



## Press Release

25 September 2017



The Passive House Institute carried out the scientific monitoring for this administrative building in the town of Baunatal in Germany. The Passive House building contributes towards climate protection due to its low energy consumption. © PHI

# Police set example for climate protection

## Successful pilot project in Germany – monitoring by Passive House Institute

***Darmstadt/Wiesbaden, Germany.*** With the completion of the new police administrative building, the German state of Hesse has shown how energy efficient construction works. The administrative building in Baunatal in northern Hesse contributes significantly to a reduction in the energy consumption of government buildings in the province of Hesse and thus promotes climate protection. This is one of the numerous outcomes of the monitoring carried out by the Passive House Institute on behalf of the Ministry of Economic Affairs in Hesse. Other government buildings in Hesse will profit from these findings, future buildings can be designed to be even better and even more cost-efficient. This was jointly announced by the Passive House Institute and the Ministry of Economic Affairs in Hesse.

## Climate neutral provincial administration by 2030

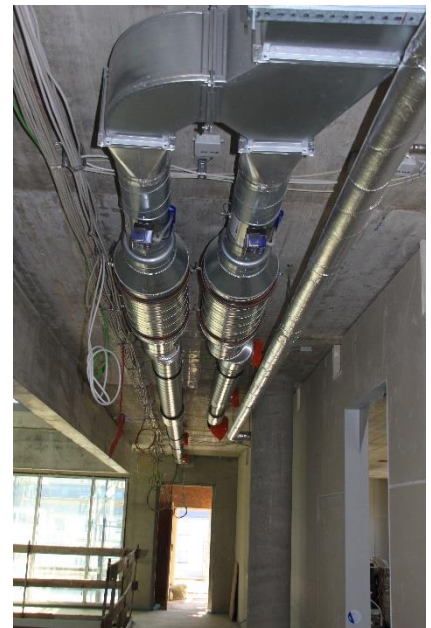
In order to play its part in climate protection, the provincial administration of Hesse will become CO<sub>2</sub> neutral by the year 2030. To achieve this goal, Hesse has specified new energy-relevant construction standards for government buildings. The building in Baunatal, which the police have been using since the end of 2014, makes a substantial contribution to climate protection due to its low energy consumption and the saved carbon dioxide (CO<sub>2</sub>) emissions. Its construction was seen as a country-wide pilot project for the Passive House Standard.

## New energy-relevant construction standards

The three-storey administrative building in Baunatal with a length of 80 metres and an effective area of about 4000 square metres is an office of Northern Hesse police department in Kassel. The Passive House Institute provided consultancy for the entire building project and carried out monitoring after its completion on behalf of the government of Hesse.

## Cables and sensors in the building shell

Preparations for subsequent scientific monitoring by the Passive House Institute already began in the planning phase of the administrative building. Staff from the Darmstadt branch of the Institute installed cables and numerous sensors in the building for the measurements and then calibrated these. After the police department moved into the building, the scientists analysed the data over a period of more than two years, beginning at the start of 2015 and ending in April 2017.



Passive House Institute staff installed numerous cables and sensors for the subsequent monitoring. Right: Ventilation pipes in the corridor of the administrative building in Baunatal.  
Photos: Passive House Institute

## What needs to be measured?

"For scientific monitoring, the measurements to be carried out during use of the building and the technology to be used were already specified during the planning phase. Accordingly, preparations were already made for this during the construction period," explains Søren Peper of the Passive House Institute. The scientist managed the monitoring in Baunatal, from initial preparations to the data analysis.

## As anticipated, the heating energy consumption was low

One of the many outcomes of the monitoring was the fact that the measured heating energy consumption of the building was just 19.2 kWh/(m<sup>2</sup>a), it was therefore significantly lower than the consumption value of normal office buildings. In addition, this value comes very close to the calculated value of 18.3 kWh/(m<sup>2</sup>a) for the prevailing boundary conditions which the Passive House designers had determined in advance using the planning tool PHPP. The building also provides a high level of thermal comfort for its users, a fact which was examined in detail and confirmed.

## Identifying the potential for improvements

Søren Peper says: "With online access to all measured data of the building, we could immediately examine any changes in the building control system. Then we were able to see the direct effects on the mode of operation as well, which in turn can affect thermal comfort. With this monitoring method, we were able to identify where the potential for improvements existed."

## Cooling energy demand

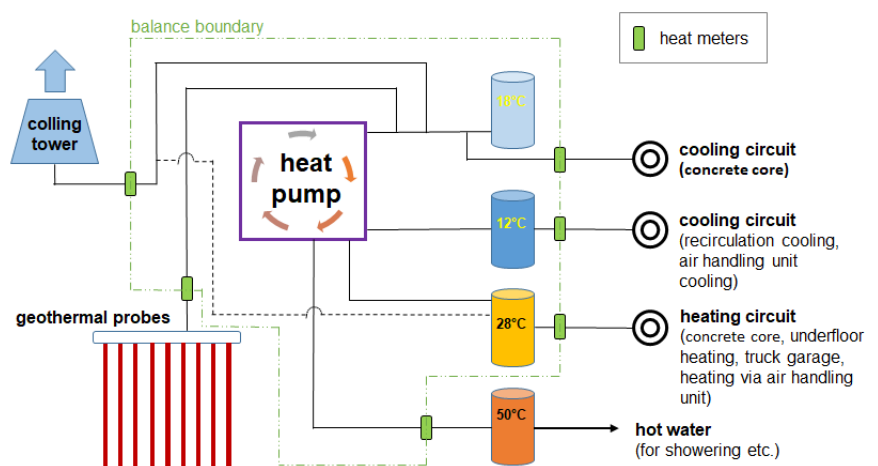
The monitoring showed that cooling energy played a big role in this project. Contrary to the planning approach, energy is used all the year round for cooling the five server rooms. As the main possibility for reducing the cooling demand, the Passive House Institute identified an increase in the temperature of the server rooms and better adjustment of the building management system (BMS).

## Passive cooling through solar protection

In addition, the potential of passive cooling on hot days by means of solar protection was not fully utilised in the offices; however, active cooling was used. Nevertheless, the Passive House Institute measured a very low electricity consumption of 10.9 kWh/(m<sup>2</sup>a) of the heat pump. Søren Peper says: "The heat pump in this building is so efficient that the entire cooling and heating energy was generated with nearly 11 kWh/(m<sup>2</sup>a). This is effective building technology, which perfectly complements the Passive House Standard."

## Heat pumps serve four accumulators

In total, two heat pumps connected to a borehole heat exchanger field and a cooling tower supply the Passive House building in Baunatal for heating and cooling. The heat pumps serve four cold and heat accumulators with different temperature levels ranging from 12°C for recirculation air coolers and cooling via an air handling unit, 18°C for space cooling, 28°C for space heating and 50°C for the hot water supply. Distribution of heat and cooling takes place by means of concrete core temperature control (CCTC).



Two heat pumps with a borehole heat exchanger field heat and cool the police headquarters in Baunatal. The heat pumps serve four accumulators with different temperatures. Illustration: Passive House Institute



The antenna mast on top of the office building in North Hesse. The Passive House Institute installed equipment for monitoring the weather on it. © PHI

## **Supply concept for the future**

Søren Peper explains: "Operation of the heat pump has definitely been successful. In addition, the exclusively electrical supply of the building fits very well into the sustainable supply system of the future which is based on electricity generated completely from renewable sources." The experts of the Passive House Institute in Darmstadt are also extremely satisfied with the performance of the highly efficient ventilation unit with heat recovery.

## **Significantly lower operating costs**

The government of Hesse has invested around 20 million euros in the construction of this administrative building. With reference to the costs, Søren Peper of the Passive House Institute explains: "Even before its construction, it was clear that the slightly higher investment costs for energy efficiency measures would be refinanced through the much lower operating costs. In addition, the building has a higher level of comfort. Furthermore, the cost risk due to rising energy prices is much lower in the Passive House with its small heating energy demand."

## **Hesse already fulfils the requirements for 2019**

In the area of energy efficient construction, Hesse already fulfils the requirements of the European Performance Buildings Directive for 2019. The extension of the Ministry of Finance Wiesbaden, which was officially inaugurated in May 2016, was also built to the Passive House Standard due to the positive experiences with the pilot project in Baunatal. "Energy efficiency in buildings means greater comfort with less energy consumption. Even large buildings with special usage requirements can be brought up to the Passive House Standard. The government of Hesse funded the scientific monitoring of this project in order to demonstrate this fact. The findings will be very helpful for many future buildings," explains Tarek Al-Wazir, the Minister of Economic Affairs in Hesse.

A summary of the [monitoring](#) report for the administrative building in Baunatal is available for download on Passive House Institute website: [www.passivehouse.com](http://www.passivehouse.com).

## General information

### Passive House

A Passive House is a building that does not require any conventional building heating on account of its excellent thermal insulation. Such buildings are called "passive houses" because a major part of their heating demand is met through "passive" sources such as solar radiation or the waste heat from occupants and technical appliances. A Passive House thus consumes about 90 percent less heating energy than existing buildings and 75 percent less energy than an average new construction.

### Passive House & COP23 in Bonn

The United Nations (UN) explicitly mention Passive Houses as a possibility to increase the energy efficiency of buildings and thus reduce global warming in "The Emissions Gap Report 2016".

### Pioneer Project

The first Passive House in the world was built in Darmstadt-Kranichstein (Germany) 25 years ago by four private homeowners on their own personal initiative. Ever since the homeowners moved in with their families in 1991, these terraced houses have been regarded as a pioneer project for the Passive House Standard. 25 years later, building physicists have attested to the unimpaired functioning of the first Passive House and its unchanged low heating energy consumption. With its newly installed photovoltaic system, the world's first Passive House now utilises renewable energy and received the Passive House Plus certificate for this reason.

### Passive House and renewable energy

The Passive House Standard can be combined well with on-site renewable energy generation. Since April 2015, the new building classes "Passive House Plus" and "Passive House Premium" have been available for this supply concept.

### Passive Houses worldwide

Passive Houses buildings for all types of uses now exist everywhere. In addition to residential and office buildings there are also kindergartens and schools, sports halls, swimming pools and factories built as Passive House buildings. The first Passive House hospital in the world is currently being built in Frankfurt am Main. Interest in Passive House is growing. In view of the consumption of resources in industrialised countries and the need to contain global warming, municipalities, businesses and private people are increasingly implementing new constructions or retrofits to the Passive House Standard.

### Passive House Institute

The Passive House Institute with its headquarters in Darmstadt (Germany) is an independent research institute for highly efficient use of energy in buildings. Under the leadership of Dr. Wolfgang Feist, the Institute holds a leading position internationally with regard to research and development in the field of energy efficient construction.

The Passive House Institute is the organizer of the International Passive House Conference and the related exhibition. The next Passive House Conference takes place 9 - 10 March 2018 in Munich, Germany.

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Pictures for editorial purposes: [www.flickr.com/photos/passive-house-institute](http://www.flickr.com/photos/passive-house-institute)

To get the latest news relating to Passive House, visit: [www.twitter.com/the\\_iPHA](http://www.twitter.com/the_iPHA)

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