EuroPHit

D3.9_Overall Refurbishment Plan

OP22_Vila Nina, Bansko

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

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

Technical References

Project Acronym	EuroPHit
Project Title	Improving the energy performance of step-by-step refurbishment and integration of renewable energies
Project Coordinator	Jan Steiger Passive House Institute, Dr. Wolfgang Feist Rheinstrasse 44/46 D 64283 Darmstadt jan.steiger@passiv.de
Project Duration	1 April 2013 – 31March 2016 (36 Months)

Deliverable No.	D3.9
Dissemination Level	PU
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Lead beneficiary	04_MosArt
Contributing beneficiary(ies)	09_EnEffect Group
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Co-author(s)	Dimitar Doucov
Date	10 03 2016
File Name	EuroPHit_D3.9_OP22_ERP_EnEffect.pdf

Source file: '2016_03_08_PHPP_Vila_Nina_BANSKO.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan

Target standard: EnerPHit Classic

Foto or drawing		
	Object:	Vila Nina
	Street:	
	Postcode/city:	End-of-terrace Passive House
	Province/country:	Blagoevgrad / Passivhaus-Reihenendhaus
	Object type:	Family house
	Climate data set:	BG0009a-Blagoevgrad
	Climate zone:	3: Cool-temperate — Altitude of location: 941

Owner:	Rila Solutions LTD
Street:	
Postcode/city:	
Province/country:	

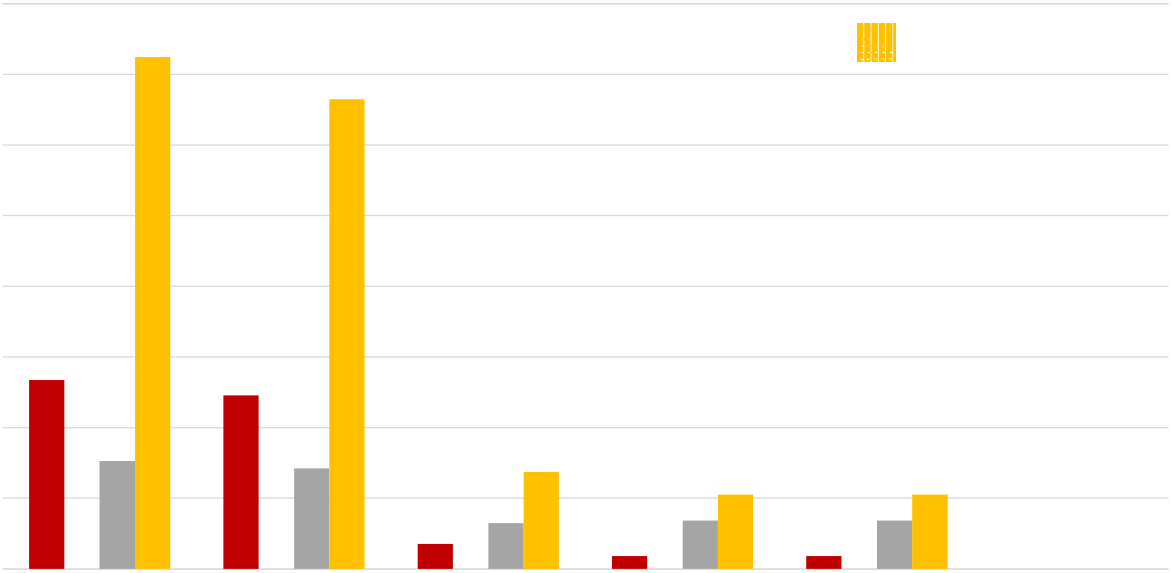
Architecture:	SolAir Architects
Street:	Blvd. Macedonia 15a
Postcode/city:	
Province/country:	

Tech. systems:	
Street:	
Postcode/city:	
Province/country:	

Energy consulting:	Eneffect Design
Street:	Hristo Smirnenski 1
Postcode/city:	Sofia
Province/country:	14200

Certification:	
Street:	
Postcode/city:	
Province/country:	

Year of construction:	2014	Interior temp. winter [°C]:	20,0	Interior temp. summer [°C]:	25,0
Number of dwelling units:	1	Treated floor area:	362,0	No. of occupants	20,0



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

First name	Last name	Signature
Iglika	Lutzkanova	

Company	Issued (date)	City
EnEffect Group	10.3.2016	

, 10.3.2016

Dear building owner,

in the next few years you intend to modernise your building and to improve stepwise its level of thermal protection. This "EnerPHit Retrofit Plan" will help you to make the right decisions at each step.

EnerPHit Standard

In the case of refurbishments of existing buildings, it is not always possible to fully achieve the Passive House Standard with reasonable effort. The reasons for this lie e.g. in the unavoidable thermal bridges due to existing basement walls. For such buildings, the Passive House Institute has developed the EnerPHit Standard. With the use of Passive House components, EnerPHit retrofitted buildings offer almost all the advantages of a Passive House building with optimum cost-effectiveness at the same time:

• Comfortable living with uniformly warm walls, floors and windows
• Draughts, condensation and mould growth are no longer a problem
• Permanent supply of fresh air with a pleasant temperature
• Independence from energy price fluctuations
• Financial profits from the very first year on due to up to 90 % reduced heating costs
• Climate protection due to decreased CO2 emissions of the same scale

EnerPHit Retrofit Plan

Most buildings are modernised in a step-by-step way when the respective building component needs to be renewed. Advantage can be taken of such opportunities to carry out future-oriented improvements to the thermal protection of the building. For example, if the façade already needs to be renewed anyway, the extra effort for thermal protection of the exterior wall to the Passive House quality at the same time will be manageable. Nevertheless, many interdependencies exist between individual energy efficiency measures, so that a good standard of thermal protection can only be achieved cost-effectively if an overall concept is prepared for the entire building prior to the first modernisation step. With the modernisation route planner, such an overall concept will be worked out for you by your Passive House Designer or energy consultant. This offers you the following advantages:

• Preparing for future steps already with today's measures will save costs on the whole and will ensure an optimal final outcome.
• An excellent final outcome can only be achieved if each individual step is implemented with the appropriate quality (EnerPHit-Standard).
• Once the overall concept has been prepared, it is available for every further step and thus facilitates the planning process (you don't have to start from the beginning every time).
• The energy demand is stated for each step.
• The approximate time points for upcoming refurbishment measures are stated in the general plan. This serves as a valuable aid for personal finance planning.

The modernisation route planner as well as other relevant documents can be checked by a PHI accredited certifier for additional quality assurance. If the examination shows that the EnerPHit Standard will be achieved with the implementation of all planned measures, then the first step can be carried out. After this a preliminary EnerPHit certificate can then be issued for the building. If quality assurance is continued accordingly for each step, then the full EnerPHit certificate will be issued for the building upon completion of the last step. A preliminary certificate increases the value of your building because its potential is clearly demonstrated. It also increases the credibility of the refurbishment concept in the context of talks with the bank e.g. because the achievable cost saving is available in a reliably calculated way. Apart from that, you can demonstrate to the outside world that you are committed to climate protection.

I wish you every success with your retrofit project!

Iglika Lutzkanova (EnEffect Group)

Scheduler

Source file: '2016_03_08_PHPP_Vila_Nina_BANSKO.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan: Vila Nina, Bansko, Bulgaria

Retrofit steps:															1	2	3	4	5						
Assemblies	Last renewal	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2014	2015	2016	2016	2020	2030	2035	2040	2045	2050	2060
Render facade	2016																								
Facade decoration	2016																								
Balconies/Loggias	2016																								
Exterior door	2015																								
Pitched roof covering	2010																								
Flat roof	2016																								
Roof weatherings	2016																								
Window	2015																								
Blinds / sun screens	2016																								
Basement ceiling	2016																								
Boiler	2016																								
Ventilation	2016																								
Solar thermal system	2030																								
Airtightn. test: X, Leakage search: (X)																									

Initial condition

X Retrofit dates

Main-tenance

Smaller Repairs

Extensive Repairs

Immediate replacement

Overview of measures

Source file: '2016_03_08_PHPP_Vila_Nina_BANSKO.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan: Vila Nina, Bansko, Bulgaria

Retrofit step No.		1-Basic	2-Windows and floor insulation	3-Walls, ground walls and roof insulation	4-Ventilation and airtightness	5-RES		Criteria	Alternative criteria
Year		2014	2015	2016	2016	2020			
Measures									
Occasion ("anyway measure")	1		Flooring	External wall plaster	Ventilation pipe system and				
Energy-saving measure			Floor insulation	Walls external insulation	MVHR	PV - modules			
Occasion ("anyway measure")	2		None	Internal wall plaster	Final airtightness test				
Energy-saving measure			New windows and air tightnes membrane	Ground walls insulation (internal)	Air gaps repearing				
Occasion ("anyway measure")	3			Balcony flooring					
Energy-saving measure				Flat roof insulation					
Occasion ("anyway measure")	4			Roof hydroinsulation					
energy-saving measure				Roof insulation					
Occasion ("anyway measure")	5								
energy-saving measure									
Occasion ("anyway measure")	6								
energy-saving measure									
Occasion ("anyway measure")	7								
energy-saving measure									
Occasion ("anyway measure")	8								
energy-saving measure									
Component characteristics									
Wall to ambient air, ext. insulation (U-value)	[W/(m²K)]	1,78	1,78	0,12	0,12	0,12			
Roof (U-value)	[W/(m²K)]	4,49	4,49	0,18	0,18	0,18			
Building envelope to ambient (U value)	[W/(m²K)]	2,12	2,12	0,14	0,14	0,14		0,15	-
Wall to ground, ext. insulation (U-value)	[W/(m²K)]								
Basement ceiling / floor slab (U-value)	[W/(m²K)]	0,68	0,20	0,20	0,20	0,20			
Building envelope to ground (U-value)	[W/(m²K)]	0,68	0,20	0,20	0,20	0,20		0,26	-
Wall, int. insulation to ambient air (U-Value)	[W/(m²K)]	7,14	7,14	0,16	0,16	0,16		0,35	-
Wall, int. insulation to ground (U-Value)	[W/(m²K)]	3,33	3,33	0,29	0,29	0,29		0,49	-
Flat roof (solar reflection index, SRI)	[W/(m²K)]	19,28	19,28	19,28	19,28	19,28		-	-
Inclined and vertical external surface (SRI)	[W/(m²K)]	72	72	72	72	72		-	-
Windows / doors ($U_{installed}$)	[W/(m²K)]	2,45	0,88	0,88	0,88	0,88		0,91	-
Windows ($U_{W,installed}$)	[W/(m²K)]	-	-	-	-	-		1,06	-
Windows ($U_{W,installed}$)	[W/(m²K)]	-	-	-	-	-		1,16	-
Glazing (g-value)	[]	0,77	0,51	0,51	0,51	0,51		0,43	-
Glazing/sun protection (max. solar load)	[kWh/(m²a)]	99	66	66	66	66		-	-
Ventilation (effective heat recovery efficiency)	[%]				82	82		75	-
Ventilation (effective humidity recovery efficiency)	[%]							-	-
Airchange at press. test n_{50}	[1/h]	4,0	2,0	2,0	1,0	1,0		1,0	-
Building characteristics									
Heating demand	[kWh/(m²a)]	534	491	71	37	37		-	-
Heating load	[W/m²]	190	171	32	19	19		-	-
Cooling + dehumidification demand	[kWh/(m²a)]	-	-	-	-	-		-	-
Cooling load	[kWh/(m²a)]	-	-	-	-	-		-	-
Frequency of overheating (> 25 °C)	[%]	13	13	0	0	0		10	-
Frequency of exc. high humidity (> 12 g/kg)	[%]	0	0	0	0	0		20	-
Non-renewable primary energy (PE demand)	[kWh/(m²a)]	306	285	130	137	137		146	-
Renewable primary energy (PER demand)	[kWh/(m²a)]	1449	1329	275	211	211		-	-
Renewable primary energy generation (reference to projected building footprint)	[kWh/(m²a)]	0	0	0	0	23		-	-
Criteria fulfilled for EnerPHit Classic?					yes	yes			
Costs									
Energy-related invest. (interest+repayment)	[€/year]	0	0	0	0	0			
Expected energy costs (total of all energy use in the building)	[€/year]	25100	23200	7000	6500	6500			
Total cost (investment+energy)	**[€/year]**	**25100**	**23200**	**7000**	**6500**	**6500**			

Investment and maintenance costs

Source file: '2016_03_08_PHPP_Vila_Nina_BANSKO.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan: Vila Nina, Bansko, Bulgaria

	Retrofit step No.	1-Basic	2-Windows and floor insulation	3-Walls, ground walls and roof insulation	4-Ventilation and airtightness	5-RES	
	Year	2014	2015	2016	2016	2020	
1	**Occasion ("anyway measure")**		**Flooring**	**External wall plaster**	**system and new suspended ceiling**		
	Investment costs		3 200 €				
	Maintenance costs						
	Energy-saving measure		**Floor insulation**	**Walls external insulation**	**MVHR**	**PV - modules**	
	Investment costs		2 800 €				
	Financial support (present value)						
	Maintenance costs						
	Service life [years]						
	Present value factor	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity factor	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity ("anyway measure")	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity (Energy saving measure)	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity (energy-related)	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**
2	**Occasion ("anyway measure")**		**None**	**Internal wall plaster**	**Final airtightness test**		
	Investment costs						
	Maintenance costs						
	Energy-saving measure		**New windows and air tightnes membrane**	**Ground walls insulation (internal)**	**Air gaps repearing**		
	Investment costs		14 200 €				
	Financial support (present value)						
	Maintenance costs						
	Service life [years]						
	Present value factor	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity factor	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity ("anyway measure")	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity (Energy saving measure)	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity (energy-related)	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**
3	**Occasion ("anyway measure")**			**Balcony flooring**			
	Investment costs						
	Maintenance costs						
	Energy-saving measure			**Flat roof insulation**			
	Investment costs						
	Financial support (present value)						
	Maintenance costs						
	Service life [years]						
	Present value factor	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity factor	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity ("anyway measure")	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity (Energy saving measure)	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity (energy-related)	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**
4	**Occasion ("anyway measure")**			**Roof hydroinsulation**			
	Investment costs						
	Maintenance costs						
	Energy-saving measure			**Roof insulation**			
	Investment costs						
	Financial support (present value)						
	Maintenance costs						
	Service life [years]						
	Present value factor	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity factor	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity ("anyway measure")	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity (Energy saving measure)	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity (energy-related)	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**
5	**Occasion ("anyway measure")**						
	Investment costs						
	Maintenance costs						
	Energy-saving measure						
	Investment costs						
	Financial support (present value)						
	Maintenance costs						
	Service life [years]						
	Present value factor	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity factor	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity ("anyway measure")	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity (Energy saving measure)	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity (energy-related)	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**
6	**Occasion ("anyway measure")**						
	Investment costs						
	Maintenance costs						
	Energy-saving measure						
	Investment costs						
	Financial support (present value)						
	Maintenance costs						
	Service life [years]						
	Present value factor	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity factor	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity ("anyway measure")	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity (Energy saving measure)	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity (energy-related)	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**
7	**Occasion ("anyway measure")**						
	Investment costs						
	Maintenance costs						
	Energy-saving measure						
	Investment costs						
	Financial support (present value)						
	Maintenance costs						
	Service life [years]						
	Present value factor	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity factor	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity ("anyway measure")	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity (Energy saving measure)	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity (energy-related)	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**
8	**Occasion ("anyway measure")**						
	Investment costs						
	Maintenance costs						
	Energy-saving measure						
	Investment costs						
	Financial support (present value)						
	Maintenance costs						
	Service life [years]						
	Present value factor	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity factor	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity ("anyway measure")	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity (Energy saving measure)	0 €	0 €	0 €	0 €	0 €	0 €
	Annuity (energy-related)	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**
	Total annuities (energy-related)	0 €	0 €	0 €	0 €	0 €	0 €
	Cumulated sums	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**	**0 €**

Boundary conditions: Nominal interest rate 3,0% Inflation 1,0% Real interest rate 2,0%

Building assemblies (U-values)

Source file: '2016_03_08_PHPP_Vila_Nina_BANSKO.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan: Vila Nina, Bansko, Bulgaria

Assembly: **03ud-Ground Floor Slab** Area: 186,0 m²

Areas with this assembly: **Slab on ground**

Retrofit step: 1-Basic 2014

Subarea 1	λ [W/(mK)]	Subarea 2 (optional)	λ [W/(mK)]	Subarea 3 (optional)	λ [W/(mK)]	Thickness [mm]
laminate	0,210					10
screeding	0,930					900
reinforced concrete	2,500					200
reinforced concrete	0,000					0
waterproofing	0,170					2
compact gravel	1,060					200

Fraction subarea 1	Fraction subarea 2	Fraction subarea 3	Total
100%	0%	0%	**131,2** cm

U-value supplement 0 W/(m²K) **U-value:** W/(m²K)

preparation for subsequent steps:

Retrofit step: 2-Windows and floor insulation 2015

Subarea 1	λ [W/(mK)]	Subarea 2 (optional)	λ [W/(mK)]	Subarea 3 (optional)	λ [W/(mK)]	Thickness [mm]
laminate	0,210					10
screeding	0,930					900
reinforced concrete	2,500					200
reinforced concrete	0,035					120
waterproofing	0,170					2
compact gravel	1,060					200

Fraction subarea 1	Fraction subarea 2	Fraction subarea 3	Total
100%	0%	0%	**143,2** cm

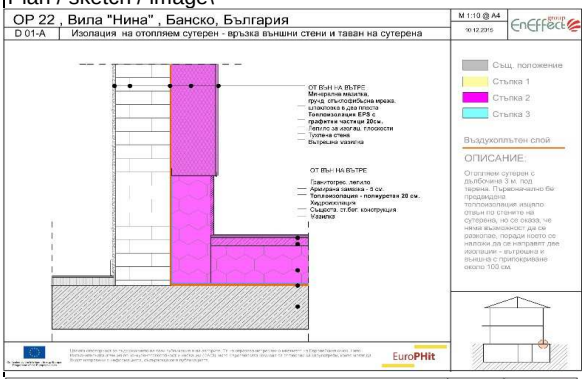
U-value supplement 0 W/(m²K) **U-value:** W/(m²K)

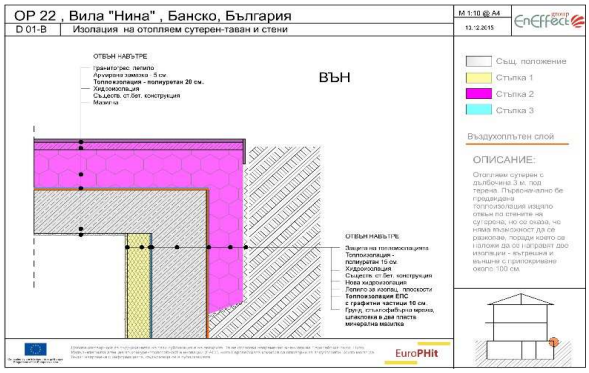
preparation for subsequent steps:

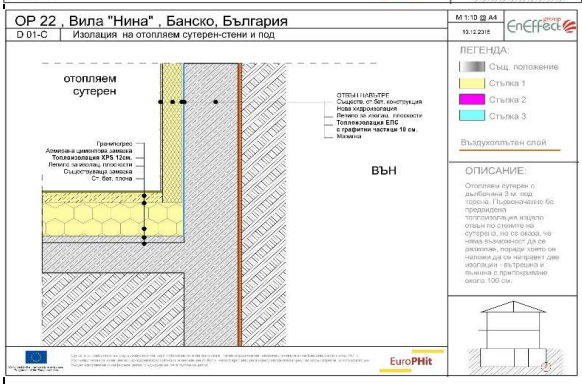
Assembly: **03ud-Ground Floor Slab**

Advice

Plan / sketch / image\







Description

Отопляем сутерен с дълбочина 3 м. под терена. Първоначално бе предвидена топлоизолация изцяло отвън по стените на сутерена, но се оказа, че няма възможност да се разкопае, поради което се наложи да се направят две изолации - вътрешна и външна с припокриване около 100 см.

Building assemblies (U-values)

Source file: '2016_03_08_PHPP_Vila_Nina_BANSKO.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan: Vila Nina, Bansko, Bulgaria

Assembly: **01ud-external wall-brick** Area: 385,7 m²

Areas with this assembly: **exterior wall South, exterior wall North, exterior wall East, ex**

Retrofit step: 1-Basic 2014

Subarea 1	λ [W/(mK)]	Subarea 2 (optional)	λ [W/(mK)]	Subarea 3 (optional)	λ [W/(mK)]	Thickness [mm]
plaster	0,870					20
thermalinsul. EPS with graphit	0,000					0
bricks Porotherm	0,330	reinforced concrete	2,100			250
inside plaster	0,700					20

Fraction subarea 1	Fraction subarea 2	Fraction subarea 3	Total
70%	30%	0%	**29,0** cm

U-value supplement 0 W/(m²K) **U-value:** W/(m²K)

preparation for subsequent steps:

Retrofit step: 3-Walls, ground walls and roof insulation 2016

Subarea 1	λ [W/(mK)]	Subarea 2 (optional)	λ [W/(mK)]	Subarea 3 (optional)	λ [W/(mK)]	Thickness [mm]
plaster	0,870					20
thermalinsul. EPS with graphit	0,032					250
bricks Porotherm	0,330	reinforced concrete	2,100			250
inside plaster	0,700					20

Fraction subarea 1	Fraction subarea 2	Fraction subarea 3	Total
70%	30%	0%	**54,0** cm

U-value supplement 0 W/(m²K) **U-value:** W/(m²K)

preparation for subsequent steps:

Building assemblies (U-values)

Source file: '2016_03_08_PHPP_Vila_Nina_BANSKO.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan: Vila Nina, Bansko, Bulgaria

Assembly: **02ud-Flat rood - terrace** Area: 145,4 m²

Areas with this assembly: **Roof, terrace**

Retrofit step: 1-Basic 2014

Subarea 1	λ [W/(mK)]	Subarea 2 (optional)	λ [W/(mK)]	Subarea 3 (optional)	λ [W/(mK)]	Thickness [mm]
waterproofing	0,170					1
concrete	0,930					50
XPS-thermal insulation	0,000	steel I beam	53,500			0
XPS-thermal insulation	0,000			steel I beam	53,500	0
reinforced concrete	2,100					200
mineral wool	0,000					0
steam insulation	0,190					1
inside plaster	0,700					20

Fraction subarea 1	Fraction subarea 2	Fraction subarea 3	Total
99%	0%	0%	**27,2** cm

U-value supplement 0 W/(m²K) **U-value:** W/(m²K)

preparation for subsequent steps:

Retrofit step: 3-Walls, ground walls and roof insulation 2016

Subarea 1	λ [W/(mK)]	Subarea 2 (optional)	λ [W/(mK)]	Subarea 3 (optional)	λ [W/(mK)]	Thickness [mm]
waterproofing	0,170					1
concrete	0,930					50
XPS-thermal insulation	0,035	steel I beam	53,500			90
XPS-thermal insulation	0,035			steel I beam	53,500	90
reinforced concrete	2,100					200
mineral wool	0,040					150
steam insulation	0,190					1
inside plaster	0,700					20

Fraction subarea 1	Fraction subarea 2	Fraction subarea 3	Total
99%	0%	0%	**60,2** cm

U-value supplement 0 W/(m²K) **U-value:** W/(m²K)

preparation for subsequent steps:

Ventilation systems

Source file: '2016_03_08_PHPP_Vila_Nina_BANSKO.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan: Vila Nina, Bansko, Bulgaria

Retrofit step	Year	Ventilation type	Ventilation unit	Heat recovery efficiency	Humidity recovery efficiency	Electric efficiency
1-Basic	2014	3-Only window ventilation	-	-	-	-
preparation for subsequent steps:						

Retrofit step	Year	Ventilation type	Ventilation unit	Heat recovery efficiency	Humidity recovery efficiency	Electric efficiency
4-Ventilation and airtightness	2016	1-Balanced PH ventilation with HR	01ud-Tangra 600 m3/h	0,82	0	0,45
preparation for subsequent steps:						

Retrofit step	Year	Ventilation type	Ventilation unit	Heat recovery efficiency	Humidity recovery efficiency	Electric efficiency
preparation for subsequent steps:						

Advice
Plan / sketch / image
Description

Photovoltaics

Source file: '2016_03_08_PHPP_Vila_Nina_BANSKO.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan: Vila Nina, Bansko, Bulgaria

Step	Technology	Module field area [m²]	Location	Annual electricity yield after inverter	
				absolute [kWh/a]	reference to projected building footprint [kWh/($m^2_{projected}$a)]
1-Basic					
preparation for subsequent steps:					

Step	Technology	Module field area [m²]	Location	Annual electricity yield after inverter	
				absolute [kWh/a]	reference to projected building footprint [kWh/($m^2_{projected}$a)]
5-RES	**Mono-Si**	**12,39**	**roof**	**2427,00**	**23,30**
preparation for subsequent steps:					

Step	Technology	Module field area [m²]	Location	Annual electricity yield after inverter	
				absolute [kWh/a]	reference to projected building footprint [kWh/(m²projecteda)]
preparation for subsequent steps:					

Advice Photovoltaics
Plan / sketch / image
Description

Window (glazing and frame)

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EnerPHit Retrofit Plan: Vila Nina, Bansko, Bulgaria

Window type:	**а-прозорци**	Fläche: 79,036 m²

Retrofit step	Year	Glazing	U_g	Frame	U_f
1-Basic	2014	93ud-Double glazing 4/12mm air /4	#REF!	54ud-EXISTING: timber 68 mm	1,6
preparation for subsequent steps:					

Retrofit step	Year	Glazing	U_g	Frame	U_f
2-Windows and floor insulation	2015	01ud-Guardian - ClimaGuard nrG (4:/16/4/16/:4 Ar 90%)	#REF!	01ud-F Rehau - REHAU GENEO PHZ - withSwisspacerV	0,79
preparation for subsequent steps:					

Retrofit step	Year	Glazing	U_g	Frame	U_f
preparation for subsequent steps:					

Advice

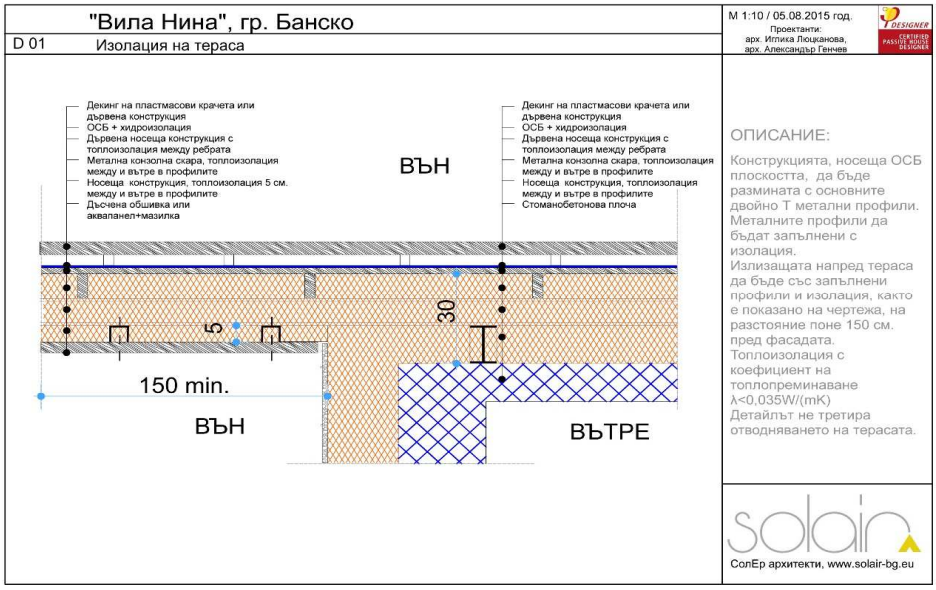
Advice

Description

Assembly: **02ud-Flat rood - terrace**

Advice

Plan / sketch / image



Description Терасата на последното ниво е от метална конструкция. Тук трябва да се внимава да не се допускат термомостове през метала. Разработен е детайл, при който термомостовете са сведени до минимум – металната конструкция е възможно най-добре изолирана от външния въздух.

Retrofit step:

Subarea 1	λ [W/(mK)]	Subarea 2 (optional)	λ [W/(mK)]	Subarea 3 (optional)	λ [W/(mK)]	Thickness [mm]

Fraction Subarea 1	Fraction Subarea 2	Fraction Subarea 3	Summe	
100%	0%	0%		cm

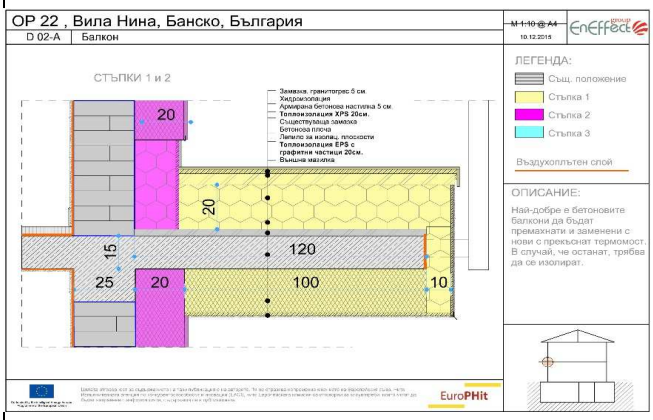
U-value supplement W/(m²K) **U-value:** W/(m²K)

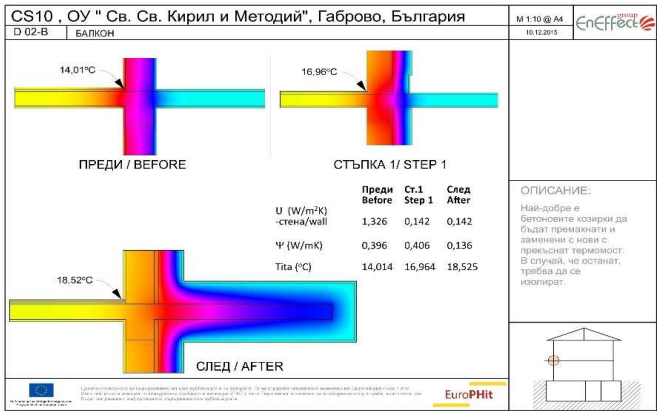
preparation for subsequent steps:

Assembly: **01ud-external wall-brick**

Advice

Plan / sketch / image





Description В по-нататъшните стъпки се предвижда изолация на терасите. Термографското изследване показва, че е възможно да се остави на следващ етап изолирането на плочата на терасите, тъй като след изолацирането на фасадите с 20 см ЕПС от вътрешната страна температурата е над 16 градуса и няма да се образува конденз. Добре е , обаче, в крайния етап терасата да се изолира цялостно, за да нямаме големи загуби.

Retrofit step:

Subarea 1	λ [W/(mK)]	Subarea 2 (optional)	λ [W/(mK)]	Subarea 3 (optional)	λ [W/(mK)]	Thickness [mm]

Fraction Subarea 1	Fraction Subarea 2	Fraction Subarea 3	Summe	
100%	0%	0%		cm

U-value supplement W/(m²K) **U-value:** W/(m²K)

preparation for subsequent steps:

Retrofit step:

Subarea 1	λ [W/(mK)]	Subarea 2 (optional)	λ [W/(mK)]	Subarea 3 (optional)	λ [W/(mK)]	Thickness [mm]

Fraction Subarea 1	Fraction Subarea 2	Fraction Subarea 3	Summe	
100%	0%	0%		cm

U-value supplement: W/(m²K)

U-value: W/(m²K)

preparation for subsequent steps:

1-Thermal insulation on the outside	**Да се постави хидроизолация над тавана на сутерена и да се обърне по цокъла, заедно с изолацията от пенополиуретан или XPS. Цокълът да се изпълни преди полагането на топлоизолацията по фасадите**