

INDUSTRY NEWS

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Energy for administrative centre in Freiburg comes mostly from the facade

- Energy for the new Freiburg Town Hall comes from the facade

The new Freiburg Town Hall in Stühlinger was opened in November 2017. Because the prize-winning design created by ingenhoven architects uses photovoltaic, solar thermal and geothermal plants, the five-storey administration building is able to provide its own renewable energy. The city of Freiburg, the Fraunhofer Institut für Solarenergiesysteme and Drees & Sommer are working together to produce a research project on the subject of grid-responsive buildings.

The main facades of the new Freiburg Town Hall, which is built in the shape of a polygon, are made as aluminium post-and-bar facades with triple thermal insulating glazing. The overall U-value – U_w – of the facade (comprising posts, bars, opening elements, glazing and substructures) is $0.8 \text{ W/m}^2\text{K}$ which meets passive house standards. The facade has manually openable ventilation flaps at every other facade axis which allow natural ventilation. These openings are narrow room-height, highly thermally insulated opaque turn-tilt windows.

There is an aluminium venetian blind on the outside for protection against the sun:

- Aluminium slats, 80 mm wide, cable-guided, primarily operated by an electric motor with manual override
- Stable in wind
- With aerophysically designed slat links in the upper area to ensure the necessary air flow around the sun blind and to direct daylight

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Thermal comfort in summer is achieved by using a moderate proportion of glazed units accounting for some 50% of the facade surface and through the highly effective external sun protection, glazing g-values of around 40% and suitably designed ventilation openings.

Thermal comfort in winter is ensured by the highly insulating triple insulation glazing $U_g = \text{approx. } 0.5 \text{ W/m}^2\text{K}$, in combination with the highly insulated aluminium post-and-bar facade and the equally highly insulating opaque areas. In front of the outer facades are fixed vertical aluminium frame slats which are aimed at the position of the sun. Integrated, anti-glare PV elements are affixed to the front, and on the back, the slats are planked with untreated wood elements.

Facade designed for durability

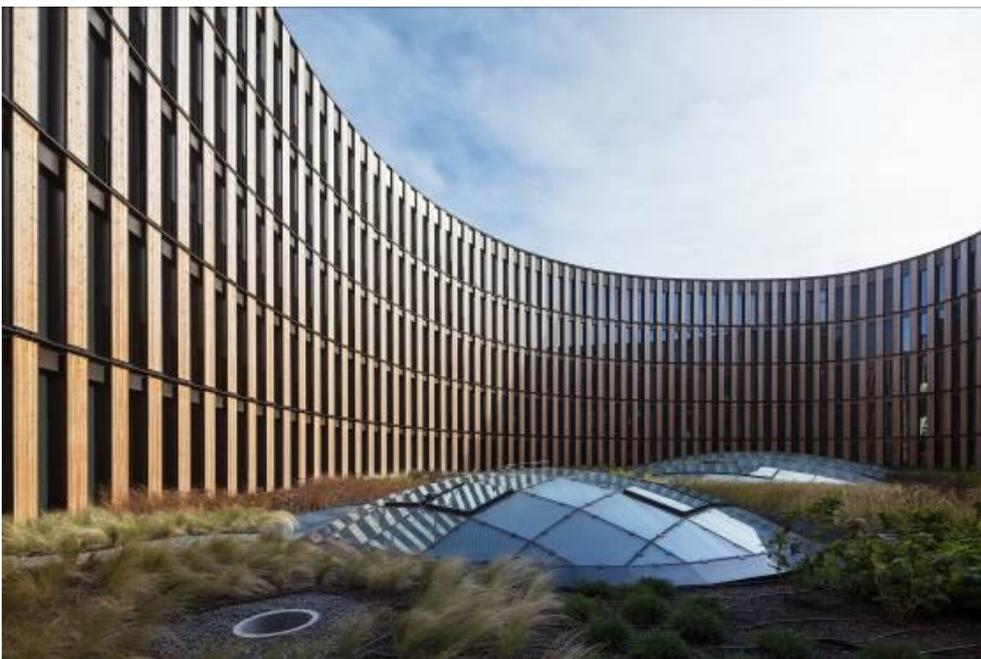
The use of glass, uncoated wood, aluminium and mineral wool means that all the facades and materials are designed for maximum durability. This also includes easy maintenance and repairs in the long term, which is guaranteed by the choice of simple constructions – post-and-bar facades, suspended back-ventilated cladding, standard sun protection elements.

Facade meets passive house standards

On the aluminium facade, which is a post-and-bar construction, vertical photovoltaic elements are placed on surfaces where the sun's rays have been calculated to be optimum. The flat roof is also fitted with these modules, which make up 75% of the surface here. Some of these are PVT modules which generate heat and power at the same time. There is thus no longer any competition for space between photovoltaic and solar thermal use. The solar energy covers the building's power requirements – lighting, ventilation and the operation of two heat pumps. The last are a part of the geothermal plant and are used for generating heat, at 200 kW each, especially in winter. Hot water is supplied by the PVT modules on the roof. The PV units on the roof have a capacity of 440 kWp, with those on the facade supplying 220 kWp; the building's primary energy requirement (German Energy Saving Regulation) is 45 kWh/m²a.

Funded by the German Government

The new administrative building is regarded as a showcase project, not least because of its size – a gross floor area of over 24,000 square metres. Because of its innovative character, the project is subsidised by the Federal Ministry for Commerce and Industry. From planning and tendering through quality assurance in construction and operation to ongoing energy monitoring: The research project demonstrates how buildings that generate a considerable share of their energy consumption themselves communicate with the municipal power network. The aim is that the model process guideline that is created here should benefit similar building projects, especially local authority ones.



Caption: On the aluminium facade of the Freiburg administrative centre, which is a post-and-bar construction, vertical photovoltaic elements have been placed on surfaces where the sun's rays have been calculated to be optimum.

Source: (Based on a text by Professor Dr Michael Bauer and Dipl.-Ing. Herwig Barf)

Professor Dr Michael Bauer is a partner in the Drees & Sommer Group with responsibility for the Engineering Division. He concentrates on integrated planning and the development of innovative energy concepts. He is an honorary professor who teaches at the University of Stuttgart.

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