

APT building on Makartstrase, Linz AT

PROJECT SUMMARY

Renovation of an apartment building built in 1958 complying with Passive House Standard. New façade with solar insulation system and closed-in, glazed balconies.

SPECIAL FEATURES

- Gap-Solar Façade
- decentral ventilation system with heat recovery and air heating

ARCHITECT

ARCH+MORE ZT GmbH
Arch. DI Ingrid Domenig-Meisinger

OWNER

GIWOG - Gemeinnützige Industrie-
Wohnungsaktiengesellschaft
Co-operative



IEA – SHC Task 37

Advanced Housing Renovation with Solar & Conservation

Before



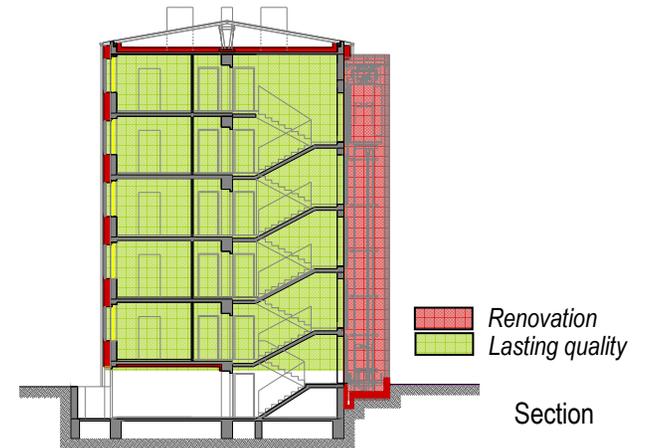
BACKGROUND

The enclosure of this building with 50 flats, which is almost five decades old, was in a good condition. The exterior walls of poured concrete were not insulated. The space heating demand of the building was 124 kWh/(m²a). Parts of the cellar ceiling were later insulated. The energy improvement of the building technical systems, reduction of thermal bridges and air tightening of the envelope were key aspects of the modernization. After renovation in 2006, the apartment building complies with Passive House Standard, needing only 11 kWh/(m²a) for space heating. The renovation was co-sponsored by the state of Upper Austria and the House of the Future Program of the Austrian Ministry of Transport, Innovation and Technology (BMVIT)

SUMMARY OF THE RENOVATION

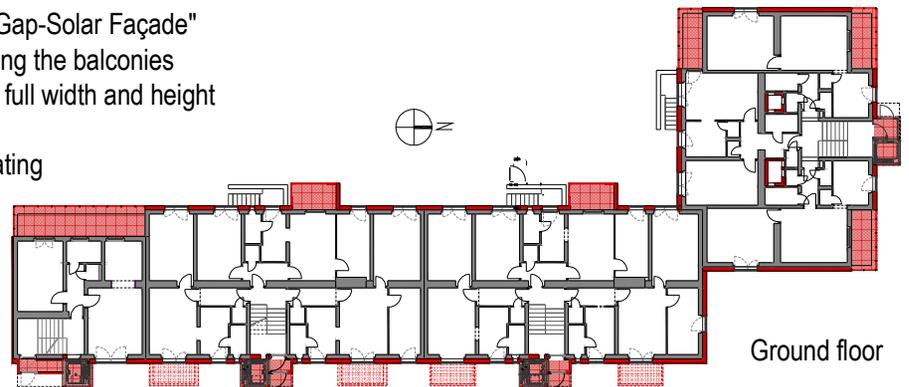
- high insulation of the facades, floors, roofs
- triple glazing windows, including an anti-glare shield
- decentral mechanical ventilation with heat recovery and air heating
- insulated outside walls with the "Gap-Solar Façade"
- enlarging the apartments by closing the balconies
- using prefabricated wall units the full width and height of an apartment
- domestic hot water by district heating

After



OBJECTIVES OF THE RENOVATION

- reduce heating costs to a minimum
- optimise ventilation and building services
- ecologically renovate and use renewable resources
- use pre-fabrication
- renovate with a least distribution of residents



Thermal skin



THERMAL SKIN



Prefabricated and mounted wall units

CONSTRUCTION

Roof construction *U-value: 0.094 W/(m²·K)*

(top down)

Eternit fibre cement tile	
roof structure construction	
rock wool	400 mm
floor screed	30 mm
crushed slag course	100 mm
reinforced concrete	140 mm
plaster	20 mm
Total	690 mm

Wall construction *U-value: 0.158 W/(m²·K)*

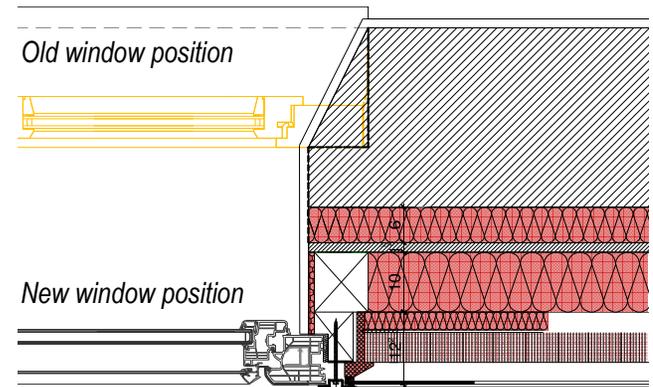
(interior to exterior)

plaster	20 mm
slag concrete	300 mm
insulation	60 mm
OSB airtight	16 mm
mineral wool	130 mm
MDF	4 mm
solar comb	50 mm
air gap (slightly ventilated)	31 mm
ESG float glass panel	6 mm
Total	617 mm

Basement ceiling *U-value: 0.206 W/(m²·K)*

(top down)

existing floor	100 mm
reinforced concrete	150 mm
porous concrete	50 mm
rock wool	100 mm
Total	400 mm



Window:

triple glazing

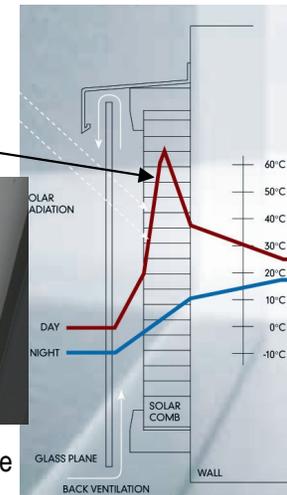
U_g: 0.71 W/(m²·K)

U_w: 0.95 W/(m²·K)

Horizontal window section



Gap-Solar Facade



Decentral mechanical ventilation system



New façade – new window

BUILDING SERVICES

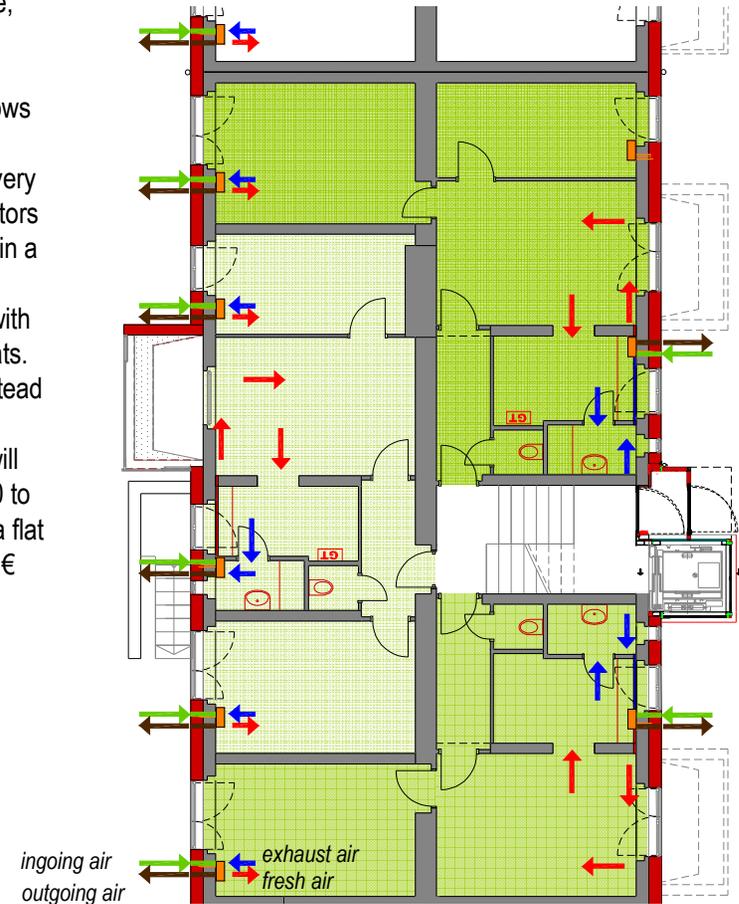
The building will meet the Passive House Standard by means of prefabricated ventilated Gap-Solar Façade, reinforced insulation of top floor and cellar ceiling, enlargement of existing balconies including parapet insulation, glazing with Passive House quality windows including integrated sun protection.

A controlled room ventilation system with heat recovery (efficiency 70%), air heating and single room ventilators is installed. The existing space heating system was in a good condition. Therefore this system is used, additionally to the room ventilation system, though with lower supply temperatures and new room thermostats. Domestic hot water is heated by district heating, instead of decentral gas heating.

Expected energy savings of about 450.000 kWh/a will decrease annual CO₂ emissions from about 140.000 to 29.000 kg. Before modernization: heating costs for a flat of 59 m² were € 40.80 /month, afterwards they are € 4.73 /month.



Intake and outlet vents by the window



Position of the decentral mechanical ventilation system



Summary of U-values W/(m²·K)

	Before	After
Attic floor	0.9	0.09
Walls	1.3	0.16 ¹⁾
Basement ceiling	0.5	0.21
Windows	ca. 2.8	0.95

¹⁾ Dynamic U-value with solar input (Gap-Solar Facade)

RENEWABLE ENERGY USE

The Gap-Solar Facade system consists of a special cellulose honeycomb protected behind a glass facade. Solar radiation enters and warms the honeycomb. A warm buffer zone is created on the outside wall, reducing heat losses from the building interior.

The efficiency of the gap-solar facade depends on the amount of sunlight and the facade orientation. On the south facing facade room heat losses over the heating season drastically reduced, with an average dynamic U-value of the wall of approx. 0.08 W/m²K

ENERGY PERFORMANCE

Space + water heating (primary energy) *

Before: 172.5 kWh/(m²a)

After: 38.7 kWh/(m²a)

Reduction: 78 %

* according to OIB Richtlinie 6

INFORMATION SOURCES

[Passiv House renovation, Makartstrasse, Linz, report of energy end environment research 21/2007, bmvit.](#)

Ingrid Domenig-Meisinger
domenig@arch-more.com

Brochure authors

Sophie Grünewald, Sigrun Rottensteiner

Contact

Thomas Mach
thomas.mach@tugraz.at

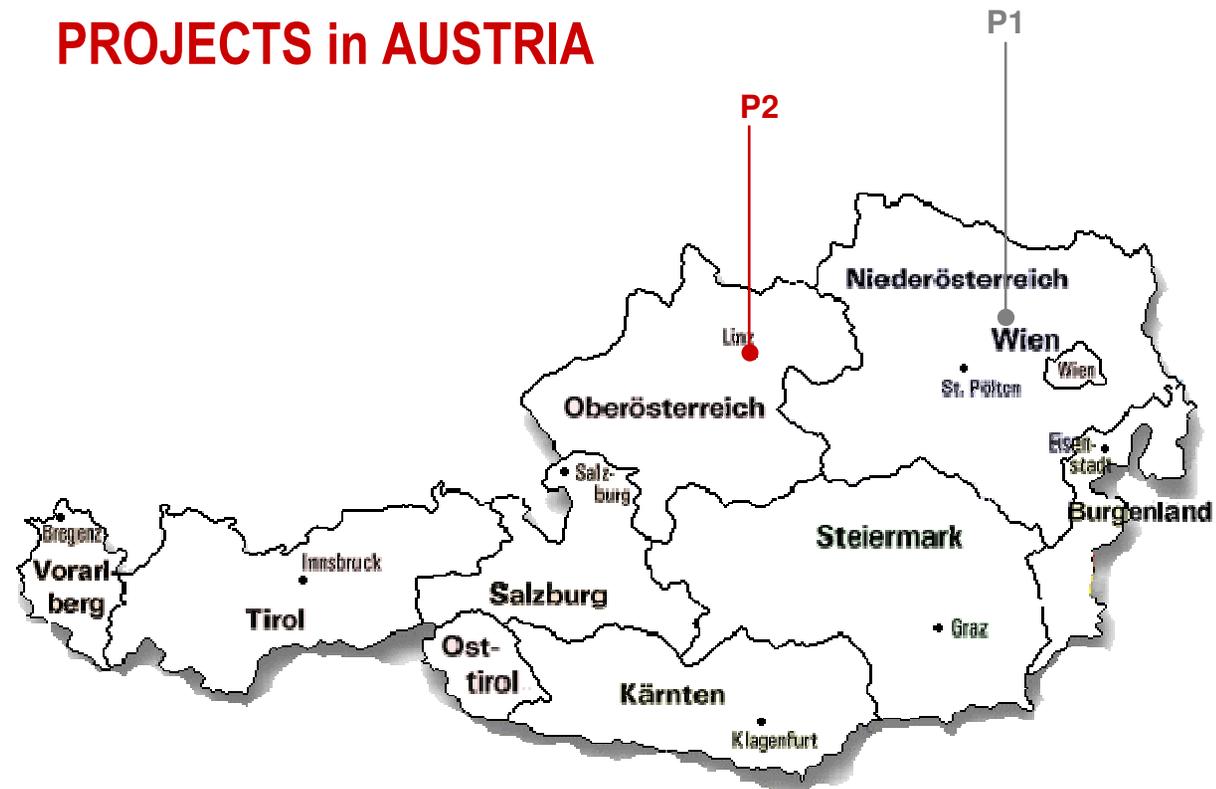
TEAM AUSTRIA



PROJECTS in AUSTRIA

PROJECT SUMMARY

- P1 Apartment building in Kierling
- P2 5 story apartment house in Linz**
- P3 Enhancement house Wimmer in St. Valentin
- P4 Single-family house in Pettenbach
- P5 Old people's home in Landeck
- P6 Housing in Purkersdorf
- P7 Historic building in Irnding
- P8 Enhancement in Mautern
- P9 Attic conversion in Innsbruck
- P10 House Schilchegger in St. Martin
- P11 Single-family house Kraiger in Kufstein
- P12 Apartmentbuildings in Dornbirn



IEA – SHC Task 37

Advanced Housing Renovation with Solar & Conservation