Report of BBRI/ENBRI Expert Workshop "Hygrothermal testing - a necessity to guarantee durable buildings" 21 and 22 September 2022

On 21 and 22 September, a first ENBRI Expert Workshop in the field of "Hygrothermal Testing" was organised by the BBRI. The place to be was Greenbizz in Brussels (Belgium), which is not only a durable building, but also an incubator for sustainable projects, as explained in the welcome speech of **Johan Vyncke (BBRI, Belgium)**.

In a first session of the workshop, three speakers of well-known universities shared their knowledge on measuring and simulating heat, air and moisture transfer in building components and moisture storage in building materials. Right away some challenges in this research field were put on the table. To reckon wind-driven rain in numerical simulations, we have to know how to implement the wind-driven rain load. **Prof. Nathan Van den Bossche (UGent, Belgium)** showed how experimental studies can be of interest to get insight in the watertightness of wall assemblies and the moisture source that has to be implemented in numerical simulations. Next, **Kirstine Meyer Frandsen (Aalborg University, Denmark)** presented the challenge of measuring water vapor sorption at above- and sub-zero temperatures in bio-based materials. **Prof. Staf Roels (KU Leuven, Belgium)** showed us, based on experimental work, that the air change rate behind rainscreen claddings strongly depends on the cladding type. Furthermore, the reliability of common modelling approaches was discussed.

The second session dealt with typical damage patterns related to moisture. **Valentina Marincioni (UCL, UK)** first presented the UK Centre for Moisture in Buildings, after which she focused on some experimental studies on moisture in traditional buildings provided with internal insulation, the suitability of input and criteria for mould growth in the decision-making, and experimental work on waterproofing insulated cavities. Next **Sebastiaan Godts (KIK-IRPA, Belgium)** and **Scott Allan Orr (UCL, UK)** took us with them inside the world of salt mixtures. They explained us about typical salt mixtures in the built environment and how they behave, which processes occur at the micro/macro pore scale,… It was clear that there are still a lot of challenges on the way to a reliable implementation of salts in hygrothermal studies.

In the last session of this first workshop day, **Martin Prignon (BBRI, Belgium)** presented BBRI's brand-new test-facility, called "HAMSTER". The HAMSTER project was made possible thanks to the support of the Brussels Capital Region, the European Regional Development FUND (ERDF) and Innoviris. The name "HAMSTER" comes from Heat, Air and Moisture (HAM) and the fact that the first idea was to design a rotatable test setup (like a HAMSTER wheel). "HAMSTER" has furthermore the same meaning in English, French and Dutch, which is a benefit at BBRI 😊. Some perceptive persons noticed that the 'S' of 'salts' is already in place, so there shouldn't be any problem to include salt studies in the future 😊. After a brief presentation of the HAMSTER test setup and its facilities, a guided tour in the BBRI laboratories was provided. The participants could see the HAMSTER in real life and ask further information about its facilities, working, future plans, collaboration possibilities, etc. As a surplus, during this guided tour, **Michael de Bouw (BBRI, Belgium)** opened the doors of the laboratory "Retrofitting & Heritage" and explained the test facilities and expertise of his laboratory.

The first day of the workshop was ended with a dinner in the centre of Brussels, which offered a nice opportunity for a further discussion of all the interesting studies presented during the day and for networking.

The next day, three interesting sessions were provided. In a first session, diagnostics and treatments related to moisture in building materials and components were dealt with. **Tim Klewe (BAM, Germany)** introduced us in the world of non-destructive testing (NDT) techniques to measure moisture in building materials and showed some benefits and limitations of the different techniques. Next, **Rémi Bouchie (CSTB, France)** presented the expertise of CSTB in regard to experimental and numerical moisture modelling. The goal to write an operational guide for hygrothermal simulations was stated. Challenges to bridge the gap between simulations and practice. Last in this session, **Julie Desarnaud (BBRI, Belgium)** discussed electromagnetic and electro-osmosis methods in the context of the treatment of rising damp.

In the final two sessions, experiences in laboratory measurements, in-situ measurements, long-term monitoring and simulations of the hygrothermal performance of building components was shared with each other. **Jože Hafner (ZAG, Slovenia)** how ZAG performs hot-cold box measurements of non-standard structural elements. A comparison between calorimetric measurements and heat flux measurements was made. Next, **Lars Olsson (RISE, Sweden)** focussed on driving rain tightness of precast concrete sandwich walls. Based on observations made during field inspections and laboratory tests it was shown that problems with water intrusion still appear in practice and entail a lot of challenges. **Silje Kathrin (SINTEF, Norway)** presented experimental work using a climate simulator in view of a better understanding of the moisture performance of thermally insulated basement walls in cold climates. **Samuel Brunner (EMPA, Switzerland)** presented experimental work on the ageing of vacuum insulation panels at a tiny house and at a freezing room. Finally, **Julia von Werder (BAM, Germany)** and **Tessa Hubert (Nobatek, France)** introduced Metabuilding Labs as a platform that aims to facilitate collaboration between new partners and experienced experts for further innovation. Additionally, Julia showed us the design and opportunities of O3BET, which is an open source building envelope test bench. Furthermore, Julia and Tessa presented the expertise of BAM and Nobatek, respectively.

At the end of the workshop, **Xavier Loncour (BBRI, Belgium)** who chaired the workshop, asked the participants about their findings on the workshop. All participants agreed that it would be extremely interesting to start an ENBRI work group 'Hygrothermal testing and modelling'. Also the suggestion for organising workshops in the research area of Hygrothermal Testing and Modelling on a regular base, if possible combined with a guided lab tour, was well received. External partners and universities expressed their desire to be part of such a working group. ***Conclusion: (1) the workshop was a success, (2) a series of interesting workshops on "hygrothermal testing and modelling" are expected to follow, (3) all participants showed their interest in the initiation of a work group. To be continued…!***

For more information on the HAMSTER test facility, please visit Hamster (bbri.be). For more information on the workshop “Hygrothermal testing – a necessity to guarantee durable buildings” please contact the ENBRI secretariat: info@enbri.org.