²/year**

Indoor climate

Practical experiences of interest for a broader audience:

The tenants are satisfied with the improved indoor environment. For example: The benefits of the ventilation system: “now we don’t have to care about opening windows to change the air” - and the costs for heating has been considerably reduced, while the thermal comfort in the dwellings has improved considerably.

A few tenants claim that the air is now too dry – during the winter season.

It is expected that the former problems with mold will not re-occur with the improved ventilation.

Users evaluation

The users are very content with:

- The new balconies – they increase the useful area of the flats
- “The buildings are more beautiful now – so we take better care”
- The air quality
- The renovation process



General data

Summary of project

Three existing building blocks have been renovated with new facades, new windows, additional insulation on the roof, mechanical ventilation with heat recovery and a PV installation on the roof.

The consultants succeeded in informing the tenants and presenting the project in detail to them well before the construction started. During the renovation process they were also good at informing and just talking with the tenants. The tenants showed great patience; probably because of the good information they had been given.

Traneparken has become a more attractive place to live and thus it will be easier to find tenants for the apartments. It is also expected that the tenants will take better care of their homes and the surroundings.



Figure: 190 mm insulation plus exterior solid standard bricks. Energy windows – aluminium – wood, 3-layer energy glass. In the panel walls: 285 mm insulation plus exterior solid standard bricks.

Experiences/lessons learned

It is important that the tenants get what they expect, so from the beginning it is necessary to spend a great deal of effort on making sure that the expectations are adjusted to what can be met in practice.

It takes longer time to plan and carry out a renovation than a new construction, mainly because the apartments are inhabited.

The inhabitants/tenants have to be part of the decision process (tenants democracy is given by law in Denmark). The time schedule is important – the tenants need to know when something is going to happen in their dwelling.

It is cumbersome to carry out work in apartments, where people live – the individual craftsman need to be considerate. There are sometimes conditions in the individual dwellings, which are not known beforehand, so the project has to be adapted to these – and there has to be money enough for this flexibility. In this case there were sufficient financial room for particular considerations in the individual dwellings and to solve unexpected problems, what always occur in a renovation project.

The security at the building site has to be the very best – it has to take into account the tenants and especially children living at the building site. The consultants and the contractor succeeded at this in the Traneparken project.

References

- [1] Notat, Martin Nørmarkve
- [2] Helhedsplan for Traneparken, Hvalsø Boligselskab