

Apartments and nursery in Ulm-Böfingen DE

PROJECT SUMMARY

Overall retrofitting of building envelope and the building technical equipment.
48% reduction of net heating demand.

SPECIAL FEATURES

Solar collectors + HVAC
Vacuum insulation panels
Terrace incorporated in living space
Single room heating control

ARCHITECT

Günther Hermann Architects

OWNER

Diocese Rottenburg-Stuttgart



IEA – SHC Task 37

Advanced Housing Renovation with Solar & Conservation



Before



After

BACKGROUND

Over 90% of all building projects for the diocese Rottenburg-Stuttgart are renovating existing buildings. This represents an annual investment of about 40 million Euros. The retrofitting of the community centre “Zum Guten Hirten” is intended to demonstrate what the church can do to help protect the environment. One of the targets was to at least halve the energy consumption while keeping within financial means.

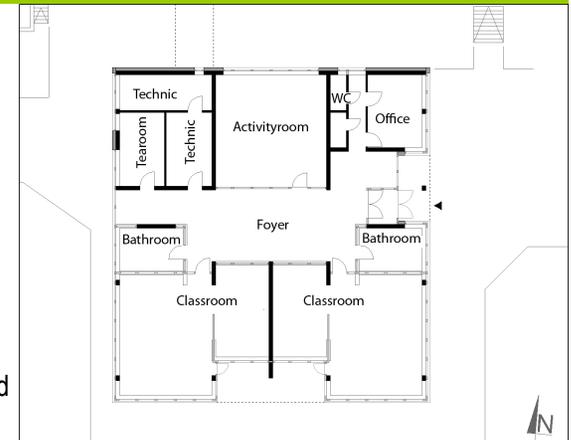
For the project three buildings on the site were renovated: the community hall, apartments with a kindergarten and the rectory with offices. The apartment with kindergarten renovation is presented here.

The project was sponsored by the German Federal Ministry of Economy and Technology.

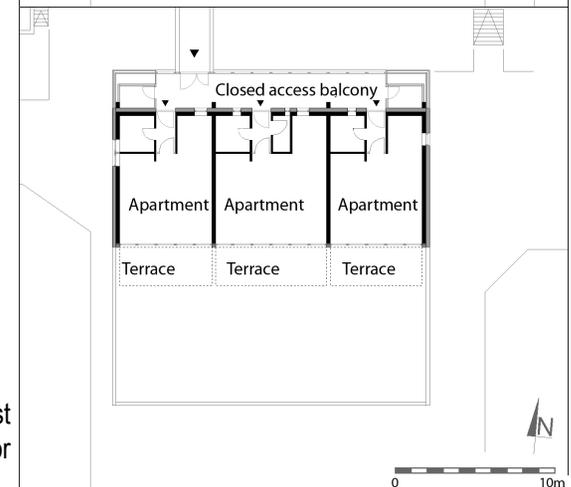
SUMMARY OF THE RENOVATION

- 6.6 m² solar collectors for preparing DHW.
- Windows were replaced (U_w -value 1.07 W/m²K)
- Classroom and activity room floors insulated with 2 cm vacuum insulation panels
- Single room heating control.
- Exhaust and supply HVAC with heat recovery.

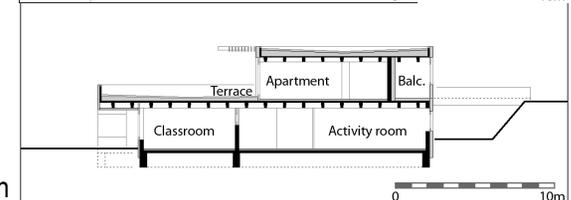
Ground floor



First floor



Section



CONSTRUCTION

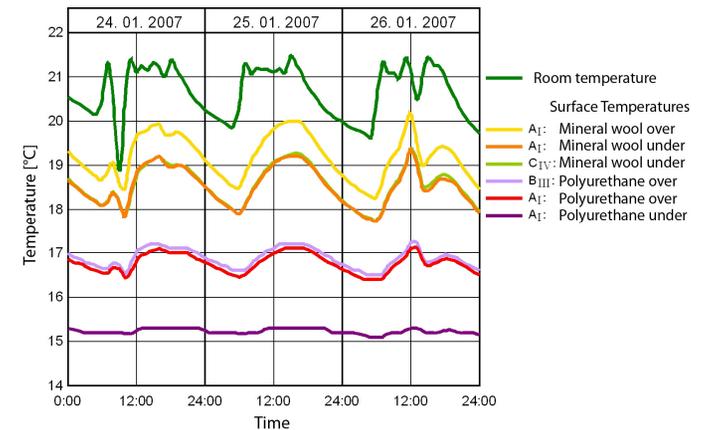
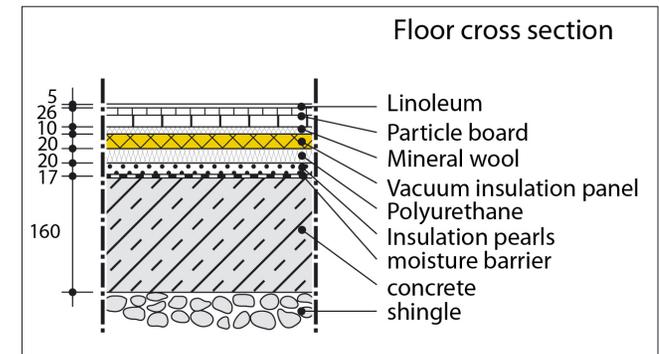
Floor construction (U -value: $0.21 \text{ W}/(\text{m}^2\text{K})$)

(interior to exterior)

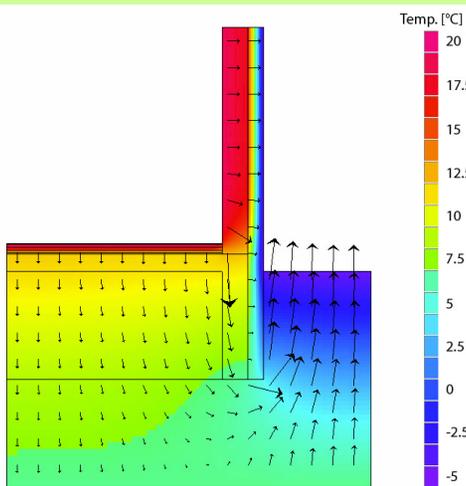
Linoleum	5 mm
Particle board	26 mm
Mineral wool	10 mm
Vacuum insulation panel	20 mm
Polyurethane	20 mm
Insulation pearls	17 mm
Concrete	160 mm

Total 258 mm

Building element	U-Value [$\text{W}/\text{m}^2\text{K}$]		Measure taken
	Before retrofit	After retrofit	
Exterior wall 1 Ground floor	0.65	0.26	14 cm from 5 cm Insulation
Exterior wall 2 Ground floor (balustrade)	1.85	0.25	14 cm insulation
Exterior wall 3 Ground floor	0.84	0.21	14 cm from 3,5 cm Insulation
Flat roof	0.58	0.17	22 cm from 6 cm Insulation
Floor 1a Lower level to earth	0.96	0.21	2 cm Vacuum insulation panel
Windows	2.50	1.07	Triple thermal glazing

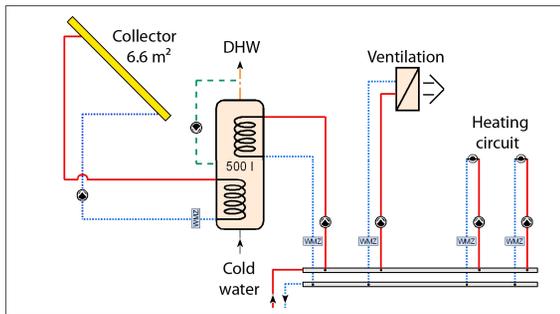


Temperature over the floor in the classroom on the east side of the building in the period from Jan 24, 2007 – Jan 27, 2007



Calculated temperature and flow up to 30cm into the earth

HEATING SCHEME



ENERGY PERFORMANCE (CONSUMPTION)

Period	Description	Primary energy factor	End Energy [kWh/m²a]	Primary Energy [kWh/m²a]
Before retrofit	Heating demand	0.78	194.9	151.8
	DHW		5.5	4.3
	Electric power	Pumps	4.3	11.7
		Ventilation	0	0
Light etc.		12.4	33.6	
2006	Heating demand	0.31	96.6	30.0
	DHW		8.4	2.6
	Electric power	Pumps	4.4	11.9
		Ventilation	5.5	14.8
Light etc.		12.6	34.1	
2007	Heating demand	0.31	91.1	28.2
	DHW		10.4	3.2
	Electric power	Pumps	4.5	12.2
		Ventilation	5.3	14.4
Light etc.		12.2	33.0	

ENERGY PERFORMANCE TOTALS*

Period	End Energy	Primary Energy
	kWh/m²a	kWh/m²a
Before	216.6	201.4
2006	127.5	93.4
2007	123.5	91.0

* Gains from the photovoltaic system for the three buildings included in this project have not been taken into account.

- 2006: 58000kWh,
- 2007: 63400 kWh

BUILDING SERVICES

The building is still supplied with heat from a district heat. Pumps were replaced with differential pressure controlled pumps. The room temperatures are individually controlled and the radiator valves have been connected to window contacts so that when windows are opened the valve closes. Solar collectors were installed on the roof to assist with DHW heating. An exhaust and supply HVAC system has been installed with a coil hot water heat exchanger in the fresh air supply after the HVAC.

RENEWABLE ENERGY USE

Solar collectors (6.6 m²) mounted on the roof

INFORMATION SOURCES

Reiss, J.; Erhorn, H.: Energetische Verbesserung der Bausubstanz, Teilkonzept 3: Messtechnische Validierung der Sanierung eines Gemeindezentrums unter Einsatz von Vakuumdämmpaneelen. IBP report WB 140/2008

<http://archiv.ensan.de>

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Laying of vacuum pack panels in activity room