PROJECT SUMMARY
Renovation of a single-family house built in 1973 with an added storey for a second housing unit, a staircase and living room addition. Complies with Austrian low energy requirements.

SPECIAL FEATURES
- central mech. ventilation system with heat recovery
- geothermal heat pump

ARCHITECT
Grundstein Architektur
Architektin Dipl. Ing. Irene Prieler

OWNER
Mag. Margit und Maria Schilchegger,
Ing. Thomas Hartl
Private

SFH in St. Martin AT

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

The single family house in St. Martin am Tennengebirge was built in 1973 with a central oil heating system, central electric domestic hot water heating and a building envelope typical for the time. The space heating demand was 230 kWh/(m²a). After the renovation 2007 with an added, wooden frame storey and the renovated of the two existing storeys, the house complies with Austrian low energy requirements and needs only 17 kWh/(m²a) for space heating.

OBJECTIVES OF THE RENOVATION

• enlarge the living space economically
• minimize heating costs
• meet Austrian low energy requirements
• renovate with least annoyance of residents

SUMMARY OF THE RENOVATION

• insulation: roof (280 mm), facade (240 mm), basement ceiling (160 mm)
• Triple glazed windows in the new storey
• enhanced first floor layout
• use of prefabricated wall units (second floor)
• new staircase
• enlarged kitchen and new sanitary installations
• mechanical ventilation with heat recovery and air heating
• geothermal heat pump
CONSTRUCTION

Roof construction  U-value: 0.088 W/(m²·K)
(interior to exterior)
softboard  40 mm
OSB airtight  15 mm
mineral wool insulation  280 mm
roof battening  23 mm
mineral wool insulation  160 mm
roof battening  23 mm
roof foil  1 mm
Total  542 mm

Wall construction  U-value: 0.127 W/(m²·K)
(interior to exterior)
boarding  20 mm
air space  25 mm
softboard  40 mm
OSB airtight  15 mm
mineral wool insulation  240 mm
softboard  40 mm
air space  25 mm
boarding  20 mm
Total  425 mm

Basement Ceiling  U-value: 0.197 W/(m²·K)
(top down)
floor construction (existing)  121 mm
concrete floor (existing)  160 mm
expanded polystyrene EPS  160 mm
plaster  15 mm
Total  456 mm

Window:
triple thermopane glazing
Uₚ: 0.70 W/(m²·K)
Uₑ: 0.90 W/(m²·K)
Summary of U-values W/(m²·K)

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attic floor</td>
<td>1.2</td>
<td>0.09</td>
</tr>
<tr>
<td>Walls</td>
<td>1.3</td>
<td>0.13</td>
</tr>
<tr>
<td>Basement ceiling</td>
<td>0.9</td>
<td>0.20</td>
</tr>
<tr>
<td>Windows</td>
<td>ca. 2.5</td>
<td>0.90</td>
</tr>
</tbody>
</table>

RENEWABLE ENERGY USE
Opportunity for a future use of Photovoltaics.

ENERGY PERFORMANCE
Space + water heating (primary energy)*
Before: 459 kWh/(m²a)
After: 11.7 kWh/(m²a)
Reduction: 97 %

* according to OIB Richtlinie 6

BUILDING SERVICES
A geothermal heat pump provides space heating. Heat distribution is by floor heating in the new storey, the other storeys use the existing radiators. The whole building is ventilated by a new, central, mechanical system with 90% heat recovery and air heating is installed in the whole building. An earth to air heat exchanger preheats intake fresh air. Domestic water is heated by the geothermal heat pump with an antibacterial preparation.

INFORMATION SOURCES
Grundstein Architektur
Grundsteingasse 14/19 A-1160 Wien
www.grundstein.cc

Brochure authors
S. Grünewald, S. Rottensteiner

Contact
Thomas Mach
thomas.mach@tugraz.at