Maratonvägen 36

Project summary

Energy concept: To achieve a substantial reduction of the energy losses.

Background for the renovation – reasons

The aim was to combine a maintenance renovation with a reduction in energy use and serve as pilot project for future renovations.

Therefore the objectives of the renovation was to:

- renovate because of wear and tear
- attend to increased radon levels
- improve on the poor thermal comfort
- improve on the poor energy efficiency by 30-50 %

Site:	**Halmstad, Sweden**
Altitude:	10 m
Heating degree days:	3325 (base temp. + 17 C°)
Cooling degree days:	0
Owner:	Halmstad Fastighets AB (HFAB)
Architect:	Krok & Tjäder
Engineer:	Ramböll, Dagsgårds VVS konsulter AB

Contact Person:	Joakim Patsonen, property engineer, HFAB
Important dates:	Renovation finished in 2011
Date of template completed:	March 31, 2014

Building description /typology

- Built 1963-65
- Three - four story buildings
- 51 apartments (of 579 apartments)
- Heated usable floor area (51 apartments) 4,521 m²

Before renovation

After renovation

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

Description of building and its situation before renovation.

The area of Maratonvägen is a typical "million homes program“ area with 580 apartments in 21 buildings. The buildings have undergone very few changes since the construction in the sixties and is therefore in need of maintenance actions. However, the bathrooms have been renovated previously. Besides it has been shown that the buildings contains a type of concrete which emits radon which results in increased radon levels in some apartments. The energy efficiency of the buildings also needs to be improved.

Building envelope

The buildings were typical for the sixties with a concrete structure and exterior walls of 0.20 m of light concrete and 0.12 m of bricks. Behind the balconies the walls were infill walls. There was 0.125 m of insulation on the roof slab and the roof was flat. The windows were double pane windows.

The apartments were perceived as drafty and had a poor indoor thermal comfort due to leaky infill walls. The balconies constituted thermal bridges.

The brick façade was partly destroyed by corroding reinforcement.

Architecturally the wish was to preserve the impression of the façade.

Heating, ventilation, cooling and lighting systems

The buildings are heated by district heating. In each apartment there are radiators under the windows. Domestic hot water was also heated by district heating. District heating is renewable to 95%.

The apartments were ventilated by a passive stack ventilation system, one passive stack in each bathroom and one in each kitchen.

The staircase lighting was of energy inefficient type.

Before renovation – basement storerooms

Before renovation

Element	U-Value before renovation W/m²K	U-Value after renovation W/m²K
Façade, behind balcony	0.82	0.43
Roof	0.35	0.08
Windows, average	2.70	1.00
Doors	2.70	1.40

Energy renovation features

Energy saving concept

The aim was to combine a maintenance renovation with a 50 % reduction in energy use.

Building

- Adding thermal insulation to the roof and the infill walls behind the balconies.
- Raising the roof from being a flat roof to a ridged roof.
- Improving the airtightness from 1.4 l/sm² to 0.5 l/sm² at 50 Pa. All apartments were tested.
- Replacing the windows with triple pane windows.

Systems

Heating:

- Installation of new thermostatic radiator valves and adjustment of the heating system.
- New substations for district heating.
- New district heating culverts between the buildings.
- New energy efficient washing machines connected to district heating.

Ventilation.

- Installation of a centralized balanced ventilation system with counter flow heat-exchanger. The heat exchanger efficiency is 80 %.

Lighting:

- Installation of low energy lighting for fixed lighting i.e. compact fluorescent tubes.

Element	After renovation
Exterior walls	Adding 45 mm of insulation to the infill walls
Roof	Adding 400 mm of thermal insulation to the roof
Windows, average	Triple pane
Doors	New doors

Renewable energy systems

No renewable energy systems were introduced. The buildings already used district heating based on 95 % renewable energy.

Other environmental design elements

Installation of ventilation ducts in the new attic and new washing machines in the common laundry room.

Achieved energy savings, CO2 reductions and Life Cycle Costs

Energy consumption for heating, hot water and property electricity before and after renovation:

Calculated energy consumption:		
before renovation:		145 kWh/(m²·year)
after renovation:		92 kWh/(m²·year)
calculated savings:		53 kWh/(m²·year)
Actual energy consumption measured over a 12 months period:		
before renovation:	normalized	145 kWh/(m²·year)
after renovation:	normalized	92 kWh/(m²·year)
actual savings:		53 kWh/(m²·year)
BBR2012 (building code requirement for new construction)		90 kWh/(m²·year)

As 95 % of the district heating is renewable energy the reduction in CO_2 emissions is small or even slightly increased due to the new ventilation system.

Renovation Costs

Craftsmen	≥ 20 mio SEK (2,25 mio Euro)	≥ 4,400 SEK/m²* (495 Euro)
Total incl. VAT	22.2 mio SEK (2,5 mio Euro)	4,900 SEK/m²* (550 Euro)
NPV (assumptions: cost of capital 4.25 %, calculation period 12 years, energy price increase 3 %/year) The owner applies the profitability requirement of 5 %.	13 mio SEK (1,45 mio Euro)	2,900 SEK/m²* (325 Euro)
NPV if no renovation	7.35 mio SEK (0,825 mio Euro)	1,625 SEK/m²* (180 (Euro)

* Net floor area or residential floor area.

New cooker hood.

Calculated energy savings

Energy savings thanks to reduced transmission losses, heat recovery and reduced use of domestic hot water are 280 MWh or 62 kWh/m²·year. However the use of electricty increased by 41 MWh or 9 kWh/m²year, caused by the new ventilation system. Measured energy use is similar to calculated.

New windows and entrance

Overall improvements, experiences and lessons learned

Energy

Annual savings 53 kWh/m²·

Indoor climate

- Improved thermal comfort and indoor air quality

Economics

The costs can be divided:

1) Energy saving measures,
2) Improved standard of the apartments paid for by the tenants (new common laundry rooms, renewed staircases and storerooms etc.) with a 15 % average rent increase,
3) The maintenance cost for the buildings, in any case needed.

Decision process – barriers that were overcome

According to information received there were no major barriers. The board of HFAB made the decisions according to the interest calculated for costing purposes. The decision paths were reasonably short.

Non-energy benefits

- Better indoor climate
- The old entrance doors to the apartments were replaced with new safety entrance doors
- New surface finish of staircases
- New burglar proof storerooms
- New common laundry rooms
- Glazing of balconies
- Improved surroundings
- Improved status of the area

Economic consequences for the tenants (2011)

Rent before: 728 SEK/m²/year íncl. space heating and dhw

Rent after: 837 SEK/m²/year incl. space heating and dhw

Rent increase: 109 SEK/m²/year

Energy savings: 239 MWh/year

Energy price: 1000 SEK/MWh

Energy savings: 53 SEK/m²/year

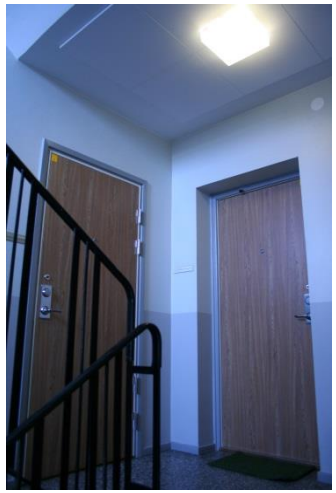
Users evaluation

The tenants were most satisfied with the glazing and widening of the balconies.

The tenants perceive that

- Draughts have been completely eliminated from external walls and windows.
- The room temperature is more comfortable.
- Less noise from outside
- The towels dry faster in the bathrooms.

After renovation – basement storerooms



Renovated staircase with new safety doors and new energy efficient lighting.

Summary and Prospect

Summary of project

A maintenance renovation was needed. The results were substantial improvements in the standard of the building and at the same a reduction in energy use with 35 %, while keeping a similar architectural appearance. This was done using traditional building materials and with common contractors.

The tenants have appreciated the improvements in thermal comfort, indoor air quality and noise climate. The tenants were however most satisfied with the glazing and widening of the balconies.

The tenants were satisfied with the overall renovation, which was carried out without evacuating the tenants.

The dialogue with the tenants has to be prioritized before and during a major renovation. A questionnaire among the tenants showed that what is most important to the tenants is security and safety. Many tenants are against changes which result in a too big an increase in rent.

During the renovation it is useful to have a renovation “host”, who the tenants can address.

The contract for the building construction was a divided contract, which had some coordination problems. It might be that partnering is more suitable for major renovations. Partnering implies that the property developer, the consultants, the contractors and other key operators collaborate to complete a construction task.

Prospect for future renovations

Currently other buildings in the same area are being renovated in a similar way. This time improvements in cost efficiency have been made. Good solutions were found during the initial renovation for e.g. window details, electrical installations.

The level of renovation in this project would make technical and financial sense in many buildings built during the sixties and seventies.

Renovated building.

References

[1] Mjörnell, K., et.al. 2011, Milparena – Million homes program arena Innovative action proposals for renovation of the building envelope and installations (in Swedish), SP Rapport 2011:39, Technical research institute of Sweden

[2] Johansson, U., Patsonen, J., 2010, Maratonvägen - Pilot study – Investigation of energy efficiency measures before planned renovation (in Swedish), Halmstad Fastighets AB.

[2] Nihlén, M., 2012, Half the energy use after step by step renovation (in Swedish), VVS Forum nr 12.2012.