

HOUT
BAY HOUSE







HOUT BAY HOUSE

New timber project in Hout bay offers combination of modern timber construction, using of natural materials and cooperation with prestige universities and experts from leading European companies as well as smaller family-owned businesses.

During the next three years we will measure temperatures and humidity in the solid wood construction and observe how the materials react to the South African climate. We will work with different wall compositions to find out which one is ideal for South African weather conditions.

HERRMANN & VOGEL
SOUTH AFRICA



Research team

This unique project, powered by seasoned experts and young researchers, encompasses expertise, usage of ecological materials and modern processing methods.

We are a team of people who know what they are doing and they do it with enthusiasm. We believe that we are able to find the optimal solution for wood constructions in South Africa and thus awake a general interest in pleasant and ecological housing.

Team of students from Stellenbosch University and Czech University of Life Sciences

Melanie Blumentritt, PhD. | Stellenbosch University (SA)
Has experience in wood composites (particle board, OSB) production and mechanical testing, wood anatomy, ultrastructure and chemical evaluation mostly using electron microscopic techniques, and life cycle assessment. In Stellenbosch she is mostly involved in projects related to Green Building, especially with regards to conducting LCA of SA timber products.

Ing. Philip Crafford | Stellenbosch University (SA)
Studied Wood Products Science and did his masters in wood mechanics, grading and wood-physics. Currently, he is doing his PhD on green building or more specific; The contribution of timber in greening the South African building industry.

Ing. Thomas Hugo | Engineer at Greenplan (SA)
Currently works as an engineer with Greenplan Greenbuild Consultants who focuses on the energy modelling and sustainable design of buildings. On a part-time basis he consults and works as a CDM Carbon Consultant (with BWC) and Renewable Energy Engineer (with NSE). His mission for working in renewable & sustainable engineering started after completing his chemical engineering degree when he did his MSc in biomass pyrolysis.

Ing. Eliška Oberhofnerová | Czech University of Life Sciences (CZ)
PhD student in the field of wooden products and constructions. She has experience with designing houses in extreme climatic conditions. She currently focuses on the topic of degradation of wooden materials.

Partners of the project



NOVATOP



pavatex



NOVASPRUCE



fermacell



wood profiles
Seca



probe
25 80 D6 9
19920121

PHOS and Temperature
ROM:
SER. NO. 1

facade length 13 m

8 m²

room sensor CO₂

70.5 m²



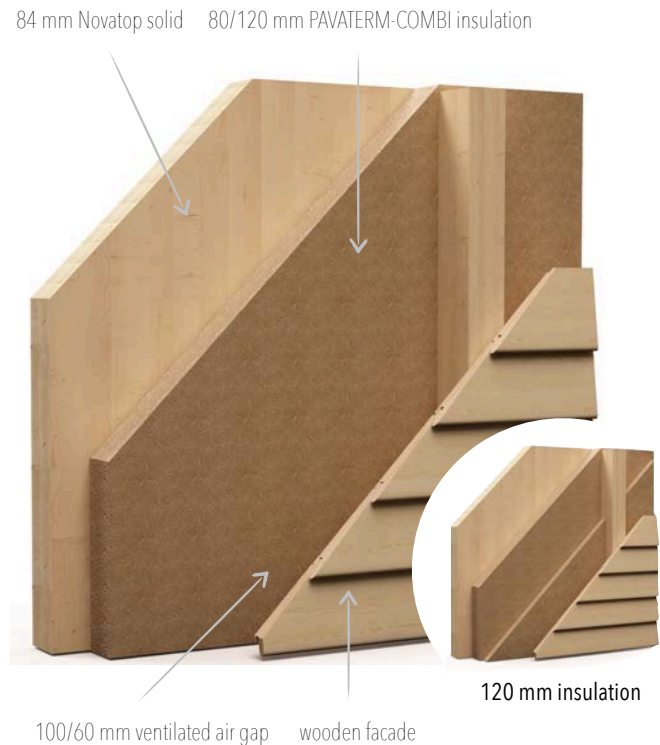
Measuring temperatures and humidity in the walls

During the three year research period we will measure the temperatures and humidity in the walls and at the surface of the facade and roof as well as in the interior of the house. The aim of this measuring is to find out the optimal wall composition for the South African climate. For the construction of the house we use 84 mm thick **NOVATOP solid wood panels** based on CLT. The thickness of the **wood fibre insulation by Pavatex** (bulk density 145 kg/m³) will vary. On one wall we used 80 mm thick insulation and 100 mm ventilated air gap, for other walls we used 120 mm of insulation and reduced the thickness of the air gap to 60 mm. This will allow us to evaluate the impact of the thickness of insulation on the indoor climate in the specific Climatic conditions of Western cape.

The house is full of **sensors** which help us to evaluate the **indoor climate as well as temperatures and humidity in the walls**. There are seven measuring points, each with one sensor measuring surface temperature of the facade, two sensors measuring temperature and humidity in the wall and one sensor measuring the surface temperature of the interior wall. Except these seven measuring points we have three CO₂ sensors evaluating the quality of indoor climate and measuring point at the roof. Data from all these sensors are collected and available online for our research team who will regularly publish the results on our homepage, Facebook page as well as in magazines and scientific journals.

We will also compare our results based on measuring in the real house with computed values based on mathematic models. This will help us to find out how far are the models useful for wall compositions of **South African Green Buildings**.

The cooperation of students, products specialist, architects and builders allows us to see the green building from different points of view and use all the **benefits of natural materials**.





Treatment and degradation of wooden materials

The team of Hout Bay House Research Project will discover how **European woods behave in specific South African conditions**, in addition close to the ocean. The behaviour of surface treatments of wooden facade and terrace elements will be monitored throughout the whole research project. Siberian larch and thermally modified pine wood is used as a siding of Hout Bay House. In European conditions these wood species are generally considered as durable. The **thermally modified wood** is produced by controlled process during which was the wood being exposed to high temperatures. The process of modification changes the chemical structure of wood. This material is generally considered to be very durable with regard to given climatic conditions and does not undergo substantial dimensional changes.

As a part of degradation examination we will consider the wooden facade **colour changes**. Exposure to solar radiation (especially UV radiation) results in wood colour changes. Some wood species turn white or grey, some tend to turn yellow, red or brown, depending on the wood composition. UV radiation also causes conversion of lignin - one of the basic components of wood - to water-soluble substance which is subsequently eluted from wood. Wood gets a typical **plastic structure**. The rate of erosion depends on local conditions, generally ranges from several months to several years. Another cause of wood degradation is an exposition to **frequent moisture changes** that causes **swelling and shrinking of the wood**. As a result **cracks** occur on the wood surface. Wind is another factor

causing degradation, it carries mechanical particles (dust, sand etc.) that contribute to the **erosion of the wood surface**.

All these observed parameters serve as important indicators of wood degradation in specific conditions. The research will allow us to compare degradation of wood according to:

- ▶ site orientation
- ▶ position towards the ocean
- ▶ comparison of untreated wood and wood with surface treatment

Wood degradation is a long term process but already during testing we are able to predict the behaviour of **wood exposed to external conditions of coastal climate in South Africa**.

The protective coatings OSMO, based on natural vegetable oils, have been selected as a **wood surface treatment** for the facade and roof overhang. Oils generally penetrate deep into the pores of the wood, but do not plug them and allow the wood to breathe. In addition they limit the outflow of the resin in the case of coniferous trees. Oils also repel water and reduce the dimensional changes and cracks formation, but still provide an attractive and natural appearance of wood. In addition, modern wood stains contain **pigments which reflect the sun rays** and thus reduce degradation of wood connected with the effects of harmful UV radiation.

The **reference samples** of treated and untreated wood will serve for comparison and evaluation of the surface treatment influence on the wood degradation.



Flooring solution

Pavatex wood fibre insulation

40 mm

PAVATERM-COMBI, wood fibre insulation boards by Pavatex with bulk density of 145 kg/m^3 which is used for walls insulation is suitable also for flooring. Pavatex offers excellent thermal and noise insulation and prevents overheating in case of fire

In Hout Bay House we use 40 mm of PAVATERM-COMBI for thermal insulation between garage and entrance area and living area. The boards with a complete tongue and groove are laid on 19 mm Solid wood panel.

Fermacell flooring elements

25 mm

Fermacell flooring elements are designed for use as floating floors in a wide variety of applications. Manufactured from two layers of fermacell gypsum fibre boards they give a dry, robust, and simple solution for flooring. Glued and screwed together the elements behave like a single piece of board covering the whole room.

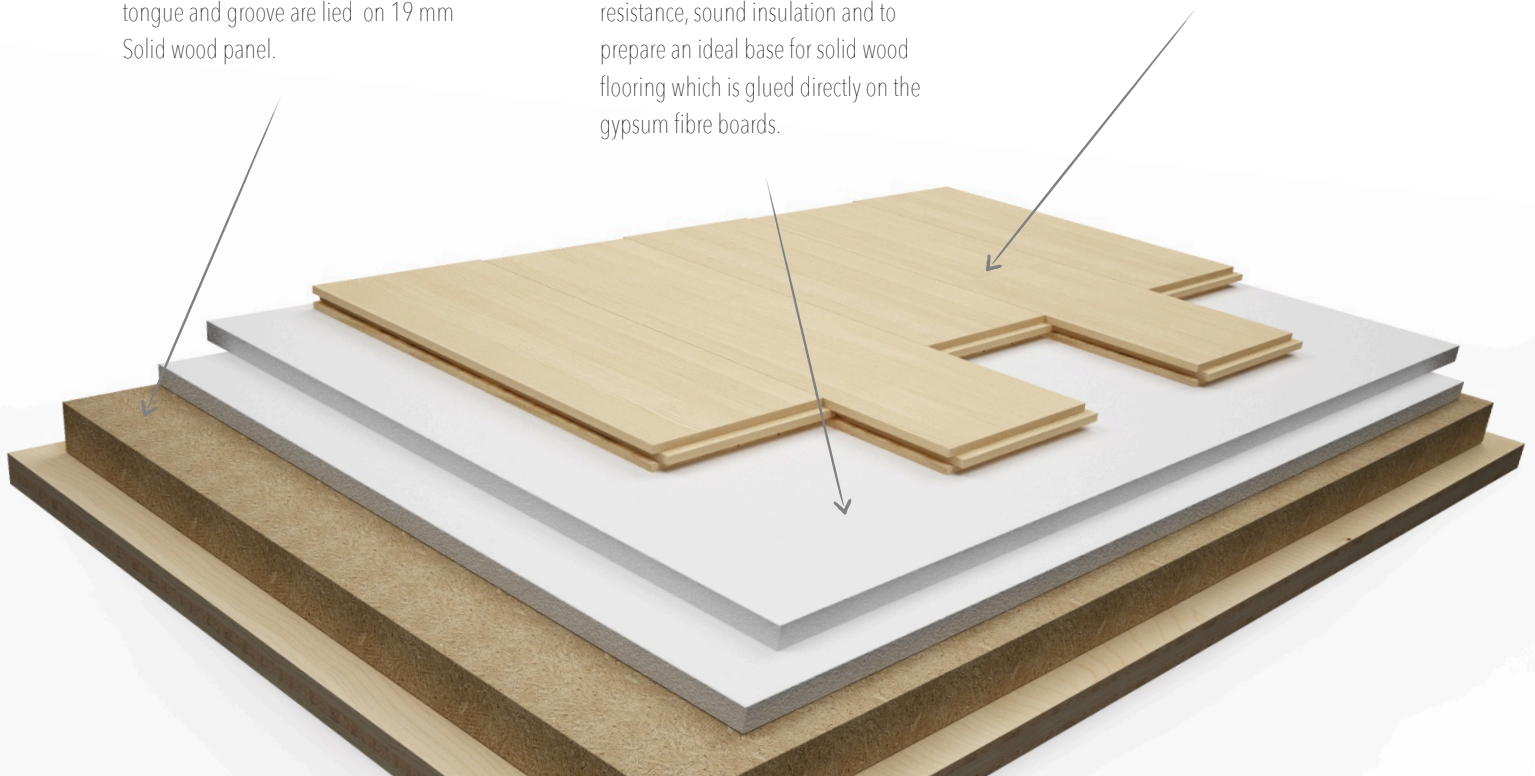
In Hout Bay House we use the fermacell flooring elements to improve the fire resistance, sound insulation and to prepare an ideal base for solid wood flooring which is glued directly on the gypsum fibre boards.

Feel Wood solid wood flooring

15 mm

The FEELWOOD solid wood floorboard is manufactured from a solid piece of wood, with a complete tongue and groove and in the raw state has a fine sanded surface.

In Hout Bay House we use Rustical Oak with oiled surface and Siberian Larch with two colours of oiled surfaces. We will regularly measure the humidity of the solid wood flooring and evaluate how the wood species react to the South African climate.





Fermacell

Fermacell gypsum fibre board is an **ecological product** which perfectly fit to timber. The combination of unique timber structure and smooth white fermacell is very modern and helps to create bright, airy and **comfortable indoor climate**.

- ▶ Fermacell is made from **gypsum and recycled paper fibres**. These two natural raw materials are mixed with water, without any other binders being added. The mixture is then pressed into **stable boards** under high pressure, dried, coated with a water repellent, and cut to the required sizes.
- ▶ 60 minutes **fire resistance** from single layer partitions up to 10 m high. Class '0' certification. European class A2. We use the boards as additional protection behind fire place.
- ▶ Boards are extremely suitable for **rooms with variable humidity**. In Hout Bay House we use them in bathroom.
- ▶ **Load carrying Up to 50 kg** per cavity fixing and 30 kg per screw. We use the stability of gypsum fibre boards for walls as well as shelves.



Terrace Decking

Wooden decking makes the terrace and balcony looking natural and represents the connection between the house and garden. Modern architecture and garden design are neither willing nor able to do without this renewable raw material.

- ▶ Testing of the same decking profile using **two wood species** - Siberian Larch and thermally modified pine (Thermo-Wood).
- ▶ The decking remains **untreated** to test how both wood species behave in the South African climate.

The manufacturing process of Thermo-Wood is based on the use of high temperature (185-225 °C) and steam. The process improves dimensional stability and biological durability of wood.



Windows

Windows and doors are very important part of the house and we decided to test various aspects of double glazed wooden as well as plastic windows.

- ▶ **Oak** windows and doors in the entrance area, **plastic** windows in garage, **spruce** windows and balcony doors and combination of **spruce and aluminum** in the first floor of the Hout bay House
- ▶ The wooden windows are protected by **three layers of treatment**. First two layers protect against insects and other biotic factors, the third layer protects against UV radiation, mechanical degradation and gives the windows the colour.
- ▶ Every window is equipped with Maco Tronic **window-security system**. This sophisticated system monitors certain points of the window frame and starts to alarm already in the moment when the burglar tries to move with the handle of the window. It gives the security patrols a chance to intervene.
- ▶ Testing of **sun protective glass** containing particles reflecting solar radiation.



Garage doors

Garage doors affect the climate of the house as well as safety of the building. Insulated dust- and watertight garage doors make the house much more comfortable.

- ▶ **Energy loss protection** - the 42 mm thick, insulated panels guarantee high stability and optimum heat insulation. (U-value of 1.1)
- ▶ Optimum tension spring system - the tension spring assemblies are encapsulated by two tension spring boxes fitted above the rail runners, so ensuring a unique intervention guard system. This way we can guarantee **maximum safety**. Normstahl doors operate smoothly with hardly any noise and also save space.
- ▶ Sealed all round, yet providing optimum **insulation**. Reliable, permanently elastic seals on the floor keep the garage **perfectly watertight** all round.
- ▶ Outstanding **protection from injury** - maximum protection for little hands thanks to covered rollers, rail runners, tension springs and a cable guide positioned on the inside.



Wood solutions and inspiration for your project

Visit Hout Bay House, meet our product specialist and find a new solution for your project. The house is open to architects, builders as well as professors, students and public. Feel free to contact our colleagues and make an appointment.

We will explain you how the research works, show you the latest data and introduce used materials and their advantages. Together we will find the best way of using modern ecological materials in your project. It doesn't matter if you are working on reconstruction of you apartment, building a small family house or creating big project. Visit the Hout Bay House and experience the **pleasant climate of modern timber construction without using air conditioning** in the summer **or heating** in the winter.

All used materials are **available in South Africa** at the warehouses of our **exclusive distribution partner Ian Fuller Agencies** and it will be a pleasure for us to assist you by choosing the ideal solution for you new house or reconstruction.

If you want to get regular updates about the Hout Bay House Research Project, see the pictures, videos and chat with the research team, follow us on **Facebook!**

Contact details

4a Helgarda Aveue, Hout Bay - Cape Town

MATERIALS USED IN HOUT BAY HOUSE

If you want to get more technical information about the materials used in Hout Bay House, feel free to contact **Milan Detko**, product specialist who will help you to find the best solution for your project.

m.detko@hwzinternational.com

If you want to buy products used in Hout Bay House, contact **Gareth Hare** from Ian Fuller Agencies, our exclusive distribution partner in South Africa.

gareth.hare@ifatimber.co.za

VISIT HOUT BAY HOUSE

Are you an architect, builder or are you just interested in ecological housing? Visit Hout Bay House to find inspiration for your projects. Our team will provide you all information about the materials used as well as research part of the project. Contact **Zaida Davids**, office manager who will arrange a program for you.

capetown@hwzinternational.com

MORE INFORMATION ABOUT THE RESEARCH PROJECT

Are you interested in the research project, do you have any question regarding methods and results? Contact project's co-ordinator **Klara Popovova**.

klara@holz.cz



www.houtbayhouse.info