



Workshop in the morning, site visit in the afternoon: energy consultants showed great interest in the 'Passive House on Tour' kick-off event in Darmstadt, Germany, focusing on energy-efficient retrofits: an 'absolutely coherent concept', as one participant summarized. © Passive House Institute

Amazed by the new indoor climate

Successful launch of 'Passive House on Tour': Benefits of an energy-efficient retrofit

Darmstadt, Germany. At the 'Smart Retrofitting' event in Darmstadt, Germany, the building owners described the entirely different kind of living comfort as 'incredible'. Now, noise also remains outside. Over 40 energy consultants accepted the invitation to the 'Passive House on Tour' kick-off event and listened intently as the family reported on the positive changes in their energy-efficient home retrofit. The aim of the new 'Passive House on Tour' series is to present highly energy-efficient projects in theory as well as in practice and to support the implementation of a high level of energy efficiency on site. Further events are in preparation.



The installation of a heat pump and windows, insulating the exterior walls and stairways, and airtightness - all these topics were discussed in detail during the morning workshop. © PHI

improved so much, it's really incredible. There is now a completely different atmosphere inside the house,' says Hanke, describing the different living conditions.

The entire family is enthusiastic about the newly gained high level of living comfort: 'Previously, we couldn't have imagined such a big difference,' says homeowner Kolja Hanke at the 'Smart Retrofitting' event (in German 'Sanieren mit Köpfchen'). This confirms what architect Georg Zielke had already stated in the morning during the workshop: the family is absolutely amazed by the entirely different indoor climate. 'Before, we often sat on the couch with a blanket even in summer because it was simply too cool. The overall level of comfort has



The ventilation system with heat recovery plays a large role for the significantly improved indoor climate. The ducts are integrated into the interior finishing. © PHI

Warmth in winter, heat protection in summer

The family from Darmstadt opened the doors of their building for the 'Passive House on Tour' kick-off event, giving participants the opportunity to look at the details of an energy-efficient retrofit in practice. The detached house in Darmstadt, built in 1928, has been transformed into a comfortable home since last autumn. Most of the exterior work has been completed, while work on the inside of the house is still ongoing. Passive House components have been used everywhere, from the cellar to the roof and the charm of the building remains the same. An essential part of the energy-efficient retrofit is the excellent thermal protection of the entire building, which ensures pleasantly warm rooms in winter and protects against heat in summer. The building retrofit concept also includes the installation of a ventilation system with heat recovery and the reduction of thermal bridges.

Heating and cooling, if needed

Specifically, the foundation of the building, the exterior walls and the roof were thermally insulated. The new windows are triple-glazed and are of Passive House quality. The ventilation system with heat

recovery ensures controlled air exchange; of course, ventilation via the windows is still possible. The ducts of the ventilation system are routed mainly along the former chimney shaft and are integrated into the interior finish. Instead of a gas boiler, there is now a heat pump with a buffer storage tank for hot water in the basement. Three split system air conditioning units are installed in the house, which distribute the heated air and can also be used for cooling if required. On the thermally insulated roof of the house, a PV system will soon be producing a peak electricity output of around 11 kilowatts for self-consumption.

Energy consumption before and after

Before the energy retrofit, the family used around 3,300 m³ of natural gas per year for heating and hot water generation using the gas boiler, an energy equivalent of around 33,000 kWh per year. In addition, around 6,000 kWh were required for household electricity. Altogether, the equivalent of around 40,000 kWh was consumed between these two energy sources. After the energy retrofit, the combined consumption for the heat pump and domestic electricity will be around 2,500 to 3,000 kWh of externally generated electricity. This is just a fraction of the previous values. Accordingly, the utility costs will be significantly lower in future for the homeowners.



Picture above: In the single-family house built in 1928 in Darmstadt, the new wall build-up has become around 30 centimetres thicker with the insulation. The windows and front door have accordingly been moved outwards. Excellent thermal protection ensures pleasantly warm rooms in winter and protects against heat in summer. It also significantly reduces the energy demand.



Picture below: Since the height of the cellar was not sufficient for the buffer storage tank together with its pipes, the building owners simply excavated the cellar floor in the relevant place. © PHI



Start of 'Passive House on Tour'. The 'Smart Retrofitting' (in German "Sanieren mit Köpfchen") event in Darmstadt took place as part of the EU project outPHit. © PHI

The best time

'The best time for an energy-efficient retrofit is when components are due to be replaced anyway. Then, components should be selected that will reliably provide a high quality to significantly reduce the energy demand. This is what was done for this detached house,' explains Berthold Kaufmann of the Passive House Institute.

Putting theory, ...

This idea of replacing what needs to be retrofitted anyway also applies if the retrofit is carried out in stages instead of all at once. The aim is to achieve the highly energy-efficient **EnerPHit-Standard**, continues Kaufmann, who during the workshop presented both the general aspects of energy-efficient retrofits and the specific steps involved in the case of the detached house in Darmstadt. The Passive House Institute is monitoring this retrofit as part of the EU **outPHit** project and organised the workshop. Together with other colleagues as well as the architect, Kaufmann discussed various insulation materials, the airtightness of the building envelope and the installation of the ventilation system and new windows. The subject of heat pumps and the challenges of insulating stairways were also discussed in detail.

... into practice

Lunch was followed by the hands-on experience: the energy consultants made the (short) walk to the property. There, they were able to witness the implementation of the retrofitting steps discussed previously, including the insulation of the building with mineral wool on the north side and the timber frame construction with blown-in cellulose for the other three walls. The building owners also described the deep retrofitting process of their home, which has been underway since autumn 2023.



Demolition or renovation?

Although the owners wanted to preserve the building from the outset, as building owner Kolja Hanke explained during the workshop, demolishing the house was also discussed: Among other things, the architect was concerned about the almost hundred-year-old brickwork. However, this problem was solved thanks to the excellent thermal protection using Passive House components. Hanke also reported that the significantly improved building envelope means that noise from passing aircrafts no longer disturbs people's sleep. Although not a specialist, Hanke carried out a lot of the work himself. When private individuals joined the tour in the afternoon, Patrick Voos, Head of the Office for Climate Protection and Climate Adaptation, explained the funding programmes for highly energy-efficient construction projects that are offered by the city of Darmstadt.

The energy-efficient retrofit began in autumn 2023 (see picture). In summer 2024, the work on the building envelope is almost complete. © Passive House Institute



'Smart Retrofitting' in Darmstadt (from left to right): Berthold Kaufmann from the Passive House Institute explains the build-up of the exterior wall insulation; the building family together with Patrick Voos) of the city of Darmstadt (right in the picture; architect Georg Zielke (left in the picture) in conversation with participants. © Passive House Institute

'Absolutely coherent concept'

The aim of **Passive House on Tour** is to support various stakeholders such as energy consultants, local authorities, architects and other building stakeholders in implementing a high level of energy efficiency on site. The response to the 'Smart Retrofitting' workshop and thus to the first regional event of 'Passive House on Tour' was very positive: the fact that the Passive House Institute discusses high energy efficiency with energy consultants, and that detailed questions can be clarified and implementation is demonstrated in practice is an 'absolutely coherent concept', summarised one participant from Gersthofen in Bavaria, Germany.

To be continued in autumn

Further events are in preparation for autumn this year and for 2025, each with a different thematic focus and aimed at different target groups and regions. 'Passive House on Tour' is an additional event organised by the Passive House Institute to complement the **International Passive House Conference**. The 28th International Passive House Conference will take place in 2026.



This press release is available in different formats [here](#) together with images.

General Information



NEW on Passipedia: 1. **Timber construction thermal bridge catalog and tool.** 2. **Validation Studies of PHPP**



youtube video **Best of Passive House Conference**



outPHit: This EU project promotes in-depth cost-effective retrofits according to Passive House principles with model projects all over Europe.



Socially compatible and highly energy efficient apartment blocks built to the Passive House standard.
© Neue Heimat Tirol

Passive House buildings: With the Passive House concept, the heat loss that typically takes place in a building through the walls, windows and roof is drastically reduced. By applying the five basic principles 1. Excellent thermal insulation, 2. Windows with triple glazing, 3. A ventilation system with heat recovery, 4. Avoidance of thermal bridges, 5. An airtight building envelope, a Passive House building needs very little energy for heating and cooling. Passive House buildings can therefore dispense with a *traditional* heating system. A major part of its remaining low heating demand is largely met through "passive" sources such as solar radiation or the heat emitted by occupants and technical appliances. The Passive House concept works well also in deep retrofits of existing buildings. The Passive House Institute has developed the **EnerPHit standard** for this purpose.

Advantages of the Passive House & EnerPHit standards: 1. Increased thermal comfort. 2. In winter the heating demand is very low: the heat escapes very slowly. 3. In Summer the cooling demand is low. 4. Socially fair: low energy costs mean low utility costs – which is the basis for affordable homes and social housing.

Passive House and renewable energy: The Passive House standard and generation of renewable energy is an excellent combination. The Passive House Institute has also introduced the building classes **Passive House Plus** and **Passive House Premium**. The world's first Passive House in Darmstadt has also been generating renewable energy after it was retrofitted with a photovoltaic system in 2015 and therefore received the Passive House Plus certificate.



first Passive House building in Darmstadt celebrated its 30th anniversary!
© Peter Cook

Building uses: There are now Passive House buildings for all types of building uses. In addition to residential-use and office buildings, there are also kindergartens, schools, sports halls swimming pools and production facilities built to the Passive House standard. In Frankfurt am Main, the Passive House certificate was awarded for the first Passive House hospital in the world.

PHPP: The planning tool **PHPP** (Passive House Planning Package) was developed by the Passive House Institute for energy balance calculation of highly energy efficient buildings. The energy demand is reliably calculated with this Excel-based tool during the planning phase.



Prof. Dr. Wolfgang Feist
© Peter Cook

Passive House Institute: Founded by Professor Wolfgang Feist in 1996, the Passive House Institute is an independent organisation that holds a leading position in research and development relating to highly energy efficient construction and building retrofits.

iPHA: The purpose of the membership based International Passive House Association (iPHA) is the dissemination of knowledge as well as networking.

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