

AT_Klaus_Hauptschule Klaus Weiler Fraxern

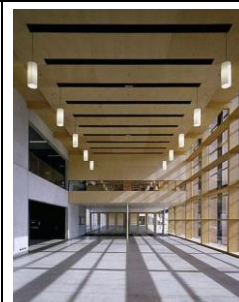
Image 01:
Exterior view_South
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Image 02:
Exterior view_Courtyard
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Image 03:
Interior view_Entrance hall
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Building Specifications

Address Treietstraße 17, 6833 Klaus, Austria

Building Category Educational

Year of Construction 2003

Special Qualities Passive House

Location 47° northern latitude, 9° eastern longitude
located on a widely open terrace towards the South in the bay of the Vorderland region of Vorarlberg, right side of the the Rhine Valley , adjoining land plots with single family houses

Climate Cfb (warm temperate, fully humid, warm summer) (monthly mean temperature below 19 °C, at least five months with a monthly mean temperature above 10 °C)

Vent. Cooling Site Design Elements (Solar Site Design and Wind Exposure Design, Evaporative Effects from Plants or Water)

The building defines a rectangular forecourt together with the existing building in the east, which is protected by planted greenery from the road bordering the building site.
Evaporative Effects from a firewater basin which is located parallel to the classroom wing in the east.

Vent. Cooling Architectural Design Elements (Form, Morphology, Envelope, Construction&Material)

Envelope: Green roof. On the south side of the building a façade in front of the hall and library perforated copper profiles protect from over-heating and glare and generates a comfortable indoor environment in summer. They are fixed to a secondary frame with an in-between space of 50 cm. Automated blinds provide shading for the classrooms located in the east and west wings of the building. A recess in the glass façade at eye level of the sitting students offers views of the natural landscape, while shielding from the sun. The classroom windows have frames with cold bridge breaks and triple glazing inflated with rare gas. The building skin is airtight throughout and features thick insulation. Inside the walls 35-cm-thick rock wool and 30-cm-thick rock wool inside the roof structure ensure U-values of 0.11 W/m²K; a 18-cm-thick rock wool layer in the ground floor ceiling helps to achieve an U-value of 0.18 W/m².K.
Construction & Material: Main structure made of pre-fabricated wooden frame elements, semi-underground parts of the building are made of concrete and provide thermal mass

Vent. Cooling Technical Components (Airflow Guiding Components, Airflow Enhancing Components, Passive Cooling Components)

Airflow Guiding Components: Ventilation flaps are installed.
Airflow Enhancing Components: Natural ventilation of the main hall, the library, the corridor serving the classrooms and the stairwells is ensured by motorized ventilation flaps located in the upper parts of the building.

IEA EBC Annex 62 Ventilative Cooling

Actuators, Sensors and Control Strategies
Control Strategies: Motorized ventilation flaps are controlled by sensors located on the ceiling of the upper floor and open automatically.
Building Energy Systems (Heating, Ventilation, Cooling, Electricity)
<p>Heating: The recess hall and the library were outfitted with a floor heating unit, while the other rooms are heated via a central ventilation unit, with 85 % heat recovery from exhaust air.</p> <p>27 polyethylene pipes with a length of 26 meters and a diameter of 40 cm were installed in three layers below the recess hall. Supply air is passively preheated by 12 K maximum or up to 5 – 7 °C. A calorific value gas heater is used to reheat the supplied air which will be replaced by a district heating which is connected to a biomass heating plant fueled with wood chippings during the second refurbishment phase of the gymnasium. The remaining heat energy is generated from renewable energy sources.</p> <p>Ventilation: centrally controlled ventilation unit, supply air heated by geothermal heat exchangers</p> <p>In summer and winter the incoming air is heated and cooled via earth coupling, fresh air is directly supplied to the building interior via a bypass system. External shutter blinds with automatically controlled moveable blinds ensure summertime comfort. Air change at a rate of 1 – 2.8 h⁻¹ and humidity control ensure low CO2 levels and clean air. Air volumes of 18 - 20 m³/h per person and CO2 ratios between 500 and 700 ppm were measured, which is two to three times below the average of schools without such a ventilation system.</p> <p>Electricity: Ideal use of daylight combined with a LON bus system operated lighting unit and automated blinds minimize energy consumption. Fittings for hot water collectors were pre-installed on the roof of the library. The photovoltaic unit has a total surface of 240 m² with a maximum capacity of 20 kWp. The generated electricity is supplied to the public network.</p> <p>Rain water is collected and used for the sprinkler system.</p>
Building Ownership and Building Facility Management Structures
Owner and Builder: Municipality of Klaus Architect: Dietrich Untertrifaller
Aknowledgements
Austrian national award for Architecture and Sustainability 2006 Energy Globe 2004, Best timber buildings in Vorarlberg First passive house school in Vorarlberg
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