# Apartment buildings in Dornbirn AT

**PROJECT SUMMARY**

Renovation of five apartment buildings built in 1980. Primary energy demand reduced 59%. Complies with Passive House Standard.

**SPECIAL FEATURES**

- central ventilation system with heat recovery
- 5x30 m² solar collectors for DHW and space heating

**ARCHITECT**

Dipl. Ing. Helmut Kuess

**OWNER**

VOGEWOSI Siedlungsgesellschaft Co-operative


SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

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

Before



After

## BACKGROUND

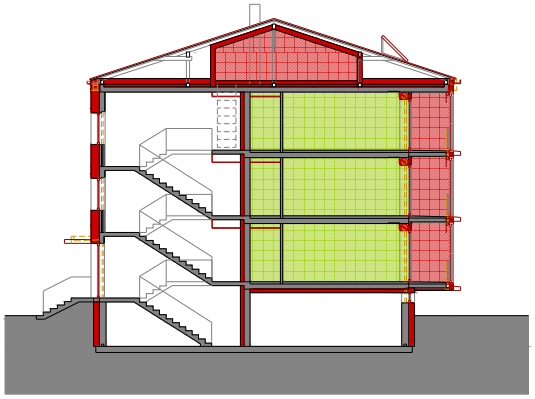
The five, three- and four- storey apartment buildings in Fussenau, Vorarlberg were constructed in 1980. The brick exterior walls were poorly insulated and the original windows still in place. The space heating was supplied by a gas heating.
During the renovation of the 54 apartments only components suitable for Passive House Standard were used. The reduction of the thermal bridges, high insulation and improvement of the technical systems efficiency resulted in a reduction of space heating demand from 80 kWh/(m²a) to 16 kWh/(m²a). The renovation, subsidized by the state of Vorarlberg, was finished in May 2008.

## OBJECTIVES OF THE RENOVATION

- minimizef heating costs
- optimize ventilation and building services
- renovation with least annoyance of residents
- ecological renovation with PH-appropriate building components
- meet Passive House standard

## SUMMARY OF THE RENOVATION

- insulation: roof (330 mm), facade (250 mm), basement ceiling (140mm)
- windows meeting PH standard (triple glazed windows; $U_w$ = 0.8 W/m²K)
- glazed balconies
- reduction of thermal bridges
- central ventilation system with heat recovery
- solar collectors for space and water heating
- modernization of the central gas heating



Section

*Renovation*
*Lasting quality*

Ground floor



## CONSTRUCTION

**Roof construction** *U-value: 0.111 W/(m²·K)*

(interior to exterior)

| | |
|---|---|
| dry screed | 20 mm |
| expanded polystyrene EPS | 250 mm |
| dry screed | 20 mm |
| rock wool | 80 mm |
| reinforced concrete | 200 mm |
| surfacer | 5 mm |
| Total | 575 mm |

**Wall construction** *U-value: 0.109 W/(m²·K)*

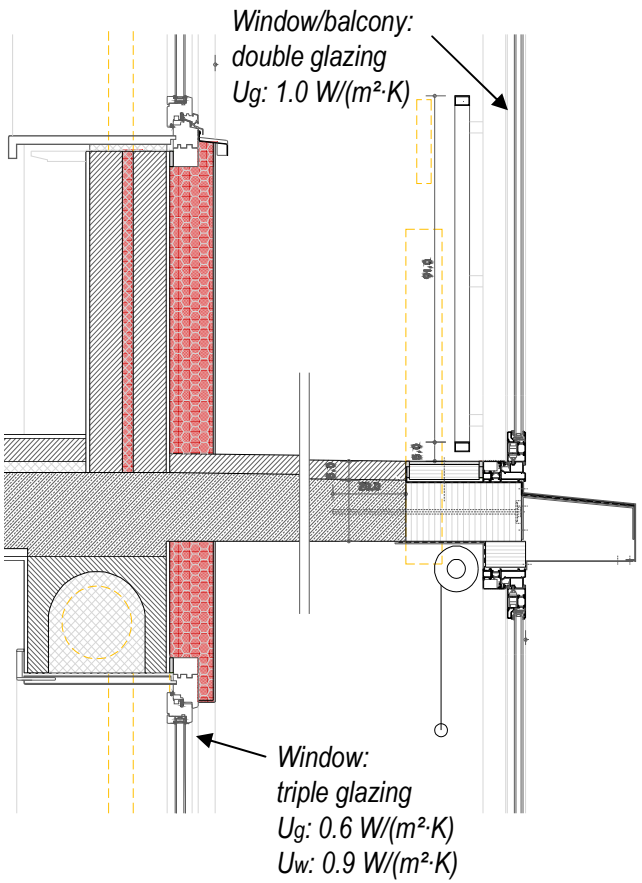
(interior to exterior)

| | |
|---|---|
| plaster | 10 mm |
| brick | 90 mm |
| polyurethane rigid foam sheet | 30 mm |
| high temperature insulating brick | 90 mm |
| plaster | 10 mm |
| expanded polystyrene EPS | 250 mm |
| plaster | 5 mm |
| Total | 485 mm |

**Ceiling** *U-value: 0.190 W/(m²·K)*

(top down)

| | |
|---|---|
| floor construction (existing) | 100 mm |
| reinforced concrete (existing) | 200 mm |
| expanded polystyrene EPS | 140 mm |
| plaster | 5 mm |
| Total | 445 mm |




Window and terrace section

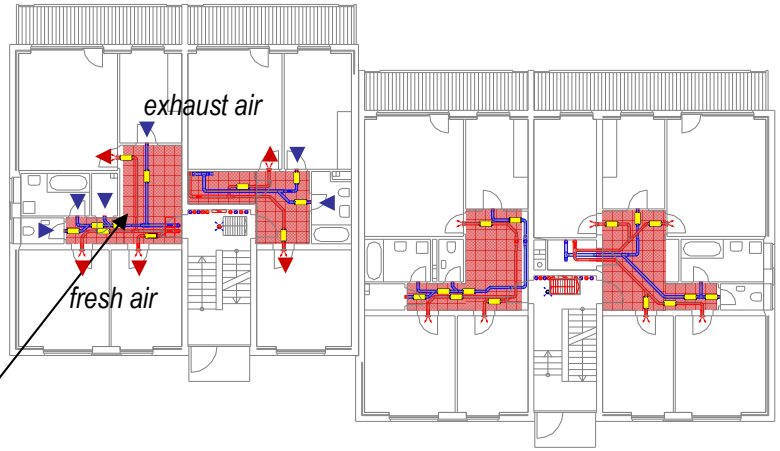
Coring for the ventilation in the stair case

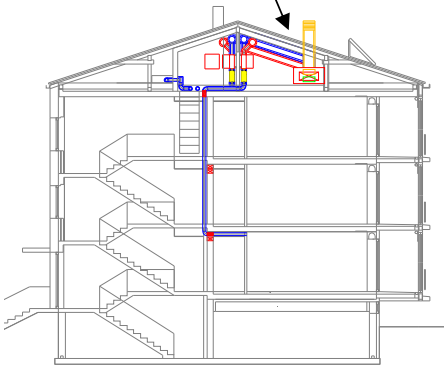
Ventilation line in the entry

## BUILDING SERVICES

Space and domestic water heating is supplied by a central gas heating and solar collectors. Solar heating covers about 60% of domestic hot water and 17% of space heating demand. The heat distribution uses existing piping.
A new central ventilation system with heat recovery (efficiency > 85 %) was installed in the attic floor of each building.

Ventilation system



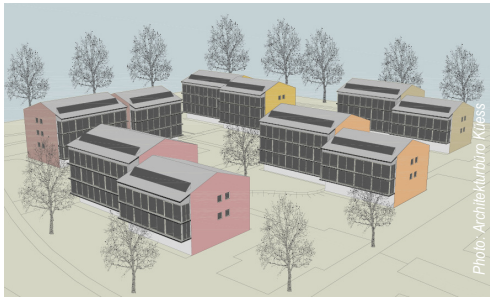



## Summary of U-values W/(m²·K)

| | Before | After |
|---|---|---|
| Attic floor | 0.4 | 0.11 |
| Walls | 0.3 | 0.11 |
| Basement ceiling | 0.8 | 0.19 |
| Windows | ca. 2.8 | 0.90 |

## RENEWABLE ENERGY USE

The 150 m² solar collectors on the south-facing roof achieve an annual solar fraction of 60% for domestic hot water preparation and 17% for space heating.




## ENERGY PERFORMANCE

Space + water heating (primary energy)*
Before: 146 kWh/(m²a)
After: 59.1 kWh/(m²a)
Reduction: 59 %

* according to OIB Richtlinie 6

## INFORMATION SOURCES

Architekt DI Helmut Kuëss
Ehregutaplatz 8
A 6900 Bregenz
T +43 5574 42 8 45
www.architektur-kuess.at

## Brochure authors

S. Grünewald, S. Rottensteiner

## Contact

Thomas Mach
thomas.mach@tugraz.at