woodenHAT – EXPERIMENTAL MODULE

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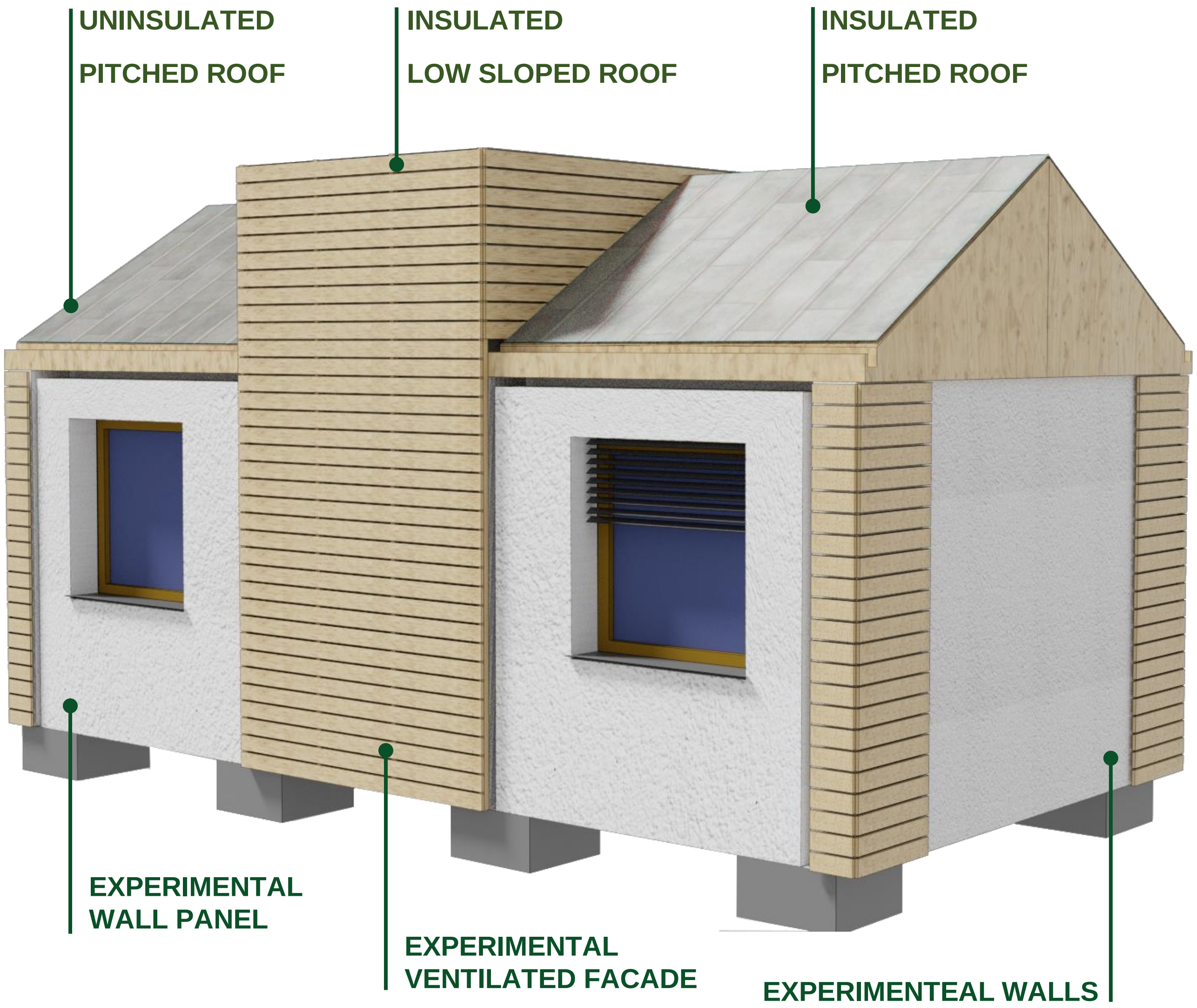
The current building physics theory is increasing importance of application of energy-efficient buildings. In accordance with European Union policy of reducing greenhouse gas emissions, buildings should reduce their energy demand and use more and more renewable energy sources. The key area is the optimization of the building envelope. Contemporary engineering must meet the incessantly increasing criteria for building design and current building materials and components are constantly being improved. Research brings new materials and technologies which are not long-term verified. On the other hand, many of the well-established building materials are used in new ways which are not proven by years of use. Especially, a lot of wooden and organic materials are very sensitive to moisture.

Their usage in components requires careful design with understanding all processes of heat, air, and moisture transport. This fact brings a lot of questions about durability and lifespan. Classic laboratory testing offers a lot of information about material characteristics. These data are very important for components design and assessment, but they are not enough for prediction of long-term durability and safety.

The only way the long-term behaviour can be proven is full scale testing under real climatic conditions. Full scale testing implements destructive sampling hence we often have no space for its application in real buildings. These reasons have led to many experimental cells and buildings all over the world.



An experimental module was inspired by several projects all over the world. The data obtained from the module bring information about real response of tested components and materials. The experimental module is placed in Mendel University Campus in Brno. The Module has floor plan dimensions of 6.5 x 3.5m and height of 4.5 m. It consists of three wall segments and three roof segments. These segments are structurally independent and could be modified, combined or changed according to future needs. The Wall segments form three rooms. Middle part covers technical infrastructure and side's rooms are used for testing. Each room has test fields in the walls, floor, and ceiling and the room is closed by test wall panels with windows. The test fields are equipped with composition samples and they could be simultaneously monitored and evaluated. The rooms are designed to study temperature stability of lightweight buildings and relations between space, components, and solar shading systems. Three roof segments are divided into two pitched roofs and one low sloped roof., Each of them has several test fields. The Middle segment is equipped for ventilated facades testing and reference ceiling for acoustical measurement. A complex meteorological weather station will monitor all significant parameters entering the calculation of HAM. The Selected reference models of building components will be tested and compared. The purpose is to obtain behavioral data of real components and compare their compliance with virtual HAM modelling. Long-term measuring will focus on temperature and humidity profiles in compositions. The Results will be compared with theoretical HAM calculations based on measured boundary conditions with an effort to directly apply research results and various algorithms. Several tools could be tested and compared as well. (WUFI, Delphin, Comsol, Ansys, OpenFOAM, developed algorithms). The results will be published in case studies reflecting the impact of moisture transfer in building materials and structures and demonstrating the findings of fundamental research in the field of HAM transport.

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