

accumulation and solar gain in the winter. Windows are recessed in the thick walls and have Venetian shutters to allow shading and ventilation.

The building is built along an east-west axis to minimise solar gains in summer and maximise solar gains in winter. The building is oriented with bedrooms towards north and east to protect the interior rooms from summer afternoon heat. The zones towards the west side are buffer areas with a short term use; as corridors and bathrooms. The living room, is located on the ground floor, placed at the southernmost tip of the house, and is protected to the west by the garage and storeroom. The southern side offers a unique location where the low sun can heat it during the cool winter days, while the high sun can be easily shaded off during the hot summer days.

The building's structural design is aimed at upgrading conventional wall sections and experimenting with new ideas, keeping in mind the use of locally produced materials as much as possible. The structure is heavy with high thermal capacity combined with an insulation layer of 50 mm insulation (mineral wool and polystyrene) in the cavity walls of the envelope. The U-values for the wall systems range between 0.4 – 0.5 W/m²K. The windows are made of steady steel frames with good weather stripping and double glazing. Extra effort has been put into high-quality construction detailing and execution to prevent air leakage.

A solar-driven adsorption cooling system was installed on the top roof. The solar hot water matrix has been designed to deliver domestic hot-water, heating and energy for the adsorption chiller, which after some time of experimenting did not deliver the required cooling. With current feed-in tariff in Jordan, most efficient split units solar powered by Photo-Voltaics, could be the most cost efficient solution.

(Sources: www.bigee.net- Your Guide to Energy Efficiency in Buildings, Dr. TareqEmtairah, Florentine Visser - Architect)



(Picture Source: © 2012 Engadin St. Moritz Mountains - GianGiovanni / kmu-fotografie.ch)

Extreme-example 2: First plus-energy hotel in the Alp region with cold mountain climate (Engadin St. Moritz, Suisse)

While the previously shown extreme example shows a passive house in desert regions, this example is meant to provide another extreme example from cold regions. The Mountain Dining Romantic Hotel MuottasMuragl (16 double bed rooms) is located at an altitude of 2,456 meters above sea level and was refurbished in 2010 as a plus-energy hotel. Even that the heated useful area was increased by around 50%, the energy consumption could be reduced by 60% through refurbishment measures and the maximization of solar yields (passive and active). A solar thermal plant is used for water heating as well as serving as a supplementary heating system. The building heating is provided by a heat pump, which is supplied with ambient heat by a ground probe field with 16 probes (à 200 m). Additionally, waste heat from cooling plants as well as waste heat from the cable railway drive is used. The electrical energy is covered with a 64 kWp photovoltaic plant. Below the line, the hotel is producing more energy than it consumes.

(Source: Fanzun AG / Engadin St. Moritz Mountains AG)