Apartment Building in Brogården, Alingsås SE

PROJECT SUMMARY
Between 1963 – 1973 about one million apartments were built in Sweden, “the million-programme”. Now 30-40 years later, they are in great need of renovation. In Alingsås, 300 of these apartments will be renovated to passive house standard.

SPECIAL FEATURES
Balconies moved to stand outside facades to decrease thermal bridges

ARCHITECT
efem architects
www.efemarkitektkontor.se

OWNER
Alingsåshem

SHC
SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

IEA SHC Task 37
Advanced Housing Renovation with Solar & Conservation

Brogården before renovation

BACKGROUND

The Brogården housing estate with 300 apartments built 1970 was in great need of renovation. The tenants complain about draughts and cold apartments and the facade exterior had mouldered away. The apartments were not suitable for elderly or disabled persons. Renovation was needed in any case and energy aspects were to be included. Initially, one building with 18 apartments wase renovated and serves as a demonstration project. Renovations following this demonstration phase will profit from the experience gained. The project will be monitored after completion of the renovation.

RENOVATION MEASURES

- Added insulation (ground floor, exterior walls and roof)
- New facade material
- New windows
- Increased air-tightness of the building envelope
- New balconies relocated to outside the facade
- New build entrance vestibules
- New ventilation system with heat exchanger
- New energy-efficient household appliances
- Improved outdoor area

Existing facade with thermal bridges

Worn out masonry facade

Outer wall with its layers of insulation

IMPROVED CONSTRUCTION

Floor construction *U-value: 0.16 W/(m²·K)*

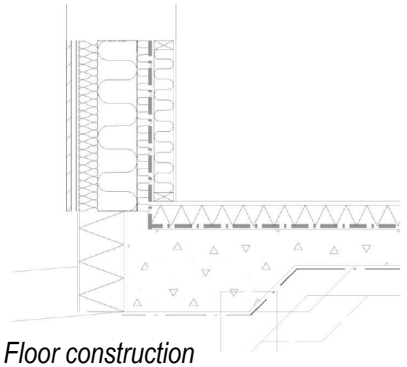
(interior to exterior)	
Particle board	16 mm
Expanded polystyrene EPS	120 mm
Moisture barrier	2 mm
Concrete (existing)	180 mm
Plastic foil (existing)	
Gravel (existing)	150 mm
Total	468 mm

Wall construction *U-value: 0.11 W/(m²·K)*

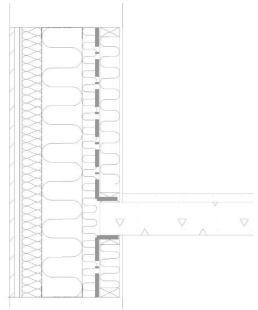
(interior to exterior)	
Interior plaster	13 mm
Steel beams + mineral wool	70 mm
Plastic foil	
Steel beams + mineral wool	120 mm
Steel beams + mineral wool	195 mm
Steel beams + mineral wool	95 mm
Shield of brick	22 mm
Total	515 mm

Roof struction *U-value: 0.10 W/(m²·K)*

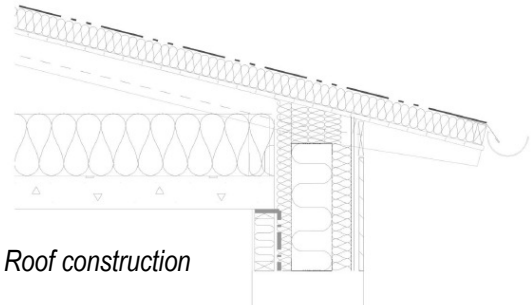
Roofing felt	
Mineral wool	100 mm
Roofing felt (existing)	
Wooden tongue (existing)	22 mm
Roof truss + Attic space (existing)	
Loose wool insulation	300 mm
Concrete (existing)	160 mm
Total	582 mm



Floor construction



Outer wall construction



Roof construction

Drawings: WSP Construction

Entrance before renovation

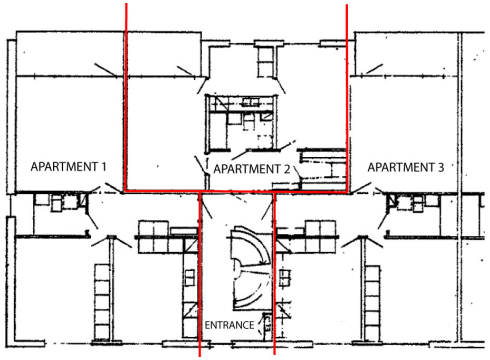
Entrance after renovation

ACCESSIBILITY

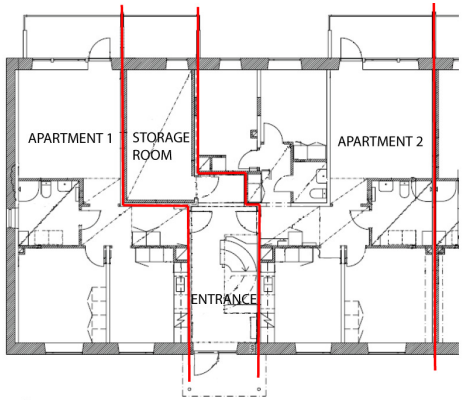
Major efforts were made to increase the accessibility of the apartments. The three apartments on the ground floor in each stairwell were converted into two larger, fully renovated units built to a new built standard and designed for disabled persons. All bathrooms are now larger, but the apartments on the second and third floor keeps otherwise were kept to the original planning.

The entrances were rebuilt to be easier to access and more distinct. A storage room for wheelchairs, walking frames and prams was built on the ground floor.

60% of the 300 apartments are now suitable for disabled persons after renovation. Elevators will be installed in some of the buildings.



Ground floor before renovation



Ground floor after renovation

Drawings: efem architects

Before renovation

After renovation

BALCONIES

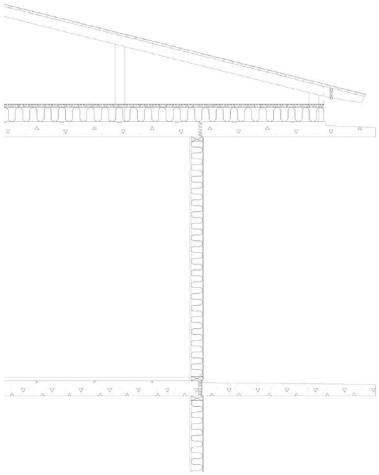
The floor in the old balconies were made of concrete and continued with almost no thermal breaking insulation in to the apartments. This caused a large thermal bridge and discomfort for the tenants.

Since the outer wall was to be rebuild anyway, it was decided to build the whole new wall in the position of the existing outer wall. The existing concrete balcony was saw off at the end to be in line with the new wall.

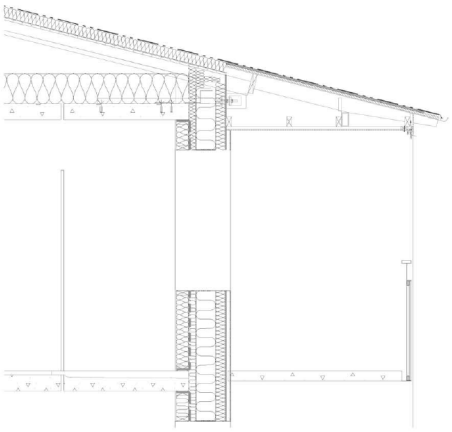
The new balconies are built on plinths and not connected to the inner floors. Glazing of the balconies is optional.

The existing roof truss is extended to fit the thicker outer walls and continues over the balconies on the top floor.

The old colour scheme is kept on the new building to keep the impression of the area.



Construction before renovation



Construction after renovation

Drawings: WSP Construction

Overview of U-values W/(m²·K)

	Before	After
Attic floor	0.21	0.10
Walls	0.32	0.11
Ground construction	0.44	0.16
Windows *	2.0	0.85

*Including frame

BUILDING SERVICES

Heat is delivered to the apartments by the ventilation system with an air to air heat exchanger. Each apartment has its own air-to-air heat exchanger with 85% heat recovery efficiency. It is placed in the bathroom or in a walk in closet, with the air intake on the façade and the outlet on the roof.

RENEWABLE ENERGY USE

The energy for heating and domestic hot water is supplied by the district heating system, using wooden chips and waste heat from industries. This is a sustainable power source with a small amount of pollutants. In the future, the district heating company will complete their system with solar panels.

ENERGY PERFORMANCE

Space + water heating
Before: 145 kWh/m²a
After: 55 kWh/m²a
Reduction: 62%

INFORMATION SOURCES

Janson, U., February 2008, *Passive Houses in Sweden,* Lund University (English)
http://www.ebd.lth.se/forskning/passivhus_demonstrationsprojekt/

Brochure author

Ulla Janson