



The Polar Bear House in Kirchheim unter Teck.
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Allplan in practice

BIM FOR THE WORLD'S MOST SUSTAINABLE BUILDING

Measured by its overall German Sustainable Building Council (DGNB) compliance level, the Polar Bear House is the most sustainable building in the world. BIM-based planning is partly responsible for the top scores in terms of sustainability.

The building's score of 94.2 percent is the highest overall degree of compliance ever achieved by a new building certified by the DGNB. The building in question is located in Kirchheim unter Teck, Baden-Württemberg, and is the headquarters of the architectural firm that designed and built it: BANKWITZ beraten planen bauen (consult design build). Strictly speaking, it is an extension (component C) of an already existing company building (components A+B). The latter was completed in

2008 and itself awarded DGNB Platinum around ten years later. Here, too, the overall degree of fulfilment (for existing buildings) was already an extraordinary 95.6 percent. Taken as a whole, the three components make up the Polar Bear House – currently the most sustainable building in the world. Behind the new building's unprecedented rating and the title that goes with it is a holistic approach that rigorously strives for maximum sustainability in every detail, from the construction method, to the



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energy concept and building services, to the materials used. At the same time, the unprecedented climate-positive residential and commercial building is the product of excellent planning using the BIM method. Among other things, the data exchange between the architects and the timber construction and building services trades was carried out independently of software manufacturers using Open BIM.

PASSIVE HOUSE IN REINFORCED CONCRETE AND WOOD

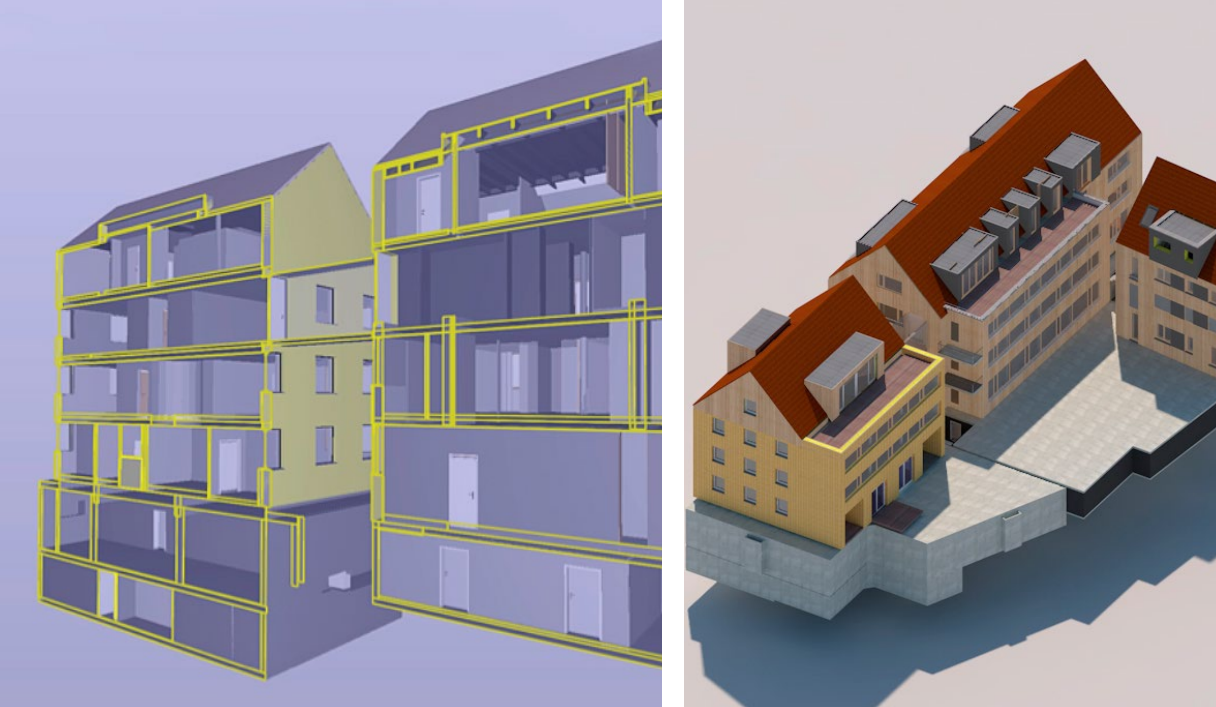
The structural basis for the record-breaking extension is a reinforced concrete-wood hybrid construction. Resource-saving concrete (RC concrete) was used wherever possible for the concrete work. The exterior walls are kept as a wooden post and beam construction made of prefabricated wooden elements with cellulose insulation. Thanks to the combination of reinforced concrete skeleton and elemental exterior walls, the façade made of untreated rough-sawn timber can be deconstructed and recycled without affecting the supporting structure. All materials used were selected in accordance with the specifications of the DGNB and the criteria of the Vorarlberg Eco Guide.

Like the existing buildings, the new building was designed as a passive house, but unlike them it does not have its own heating system. Instead, hot water and local heat for floor heating and concrete core

activation are obtained from the existing building. Decentralized comfort ventilation units for aeration and deaeration as well as a heat exchanger with a heat recovery rate of 85 percent are responsible for an excellent indoor climate. Cooling in the summer months is provided by brine pipes and four geothermal boreholes. The central shaft guide and the heating and cooling supply are arranged in such a way that even potential future conversion measures can be carried out without having to make any adjustments to the building technology. The latter, in turn, is completely software-controlled and includes a central data acquisition system that records and monitors all consumption figures. This allows errors or optimization opportunities to be identified at an early stage and appropriate adjustments to be made. For example, the automatic control of the screens for heat, sun, and glare protection, which reacts to the current weather conditions, can be further optimized on the basis of the data. A photovoltaic system including a battery storage system for time-delayed use of electricity ensures a largely self-sufficient power supply. Water for toilets and garden irrigation are supplied from rainwater collected in a cistern.

BIM-BASED DESIGN

Every detail in the polar bear house is geared towards sustainability. To ensure that the individual elements also interlock perfectly, the complex planning was carried out using a 3D building model



Left:
Cross-sectional view
through bridge connection
between component C
and component A

Right:
Plan view of components
A, B, and C with inner
courtyard

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in Allplan Architecture. This BIM-based planning process brought with it numerous advantages that ultimately also contributed to the high overall degree of completion. A decisive point for this was the calculation of volumes. For example, reports generated from the model – and the service specifications created from them – formed the calculation basis for the life cycle assessment, which was an important part of the sustainability assessments for the platinum certification from the DGNB. The architects also benefited from the use of the BIM method in other ways. Working on the model enabled a better understanding of the building's construction, including floors, access to the underground car park from the existing building into the new component, and various ceiling jumps and levels. In addition to automatic volume calculation and improved detailed planning, the 3D model also enabled quick and easy comparisons of variants for the room layouts.

ADVANTAGES THROUGH OPEN BIM

Particular importance was also attached to the manufacturer-independent data exchange with the trades via IFC interface. On one hand, this concerned timber construction. The structural framework of slabs and concrete supports created by BANKWITZ in the BIM model proved to be extremely helpful, such as for the development of the complex connection details – especially in the plinth area. Conflict points in window connections,

PROJECT INFORMATION AT A GLANCE

- > **Focus:** Architecture
 - > **Software used:** Allplan Architecture
 - > **Client/Architect:** BANKWITZ beraten planen bauen Planungsgesellschaft mbH
 - > **Service phases:** 1 – 9
 - > **Total construction costs:** € 4.1 million
 - > **Start of construction:** 03/2019
 - > **Construction completion:** 03/2020
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parapets and eaves, and plinth details could be identified at an early stage by means of collision checks. At the same time, the Open BIM workflow promoted communication between the architects and carpenters, which contributed significantly to the rapid resolution of ambiguities and problems. In addition to the timber construction, the building services planning also benefited from the building model. The company commissioned for this purpose developed the ventilation planning as a specialist model that could be easily imported into Allplan and checked for collisions.



"The BIM-based planning in Allplan brought numerous advantages – both for us in our planning and in the collaboration with the timber construction and building services trades. Last but not least, the 3D building model also benefited us in obtaining certification from the DGNB thanks to the volume calculations."

Ralf Pimiskern, BIM manager as well as architect and business unit manager at BANKWITZ

THE CUSTOMER

For BANKWITZ beraten planen bauen Planungs-gesellschaft mbH, architecture is the conception, planning, and execution of individual buildings using state-of-the-art technology. To this end, the office conducts an extensive and cooperative dialogue with the clients. In this way, tailor-made solutions are created that meet the wishes of the client and the needs of the market. For BANKWITZ,

architecture not only means fulfilling aesthetic and functional requirements, but also adhering precisely to the target specifications in terms of deadlines and finances. BANKWITZ shows its clients possibilities for sustainable, value-oriented construction and further development of their properties.

ABOUT ALLPLAN

ALLPLAN is a global provider of BIM design software for the AEC industry. True to our "Design to Build" claim, we cover the entire process from the first concept to final detailed design for the construction site and for prefabrication. Allplan users create deliverables of the highest quality and level of detail thanks to lean workflows. ALLPLAN offers powerful integrated cloud technology to

support interdisciplinary collaboration on building and civil engineering projects. Around the world over 500 dedicated employees continue to write the ALLPLAN success story. Headquartered in Munich, Germany, ALLPLAN is part of the Nemetschek Group which is a pioneer for digital transformation in the construction sector.

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