Hof Neuhäusl

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Cellulose for log Wall

Walls

What is the solution?

A possible solution to refurbish a wooden block wall to passive house standard is to apply a 22 cm thick cellulose insulation. The insulation is blown into the cavity between the stock log wall and the internal wooden construction. In order not to create any cavities in the insulation layer and to avoid subsidence of the insulation afterwards, it is important to blow the cellulose with sufficient pressure. The inner end of the hollow box is formed by an OSB board (Norbord), which also has the function of an airtight layer and a vapour control layer. The OSB board is screwed onto wooden T-beams (Steico company) and all butt joints are glued with airtight strips. With a board thickness of 15 mm, the OSB board achieves an Sd value of 3,0 – 4,5 m. It is accordingly a diffusion-limiting interior insulation system. A wooden formwork is assembled on the OSB board, which presents the visible surface in the interior area. In order to prevent the insulation from being flushed through, a wind paper is applied to the inside of the existing block wall.

Cross section of the wall build-up, available pictures of the solution:

Black wind paper and frame construction for the OSB panels © DI Hans Peter Gruber

View of the airtight surface (OSB board), ©
DI Hans Peter Gruber

facade cross section, © UIBK

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Why does the solution work in terms of compatibility with conservation, moisture safety and energy improvement?

The combination of capillary-active properties of cellulose and the reduction of vapour diffusion through the OSB board contribute to the functionality of this solution. Another essential aspect is the existing wood block wall. Due to the relatively high thermal resistance of the wooden wall, the temperature between the existing wall and the insulation is much higher compared to a solid stock wall. Another important factor is the air circulation through the wooden beams. The air exchange has a positive effect on the drying behaviour of the construction. Despite the lack of driving rain protection on the surface of the wooden wall, a certain constructive driving rain protection is given by the surrounding balcony and a relatively high base wall, which minimizes the moisture input from outside. In order to prevent the entry of the construction moisture of the reinforced concrete structure into the wooden wall, the sealing of the floor construction was drawn over the contact area of the old wooden block wall. A moisture-resistant beam on a PUR/PIR hard foam basis (Purenit)

was used as the first beam layer to exclude possible moisture damage caused by the support on the waterproofing.

Description of the context:

The 300-year-old "Hof Neuhäusl" is a prime example of the combination of old building stock and energy efficiency. While retaining its historical appearance, the building was refurbished completely in 2017. The preservation of the façade required the implementation of consistent internal insulation. Inside, the rooms were restructured in order to meet the highest, modern living standards. The aim of the renovation was to preserve the old building structure and achieve the living comfort of a passive house. To create sufficient room height, the building was undermined and placed on a reinforced concrete foundation. Due to the frame construction the loads of the ceiling can be transferred directly into the foundation and the old block building can be considered as independent and decoupled. This has the great advantage of being independent of the subsidence and the swelling and shrinking of the blockhouse.

Pros and cons of the solution:

The pros of this construction are the relatively simple installation and the use of a cheap insulation material. In contrast to sprayed-on cellulose, the blow-in insulation is installed completely dry and does not add any moisture to the construction. As a disadvantage, the airtight and vapour retarding layer must be mentioned. All installation in the external wall must be integrated airtight and a clean and professional installation must be meticulously carried out. In order not to penetrate this level with installation, a facing shell can be mounted in front of the OSB board.

Type of data available (level of information, simulation):

The wall construction was hygrothermally simulated and tested by Holzforschung Austria using the WUFI software during the execution planning. The University of Innsbruck also carried out some hygrothermal simulations with the DELPHIN software. In these simulations, different boundary conditions were varied in order to examine a susceptibility to regional differences. Furthermore, since the end of 2019, a wood moisture measurement is carried out at the farm "Neuhäusl" in Scheffau in Tyrol.

Is there any related publication? If yes, please provide any available link or document for further reading

https://www.hiberatlas.com/smartedit/projects/130/Masterarbeit_Alexander Rieser_Thermische Sanierungskonzepte für landwirtschaftliche Holzgebäude.pdf

Masterthesis - Alexander Rieser

Link to best practice example (Hiberatlas):

https://www.hiberatlas.com/en/hof-neuhaeusl--2-130.html