REPORT
PUBLIC

GR CS4: Maroussi, Athens

RENOVATION APPROACH DOCUMENT

outPHit
Deep retrofits made faster, cheaper and more reliable

Call: H2020-LC-SC3-2018-2019-2020 / H2020-LC-SC3-EE-2020-1

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OUTPHIT – DEEP RETROFITS MADE FASTER, CHEAPER AND MORE RELIABLE
outPHit pairs such approaches with the rigour of Passive House principles to make deep retrofits cost-effective, faster and more reliable. On the basis of case studies across Europe and in collaboration with a wide variety of stakeholders, outPHit is addressing barriers to the uptake of high quality deep retrofits while facilitating the development of high performance renovation systems, tools for decision making and quality assurance safeguards.
outphit.eu

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Renovation Approach Description

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1. Executive Summary

Single family house in Maroussi, in the northern area of Athens. The single family house is constructed with three floors, in 1975. The building needed to be renovated because it was too expensive to maintain proper inside temperatures during winter and summer period. So the decision to make the renovation by EnerPHit standard was easy. The owner is a banker so he understood easily the benefit of the Passive House concept in terms of cost and Life Cycle analysis.

For the renovation of the house everything will be calculated and the renovation will take place holistically. The thermal envelope is going to be upgraded with the adequate insulation in order to achieve the EnerPHit Classic standard by using the energy demand method.

What made this renovation a fast, cheap and reliable was the time spend during the designing and the implementation study that took place. Everything was calculated in order to follow a streamlined renovation method. This resulted in a fast renovation with minimum gaps between the necessary phases, the installation of the insulation, then the windows replacement and in the end the installation of the MVHR.

In this project the RES will be implemented by a solar hot water collector with separated hot water tank.

The biggest challenges in this project were the need for the users to stay inside the house during the whole renovation, the limitation of the thermal bridges as well as the fact that everything had to be well described and oriented before the construction start, in order for the owner to be able to proceed in the renovation by his own. The concept was to make it DIY.

Figure 1 Photo taken during the installation of the wall insulation

2. Description of the existing building

The existing building had a moderate to bad efficiency. To be heated in an adequate, but out of the thermal standard, temperature the building used to operate a heat pump with radiators. During the cooling period the building used to struggle to reach the temperatures that where set.

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Figure 2 The existing building before the renovation

2.1. Building data

Year of construction:	1975
Treated Floor Area:	268.6m^2
Number of floors:	3
Number of apartments:	2
Building typology (residential / other):	Residential
Main construction type (e.g. massive)	massive

2.2. Owner data

Name:	Spyros Mavromatis
City:	Athens, Greece
Type (private / housing association):	Private

2.3. Location description

The house is located in the northern part of Athens, in Maroussi area. The climate is considered warm with an annual average external temperature of 17,6°C.

2.4. Original situation

The existing building has a massive construction with pillars and columns from reinforced concrete and brick-concrete walls. The envelope was poorly insulated before the EnerPHit renovation. The situation of the building was moderate as there were some building elements with mold and some bad external surfaces.

2.5. Plans and pictures of the existing building

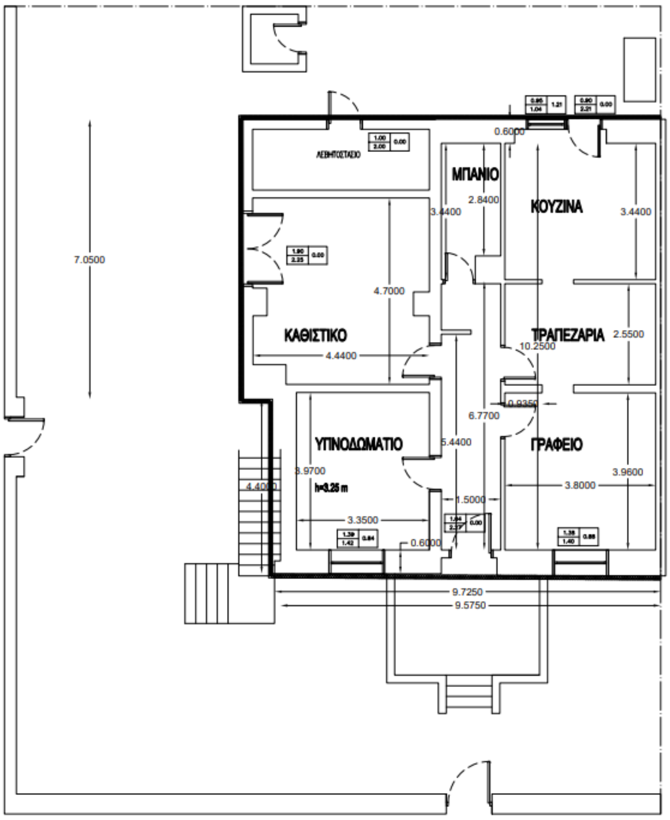

Figure 3 Groundfloor plan of the existing building

Figure 4 Elevation of the existing building

2.6. Envelope of the existing building

External walls

Material:	stone
Thickness:	52[cm]
Surface (Render / Brick / Cladding):	Int. Plaster/Stone wall
U-Value:	2.978[W/(m²K)]

External walls

Material:	brick wall
Thickness:	33[cm]
Surface (Render / Brick / Cladding):	Int. Plaster/ brickwork-concrete/air layer-concrete/ brickwork
U-Value:	1.827[W/(m²K)]

Floor slab Ground

Material:	Reinforced Concrete
Thickness:	25[cm]
Surface (Render / Brick / Cladding):	concrete-cement plaster-tiles
U-Value:	3.876[W/(m²K)]

Roof / Top floor ceiling

Material:	Reinforced Concrete
Thickness:	27[cm]
Surface (Render / Brick / Cladding):	int plaster-concrete slab-cement
U-Value:	3.082[W/(m²K)]

Windows

Material:	Aluminium
Thickness:	5[cm]
Material (Wood / Plastic / Aluminium):	Aluminium
U-Value (Uw, installed):	5[W/(m²K)]

2.7. Technical equipment of the existing building

Ventilation

Ventilation concept:	Window Ventilation

Heating, Cooling and DHW

Heating:	Heat pump with radiators
Cooling:	Three split unit A/C per apartment
Domestic hot water:	Large system of solar DHW with separated 500L storage tank

2.8. Energy efficiency of the existing building

Passive House Planning Package (PHPP)

PHPP calculation:	PHPP_9.6
Space heating demand:	143.12 [kWh/(m²a)]

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Heating Load:	72 [W/m²]
Overheating frequency:	- %
Cooling demand:	30.44 [kWh/(m²a)]
Cooling Load:	35 [W/m²]
Primary Energy Demand:	365[kWh/(m²a)]
PER Demand:	221[kWh/(m²a)]

Final Energy demand

Final energy demand gas:	-[kWh/(m²a)]
Final energy demand oil:	-[kWh/(m²a)]
Final energy demand electricity:	41.4 [kWh/(m²a)]
Final energy demand other:	-[kWh/(m²a)]

Available consumption before renovation

Annual energy consumption gas:	- [kWh/(m²a)]
Annual energy consumption oil:	- [kWh/(m²a)]
Annual energy consumption electricity:	- [kWh/(m²a)]
Annual energy consumption other:	- [kWh/(m²a)]

Available energy costs before renovation

Annual energy costs gas:	- [€/(m²a)]
Annual energy costs oil:	- [€/(m²a)]
Annual energy costs electricity:	- [€/(m²a)]
Annual energy costs other:	- [€/(m²a)]

PHPP verification sheet before retrofit

Specific building characteristics with reference to the treated floor area							The PHPP has not been filled completely; it is not valid as verification
	Treated floor area	m²	268,6		Criteria	Alternative criteria	Fullfilled?[2]
Space heating	Heating demand	kWh/(m²a)	143,12	≤	15	-	no
	Heating load	W/m²	72	≤	-	-	
Space cooling	Cooling & dehum. demand	kWh/(m²a)	30,44	≤	16	16	no
	Cooling load	W/m²	35	≤	-	10	
	Frequency of overheating (> 25 °C)	%	-	≤	-		-
	Frequency of excessively high humidity (> 12 g/kg)	%	0	≤	10		yes
Airtightness	Pressurization test result n_{50}	1/h	8,0	≤	1,0		no
Non-renewable Primary Energy (PE)	PE demand	kWh/(m²a)	365	≤	288		no
Primary Energy Renewable (PER)	PER demand	kWh/(m²a)	221	≤	-	-	-
	Generation of renewable energy (in relation to projected building footprint area)	kWh/(m²a)	17	≥	-	-	

[2] Empty field: Data missing; '-': No requirement

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.

EnerPHit Classic? no

Task:	First name:	Surname:	Signature:
	Issued on:	City:	

3. Renovation approach description

This renovation will be fast, cheap and reliable due to the time spend during the designing and the implementation study that took place. Everything was calculated in order to follow a streamlined renovation method. This resulted in a fast renovation while minimizing the performance gap of the building designed.

The necessary improvements consist of the installation of the insulation, the windows replacement and the installation of the MVHR.

In this project the RES will be included in the energy balance through $12m^2$ of solar panels that they provide hot water in a buffer tank, in order for the owner to be able also to warm his house even with the solar stored power.

3.1. EnerPHit standard approach

EnerPHit standard target (class):	Classic
Climate Zone	Warm
EnerPHit verification method :	Energy demand method

3.2. Design / Consultancy teams

Name:	Hellenic Passive House Institute
City:	Athens
Type (private / housing association)	Private

3.3. Design / Construction periods

Design period:	5.2021 – 10.2021
Construction period:	11.2021 – 6.2022

3.4. Plans and pictures of the renovation

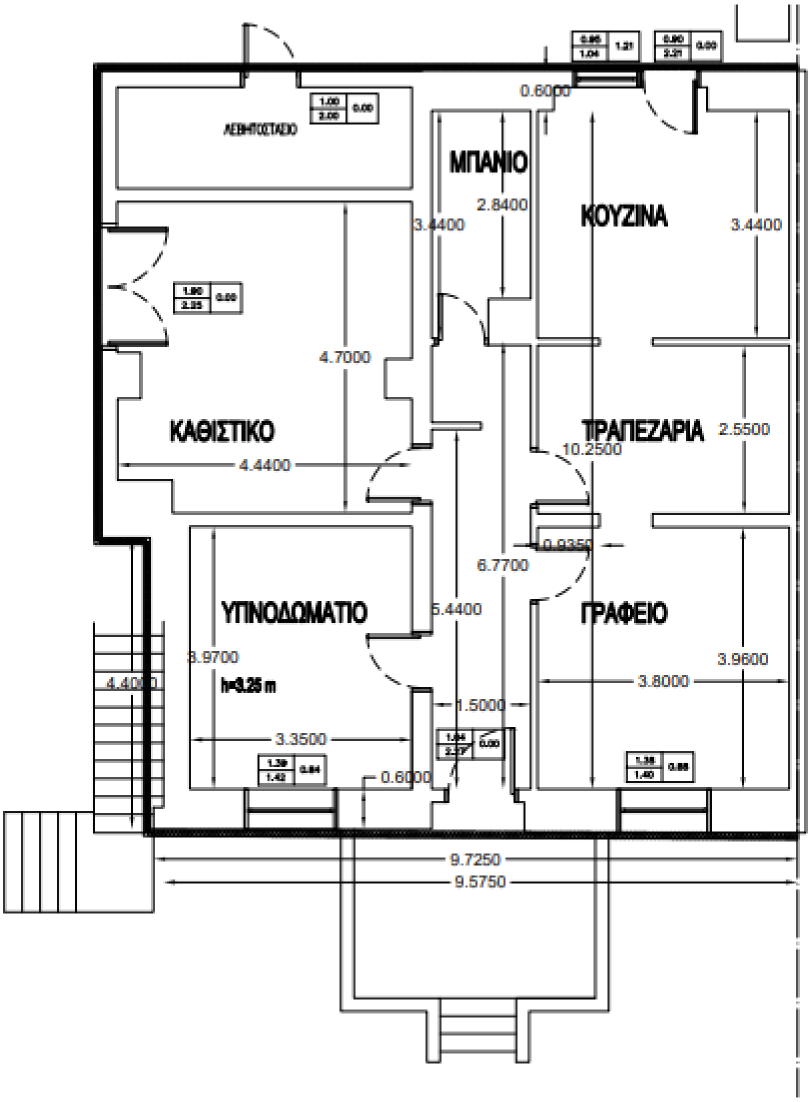

Figure 5 Post renovation groundfloor plan as it remain the same

There are not available connection details

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Photos during the construction phase

3.5. Envelope of the renovated building

External walls

Material:	stone
Thickness:	64[cm]
Surface (Render / Brick / Cladding):	Int. Plaster/Stone wall/ EPS
U-Value:	0.238[W/(m²K)]

External walls

Material:	brick wall
Thickness:	45[cm]
Surface (Render / Brick / Cladding):	Int. Plaster/ brickwork-concrete/air layer-concrete/ brickwork / EPS
U-Value:	0.225[W/(m²K)]

Floor slab Ground

Material:	Reinforced Concrete
Thickness:	25[cm]
Surface (Render / Brick / Cladding):	concrete-cement plaster-tiles
U-Value:	3.876[W/(m²K)]

Roof / Top floor ceiling

Material:	Reinforced Concrete
Thickness:	42[cm]
Surface (Render / Brick / Cladding):	int plaster-concrete slab-cement - EPS
U-Value:	0.188[W/(m²K)]

Windows

Material:	PVC
Thickness:	8.8[cm]
Material (Wood / Plastic / Aluminium):	Plastic
U-Value (Uw, installed):	0.86[W/(m²K)]

3.6. Technical equipment of the renovated building

Ventilation

Ventilation concept (central / decentral)	Central
Ventilation heat recovery efficiency	84%
Ventilation specific efficiency	0.35[Wh/m³]
Ventilation standard air flow rate	265[m³/h]

Add short description if required:

Three separated central ventilation systems in order to service three separated apartments which they were created after the renovation by changing the initial plans.

Heating, Cooling and DHW

Heating:	Heat pump with radiators – A/C
Cooling:	One split unit A/C per building
Domestic hot water:	Solar DHW with separated storage tank

3.7. Summer comfort

Summer ventilation through the windows with about 0.30ach and temporary summer shading eliminating 75% of the solar radiation and fixed shading providing 23% reduction during the cooling period. Active cooling with the split unit A/C.

3.8. Energy efficiency of the renovated building

Passive House Planning Package (PHPP)

PHPP calculation:	PHPP_9.6
Space heating demand:	14.37 [kWh/(m²a)]
Heating Load:	11[W/m²]
Overheating frequency:	-%
Cooling demand:	13.25[kWh/(m²a)]
Cooling Load:	9[W/m²]
Primary Energy Demand:	85[kWh/(m²a)]
PER Demand:	48[kWh/(m²a)]

Airtightness n50 target:	1 [1/h]

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Final Energy demand

Final energy demand gas: -[kWh/(m²a)]

Final energy demand oil: -[kWh/(m²a)]

Final energy demand electricity: 45.72[kWh/(m²a)]

Final energy demand other: [kWh/(m²a)]

PHPP verification sheet after retrofit

Specific building characteristics with reference to the treated floor area

			Value		Criteria	Alternative criteria	Fullfilled?[2]
	Treated floor area	m²	268,6				
Space heating	Heating demand	kWh/(m²a)	14,37	≤	15	-	yes
	Heating load	W/m²	11	≤	-	-	
Space cooling	Cooling & dehum. demand	kWh/(m²a)	13,25	≤	16	16	yes
	Cooling load	W/m²	9	≤	-	11	
	Frequency of overheating (> 25 °C)	%	-	≤	-		-
	Frequency of excessively high humidity (> 12 g/kg)	%	5	≤	10		yes
Airtightness	Pressurization test result n_{50}	1/h	0,9	≤	1,0		yes
Non-renewable Primary Energy (PE)	PE demand	kWh/(m²a)	85	≤	120		yes
Primary Energy Renewable (PER)	PER demand	kWh/(m²a)	48	≤	-	-	-
	Generation of renewable energy (in relation to projected building footprint area)	kWh/(m²a)	17	≥	-	-	

[2] Empty field: Data missing; '-': No requirement

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EnerPHit Classic? **yes**

Task: First name: Surname: Signature:

Issued on: City:

3.9. Predicted energy savings

In space heating demand:	128.75 [kWh/(m²a)]
Primary Energy Demand:	280[kWh/(m²a)]
PER Demand:	173[kWh/(m²a)]
Final energy demand gas:	-[kWh/(m²a)]
Final energy demand oil:	-[kWh/(m²a)]
Final energy demand electricity:	-6.6[kWh/(m²a)]
Final energy demand other:	-[kWh/(m²a)]

3.10. RES strategy

There would not be installed PV Systems

Solar Thermal Systems

Location (Pitched / flat roof or façade):	Flat Roof
Orientation (East / South / West):	South
Technology (Flat Plate / Evacuated tube):	Flat plate
Solar collector area:	12[m²]
Solar contribution (DHW/Heating/Both):	DHW
Annual solar contribution absolute:	3478[kWh/a]

4. Project challenges and opportunities

The challenges in this project were the elimination of the thermal bridges due to the high amount of balconies that extend through the perimeter of the building.

Also the boundary conditions towards the neighbor buildings. Also the fact that we are going to monitor the consumption of the building will give us the opportunity to confirm the percentage of the heat losses, the X factor, that we calculate during the design and the implementation of the PHPP.

5. Current project status

During this pilot project we learnt how to collaborate with the owner that he is not into the construction sector but he is pretty curious, adaptive and fast learner. That way we learn how to guide those people to be able to build their own house and doing it by themselves, like a DIY construction.

We also dive into the elimination of the thermal bridges in the balconies because every building has different wall properties.

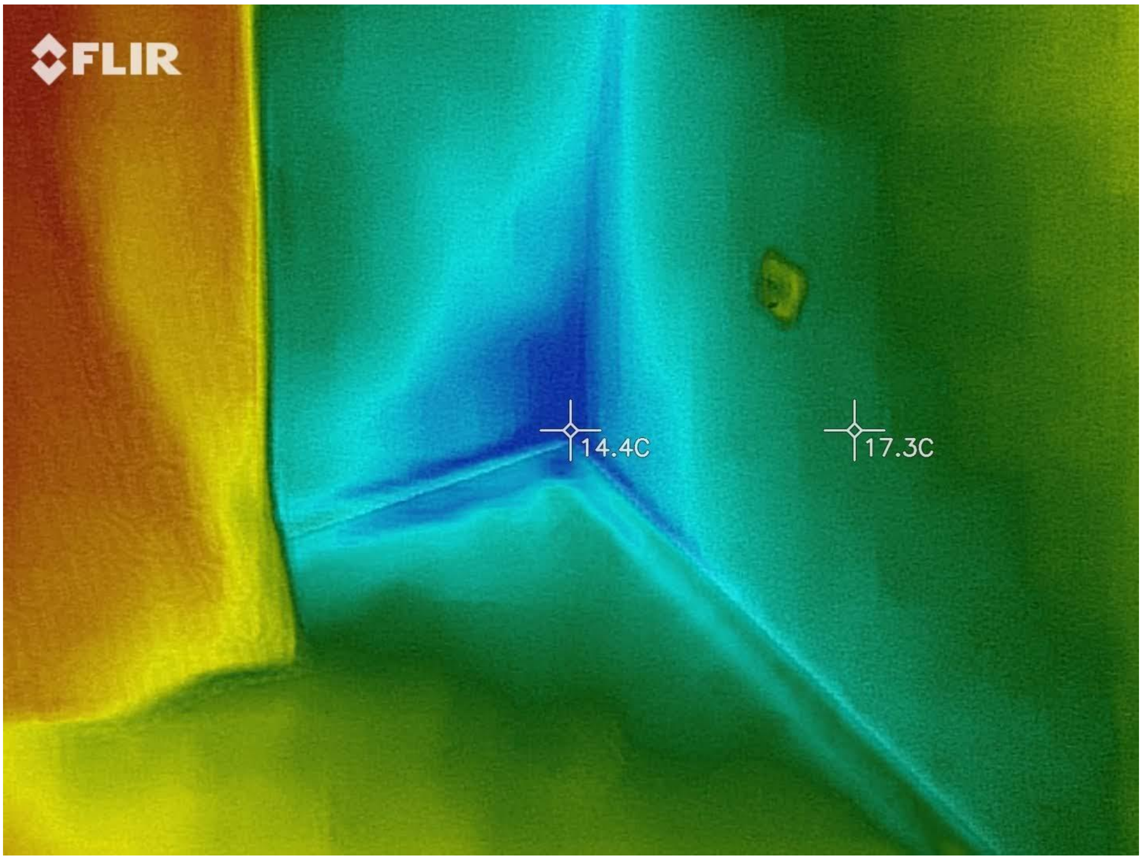

Figure 6 Identification of the thermal bridges

Figure 7 Installation of insulation

Figure 8 Installation of insulation

6. Lessons learnt and guidelines for replication

Short description of the lessons learnt, if available

Add pictures, sketches, details, diagrams, if available

7. Pre-Monitoring description (if applicable)

Number of apartments: 3

Period of pre-monitoring: 2.2021 – 2.2022

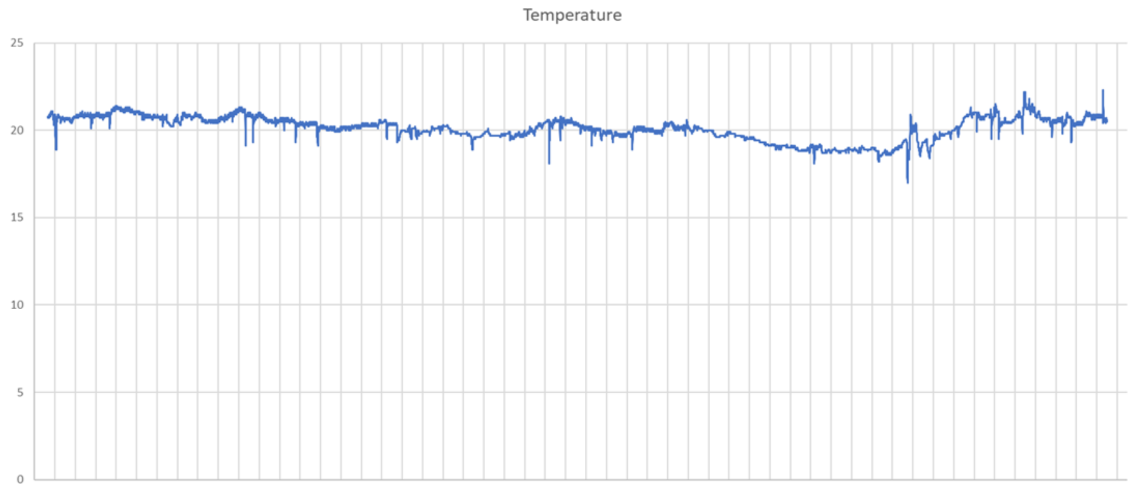

Figure 9 Temperature during November 2021-February 2022