Apartment building “Schlesierstraße” in Ludwigshafen, DE

PROJECT SUMMARY
Renovation of an apartment building, built in the 1960s. 94 % reduction of annual heat energy demand: (according to PHPP). Complies with Passive House Standard

SPECIAL FEATURES
Decentral mechanical ventilation with heat recovery, PV

ARCHITECT
GAG Ludwigshafen am Rhein

OWNER
GAG Ludwigshafen am Rhein

SHC
SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

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

Before

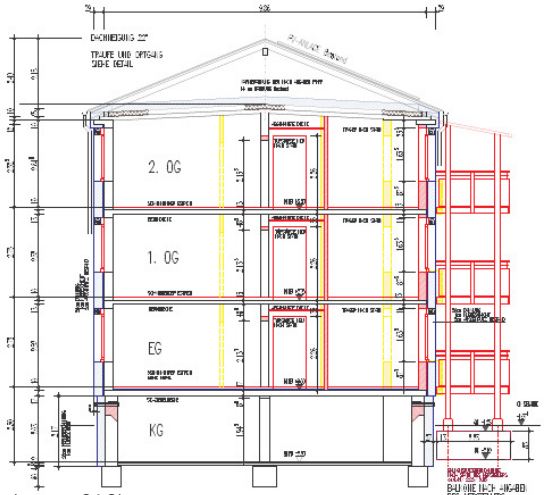
After

BACKGROUND

The apartment building Schlesierstraße 25 - 29 in Ludwigshafen, DE was built in the 1960s. 18 apartments, each 53 m², had to be renovated. The building envelope was typical for the time when built, with a heating energy demand of 322 kWh/m²a. After refurbishment in 2008 the building complied with Passive House Standard and achieved an annual heat energy demand of 14 kWh/(m²a) as calculated by the Passive House Planning Package (PHPP).

SUMMARY OF THE RENOVATION

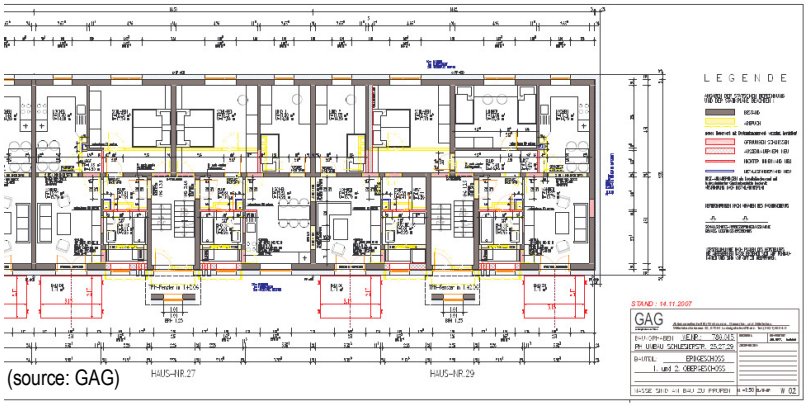
- exterior insulation and finish system
- insulation of basement and attic ceiling
- passive house suitable windows (triple glazing)
- reduction of thermal bridges (eaves, verge, plinth)
- decentral mechanical ventilation with heat recovery
- new electric and sanitary installation
- improvement of the floor plan creating 15 apartments of different sizes (56 m² - 93 m²), making use of parts of the former balconies
- demolition of the existing balconies and construction of new stand-alone balconies.



(source: GAG)

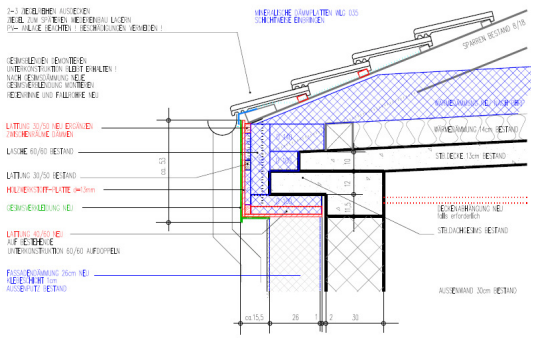
Section

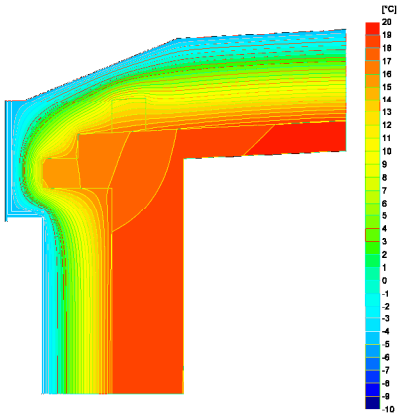
Ground floor



(source: GAG)

cladding and insulation of the existing principal moulding (source: GAG)





Reduction of thermal bridge at the eaves(ψ = 0.04 W/mK).
(source:PHI)

CONSTRUCTION

Roof construction *U-value: 0.09 W/(m²·K)*

(top down)	
chipboard	20 mm
expanded polystyrene	240 mm
expanded polystyrene (existing)	140 mm
standard concrete (existing)	130 mm
plaster (existing)	20 mm
total	550 mm

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

(interior to exterior)	
interior plaster	20 mm
vertically perforated brick (existing)	300 mm
exterior plaster (existing)	20 mm
adhesive layer	10 mm
extruded polystyrene	260 mm
exterior plaster (new)	20 mm
total	630 mm

Basement ceiling *U-value: 0.29 W/(m²·K)*

(top down)	
anhydrite floor	25 mm
footstep sound insulation	15 mm
polyurethane	60 mm
brick floor (existing)	175 mm
total	275 mm

Before

After

Reduction of thermal bridges by removing existing balconies. And construction new stand-alone balconies.

Supply and extract air grills

Fire safety: mineral wool at the windows

Covering of the insulation anchor

Summary of U-values W/(m²·K)

	Before	After
Attic floor	0.26	0.09
Walls	1.35	0.11
Basement ceiling	0.91	0.29
Windows		0.84*

* incl. installation thermal bridges

BUILDING SERVICES

Each apartment has mechanical ventilation with heat recovery (efficiency >85%) and a towel radiator. The remaining heat energy demand is supplied by a gas-fired combined heat and power unit.

RENEWABLE ENERGY USE

The south oriented roof areas are used for PV in place since 2005 (141 solar modules with an annual output of approx. 19 000 kWh).

ENERGY PERFORMANCE

Heat energy demand (according to PHPP)

Before:	233 kWh/m²a
Afterwards (PHPP):	15 kWh/m²a
Reduction:	94 %

Primary energy demand (heating, hot water, auxiliary and household electricity according to PHPP)

Before:	327 kWh/m²a
After (PHPP:	29 kWh/m²a
Reduction:	88 %

INFORMATION SOURCES

Passive House Institute, Darmstadt, DE
www.passiv.de
GAG Ludwigshafen am Rhein
www.gag-ludwigshafen.de

Brochure authors

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