Introducing Hout Bay House

A research project about a unique type of timber construction in South Africa

Article by Klára Popovová

Energy efficient housing and construction have become very topical in South Africa, not only because of the growing prices of heating, but mainly because of the increasing ecological awareness of many South Africans who want to live in a modern, but, at the same time, sustainable way.

This trend is the starting point of a unique research project through which a team of PhD students from Europe and South Africa will attempt to build an ideal timber home to suit South African climatic conditions.

The project is a unique combination of expertise, use of ecological materials and modern processing methods, steered by a team consisting of seasoned experts and young researchers.

We are especially proud of our young research team of PhD students, including Eliska Oberhofnerova and Regina Oralkova from the Czech University of Life Sciences in the Czech Republic, as well as Phillip Crafford and Melanie Blumentritt both from the Department of Forestry and Wood Science at Stellenbosch University. Eliska has experience with designing houses in extreme climatic conditions and currently focuses on the topic of degradation of wooden materials, while Regina focuses on designing experimental buildings and specialised furniture, with the aim of broadening the contemporary possibilities in housing. Her PhD research focuses on energy solutions for timber houses and the optimisation of construction processes. Phillip and Melanie focus on green building with wood as a construction material.

WHY DID WE START THE HOUT BAY HOUSE PROJECT?

The aim of the project is to find an optimal form of timber construction suitable for the specific climatic conditions in South Africa, to define the ideal thickness of thermal insulation for this setting, and to evaluate the benefits of using the air gap. Such data can be used in the process of house building and to develop the use of timber construction in the area. Our aim is to build an ecological family house in Hout Bay, which will be then tested for several years with people living in the house.

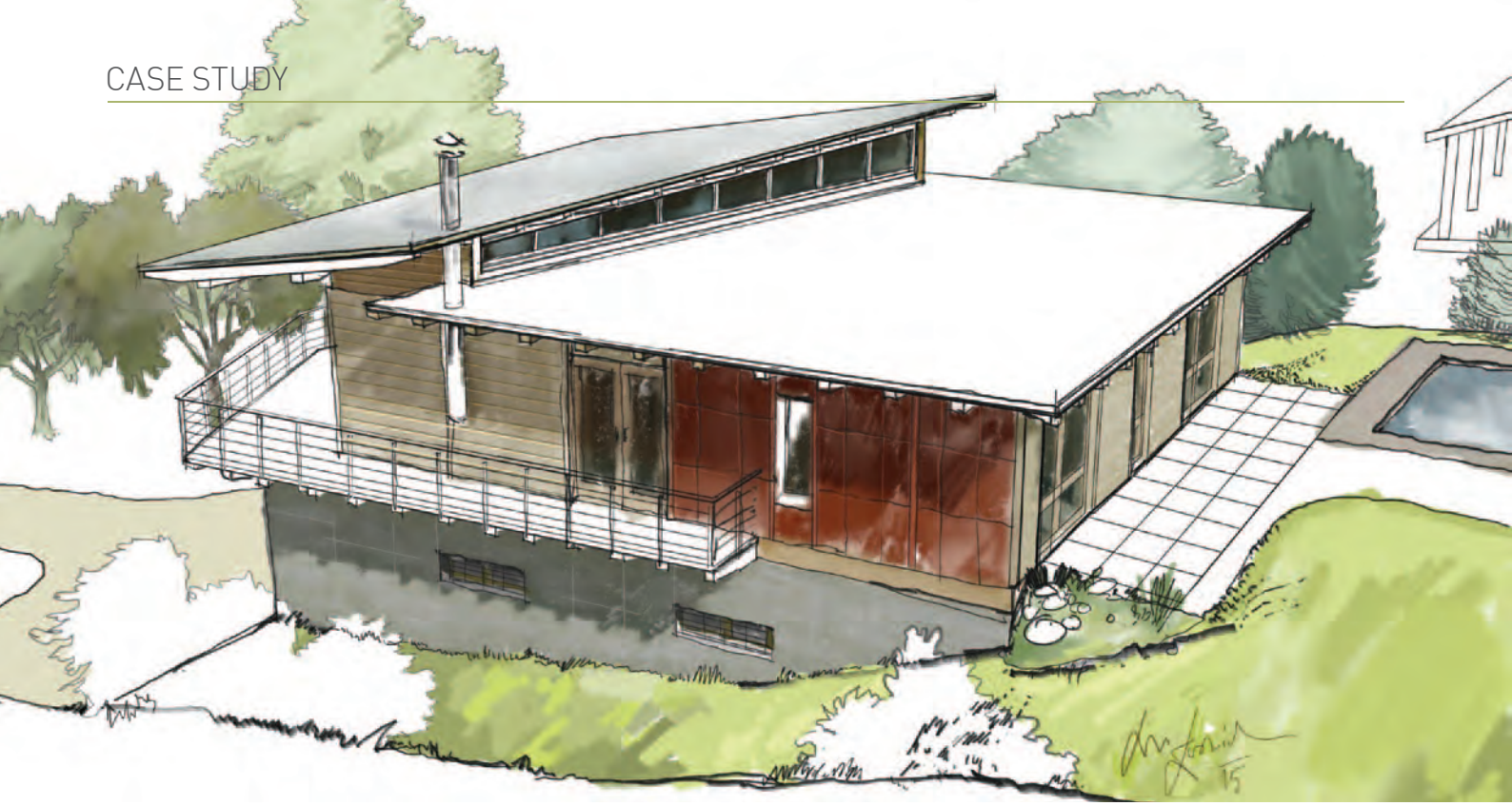
Hout Bay House was designed by the academic architect, Michal Dostal in co-operation with timber construction experts, in order to suit a specific locality. The research will be carried out in co-operation with the Research and Development Institute for Wood Processing (VVUD) in Prague.

LESSONS LEARNED FROM PREVIOUS EXPERIENCE

First and foremost, we draw on our experience from already having built a wooden house, House Pinotage, in the Cape Town area. What we know from House Pinotage is that during the year, the house showed a high level of thermal comfort, with a pleasant ambient environment without any need for heating or air-conditioning. The design of the house was executed according to European standards, which means that the insulation may have been over-specified for the conditions in South Africa and therefore unnecessarily costly.

Using this information, we intend to make the Hout Bay project suitable for the specific climatic conditions in South Africa.

This project will allow us to test the wall composition with different thickness of thermal insulation and other possibilities with ventilated gaps. The evaluation of data we gain in this way will help us to find out what an ideal South African wooden building should be like.



Using wood in all its forms: Hout Bay House will be constructed using Novaspruce cross-laminated timber, wood panels, insulation, floors, frontages, Fermacell gypsum fibre board and many other materials and techniques.

HOW WILL THE HOUT BAY HOUSE BE CONSTRUCTED?

The composition of the house is diffusely open, which allows the building to conduct away humidity. By employing insulation materials with a low level of diffusion resistance, we achieve a diffusely open shell for the house, and we do not have to use vapour barriers.

Novatop, based on cross-laminated timber (CLT) panels (84mm), is produced in the Czech Republic and is used in the supporting frame. They are made of dried coniferous lamellas arranged in an odd number of layers. Each layer is turned 90° in relation to the next one, which guarantees stability of shape in spite of changes in humidity. CLT panels create a pleasant microclimate, which has beneficial effects on human health. For processing the wooden components, we use the most advanced CNC equipment. The most important advantage of this system is the simple execution of construction details, minimal number of assembling joints, simple composition of walls, resistance to fire, construction speed (several days) and, because of its aesthetic appeal, the possibility of showcasing the timber as part of the interior.

Alongside CLT panels, modern Pavatex ecological wood-fibre insulation is used. Thanks to its features, it is a great solution for thermal stability and sound-proofing of wood constructions. It insulates the structure against outside temperatures and moderates the microclimate in the house, keeping the interior climate agreeable even during winter.

In summer, on the other hand, it cools the building down in a natural, ecological and economical manner. The air gap also helps to achieve this.

One part of the project focuses on the use of air gap in the construction in such a way that it would, in the most advantageous way, air the overheated composition and conduct away humidity from the construction.

We also incorporate windows with a new type of glazing (insulated double glass) into the perimeter shell of the building, which will contribute to the protection of the building from the changes in the temperature outside. The whole building will be tested for several years. The purpose of the house is to test different types of insulation, varying in thickness, and the possibilities of using the air gap, with the focus on economical use of material in construction in the given locality.

HOW WILL WE OBTAIN THE DATA?

The aim of the project is to evaluate the influence of the composition of the building's thermal and humidity transmission in order to maintain a high level of comfort of the inhabitants. Sensors will be placed in each layer of composition. During the research, sensors will be placed in the house to measure temperature and humidity in the external wall. With the help of special sensors, data will be gathered which will tell us about the thermal technical features of the walls we designed (temperature falls and humidity curves). We will measure the heat-transmission coefficient in the perimeter construction, its surface temperature and humidity. The results will allow us to test the suitability of the construction. Data, which will be obtained while the house is occupied, will be downloaded through an ethernet cable, gathered in an electronic database, and assessed.

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