PROJECT SUMMARY
After renovating this home for the elderly, built in 1976, comfort was greatly improved. Balconies were closed in to increase the bedrooms. Handicapped accessibility was improved. The building complies with Austrian low energy requirements.

SPECIAL FEATURES
- prefabricated modules
- accessible for handicapped people

ARCHITECT
Gharakhanzadeh & Sandbichler architekten zt gmbh

OWNER
Township Landeck Public

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

The terrace structure, built in 1976, had become uneconomical due to sub-standard design. A three-stage renovation was planned and is in progress:
- 1999: the east front was renovated and existing heating system replaced by a modern central oil heating unit. Windows were replaced. Space heating demand was reduced to 59 kWh/(m²a).
- 2004: remodelling the building with 89 rooms instead of 109 (79 rooms for residents, 10 for employees). The building then complied with low Austrian low energy requirements. Space heating demand is now 38 kWh/(m²a).
- future: use of renewable energy

The renovation was subsidized by the state of Tyrol.

OBJECTIVES OF THE RENOVATION

• reduce operating and maintenance costs
• ecological renovation with renewable resources
• comply with Austrian low energy requirements
• renovation with least annoyance of residents
• high use of pre-fabrication modules

SUMMARY OF THE RENOVATION

• west, north and south facade, floors, roofs insulated
• new windows on the west façade
• enlargement of floor space by closing in balconies
• reduction of thermal bridges
• prefabricated room width and height modules
• addition of a conservatory
CONSTRUCTION

Roof construction  
U-value: 0.124 W/(m²·K)  
(interior to exterior)  
- plaster (existing): 15 mm  
- reinforced concrete (existing): 230 mm  
- cellulose insulation: 300 mm  
- wood boarding: 24 mm  
- air space: 20 mm  
- gravel, sealing layer: 80 mm  
Total: 669 mm

Wall construction  
U-value: 0.193 W/(m²·K)  
(interior to exterior)  
- wood board: 18 mm  
- lathing: 70 mm  
- OSB airtight: 25 mm  
- wood-fibre insulation: 230 mm  
- hard board: 15 mm  
- pre-oxidised copper sheet on corrugated aluminium and air space: 56 mm  
Total: 414 mm

Basement ceiling  
U-value: 0.146 W/(m²·K)  
(top down)  
- floor construction (existing): 120 mm  
- reinforced concrete ceiling (existing): 180 mm  
- mineral wool insulation: 180 mm  
Total: 480 mm
**Summary of U-values W/(m²·K)**

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
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</thead>
<tbody>
<tr>
<td>Attic floor</td>
<td>0.1</td>
<td>0.12</td>
</tr>
<tr>
<td>Walls</td>
<td>1.3</td>
<td>0.19</td>
</tr>
<tr>
<td>Basement ceiling</td>
<td>0.5</td>
<td>0.15</td>
</tr>
<tr>
<td>Windows</td>
<td>ca. 2.6</td>
<td>1.20</td>
</tr>
</tbody>
</table>

**ENERGY PERFORMANCE**

Space + water heating (primary energy)*

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<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Before:</td>
<td>123 kWh/(m²·a)</td>
</tr>
<tr>
<td>After:</td>
<td>93 kWh/(m²·a)</td>
</tr>
<tr>
<td>Reduction:</td>
<td>25% (with existing oil heating)</td>
</tr>
</tbody>
</table>

Future reduction: 89% (new wood pellet heating)

*according to OIB Richtlinie 6

**BUILDING SERVICES**

Space and domestic hot water heating are provided by the central oil heating installed in 1999. New heaters were installed. The wooden construction’s high insulation value and frameless glazing of the west façade minimize losses. Passive solar use is possible thanks to the thermal mass of the concrete structure. - Space heating demand was reduced by 65%.

**RENEWABLE ENERGY USE**

Solar collectors to heat domestic hot water and a heating system with renewable energy are planned for the third stage of renovation.

**INFORMATION SOURCES**

Revitalising with S.A.M. - Synergy Activation Modules, bmvit and House of the future

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*Photos: Rupert Steiner*