D3.9_EnerPHit Retrofit Plan

CS14 Wilmcote House, Portsmouth

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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EuroPHit

Source file: 'PHPP_V9.3a_CS14_Wilmcote House_BlockA.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan

Target standard: Passive House Classic

EuroPHit

Object:	Wilmcote House - Block A		
Street:	Tyseley Road		
Postcode/city:	Southsea	End-of-terrace Passive House	
Province/country:	Hampshire	Passivhaus-Reihenendhaus	
Object type:	Residential		
Climate data set:	GB0004a-Efford		
Climate zone:	4: Warm-temperate	Altitude of location:	5

Owner:	Portsmouth City Council		
Street:	Civic Offices, Guildhall Square		
Postcode/city:		Portsmouth	
Province/country:	United Kingdom		

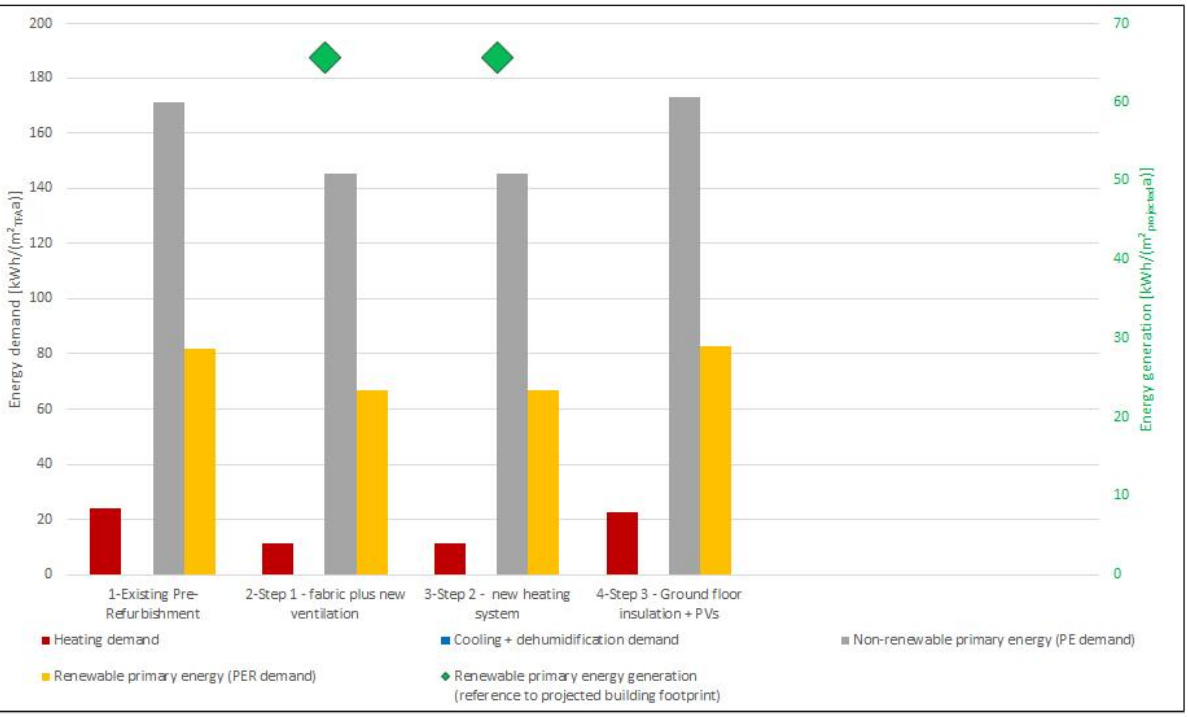
Architecture:	ECD Architects/Sustainable by Design		
Street:	237 Long Lane		
Postcode/city:	SE1 4PX	London	
Province/country:	United Kingdom		

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

Energy consulting:	Encraft		
Street:	Perseus House, 3 Chapel Court, Holly Walk,		
Postcode/city:	CV32 4YS	Leamington Spa	
Province/country:	United Kingdom		

Certification:	Kym Mead		
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:	34	Treated floor area:	3119.6	No. of occupants	76.3



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
Helen	Brown	

Company	Issued (date)	City
Encraft		

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, 0.1.1900

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.

Pre-certification

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!

Helen Brown (Encraft)

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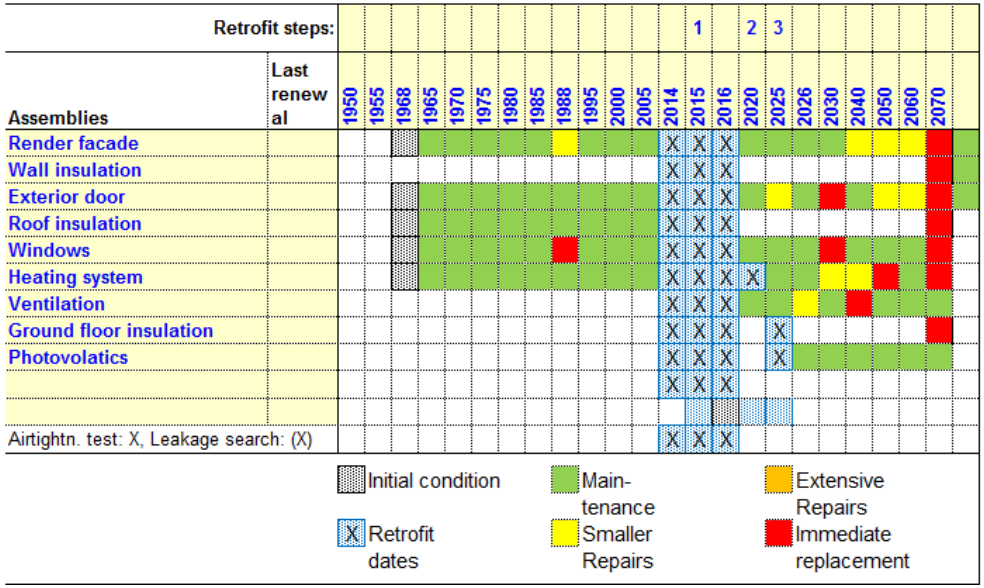
Scheduler

Source file: 'PHPP_V9.3a_CS14_Wilmcote House_BlockA.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan: Wilmcote House - Block A, Portsmouth, GB-United Kingdom/ Britain



up to x years	up to x years	up to x years	from x years
Main-tenance	Smaller repairs	Extensive repairs	Immediate replacement
20	35	55	55
40	40	60	60
15	35	50	50
40	40	40	40
15	30	50	50
10	15	20	20
10	15	20	20
60	60	60	60
10	15	30	30

until year	until year	until year	from year
Main-tenance	Smaller repairs	Extensive repairs	Immediate replacement
2036	2051	2071	2071
2056	2056	2076	2076
2031	2051	2066	2066

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Overview of measures

Source file: 'PHPP_V9.3a_CS14_Wilmcote

EnerPHit Retrofit Plan: Wilmcote House - Block A, Portsmouth, GB-United Kingdom/ Britain

Retrofit step No.		1-Existing Pre-Refurbishment	2-Step 1 - fabric plus new ventilation	3-Step 2 - new heating system	4-Step 3 - Ground floor insulation + PVs	
Year		Until 2014	2016	2020	2025	
Measures						
Occasion ("anyway measure")	1		Window replacement	New heating systems	New ground floor	
Energy-saving measure			Passivhaus windows	Energy efficient heating system	Insulated ground floor	
Occasion ("anyway measure")	2		New façade		New roof covering	
Energy-saving measure			External wall insulation		PV	
Occasion ("anyway measure")	3		New ventilation system			
Energy-saving measure			Heat recovery ventilation system			
Component characteristics						
Wall to ambient air, ext. insulation (U-value)	[W/(m²K)]					
Roof (U-value)	[W/(m²K)]	0.13	0.13	0.13	0.13	
Building envelope to ambient (U value)	[W/(m²K)]					
Basement ceiling / floor slab (U-value)	[W/(m²K)]	2.45	2.45	2.45	2.45	
Building envelope to ground (U-value)	[W/(m²K)]	2.45	2.45	2.45	2.45	
Windows / doors ($U_{installed}$)	[W/(m²K)]	0.93	0.93	0.93	0.93	
Glazing (g-value)	[]	0.50	0.50	0.50	0.50	
Glazing/sun protection (max. solar load)	[kWh/(m²a)]	160	160	160	160	
Ventilation (effective heat recovery efficiency)	[%]		76	76		
Ventilation (effective humidity recovery efficiency)	[%]		0	0		
Airchange at press. test n_{50}	[1/h]	1.0	0.6	0.6		
Building characteristics						
Heating demand	[kWh/(m²a)]	24	11	11	22	
Heating load	[W/m²]	13	8	8	12	
Cooling + dehumidification demand	[kWh/(m²a)]	-	-	-	-	
Cooling load	[kWh/(m²a)]	-	-	-	-	
Non-renewable primary energy (PE demand)	[kWh/(m²a)]	171	145	145	173	
Renewable primary energy (PER demand)	[kWh/(m²a)]	82	67	67	83	
Renewable primary energy generation (reference to projected building footprint)	[kWh/(m²a)]	0	66	66	0	
Criteria fulfilled for Passive House Classic?			yes			
Costs						
Energy-related invest. (interest+repayment)	[£/year]	0	56	666	821	
Expected energy costs (total of all energy use in the building)	[£/year]	51400	43600	43600	51900	
Total cost (investment+energy)	**[£/year]**	**51400**	**43656**	**44266**	**52721**	

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Investment and maintenance costs

Source file: 'PHPP_V9.3a_CS14_Wilmcote House_BlockA.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan: Wilmcote House - Block A, Portsmouth, GB-United Kingdom/ Britain

	Retrofit step No.	1-Existing Pre-Refurbishment	2-Step 1 - fabric plus new ventilation	3-Step 2 - new heating system	4-Step 3 - Ground floor insulation + PVs		
	Year	Until 2014	2016	2020	2025		
1	**Occasion ("anyway measure")**		**Window replacement**	**New heating systems**	**New ground floor**		
	Investment costs		£0.00	£6,440.00	£12,000.00	£11,180.00	
	Maintenance costs		£0.00	£0.00	£320.00	£0.00	
	Energy-saving measure		**Passivhaus windows**	**Energy efficient heating system**	**Insulated ground floor**		
	Investment costs		£2,160.00	£23,920.00	£16,000.00	£16,770.00	
	Financial support (present value)		£400.00	£3,000.00	£2,000.00	£2,000.00	
	Maintenance costs		£0.00	£0.00	£100.00	£0.00	
	Service life [years]		£50.00	£50.00	£20.00	£40.00	
	Present value factor	£0.00	£31.55	£31.55	£16.38	£27.45	£0.00
	Annuity factor	£0.00	£0.03	£0.03	£0.06	£0.04	£0.00
	Annuity ("anyway measure")	£0.00	£0.00	£204.09	£1,052.48	£407.28	£0.00
	Annuity (Energy saving measure)	£0.00	£55.78	£662.97	£954.56	£538.06	£0.00
	Annuity (energy-related)	**£0.00**	**£55.78**	**£458.88**	**-£97.92**	**£130.78**	**£0.00**
2	**Occasion ("anyway measure")**		**New façade**		**New roof covering**		
	Investment costs			£5,810.00	£1,000.00	£4,680.00	
	Maintenance costs			£0.00	£0.00	£50.00	
	Energy-saving measure		**External wall insulation**		**PV**		
	Investment costs			£11,620.00	£5,000.00	£8,580.00	
	Financial support (present value)			£1,500.00	£1,000.00	£1,000.00	
	Maintenance costs			£0.00	£70.00	£100.00	
	Service life [years]			£50.00	£20.00	£30.00	
	Present value factor	£0.00	£0.00	£31.55	£16.38	£22.46	£0.00
	Annuity factor	£0.00	£0.00	£0.03	£0.06	£0.04	£0.00
	Annuity ("anyway measure")	£0.00	£0.00	£184.12	£61.04	£258.39	£0.00
	Annuity (Energy saving measure)	£0.00	£0.00	£320.71	£314.16	£437.53	£0.00
	Annuity (energy-related)	**£0.00**	**£0.00**	**£136.59**	**£253.12**	**£179.13**	**£0.00**
3	**Occasion ("anyway measure")**		**New ventilation system**				
	Investment costs			£1,000.00			
	Maintenance costs			£0.00			
	Energy-saving measure		**Heat recovery ventilation system**				
	Investment costs			£1,600.00			
	Financial support (present value)			£200.00			
	Maintenance costs			£0.00			
	Service life [years]			£40.00			
	Present value factor	£0.00	£0.00	£27.45	£0.00	£0.00	£0.00
	Annuity factor	£0.00	£0.00	£0.04	£0.00	£0.00	£0.00
	Annuity ("anyway measure")	£0.00	£0.00	£36.43	£0.00	£0.00	£0.00
	Annuity (Energy saving measure)	£0.00	£0.00	£51.00	£0.00	£0.00	£0.00
	Annuity (energy-related)	**£0.00**	**£0.00**	**£14.57**	**£0.00**	**£0.00**	**£0.00**
	Total annuities (energy-related)	£0.00	£55.78	£610.04	£155.20	£309.91	£0.00
	Cumulated sums	**£0.00**	**£55.78**	**£665.82**	**£821.02**	**£1,130.93**	**£1,130.93**

Boundary conditions: Nominal interest rate 3.0% Inflation 1.0% Real interest rate 2.0%

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EuroPHit

Building assemblies (U-values)

Source file: 'PHPP_V9.3a_CS14_Wilmcote House_BlockA.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan: Wilmcote House - Block A, Portsmouth, GB-United Kingdom/ Britain

Assembly: **01ud-External wall** Area: 0.0 m²

Areas with this assembly: **Wall_507924_E**

Retrofit step: 1-Existing — Until 2014

Subarea 1	λ [W/(mK)]	Subarea 2 (optional)	λ [W/(mK)]	Subarea 3 (optional)	λ [W/(mK)]	Thickness [mm]
Rockwool Quilt	0.044	Timber fraction	0.130			75
Plywood Sheathing (K11/415)	0.130					18
Rockwool Flexi (P10/214)	0.038					175
Cement Particle Board (K11/845)	0.100					12
Rocksmeld System - Insulation (M21/210)	0.036			Plastic fixings	0.500	100
Rocksmeld System - Render (M21/210)	0.300					8

Fraction subarea 1	Fraction subarea 2	Fraction subarea 3	Total
92%	8%	0%	**38.8** cm

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

Retrofit step: 3-Ext. wall+roof insulation, PV system — 2020

Subarea 1	λ [W/(mK)]	Subarea 2 (optional)	λ [W/(mK)]	Subarea 3 (optional)	λ [W/(mK)]	Thickness [mm]
Rockwool Quilt	0.044	Timber fraction	0.130			75
Plywood Sheathing (K11/415)	0.130					18
Rockwool Flexi (P10/214)	0.038					175
Cement Particle Board (K11/845)	0.100					12
Rocksmeld System - Insulation (M21/210)	0.036			Plastic fixings	0.500	100
Rocksmeld System - Render (M21/210)	0.300					8

Fraction subarea 1	Fraction subarea 2	Fraction subarea 3	Total
92%	8%	0%	**38.8** cm

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

preparation for subsequent steps:

13-Photovoltaics	

Assembly: **01ud-External wall**

Advice

Plan / sketch / image

Description

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Window (glazing and frame)

Source file: 'PHPP_V9.3a_CS14_Wilmcote House_BlockA.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan: Wilmcote House - Block A, Portsmouth, GB-United Kingdom/ Britain

Window type:	a-Opening casement 1	Fläche: 0 m²

Retrofit step	Year	Glazing	U_g	Frame	U_f
1-Existing	Until 2014	97ud-Double glazing 4/30mm air/4	#REF!	56ud-EXISTING: synthetic before 1998	1.8

Retrofit step	Year	Glazing	U_g	Frame	U_f
5-Windows + heat recovery vent.	#N/A	0	#REF!	0	#N/A

preparation for subsequent steps:	
1-THERMAL INSULATION ON THE OUTSIDE	Prepare for subsequent thermal bridge minimised connection of the wall insulation
6-ROOF TERRACE INSULATION	Set the French window threshold high enough so that later insulation of the roof terrace will be possible
7-BASEMENT CEILING/FLOOR SLAB INSULATION	The installation position of casement windows and doors in the basement should leave enough head room to allow for opening the window/door, even if insulation under the basement ceiling is installed later on -- or thresholds of french windows should be high enough to allow for subsequent installation of insulation above the basement ceiling
8-PERIMETER INSULATION	In case of a "heated" basement, prepare for subsequent thermal bridge minimised connection to perimeter insulation
10-BOILER	If necessary, decrease the forward flow temperature
11-RADIATORS AND DISTRIBUTION	With Passive House suitable windows, the heaters can be placed anywhere (e.g. next to interior walls).
12-VENTILATION SYSTEM	To avoid mould formation, a ventilation system should be installed at the same time, in case sufficient ventilation (4 times a day) via windows is not possible

Advice

Plan / sketch / image

Description

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Ventilation systems

Source file: 'PHPP_V9.3a_CS14_Wilmcote House_BlockA.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan: Wilmcote House - Block A, Portsmouth, GB-United Kingdom/ Britain

Retrofit step	Year	Ventilation type	Ventilation unit	Heat recovery efficiency	Humidity recovery efficiency	Electric efficiency
1-Existing	Until 2014	3-Only window ventilation	-	-	-	-

Retrofit step	Year	Ventilation type	Ventilation unit	Heat recovery efficiency	Humidity recovery efficiency	Electric efficiency
5-Windows + heat recovery vent.	#N/A	0	0	#N/A	#N/A	#N/A

preparation for subsequent steps:

5-TOP FLOOR CEILING INSULATION	With simultaneous insulation of the top floor ceiling (cost-effective even without general need for renovation) the warm air ducts may be routed in the attic in or under the insulation layer in a space saving manner
11-RADIATORS AND DISTRIBUTION	If the heating load is reduced to Passive House level, supply air heating may be possible (heaters can be omitted completely or in part)

Advice

Plan / sketch / image

Description

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Heating & cooling

Source file: 'PHPP_V9.3a_CS14_Wilmcote House_BlockA.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan: Wilmcote House - Block A, Portsmouth, GB-United Kingdom/ Britain

	Retrofit step:	1-Existing		Until 2014	
		Type	Type	Heating fraction	DHW fraction
Heating	Primary heat generator	7-Other	#REF!		
Heating	Secondary heat generator	-	-	#VALUE!	#VALUE!
		used?	Seasonal performance factor		
Cooling	Supply air cooling	-	-		
Cooling	Recirculatio cooling	-	-		
Cooling	Additional dehumidification	-	-		
Cooling	Panel Cooling	-	-		

	Retrofit step:	5-Windows + heat recovery vent.		#N/A	
		Type	Type	Heating fraction	DHW fraction
Heating	Primary heat generator	-	#VALUE!		
Heating	Secondary heat generator	-	-	#VALUE!	#VALUE!
		used?	Seasonal performance factor		
Cooling	Supply air cooling	-	-		
Cooling	Recirculatio cooling	-	-		
Cooling	Additional dehumidification	-	-		
Cooling	Panel Cooling	-	-		

preparation for subsequent steps:	
12-VENTILATION SYSTEM	Check the possibility of air heating by means of the boiler via a hydraulic post heating coil
3-PITCHED ROOF INSULATION	Install solar collectors only after the roof insulation.

Advice Heating & cooling
Plan / sketch / image
Description

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Photovoltaics

Source file: 'PHPP_V9.3a_CS14_Wilmcote House_BlockA.xlsm' (PHPP version: 9.3)

EnerPHit Retrofit Plan: Wilmcote House - Block A, Portsmouth, GB-United Kingdom/ Britain

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-Existing	none				

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)]
4-Heatpump + solar thermal	4-Mono-Si	83.41	4-Roof	6444.70	79.64
preparation for subsequent steps:					
3-PITCHED ROOF INSULATION		PV installation must take place after roof insulation.			

Advice Photovoltaics

Plan / sketch / image

Description

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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
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