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

Operational success story

Chalet 'La Pedevilla',

Nuova costruzione 2011, Marebbe (IT)

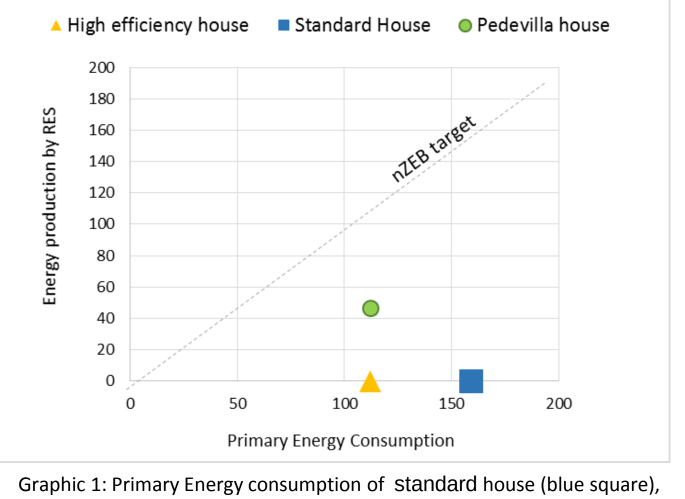
GENERAL INFORMATIONS

Owner:	Armin Pedevilla - Caroline Willeit - Pedevilla architects
Architect:	Pedevilla architects
Thermal mechanical engineer	Peintner www.peintner.it
Contractor	PLAICKNER BAU G.m.b.H www.plaickner.com
Windows and doors	Falegnameria Nagà www.naga.bz.it
Electric plant	Electro Leitner www.leitnerelectro.com
Hydraulic plant and ventilation system	Peintner www.peintner.it
Carpenter:	Zimmerhofer
Use:	Residential
Heated surface (usable area):	Residential 180m^2 Chalet 94 m^2 Tot. 334 m^2
Volume	895 m^3 first floor 623 m^3 groudfloor Heating volume 1533 m^3
Built in:	2011 (start 04.2012 – end 02.2013)
Cost:	Planning cost: € 680.000 Total cost: € 680.000 Cost: €/m² 1.900 Design cost (%): 15 Plans cost (%): 22 Energy certification (€): 1.600 Surplus for the achievement of the higher energy performance standard (%): 10
Method of financing:	Private part

ENERGY PERFORMANCE

Primary energy demand:	111,9 kWh/m²a
Type of certification:	CasaClima A
Heating energy demand:	House 20 kWh/m²a Chalet 28 kWh/m²a
Energy saving of fuel oil:	1.300 Kg/year
CO2 emissions:	House e Chalet 8,31 kg/(m²*y)

Pedevilla house		
Primary energy demand	9795 kWh/a	47,09 kWh/m²a
Heating Area (net)	208 m^2	
Chalet		
Primary energy demand	6018 kWh/a	64,84 kWh/m²a
Heating Area (net)	92,82 m^2	
Energy production	13964 kWh/a	46,42 kWh/m²a



Graphic 1: Primary Energy consumption of standard house (blue square), high energy efficnecy building (yellow triangule) and the case study , house Pedevilla (green circle).

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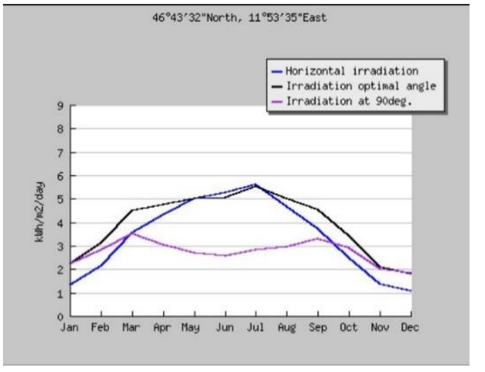
DESCRIPTION OF THE CLIMATE:

Address:	Plisciastr. 13 / 39030 Pliscia/Marebbe
GPS:	Location: 46.725977, 11.893213
Altitude:	1200 m
Yearly solar radiation: (graphic)	3,93 kWh/m² *day (Average sum of horizontal global irradiation per square meter received) 1430 kWh/m² (Average sum of horizontal global irradiation per square meter received) (http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php)
HDD20 (http://www.degreedays.net/):	HDD20= 24677 Dobbiaco, IT (12.22E,46.73N)
CDD26 (http://www.degreedays.net/):	CDD26= 5 Dobbiaco, IT (12.22E,46.73N)
HDD20, Italian Classification: (italian law: n. 412 26/august/1993)	HDD20= 4.411 Comune di Marebbe



SPECIFICATIONS OF THE BUILDING:

1) Thermal envelope

House

Opaque surface / heating volume

Compact: : S/V = 0.70 1/m

U-value of opaque surface

- Wall: 0.14-0,17 W/m²K, con pannello in lana di roccia sp. 26cm e XPS 20 cm
- Roof: 0.13 W/m²K, con pannello in lana di roccia sp. 30 cm
- Basement (groud): 0.18 W/m²K, with 20 cm mineral foam
- Basement (garage): 0.31 W/m²K, with 2 cm EPS and 8 cm XPS

U-value windows

U_w: 0.50-0.68 W/m²K
Ug: 0,5 W/m²K
g: 0.50-0.55

Chalet

Opaque surface / heating volume

Compact: : S/V = 0.81 1/m

U-value of opaque surface

- Wall: 0.16-0,17 W/m²K, con pannello in lana di roccia sp. 20 cm e XPS di 20cm
- Roof: 0.13 W/m²K, con pannello in lana di roccia sp. 30 cm
- Basement (garage): 0.28 W/m²K, with 7 cm mineral foam

U-value windows

U_w: 0.50-0.88 W/m²K
Ug: 0,5 W/m²K
g: 0.50-0.55

2) Building system

Ventilation system with heating recovery

House
- Air volume max.: 350 m³/h
- Air volume project: 200 m³/h

Chalet
- Air volume max.: : 350 m³/h
- Air volume project: 200 m³/h

Heating system

- Radiant pavement
- Geothermic plant with water
- Electric heating pump

Electric nominal power 2.1 kW
Thermal nominal power 9.7 kW
COP 4,62

Power:
DHW : 9.777 kWh/year
Heating system: 5.792 kWh/year
Totale: 15.569 kWh/year

- DHW store 825 liters

RES

FV 43,30 m² of silicon polycrystalline photovoltaic panels (25 panels)
Efficiency 13,8
Electric peak power of 240 Wp

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The vacation house is located at 1200m altitude, embedded with the rough and majestic mountain scape of the South Tirol Dolomites. The picturesque scenery derives from its 23 inhabitants, four farmhouses and one church and now with the ‘La Pedevilla’ ensemble, the hamlet Pliscia. The nature is right there, outside the door, and can be experienced through the window already during breakfast. Crows and Jaybirds are quite regular visitors on the neighboring roofs, dow and deer and foxes streak through the fields and wild meadows, raptors circulate with the rising winds.
Within the hamlet, one can get dairy and fresh milk direct ‘ab-Hof’, from the farmyard and our neighbor Pasquale handcrafts keys and cribs from wood. Pliscia is located just three kilometers apart from Enneberg, and with additional four kilometers one reaches St. Vigil, a base of the ‘Kronplatz Ski Resort’.
The close by Valley of Pederü offers a 15 kilometer long cross-country track, besides the diverse downhill slopes and options.
Throughout the year, the 25.000 Hektar expansice Fanes-Sennes Park invites for touring, mountain biking and climbing as well as exploring expeditions on the trail of , the ladinish legends‘. Numerous mountains and lakes can be explored via hikes and with it one can discover the unique landscape of the Dolomites. (SOURCE: http://www.lapedevilla.it/)

CONTEXT AND HISTORY OF THE BUILDING

January 2012

Design concept
The starting point of the design strategy is to achieve the nZEB target, project an high energy efficiency building, able to produce energy required for the need using the RES . The architectural concept follows the traditional local typology construction of the ' villas ‘, building on wood and stone, but the innovative idea of building was to build it entirely on reinforced concrete (inside), rock-wool insulation panels and oak painted dark externally.

April 2012

Construction phase
The biggest challenge was for the design of plant, because the concrete structure, from the beginning of the design phase, had to be included the electric/hydraulic plants, completely integrated into the concrete. Further changes was not possible.

February 2013

End of the construction phase
Made the Blower-Door-Test , with the results of:
House: n50 = 0,45/h method A
Chalet: n50 = 0,24/h method A

February 2015

After 2 years of monitoring
The building orientation permits to the large windows, on south façade without external shading, to maximize solar gains during the winter, when the sun is low. In summer, the solar radiation is not a problem for the overheating, because outside the air temperature is very low, due to the location of buildings (above 1200 m over see level). The typology of glasses (g-value 0,5-0,55) guarantee high solar gains. Furthermore, during the summer season, the high thermal mass due to the concrete maintains a constant internal microclimate; storing heat during the day and releasing it during the night though a natural ventilation.
On the ground floor the sleeping area is not heated in the winter, but thanks to the direct solar gains the internal temperature is about 19 degrees constant.
The thermal systems used operates independently and requires low maintenance.

Energy concept
Thermal plants uses the renewable energy sources on site to produce (thermal and electric) energy in and permits to achieve the nZEB target. The thermal systems is composed by a geothermal system with heat pump, integrated photovoltaic panels able to coverage the electric consumption of the ventilation system and the heat recovery.