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
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OWNER
WBG Nürnberg GmbH

Apartment building Jean-Paul-Platz in Nürnberg DE

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

Attic floor construction  \( U\)-value: 0.12 \( W/(m^2\cdot K) \)
(top down)
- anhydrite floor: 60 mm
- expanded polystyrene: 250 mm
- air tight foil: 24 mm
- existing timber floor board: 24 mm
- cavity: 240 mm
- interior plaster (existing): 15 mm
- total: 584 mm

Wall construction  \( U\)-value: 0.15 \( W/(m^2\cdot K) \)
(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: 0.19 \( W/(m^2\cdot K) \)
(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. \( \Psi_a = 0.134 \) \( W/(mK) \)

Basement ceiling: The insulation is continued vertically for 30 cm at the interior and exterior walls. \( \Psi_a = 0.30 - 0.46 \) \( W/(mK) \)
**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](http://www.passiv.de)
Schulze Darup & Partner Architekten, Nürnberg, DE
[www.schulze-darup.de](http://www.schulze-darup.de)
WBG Nürnberg GmbH
[www.wbg.nuernberg.de](http://www.wbg.nuernberg.de)

**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)

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attic floor</td>
<td>0.87</td>
<td>0.12</td>
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<tr>
<td>Walls</td>
<td>1.40</td>
<td>0.15</td>
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<tr>
<td>Basement ceiling</td>
<td>0.88</td>
<td>0.19</td>
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<tr>
<td>Windows</td>
<td>2.80</td>
<td>0.85</td>
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