Enhancement house in St. Valentin - AT

PROJECT SUMMARY

Renovation of a single-family house built in 1982 with vertical enhancement for a second housing unit and an annex for a staircase.

SPECIAL FEATURES

- components of a Passive House in the first floor
- ventilation system with heat recovery and air heating

ARCHITECT

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Private

Photo: T. Wimmer

SHC
SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

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

Before

After

BACKGROUND

The residential building, a single family bungalow in St. Valentin near Linz, was built in the 1980s with a coke boiler, later on with an oil driven floor heating system, a central supply of hot water by electricity and a typical building envelope with a space heating demand of 198 kWh/(m²a).The fabric of the building was in a good condition but with very few insulation.

After renovation 2006 with an intensive engagement of the owner, a new storey built with wooden framework walls, almost complies with Passive House standard and the ground floor is up to the mark of low energy requirements. The whole building achieves 30 kWh/(m²a) space heating demand.

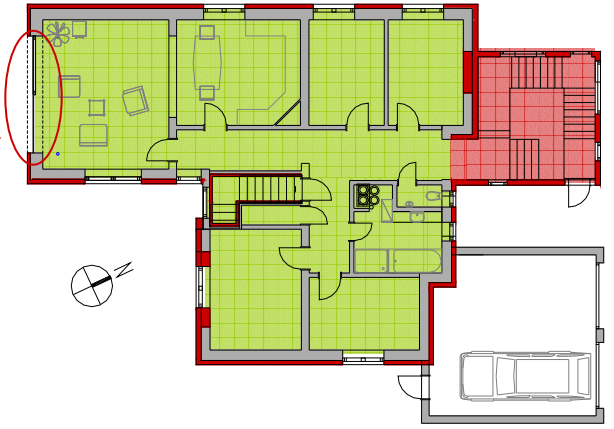
Section

OBJECTIVES OF THE RENOVATION

- doubling of the living space
- reduction of the heating costs to a minimum
- high degree of pre-fabrication
- to meet low energy requirements in the ground floor
- to comply with Passive House standard in the new storey
- renovation with a least distribution of residents
- to construct an economic building

SUMMARY OF THE RENOVATION

- Insulation of the building envelope: roof (456 mm), façade (300 mm) basement ceiling (120 mm)
- one new window in the ground floor
- windows meeting Passive House standard in the upper floor
- enhancement of the ground floor
- utilization of prefabricated wall units (first floor)
- addition of a staircase
- new sanitary installations
- ventilation system with heat recovery and air/air heat pump in the first floor
- central vacuum cleaner system



Ground floor

Renovation
Lasting quality

CONSTRUCTION

Roof construction *U-value: 0.089 W/(m²·K)*

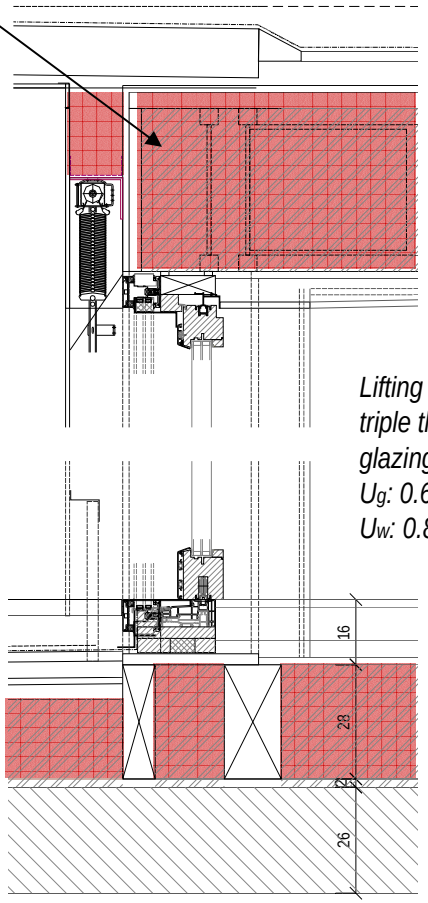
(interior to exterior)	
plasterboard	15 mm
roof board	24 mm
OSB airtight	18 mm
cellulose insulation	456 mm
softboard	16 mm
air space	60 mm
boarding	24 mm
roof foil	2 mm
Total	615 mm

Wall construction *U-value: 0.109 W/(m²·K)*

(interior to exterior)	
plasterboard	15 mm
OSB airtight	11 mm
insulation	100 mm
OSB airtight	18 mm
cellulose insulation	300 mm
softboard	16 mm
air space	50 mm
façade panel	10 mm
Total	520 mm

Basement ceiling *U-value: 0.211 W/(m²·K)*

(top down)	
floor construction (existing)	121 mm
brick	250 mm
insulation	120 mm
plaster	2 mm
Total	493 mm



Lifting sliding door: triple thermopane glazing
U_g: 0.60 W/(m²·K)
U_w: 0.86 W/(m²·K)

Window section

Summary of U-values W/(m²·K)

	Before	After
Attic floor	0.5	0.09
Walls	0.7	0.11
Basement ceiling	1.0	0.21
Windows	2.8	0.86

BUILDING SERVICES

A new centralised ventilation system with heat recovery (efficiency 90%) combined with an air/air heat pump is installed in the first floor. The preheating of the cold air is realized with a earth to air heat exchanger. The existing floor heating and the floor heating in the first floor is working with the central oil heating, 22 kW (1998). Aim of the owner is to use the oil heating system infrequently. The domestic hot water is heated by the central oil heating. Reduction of the heating cost of 2/3 is reached even though the usable floor space is doubled from 165 m² to 337 m².

RENEWABLE ENERGY USE

The residents are planning to create an energy self-sufficient building. The first step will be the change from oil heating to an air/air heat pump, followed by windmills and PV for providing electricity.

ENERGY PERFORMANCE

Space + water heating (primary energy)*

Before: 317 kWh/(m² a)

After: 66.7 kWh/(m² a)

Reduction: 79% (existing oil heating)

Future reduction: 93% (new pellets heating)

*according to OIB Richtlinie 6

INFORMATION SOURCES

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