D3.9_Overall Refurbishment Plan

DRAFT

CS03

Hotel Restaurant Valcanover

INTELLIGENT ENERGY – EUROPE II

Energy efficiency and renewable energy in buildings

IEE/12/070

EuroPHit

[Improving the energy performance of step-by-step refurbishment and integration of renewable energies]

Contract N°: SI2.645928

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Technical References

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Abstract

This overall refurbishment plan provides an overview of the retrofit steps of a step-by-step refurbishment to EnerPHit standard to be undertaken for the project Hotel-Restaurant Valcanover.

First, the existing building will shortly be described, including building component and component conditions. In addition, the existing energy efficiency performance of the building will be described.

In a second step, the overall refurbishment plan will describe the retrofit steps to be undertaken until the refurbishment will finally be completed. The EnerPHit standard will be achieved by refurbishing the existing building according to the Passivhaus principles. The thermal protection of all the dissipating surfaces will be improved by adding an external insulation. The airtightness of the building will be realized taking care of realizing a continuous layer in all the connection points. The existing windows will be replaced with triple glazed windows with insulated frame. Furthermore the building will also be enlarged adding two new volumes and using Passivhaus suitable components. From the point of view of the building services we will install four different ventilation units with heat recovery and we will replace the existing gas boiler with a more efficient heat generator, probably a water-water heat pump. We will add photovoltaic panels on the roof.

Figure 1: The existing building [ZEPHIR, 2013]

1 General Project description

1.1 Motivation

The running costs of the building are, at present, extremely high and the living comfort is very low. For these reasons, during the coldest month of the year, the hotel and the restaurant are usually closed. The owners are interested in the Passivhaus standard to reduce the running costs of the building as much as possible and increase the living comfort to the highest standards. Moreover they also believe that the visibility of the Hotel-Restaurant can benefit significantly from being the first building in Italy refurbished to the EnerPHit standard using a step by step approach.

1.2 Existing Building

The existing building is a three-storey building with three main destinations of use: restaurant, hotel and residential. The building was constructed in 1928 and later it was enlarged and refurbished in 1994 and 2008. The main body of the building, which is the oldest part, is a limestone construction. Most of the windows are single glazed and with uninsulated wooden frames. The newer extension is a brickwork construction and the windows have wooden frames with no insulation and double glazing. The timber roof is in precarious conditions and needs to be replaced as soon as possible. At present the envelope of the building has mainly no insulation. The restaurant is currently located at the ground floor, the residential part at the 1st floor while the hotel extends to the 1st and 2nd floors.

1.3 Refurbishment steps

1.3.1 Retrofit steps within EuroPHit

The all building will be retrofitted according to the Passivhaus principles with the target to reach the EnerPHit certification following a step-by-step approach. The refurbishment plan includes the dismantling of some parts of the building and the realization of some new extensions. In particular the restaurant at the ground floor will be enlarged and redesigned. The *2nd* floor will be demolished and rebuilt with a larger treated floor area. All the new parts of the building will be realized entirely with cross laminated timber (xlam). We plan also to rearrange the internal spaces in order to make it more functional. The *1st* floor of the building will be fully devoted to the hotel while the *2nd* floor will contain a residential part, composed by two different dwelling units, and a little apartment which is part of the hotel. We also planned a little solarium and a terrace on the roof.

Probably within the end of the project we will demolish and rebuild the second floor, thus replacing the precarious roof. In rebuilding the floor we will use Passivhaus components for all the elements of the thermal envelope and also for the building services.

1.3.2 Further retrofit steps

The future steps that have to be undertaken after the end of the EuroPHit project are the realization of the extension at the ground floor and the refurbishment of the existing parts of the ground and of the first floor. These have to be renovated both from the point of view of the building envelope and of the building services. As regards the building envelope, a new insulation layer will be added to all the opaque components, the existing windows will be replaced and a new airtight layer will be implemented. As regards the building services a new ventilation system with heat recovery will be installed, the existing heat generator will be replaced and PV panels will be added on the roof.

1.4 EnerPHit standard

The EnerPHit standard will be reached after the end of the project when the last step of the refurbishment plan will be completed.

1.5 Pictures

Figure 2: Pictures of the existing building. Top: north view. Bottom: south view. [ZEPHIR, 2013]

2 Existing building

2.1 General description

The existing building has a rather compact shape, the A/V ratio is 0.47 and the treated floor area is 584.61 m^2. The main challenges of the project are the poor orientation of the building and of the windows, the thermal bridge at the external wall-basement connection and the limitation/removal of the internal heating loads of the restaurant, especially in summer. Another challenge is the fact that the building contains three different destination of use that needs to be refurbished in different steps. At the same time some old parts of the building will be demolished and some new extensions will be built.

2.1.1 Building data

Construction Time	:	1928
Last retrofit	:	2008
Building use	:	restaurant, hotel, residential
General condition	:	
Occupancy	:	one dwelling unit (1st floor), restaurant with 100 seats (ground floor), hotel with 15 double rooms (1st and 2nd floors).
Treated floor Area	:	584.61
Other	:	

2.1.2 Client

Name / Company	:	Maria Biasi and Monica Valcanover
Address	:	Via di Mezzolago 1, I-38057 Pergine Valsugana (TN)
Email	:	albergo.valcanover@virgiglio.it
Other	:	

2.2 Envelope of the existing Building

2.2.1 Floor slab

Description	:	Concrete slab
U-Value [W/(m²K)]	:	2.806 W/m^{2}K
Installation date	:	1928
Condition	:	Good
Next replacement	:	
Other	:	

2.2.2 External walls

Description	:	Masonry construction
U-Value [W/(m²K)]	:	1.44 W/m^{2}K (average)
Installation date	:	1928, 1980, 1994, 2008

Condition	:	Good
Next replacement	:	2015
Other	:	

2.2.3 Windows

Description	:	Double glazed and single glazed windows with wooden frame
U-Value [W/(m²K)]	:	3.088 W/m^2K (average)
Installation date	:	1928, 1980, 1994, 2008
Condition	:	Good
Next replacement	:	2015
Other	:	

2.2.4 Roof / Top floor ceiling

Description	:	Lightweight timber construction
U-Value [W/(m²K)]	:	1.917 W/m^2K
Installation date	:	1928
Condition	:	End of lifecycle
Next replacement	:	2015
Other	:	

2.3 Technical equipment of the existing building

2.3.1 Heating

Description	:	Gas Boiler
Performance ratio of heat generation [%]	:	n.a.
Installation date	:	2004
Condition	:	Good
Next replacement	:	
Other	:	

2.3.2 Domestic hot water

Description	:	Gas Boiler
Performance ratio of heat generation [%]	:	n.a.
Installation date	:	2004
Condition	:	Good
Next replacement	:	

Other :

2.3.3 Ventilation

Description	: Natural
HR Efficiency[%]	:
El.Efficiency [Wh/m³]	
Installation date	:
Condition	:
Next replacement	:
Other	

2.4 Energy efficiency of the existing building

The energy efficiency properties of the existing building were calculated with the use of the PHPP 9 (Passive House Planning Package) and the results prove that the energy performance of the building is very poor due mainly to the lack of insulation in the thermal envelope and the low level of airtightness of the building.

2.4.1 Modelled efficiency parameters

PHPP: specific heating demand [kWh/(m²K)]	:	268.8
PHPP: specific cooling demand | Overheating frequency [kWh/(m²K) | %]	:	3.5
PHPP: specific primary energy demand [kWh/(m²K)]	:	867.9

2.4.2 Available consumption parameters

Annual Gas/Oil consumption | bills [kWh/a | €]	:	about 13000 €/a (hotel and restaurant) + about 3000 €/a (residential)
Annual Electricity consumption | bills [kWh/a | €]	:	about 13000 €/a
Other	:	

For an overview of the energy efficiency of the existing building, see the verification spreadsheet of the PHPP 9 beta version [PHI 2013] on the next page.

EnerPHit verification

		Building:	Hotel Restaurant Valcanover
		Street:	
		Postcode/City:	
		Country:	Italy
		Building type:	Masonry construction
		Climate:	Pergine
		Altitude of building site (in [m] above sea level):	459
		Home owner/client:	
		Street:	
		Postcode/City:	
Architecture:		Mechanical System:	
Street:		Street:	
Postcode/City:		Postcode/City:	
Energy consulting:	ZEPHIR	Certification:	
Street:		Street:	
Postcode/City:	Pergine Valsugana	Postcode/City:	

Year of Construction:	1928	Interior temperature winter [C°]	20.0	Interior temp. summer [C°]	25.0
Number of dwelling units:	1	Internal heat gains winter [W/m²]	9.4	IHG summer [W/m²]	9.9
Number of Occupants:	37.0			Spec. capacity [Wh/K per m² TFA]	204
Exterior vol. V_e:	2948.8 m³			Mechanical cooling:	x

Specific building demands with reference to the treated floor area

				Requirements	Fulfilled?*
	Treated floor area	584.6	m²		
Space heating	Annual heating demand	**269**	**kWh/(m²a)**	25 kWh/(m²a)	**no**
	Heating load	**128**	**W/m²**	-	**-**
Space cooling	Overall specific space cooling demand	**4**	**kWh/(m²a)**	-	**-**
	Cooling load	**13**	**W/m²**	-	**-**
	Frequency of overheating (> 25 °C)		%	-	**-**
Primary Energy	Heating, cooling, dehumidifying, DHW,	**868**	**kWh/(m²a)**	425 kWh/(m²a)	**no**
	DHW, space heating and auxiliary electricity	445	kWh/(m²a)	-	**-**
	Specific primary energy reduction through solar electricity		kWh/(m²a)	-	**-**
Airtightness	Pressurization test result n_{50}	**10.0**	**1/h**	1 1/h	**no**

***** empty field: data missing; '-': no requirement

EnerPHit building retrofit (acc. to heating demand)? **no**

I confirm that the values given herein have been determined following the PHPP methodology and were determined based on the characteristics of the building. The PHPP calculations are attached to this application.

Name:	Company:	Registration number PHPP:
Surname:	Issued on:	
		Signature

Figure 3: Specific energy efficiency values of the existing building modelled with PHPP 9 Beta

2.5 Pictures / Drawings

These pictures or drawings illustrate the existing building.

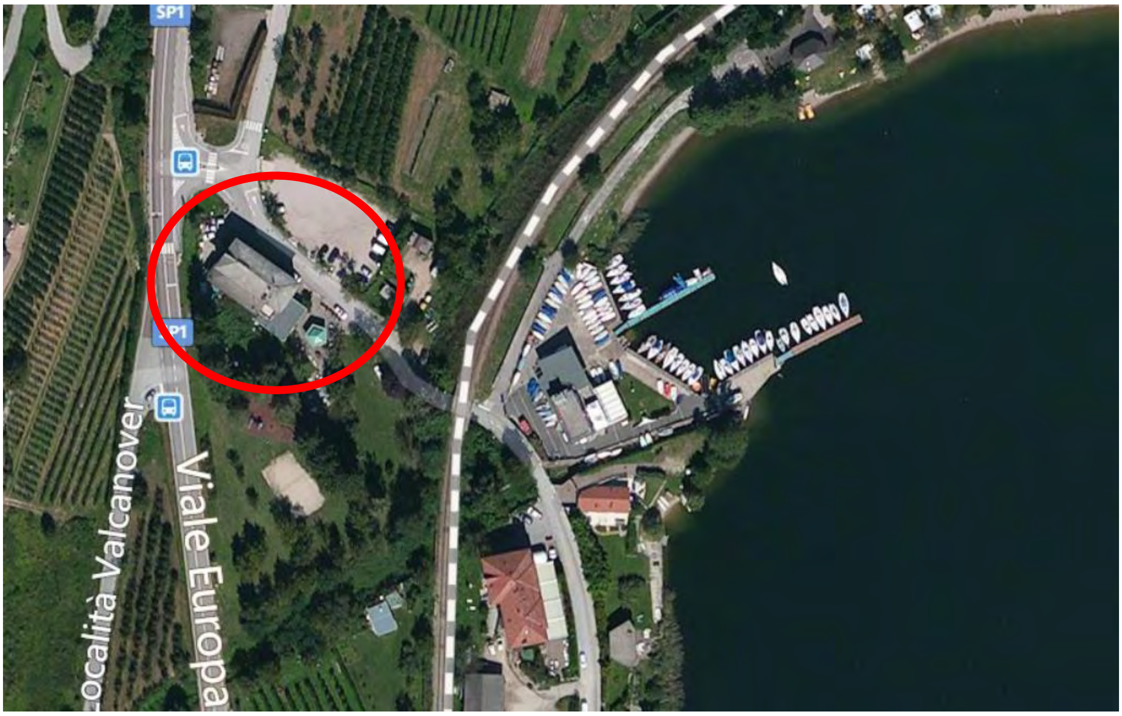


Figure 4: Aerial view of Hotel Restaurant Valcanover [Bing Maps, 2013].

Figure 5: Existing double glazed (left) and single glazed (right) windows [ZEPHIR 2013].

Figure 6: Roof of the existing building [ZEPHIR 2013].

Figure 7: Ground floor plan, existing building.

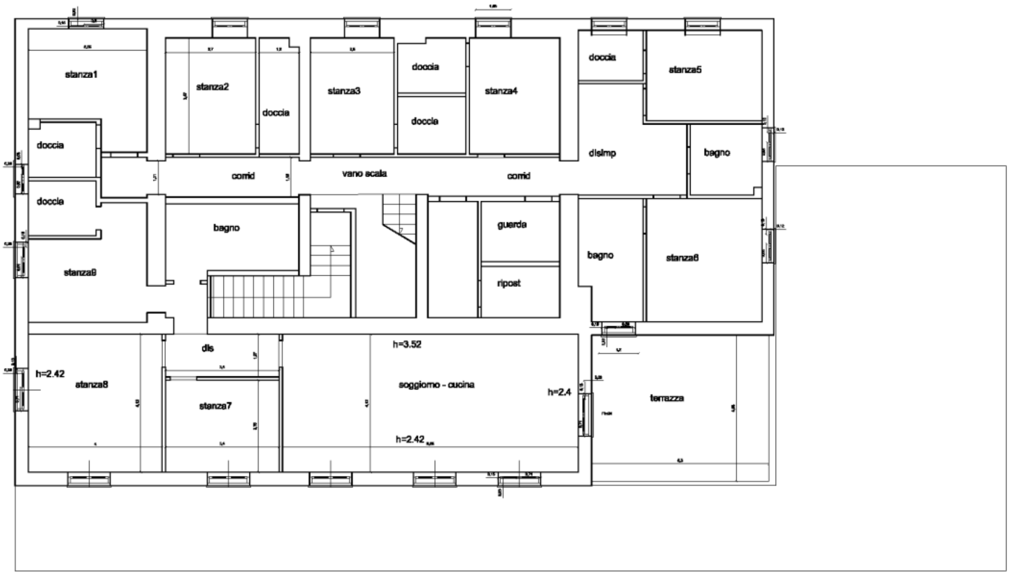


Figure 8: First floor plan, existing building.

Figure 9: Second floor plan, existing building.

3 Retrofit steps

3.1 Overall refurbishment Plan

3.1.1 Retrofit steps:

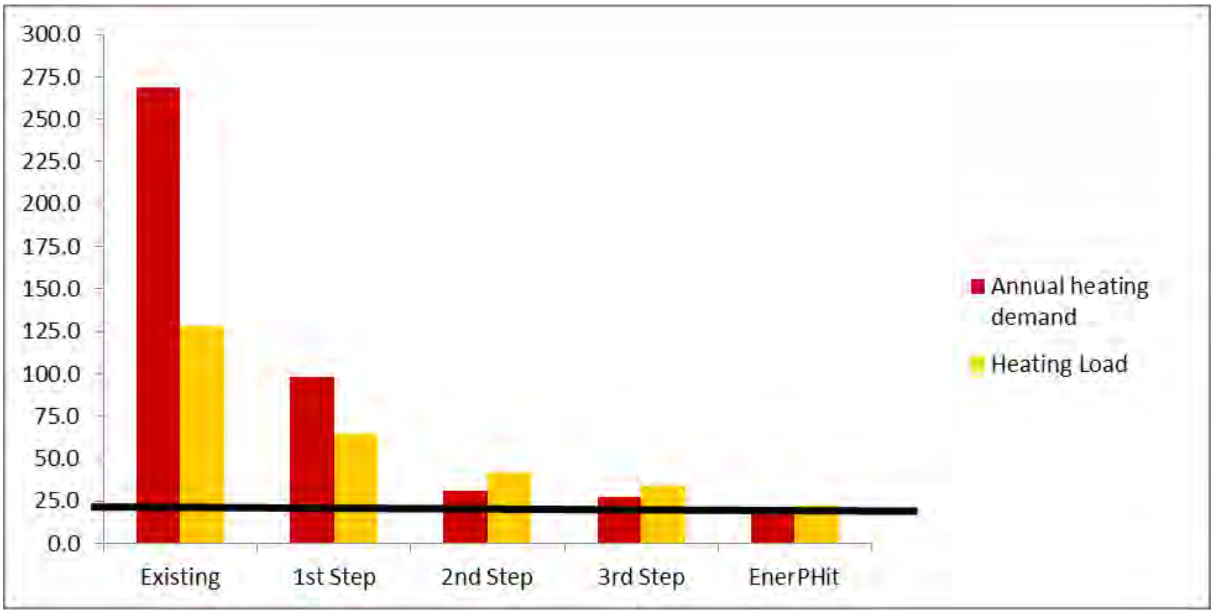
The building will be probably refurbished in four different steps. A detailed plan of the different steps with a detailed time schedule has not been developed so far. Here we present a preliminary plan of the possible steps.

The building will not only be refurbished, some parts will also be demolished and some new extension will be realized. In particular the second floor will be demolished and reconstructed with a larger treated floor area. Also at the ground level a new extension will be constructed in order to increase the area devoted to the restaurant. All the new parts of the building will be realized using cross laminated timber.

Step	Year	Measure	Specific Heating Demand	Specific Primary Energy Demand	Additional Specific Renewable Energy Gains
0	2013	Existing	269 kWh/m^{2}a	868 kWh/m^{2}a	
1	2015	Demolition and reconstruction of the second floor of the building	98.2 kWh/m^{2}a	n.a.	
2	2016	Realization of the extension of the ground level and insulation of all the external walls	31.2 kWh/m^{2}a	n.a.	
3	2017	Energy retrofitting of the existing part of the ground level (windows, airtightness, ventilation, floor slab insulation)	27.5 kWh/m^{2}a	n.a.	
4	2018	Energy retrofitting of the existing part of the first level (windows, airtightness, ventilation)	17.8 kWh/m^{2}a	n.a.	

Figure 10: Overview refurbishment steps

3.1.2 Efficiency Improvements



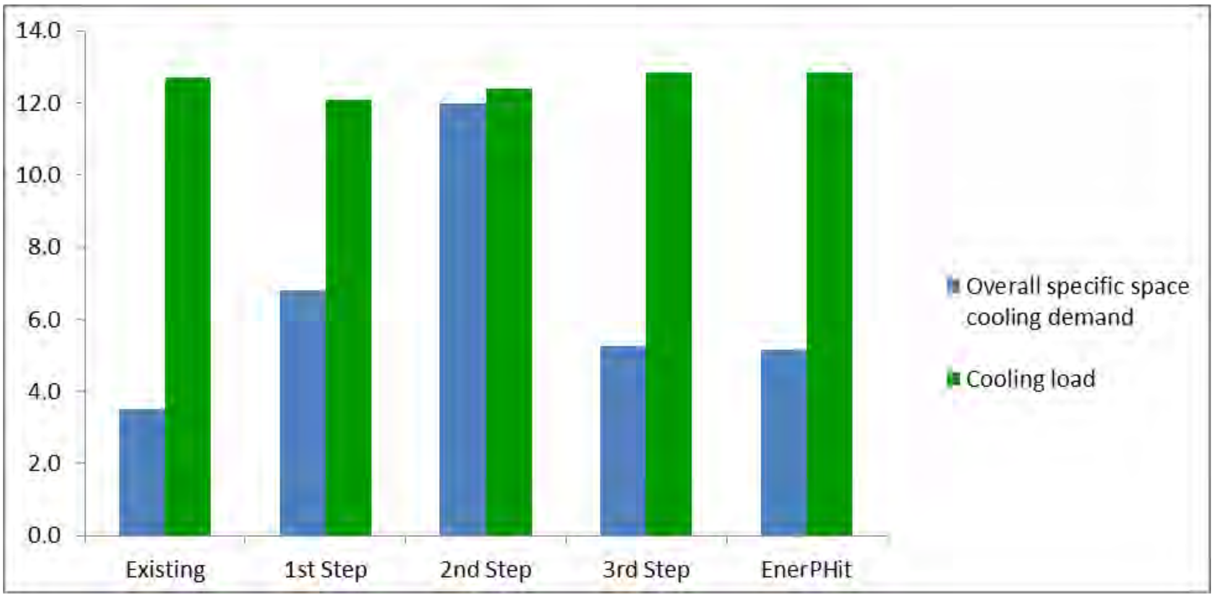


Figure 11: Overview energy efficiency improvement according to the overall refurbishment plan

3.2 Retrofit steps within EuroPHit

3.2.1 Retrofit step 1:

Demolition and reconstruction of the second level of the building with a larger treated floor area. The new external walls will be realized with cross laminated timber and external EPS insulation. The new windows will be timber/aluminium windows with insulated frame and triple glazing. The destination of use of the reconstructed level will be residential with two dwelling units. Two ventilation units with heat recovery will be installed, one for each apartment.

Start date	:	Winter 2015
Completion date	:	Spring 2016
Budget	:	€ 281500
PHPP: specific heating demand [kWh/(m²K)]	:	98.2
PHPP: specific cooling demand | Overheating frequency [kWh/(m²K) | %]	:	6.8
PHPP: specific primary energy demand [kWh/(m²K)]	:	

3.2.1.1 New Envelope component (new external walls)

Description	:	XLAM with external EPS insulation and internal mineral wool insulation
U-Value [W/(m²K)]	:	0.115
Installation date	:	2015
Condition	:	
Next replacement	:	
Other	:	

3.2.1.2 New Envelope component (top floor ceiling)

Description	:	wood-concrete slab + XPS insulation
U-Value [W/(m²K)]	:	0.11
Installation date	:	2015
Condition	:	
Next replacement	:	
Other	:	

3.2.1.3 New Envelope component (windows)

Description	:	Aluminium clad timber frame triple glazed windows
U-Value [W/(m²K)]	:	0.95
Installation date	:	2015
Condition	:	
Next replacement	:	
Other	:	

3.2.2 New ventilation component (ventilation unit)

Description	:	2 Ventilation units with heat recovery
HR Efficiency[%]	:	90%
El.Efficiency [Wh/m³]	:	0.42

Installation date	:	2015
Condition	:	
Next replacement	:	
Other	:	

EnerPHit verification

		Building:	Hotel Restaurant Valcanover
		Street:	
		Postcode/City:	
		Country:	Italy
		Building type:	Masonry construction
		Climate:	Pergine
		Altitude of building site (in [m] above sea level):	459
		Home owner/client:	
		Street:	
		Postcode/City:	
Architecture:		Mechanical System:	
Street:		Street:	
Postcode/City:		Postcode/City:	
Energy consulting:	ZEPHIR	Certification:	
Street:		Street:	
Postcode/City:	Pergine Valsugana	Postcode/City:	

Year of Construction:	1928	Interior temperature winter [C°]	20.0	Interior temp. summer [C°]	25.0
Number of dwelling units:	1	Internal heat gains winter [W/m²]	9.4	IHG summer [W/m²]	9.9
Number of Occupants:	37.0			Spec. capacity [Wh/K per m² TFA]	204
Exterior vol. V_e:	3018.9 m³			Mechanical cooling:	x

Specific building demands with reference to the treated floor area

				Requirements	Fulfilled?*
	Treated floor area	635.8	m²		
Space heating	Annual heating demand	98	kWh/(m²a)	25 kWh/(m²a)	no
	Heating load	65	W/m²	-	-
Space cooling	Overall specific space cooling demand	7	kWh/(m²a)	-	-
	Cooling load	12	W/m²	-	-
	Frequency of overheating (> 25 °C)		%	-	-
Primary Energy	Heating, cooling, dehumidifying, DHW,		kWh/(m²a)	220 kWh/(m²a)	
	DHW, space heating and auxiliary electricity		kWh/(m²a)	-	-
	Specific primary energy reduction through solar electricity		kWh/(m²a)	-	-
Airtightness	Pressurization test result n_{50}	7.1	1/h	1 1/h	no

* empty field: data missing; '-': no requirement

I confirm that the values given herein have been determined following the PHPP methodology and were determined based on the characteristics of the building. The PHPP calculations are attached to this application.

EnerPHit building retrofit (acc. to heating demand)?

Name: | Company: | Registration number PHPP:

Surname: | Issued on:

Signature

Figure 12: Specific energy efficiency values after step 1.

3.3 Future retrofit Steps

3.3.1 Retrofit step 2:

Realization of the extension of the ground floor and thermal insulation of the existing walls of the thermal envelope.

Start date	:	Winter 2016
Completion date	:	
Budget	:	
PHPP: specific heating demand [kWh/(m²K)]	:	31.2
PHPP: specific cooling demand | Overheating frequency [kWh/(m²K) | %]	:	12.0
PHPP: specific primary energy demand [kWh/(m²K)]	:	

3.3.1.1 New Envelope component (new external walls)

Description	:	XLAM with external EPS insulation and internal mineral wool insulation
U-Value [W/(m²K)]	:	0.115
Installation date	:	2016
Condition	:	
Next replacement	:	
Other	:	

3.3.1.2 New Envelope component (insulation existing walls)

Description	:	external EPS insulation
U-Value [W/(m²K)]	:	0.18
Installation date	:	2016
Condition	:	
Next replacement	:	
Other	:	

3.3.1.3 New Envelope component (floor slab)

Description	:	concrete slab + XPS insulation
U-Value [W/(m²K)]	:	0.184
Installation date	:	2016
Condition	:	
Next replacement	:	
Other	:	

3.3.1.4 New Envelope component (windows)

Description	:	Aluminium clad timber frame triple glazed windows
U-Value [W/(m²K)]	:	0.95
Installation date	:	2016
Condition	:	
Next replacement	:	
Other	:	

EnerPHit verification

Building:	Hotel Restaurant Valcanover
Street:	
Postcode/City:	
Country:	Italy
Building type:	Masonry construction
Climate:	Pergine
Altitude of building site (in [m] above sea level):	459
Home owner/client:	
Street:	
Postcode/City:	

Architecture:		Mechanical System:	
Street:		Street:	
Postcode/City:		Postcode/City:	
Energy consulting:	ZEPHIR	Certification:	
Street:		Street:	
Postcode/City:	Pergine Valsugana	Postcode/City:	

Year of Construction:	1928	Interior temperature winter [C°]	20.0	Interior temp. summer [C°]	25.0
Number of dwelling units:	1	Internal heat gains winter [W/m²]	9.4	IHG summer [W/m²]	9.9
Number of Occupants:	37.0			Spec. capacity [Wh/K per m² TFA]	204
Exterior vol. V_e:	3281.5 m³			Mechanical cooling:	x

Specific building demands with reference to the treated floor area

				Requirements	Fulfilled?*
	Treated floor area	723.4	m²		
Space heating	Annual heating demand	**31**	**kWh/(m²a)**	25 kWh/(m²a)	**no**
	Heating load	**42**	**W/m²**	-	**-**
Space cooling	Overall specific space cooling demand	**12**	**kWh/(m²a)**	-	**-**
	Cooling load	**12**	**W/m²**	-	**-**
	Frequency of overheating (> 25 °C)		%	-	**-**
Primary Energy	Heating, cooling, dehumidifying, DHW,		**kWh/(m²a)**	139 kWh/(m²a)	
	DHW, space heating and auxiliary electricity		kWh/(m²a)	-	**-**
	Specific primary energy reduction through solar electricity		kWh/(m²a)	-	**-**
Airtightness	Pressurization test result n_{50}	**7.1**	**1/h**	1 1/h	**no**

* empty field: data missing; '-': no requirement

EnerPHit building retrofit (acc. to heating demand)?

I confirm that the values given herein have been determined following the PHPP methodology and were determined based on the characteristics of the building. The PHPP calculations are attached to this application.

Name:	Company:	Registration number PHPP:
Surname:	Issued on:	
		Signature

Figure 13: Specific energy efficiency values step 2.

3.3.2 Retrofit step 3:

Retrofitting of the existing part of the ground level. This includes installation of new windows, realization of an airtightness layer, insulation of the existing floor slab and installation of a ventilation unit with heat recovery and replacement of the heat generator.

Start date	:	Winter 2017
Completion date	:	
Budget	:	
PHPP: specific heating demand [kWh/(m²K)]	:	27.5
PHPP: specific cooling demand | Overheating frequency [kWh/(m²K) | %]	:	5.3
PHPP: specific primary energy demand [kWh/(m²K)]	:	

3.3.2.1 New Envelope component (windows)

Description	:	Aluminium clad timber frame triple glazed windows
U-Value [W/(m²K)]	:	0.95
Installation date	:	2017
Condition	:	
Next replacement	:	
Other	:	

3.3.2.2 New Envelope component (floor slab)

Description	:	XPS insulation
U-Value [W/(m²K)]	:	0.212
Installation date	:	2017
Condition	:	
Next replacement	:	
Other	:	

3.3.3 New ventilation component (ventilation unit)

Description	:	Ventilation unit with heat recovery
HR Efficiency[%]	:	80%
El.Efficiency [Wh/m³]	:	0.37
Installation date	:	2017
Condition	:	
Next replacement	:	

Other	:	

3.3.3.1 New heating component

Description	:	Water-water heat Pump
Performance ratio of heat generation [%]	:	
Installation date	:	2017
Condition	:	
Next replacement	:	
Other	:	

EnerPHit verification

Building:	Hotel Restaurant Valcanover
Street:	
Postcode/City:	
Country:	Italy
Building type:	Masonry construction
Climate:	Pergine
Altitude of building site (in [m] above sea level):	459
Home owner/client:	
Street:	
Postcode/City:	

Architecture:		Mechanical System:	
Street:		Street:	
Postcode/City:		Postcode/City:	
Energy consulting:	ZEPHIR	Certification:	
Street:		Street:	
Postcode/City:	Pergine Valsugana	Postcode/City:	

Year of Construction:	1928	Interior temperature winter [C°]	20.0	Interior temp. summer [C°]	25.0
Number of dwelling units:	1	Internal heat gains winter [W/m²]	9.4	IHG summer [W/m²]	9.9
Number of Occupants:	37.0			Spec. capacity [Wh/K per m² TFA]	204
Exterior vol. V_e:	3281.5 m³			Mechanical cooling:	x

Specific building demands with reference to the treated floor area

				Requirements	Fulfilled?*
	Treated floor area	723.4	m²		
Space heating	Annual heating demand	**27**	**kWh/(m²a)**	25 kWh/(m²a)	**no**
	Heating load	**34**	**W/m²**	-	**-**
Space cooling	Overall specific space cooling demand	**5**	**kWh/(m²a)**	-	**-**
	Cooling load	**13**	**W/m²**	-	**-**
	Frequency of overheating (> 25 °C)		%	-	**-**
Primary Energy	Heating, cooling, dehumidifying, DHW,		**kWh/(m²a)**	135 kWh/(m²a)	
	DHW, space heating and auxiliary electricity		kWh/(m²a)	-	**-**
	Specific primary energy reduction through solar electricity		kWh/(m²a)	-	**-**
Airtightness	Pressurization test result n_{50}	**3.9**	**1/h**	1 1/h	**no**

* empty field: data missing; '-': no requirement

EnerPHit building retrofit (acc. to heating demand)?

I confirm that the values given herein have been determined following the PHPP methodology and were determined based on the characteristics of the building. The PHPP calculations are attached to this application.

Name:	Company:	Registration number PHPP:
Surname:	Issued on:	
		Signature

Figure 14: Specific energy efficiency values after step 3.

3.3.4 Retrofit step 4:

Retrofitting of the existing part of the first level. This includes installation of new windows, realization of an airtightness layer, installation of a ventilation unit with heat recovery.

Start date	:	Winter 2018
Completion date	:	
Budget	:	
PHPP: specific heating demand [kWh/(m²K)]	:	17.8
PHPP: specific cooling demand | Overheating frequency [kWh/(m²K) | %]	:	3.5
PHPP: specific primary energy demand [kWh/(m²K)]	:	

3.3.4.1 New Envelope component (windows)

Description	:	Aluminium clad timber frame triple glazed windows
U-Value [W/(m²K)]	:	0.95
Installation date	:	2018
Condition	:	
Next replacement	:	
Other	:	

3.3.5 New ventilation component (ventilation unit)

Description	:	Ventilation unit with heat recovery
HR Efficiency[%]	:	80%
El.Efficiency [Wh/m³]	:	0.45
Installation date	:	2018
Condition	:	
Next replacement	:	
Other	:	

EnerPHit verification

Building:	Hotel Restaurant Valcanover		
Street:			
Postcode/City:			
Country:	Italy		
Building type:	Masonry construction		
Climate:	Pergine		
Altitude of building site (in [m] above sea level):	459		
Home owner/client:			
Street:			
Postcode/City:			
Architecture:		Mechanical System:	
Street:		Street:	
Postcode/City:		Postcode/City:	
Energy consulting:	ZEPHIR	Certification:	
Street:		Street:	
Postcode/City:	Pergine Valsugana	Postcode/City:	

Year of Construction:	1928	Interior temperature winter [C°]	20.0	Interior temp. summer [C°]	25.0
Number of dwelling units:	1	Internal heat gains winter [W/m²]	9.4	IHG summer [W/m²]	9.9
Number of Occupants:	37.0			Spec. capacity [Wh/K per m² TFA]	204
Exterior vol. V_e:	3281.5 m³			Mechanical cooling:	x

Specific building demands with reference to the treated floor area

		Value	Unit	Requirements	Fulfilled?*
	Treated floor area	723.4	m²		
Space heating	Annual heating demand	18	kWh/(m²a)	25 kWh/(m²a)	yes
	Heating load	22	W/m²	-	-
Space cooling	Overall specific space cooling demand	5	kWh/(m²a)	-	-
	Cooling load	13	W/m²	-	-
	Frequency of overheating (> 25 °C)		%	-	-
Primary Energy	Heating, cooling, dehumidifying, DHW,		kWh/(m²a)	123 kWh/(m²a)	
	DHW, space heating and auxiliary electricity		kWh/(m²a)	-	-
	Specific primary energy reduction through solar electricity		kWh/(m²a)	-	-
Airtightness	Pressurization test result n_{50}	1.0	1/h	1 1/h	yes

* empty field: data missing; '-': no requirement

EnerPHit building retrofit (acc. to heating demand)?

I confirm that the values given herein have been determined following the PHPP methodology and were determined based on the characteristics of the building. The PHPP calculations are attached to this application.

Name:	Company:	Registration number PHPP:
Surname:	Issued on:	
		Signature

Figure 15: Specific energy efficiency values after measures within EuroPHit

3.4 Pictures / Drawings

These pictures or drawings illustrate the retrofit process.

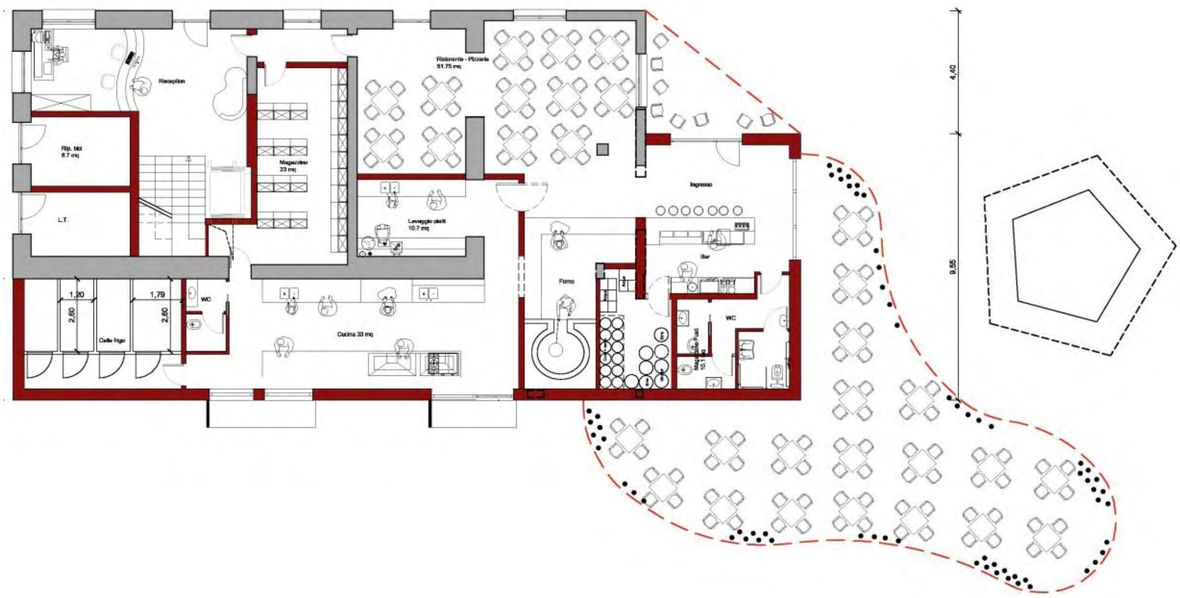


Figure 16: Ground floor plan of the refurbished building.

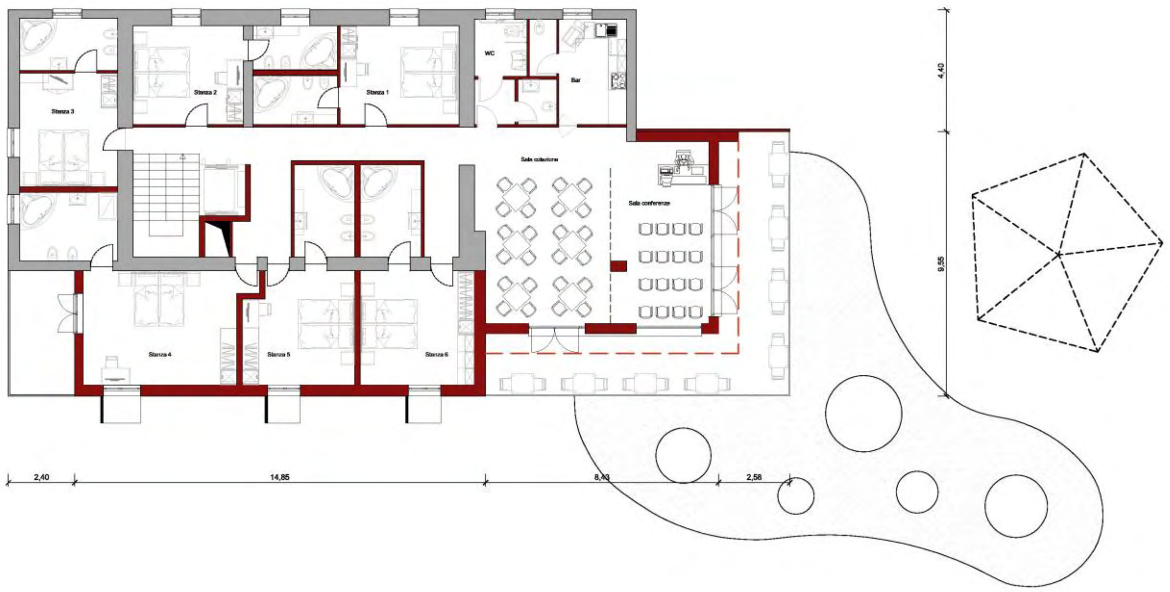


Figure 17: First floor plan of the refurbished building.

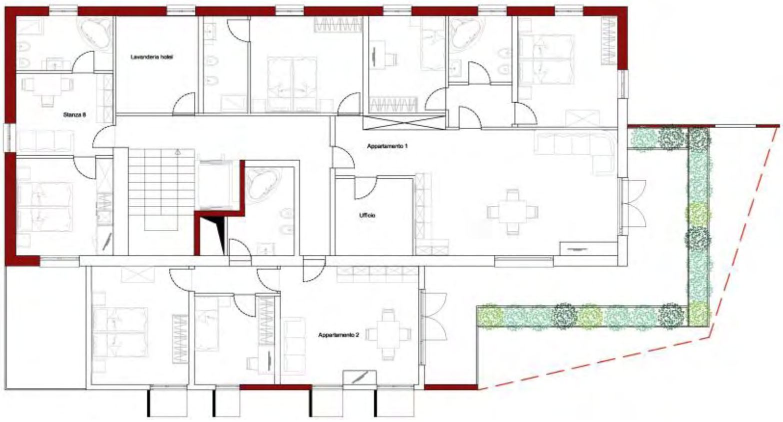


Figure 18: Second floor plan of the refurbished building.

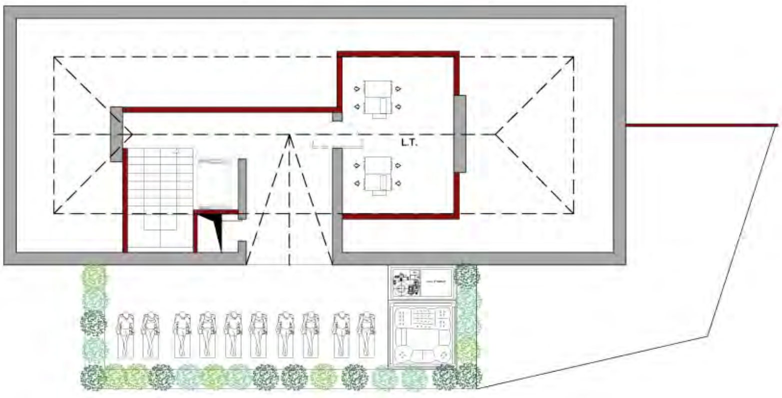


Figure 19: Attic floor plan of the refurbished building.

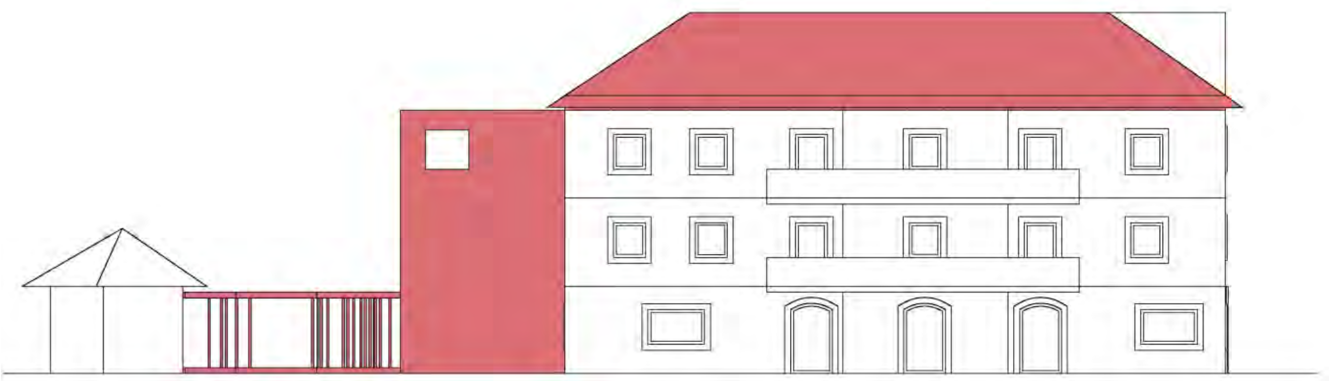


Figure 20: North-East elevation of the refurbished building.

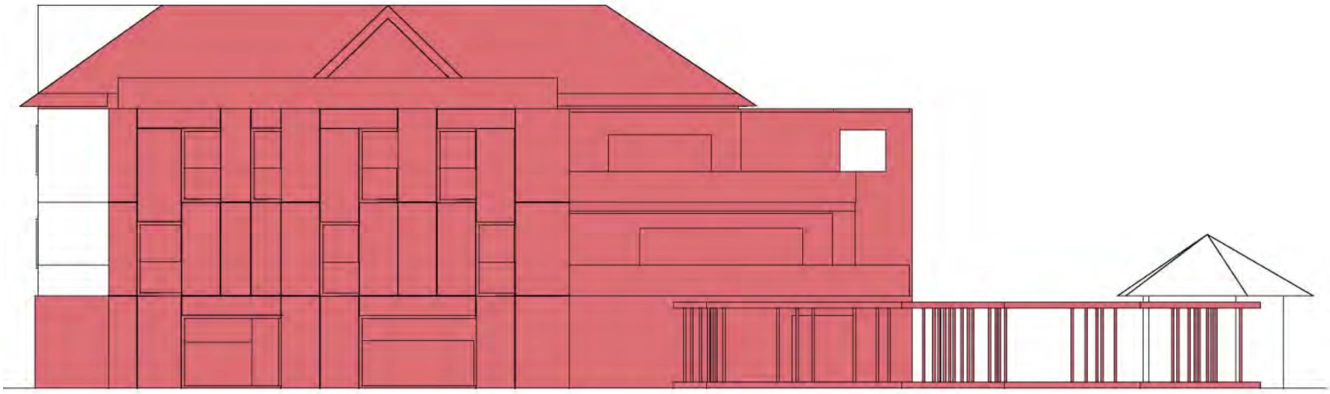


Figure 21: South-West elevation of the refurbished building.

4 Completion of step-by-step refurbishment to EnerPHit standard including RES

4.1 General description

The proposed refurbishment reaches the EnerPHit standard at the last step when all the parts of the building have been renovated. The large improvement that can be achieved with this refurbishment plan is possible mainly due to the improvement of the envelope of the building as regards the thermal protection and the airtightness. The ventilation system gives the possibility to provide fresh air to the building without dissipating a large amount of energy.

4.2 Retrofit steps carried out

The following

EnerPHit planning: CALCULATION OF VARIANTS

select active variants >>		Active: 5-3rd Step (Airtigtness/Windows Ground Floor - VentialtionRestaurant -Basment Insulation)	Exsisting	4th step (Final state)	1st Step (Roof-Extension/Airightness/Windows/Ve	2nd Step (Windows/Airtightness/ Extension Ground	3rd Step (Airtigtness/Windows Ground Floor -
Results	**Units**	5	1	2	3	4	5
Annual heating demand	kwh/(m²a)	17.8	268.8	98.2	31.2	31.6	17.8
Heating Load	W/m²	22.4	128.0	64.9	42.2	35.4	22.4
Overall specific space cooling demand	kwh/(m²a)	5.1	3.5	6.8	12.0	5.3	5.1
Cooling load	W/m²	12.9	12.7	12.1	12.4	12.9	12.9
Frequency of overheating	%						
Total primary energy demand	kwh/(m²a)		867.9				
Certifiable as EnerPHit building retrofit (acc. to heating demand)?	yes / no		no				

Figure 22: PHPP9 beta Variant sheet with the planned retrofit steps.

4.2.1 Building data

Construction Time : 2015-2020

Last retrofit : 2020

Building use : residential, hotel, restaurant

General condition :

Occupancy : 2 dwelling unit (2nd floor), restaurant with 60 seats (ground floor), hotel with 7 double rooms (1st floor).

Treated floor Area : 723.4 m²

Other :

4.2.2 Client

Name / Company : Maria Biasi and Monica Valcanover

Address : Via di Mezzolago 1, I-38057 Pergine Valsugana (TN)

Email : albergo.valcanover@virgiglio.it

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

Other :

4.3 Description of Building components

4.3.1 Floor slab

Description	:	Existing floor slab	New floor slab
U-Value [W/(m²K)]	:	0.221	0.184
Installation date	:		
Condition	:		
Next replacement	:		
Other	:		

4.3.2 External walls

Description	:	Existing walls	New walls
U-Value [W/(m²K)]	:	0.193 - 0.171	0.115
Installation date	:		
Condition	:		
Next replacement	:		
Other	:		

4.3.3 Windows

Description	:	New windows
U-Value [W/(m²K)]	:	0.95
Installation date	:	
Condition	:	
Next replacement	:	
Other	:	

4.3.4 Roof / Top floor ceiling

Description	:	New Ceiling Last Floor
U-Value [W/(m²K)]	:	0.110
Installation date	:	
Condition	:	
Next replacement	:	
Other	:	

4.4 Technical equipment of the refurbished building

4.4.1 Heating

Description	:	Water-water Heat Pump
Performance ratio of heat generation [%]	:	n.a.
Installation date	:	
Condition	:	
Next replacement	:	
Other	:	

4.4.2 Domestic hot water

Description	:	Water-water Heat Pump
Performance ratio of heat generation [%]	:	n.a.
Installation date	:	
Condition	:	
Next replacement	:	
Other	:	

4.4.3 Ventilation

Description	:	4 Ventilation units with heat recovery
HR Efficiency[%]	:	80 - 90 - 91 - 80
El.Efficiency [Wh/m³]		0.37 – 0.42 – 0.42 – 0.45
Installation date	:	
Condition	:	
Next replacement	:	
Other	:	

4.5 Energy efficiency of the refurbished building

The last step of the proposed retrofit process reaches the EnerPHit standard. The PHPP calculation performed provides the following results.

4.5.1 Modelled efficiency parameters

PHPP: specific heating demand [kWh/(m²K)]	:	17.8
PHPP: specific cooling demand | Overheating frequency [kWh/(m²K) | %]	:	5.1
PHPP: specific primary energy demand [kWh/(m²K)]	:	n.a.

For an overview of the energy efficiency of the completed step-by-step refurbishment, see the verification spreadsheet of the PHPP 9 beta version [PHI 2013] on the next page.

EnerPHit verification

Building:	Hotel Restaurant Valcanover
Street:	
Postcode/City:	
Country:	Italy
Building type:	Masonry construction
Climate:	Pergine
Altitude of building site (in [m] above sea level):	459
Home owner/client:	
Street:	
Postcode/City:	

Architecture:		Mechanical System:	
Street:		Street:	
Postcode/City:		Postcode/City:	
Energy consulting:	ZEPHIR	Certification:	
Street:		Street:	
Postcode/City:	Pergine Valsugana	Postcode/City:	

Year of Construction:	1928	Interior temperature winter [C°]	20.0	Interior temp. summer [C°]	25.0
Number of dwelling units:	1	Internal heat gains winter [W/m²]	9.4	IHG summer [W/m²]	9.9
Number of Occupants:	37.0			Spec. capacity [Wh/K per m² TFA]	204
Exterior vol. V_e:	3281.5 m³			Mechanical cooling:	x

Specific building demands with reference to the treated floor area

				Requirements	Fulfilled?*
	Treated floor area	723.4	m²		
Space heating	Annual heating demand	18	kWh/(m²a)	25 kWh/(m²a)	yes
	Heating load	22	W/m²	-	-
Space cooling	Overall specific space cooling demand	5	kWh/(m²a)	-	-
	Cooling load	13	W/m²	-	-
	Frequency of overheating (> 25 °C)		%	-	-
Primary Energy	Heating, cooling, dehumidifying, DHW,		kWh/(m²a)	123 kWh/(m²a)	
	DHW, space heating and auxiliary electricity		kWh/(m²a)	-	-
	Specific primary energy reduction through solar electricity		kWh/(m²a)	-	-
Airtightness	Pressurization test result n_{50}	1.0	1/h	1 1/h	yes

* empty field: data missing; '-': no requirement

EnerPHit building retrofit (acc. to heating demand)?

I confirm that the values given herein have been determined following the PHPP methodology and were determined based on the characteristics of the building. The PHPP calculations are attached to this application.

Name:	Company:	Registration number PHPP:
Surname:	Issued on:	Signature

Figure 23: Specific energy efficiency values of the completed project modelled with PHPP 9 Beta

4.6 Pictures / Drawings

These pictures or drawings illustrate the final status of the retrofit.

Figure 24: Rendering of the west view of the refurbished building.

Figure 25: Rendering of the North-East view of the refurbished building.

Figure 26: Rendering of the South view of the refurbished building.

5 RES Strategy / PV potential Evaluation

evaluation in process

5.1 Inhabitant's comfort and location concept

5.2 Evaluation of potential BIPV systems

5.3 Production estimation

PV type	:	Poly-Si
Location	:	On the roof
Installed PV area [m²]	:	24
Installed peak power [Wp]	:	2200
Annual RES gains [kWh]	:	1800
Other	:	

5.4 Multifunctional behaviour of the BIPV systems: passive properties

5.5 Financial evaluation & taxes and incentives assessment

5.6 Conclusion

6 Refurbishment to the current National Standards

evaluation in process

6.1 General Description

Add a more detailed description of the main differences between the building retrofitted according to national regulations and EnerPHit standard.

6.2 Efficiency results comparison table

	Existing building	National regulations	EnerPHit standard	Differences [%]
Space heat demand [kWh/(m^2/a)]				
Primary energydemand [kWh/(m^2/a)]				
Heat Load [W/m^2]				

Figure 27: Comparison of efficiency results

6.3 Building envelope comparison table

	Existing building	National regulations	EnerPHit standard	Differences [%]
Airtightness Pressure test n50 [1/h]				
Building envelope				
Floor Slab [W/(m^{2}K)]				
Walls to ground [W/(m^{2}K)]				
Walls [W/(m^{2}K)]				
Roof / Attic ceilings [W/(m^{2}K)]				
Windows [W/(m^{2}K)]				
Doors [W/(m^{2}K)]				
Thermal bridging ΔU[W/(m^{2}K)]				

Figure 28: Comparison of building envelope components

6.4 Building equipment comparison table

	Existing building	National regulations	EnerPHit standard	Differences [%]
Ventilation	**Natural**	**Natural**	**Zehnder comfoair**	
HR Efficiency [%]			84	
Electric efficiency [Wh/m³]			0,29	
Ducting				
Heating	**Boiler**		**Heat pump**	
Energy source	Gas		Electricity	
Performance ratio of heat generation [%]				
Thermal output kW				
Insulation of pipes				
Domestic hot water	**Gas**		**Heat pump**	
Energy source	Gas		Electricity	
Performance ratio of heat generation [%]				
Thermal output kW				
Insulation of pipes				
Cooling	**Gas**		**Heat pump**	
Energy source	Gas		Electricity	
Performance ratio of cooling generation [%]				
Thermal output kW				
Insulation of pipes				

Figure 29: Comparison of building envelope components

6.5 RES implementation comparison table

	Existing building	National regulations	EnerPHit standard	Differences [%]
Renewables	None			

Figure 30: Comparison of building envelope components

6.6 Conclusions

Add some general comments, observations on the comparison of the project according to national regulations and EnerPHit standard…

evaluation in process