Apartment building Jean-Paul-Platz in Nürnberg DE

PROJECT SUMMARY
Renovation of an apartment building built in 1930. 87 % reduction of annual heat energy demand (according to PHPP).

SPECIAL FEATURES
Decentral ventilation units with heat recovery, solar collectors

ARCHITECT
Schulze Darup & Partner Architekten, Nürnberg, DE

OWNER
WBG Nürnberg GmbH

SHC
SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

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

Before

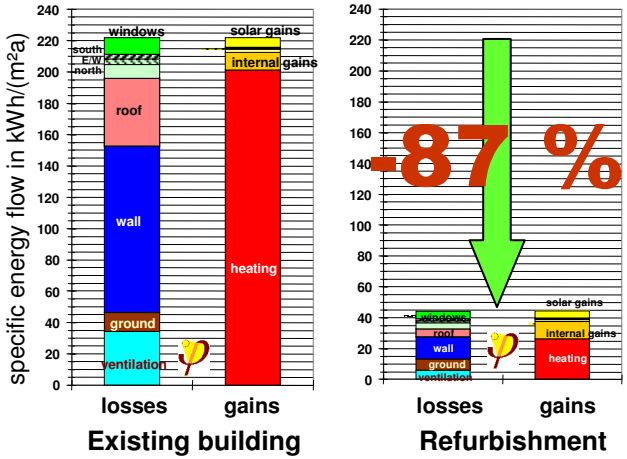
After

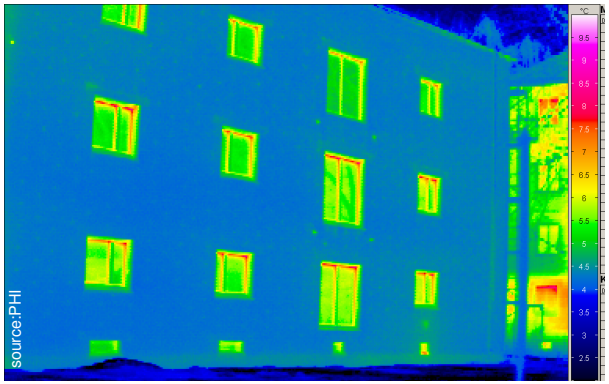
BACKGROUND

The apartment building Jean-Paul-Platz 4 was built in 1930 and renovated in 2002. The inhabitants were home during the renovation. The floor layout of the six 149 m² apartments was only slightly changed.
The refurbishment was funded by the Bavarian State Ministry for Economic Affairs with an accompanying quality assurance and scientific monitoring.

SUMMARY OF THE RENOVATION

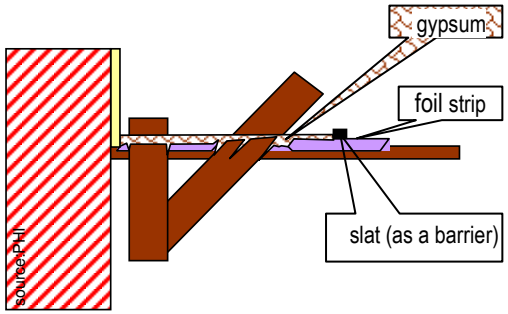
- exterior insulation and finish system
- insulation of basement and attic floor ceiling
- insulation: the basement staircase and roof
- Passive House suitable doors and windows (triple glazing)
- reduction of thermal bridges (eaves, windows, plinth)
- decentral ventilation units with heat recovery
- new electric installation outside the apartments
- new stand-alone balconies in front of the facade
- rebuilding the roofing
- installation of solar collectors

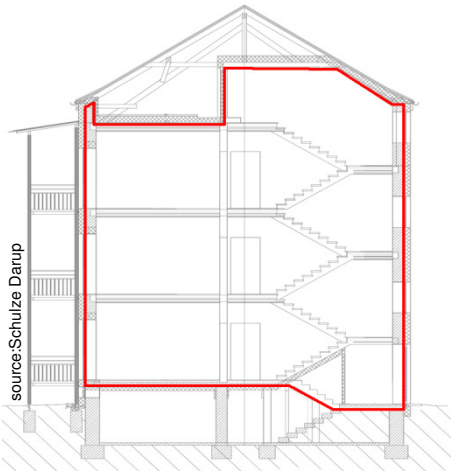




Thermography of the south facade shortly before erecting the balconies. For comparison at the right: An existing building constructed in the same way.[PHI 2003]

Penetration of wooden beams in the attic floor ceiling: caulking with gypsum.





Air-tight layer at the outside of the thermal building envelope.

AIR – TIGHTNESS

In cooperation with the Passive House Institute (PHI) a concept for the airtight layer was developed.
The air tight layer could not be positioned on the inner surface of the exterior wall because no renovations were planned inside the building. Therefore the air tightness was achieved outside of the thermal building envelope.
The numerous penetrations of the attic ceiling were a significant challenge. The airtight foil was laid over the existing timber floor boards and carefully connected to walls and chimneys. Unevenness and gaps of the penetrating wooden beams were caulked with gypsum and then connected to the airtight foil.
The pressure test of the building averaged an air change rate of 4.9 1/h before the renovation, 0.35 1/h afterwards.

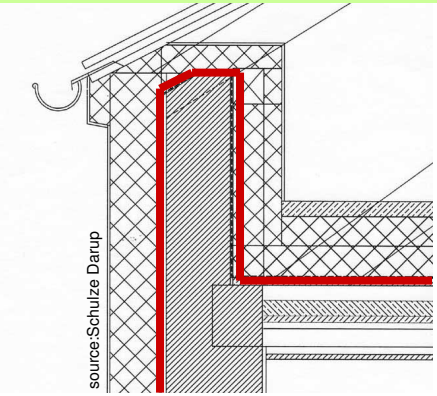
THERMAL BRIDGES

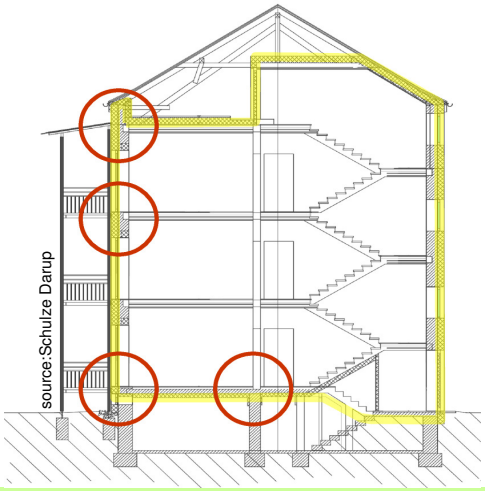
(Figures on the next page)
The reduction of thermal bridges is an important means to decrease the heat load and avoiding structural damage. Therefore, essential details were checked and optimized by the PHI with regard to thermal bridges and the characteristics of the structural components with regard to humidity.
Besides the installation of the windows and insulation of the knee wall, minimizing thermal bridge connections at the basement ceiling were important.

Caulking of wooden beams with gypsum

Caulked beam connected with the air-tiht foil

The knee wall is completely insulated. The side with 20 cm and above with 10 cm. Ψ_a = 0.056 W/(mK)





Section with the thermal building envelope and essential details concerning thermal bridges.

CONSTRUCTION

Attic floor construction *U-value: 0.12 W/(m²·K)*

(top down)	
anhydrite floor	60 mm
expanded polystyrene	250 mm
air tight foil	
existing timber floor board	24 mm
cavity	240 mm
interior plaster (existing)	15 mm
total	584 mm

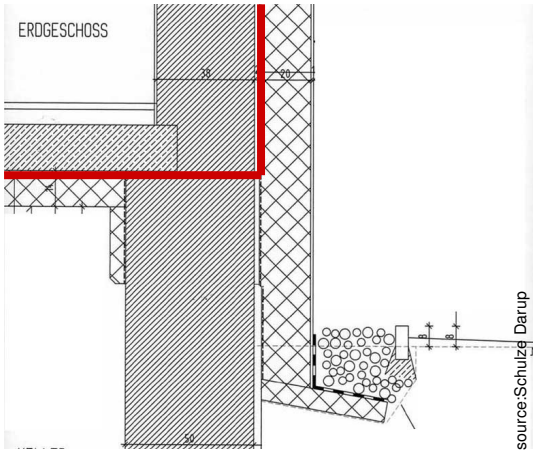
Wall construction *U-value: 0.15 W/(m²·K)*

(interior to exterior)	
interior plaster	15 mm
solid brick (existing)	380 mm
exterior plaster (existing)	20 mm
expanded polystyrene	200 mm
exterior plaster (new)	8 mm
total	623 mm

Basement ceiling *U-value: 0.19W/(m²·K)*

(top down)	
parquet	22 mm
substructure	30 mm
reinforced brick floor (existing)	180 mm
plaster (existing)	10 mm
expanded polystyrene	140 mm
stopping	5 mm
total	387 mm

Exterior wall (basement): The insulation is integrated in the ground only 25 cm but extended by an insulation skirt running outwards. Ψ_a = 0.134 W/(mK)



Basement ceiling: The insulation is continued vertically for 30 cm at the interior and exterior walls.
Ψ_a = 0.30 - 0.46 W/(mK)

ventilation ducts behind the suspended ceiling in the corridor

Fully insulated pipes in the utility room

Summary of U-values W/(m²·K)

	Before	After
Attic floor	0.87	0.12
Walls	1.40	0.15
Basement ceiling	0.88	0.19
Windows	2.80	0.85

BUILDING SERVICES

The existing decentral gas heating system supplying one storey was replaced by a decentral ventilation unit with heat recovery (efficiency >80%). Domestic water is partially heated by solar collectors. The remaining energy demand for heating and domestic hot water is covered by a central gas-fired condensing boiler, located in a new utility room in the attic.

RENEWABLE ENERGY USE

The roof area is used for solar collectors (17 m² flat-plate collectors)

ENERGY PERFORMANCE

Heat energy demand (according to PHPP)

Before:	204 kWh/m²a
Afterwards (PHPP):	27 kWh/m²a
Reduction:	87 %

Primary energy demand for heating, hot water and technical system electricity (according to PHPP)

Before:	362 kWh/m²a
Afterwards (PHPP):	47 kWh/m²a
Reduction:	87 %

INFORMATION SOURCES

Passive House Institute, Darmstadt, DE
www.passiv.de
Schulze Darup & Partner Architekten, Nürnberg, DE
www.schulze-darup.de
WBG Nürnberg GmbH
www.wbg.nuernberg.de

Brochure authors

Dipl.Ing. Susanne Winkel, Dr. Berthold Kaufmann,
Passive House Institute