Row Houses in Mannheim DE

PROJECT SUMMARY
Overall renovation of building envelope and technical equiment.
Reduction of primary energy: >80%

SPECIAL FEATURES
5 different ventilation systems with heat recovery,
gas condensing boiler and block power station (Stirling engine)

ARCHITECT
GBG – Mannheimer Wohnungsbaugesellschaft mbH

OWNER
GBG – Mannheimer Wohnungsbaugesellschaft mbH

SHC
SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

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

Before

After

BACKGROUND

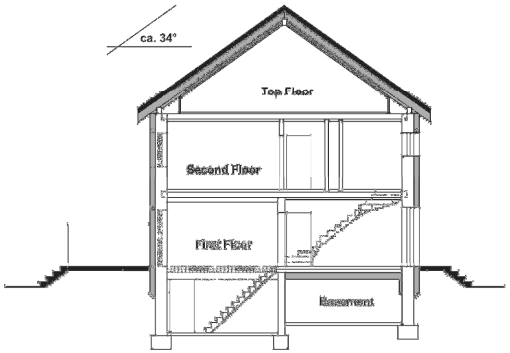
The GBG-owned apartments were built in the 1930's and the 1950's. Their construction and building systems do not meet today's standards. In renovating the houses GBG Mannheimer Wohungsbaugesellschaft also wished to improve the attractiveness of the neighborhood. For one building, GBG set the 3-litre building as a target.

SUMMARY OF THE RENOVATION

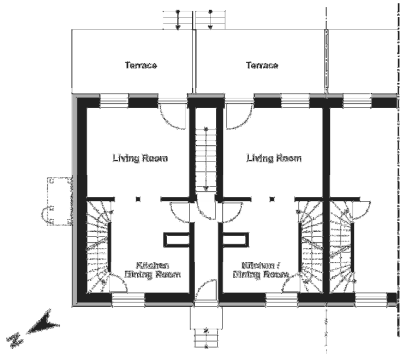
• Floor plan change: 24 small, single-storey apartments converted to 12 two-storey apartments with modern floor plans.

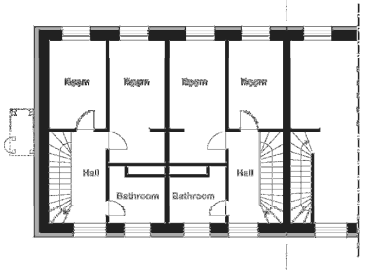
• Insulation: attic floor (360 mm), longitudinal wall (200 mm), end wall (250 mm), basement ceiling (300 mm), windows with triple low-e glazing.

• local heat supply system with central, gas-fired condensing boiler and a CHP (Stirling engine), 5 different heating and ventilation systems.

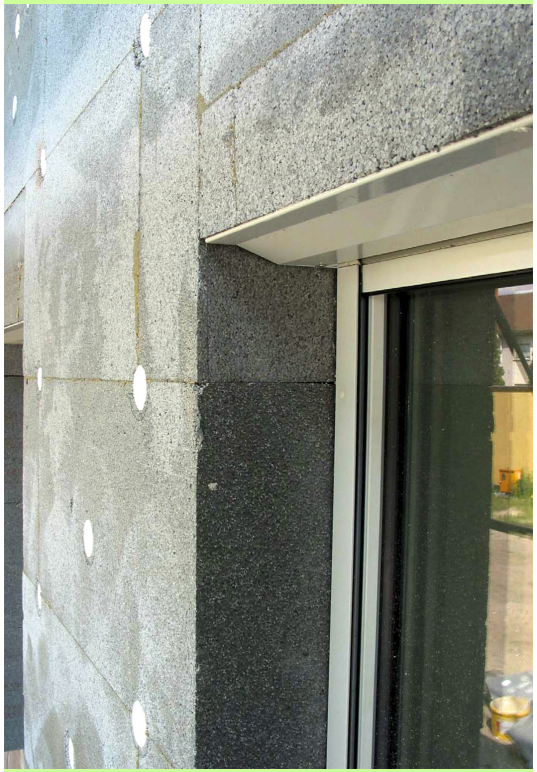


Section





First and second floor



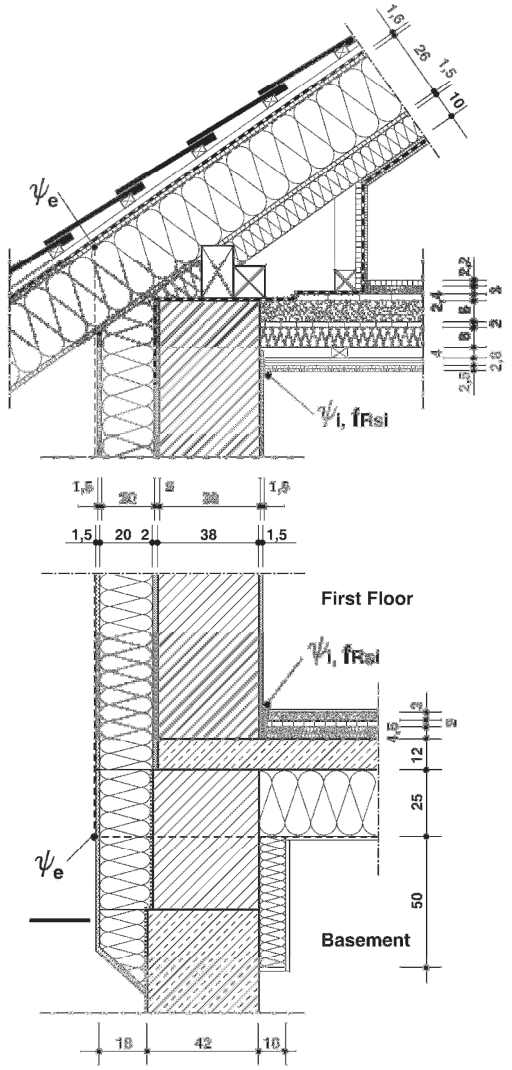
Connection details: Windows and blinds

CONSTRUCTION

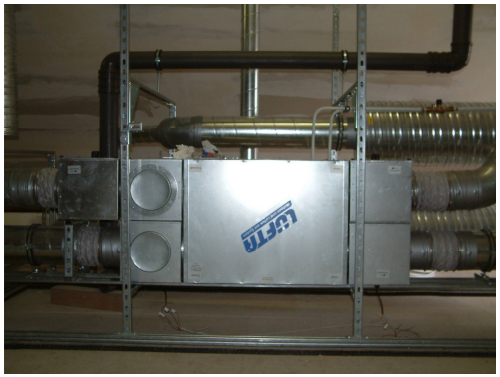
Roof construction	*U-value: 0.11 W/(m²·K)*
Plasterboard (double)	25 mm
Insulation	100 mm
Particle board	15 mm
Insulation	260 mm
Particle board	15 mm
Lathing /Roof covering	
Total	415 mm

Wall construction	*U-value: 0.12 W/(m²·K)*
(interior to exterior)	
Interior plaster	15 mm
Brickwork	380 mm
Exterior plaster	20 mm
Polystyrene ext. insulation	250 mm
Exterior plaster	15 mm
Total	680 mm

Basement ceiling	*U-value: 0.11 W/(m²·K)*
(top down)	
Poured asphalt	30 mm
Cover plate	20 mm
Insulation	45 mm
Concrete	120 mm
Insulation	250 mm
Total	465 mm



Connection details: Attic and basement ceiling



Summary of U-values W/(m²·K)

	Before	After
Attic floor	0.94	0.11
Walls	1.28	0.12
Basement ceiling	1.37	0.11
Windows*	2.60	0.80

BUILDING SERVICES

A local heat supply system replaced the individual stoves. Heat for the 12 flats is generated by a gas-fired condensing boiler and a combined heat + power Stirling engine, which are located in a nearby heating station. Each flat was provided with a separate high-efficiency ventilation unit placed on the attic floor. Implemented concepts includes warm-air heating featuring various control concepts, variations using separate systems for heating and ventilation, and even one variation with summertime cooling.

RENEWABLE ENERGY USE

A ground heat exchanger (90m x 5m, depth: 1.2 m) was buried beside the building to cool two apartments in summer.

ENERGY PERFORMANCE

Space + water heating (primary energy)*
Before: 398 kWh/m²a
After: 52 kWh/m²a
Reduction: 87 %
*German Standard: Energy saving ordinance (EnEV)

INFORMATION SOURCES

Schmidt, M.; Schmidt, S.; Treiber, M.; Arold, J.: Konzept fuer 3-Liter-Haus-Niveau in Mannheim-Gartenstadt. Final report Stuttgart University, http://archiv.ensan.de/

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