

Introduction



Ölz Bündt is a three-storey multiple dwelling building in Vorarlberg which is a prototype of a timber construction system for multi-storey residential buildings. The building is structural wood building with standardised and prefabricated wooden elements. Also wet cells were prefabricated and mounted to the deck elements.

The building is set up a passive house. In order so save energy, the building concept is based on a compact cube without setbacks or bulges. Energy for tapwater is for 2/3 supplied by a solar collector on the roof.

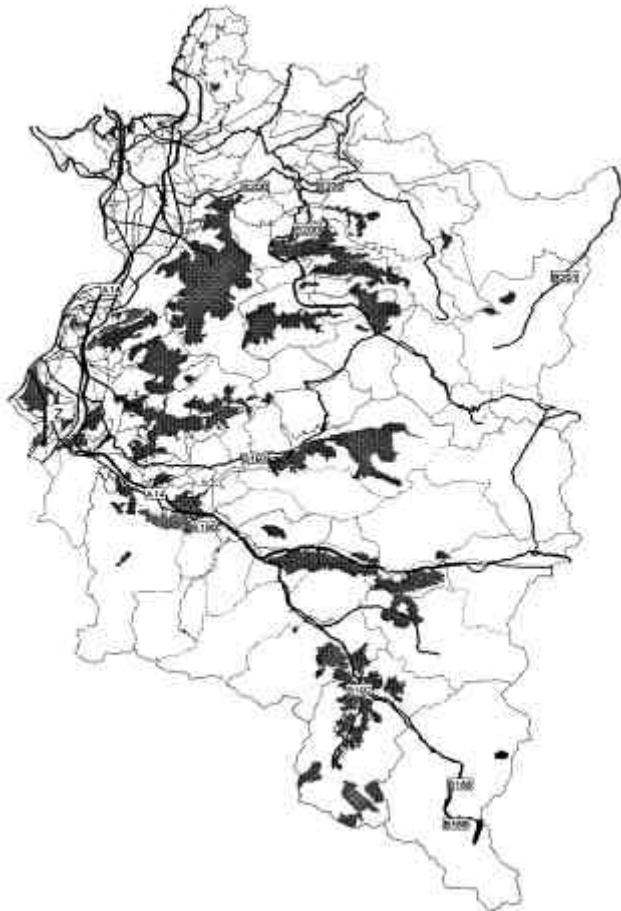
The single-depth compound is north-south oriented and is situated among 2- to 3-storey residential buildings. The multifamily house comprises 13 dwellings and a two-storey office.

The building is accessed from the north, the individual dwellings from the pergola on the east. Balconies on the west are unconnected bearing structures outside the main construction.

- Use of ecological and sustainable materials from Austria.
- Very simple and compact building shape, extremely reduced energy consumption.
- Reuse of non-preserved wood possible.
- Controlled ventilation systems with an air change rate of 0.5 - 0.7.

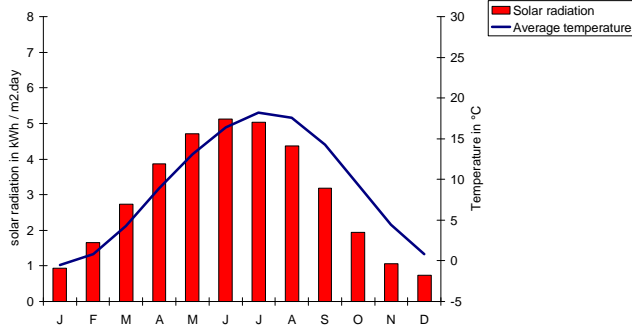
Architect / contact	<i>Architect Kaufmann Hermann www.kaufmann.archbuero.com</i>
Construction	<i>Merz + Kaufmann</i>
Engineering	<i>Hard Haustechnik,</i>
Simulation	<i>GMI, Gasser und Messner</i>
Building physics	<i>Dr. DI Künz</i>
Involved partner	<i>Österr. Holzleimbauverband</i>
Publications a.o.	<i>db.nextroom.at/bw/14477.html Baumeister 10/97 Architektur aktuell 11/97 Architektur & wirtschaft, 97. Hochparterre Nr. 3, 1998 Architektur, holzbau, 4/1998. Pro Holz Österreich, mehrgesch. Wohnbau in Holzbauweise. Holzbau für Architekten, Loseblattwerk (WEKA Verlag). Architektur + Wettbewerbe, 98 Das Haus, Energie Spezial, 3/98 Effizienz Energiesparförderung, DBZ deutsche Bauzeitschrift, 99 Architecture in Austria survey of the 20th century.</i>

Regional and Urban Context



Relative position of the project

Suburban	suburban, surrounded by detached 2-3-storey buildings
Energy infrastructure	electricity (not connected to natural gas supply)
Material resources availability	prefabricated wooden elements produced locally
Transportation systems	bus, railway, car
Water management	public water supply



Climate

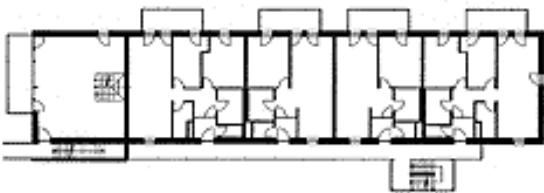
Type of climate	<i>Atlantic Mediterranean</i>
Altitude (m)	440
Latitude	48,12° N
Longitude	8,53° E
Average ambient temp (°C)	
January	-0.5
July	18.2
Degree days (base 18°C)	3654
Global irradiation (kWh/m²)	1077
Sunshine hours (h)	



Green building issues

- Very low energy consumption by highly insulated elements.
- Special timber bearing frame system with highly prefabricated wall-, and floor elements and sanitary units.
- An extraordinary level of prefabrication.
- Dwelling sizes of 55 and 75 m² meeting modern demands for small flats.
- Ventilation with heat recovery.

Block and Building



The prototype in Ölz/Bündt is based on a number of principles:

- **Variability:** Besides the single-depth terraced houses, which have actually been built, it is envisaged to build double-depth houses, and buildings grouped around an inner courtyard.
- **Standardisation:** The construction system, the facade, and the mechanical services are standardised units that can be used in the same way regardless of the site conditions.
- **Prefabrication:** The design allows assembly without scaffolding, independently of weather and within very short time.
- **Mechanical services and building physics:** Thermal insulation to the level of an 'low-energy-house' or the standard of a 'passive house'. Airtightness is sufficient to operate controlled ventilation with heat recovery and additional air heating.

Low energy consumption

The energy consumption of the building has been estimated using the dynamic thermal model TRNSYS.

The energy consumption was estimated is 17 kWh/m². Use of energy is reduced to a value as low as 7.3 kWh/m² by pre-heating of fresh air supply passing through earth channels, waste heat recovery from used air and small heat pumps.

Due to the low energy needs, the prototype house has no chimneys for heating systems. Electrical heating covers the remaining heat demand.

A 33 m² central solar heating facility on the roof produces 63% of the yearly demand for warm water.

Construction

The bearing construction is based on a grid of 2.4x4.8m. The bearing elements consist of wooden pillars and point born floor- and roof boards forming a 'table system'.

Facade and interior walls are non-load bearing. Balconies and stairs are detached bearing constructions of steel and wood. Elements, including sanitary units, are prefabricated and assembled on the construction site within very short time (total construction time 5.5 months).

Project Data	Project case		Reference case	
Design - building start - opening Construction costs (€)	November 1996 - January 1997 - May 1997 1400/m ²		comparable for this region	
Urban plan Area (ha) Floor Area (m ² gross floor area) Floor Area Ratio (m ² gross floor area)	0.2414 1,160 (nett 940) 0.39			
Transport Distance to car park Distance to public transport Frequency of public transport Bicycle storage Telecommunication	underground car park 17 spaces 250 m 15 min on site internet cable 1998			
Waste separation Construction and demolition waste Household waste Design for deconstruction	local wood paper, plastic, textile, bio waste screwed constructions		concrete, asphalt, wood, metal, plastic, mineral waste, build site materials paper, plastic, textile, bio waste demolition	
Building Materials Construction Facades Roof Window frames Internal walls Recycled materials	wooden 'table' elements (prefab) elements with 35 cm min. wool 40 cm mineral wool oregon pine 3 panes 0,7 W/m ² K gypsum wood construction		brick, wood, concrete polystyrol insulation 5 cm brick, metal plastic and wood brick, gypsum	
Insulation Ground floor area (m ² /bldg) Roof area (m ² /bldg) External wall area (m ² /bldg) Window area total (m ² /bldg) South (m ² /bldg)	area (m²) 433 433 894 181	U-value (W/m²K) 0.12 0.10 0.11 0.70	area (m²)	U-value (W/m²K) 0.40 0.25 0.35 1.40
Ventilation system Infiltration Exhaust Heat recovery Air exchange rate, heating season	mechanical, earth pipe mechanical yes 0,6			
Back-up systems Space heating Domestic hot water Cooling Electricity production Ventilation	system infiltration system collector 63%	energy source electricity	system central or flat	energy source gas, oil, electricity
Energy data Space heating Space cooling Domestic hot water Electricity (total) Lightning Fans + pumps Small power	(kWh/m²) 17		(kWh/m²) 55	
Solar systems Passive Active PV	yes 33 m ²			
Water Supply Toilet system (4, 6, 9 litres) Shower Bath Sewage Rainwater collection Grey water system	6 l toilets n.a. n.a.		6 l toilets n.a. n.a.	