Terrasse apartments Husby, Stjørdal, NO

PROJECT SUMMARY
Renovated 2004-2005
110 Apartments
The first large low-energy housing renovation project in Norway

ARCHITECT
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OWNER
Husby borettslag

IEA – SHC Task 37
Advanced Housing Renovation with Solar & Conservation

Original facades from 1970

After renovation, 2005

The living room view towards south and the fjord

BACKGROUND

• Terraced apartments, built in 1970 according to building codes from 1969. Orientated towards south.

• An important aim of the project in 1970 was making use of non-productive, steep slopes at low construction costs. The project received national and international attention during the seventies for this concept. The buildings are built on an old slate quarry, and stand on pillars. There is a cavity between the floors and the ground slope.
• The motivations for the current renovation were:
    • High electricity consumption
    • Complaints about poor indoor climate
    • Inspiration from the low energy project at Husby Amfi (built by the housing cooperative)
    • The inadequate capacity of the electric transformer to meet the demand of both the old (Husby Terrasse) and the new (Husby Amfi) buildings.

SUMMARY OF THE RENOVATION

• 15 cm insulation added and gable walls made more air tight.
• Thermal bridges reduced at gable walls and at the floor/south wall joint. Floor heating slots at front windows and balcony doors filled with mineral wool).
• Balanced ventilation system (rotary wheel heat exchangers) in each flat, with assumed 80 % efficiency.
• New windows and balcony doors (triple glazing, U = 1.0 W/m^{2}K).
• Replacing the old electric convector heaters with modern electric room heaters with thermostats (solar collector assessed, but poor profitability).

The south walls had previously received additional insulation (to a total of 150 mm) and new cladding. Therefore, these walls were not touched during the renovation.

No insulation of the floors was added due to too high costs and resistance of occupants having to move out during the work.

The triple glazed window panes reduce daylight admittance by approx. 10 %.

The old electric convector heaters in front of the balcony doors were removed and the cavities insulated and sealed.

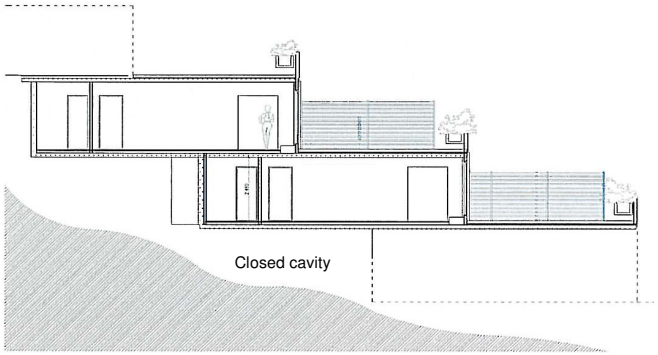
After removing the panels and old insulation of the gable walls, 2 layers of insulation were added.

CONSTRUCTION

Roof construction	*U-value: 0.48 W/(m²·K)*
Concrete (existing)	120 mm
Insulation (existing)	50 mm
Concrete (exisiting)	130 mm
Total	300 mm

Floor construction	*U-value: 0,94 W/(m²·K)*
Concrete (exisiting)	130 mm
Insulation (existing)	15 mm
Total	145 mm

Gable wall construction	*U-value: 0,18 W/(m²·K)*
Facade panels	20 mm
Asphalted cardboard	13 mm
Concrete	150 mm
Plaster Board	13 mm
Insluation (existing)	50 mm
Insulation (new)	150 mm
Total	396 mm



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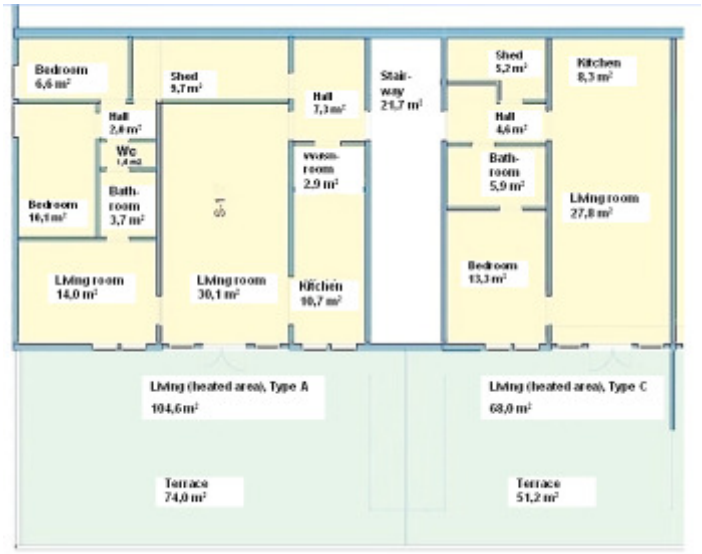

Plan of a large and a small ground floor apartment

The new, exposed ventilation ducts, occupants dislike this.

The occupants had to cover the ducts themselves, for instance in the kitchen shown here.

Summary of U-values W/(m²·K)

Construction	Before	After
Roof	0.48	0.48
Floor	0.94*	0.94
Outside wall south	0.35**	0.35
Gable walls	0.64	0.18
Outside wall north (only top floor)	0.76	0.76
Windows	2.5	1.0
Balcony door	3.0	1.0

* Before the renovation, room air was exhausted through the closed cavities beneath the floor. to use heat from the exhaust ventilation air. The tempered cavities thus reduced floor heat losses. After the renovation exhaust air is routed through the new balanced, heat recovery ventilation system and the floor is colder.

**The south walls had earlier been renovated with 5 cm additional insulation to a total of 15 cm

BUILDING SERVICES

Electric resistance panel heaters

Electric water heating

Balanced ventilation with rotary wheel heat exchanger

ENERGY PERFORMANCE

Total measured energy use (delivered/primary energy):

Before: 265/623* kWh/m²
After: 150/353 kWh/m²
Reduction: 43 %
* Primary energy factor for electricity: 2.35

Calculated energy use for space + water heating (delivered / primary energy)

Before: 205 / 482 kWh/m²
After: 90 / 212 kWh/m²
Reduction: 56 %

INFORMATION SOURCES

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