

Environmentally Conscious Design



The housing market is in crisis and the Government is attempting to tackle this crisis with housing policies and aim to build approximately 250,000 new homes in coming years. With the huge impact on innovation and technology, focus is on the sustainable construction and the better built environment. Let's have a look how it is done in Germany. The police administrative building erected in Baunatal in Northern Hesse, Germany sets an example for climate protection. It contributes significantly to a reduction in the energy consumption of government buildings in the province of Hesse and thus promotes climate protection.

In previous edition we have discussed the passive house technologies. Briefly, 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 Institute





Passive House Institute

The Passive House Institute provided consultancy for the entire building project in Baunatal, Hesse and carried out monitoring after its completion on behalf of the government of Hesse. Other buildings will profit from these findings. This was jointly announced by The Passive House Institute and the Ministry of Economic Affairs in Hesse jointly announced that other buildings will benefit the future buildings can be designed to be even better and more cost-efficient.

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.

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 Insti-

tute 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.

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/(m²a), 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/(m²a) 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.

Heat pumps serve four accumulators

In total, two heat pumps connected to a bore-hole heat exchanger field and a cooling tower supply the Passive House building in Baunatal for heat-

ing 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).

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/(m²a) of the heat pump. Soren Peper says: "The heat pump in this building is so efficient that the entire cooling and heating energy was generated with nearly 11 kWh/(m²a). This is effective building technology, which perfectly complements the Passive House Standard."

Supply concept for the future

Soren 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 com-

pletely 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, Soren 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.

Source:
Passive House Institute

