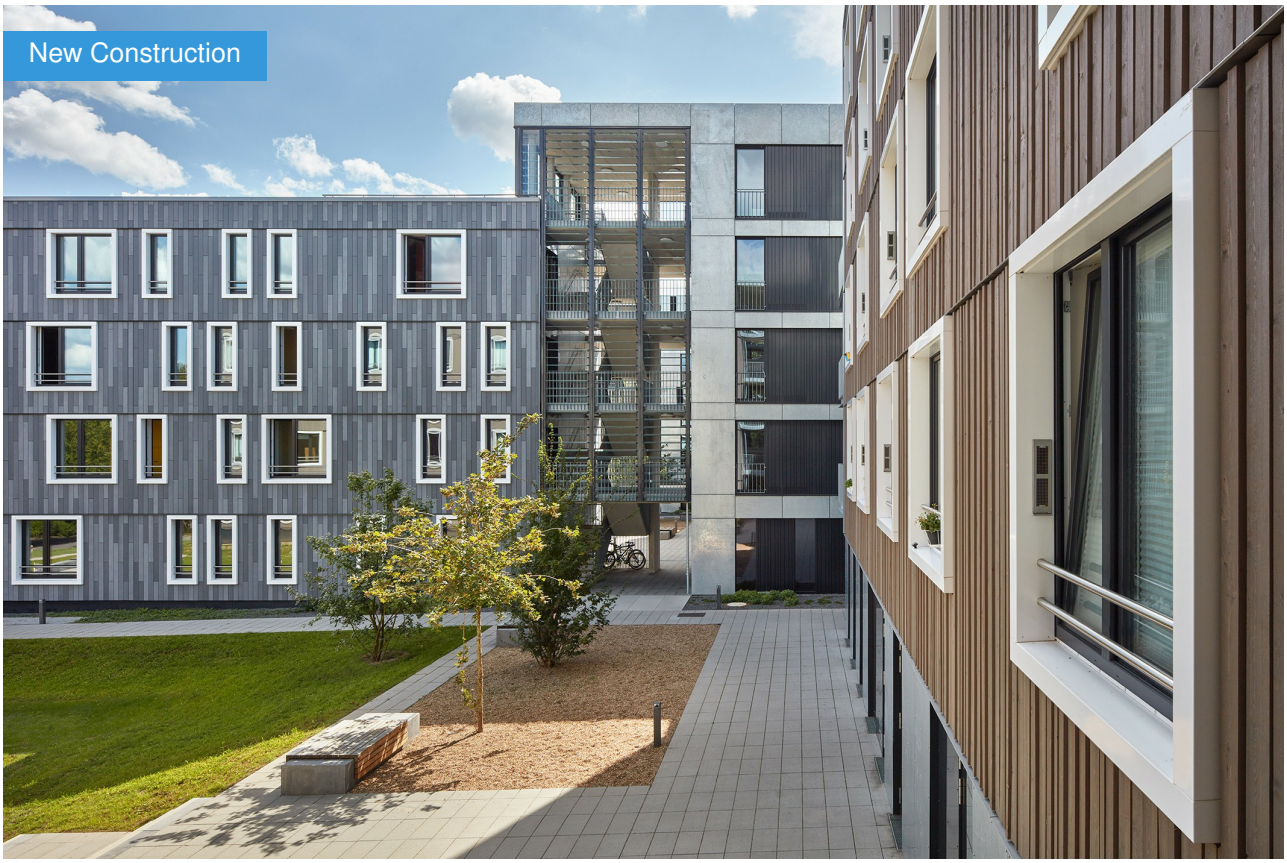
Wood hybrid construction: 258 new living spaces in passive house standard - Variowohnen Bochum

by Markus Kersting / 2021-03-17 09:43:31 / Deutschland / 177 / DE



Building Type : Student residence
Construction Year : 2020
Delivery year : 2020
Address 1 - street : Laerheidestraße 4-8 44799 BOCHUM, Deutschland
Climate zone : [Cfb] Marine Mild Winter, warm summer, no dry season.

Net Floor Area : 8 760 m^2 NGF
Construction/refurbishment cost : 16 500 000 €
Cost/m2 : 1883.56 €/m^2

Primary energy need :

39 **kWhpe/m^2.year**

(Calculation method : Other)

ENERGY CONSUMPTION

Economical building *Building*

- < A
- 51 à B
- 91 à C
- 151 à D
- 231 à 330 E
- 331 à 450 F
- > 450 G

Energy-intensive building

Certifications :

DGNB DGNB

Description

Design concept
The new buildings revitalise a former mining site. Within the framework of the Variowohnen funding programme, 258 living spaces for students could be realised. The small space ratios implied in the construction task and the space programme, which allow living per person on approx. 20 m² and are thus significantly below the national average of just under 50 m², represent an essential building block in the sufficiency strategy for achieving sustainable buildings. An essential success factor for such small space ratios is to create the greatest possible acceptance, which can be achieved primarily through high-quality design, but also through high interior variability and various possible uses. The high-quality furniture offers space for personal development and a personal touch. It uses a colour scheme that creates identity but is not obtrusive.

Innovation
The timber façade (building class 5) was approved as a deviation with reference to Swiss building regulations. The detailed design allows the prefabricated façade elements to be installed without scaffolding and without the need for any finishing work. In addition to the windows and the complete façade cladding, the necessary installations for the decentralised ventilation system were also already carried out at the factory. This wall construction is more cost-effective than a comparable solid construction with a lower component thickness and significantly reduces the CO2 balance. The buildings realised in the publicly subsidised housing sector achieve the DBNB Gold Standard. In the criterion "ecological quality", the project even achieves the platinum standard with a degree of fulfilment of over 83%. High freedom from pollutants in the interior: Here, the best requirement value according to DGNB was again undercut by 50%. The design in passive house quality enables the building to be certified as a KfW Efficiency House 40 Plus. In order to document the innovative approaches from the Variowohnen funding programme, the entire planning and construction phase was scientifically accompanied and evaluated.

Certification
The buildings realised in publicly subsidised housing achieve the DBNB Gold Standard. In the criterion "ecological quality", the project even achieves the platinum standard with a degree of fulfilment of over 83%. The design in passive house quality exceeds the current requirements of the Energy Saving Ordinance EnEV. High freedom from pollutants in the interior: Here, the best requirement value according to DGNB was again undercut by 50%.

Transformation potential with regard to ecological sustainability
The special importance of the reusability of buildings arises from the realisation of the high environmental impacts from the manufacturing and recycling phases. Even with the approach of a building structure designed on the basis of the cycle concept (cradle to cradle), new resources are generally used in each change phase of the cycle. The most environmentally advantageous scenario is therefore the direct re-use of buildings or as large a part of the building structure as possible. This applies in particular against the background of the lack of clarity about subsequent recycling possibilities.

In the area of after-use scenarios, different use variants were presented and examined for their advantages and disadvantages. At the time of planning, the Variowohnen programme defined student housing as the initial use and developed the floor plans accordingly. Due to the increasing number of students and a higher demand for affordable housing, a tighter housing market for students is to be expected in conurbations in the coming years. It was already taken into account in the planning that various living concepts can be implemented in the later course of use of the building. The axial dimension is designed in such a way that a divergent use, such as office use, would also be possible as a conversion scenario. Against the background of demographic change, living concepts for older people are becoming increasingly important and also represent an alternative floor plan concept.

Economy
The buildings are designed as a modular system. Various prefabricated elements are organised in a system in such a way that a variable design of the individual buildings as well as flexible subsequent use are possible. In detail, the following systems were chosen:

- Shell made of prefabricated reinforced concrete elements and hollow prestressed concrete planks.
- Façade made of wooden panel elements with integrated, decentralised ventilation systems with heat recovery
- Sanitary cells made of self-supporting sandwich elements of sheet steel.

Thanks to the prefabrication of the timber panel elements in the factory, wood as a building material contributes to a reduction in construction time and ensures a significantly improved CO2 balance. Thanks to the hybrid construction method, thermal bridges can be minimised and potential energy losses minimised, which has a positive effect on operating costs.

Social
The future users were involved in the processes at an early stage; the buildings were planned not only for the owner, the AKAFÖ (Akademisches Förderungswerk), but for and with the users. An essential factor for success in such small spaces is to create the greatest possible acceptance, which can be achieved above all through high-quality design, but also through a high degree of interior variability and various possible uses. The high-quality furniture offers space for personal development and a personal touch. It makes use of a colour scheme that creates identity but is not intrusive.

In addition to the guaranteed individual spaces, numerous variably usable communal areas are offered. This was the only way to implement the drastic reduction in living space per person.

See more details about this project

https://acms-architekten.de/detailseiten-projekte/variowohnungen-bochum

Data reliability

3rd part certified

Photo credit

Sigurd Steinprinz, Düsseldorf
ACMS Architekten GmbH Wuppertal
Rubner Holzbau, Ober-Grafendorf

Stakeholders

Contractor

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Construction Manager

Name : Architekt: ACMS Architekten GmbH
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Stakeholders

Function : Contractor

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Function : Certification company

MNP Ingenieure

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Bild + Partner Beratende Ingenieure, Hagen

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Function : Others

Landschaftsarchitekt: wbp Landschaftsarchitekten GmbH, Bochum

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Function : Others

Fotograf: Steinprinz Fotodesign, Sigurd Steinprinz, Düsseldorf

Herr Sigurd Steinprinz, mail@steinprinz.de, Düsseldorf

Contracting method

Separate batches

Owner approach of sustainability

The non-load-bearing exterior walls as prefabricated timber panel walls result in fast construction times with the highest insulation standards and a CO2 saving of over 400 t compared to solid construction methods.
The compact construction and good orientation towards the sun enabled the economic implementation of a passive house. A photovoltaic system was installed to

further reduce primary energy expenditure. Within the framework of the DGNB overall rating in gold, the highest rating level in platinum is even achieved in the area of ecology with a degree of fulfilment of over 83%.

Architectural description

The new buildings revitalise a former mining site. Within the framework of the Variowohnen funding programme, 258 places for students could be realised. With this programme, the Federal Ministry of the Interior aims to create affordable housing for students, trainees and senior citizens as part of the research initiative Zukunft Bau. The project was funded as an outstanding project with the maximum funding amount of € 3.3 million by the BMI via the BBSR, Bonn and with € 13.6 million from the housing promotion of the state of NRW.

In order to achieve a high degree of flexibility and convertibility as well as time-saving and quality-assuring high prefabrication, the buildings are designed as hybrid constructions. A shell structure with wide-span prestressed concrete hollow slabs on steel beams and prefabricated concrete columns allows for the greatest flexibility. In spite of the fire class B1, flame-retardant, required for the present building class 4 according to the building regulations of North Rhine-Westphalia (the same in all federal states), it was possible to use wood as a cost-effective and CO2-binding material. This was made possible by a corresponding exemption based on the technical building regulations introduced in Switzerland since 2005.

Sustainable building
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The compact construction and good orientation towards the sun enabled the economic implementation of a passive house. A photovoltaic system was installed to further reduce primary energy expenditure. Within the framework of the DGNB overall rating in gold, even the highest rating level in platinum is achieved in the area of ecology with a degree of fulfilment of over 83%.

In order to document the innovative approaches from the Variowohnen funding programme, the entire planning and construction phase was scientifically accompanied and evaluated. The aim is to derive transferable recommendations for action.

Energy

Energy consumption

Primary energy need : 39,00 kWhpe/m^2.year

Primary energy need for standard building : 120,00 kWhpe/m^2.year

Calculation method : Other

Final Energy : 36,00 kWhfe/m^2.year

Breakdown for energy consumption :
Electricity: 7.8 / heating: 28.6

Renewables & systems

Systems

Heating system :
- Urban network

Hot water system :
- Urban network

Cooling system :
- Others

Ventilation system :
- Double flow heat exchanger

Renewable systems :
- Solar photovoltaic

Environment

GHG emissions

GHG in use : 12,00 $KgCO_2/m^2$/year

Methodology used : LCA

GHG before use : 8,00 $KgCO_2$ /m^2

Building lifetime : 50,00 year(s)

, ie xx in use years : 0.67

GHG Cradle to Grave : 20,00 $KgCO_2$ /m^2

Indoor Air quality

The measurements in the rooms were taken within the 28-day period after completion.
08.04.2020: The measurement was carried out after keeping the rooms closed for at least 8 hours in 8 previously defined rooms. Duration approx. 2-2.5 h.

08.04.2020: House C was measured in the 8 rooms specified beforehand. Duration approx. 2-2.5 h.

The measurements were carried out and evaluated in accordance with the DGNB criteria specification NWO 15.
The measurements were carried out according to the specifications of DIN EN ISO 16000-5, DIN ISO 16000-6 and 16000-3.

Result: Very high freedom from pollutants in the interior. Here, the best requirement value according to DGNB was again undercut by 50%.

Costs

Building Environnemental Quality

Building Environmental Quality

- Building flexibility
- indoor air quality and health
- comfort (visual, olfactive, thermal)
- energy efficiency
- renewable energies
- integration in the land
- mobility
- building process
- products and materials

Contest

Contest categories

Alle Kategorien

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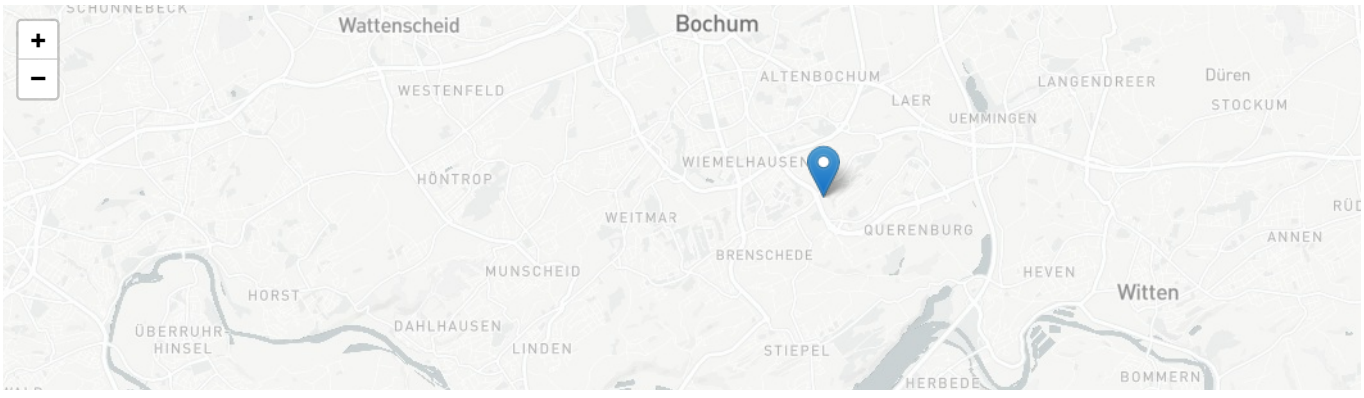


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