Case Study

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Living with Triple A Rating

Thermal separation with the Schöck Isokorb: passive house construction is the minimum standard for new builds in Luxembourg, with the rest of the EU to follow by 2021

Baden-Baden (Germany) / Burden (Luxembourg) – The view from this residential building extends right over the rolling countryside. These green surroundings are even echoed in the building itself, which has been thermally simulated and architecturally designed in such a way that it has been awarded with the AAA Luxembourg Passive House classification. The balcony has been thermally isolated from the building with the help of the Schöck Isokorb. It also serves to provide shade, which minimises the need for protection against the sun whilst exploiting the maximum amount of daylight.

"20-20-20" is the tag line that defines the targets of the European Union (EU) for the year 2020. This refers to the aims to cut CO_2 emissions by 20 per cent compared to 2007 projections and boost both energy efficiency and the use of regenerative energies by 20 per cent respectively. The building sector has a huge role to play when it comes to achieving these ambitious objectives, as private households account for around a quarter of the total energy requirements. The Grand Duchy of Luxembourg has been promoting thermal insulation and energy efficiency long before all of the other EU countries. Here, passive house construction techniques already constitute the minimum standard for new builds.

As of 2017, every new home must meet the requirements of energy class AA. This corresponds to a building whose energy consumption is virtually zero. Having a reference system in place allows buildings to be classified

irrespective of their plot or architecture. What's more, the country also offers financing proposals and incentive bonuses for sustainable living and energy-saving renovations. It is hoped that this model will take off on a wider scale, as similar high standards are expected to apply across the EU from 2021.

Light, bright passive house

"The process of optimising the energy-efficiency levels of buildings has been a top priority in Luxembourg for around ten years now. That said, when we received the planning permission for the property in Burden back in 2014, the requirements had not yet become as strict as they are today," recalls architect Serge Schmitgen from OBLIK. Nevertheless, the client still handled the project with the future in mind, and achieving a AAA rating was the aim right from the outset. For this to be possible, the primary energy demand must be below 45 kWh/m^2a, the heat demand below 22 kWh/m^2a, and the CO_2 emissions below 11 kg CO_2/m^2a.

"In order to achieve these values, we conducted a thermodynamic simulation using the 3D model of the house," Serge explains. "We wanted the building envelope to let in plenty of daylight and offer a panoramic view across the countryside. At the same time, we also wanted to distribute solar gains over the course of the day in a way that meant the building could be heated and cooled using as little energy as possible. By using the computer to simulate the temperature development inside the building, we were able to ensure our architectural designs were also optimised in terms of their solar protection.

Minimal thermal bridging

A combination of protruding edges, recesses and cantilevered components means only five of the home's 14 large, glazed openings requires solar energy management. The balcony and its canopy on the garden side of the house, for example, have been designed to ensure that the floor below is nicely shaded during the heat of the day. We decided to use the Schöck Isokorb load bearing thermal insulation element to ensure that the 1.60 m x 4.00 m large concrete slabs could be connected to the building by means of a stable, low thermal bridge construction.

The Schöck Isokorb facilitates thermal separation in the statically supporting connection of balconies, parapets and canopies to the building, whether it's concrete to concrete, steel to concrete, or steel to steel. This minimises thermal bridges – which are often the cause of high energy losses, damp walls and mould formation – to the greatest possible extent and prevents construction damage in the long term. The product range offers enormous scope for design when it comes to connecting balconies to walls and floor slabs in new builds and renovations alike.

Seamless installation

"In the world of thermally isolated building component connections, Isokorb is as much of a household name as Gillette," compares Serge Schmitgen, who specialises in energy-efficient construction as an architect and accredited passive-house designer. The Isokorb KXT model was used on the front and the QXT+QXT on the sides of the balcony. With their pressure bearings made of microfibre-reinforced high-performance fine concrete and an insulating element measuring 120 mm thick, the certified passive house components fit together seamlessly without expansion joints into the reinforced concrete inner slab layer.

The installation involved bringing the cladding of the balcony and floor slab into position. The load bearing thermal insulation elements were then positioned according to the plans drawn up by structural engineers from Simon-Christiansen & Associés and secured to the steel reinforcements using binding wire. The floor slab and balcony could then be covered with concrete in a single pour. The Isokorb KXT model transfers negative moments and positive shear forces from the balcony to the building structure. The QXT+QXT, on the other hand, absorbs positive and negative shear forces during continuous support.

Requirements exceeded

"The installation of the Isokorb elements ran smoothly from start to finish thanks to the detailed planning documents, which complied with all technical, structural and thermal requirements," confirms Serge. The bright white residential building in Burden was completed in 2016. The heat demand comes in at 21.7 kWh/m^{2}a, the primary energy demand at 40.6 kWh/m^{2}a, and the CO_2 emissions at 8.6 kg/m^{2}a. So even before the higher

minimum standards for new builds came into force in 2017, this meant it had already exceeded the requirements of the Luxembourg passive house classification with a AAA rating.

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Author: Oliver Hahr

Project Information	
Project:	Private residential building in Burden, Grand Duchy of Luxembourg
Gross floor space:	402 m^2
Gross volume:	1346 m^3
Special features:	AAA passive house standard (the minimum standard in Luxembourg for new properties built from 1 January 2017). A: Heat demand < 22 kWh/m^2a, A: Primary energy demand < 45 kWh/m^2a, A: CO_2 emissions < 9.4 kg/m^2a. Achieved: 21.7 kWh/m^2a heat demand, 40.6 kWh/m^2a primary energy demand, 8,6 kg/m^2a CO_2 emissions (energy reference area for the house: 249 m^2).
Architect and construction supervisor:	
	OBLIK. Serge Schmitgen Architecte, Mertert, Luxembourg
Bearing structure and structural design:	
	Simon-Christiansen & Associés, Capellen, Luxembourg
Building structure:	No general contractor – contracts awarded in structural element subsections.
Insulation:	Floor slab XPS 24 cm, cellar XPS 24 cm, outer wall EPS 26 cm, roof PIR 32 cm
Construction period:	March 2015 to June 2016
	Balcony connection: Low thermal bridge construction thanks to the Schöck Isokorb certified passive house component. The Schöck Isokorb KXT and QXT+QXT models were used.

Images and Captions

[front view.jpg]

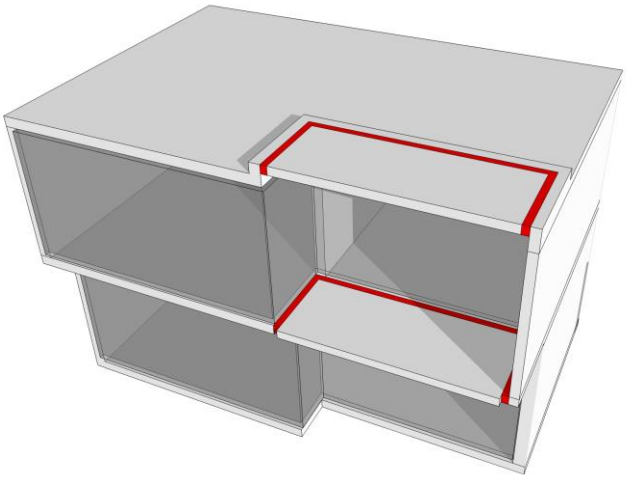
The residential building in Burden, Luxembourg, achieves the AAA energy efficiency class. Image: Jessica Theis (jess.lu) for Schöck

[rear view.jpg]

[side view.jpg]

Large insulated glass windows let in plenty of daylight and a panoramic view of the countryside. The protruding edges, recesses and cantilevered components provide the ideal amount of shade.
Image: Jessica Theis (jess.lu) for Schöck

[illustration balconies.jpg]



Measuring 1.60 m x 4.00 m, the balcony and its canopy were connected to the building in a way that is both stable and thermally separated using the Schöck Isokorb. Image: OBLIK. Serge Schmitgen Architecte

[positioning Isokorb.jpg]

Positioning of the Schöck Isokorb elements: KXT model on the front, QXT+QXT model on the sides. Image: OBLIK. Serge Schmitgen Architecte

[reinforcements.jpg]

The reinforcements were laid and connected to the Schöck Isokorb. The floor slab and balcony could then be covered with concrete in a single pour.
Image: OBLIK. Serge Schmitgen Architecte

[underside view_balcony.jpg]

The Schöck Isokorb makes it possible to connect the balcony without the need for expansion joints. The balcony is ready to bear loads as soon as the in-situ concrete has hardened. Image: OBLIK. Serge Schmitgen Architecte

For questions and feedback, please contact:

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