Working Group on Builidings

online

28 September 2022 | 16:00

Passive House Institute

outPHit

Photo: ecoworks

Brought to you by outPHit

For deep retrofits made faster, cheaper and more reliable

outPHit

Oct 2020 – Sep 2023 | EU funded via H2020
with 10 partners from 7 countries

Find out more at **outphit.eu**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 957175. The presented contents are the author's sole responsibility and do not necessarily reflect the views of the European Union. Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

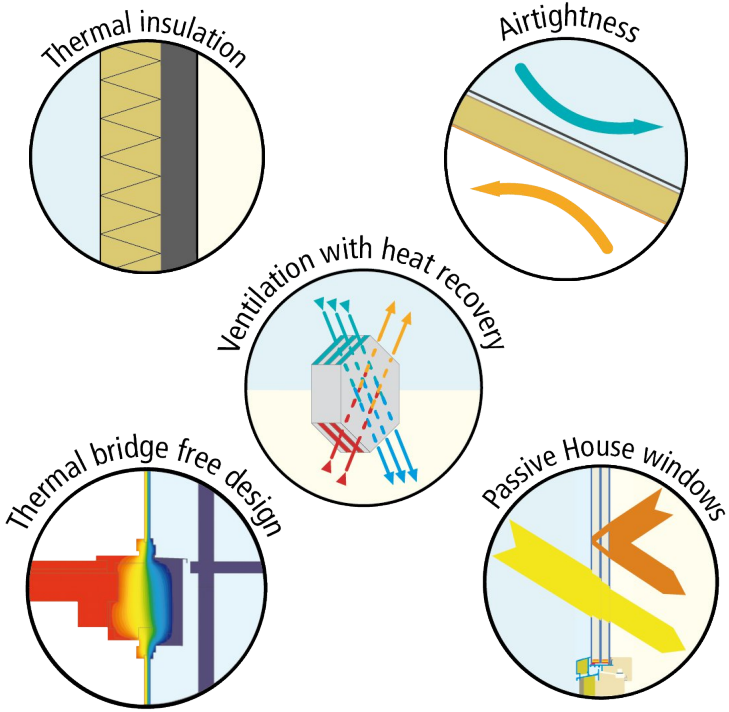
outPHit wants to...

*...lower the barriers to the uptake of high quality deep retrofits by pairing **prefabrication** and **streamlined processes** with the rigour of the **EnerPHit Standard** for renovations according to Passive House principles.*

The outPHit approach

The EnerPHit Standard

- A sound basis in Passive House principles
- A focus on quality, comfort and outstanding performance



Passive House principles | © Passive House Institute

EnerPHit Certified Retrofit Passive House Institute

EnerPHit requirements
Passive House components and very low annual space heating demands*

*climate dependent; in Europe from 15 to 30 kWh/m²a

Energy Standards

Energy standards in PHI's certification scheme:

Passive House buildings are characterised by especially high levels of indoor comfort with minimum energy consumption. The Passive House Standard offers excellent economic efficiency especially for new builds.

The **Passive House Classes Classic, Plus or Premium** can be achieved depending on the use of renewable energy sources

EnerPHit is the established Standard for refurbishment of existing buildings using Passive House components. Despite the slightly higher energy demand, it offers most of the advantages of the Passive House Standard.

The **EnerPHit Classes Classic, Plus or Premium** can be achieved depending on the use of renewable energy sources

The **PHI Low Energy Building** Standard is suitable for buildings that, for various reasons, do not fully comply with the more ambitious Passive House criteria.

Introduction: EnerPHit

Certificate

Passive House Institute
Dr. Wolfgang Feist
Rheinstraße 44/46
64283 Darmstadt, Germany

The Passive House Institute hereby awards the EnerPHit certificate to the following building:

Passive House, Passivestr. 100, P-12345 Passivecity

EnerPHit Certified Retrofit
Passive House Institute

Client:	Paula Passive Passivestr. 100, 12345 Passivecity, Country
Architecture:	Architect's Office Passivestr. 100, 12345 Passivecity, Country
Building Services:	MEP Engineering Office Passivestr. 100, 12345 Passivecity, Country

This building was designed to meet the Passive House component energy retrofit criteria as defined by the Passive House Institute Darmstadt. Given appropriate on-site implementation, this building has the following characteristics:

Building characteristics:	Achieved	Required	
Annual specific space heating demand	99 kWh/(m²a)	≤ 25 kWh/(m²a)	-[1]
Annual specific primary energy demand[2] for heating, DHW, ventilation and all other electric appliances for standard use	999 kWh/(m²a)	≤ 129 kWh/(m²a)	✓
Airtightness of building envelope (no. air change per test Pa)	0.9 h⁻¹	≤ 1.0 h⁻¹	✓
Mean value of individual building component thermal protection :			
Exterior insulation to ambient Thermal transmittance (U-value)	0.999 W/(m²K)	≤ 0.15 W/(m²K)	✓
Exterior insulation to ground[3] Thermal transmittance (U-value)	0.999 W/(m²K)	≤ 0.19 W/(m²K)	-[3]
Interior insulation to ambient Thermal transmittance (U-value)	0.999 W/(m²K)	≤ 0.35 W/(m²K)	✓
Interior insulation to ground Thermal transmittance (U-value)	0.999 W/(m²K)	≤ 0.61 W/(m²K)	✓
Thermal bridges Δ_U Building envelope (window installation excluded)	0.999 W/(m²K)	No limiting value	
Windows Thermal transmittance U_{window}	0.999 W/(m²K)	≤ 0.85 W/(m²K)	✓
Exterior doors Thermal transmittance $U_{insulator}$	0.999 W/(m²K)	≤ 0.80 W/(m²K)	✓
Ventilation unit Effective efficiency of heat recovery	99.9 %	≥ 75 %	✓

[1] Limiting value is not relevant. [2] Limiting value differs for each building. [3] The requirements can not be met (exception applies)

Certification criteria met? Selection of the evaluation method	Space heating demand	
	Component quality	✓

issued:
City, Date

Dr. Wolfgang Feist

EnerPHit Standard:

Quality assurance for retrofit of existing buildings

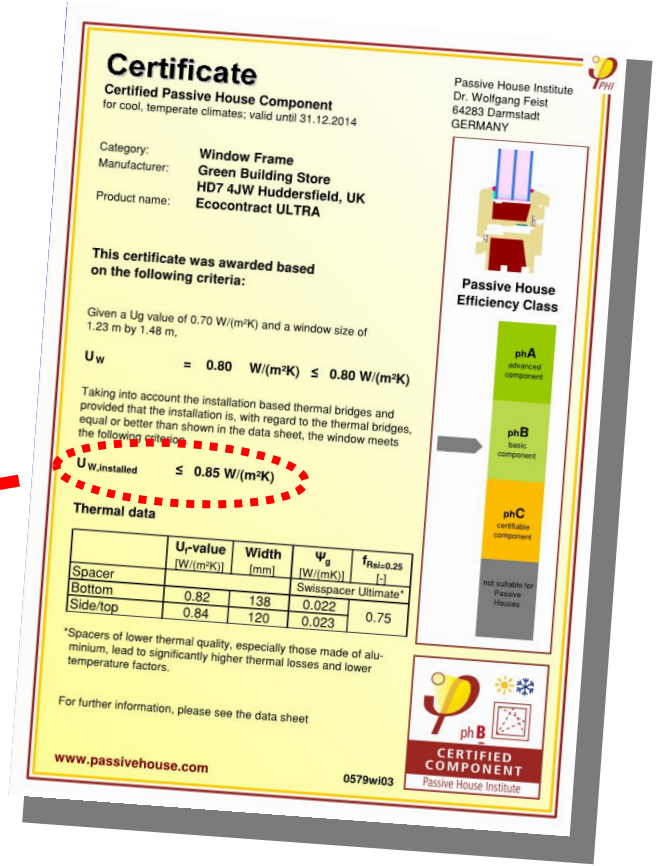
- Guideline and incentive for an optimal efficiency standard
- Quality assurance for building owners
- Market transparency

“Energy Retrofit with Passive House Components”

EnerPHit certification criteria: 2 ways

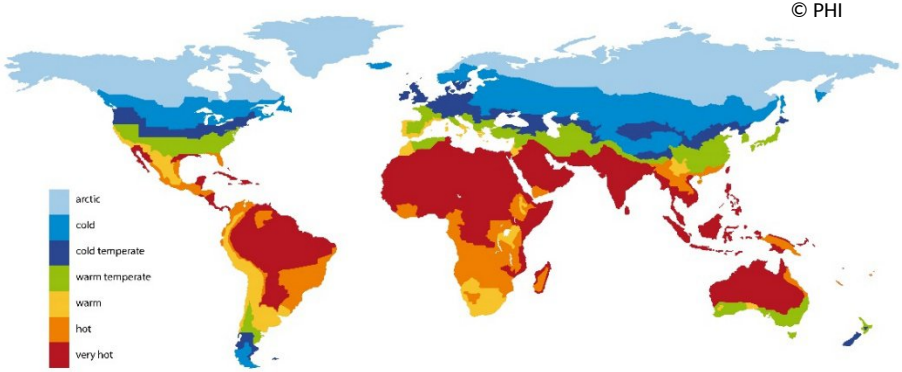
1) Based on component criteria for Certified Passive House Components

Component	Limit value
Opaque exterior components	Exterior insulation: f_T* U ≤ 0.15 W/(m²K) Interior insulation: f_t * U ≤ 0.35 W/(m²K)
Opaque exterior components to ground and unheated basement	f * U ≤ 0.15 W/(m²K) where f: "ground reduction factor" from PHPP "Ground" worksheet
Windows	$U_{w,installed}$ ≤ 0.85 W/(m²K) g • 1.6 W/(m²K) ≥ U_g
Ventilation system	$h_{heat\ recovery,eff}$ ≥ 75 % (incl. duct losses)
Airtightness	limit value: n_{50} ≤ 1.0 h^{-1} target value: n_{50} ≤ 0.6 h^{-1}



2) Heating demand below 25 kWh/(m²a)

Global EnerPHit Criteria



building component method:

Climate zone according to PHPP	Opaque envelope[1] against...				Windows (including exterior doors)				Ventilation	
	...ground	...ambient air			Overall[4]			Glazing[5]	Solar load[6]		
	Insulation	Exterior insulation	Interior insulation[2]	Exterior paint[3]	Max. heat transfer coefficient ($U_{D/W,installed}$)			Solar heat gain coefficient (g-value)	Max. specific solar load during cooling period	Min. heat recovery rate[7]	Min. humidity recovery rate[8]
	Max. heat transfer coefficient (U-value)			Cool colours							
	[W/(m²K)]			-	[W/(m²K)]			-	[kWh/m²a]	%	
Arctic	Determined in PHPP from project specific heating and cooling degree days against ground.	0.09	0.25	-	0.45	0.50	0.60	$U_g - g*0.7 \leq 0$	100	80%	-
Cold		0.12	0.30	-	0.65	0.70	0.80	$U_g - g*1.0 \leq 0$		80%	-
Cool-temperate		0.15	0.35	-	0.85	1.00	1.10	$U_g - g*1.6 \leq 0$		75%	-
Warm-temperate		0.30	0.50	-	1.05	1.10	1.20	$U_g - g*2.8 \leq -1$		75%	-
Warm		0.50	0.75	-	1.25	1.30	1.40	-		-	-
Hot		0.50	0.75	Yes	1.25	1.30	1.40	-		-	60 % (humid climate)
Very hot		0.25	0.45	Yes	1.05	1.10	1.20	-		-	60 % (humid climate)

or alternatively,

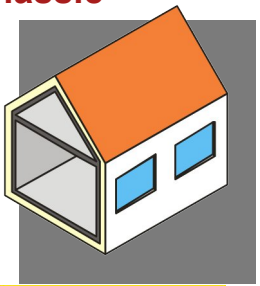
energy demand method:

Climate zone according to PHPP	Heating	Cooling
	Max. heating demand	Max. cooling + dehumidification demand
	[kWh/(m²a)]	[kWh/(m²a)]
Arctic	35	equal to Passive House requirement
Cold	30	
Cool-temperate	25	
Warm-temperate	20	
Warm	15	
Hot	-	
Very hot	-	

EnerPHit Standard: Efficiency first!

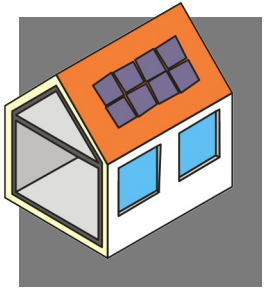
Basic requirement: Low heating / cooling demand

Classic



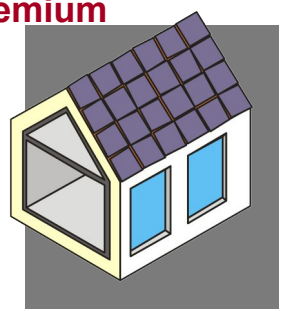
EnerPHit
Certified Retrofit
Passive House Institute
| classic | plus | premium |

Plus



EnerPHit
Certified Retrofit
Passive House Institute
| classic | plus | premium |

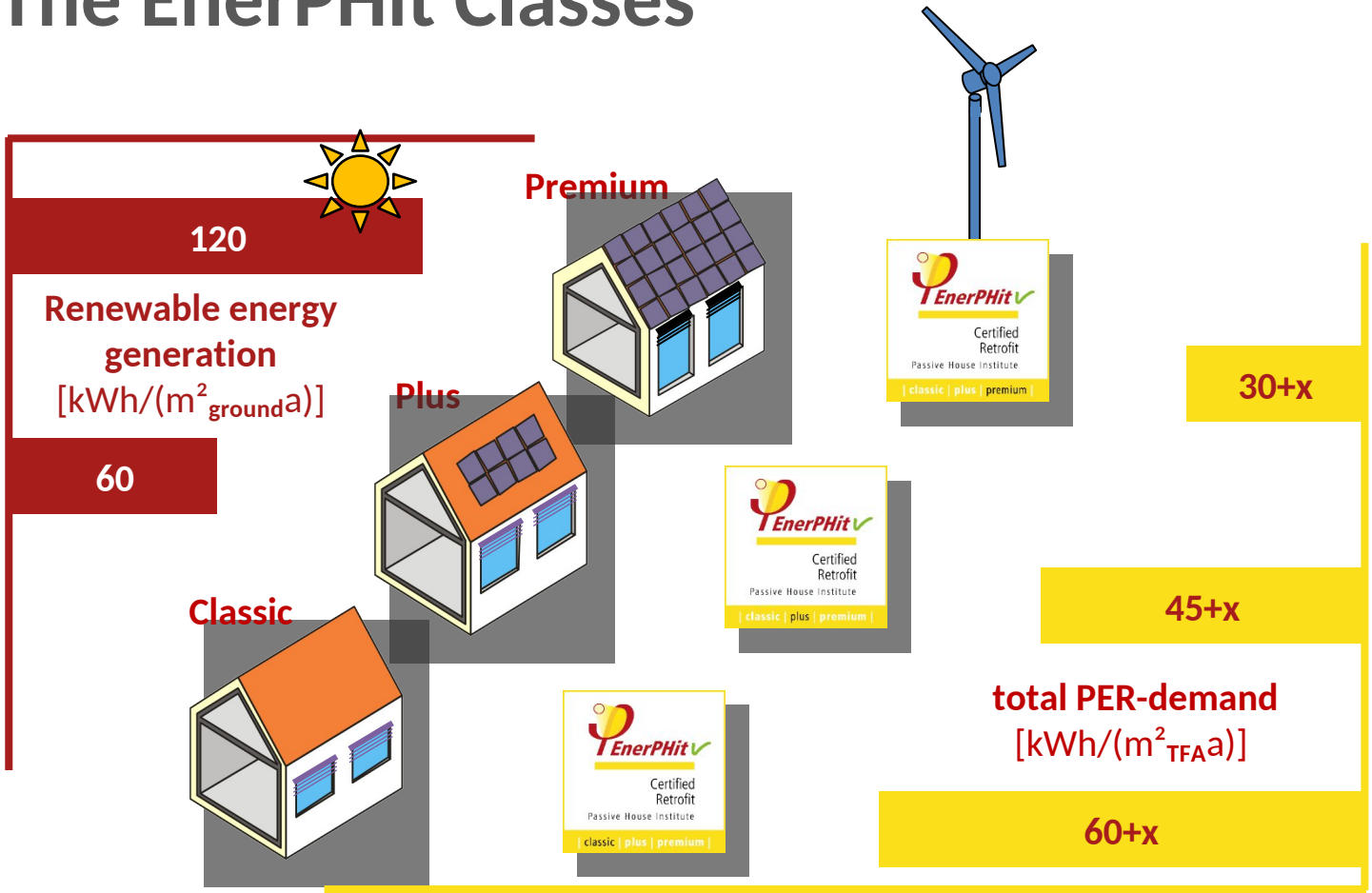
Premium



EnerPHit
Certified Retrofit
Passive House Institute
| classic | plus | premium |

PH components and high energy efficiency (PER) + RES

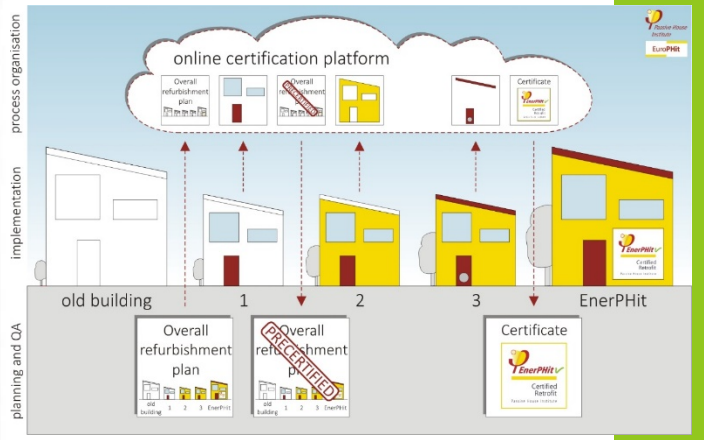
The EnerPHit Classes



Step-by-step retrofits with EnerPHit Retrofit Plan

2017 Retrofit of one Apartment in MFH
Vienna, Austria | TFA: 70 m² (Apartment)
Passive House Database: ID 3759

www.europhit.eu



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

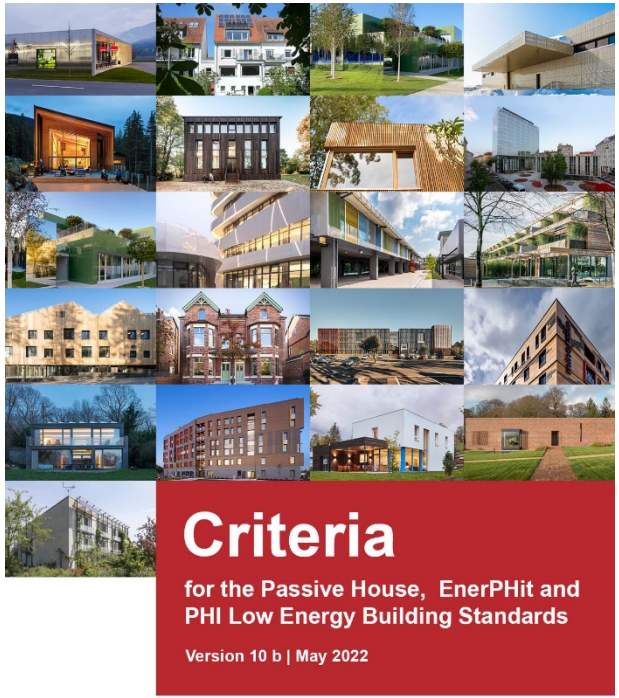
2017 MFH IN28 step-by-step EnerPHit
Innsbruck, Austria | TFA: 4 206 m²
Passive House Database: ID 5528

First EnerPHit plus building

Residential and Business building in 2016
Papagou (Griechenland)
Architekt: Athanasia Roditi
Consultancy: Stefanos Pallantzas

EnerPHit
Certified Retrofit
Passive House Institute
classic | plus | premium

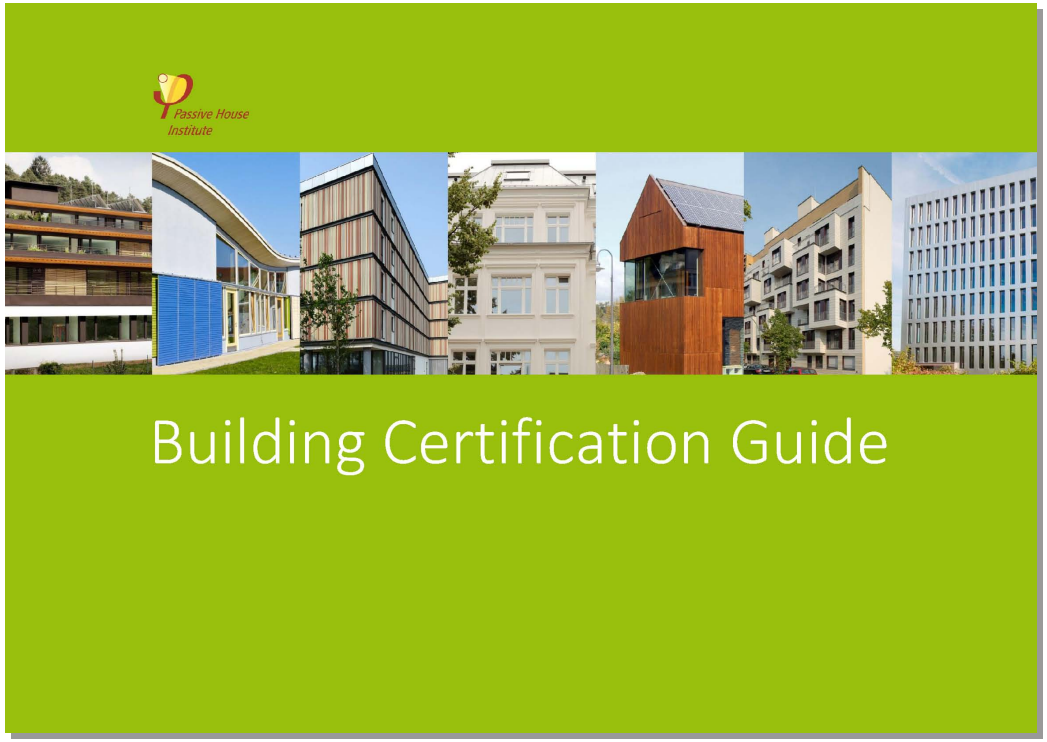
The Criteria Document



Validity of the criteria

- Applicable **worldwide** in any climate
- Applicable for all common usage types like residential buildings, offices, schools, university buildings…
- Applicable for all construction types like masonry, timber, concrete, steel, …
- Criteria are coupled to PHPP version
- English, German and Spanish versions are published by PHI. Translations into other languages are not verified by PHI and are for information only.

Certification Brochure

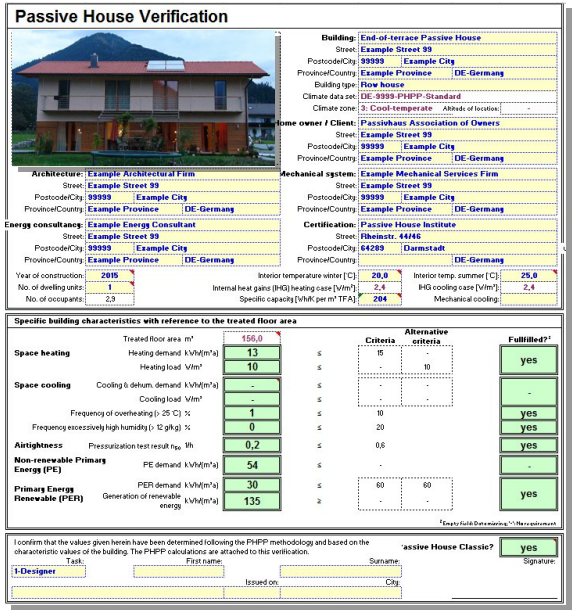


www.passivehouse.com > Certification > Buildings > Building Certification Guide

What does the client receive?

Certificate with ID

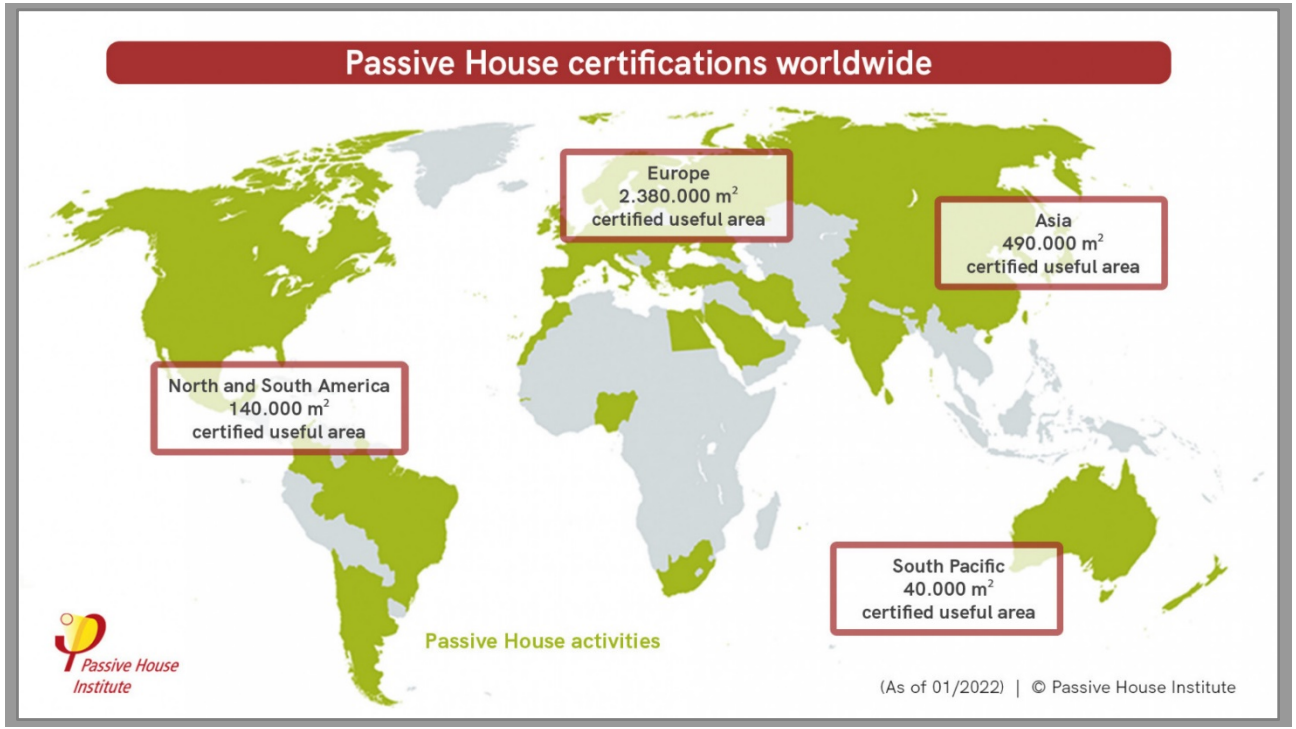
Seal as JPG file for use in context with the building



Booklet (PHPP print-out)

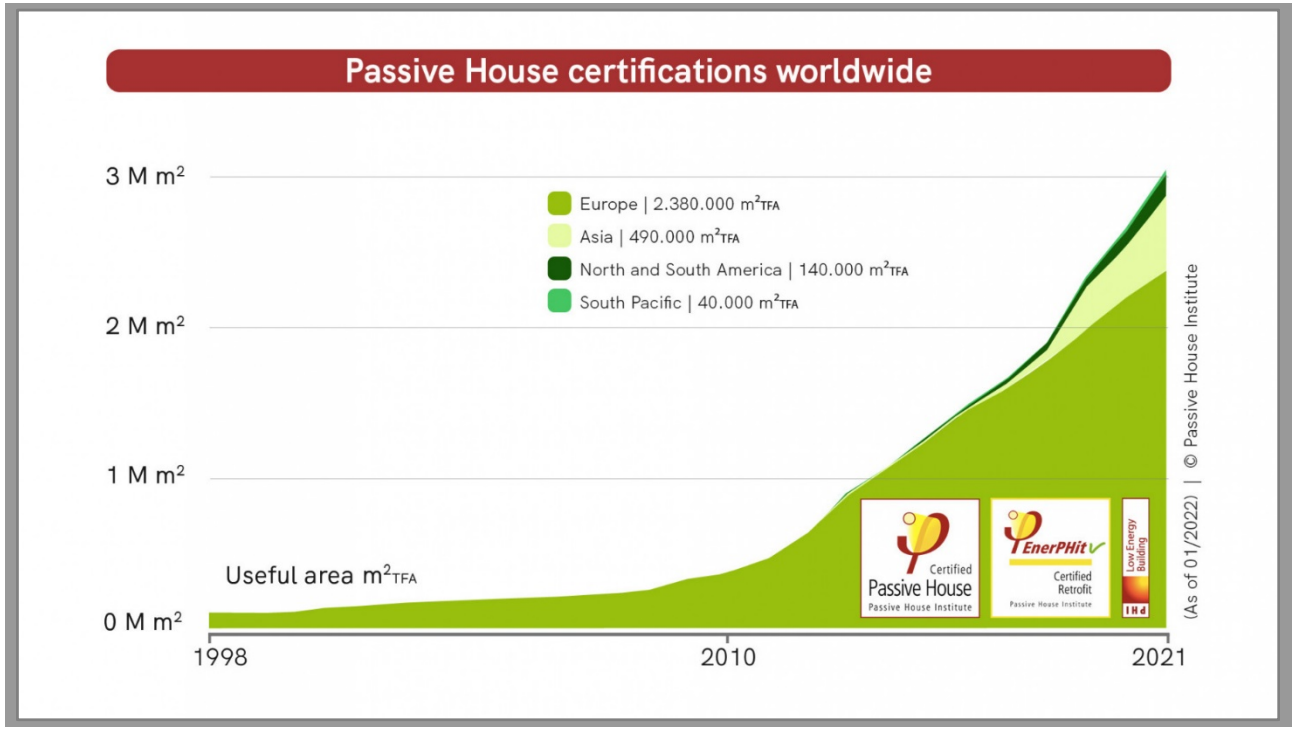
Wall plaque

Passive House all around the world!



www.passivehouse-international.org iPHA

Passive House all around the world!



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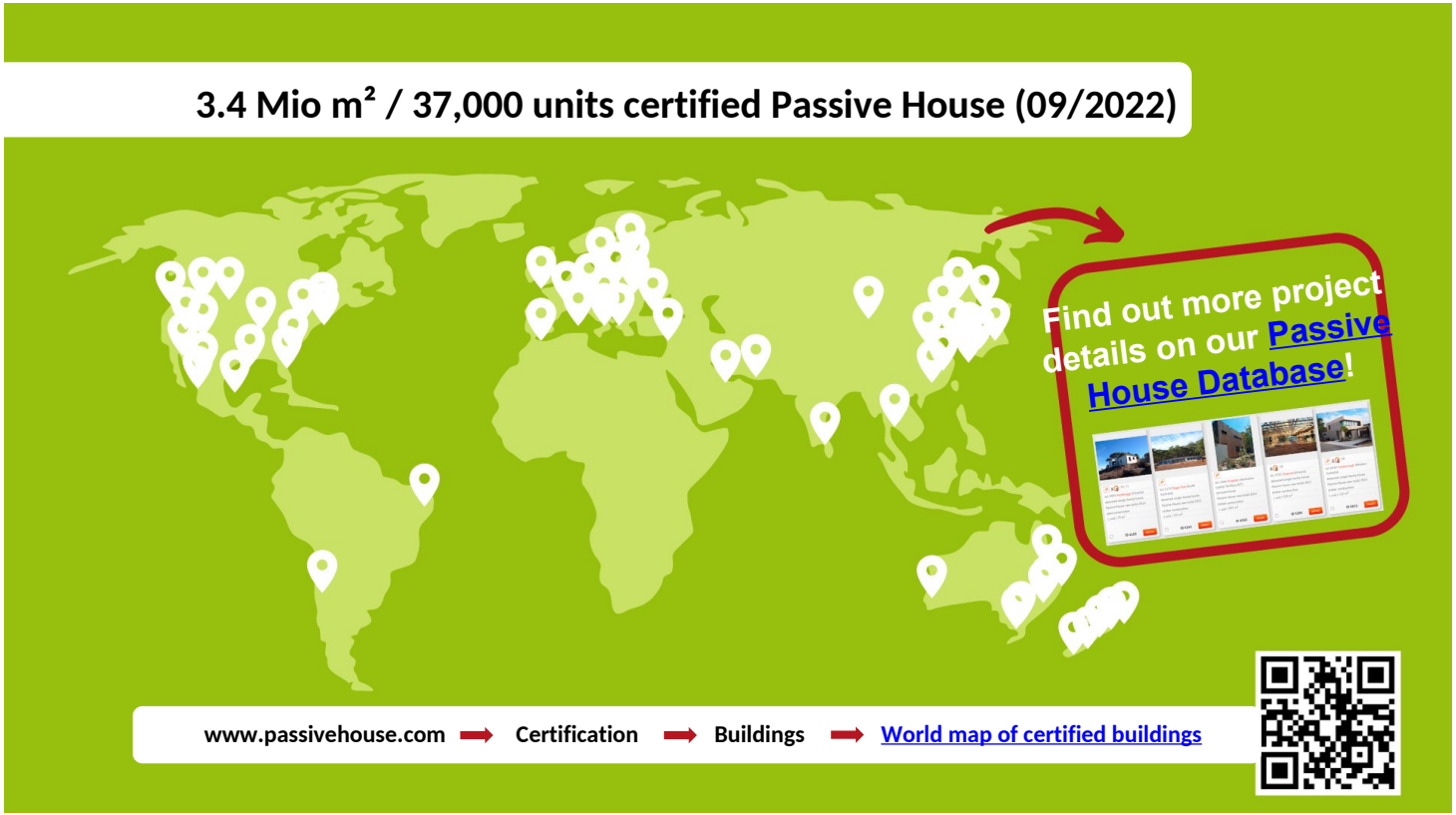


Why should I certify my Passive House?

Passive House Certification provides quality assurance.

Independent review by third

Video

Especially for new builds

For retrofit projects

… and even for difficult cases

My benefits as owner?

- Top quality living standard for the occupants: Comfortable and healthy

- Reliable energy performance

- Better solutions and lower risks due to thorough review by accredited expert ☾ lower construction costs

- Increase in property value

- Standard recognition and eligibility for subsidies *passivehouse-international.org < Passive House < Legislation & Funding*

Benefits for me as the Designer?

- Better solutions and lower risks due to thorough review by accredited expert ☾ lower construction costs

- Recognition as a certified Passive House Designer
  passivehouse.com/training

- Showcase the building via international Passive House database
  passivehouse-database.org

BUT HOW? - Quality is Key to Success

Quality assurance of design and construction

PHPP Design Tools

Certified Passive House – Passive House Institute

EnerPHit Certified Retrofit – Passive House Institute

Quality assurance of materials and components

- Identification of relevant parameters
- Measurement and calculation procedures
- Documentation and integration in whole building performance calculation

Prediction cannot be better than the actual building realisation and the quality of the components

CERTIFIED COMPONENT – Passive House Institute

Components and systems: reliable performance data

Capacity building: Training and certification of

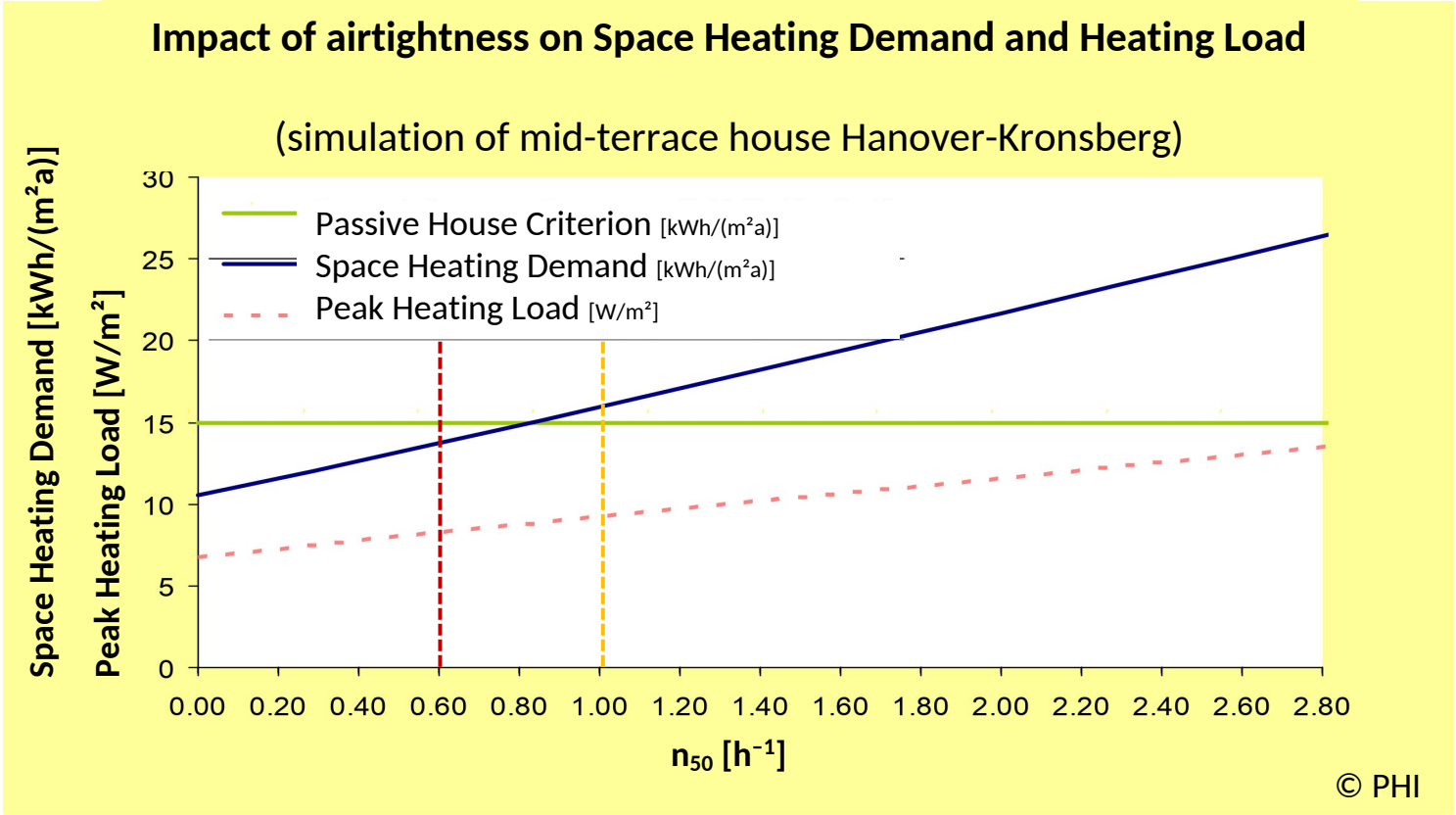
- Designers / Consultants (ca. 10.000)
- Craftsmen (ca. 4.000)

DESIGNER – CERTIFIED PASSIVE HOUSE DESIGNER

CONSULTANT – CERTIFIED PASSIVE HOUSE CONSULTANT

CERTIFIED PASSIVE HOUSE TRADESPERSON – TRADESPERSON

Airtightness and Energy Balance

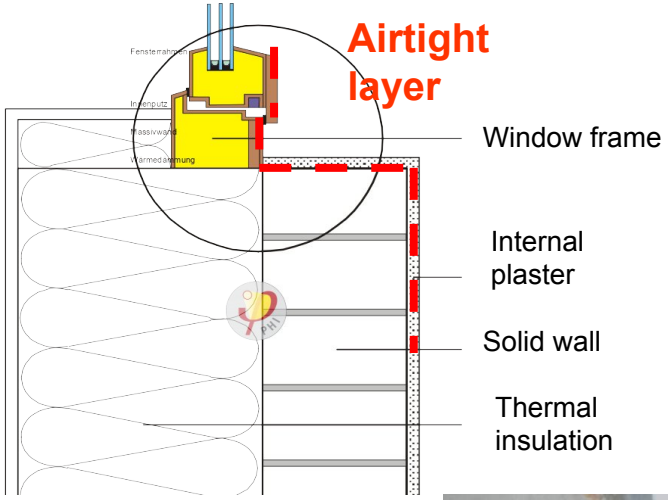


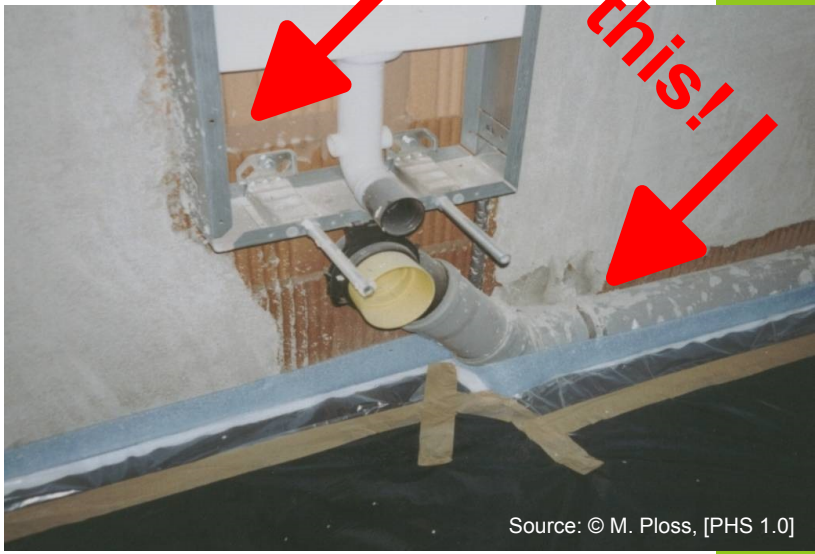
Airtightness

Prepare the connection on site.
Ideally, the surface should be

- dry
- grease-free
- dust-free.

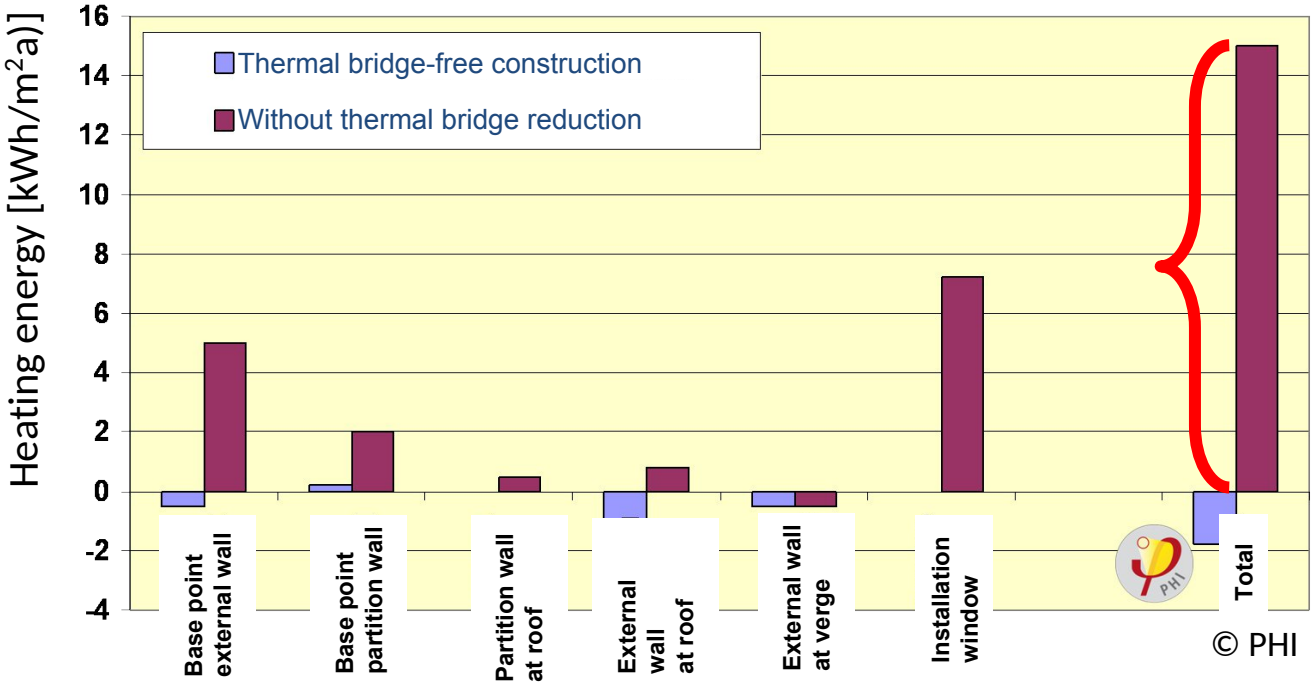
Otherwise, adhesion will not last for long.



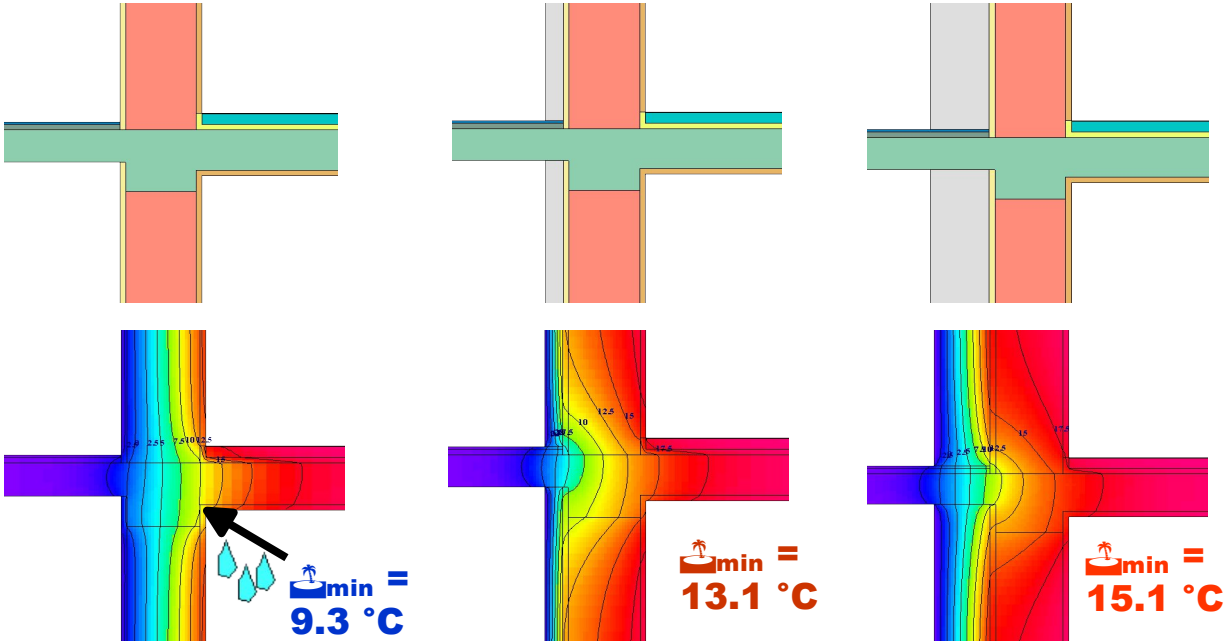


Thermal Bridge-free Constructions

The total sum of heat losses caused by thermal bridge effects corresponds to U_{TB} = 0.1 W/(m²K)



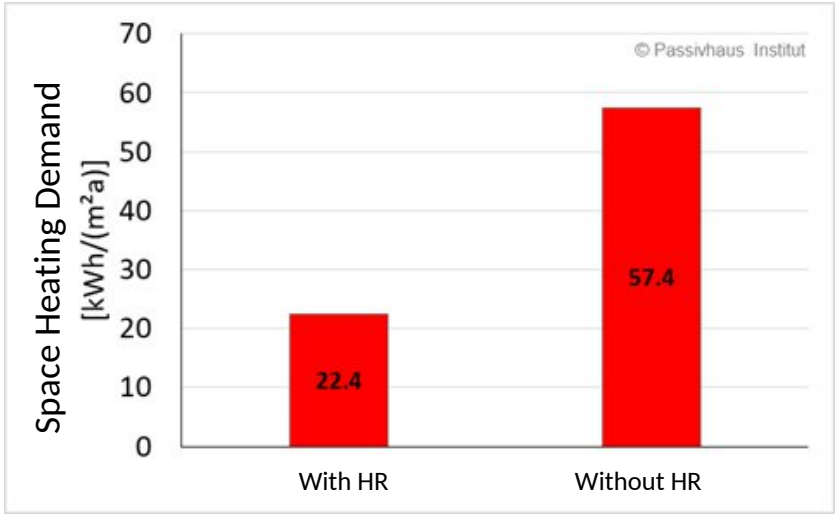
Improvement of Projecting Elements



© PHI

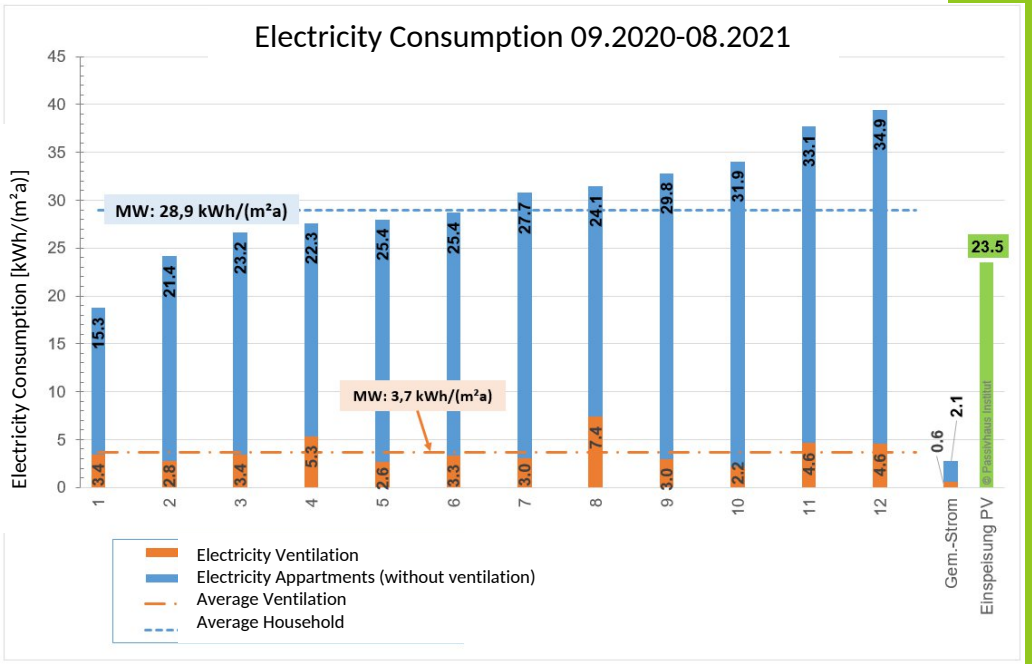
not insulated	conventional	highly efficient
U = 1.37 W/(m²K)	U = 0.41 W/(m²K)	U = 0.16 W/(m²K)
Ψ_{BS} = 0.41 W/(mK)	Ψ_{BS} = 0.57 W/(mK)	Ψ_{BS} = 0.50 W/(mK)

Ventilation with heat recovery



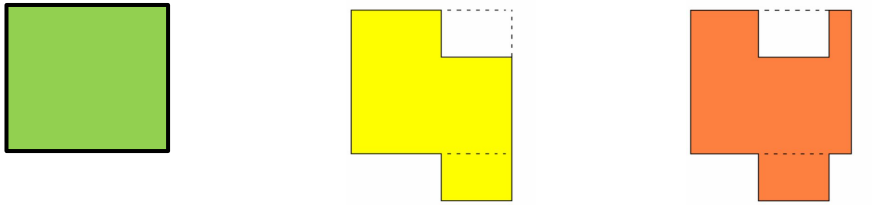
© PHI

© PHI



Compactness

Influence of an increased building perimeter at the same area



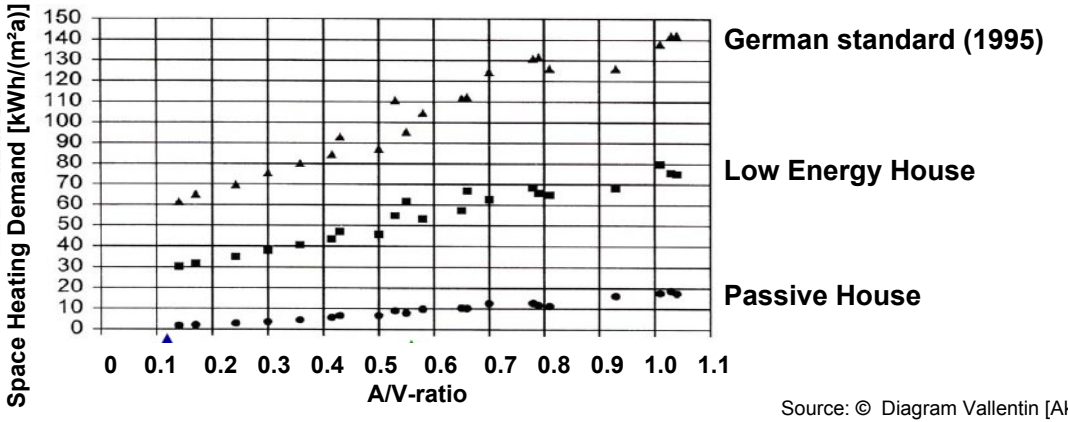
Compact situation

Increase of 10%
Insulation = 20 mm

Increase of 20%
Insulation = 40 mm

Source:
© R. Borsch-Laaks,
[PHS 1.0]

Space heating demand (SHD) varies with area/volume (A/V) ratio

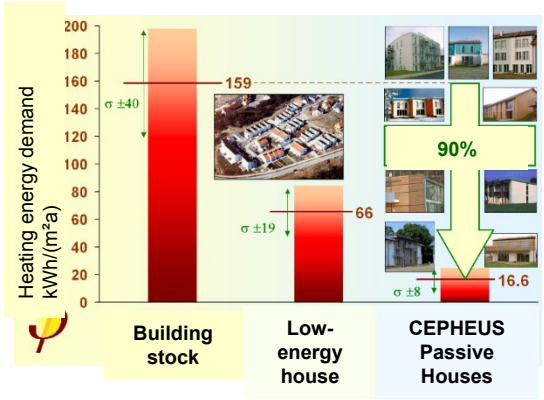


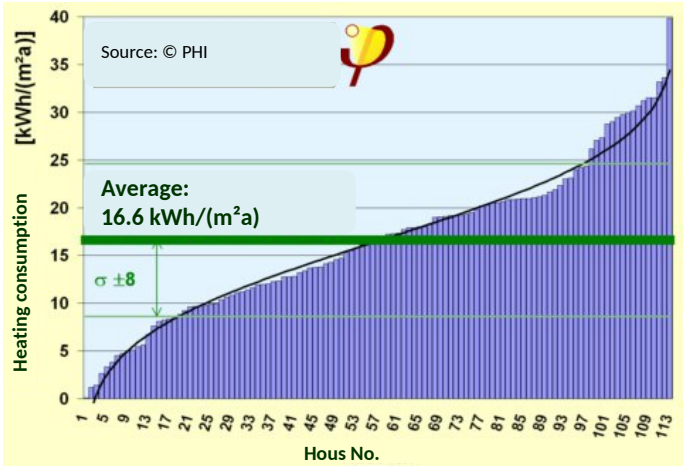
Source: © Diagram Vallentin [AkkP 19]

Passive Houses in Europe

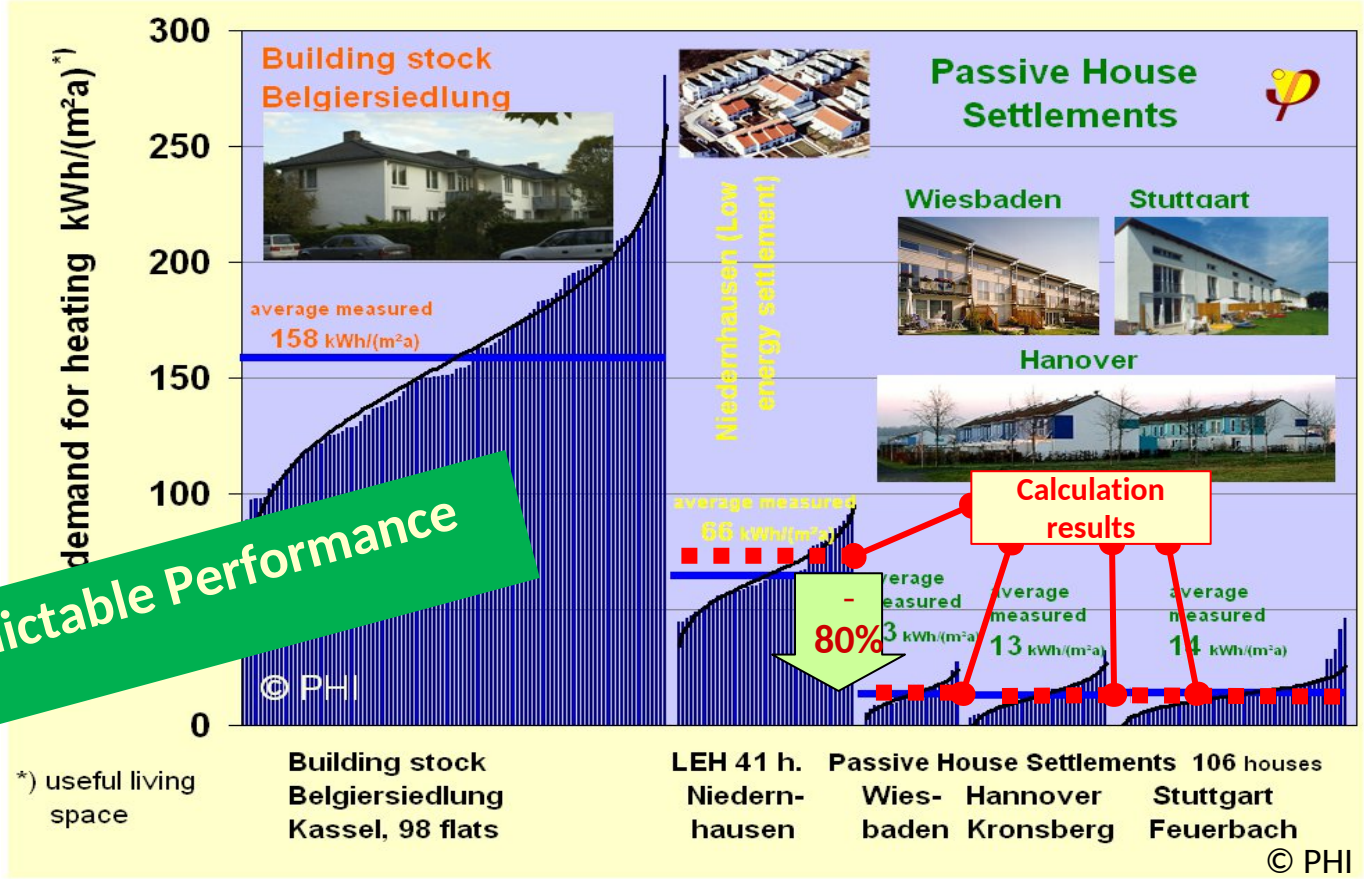
CEPHEUS (1998-2001)

© PHI



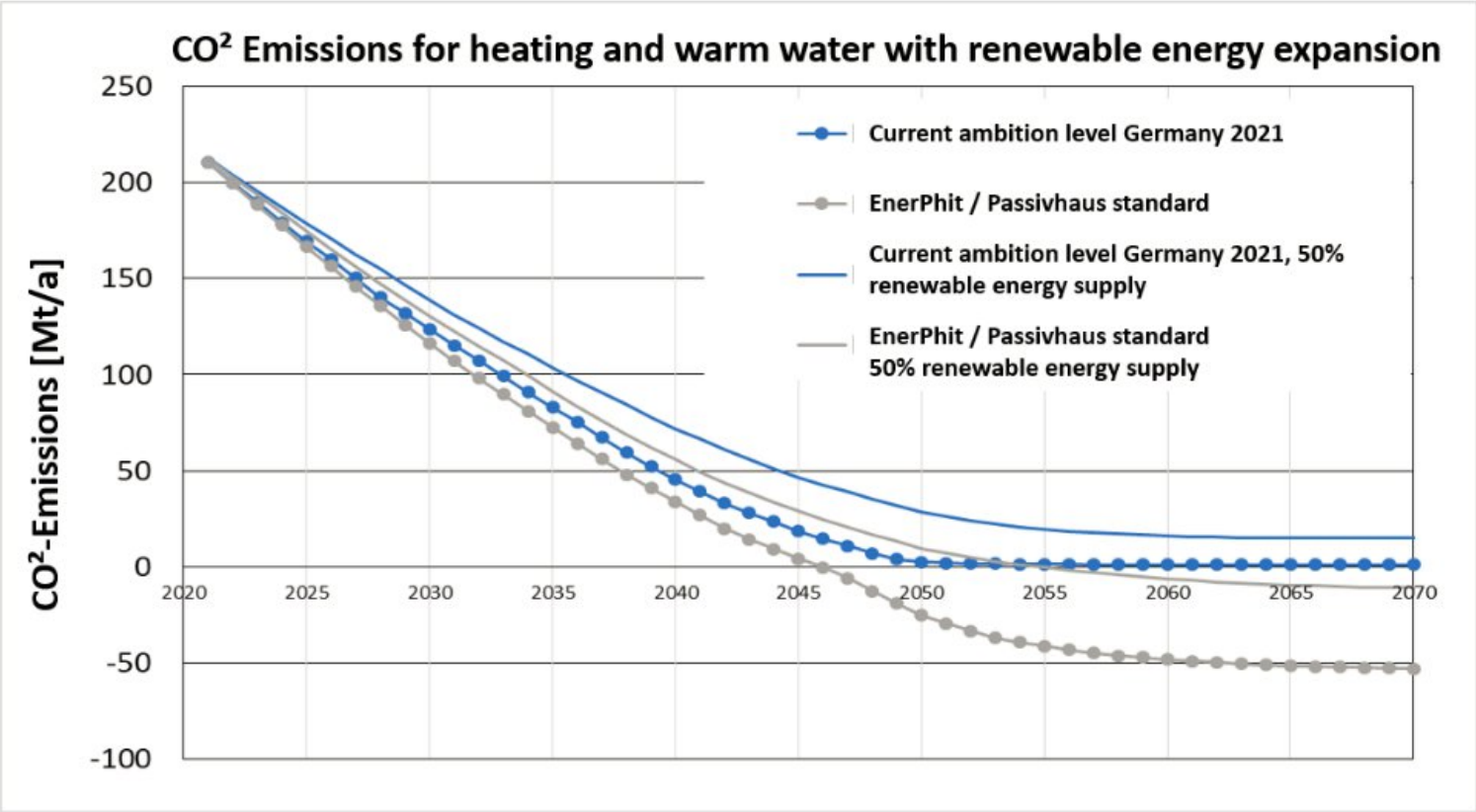


Energy Use IS Predictable



An EPC within the PHPP:

Benefits of going beyond requirements:



outPHit pilot projects


CS02_Papagos / GR


CS09_Lons le Saulnier / FR

CS23_ St. Johann in Tirol / AT


CS25_ Hamburg / DE


CS29_ Bonneuil sur Marne / DE


S17_ Teruel / ES


CS12_Ansoain / ES


OP06_Tavros / GR


CS11_Coulanges-sur-Yonne / FR

OP21_ Innsbruck / AT


CS03_Cholargos / GR


CS27_ Frankfurt am Main / DE


OP01_Papagou / GR


CS14_Mendillorri / ES


OP28_Hamburg / DE


CS22_ St. Johann in Tirol / AT


CS13_Pamplona / ES

CS24_ St. Johann in Tirol / AT

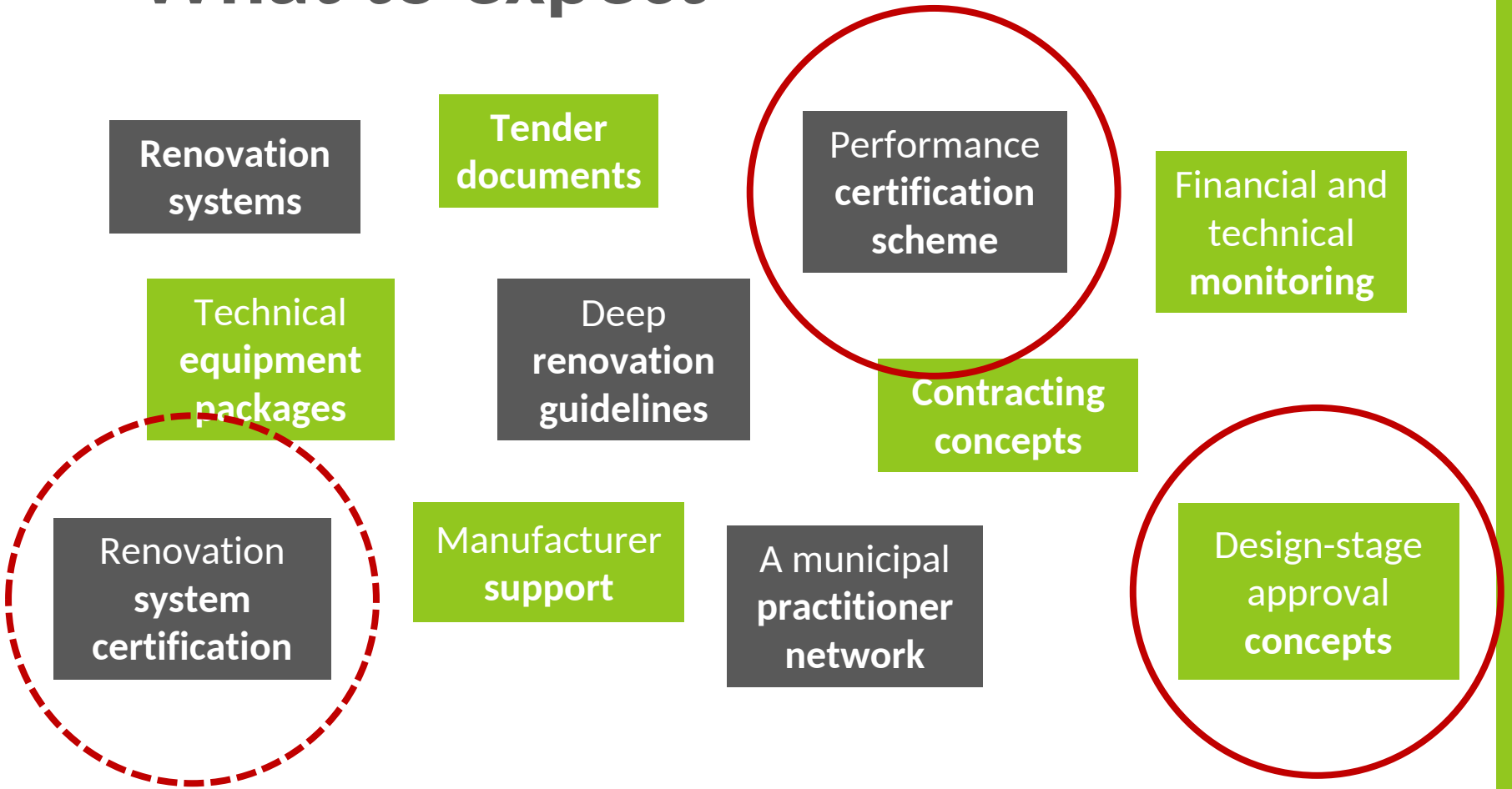

CS04_Marousi / GR


CS26_ Bünde / DE


OP06_Chalandri / GR


CS07_Bagnères / FR

What to expect



The Facts

- **PROJECT LEAD** Passive House Institute
- **PROJECT PARTNERS** 10 partners from 8 countries (AT, BE, FR, DE, GR, NL, ES, BG)
- **PROJECT DURATION** 36 months, until August 2023
- **OVERALL BUDGET** € 2.5 million
- **FUNDING AUTHORITY** European Union’s Horizon 2020 programme

Project team

outPHit

Passive House Institute

International PASSIVE HOUSE Association iPHA

Climate Alliance

universität innsbruck

Passief Bouwen

HELLENIC PASSIVE HOUSE INSTITUTE

EnEffect

ecoworks

NHT

PROPASSIF la transition en action

VAND PASSIVHAUS ARQUITECTURA

Want to learn more?

Get in touch with **jan.steiger@passiv.de**

or visit **outphit.eu**

outPHit

Passive House Institute