EnerPHit

Renovation done right

SUCCESS STORIES WITH THE ENERPHIT STANDARD

outPHit

From September 2020 to August 2024, the outPHit project team promoted deep retrofits in line with the EnerPHit Standard for renovations according to Passive House principles. The approach results in high performance, cost-efficient and reliable renovation. On the basis of model projects and with the cooperation of ten partners in seven different European countries, outPHit demonstrated approaches that facilitate the deep renovation our building stock requires while developing comprehensive solutions to reduce the effort required for planning, execution and quality assurance. **outphit.eu**

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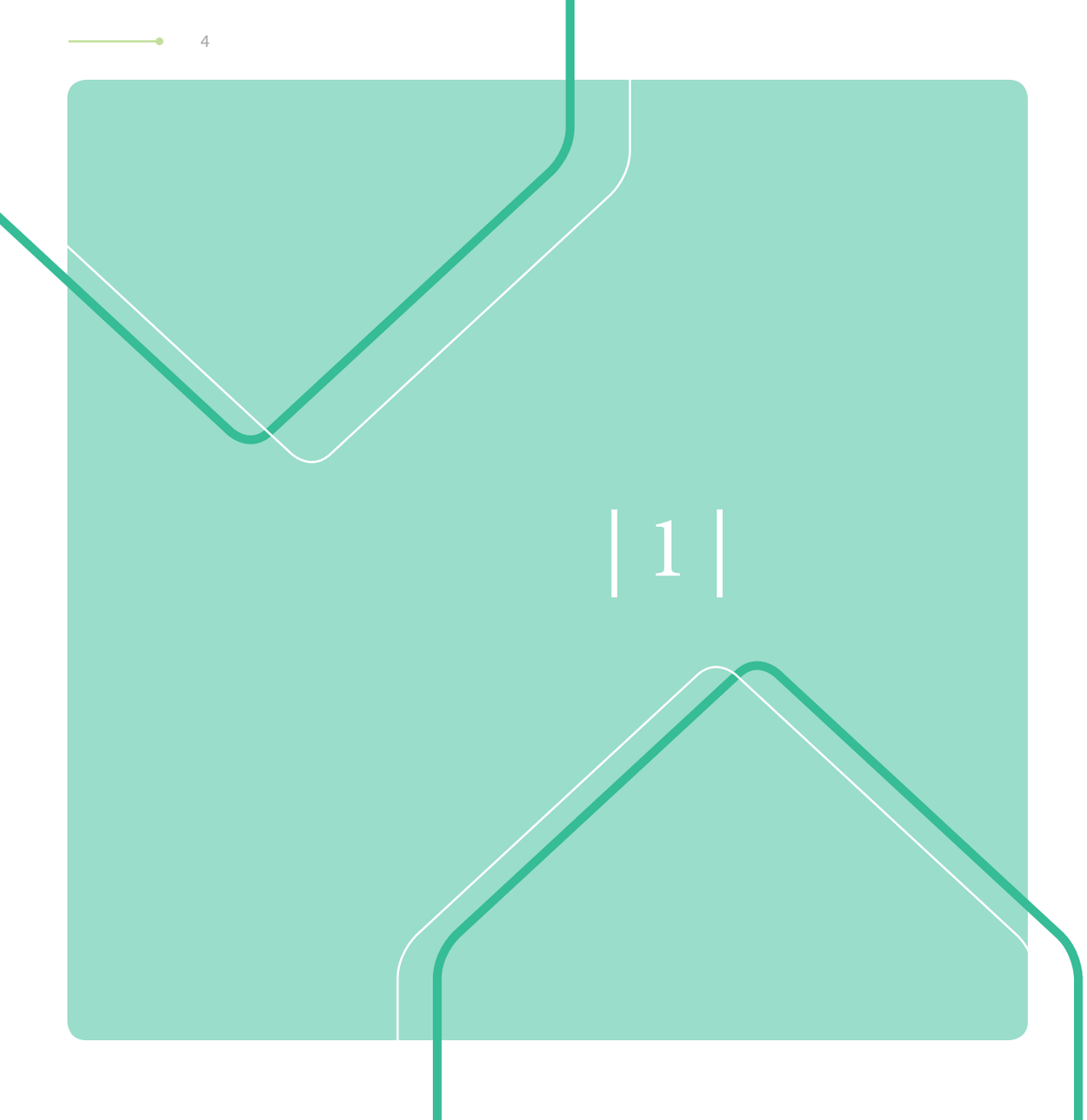


| 1 |

A BLUEPRINT FOR RENOVATION DONE RIGHT

| Performance is key |

Buildings are responsible for nearly 40% of Europe's energy consumption and 35% of its carbon emissions, making them a focal point in the fight against the climate crisis. There is much head-way yet to be made.

An estimated three quarters of Europe's building stock is considered inefficient while roughly 95% of the buildings currently standing will likely remain in use by 2050. It's no wonder decision makers so often point to the need to greatly increase renovation rates. But the way in which we renovate also matters.

How we renovate matters

Not all renovations are created equal. Poor quality renovations can result in lock-in effects with suboptimal improvements typically left untouched for decades if not generations. We simply cannot afford the resulting missed opportunities for energy savings and emissions reductions.

Truly high-performance renovation with a fabric-first approach has the power to substantially mitigate climate impacts while providing manifold other benefits. When we expand our focus to include a building's walls, roof and windows, prioritising its envelope instead of solely focusing on heating and other technical systems, we not only reduce energy consumption but also enhance comfort and health benefits while combatting energy poverty – a triple win. On a societal level, high-performance renovations can also dampen peak loads on our energy grids, boost our energy independence and facilitate our transition to a renewables-based energy system, thus further contributing to our climate goals.

The EnerPHit difference

By aiming for optimal comfort and energy efficiency in our renovation endeavours from the outset, we can avoid lock-in effects and ensure long-term sustainability. This is where the Ener-PHit standard comes into play.

The EnerPHit standard is based on the sound building physics codified by Passive House principles. EnerPHit provides a straightforward and rigorous framework for achieving high-performance renovations that meet stringent energy performance criteria. It emphasises superior insulation, airtightness and efficient ventilation, taking a big-picture approach to energy efficiency.

With the EnerPHit standard as a solid basis, public and private building owners alike can achieve substantial energy savings, reduce carbon emissions, improve indoor air quality and increase comfort for occupants. By further adding photovoltaics, EnerPHit provides an optimal pathway to fulfilment of the European Union's "Zero Energy Building" – making such renovations fit for future in terms of regulatory requirements to boot!

Photo: Building renovated with pre-fab components in Goes Polder, Netherlands | © Chris van den Bos , Van Dillen Bouwgroep

Photo: Balcony installation on a Passive House plus certified serial renovation in Schwalbacher Strasse, Cologne, Germany | © Zeller Kölmel Architekten

| Sound building physics |

EnerPHit is to renovations what Passive House is to new builds – both standards are based on the same, basic physical principles of superior building insulation, thermal-bridge-minimising design, high performance windows, consistent airtightness and ventilation with heat recovery. Both centre on good building physics, pure and simple. And both ensure that the energy savings over a building's lifecycle will more than make up for the upfront investment.

Don't skimp on insulation
Superior building insulation applied in one continuous layer significantly reduces energy transfer through the building envelope, resulting in stable indoor temperatures regardless of external conditions. What constitutes adequate insulation is climate dependent. While 24 cm may be needed to reach the EnerPHit standard in Innsbruck (AT), 14 cm may suffice in the more temperate climate of Madrid (ES).

Minimise thermal-bridges
Thermal-bridge-minimising design addresses points in the building envelope where heat can bypass insulation such as balconies, roller-shutter boxes, wall-basement, wall-roof and wall-window connections. Reducing thermal bridges to a minimum or even eliminating them completely enhances overall insulation performance, prevents condensation and mould issues, provides for even surface temperatures and mitigates energy loss.

Install high-performance windows
High-performance windows, typically triple-glazed and always airtight, provide excellent thermal insulation and solar control. These windows reduce heat loss in winter and limit heat gain in summer, enhancing energy efficiency and improving indoor comfort while also minimising condensation and noise pollution. Additional external shading helps boost comfort during the warmer parts of the year.

Seal up those leaks
Airtightness in the form of a single, undisturbed airtight layer prevents unwanted air leakage, thus reducing heat loss, eliminating drafts, ensuring a stable indoor environment, lowering energy consumption, preventing moisture damage and ensuring the long-term durability of building components. When looking at a drawing of the building, you should be able to trace the whole building envelope without ever lifting your pen from the page.

Provide efficient ventilation
Ventilation systems with heat recovery ensure a continuous supply of fresh air while retaining most of the energy from the outgoing stale air. They are very effective in airtight buildings. This simple and silent technology enhances indoor air quality and comfort by reducing CO_2 concentrations, pollutants and moisture. It also significantly lowers the energy required for heating and cooling.

Passive House principles for EnerPHit renovations

By prioritising deep, high-quality renovations in line with the EnerPHit standard, we can make significant strides towards our climate goals, ensuring that our building stock becomes more sustainable, energy-efficient, and resilient for the future.

These are the main principles behind the standard.

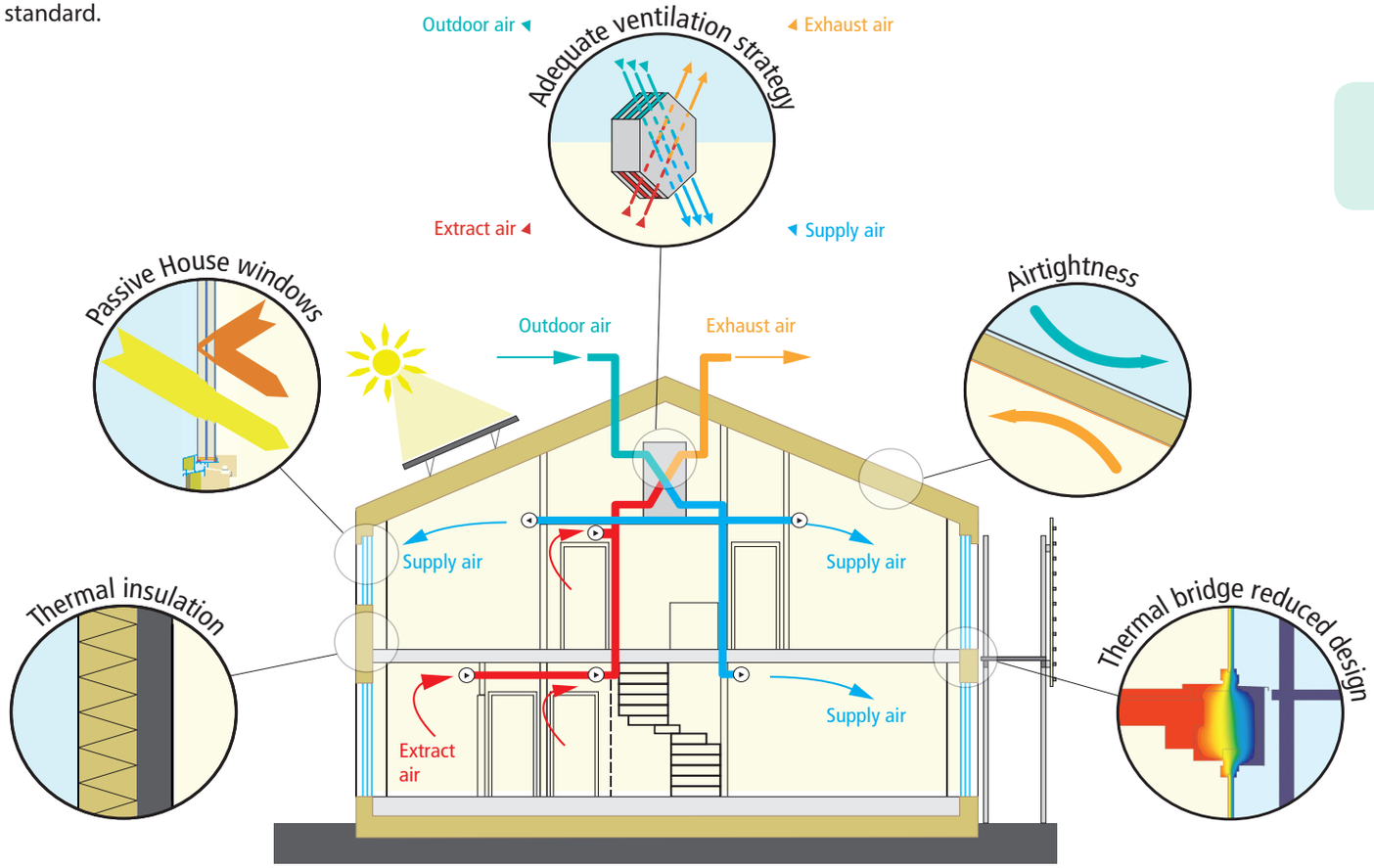


Figure: The five Passive House Principles known from new constructions apply to EnerPHit renovations as well | © Passive House Institute

| EnerPHit criteria |

The EnerPHit standard for renovations offers two compliance methods: the component method and the demand method.

Component method
This method defines specific energy-relevant criteria for individual building components such as windows, roofs, and ventilation systems. These criteria align with the requirements for Passive House suitable components and are thus climate dependent – the colder the climate, the more ambitious the requirements for insulation and window performance as well as for ventilation heat recovery efficacy. A database of suitable components and information on the criteria can be found at database.passivehouse.com/en/components.

With this method, there are no specific requirements for a building's overall heating or cooling demand, making it ideal for trickier retrofitting projects.

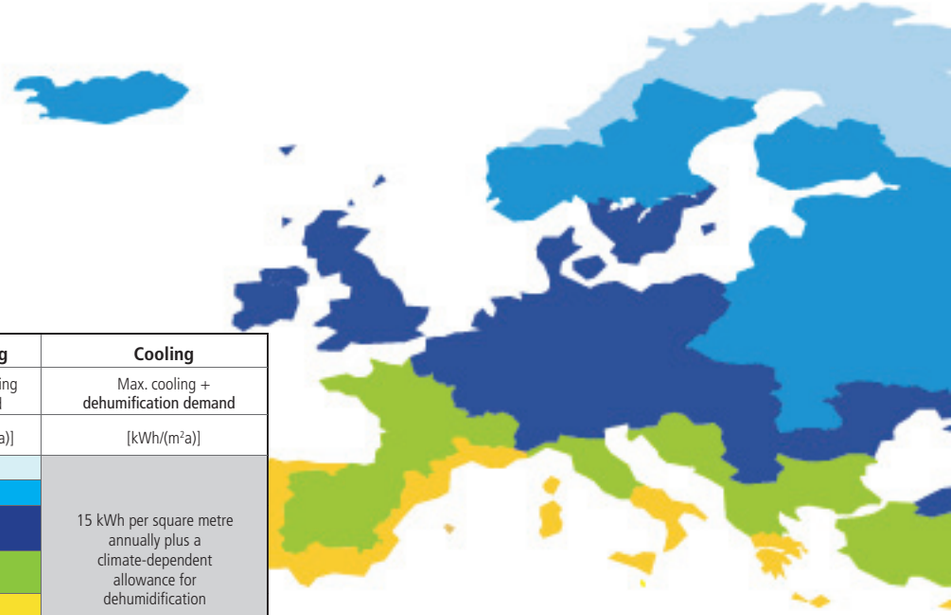
Demand method
Instead of imposing requirements on individual building components, the demand method, just like the Passive House Standard for new builds, sets a limit on the final energy – the energy that comes out of the socket. The ambitious, overall limits on heating, cooling and dehumidification are climate-dependent and designers are free to decide how best to keep building energy use within these boundaries.

This makes the demand method most suited to buildings with conditions favourable to comprehensive high-performance renovation.

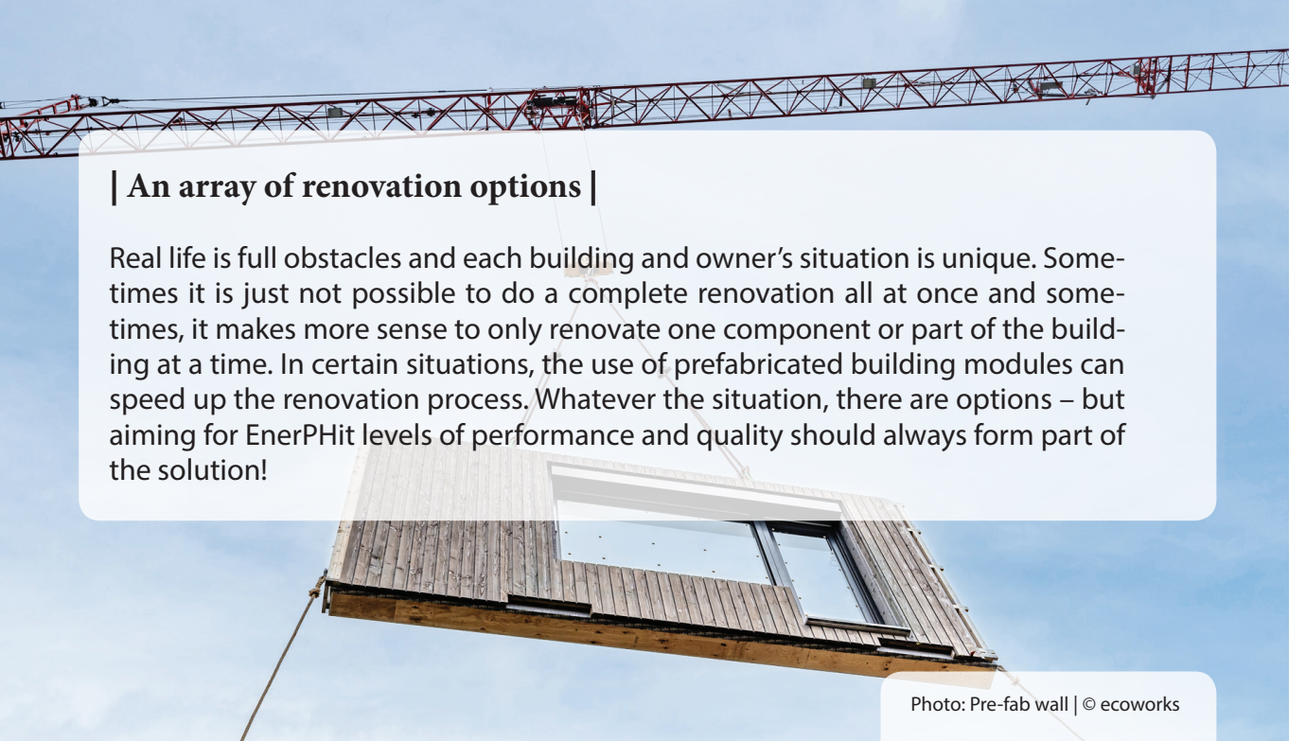
The EnerPHit standard's dual compliance options provide design teams with the flexibility to choose the approach that best fits their individual projects, ensuring high energy efficiency and comfort in the buildings they renovate.

EnerPHit level energy demand
While renovation projects in arctic climates should meet heating demands of 35 kWh per square metre annually, projects in most central European climates would have to target 25 kWh and warmer climates in southern Europe should aim for 15 kWh.

In terms of cooling, EnerPHit renovation projects following the demand method in all climates should strive for 15 kWh per square metre annually with an additional, climate-dependent allowance for dehumidification.



Climate zone acc. to PHPP	Heating	Cooling
	Max. heating demand	Max. cooling + dehumification demand
	[kWh/(m²a)]	[kWh/(m²a)]
Arctic	35	15 kWh per square metre annually plus a climate-dependent allowance for dehumidification
Cold	30	
Cool temperate	25	
Warm temperate	20	
Warm	15	
Hot	-	
Very Hot	-	



| An array of renovation options |

Real life is full obstacles and each building and owner's situation is unique. Sometimes it is just not possible to do a complete renovation all at once and sometimes, it makes more sense to only renovate one component or part of the building at a time. In certain situations, the use of prefabricated building modules can speed up the renovation process. Whatever the situation, there are options – but aiming for EnerPHit levels of performance and quality should always form part of the solution!

Photo: Pre-fab wall | © ecoworks

Step-by-step with EnerPHit

Renovating in a step-by-step manner allows for incremental improvements to a building's energy performance, spreading costs and effort over time but it's best done with the EnerPHit retrofit plan. This approach is particularly useful when budget constraints or practical considerations make a full renovation executed all at once unfeasible. By planning each step to align with long-term energy efficiency goals such as those set by the EnerPHit standard, building owners can gradually reduce energy consumption, improve comfort, and avoid suboptimal interim solutions. This method, also enshrined in the EU's building directive via the building renovation passport, ensures that each phase of renovation contributes effectively to the overall performance, ultimately achieving high standards of efficiency and sustainability.

Individual EnerPHit units

Renovating single apartment units allows for targeted energy efficiency improvements within a multi-unit building, addressing the specific needs and constraints of individual spaces. This approach is beneficial when the entire building cannot be renovated at once due to financial or logistical reasons. By focusing on one unit at a time, owners and tenants can experience immediate benefits such as reduced energy bills and enhanced comfort. Additionally, the approach provides a manageable way to gradually upgrade the building's overall performance, aligning each unit's renovation with long-term goals as set out, for example, in the EnerPHit standard. This method ensures each apartment contributes to the building's collective energy efficiency, paving the way for a more sustainable future.

Entire EnerPHit districts

With the districtPH tool, entire districts can be also be assessed and addressed. This is especially useful in municipal planning and can work synergistically with the European Union's Energy Efficiency Directive, which requires cities with populations of 45,000 or more to develop local heating and cooling plans.

Scan the code to read more about the Passive House and EnerPHit energy standards and to download the building certification criteria.

With the districtPH tool, even entire neighbourhoods can be assessed. Scan to learn more.

EnerPHit with pre-fab

Renovation using prefabricated Passive House modules, sometimes called serial EnerPHit renovation, offers a swift and effective way to upgrade buildings with minimal disruption. Prefabricated modules can be designed to meet specific energy efficiency criteria and assembled offsite. They are then installed onsite, allowing for faster renovation, consistent quality control and a reduction of waste. This approach ensures a seamless integration of advanced energy-saving technologies and superior insulation, significantly enhancing building performance and comfort.

Whether you are renovating a single window, an entire facade, one unit of an apartment complex or a complete building and whether you are looking into conventional renovation approaches or interested in using fully prefabricated modules – be sure that whatever you do is done with an eye to high performance and quality. This is the only way to ward off lock-in effects.

Photo: Pre-fab wall | © ecoworks

Photo: Pre-fab straw bale panels, a certified Passive House component used for renovations | © Ecococon

| 2 |

WHEN WHAT WAS PLANNED IS WHAT YOU GET

Sometimes the best plans are just not executed well and sometimes plans that seem ideal are not actually realistic. In construction, either scenario can mean that the results disappoint in terms of energy performance, quality, comfort, costs or otherwise. It also typically translates into lock-in effects that hinder us from reaching our climate goals.

Unfortunately, underperformance happens more often than one might expect and typically goes undetected. Quality assurance is of the essence. With EnerPHit, a variety of quality assurance mechanisms are available to help building planners, owners and occupants ensure that what they plan is what they actually get in the end – and that the renovation investment is money well-spent.

Photo: © Passive House Institute

Learn more at
bit.ly/PHPP_tool

The PHPP

The PHPP or Passive House Planning Package, is where quality assurance begins – not only for Passive House new builds and EnerPHit renovations, but also for other low energy buildings. This transparent and Excel-based planning tool delivers precise energy demand results and has been proven reliable by thousands of architects and planning experts over the last two and a half decades. The tool also comes with an increasing number of newer add-ons made possible by outPHit including assessments for overheating risk, energy demand coverage via renewable systems and the embodied or upfront energy contained in the materials used.

For general guidance on renovation approaches, building owners can take advantage of outPHit's Decision Support Tool. The web-based tool compares retrofit concepts for a specific building on the basis of general data and is available free of charge at desuto.outphit.eu.

Find accredited designers at
bit.ly/AccreditedDesigners

Scan to download the **Description for a design-stage-approval concept**

Find out more at
database.passivehouse.com/en/components

Certified designers

Accredited Passive House designers and consultants help ease the planning process from the start. Many also have experience with EnerPHit renovations. These professionals are well-versed in using the PHPP design tool – essential for precise planning of extremely efficient buildings.

Design stage approval

The success of a renovation is best ensured early on – beginning with its design and planning. Design stage approval establishes a preliminary and independent validation of energy-efficiency-relevant planning even before construction begins. This is especially useful in step-by-step renovations with roadmaps stretching far into the future. Design stage approval offers all parties involved – from the occupants to the architects to the funding bodies – the certainty that the targeted efficiency can actually be achieved.

Component certification

Using building components that have been quality assured helps bring more certainty into the planning and execution of a project. Component certification has long been available for individual windows, insulation systems, ventilation units and more. The options for high quality building components are constantly growing. A growing number of quality certified renovation systems and prefabricated building modules, especially useful for renovations, will soon also be available.

PASSIVE HOUSE CERTIFIER
Passive House Institute accredited

Find an accredited certifier at **bit.ly/BuildingCertifiers**

Building certification

Certification of the entire building once renovation is completed, including the onsite execution of what was planned and construction documentation such as the airtightness test, is perhaps the most well-known quality assurance mechanism. A network of accredited building certifiers worldwide can provide certification for EnerPHit renovations.

Post-renovation monitoring

To really understand whether a building delivers on what was promised, building performance after renovation can be monitored. The verified building performance scheme can independently confirm a building's actual energy consumption in an occupied state, post-construction, so that adjustments to building services can be made as needed. Optionally, planners will be able to enter their building into a centralised database that will compile all monitoring data in real-time – an innovation made possible by the outPHit project that allows you to really see if what was planned is what is being delivered!

Many certified Passive House new builds and EnerPHit renovations have documented their outstanding results on passivehouse-database.org.

Photo: Calle de Cartagena apartment complex renovation in Spain | © PAEE Construcción Passivhaus-ECCN

| 3 |

ENERGY EFFICIENCY SUCCESS STORIES – A VITAL SOLUTION FOR CURRENT CRISES

Unfathomable heatwaves, soaring energy costs, rising rents and spreading energy poverty – those are just a few of today's crises people throughout Europe are fighting. Renovating to the EnerPHit standard is one powerful solution, providing liveable homes with comfortable indoor conditions along with low heating and cooling costs! In the following chapter, we highlight four remarkable examples of energy-efficient retrofits from across Europe. Theses success stories showcase the profound impact and value of deep retrofits, emphasising the need for increased ambition in the buildings sector to address current challenges.

The following success stories were part of the EU Horizon 2020 outPHit project. In this capacity, they all highlight the project's main principle: making deep retrofits faster, cheaper and more reliable. To achieve this, the outPHit project combined streamlining approaches such as serial renovation and prefabrication with the rigour of the Passive House principles for energy-efficient renovations but also showed how traditional renovation is improved by using the EnerPHit method and certified Passive House components. The project's case studies have shown how successful the application of these approaches can be in practice – reducing the costs of living, speeding up the renovation process and ensuring sustainable and energy-efficient living conditions for all!

Photo: Building in Papagos, Greece, before its EnerPHit renovation | © Hellenic Passive House Institute

The house before the renovation was very cold and very damp. Before we retrofitted, the indoor temperature fell as low as 8.5°C. Now this seems like a bad dream. The temperature inside the house can be easily kept at 20°C to 25°C year round. If it goes any higher or lower, 30 to 60 minutes of heating or cooling will bring us back into range.

The humidity now always stays between 30 and 50%, depending on outside conditions – something that we could have never imagined before when the average indoor humidity was typically over 80%.

These are living conditions that I wish all people could enjoy in their homes.

— Resident of an EnerPHit renovation in Papagos, Greece

Photo: Building before renovation | © Aris Stavropoulos

01

| A renovation that beats the heat in Greece |

Papagos, Athens, Greece

Mould-infested with interior temperatures ranging from 8°C to 40°C, annual oil bills amounting to €3,500 for heating and cooling costs of up to €1,500 — that was the grim reality for the residents of a 1970s house in Papagos. But not anymore. Thanks to deep renovation within the framework of the outPHit project, living conditions have drastically improved. Consistently comfortable temperatures are now paired with running costs of less than €900 annually for heating and cooling combined. The result: a comfortable and sustainable home.

EnerPHit renovation
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Want to learn more?
Contact the team from the Hellenic Passive House Institute!

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THE BUILDING BEFORE RENOVATION

Building type:	Detached house
Size:	150 m²
Construction type:	Massive construction with 20 m of balconies, concrete pillars and columns as well as uninsulated brick-concrete walls | 1970s
Heating:	Oil-based
Cooling:	Air conditioning
Windows:	Double-glazed with aluminum frames
Budget:	€80,000

Renovation approach: Streamlined retrofit

The primary objective was to achieve a fast, cost-effective, and reliable renovation. The consultancy and design team from the Hellenic Passive House Institute adopted a comprehensive and streamlined retrofit approach following the EnerPHit standard's component method. This approach involved a very detailed design and precise calculations, which accelerated the work onsite. In addition, the design team provided specialised workshops onsite for the tradespeople prior to construction. The time invested proved worthwhile, resulting in fewer on-the-spot decisions during the construction phase, less waste and faster implementation.

This complete renovation included insulating the facade, roof, and pillars; installing new triple-glazed windows with insulated PVC frames; minimising thermal bridges while greatly enhancing airtightness; integrating a ventilation system with heat recovery to both save energy and improve indoor air quality; and adding a solar hot water collector with a hot water tank.

| Before |

| Follow the renovation journey |

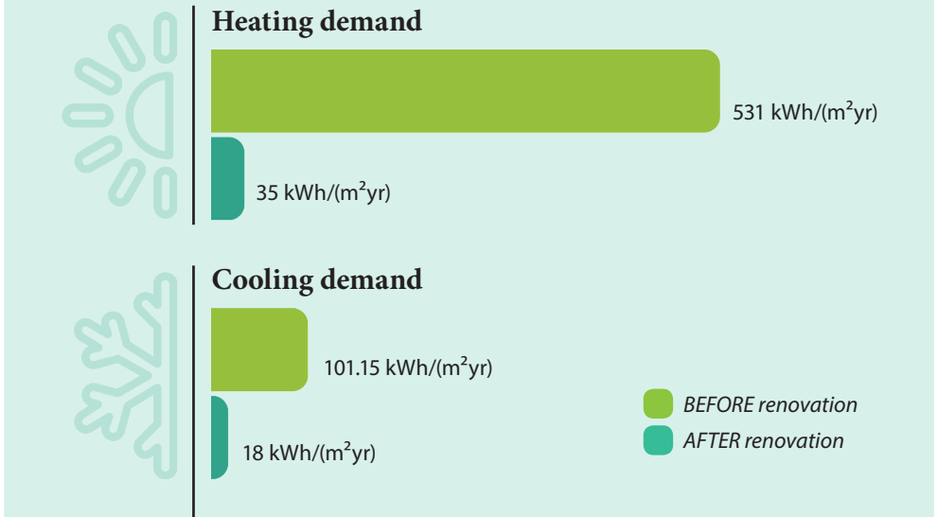
Before renovation | © Aris Stavropoulos - Renovation process | © Hellenic Passive House Institute - After renovation | © Maria Dimitriou

Renovation success story

What makes this retrofit project so special? The streamlined renovation process allowed for a fast renovation with minimal performance gaps between project phases and, all the while, residents were able to remain in the home. The house's numerous pillars and columns, initially major thermal bridges, were also ingeniously insulated along with the balcony, thus overcoming a significant challenge.

The Hellenic Passive House Institute's efforts paid off: with a single split unit for heating and cooling, indoor temperatures now range from 19°C to 27°C, electricity bills are 30% lower and the oil bills for heating, which totalled thousands of euros annually, are now a thing of the past. Most importantly, the homeowners are delighted. During the hottest days of summer 2023, when temperatures across the country exceeded 40°C, the building's performance exceeded all expectations, keeping them at a comfortable 27°C or less.

| A look at the numbers |



| After |

This project really drives home how crucial energy-efficient renovations are in Southern Europe's increasingly hot climate. With temperatures that surpass 40°C not uncommon for the area, having a home that can keep residents comfortable with minimal energy input is a must. The residents in Papagos can vouch for this first-hand. They were blown away by the heightened quality of life the renovation provided, especially during the scorching heatwave of 2023!

— Stefanos Pallantzas, Hellenic Passive House Institute

Photo: Building before renovation | © Nuria Díaz Antón, VAND arquitectura

02

| A blueprint for social housing in Spain |

Teruel, Spain

The social housing complex in Teruel, dating back to the 1970s, was both uncomfortable and unhygienic with sky-high energy consumption pushing tenants into energy poverty. During the winter, indoor temperatures would sink below 15°C, resulting in pervasive mould. These challenging conditions prompted the Aragon Regional Government, the building's owner, to take decisive action. They were able to address these issues directly with the support of the VAND team through the outPHit project.

EnerPHit renovation
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THE BUILDING BEFORE RENOVATION

Building type:	Apartment house
Size:	615 m² (10 apartment units)
Construction type:	Concrete skeleton with an uninsulated double-leaf façade, uninsulated roof as well as an unheated attic and basement | 1970s
Heating:	Electric
Cooling:	None
Windows:	Single-glazed with metal frames
Budget:	€1,222,495

Renovation approach: Streamlined retrofit

A comprehensive renovation strategy employing EnerPHit's components certification method was adopted for this building, whereby outdated and inefficient building elements were replaced with Passive House certified components. Key measures included insulation of the entire building envelope and certain interior walls (for example, between units); replacement of windows, doors, and roller shutters; enhancement of airtightness and mitigation of thermal bridges; as well as installation of a ventilation system with heat recovery and a central heat pump for heating, cooling and domestic hot water. The project was successfully completed within a tight timeframe of five months.

Renovation success story

Gone are the days of frigid indoor temperatures during the winter or scorching living quarters during the summer for tenants at this social housing complex. Energy-efficient retrofit measures have completely transformed this Teruel building so that its apartments are now completely free of mould with high indoor air quality and consistently comfortable temperatures. The substantial reduction in heating demand has lifted many residents, who previously could not afford to adequately heat their apartments, out of energy poverty. Furthermore, the newly installed central heat pump can also be used for cooling,

| Follow the renovation journey |

Renovation process | © Nuria Díaz Antón, VAND arquitectura - Before and after renovation | © Nuria Díaz Antón,

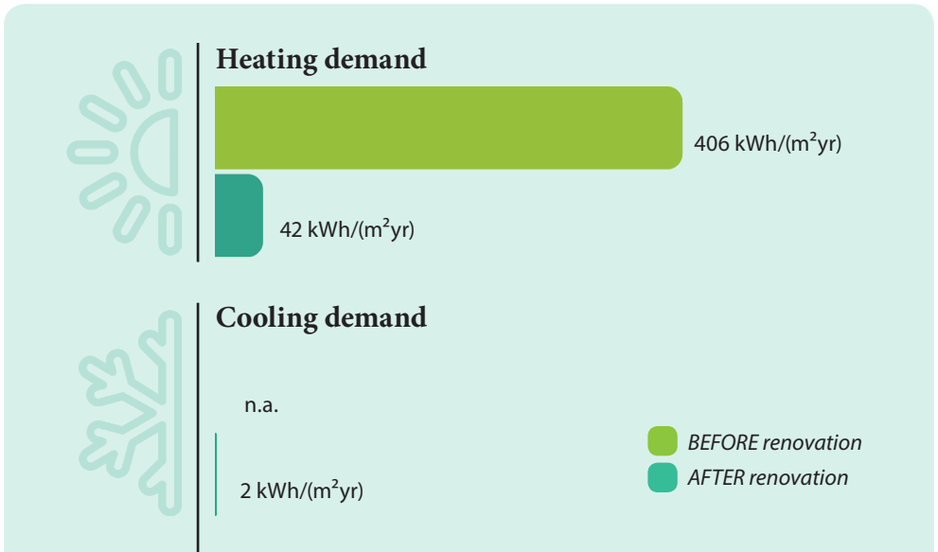
| Before |

VAND arquitectura - Roof insulation | © Carlos Navarro, B+HAUS

ensuring enhanced summer comfort and making tenants resilient to extreme temperatures in the future. Smart solutions such as light-coloured façades and high-quality windows also minimise solar heat gains, automatically contributing to cooler indoor temperatures.

The success story in Teruel transcends the renovated building itself, serving as an inspirational example within this residential area and beyond. With a construction type very typical of many such complexes throughout Spain, it serves as a model and blueprint to be followed. This potential was also recognised at the EU level, culminating in the selection of the outPHit project as a finalist for EU Commission's 2024 Sustainable Energy Awards. Teruel highlights the broader impact of such initiatives on communities and entire regions, inspiring owners and policymakers across Spain and beyond to embrace high performance deep renovation practices.

| A look at the numbers |



| After |

The project in Teruel underscores the tangible benefits of deep renovation to truly ambitious levels of energy efficiency. One long-time resident even expressed regret at only having discovered at such an old age how renovating to the EnerPHit standard could enhance quality of life.

— Nuria Díaz Antón, VAND Arquitectura

Photo: Building after renovation | © Chris van den Bos - Van Dillen Bouwgroep

03

EnerPHit renovation
outphit.eu/en/case-studies
OP31

Want to learn more?
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| Prefabrication at its best in the Netherlands |

Goes Polder, Netherlands

In the wake of the war in Ukraine, the Netherlands and many other European countries faced a staggering 600% increase in gas prices. Despite government subsidies, the crisis triggered a surge in energy poverty throughout the Netherlands, with some social housing companies likening energy costs to a second, even more expensive rent. Even before the crisis, however, many residents of a social housing complex in Goes Polder were unable to adequately heat their homes. The fully prefab renovation of this 194 unit settlement in Goes Polder shows just how much relief deep renovation can provide.

THE BUILDING BEFORE RENOVATION

Building type:	Terraced houses
Size:	25,000 m^2 (194 houses)
Construction type:	Concrete structures with uninsulated masonry façades and uninsulated roofs | 1960s
Heating:	Heat recovery + natural gas heater
Cooling:	None
Windows:	Single and double-glazed (on ground floor) with timber frames

Renovation approach: Fully prefabricated retrofit

The Goes Polder project adopted a renovation approach that involved fully pre-fabricated roof and wall elements, complete with Passive House-grade windows. The modules, built to specification in the factory, also met the ambitious requirements of the EnerPHit standard. These were then installed on top of the existing building envelope onsite. The primary objective was to achieve the rapid and highly energy-efficient refurbishment of all 194 houses with minimal impact to residents. Each house was also outfitted with rooftop solar panels to further enhance both emissions reductions and energy savings.

| Follow the renovation journey |

Pre-fab panel mounting | © Chris van den Bos, Van Dillen Bouwgroep - Pre-fab window and doors production & before

Renovation success story

Prior to the renovation, many tenants endured chilly indoor environments and refrained from heating during the day to cut back on the steep energy bills. The energy upgrade has turned the tide, providing residents with greatly enhanced comfort and improved indoor air quality. Each row house consisting of multiple homes took less than one week to completely renovate and at no point did the tenants need to move out – showing how prefabrication can not only save time, but also nerves and money.

| Before |

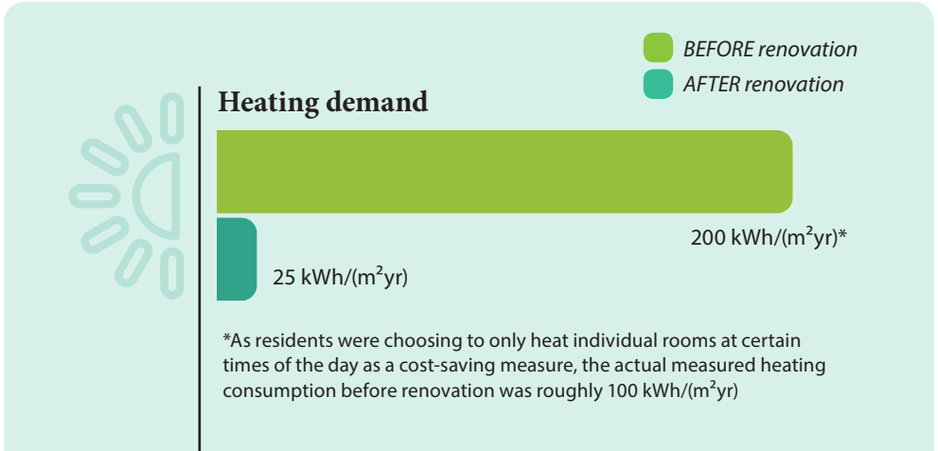
and after renovation | © Gerben Bos, Stichting PassiefBouwen - Aereal view of the renovation site | © Bouwbedrijf Joziasse

The timing of the renovation couldn't have been better. Amidst the staggering increase in gas prices, tenants in Goes Polder saw their heating demand plummet by 75% and their overall energy demand drop by 80 to 90%, despite now being able to heat their entire homes throughout the winter. This added resilience has helped them weather the energy crisis with ease. And thanks to newly installed solar panels, some households are saving an additional €200 per month on energy costs.

Central to the success of the project was its prefabricated approach. Faced with the challenge of renovating 194 similar terraced houses, the use of prefabricated construction elements enabled a swift and painless renovation process. While prefabrication is more common in the Netherlands than in many other countries, its combination with the rigour of EnerPHit energy requirements makes the project really stand out.

This comprehensive transformation not only ensured almost immediate benefits for residents of Goes Polder but also serves as a shining example of how strategic, energy-efficient renovations to the highest quality standards can mitigate energy challenges and enhance quality of life across communities.

| A look at the numbers |



*As residents were choosing to only heat individual rooms at certain times of the day as a cost-saving measure, the actual measured heating consumption before renovation was roughly 100 kWh/(m²yr)

| After |

The Goes Polder renovation is an example of prefabrication and energy efficiency at its best! Each row of houses was completed in just five days, with tenants able to remain at home throughout. They also showed real pride in the works, with some even offering to help out!

— Gerben Bos, PassiefBouwen

Photo: Building after renovation | © R. Claret, Ajena

04

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| A centre that practices what it preaches in France |

Lons le Saunier, France

The 1960s concrete office building on the outskirts of Lons le Saunier serves AJENA, a prominent French association for renewable energies, as its training centre for energy-efficient renovation. Yet with its oil-based heating system, uninsulated envelope and single-paned windows, the very centre in which professionals are taught how to upgrade buildings was itself in desperate need of an efficiency upgrade. It was time to lead by example and the team at ProPassif took up the call, supporting the entire renovation process in accordance with the high-performance of the EnerPHit standard while also maximising the integration of renewable energies.

THE BUILDING BEFORE RENOVATION

Building type:	Non-residential
Size:	285 m²
Construction type:	Reinforced concrete structure with uninsulated masonry facades | 1960s
Heating:	Oil-based
Cooling:	None
Windows:	Single-glazed with wooden frames
Budget:	€550,000

Renovation approach: Semi-prefabricated retrofit

For the AJENA project, the team adopted a semi-prefabricated approach, tailored both to the building's specific situation and its owners sensibilities. The strategy involved combining prefabricated elements with onsite solutions for optimal results. Prefabricated wooden boxes and insulation were delivered to Lons le Saunier and were installed onsite. Additionally, the team made use of internal insulation elements, advanced ventilation with high-efficiency heat recovery and triple-glazed windows while ensuring airtightness and taking care to minimise existing thermal bridges throughout the building envelope. The renovation was rounded off with the installation of a photovoltaic system on building's southern roof.

| Before |

| Follow the renovation journey |

Before renovation & Renovation process | © R. Claret, Ajena - After renovation | © Ahlem PARIS Architecte D.P.L.G.

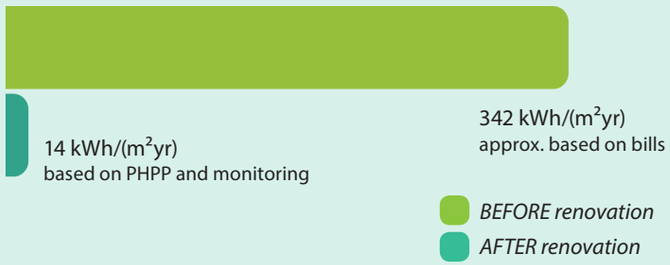
Renovation success story

The AJENA renovation illustrates both the challenges and rewards of prefabricated approaches. Initial debates surrounding the use of prefab elements – as of yet uncommon in France – gave way to consensus as the ProPassif Team provided expertise and demonstrated the tangible benefits of such approaches. This project emphasises that the best solutions are not one-size-fits-all. Instead, the renovation approach must be tailored to suit the specific project, budget, and requirements. For AJENA, integrating prefabricated elements alongside more conventional onsite solutions proved to be the path of choice, resulting in high performance and swift project completion – all onsite renovation work was completed in only six months.

The project's remarkable achievements speak volumes. The heating demand was reduced by a factor of 10, showcasing a staggering improvement in energy efficiency. As an energy agency supported by the French State and by Europe, AJENA's renovation story sparked widespread interest among local stakeholders, the media, and politicians. This attention underscores the renovation's potential to serve as a model to replicate, inspiring and catalysing further energy-efficient renovations both locally and beyond.

| A look at the numbers |

Heating demand



| After |

The AJENA renovation was highly anticipated and rightly so. Bringing a training centre for renovation up to such a high performance energy standard sets an influential example and is a true success story with the power to inspire new generations of construction professionals!

— Etienne Vekemans, ProPassif

BUILDING A BETTER FUTURE

The success stories highlighted in this booklet demonstrate the profound impact of high-performance, energy-efficient renovations. Together, they represent a window into the many hundreds of successful EnerPHit renovations already carried out across Europe.

Renovating with attention to good building physics, aiming for quality and ambitious energy efficiency every step of the way, is not merely about reducing energy consumption and carbon emissions. It is a weapon with which we can fight the climate crisis, a tool with which we can adapt to climate impacts and a means with which we can lift vulnerable groups out of energy poverty. Renovation done well is a question of comfort, health, and quality of life.

The EnerPHit standard lays the foundation for renovation done right – for avoiding lock-in effects and missed opportunities; for rising to the climate challenge and becoming energy independent; and for building a better future, one renovation at a time.

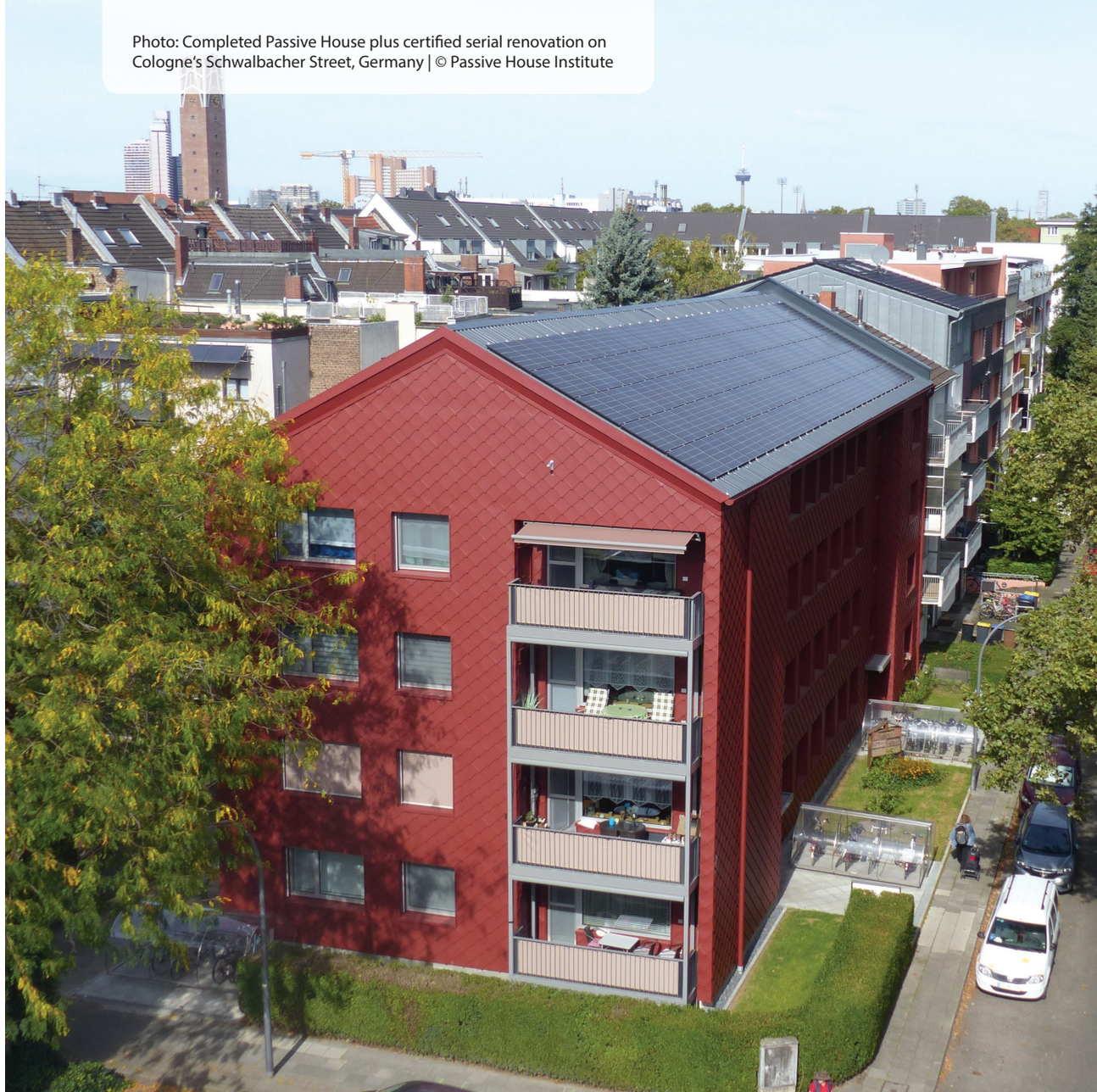


Photo: Completed Passive House plus certified serial renovation on Cologne's Schwalbacher Street, Germany | © Passive House Institute

USEFUL RESSOURCES

Passipedia
The ever-expanding knowledge database on energy efficient building and Passive House, comprising over two decades of research. Articles relating to step-by-step energy refurbishments and deep retrofits are also found here.
www.passipedia.org

Passive House Institute
An independent research institute that has played an especially crucial role in the development of the Passive House concepts – the only internationally recognised, performance-based energy standard in construction.
www.passivehouse.com

iPHA – the International Passive House Association
A global network for Passive House knowledge working to promote the Passive House Standard and connect international stakeholders. Join us!
www.passivehouse-international.org

outPHit website
www.outphit.eu

Passive House Database
www.passivehouse-database.org
Component Award
www.passivehouse.com (awards)
Component Database
www.database.passivehouse.com

OUTPHIT PROJECT LEAD:

Passive House Institute

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International PASSIVE HOUSE Association iPHA
www.passivehouse-international.org

CLIMATE ALLIANCE
www.climatealliance.org

EnEffect
www.eneffect.bg

ecoworks
www.ecoworks.tech

VAND PASSIVHAUS ARQUITECTURA
www.vandarquitectura.info

universität innsbruck
www.uibk.ac.at/en

HELLENIC PASSIVE HOUSE INSTITUTE
www.eipak.org

Passief Bouwen
www.passiefbouwen.nl

PROPASSIF la transition en action
www.propassif.fr

NHT
www.neueheimat.tirol

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We hereby explicitly address all gender identities even if the generic masculine is used for reasons of better readability and easier comprehension.

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