Doragno Castle

Operazione co-finanziata dall’Unione Europea, Fondo Europeo di Sviluppo Regionale, dallo Stato Italiano, dalla Confederazione elvetica e dai Cantoni nell’ambito del Programma di Cooperazione Interreg V-A Italia-Svizzera. (Codice progetto 603882)

Introduction

The current building is the result of the transformation and expansion of an old medieval castle. Situated on a promontory at the time of its construction (11th century), the castle was in a very strategic position and was an observation and defence point along the road to the Mara and Intelvi valleys. In 1960 only the stone perimeter walls of the building and part of the defensive walls remained. During the beginning of the 1990s, it was transformed and expanded to create a private residence. The original area was completed in imitation of the medieval style and then subjected, years later, to further restoration in which the "soul of the castle" was restored, preserving the old part and clearly showing the difference between the medieval part and the recent works. The BIPV system was added in the later phase.

Sources: DeltaZERO architetti, Polo López C.S.

Design approach

The restoration project to "preserve" the castle freed the original walls from the superfluous material of the 1990s and completed the existing construction areas with large glass surfaces and steel elements. The lines of the new, simple, and essential elements were designed so that they would be recognised as a modern addition and at the same time complement the original stonework by framing it and without overpowering it. The large glass surfaces that complete the building reflect the surrounding landscape, the green of the woods and the hill, and what emerges from the landscape are the stone walls of the old manor house. The L shaped layout was kept, but the interior was reorganised. While the roof of the west wing remained unchanged (a single pitch sloping towards south-west), the east wing of the building was given two pitches, sloping towards north-west and the south-east, to create a more coherent shape with the profile of the old manor house. The BIPV system was integrated on the south pitch.

Aesthetic integration

The photovoltaic modules and solar thermal collectors are customized black panels, covering the entire south-facing roof surface. They have the same aesthetic characteristics as inactive roof panels. This way, the active elements do not become an extraneous element of the building; they integrate perfectly into the roof's appearance so that their function is hardly recognisable to the untrained eye. The work is extremely integrated in terms of morphology, colour, and attention to construction details and is in perfect harmony with the expressive line of the entire conservative restoration project.

Energy integration

The BIPV has an annual production of about 16,400 KWh, added to the 3,780 kWh generated by thermal solar collectors. This helps cover the 11,747 kWh consumed by the building annually for heating, hot water, ventilation, cooling, and domestic electricity.

Technology integration

The glass-glass BIPV modules are installed above a waterproofing sheathing and attached using special anchoring systems. They are the last layer of the building's roof.

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Lessons learnt

Due to the nature of the retrofit work, it has been calculated that approximately 100 tonnes of CO_2 will be prevented from being emitted into the atmosphere over the next 40 years.

The integration of the photovoltaic system is part of a "conservative" restoration work guided by principles such as respect for the work, authenticity (not creating a "false history"), and consideration of the context in which the building fits. In transformation processes, these principles should always be observed to respect the past and the surrounding area. We must use foresight to assess how much and what to preserve of the heritage of the past. While this assessment is undoubtedly complex, how to intervene and conserve also needs to be assessed on a case-by-case basis.

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PROJECT DATA

Project type	renovation
Building use	residential
Heritage constraint	listed building
Building construction technique	pre-industrial
Building address	Doragno, Rovio, Switzerland

BIPV systems

BIPV SYSTEM DATA

Architectural system	Opaque roof
Integration year	2017
Active material	Monocrystalline silicon
Module transparency	opaque
Module technology	glass-glass, hidden PV, customized modules
System power [kWp]	16.42
System area [m²]	100.10
Module dimensions [mm]	1,498 x 997 x 9.4
Modules orientation	South-East, South-West
Modules tilt [°]	20°, 11°
Annual FV production [kWh]	16400

BIPV SYSTEM COSTS

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Stakeholders

Main building designer

deltaZERO

BIPV components producer

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Case study author:

Eurac Research