

## News archive 2018

### 19<sup>th</sup> of Nov 2018

Signing up for the fourth and final seminar of the project COMBI is open [here](#). The seminar will be held on Thursday 24.1.2019 in Tietotalo Building, lecture hall TB104 at TUT. Come hear about the last results of the COMBI-project! In case you cannot attend, the seminar can be watched afterwards from the project's webpage in the seminars-section.

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### 17<sup>th</sup> of Sep 2018

#### **The construction of new test buildings has begun in the parking space behind TUT**

The building physics research group of TUT is currently building two new test buildings to replace the old ones on the parking space behind TUT. The test buildings will be real buildings, stressed by real climate conditions. Once the new test buildings are finished, it will be possible to simultaneously study 12 different exterior wall structures and six roof structures in the same climate conditions. This way the performance of structures can be reliably compared in changing climates. Additionally, the performance of south- and north-facing walls can be compared, since their thermal and moisture stresses are significantly different. The walls can also be replaced with window or door structures, if desired.



New test buildings are needed, since the building physical performance of structures must also be studied in real environments. Computational modelling or laboratory tests alone can't

guarantee accurate enough analyses of the true behaviour of structures. The problem with the old test buildings was that their structures couldn't be replaced. Additionally, these buildings were mainly designed for studying the energy consumption through the structures, whereas in the new buildings, the moisture behaviour of structures can be studied too. The old test buildings were also small.

The test buildings have been designed so, that the area and thickness of the studied structures are adjustable. A total of six examination openings were made on the south- and north-facing walls of both buildings. The area of one opening is 1.25x2.60 m<sup>2</sup>. The frames of the buildings have been designed to allow a 600 mm thick wall element, and to be able to carry even heavy wall structures made out of rock materials. The roof has been divided into elements so, that studying different roof structures is possible. The area of one replaceable roof element is 1.8x4.0 m<sup>2</sup>.

The indoor temperature, relative humidity and the pressure difference over the envelope will be regulated. The inside of the building can also be divided into three separate sections that can have slightly different indoor conditions. A weather station will be installed outside the buildings, and it will record all building physically important weather data near the buildings. According to a preliminary plan the data will include temperature, relative humidity, wind direction and speed, short- and longwave radiation both globally and on the south- and north-facing walls, rain as well as driving rain in several different spots on both walls. For the sake of monitoring indoor and outdoor conditions a system will be purchased, which uses cloud computing. This way the conditions can be monitored from afar and alerts can be set for when certain limit values are crossed.

The construction of the test buildings will happen in two stages; this year the changes to the area will be made and the first building will be built, and next year the area will be completed with the other building and some storage space. The new buildings are meant to be operational at the start of 2020. Similar buildings are not available for testing anywhere else in Finland.

The construction of the test buildings also slightly affects the use of the parking space behind TUT. A few parking spots have permanently been removed from use to make way for the new buildings. Every now and then during construction some extra space has been needed. Temporary protective structures will be built in the test building area if necessary during the final installation work, so as to not limit the use of the parking space during the fall semester.

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**17<sup>th</sup> of Aug 2018**

## **Significant funding for Rapid U-value metering in Finland and Germany**

The project proposal RAPID U has been granted significant funding both by Business Finland (former Tekes) and the German Federal Ministry for Economic Affairs and Energy (BMWi). RAPID U is dedicated to both on-site measurements of building constructions' U-values, using a novel measurement principle, and to the market deployment of U-value meters. Further support for the project comes from the Foundation of Technical Development and Research (TUF), the Finnish Ministry of Environment, The Finnish Real Estate Federation (Kiinteistöliitto) as well as The Finnish Association of Building Owners and Construction Clients (RakLi).



Precise measurements, rather than calculations, are necessary when defining the true insulation performance of any building element since the construction quality and wetness of materials are determining factors of the real thermal insulation performance. This means that the success of the RAPID U proposal will be of great benefit for the real estate sector regarding risks associated to thermal retrofitting and on-site quality control. True U-values are fundamental requirement for reality-based energy performance certificates, precise planning of thermal retrofitting, quality control of thermal insulation and detection of moisture. When speaking about rapidness of measurements for us it means around one hour.

RAPID U is co-ordinated by the inventor of the instruments, Arcada University of Applied Sciences, Helsinki, Finland. Other consortium partners are Tampere University of Technology/Building Physics (TUT), Raksystems Insinööritoimisto Oy and FIW München, that will coordinate the research activities in Germany. The research and dissemination partner is Deutsches Energieberater-Netzwerk DEN e.V., the German association of certified energy consultants. The overall budget of the project is around 1.5 million euros and the project duration is two years.

Accurate but fast U-value measurements are already possible today but are only offered by a very small group of experienced experts and bound to unnecessarily limited weather conditions. Since our goal is extensive deployment of U-value metering services, increasing the number of skilful experts who can provide these services is just as necessary as maximizing the measurement hours available during each heating, and thus measurement, season. Therefore, further work on appropriate training measures and the study of the influence of weather conditions is necessary.

Major challenges for fast U-value measurements in existing buildings are various wall constructions found in buildings from different time periods – ranging from hundreds of years old to new ones. Therefore, the main goal of the RAPID U project is determining the measurement limitations concerning thermal inertia of the most common types of wall constructions and varying outdoor temperature. In addition, moisture and anisotropic building elements require likewise detailed guidelines. Possible limitations of the procedure are subject of investigations by simulations (TUT) and real measurements at large-scale testing facilities (FIW). Comparisons of RAPID U results with long-term U-value measurements using heat-flux-meter sensors on site will be used for validation. Based on the data and conclusions of this project the RAPID U consortium will record the procedure for experts conducting measurements in a detailed manual, stating boundary conditions for high-precision Rapid U-value metering.



“But measurement expertise can’t be based on reading manuals and instructions alone, and therefore we’ll allocate significant resources for eligibility-giving training”, says Dr. Mikael Paronen, who is the co-inventor of the RAPID U-value meter. “Therefore, the existing Finnish Rapid U-value meter training contents will be adapted for German markets and updated with the new information on thermal inertia. This will be followed by ongoing training given in Germany by DEN eV. All the activities in the project are dedicated to the successful deployment of RAPID U-value metering, and to practicalities, such as the fine tuning of instrument characteristics allowing easier usage, development of in-field data collection principles and reporting systems,” Dr. Paronen says.

For additional information kindly contact Dr. Mikael Paronen (for all countries) or Christoph Sprengard (in Germany).

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## 8<sup>th</sup> of Jun 2018

Building physics research group from TUT has received funding to the SAFEHEAT-project. In the project, intelligent heating to keep empty buildings and vehicles (camper vans and boats) dry is studied. The purpose of the study is to develop a service concept and control equipment. With this product empty spaces can be heated in the way that mould growth and significant water condensation are not possible in the examined spaces or the structures surrounding them. However, heating is optimized to save energy.

When using intelligent heating the inside temperature is usually only a couple of degrees higher than the outdoor temperature. The indoor conditions are controlled by equipment which follows indoor and outdoor conditions. With the equipment the indoor and outdoor conditions can be followed and also adjusted with remote access. If a building has mechanical ventilation it can also be attached to the control system.

The new product has plenty of demand, since, in Finland alone, the amount of buildings that are out of use at least temporarily is estimated to be 5-10%. A significant portion of them are summer cottages. Additionally, the control system can be used to maintain desired indoor conditions in warehouses. The product is intended to be brought to the international markets rapidly.

The project starts on the 1st of August 2018 and ends 29th of February 2020. Professor Juha Vinha from building physics research group (TUT) is the responsible leader of the project and Tommi Mahlamäki, D.Sc. (Tech.), from industrial and information management laboratory is the project manager. The total funding to TUT is 460000 €. The project is a part of TUTL projects which are funded by Business Finland.

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## 12<sup>th</sup> of Feb 2018

The third public seminar of the COMBI-project was held at TUT on Thursday 25.1.2018. The seminar gathered audience to the big lecture hall of Festia to hear the latest results of the project, which is related to improving the energy efficiency of service buildings to nearly zero-energy levels.



The project COMBI is already far, but research will still be conducted in some of the studied areas in 2018. Moreover, the contents of the study will be compiled into different publications, for example, into easily approachable result cards and educational material. The project will produce approximately 40 result cards and their educational material, as well as about 80 more extensive publications. The project involved over 70 people in seven different research groups, five of which worked at TUT, one at TAMK, and one at Aalto University. The project involved 9 cities/municipalities and 37 companies in the field of construction. The master budget of the project was 2.4 M€ and it is currently about 80% finished.

Jyrki Kauppinen from the Ministry of the Environment came to the seminar to talk about the new building regulations, which came into effect on 1.1.2018. The biggest change are the clearer definitions of the requirements in new and repair construction. In the future the development of the requirements will be aimed more towards promoting low-carbon and sustainable development.

Pirkko Pihlajamaa from TAMK talked about the tools developed in the COMBI-project to develop project processes and to support performance analyses. Several research groups from TUT were also involved in this.

From the material and structure experiments, the ones presented in the seminar were the convection analyses of mineral wool insulation, the determination of material properties of concrete test pieces, as well as the laboratory tests and computational modelling of concrete elements drying. The results were presented by Eero Tuominen, Pauli Sekki and Henna Kivioja from the building physics research group of TUT.

The COMBI-project includes continuous measurements in 24 schools and day care centers in Pirkanmaa and Helsinki. Half of the buildings are new and half are renovated. The measured variables are indoor temperature, relative humidity, carbon dioxide and radon content, as well as the pressure difference over the envelope structures. Users and maintenance staff will also be interviewed. A presentation on the pressure differences and radon content measurements was given by Antti Kauppinen from TUT.

Kari Kallioharju, who is a researcher at TAMK, talked about the energy efficiency of lighting, as well as automatic solar protection in service buildings. Careful lighting design can significantly affect the electrical power required by lighting in service buildings. In an accommodation building the total delivered energy consumption of heating, cooling and lighting was studied.

Malin Moisio from TUT talked about a management model for energy optimization aimed at architects. It is based on different simulation analyses. According to the computational analyses the most important factors of energy consumption are the size of the building, purpose of use, indoor temperature, the type of heat generation system, as well as the amount of ventilation and the heat recovery coefficient of efficiency.

Juha Jokisalo from Aalto University and Juhani Heljo from TUT have developed tools for the economic analyses of municipal service buildings. Heljo presented the KOP-COMBI tool for practical cost optimization analyses. The tool is meant to be generally available in the beginning of 2019.

The presentations and video recordings of the seminar will be published on the [webpage of the COMBI-project](#). The result card presentation of the project can also be seen on the webpage.

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## 17<sup>th</sup> of Jan 2018

The third public seminar of the COMBI-project will be held on Thursday 25.1.2018 in the big lecture hall of Festia at TUT at 9-16. Many presentations will be heard on many interesting subjects related to improving the energy efficiency of service buildings to nearly zero-energy. The seminar is open to all, welcome!