

## Press Release

Sustainable building on a large scale

# Research lab made of hardwood

Zurich, July 10, 2014

**ETH Zurich is currently at work on a new building on Hönggerberg designed to test several new technologies along with structural elements made from Swiss hardwood. The office building – which will also be a research lab of sorts – is scheduled to open in May 2015.**

The building, whose top storey is currently under construction, has numerous advantages: thanks to the simple frame construction, the ground plan is flexible and the inner and outer walls can be arranged as desired. With its transparent facade and a continuous outer shell, it will doubtless be a pleasant workplace. However, the House of Natural Resources (HoNR) is much more than just an office building – it is also a laboratory for sustainable construction in which ETH Zurich is testing new technologies and construction elements that have never been used anywhere else.

### **Transdisciplinary project**

When the Laboratory of Hydraulics, Hydrology and Glaciology (VAW) moved from the city centre to the Hönggerberg campus in spring 2013, it soon became clear that its scientists would require additional office space. So why not use this opportunity to turn the annexe into a transdisciplinary research project? Six ETH professors from the institutes of Structural Engineering, Building Materials and Technology in Architecture were convinced by the idea and are now carrying out their research projects directly as part of construction.

In the House of Natural Resources, solar elements are to be arranged using wood modules, and an adaptive solar facade will provide supplementary electricity. Additionally, a new type of wooden facade promises increased weather resistance and stability. These elements are still being under development. The two research projects focusing on the innovative use of hardwood are already implemented in the building.

### **Unique use of Swiss hardwood**

The project boasts a worldwide first application of a wood-concrete composite floor with beech wood sourced from Swiss forests. An approximately 4 cm-thick beech wood veneer board is used both as a formwork element and as reinforcement while also providing an aesthetically pleasing ceiling.

Notched details cut from the board enable it to be joined to the 16cm-thick concrete layer which tops it. This creates a composite floor with similar load-bearing properties to reinforced concrete floors, the most commonly used load-bearing slab elements in Switzerland.

The frame structure of the HoNR is made of Swiss wood and is also unique for many reasons. The columns are made of 100 per cent ash wood, and the beams are made of a combination of ash and spruce. This provides increased strength. Both components use what is known as glued laminated timber, whereby different timber lamellas are glued on top of each other in the same grain direction. Due to the use of hardwood, the joints at which the columns and the beams meet are reinforced and remarkably stiff. Additionally, all the beams are post-tensioned with a cable running through the inside of the wood. As a result, the beams centre themselves, meaning that the overall frame structure is particularly ductile and significantly more earthquake-proof. "This unique construction, which was developed as part of an ongoing CTI project and is being implemented for the first time in the HoNR, is easy to prefabricate and can be built quickly. This means that both the composite floor and the post-tensioned frame construction are very cost effective," explains project manager Andrea Frangi, Professor of Timber Structures at ETH Zurich's Institute of Structural Engineering.

### **More hardwood due to global warming**

The research project will demonstrate whether this frame structure and this type of wood-concrete composite floor are feasible long-term construction options. As the researchers are continuously monitoring the HoNR with sensors, this is the first time that they are able to analyse the structural behaviour in a real building over a number of years. And because their colleagues in the VAW are using the building, the researchers can not only monitor measurable variables such as deformations, vibrations and tensions, but can also incorporate the subjective perceptions of the users – such as well-being, comfort and vibrations felt – into their studies. This is valuable data that could not possibly be gathered through laboratory research.

The ETH project places special emphasis on the use of hardwood, because climate warming is causing the number of deciduous trees in Swiss forests to rise. However, up to now a wood such as beech wood has mainly been used for interior finishing and furniture or as a resource for generating energy; the latter makes little sense from an ecological viewpoint. If wood is initially utilised in a high-quality capacity, for example in timber construction, and burned for fuel only at the end of its life cycle following further stages of exploitation, this improves the emission balance considerably.

You can read more about innovative construction using hardwood in the blog entry (German) by Professor Andrea Frangi in our [Zukunftsblog](#) →.

## Further Information

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## “Sustainable construction” as a key strategic area

ETH Zurich has defined “sustainable construction” as a key strategic area. The House of Natural Resources is a research, teaching and demonstration building which ETH Zurich is using to prove that its research can be applied to this sector while facilitating transdisciplinary research.

Alongside the House of Natural Resources, ETH Zurich has also created a number of new professorships that strengthen its existing expertise in research and teaching in the field of sustainable construction. Additional goals are to intensify transdisciplinary research work in this key area, to promote the transfer of knowledge, and to support the education of young academics for the construction industry.

The building costs for the HoNR amount to around six million Swiss francs. Part of the financing was provided by the ETH Zurich Foundation through donations. The Federal Office for the Environment (FOEN) is also offering financial support for the HoNR’s construction in the form of 500,000 Swiss francs from the Environmental Technology Promotion programme. With its Timber Action Plan, FOEN is promoting the increased use of hardwood as a material, such as in the construction sector. Along with FOEN, the EU’s Climate-KIC initiative is also an important partner of the HoNR. The Climate-KIC “Building Technologies Accelerator” (BTA) flagship project, in which ETH Zurich is the leading partner, focuses on the development and market launch of technologies that lead to measurable CO<sub>2</sub>e reductions. Over the next six years, Climate-KIC will be contributing several million to ETH technology development in the sustainable building sector. The HoNR, which is one of six European Living Labs in the BTA project, is intended to help establish new building technologies in the market more quickly.

[Building Technologies Accelerator](#) →