AIDA AFFIRMATIVE INTEGRATED ENERGY DESIGN ACTION

Co-funded by the Intelligent Energy Europe Programme of the European Union

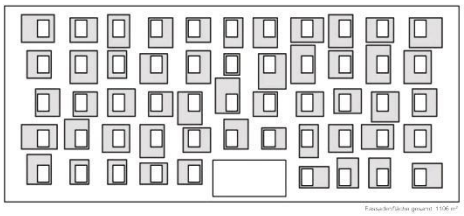
EURAC research

Operational success story

The building before the refurbishment

Ex-Post

Refurbishment 2005, Bolzano (IT)

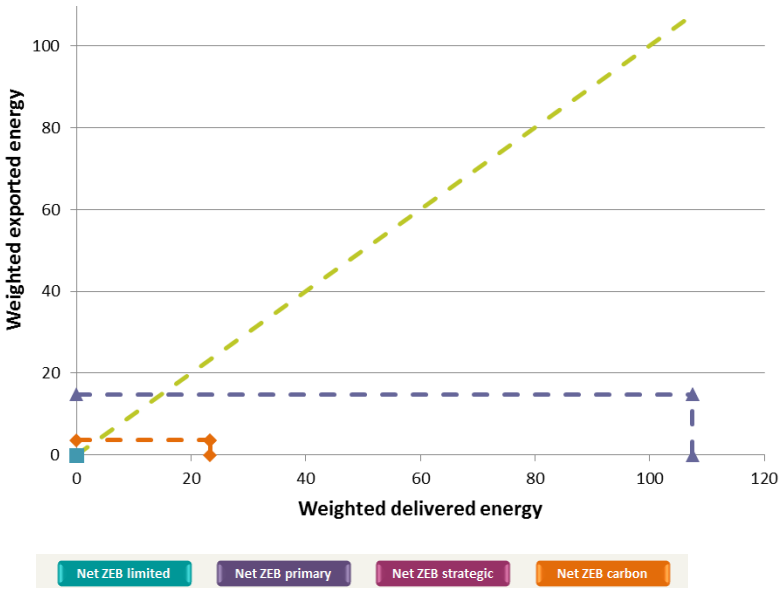


GENERAL INFORMATION

Owner:	Province of Bolzano
Architect:	Michael Tribus
Design office:	Michael Tribus
Use:	office building
Heated surface:	3960 m² gross surface 3366 m² net surface (2857 m² from PHPP)
Heated volume:	13464 m³ Gross Volume 10098 m³ Net Volume (12817 m³ from PHPP)
Built in:	1950
Renovated in:	2005
Cost:	4.820.000,00€ -278.000,00€ demolition -2.779.000,00 € construction -542.00,00 € Windows-doors -712.00,00 € Heating/ ventilation/ DHW -509.000,00 € electric system Others: 490.000,00 € Furniture
Method of financing:	Province of Bolzano

ENERGY PERFORMANCE

Primary energy demand:	118 kWh/m²y calculated by PHPP tool.
Type of certification:	*CasaClima certification (mandatory certification for Energy Demand for Heating):* 7 kWh/m²y standard 'Casa Clima Gold'. (m² of net heated surface)



Graphic1: Monitored Import/Export calculated by Net ZEB Evaluation Tool.* Elaboration made by monitoring data (2011-2012).
*Developed within the IEA - SHC Task 40/ECBCS Annex 52 - "Towards Net Zero Energy solar Buildings". Created by: Eurac Research within STA. Draft: V4.3

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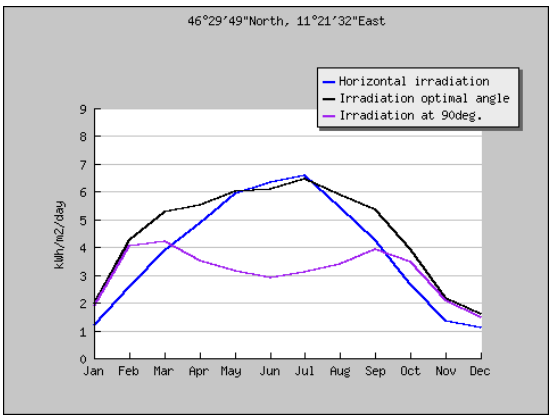
DESCRIPTION OF THE CLIMATE:

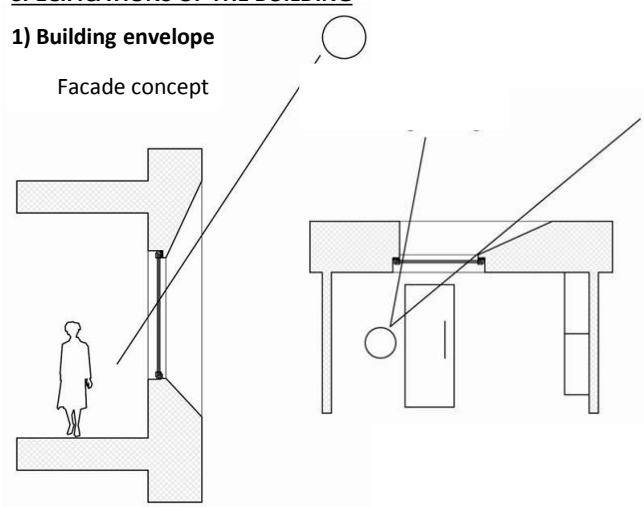
Address:	Via Renon n.4, Bolzano, South Tyrol, North Italy.
GPS:	Latitude = 46. 4971, Longitude = 11. 3591
Altitude:	262m
Yearly solar radiation: (graphic)	3,86 kWh/m²*day (Average sum of horizontal global irradiation per square meter) 1410 kWh/m² (Average sum of horizontal global irradiation per square meter) (http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php)
HDD20 (http://www.degreedays.net/):	HDD_{20}= 3131 Bolzano, IT (11.33E,46.46N)
CDD26 (http://www.degreedays.net/):	CDD_{26}= 106 Bolzano, IT (11.33E,46.46N)
HDD20, Italian Classification: (italian law: n. 412 26/august/1993)	HDD20= 2791 Bolzano, IT (11.33E,46.46N)



SPECIFICATIONS OF THE BUILDING

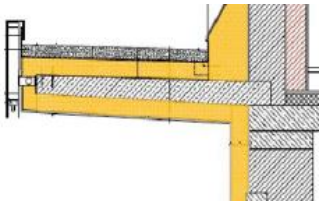
1) Building envelope

Facade concept

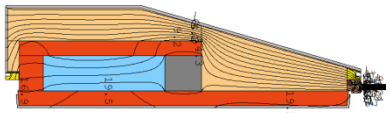


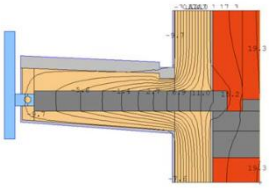
- Green Roof
- The main character of the building is transmitted by its façade design. This has been obtained by a particular application of the external insulation layer. In order to maximize the solar gains in the office, external EPS layer (λ=0,035 W/mK) has been applied through diagonal cutting of EPS-panels around the windows. In order to reduce the artificial lighting, desks are placed under the window.
- Passive-House windows with U-value 0.79 W/m²K
- Analisys of thermal bridges around the windows and for other architectural elements
- Bloower Door Test: n_{50}=0.60

Analysis of thermal bridges:
Façade: Technical solution for the windows

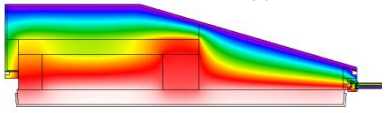


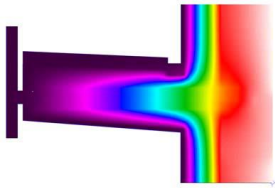
isothermal curves

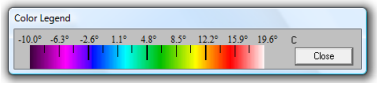




temperature ψ_{ext}= 0,10 W/mK







2) Systems

Ventilation system:	Menerga (capacity 10000 m³/h)
Ventilation with Heat Recovery :	nominal efficiency of 90 %
Heating system:	Condensation boiler Air heating system with post-heating coils in each office
Cooling system:	• air dehumidification • cooling machine (12 kW) with a direct evaporator (47 kW)
PV:	Polycrystalline silicon (26.73 kWp) PV orientation South-West/South-east, inclination 90°

CONTEXT AND HISTORY OF THE BUILDING

1950s **Building erected as Postal Service offices**.
The original envelope consisted of three storeys building, with a structure of bearing walls and reinforced concrete.

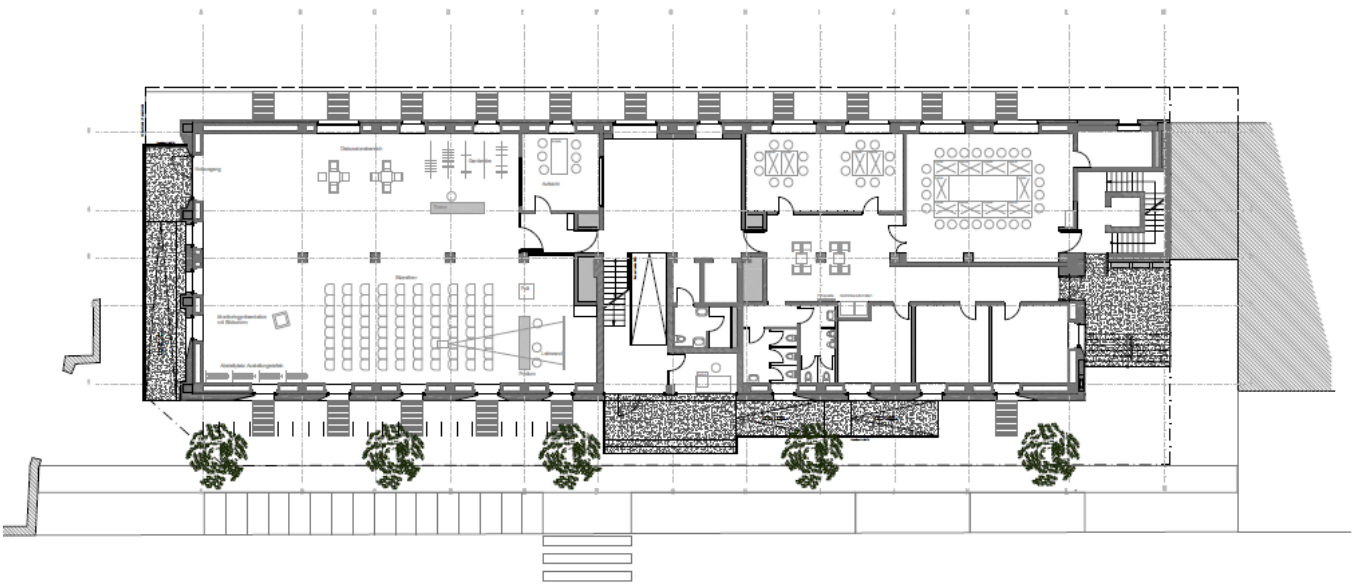
2004 **Change of use**
Used as an office building by Department of Planning and Environment of the local government (Provincia Autonoma di Bolzano/Autonome Provinz Bozen).

2004-06 **Refurbishment of the building**
The building was enlarged to five storeys, the facade was modified with the aim to have both good illumination and shading. The architectural concept was not modified: a very simple shape opened by the diagonally windows reveals. In the basement different serving facilities are installed: the archives, the server room, and the heating and cooling system. On the ground floor there are three offices, two meeting rooms and a big exhibition hall. On the other four storeys there are situated offices for two or three people and two lounge halls. The entry of the building is situated on the ground floor at the north side on the street.

- windows: The particular reveals of the windows have different inclinations to optimize the access of the sun in winter and prevent overheating in summer. Important to underline is, that the solar irradiation on the southern side is highly necessary during the winter period, but a problem during the summer, because of missing external shading systems.
- isolation: a continuous layer of a 35cm EPS with a λ=0,035 W/mK on the façade contributes with the massive structure to have a very low u value of U= 0,08 W/m²K.
- minimization of the thermal bridges, simulated by using the tool THERM.
- green roof
- central heating system gas-condensing boiler (60 kW power).
- central ventilation system with heat recovery (nominal efficiency of 90 %).
- active cooling system: chilled water is produced by a 85 kW battery of gas-driven absorption chillers.
- monitoring system to assess the energy performance of the building in order to obtain necessary data for an energy optimization.

2006 **Use of the building and monitoring of energy consumption**

2009 **Management of the heating and cooling system plans**
Thanks to the monitoring of the energy consumption an incorrect regulation of the energy system plans is been found and corrected.



Umbau des ehemaligen Postgebäudes in Bozen
Erdgeschoss M 1:100

Autonome Provinz Bozen

Michael Tribus Architecture
Oktober 2006