

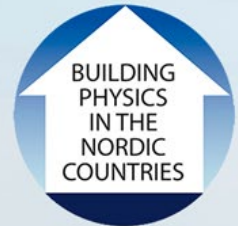


NSB 2023



AIRMASTER

WOODSENSE



FINAL PROGRAM

INCLUDING LINKS TO ALL
SCIENTIFIC AND TECHNICAL PAPERS

NSB2023

13TH NORDIC SYMPOSIUM ON BUILDING PHYSICS

12-14 JUNE 2023 AALBORG, DENMARK

ORGANIZED BY

AALBORG UNIVERSITY



Sunday 11th of June

17:00–19:00 Welcome reception

at KUNSTEN, Museum of Modern Art

Monday 12th of June

8:00–8:30 Registration and coffee

8:30–9:00 Opening session (Room 1: Auditorium)

Welcome: **Ruut Peuhkuri**, Conference Chair, Research Director, BUILD, Aalborg University

Program and Sessions: **Hicham Johra**, Scientific Committee Chair, Associate Professor, BUILD, Aalborg University

9:00–10:00 Keynote: Mark Payne (Room 1: Auditorium)

"Climate change and impact on building design for Scandinavia"

In this talk he will discuss how we couple of the work of climate science at the global level, including the IPCC, to the needs to plan for the challenges that climate change will bring at the very local level. He will discuss expected changes that are particularly of relevance to the design of buildings, including changes in winds, rain, ground water, snow loadings, sea levels and storm surges, using examples from both Denmark and the rest of Scandinavia.

Dr. Mark R. Payne is a climate researcher and the scientific leader of Klimaatlas, the Danish National Climate Atlas, based at the National Center for Climate Research at the Danish Meteorological Institute (DMI).

He has a background and PhD in Chemical Engineering, and has worked as a researcher on climate effects on life in the ocean for much of the last two decades. He is the author of more than 50 scientific articles, and has contributed to the IPCC reports. In his current role he is responsible for building a bridge between the society's needs for climate information on the one hand, and the climate data generated by climate science on the other. Klimaatlas provides such information all the way down to the local level, and currently forms the scientific basis for climate adaptation activities in all 98 local authorities in Denmark.



10:00–10:30 Coffee break

10:30–12:00 Track I - Mould, moisture safety and durability (Room 1: Auditorium)

Session Chair: Hans Janssen, KU Leuven, Belgium

10:30-10:45 [Comparing Canadian and Norwegian moisture indices for building climate adaptation](#), J E Gaarder, E Andenæs, I Astrup, M Lacasse, B Time and T Kvande

10:45-11:00 [Impact of different water penetration criteria and cavity ventilation rates on the risk of mold growth in timber frame walls with brick veneer cladding](#), S Kahangi Shahreza, A Abdul Hamid

11:00-11:15 [Wind-driven rain load in Finland in present and future projected climates](#), Toni A. Pakkala, Jukka Lahdensivu

11:15-11:30 [Distribution and location of damages in Swedish buildings](#), S O Mundt-Petersen, P Wallentén, A Joelsson, M Kläth

11:30-11:45 [Accuracy of using Moisture Reference Years for assessing the Long-Term Moisture Performance of Wall Assemblies](#), Zhe Xiao, Maurice Defo, Lin Wang, Michael A. Lacasse

11:45-12:00 [Climate data for moisture simulations: producing a Danish moisture reference year and comparison with previously used reference year locations](#), Nickolaj Feldt Jensen, Tessa Kvist Hansen, Anne Marie Svane, Martin Morelli, Rasmus Waagepetersen

10:30–12:00 Track II - Windows, glazed facades and solar shadings (Room 2)

Session Chair: Olena Kalyanova Larsen, Aalborg University, Denmark

10:30-10:45 [Rain resistance of windows – Lessons learned from two decades of laboratory testing](#), Lars Gullbrekken, Therese Gransjøen, Erlend Andenæs, Berit Time, Tore Kvande

10:45-11:00 [Parametric Thermal Simulations of an Airflow-Screen Façade System](#), H Ohga and K Kimoto

11:00-11:15 [Thermal characterization of a novel heated glass element](#), T J H Rovers, J A N van 't Ende, C W J Gieling, C Struck and M Ribberink

11:15-11:30 [Influence of window recess on solar loads, heat loss and external condensation](#), Kim B. Wittchen, Jørgen Rose, Anker Nielsen

11:30-11:45 [Thermal performance of indoor solar shading devices using a thermal nodal model and a lighting simulation model](#), K Kimoto, H Ohga, C Ohki, N Yoshizawa and T Nagai

11:45-12:00 [To Shade or not to Shade \(and how\)? Annual heating energy balance and internal temperature in low energy houses in Wrocław, Poland.](#) Magdalena Baborska-Narożny, Karol Bandurski and Magdalena Grudzińska

10:30–12:00 Track III - HVAC systems, renewable energy sources and smart building control (Room 3)

Session Chair: Dirk Saelens, KU Leuven, Belgium

10:30-10:45 [Experimental study of a heat recovery ventilator preheated by a Building Integrated Photovoltaic system in a cold climate](#), Jing Li, Kai Ye, Daniel Baril, Hua Ge, Radu Zmeureanu, Andreas K. Athienitis

10:45-11:00 [Assessment of the Effects of the Cavity in BIPV Applications](#), Abdella Alzade, Dirk Saelens

11:00-11:15 [Experimental evaluation of PCM embedded radiant chilled ceiling for efficient space cooling](#), Seyedmostafa Mousavi, Behzad Rismanchi, Stefan Brey and Lu Aye

11:15-11:30 [Increasing Energy Efficiency of Central Cooling Systems with Engineered Nanofluids](#), Bernard Sagaiyaraj

11:30-11:45 [Assessment of thermally activated inner building components or a high temperature stone storage system to utilize surplus renewable electrical energy](#), M Pazold, F Hanen, F Sirtl, J Radon, F Antretter, M Kersken and H Sinnesbichler

11:45-12:00 [Realizing the load shifting potential of residential space heating - A field study on the control input for thermostatic control of indoor air temperature](#), Louise R. L. Christensen and Steffen Petersen

10:30–12:00 Track IV - Building energy performance (Room 4)

Session Chair: Targo Kalamees, Tallinn University of Technology, Estonia

10:30-10:45 [A review of the 1-2 apartment residential building stock in Lithuania based on an analysis of Energy Performance Certificates](#), E Monstvilas, Simon Paul Borg, R Norvaišienė, K Banionis and R Bliūdžius

10:45-11:00 [Cooling Demand and Indoor Temperatures of a Detached House in Southern Finland: Feasibility of a Monthly calculation Method](#), Olli Rantanen, Socorro Järvistö, Ilkka Valovirta, Juha Vinha

11:00-11:15 [How reliable is the co-heating test?](#), K Ritosa, D Saelens and S Roels

11:15-11:30 [Numerical sensitivity analysis of the energy performance of building envelope with dynamic conditions](#), Martin Veit, Hicham Johra, Rasmus Lund Jensen, Nikolaj Rask, Simon Roesgaard

11:30-11:45 [Benchmarking Heating System Performance in Office Buildings through Grey-box Modeling](#), Esben Visby Fjerbæk, Christian Anker Hviid

11:45-12:00 [Evaluating Floor Losses in the Context of QUB Measurements of a Passivhaus Dwelling](#), Mark Collett, Adam Hardy, Johann Meulemans, David Glew

12:00–13:00 Lunch

13:00–14:30 Track I - Mould, moisture safety and durability (Room 1: Auditorium)

Session Chair: Carsten Rode, Technical University of Denmark, Denmark

13:00-13:15 [Frost Damage Risk in Insulated Masonry Walls: Challenges in Analysing Large Number of Numerical Simulations](#), Martin Prignon, Timo De Mets, Evy Vereecken, Antoine Tilmans

13:15-13:30 [Microclimate modelling and hygrothermal investigation of freeze-thaw degradation under future climate scenarios](#), Jan Mandinec and Pär Johansson

13:30-13:45 [Modelling of mould growth on pine sapwood: the preliminary analysis of input parameters in a logistic mould growth model](#), Pavel Kopecký and Kamil Staněk

13:45-14:00 [Accelerated climate aging tests of structural insulated panels with waste-based core materials](#), Roberta Moschetti, Lars Gullbrekken and Joana Maia

14:00-14:15 [Freeze-thaw risk in solid masonry: The difference between a climate-based and response-based analysis to study climate change.](#), I Vandemeulebroucke, L Kotova, S Caluwaerts and N Van Den Bossche

14:15-14:30 [Improving hygrothermal risk assessment tools for brick walls in a changing climate](#), Kaat Janssens, Valentina Marincioni, Nathan Van Den Bossche

13:00–14:30 Track II - Building sustainability and life-cycle assessment (Room 2)

Session Chair: Anna Marszal-Pomianowska, Aalborg University, Denmark

13:00-13:15 [Determining the net present global warming potential of energy saving measures in buildings](#), Petersen, Arnkell Jonas and Thiis, Thomas Kringlebotn

13:15-13:30 [Analysis of Hybrid Timber Construction by Multiple Criteria Decision-Making Method](#), Markas Dolgunovas and Rosita Norvaišienė

13:30-13:45 [Comparative Assessment of the Carbon Footprint of on-site and off-site Wall Element Constructions](#), Selamawit Mamo Fufa, Randulf Høyli, Andreas Einejord, Oddgeir Johnsen

13:45-14:00 [Evaluation of the embodied carbon of insulation in achieving a national retrofit plan in Ireland: Probono case study and the national perspective](#), F. Sajadirad, R. O'Hegarty and O. Kinnane

14:00-14:15 [A chronological development of a framework for emission free construction sites in Norway](#), Marianne Kjendseth Wiik, Selamawit Mamo Fufa, Shabnam Homaei, Kristin Fjellheim

13:00–14:30 Track III - HVAC systems, renewable energy sources and smart building control (Room 3)

Session Chair: Marco Perino, Politecnico di Torino, Italy

13:00-13:15 [Linking dataset quality and MPC in buildings: impact of temporal resolution](#), Arash Erfani, Tohid Jafarinejad, Staf Roels and Dirk Saelens

13:15-13:30 [Potential for Electricity Reduction in Demand Response Using Building Thermal Storage](#), T Nagai, K Tanno, D Kuboi, T Kakegawa, K Yokoyama and H Nambu

13:30-13:45 [Model predictive control for demand response in all-electric school buildings](#), N Morovat, A K Athienitis, and J A Candanedo

13:45-14:00 [Analysis of the influence of district thermal properties for enhancing energy flexibility through thermal mass activation](#), Tohid Jafarinejad, Arash Erfani, Katia Ritosa, Dirk Saelens

14:00-14:15 [Development of smart control system for leakage warning in compact roofs](#), Silje Asphaug, Stig Geving and Roberta Moschetti

14:15-14:30 AIRMASTER presentation

13:00–14:30 Track IV - Building energy performance (Room 4)

Session Chair: Kim B. Wittchen, Aalborg University, Denmark

13:00-13:15 [Residents' thermal comfort and energy performance of a single-family house in Poland: a parametric study](#), Marcin Zygmunt and Dariusz Gawin

13:15-13:30 [Experimental study of micro-encapsulated phase change materials' influence on indoor temperature](#), Hongxia Zhou, Anjan Rao Puttige, Gireesh Nair, Thomas Olofsson

13:30-13:45 [Occupant behaviour and the potential of automating lighting control in terms of energy consumption – is there a link for residential buildings?](#), L Van Thillo, S Verbeke and A Audenaert

13:45-14:00 [Over- and underconsumption of residential heating: Analyzing occupant impacts on performance gaps between calculated and actual heating demand](#), Anders Rhiger Hansen and Kirsten Gram-Hanssen

14:00-14:15 [Impact of Positioning Phase Change Materials on Thermal Performance of Buildings in Cold Climates](#), Alireza Norouzasas, Hang Yin, Mohamed Hamdy

14:15-14:30 [The impact of the solar absorption coefficient of roof and wall surfaces on energy use and peak demand](#), Mikael Salonvaara and André Desjarlais

14:30–15:00 Coffee break

15:00–16:30 Track I - Mould, moisture safety and durability (Room 1: Auditorium)

Session Chair: Ernst Jan de Place Hansen, Aalborg University, Denmark

15:00-15:15 [Proposed flood risk classification of buildings - A case study with a heavy rain event](#), Peter Lidén, Brita Stenvall, Niklas Thidevall

15:15-15:30 [Development of laboratory experiments to determine critical moisture condition of CLT constructions](#), Lars Olsson, Lukas Lång, Gunilla Bok, Kristina Mjörnell

15:30-15:45 [Modelling hygrothermal performance of wood assemblies exposed to fungi growth](#), Camille Roy, Dominique Derome, Caroline Frenette

15:45-16:00 [Hyperspectral camera technology for detection of fungal growth on building materials](#), S M Kristensen, L Vanhoutteghem, T Hansen and T R Laursen

16:00-16:15 [Climate Change Effect on Freeze-thaw Load in Finland](#), Toni A. Pakkala

16:15-16:30 [A Method for the Evaluation of Frost Damage at different Moisture Contents and Temperatures based on Laboratory Measurements](#), Hauke Hirsch, Hans Petzold, Rüdiger Heyn, John Grunewald

15:00–16:30 Track II - Building sustainability and life-cycle assessment (Room 2)

Session Chair: Pär Johansson, Chalmers University of Technology, Sweden

15:00-15:15 [A holistic sustainability assessment of a zero-emission development in Norway](#), Marianne Kjendseth Wiik, Irene González-Fernández, Patricia Schneider-Marin

15:15-15:30 [A comparative assessment of the development of GHG emission criteria and benchmark values for buildings in Norway](#), Marianne Kjendseth Wiik

15:30-15:45 [Strategies for Low CO₂-emission Schools in Norway](#), L C Felius, J Brozovsky, F Smits

15:45-16:00 [Exploring the health and energy savings dilemma in swimming facilities and the potential influence of Positive Energy Districts](#), Moa Mattsson, Thomas Olofsson and Gireesh Nair

15:00–16:30 Track III - Education, learning and training about building physics (Room 3)

Session Chair: Steffen Petersen, Aarhus University, Denmark

15:00-15:15 [Building Physics in Living Lab](#), J Tywoniak, K Sojková and Z Malík

15:15-15:30 [Internal insulation: two condensed guidelines for beginners](#), Ruisinger, Ulrich and Sonntag, Heike

15:30-15:45 [The co-operation between the University and the Industry association in the application of building physics results to practice](#), Timo Kauppinen, Markku Hienonen, Filip Fedorik

15:45-16:00 [Do International Building Researchers Mostly Work Right Before the Deadline? Yes, According to Empirical Data](#), Hicham Johra, Anders Rhiger Hansen, Lasse Rohde

16:30–17:00 Coffee break

17:00–18:30 Technical Tour

Laboratories of the Department of the Built Environment, Aalborg University

Tuesday 13th of June

8:00–8:30 Registration and coffee

08:30–10:00 Track I - Hygrothermal performance of building envelope and elements (Room 1: Auditorium)

Session Chair: Jan Tywoniak, Czech Technical University in Prague, Czech Republic

8:30-8:45 [Hygrothermal performance of a CLT Ice Sports Arena in a Nordic climate](#), Vegard A. Skagseth, Erlend Andenæs, Bjørn Aas, Gabriele Lobaccaro, Tore Kvande

8:45-9:00 [Heat loss characteristics of typology-based apartment building external walls for a digital twin-based renovation strategy tool](#), Elisa Iliste, Siim Lomp, Ergo Pikas, Endrik Arumägi, Jaanus Hallik, Karl Õiger, Elnari Kisel, Innar Liiv, Targo Kalamees

9:00-9:15 [Impact of artificial ageing on the performance of acrylic selfadhesive tapes](#), V Dobilaitė, M Jucienė, J Kumžienė, K Banionis, V Paukštys and A Stonkuvienė

9:15-9:30 [Temperature measurements in the air gap of highly insulated wood-frame walls in a Zero Emission Building](#), J Brozovsky, O Oksavik and P Rüter

9:30-9:45 [In-use conditions of air-tightening materials applied in the air gap of ventilated building envelope constructions: A parametric study for different European climates](#), J Brozovsky, A Nocente and P Rüter

9:45-10:00 [Numerical and experimental estimation of building wall heat flux in presence of moisture transfer](#), M El Assaad, T Colinart, T Lecomte

08:30–12:00 Track II - Airborne transmission of infectious disease in buildings (Room 2)

Session Chair: Chen Zhang, Aalborg University, Denmark

8:30-8:45 [Airborne transmission of disease in stratified flow](#), Peter V. Nielsen, Chen Zhang and Li Liu

8:45-9:00 [Exploring the Role of Ambient Temperature in Exhaled Jet Related to Cross Infection between Individuals by CFD](#), Hua Qian, Jianchao Ma, Peter Nielsen

9:00-9:15 [Assessing the impact of ventilation on the potential airborne infection risk in hospital lung function room](#), Yuqi Fu, Shuo Liu, Weijie Chen, Guohui Ruan, Li Liu

9:15-9:30 [Accurate CFD prediction of respiratory airflow and dispersion through face mask](#), Zhengtao Ai and Zhongjian Jia

9:30-9:45 [Experimental characterization of exhaled flow dynamics of human breathing and vocalization](#), Shihai Pan, Yijing Ren, Na Li, Weiqiang Ma, Chunwen Xu

9:45-10:00 [Assessing the relative importance of mucosal exposure and inhalation exposure to airborne particles](#), Mengjie Duan, Li Liu, Guillaume Da, Yi Wang, Evelyne Géhin

10:30-10:45 [Local control of near-field diffusion of infected respiratory cloud in a room by air-blades](#), Hamed Rasam, Vincenzo Gentile, Marco Simonetti, Paolo Tronville

10:45-12:00 *Discussion:* Airborne transmission of infectious disease in buildings

08:30–10:00 Track III - Heat, air and moisture transport measurement and modelling (Room 3)

Session Chair: Eva Møller, Technical University of Denmark, Denmark

8:30-8:45 [Experimental and Numerical Investigation of Mould Growth Risk on Wooden Load-Bearing Structure in Hemp-lime Concrete Facades](#), S Petersen, S Svendsen and M Hahn-Hundsahl

8:45-9:00 [Metrological evaluation of facade coating systems regarding their resistance to microorganism growth](#), Ayman Bishara, Nadja Bishara, Helge Kramberger-Kaplan

9:00-9:15 [Weather protection at the construction site: work environment and conditions for moisture and mould growth on massive timber](#), Å Bolmsvik, O Eriksson, C Svensson Tengberg and P Johansson

9:15-9:30 [Evaluation of cleaning products on the viability of mould growth on facades and decks](#), P Johansson, M Sellén, G Bok, M Sparr

9:30-9:45 [Water uptake measurement for thermal renovations – comparison between non-destructive method, the Karsten tube, and automatic laboratory measurements](#), Frank Meißner, Heike Sonntag, Anita Morandell-Meißner

9:45-10:00 [Moisture safety strategy for construction of CLT structures in a coastal Nordic climate](#), Berit Time, Erlend Andenæs, Trygve Karlsen, Stig Geving, and Tore Kvande

08:30–10:00 Track IV - Indoor environment quality (Room 4)

Session Chair: Lasse Rohde, Aalborg University, Denmark

8:30-8:45 [Understanding Discrepancies between predicted and experienced \(Dis\)comfort for hospitalized Patients: Four Reasons explored](#), Sara Willems, Dirk Saelens, and Ann Heylighen

8:45-9:00 [The IEQ Occupant Manikin: a holistic indoor environmental quality assessment tool](#), Lasse Rohde, Hicham Johra, Rasmus Lund Jensen, Paulina Michalak, Martin Fabian, Marcin Wielgolewski

9:00-9:15 [A Critical Review of Lighting Design and Asset Management Strategies. Illuminating Practices and Lessons Learned for Swedish Public Libraries](#), Jingchun Shen, Xingxing Zhang, Nina Mylly, Jing Lin

9:15-9:30 [Sound insulation of slabs in dwellings](#), Kęstutis Miškinis, Raimondas Bliudžius and Andrius Buska

9:30-9:45 [Super adsorbent bio-polymer additive to improve hygroscopic and acoustic properties of a conventional lime plaster](#), Vincenzo Gentile, Michele Libralato, Stefano Fantucci, Louena Shtrepi, Giorgia Autretto

9:45-10:00 [Evaluating the indoor radon concentrations in the Swedish building stock using statistical and machine learning](#), Pei-Yu Wu, Tim Johansson, Mikael Mangold, Claes Sandels, Kristina Mjörnell

10:00–10:30 Coffee break

10:30–12:00 Track I - Hygrothermal performance of building envelope and elements (Room 1: Auditorium)

Session Chair: Steffen Petersen, Aarhus University, Denmark

10:30-10:45 [Thermal performance of wedge pile slab foundation without frost protection insulation and highly insulated slab on ground floor – first year measurements](#), Siim Lomp, Targo Kalamees, Jaanus Hallik, Roomelt Needo

10:45-11:00 [Hygrothermal performance of corners and floor junctions of timber-framed exterior walls: a simulation](#), *Topi Moisio, Ilkka Valovirta, Anssi Laukkarinen, Juha Vinha*

11:00-11:15 [Improving the optical properties of finishing coatings for façade systems](#), Rita Carvalho Veloso, Catarina Dias, Andrea Resende Souza, Joana Maia, Nuno M. M. Ramos and João Ventura

11:15-11:30 [Airtightness of Estonian dwellings – median and base-values for heat loss estimation.](#), Jaanus Hallik, Targo Kalamees, Ergo Pikas

11:30-11:45 [Wind-driven rain tightness of building-integrated photovoltaics panels](#), R Moschetti, L Gullbrekken, SK Asphaug

11:45-12:00 [On site measurement and hygrothermal modelling of degraded ETICS facade with EPS and mineral wool fire breaks](#), M Talvik, P Klõšeiko, T Kalamees, E Liisma and S Ilomets

10:30–12:00 Track III - Heat, air and moisture transport measurement and modelling (Room 3)

Session Chair: Hans Janssen, KU Leuven, Belgium

10:30-10:45 [A three-dimensional steady-state heat and vapour transport model to assess the risk for interstitial condensation in building enclosures](#), Jelle Langmans, Piet Houthuys, Staf Roels

10:45-11:00 [Water uptake of porous building materials with extremely small air entrapment effects](#), Kazuma Fukui and Satoru Takada

11:00-11:15 [Moisture buffer value for hygroscopic materials with different thickness](#), Oliver Søndergaard Rasmussen and Menghao Qin

11:15-11:30 [Development of a fast moisture prediction model based on the moisture buffer value theory](#), Kan Zu and Menghao Qin

11:30-11:45 [Ruggedness test made with mortars by free water intake test](#), Eero Tuominen, Juha Vinha

11:45-12:00 [HAMSTER Test Facility – Features and future Potential of a unique bi-climatic Chamber](#), Evy Vereecken, Martin Prignon, Antoine Tilmans, Timo De Mets

10:30–12:00 Track IV - Building materials (Room 4)

Session Chair: Valentina Marincioni, University College London, UK

10:30-10:45 [Classification and simplified design rules concerning the moisture performance of capillary active insulation materials](#), D Zirkelbach, E Tanaka, T Schöner

10:45-11:00 [Performance of Bio-based Products for Interior Insulation of Solid Masonry Walls](#), Carsten Rode, Nickolaj Feldt Jensen, Eva B. Møller, Kurt Kielsgaard Hansen

11:00-11:15 [An innovative forced convection method for drying geosourced and biosourced construction materials at wall scale](#), N Hamieh, F Collet and A Meslem

11:15-11:30 [An influence of temperature on thermal conductivity of loose fill insulations of natural origin](#), Piotr Kosiński, Robert Wójcik, Arkadiusz Rosiński

11:30-11:45 [How to design the drying of porous materials?](#), Linlin Fei, Dominique Derome, Jan Carmeliet

12:00–13:00 Lunch

13:00–14:30 Track I - Hygrothermal performance of building envelope and elements (Room 1: Auditorium)

Session Chair: Berit Time, SINTEF, Norway

13:00-13:15 [Green roof evaluation and comparison during summer in Central Europe climate](#), Peter Juras

13:15-13:30 [Moisture Performance Requirements for Insulation in Exterior Wood-Frame Walls without a Vapour Barrier](#), Anna E. Leszmann, Martin Morelli and Torben Valdbjörn Rasmussen

13:30-13:45 [Influence of the active irrigation system on the vegetation façade](#), Marek Chabada, Peter Juras, Pavol Durica

13:45-14:00 [Study of ventilated low-slope and large span wooden element roofs in the current and future climate](#), P Sekki, E Saleva and P Laamanen

14:00-14:15 [Envelope systems with high solar reflectance by the inclusion of nanoparticles – an overview of the EnReflect Project](#), Nuno M. M. Ramos, Joana Maia, Rita Carvalho Veloso, Andrea Souza, Catarina Dias, and João Ventura

14:15-14:30 [Lime-hemp as Wall Insulation - Hygrothermal Performance Analysis by Validated Simulations](#), Timo De Mets, Martin Prignon, Elke Knapen

13:00–14:30 Track II - Outdoor microclimate (Room 2)

Session Chair: Thomas Olofsson, Umeå University, Sweden

13:00-13:15 [Modelling of rain interception by trees in outdoor urban climate](#), Léopold Giroux-Gauthier, Aytaç Kubilay, Audrey Maheu, Sylvia Wood, Jan Carmeliet, Dominique Derome

13:15-13:30 [Validation of decomposition models for solar irradiance at high latitudes: A preliminary study](#), M Manni, A Nocente, K Skeie, M Bellmann, G Lobaccaro

13:30-13:45 [Time-evolving Impact of Trees on Street Canyon Microclimate](#), Haiwei Li, Yongling Zhao, Ronita Bardhan, Aytac Kubilay, Dominique Derome, Jan Carmeliet

13:45-14:00 [Improved mesoscopic meteorological modelling of the urban climate for building physics applications](#), D Strebel, D Derome, A Kubilay, J Carmeliet

14:00-14:15 [Impact of Tree Leaf Area Density on Cooling and Ventilation of an Urban Neighborhood](#), A Kubilay, D Strebel, D Derome, J Carmeliet

14:15-14:30 [How to predict wind driven rain in a changing climate?](#), Aytaç Kubilay, John Bourcet, Jan Carmeliet, Dominique Derome

13:00–14:30 Track III - Heat, air and moisture transport measurement and modelling (Room 3)

Session Chair: Rasmus Lund Jensen, Aalborg University, Denmark

13:00-13:15 [Equilibrium Moisture Content of High Strength Concrete Used in Hollow Core Slabs](#), Kari Väänttinen, Olli Tuominen, Eero Tuominen, Ilkka Valovirta, Pauli Karjala, Ilkka Tuurala, Juha Vinha

13:15-13:30 [Moisture localisation in unsaturated materials using nuclear magnetic resonance experiments, X-ray computed tomography and pore network modeling](#), Daan Deckers and Hans Janssen

13:30-13:45 [Measurement and modelling of the moisture distribution in early-age concrete in the joint of composite beam and hollow core slab](#), P Sekki, T Raunima and J Vinha

13:45-14:00 [Promoting advances in understanding water vapor sorption in wood: relegating popular models and misconceptions](#), S V Glass, S L Zelinka, C R Boardman and E E Thybring

14:00-14:15 [In-situ characterization of the relative humidity at the surface of building materials](#), Helle Vibeke Andersen, Martin Morelli, Tessa Kvist Hansen, Ruut Peuhkuri

14:15-14:30 [Estimating the hydratable surface area of building materials from water vapour sorption](#), K M Frandsen, J V Lennert, R L Jensen and P Møldrup

13:00–14:30 Track IV - Building materials (Room 4)

Session Chair: Carsten Rode, Technical University of Denmark, Denmark

13:00-13:15 [The Influence of Application Rate of Hydrophobic Treatments on the Drying Behaviour of Brick](#), Toby Cambray, Valentina Marincioni, Hector Altamirano

13:15-13:30 [Preliminary Studies on a Lightweight Porous Cement-Based Composite – Gel Concrete](#), Jarosław Strzałkowski, Agata Stolarska

13:30-13:45 [Preliminary study of the application of thermal mortar in 3D printed concrete walls](#), S Pessoa, M Jesus, C Rangel, A S Guimarães, S S Lucas and N Simões

13:45-14:00 [Exploring the variability of hygrothermal material properties in historic bricks in London](#), Bingyu Xu, Toby Cambray, Valentina Marincioni and Anna Mavrogianni

14:00-14:15 [Protection of pre-treated wood and construction materials using intumescent coatings](#), F Markert, I González, C de la Parra Rogero, E Serra Hosta

14:30–15:00 Coffee break

15:00–16:30 Track I - Hygrothermal performance of building envelope and elements (Room 1: Auditorium)

Session Chair: Petra Rüther, SINTEF, Norway

15:00-15:15 [Hygrothermal properties of hollow brick masonry used in veneer](#), P Karjala, I Tuurala, E Tuominen, I Valovirta, J Vinha

15:15-15:30 [Impact of indoor humidification on hygrothermal performance of building envelope in Northern Finland](#), S Schroderus, P Kuurola, U Haverinen-Shaughnessy, F Fedorik

15:30-15:45 [Studies of hygrothermal processes in a façade by long term high resolution measurements](#), Folke Björk

15:45-16:00 [The Behaviour of Wood Fibre Insulation Systems for Solid Wall Buildings: Lessons from a Long-term Monitoring Study](#), Valentina Marincioni, Hector Altamirano-Medina

16:00-16:15 [Watertight insertion of heavy sliding doors in exterior walls](#), Erlend Andenæs, Torill Raugstad, Jonas Strid, Lars Gullbrekken, Tore Kvande

16:15-16:30 [Experimental analysis of thermal behavior of latent heat thermal energy storage coupled to opaque ventilated façade](#), T Colinart, M Batard, A Fuentes, H Noël, P Glouannec

15:00–16:30 Track II - Retrofitting and conservation of buildings (Room 2)

Session Chair: Toke Rammer Nielsen, Technical University of Denmark, Denmark

15:00-15:15 [Energy use patterns and renovations of Swedish second homes](#), K Mjörnell, D Johansson, P Femenias, P Eriksson, A Donarelli, T Johansson

15:15-15:30 [Hygrothermal Performance of Prefabricated Insulation Elements for Serial Renovation of Apartment Buildings in a Moderately Continental German Climate](#), P Pihelo and T Kalamees

15:30-15:45 [Energy retrofitting of non-residential buildings with effects on the indoor environment: a study of university buildings at NTNU in Trondheim, Norway](#), David Bjelland and Bozena Dorota Hrynyszyn

15:45-16:00 [Documentation of moisture reduction up to two years after refurbishment of moisture damaged exterior basement walls](#), B H Høegh, L Vanhouttegehem and T Hansen

16:00-16:15 [Historic buildings to Positive Energy Buildings: a trilemma between energy efficiency, lifecycle carbon and architecture conservation.](#), Dennis Mathew, Richard O'Hegarty, and Oliver Kinnane

16:15-16:30 [Sensitivity Analysis of Traditional Solid Masonry Wall to Frost Damage in North China](#), Xiaolin Chen, Nathan van de Bossche

16:30-16:45 [Data-driven modelling of building retrofitting with incomplete physics: A generative design and machine learning approach](#), Haitao Yu, Kailun Feng, Santhan Reddy Penaka, Qingpeng Man, Weizhuo Lu, Thomas Olofsson

15:00–16:30 Track III - Heat, air and moisture transport measurement and modelling (Room 3)

Session Chair: Staf Roels, KU Leuven, Belgium

15:00-15:15 [Performance Comparison of Indoor Humidity Modeling: A Novel Hybrid Model vs. the Simplified Calculation Model by EN ISO 13788](#), Tao Lu, Xiaoshu Lü and Heidi Salonen

15:15-15:30 [Hygrothermal Modelling of one-dimensional Wall Assemblies: inter-model Validation between WUFI and DELPHIN](#), Xinyuan **Dang**, Hans Janssen, Staf Roels

15:30-15:45 [Measurement of water vapor transmission properties using the cup method – error caused by air buoyancy](#), Jan Richter, Kamil Staněk, Pavel Kopecky, Jan Tywoniak

15:45-16:00 [Capillary condensation redistribution \(CCR\) test: measurement results of 5 materials and comparison to modelling](#), P Klößeiko, T Valk, M Põldaru and T Kalamees

16:00-16:15 [Karsten tube analysis for joint mortar identification in masonry](#), Rasmus Stenholt-Jacobsen, Kurt Kielsgaard Hansen, Inge Rörig-Dalgaard

15:00–16:30 Track IV - Building materials (Room 4)

Session Chair: Martin Morelli, Aalborg University, Denmark

15:00-15:15 [Experimental study on the capillary water absorptivity of an aerogel-based coating mortar under subsequent drying and wetting cycles](#), A N Karim, A Sasic Kalagasidis and P Johansson

15:15-15:30 [Effects of coating a drying Calcium Sulphate Floor on the relative humidity of the Structure](#), T Raunima, E Tuominen, J Vinha

15:30-15:45 [Hygrothermal Performance of Lime-Based Thermal Insulation Mortars: Water Absorption, Hygroscopic Sorption, and Water Vapour Permeability](#), A Ruus, A-L Kaeramaa, K Kirtsi, M Mihkelsoo, M Kiviste, J Raamets

15:45-16:00 [Laboratory tests on decay of natural fibre insulation materials suggest a more differentiated evaluation and higher RH thresholds](#), E Tanaka, R Schwerd, N Krueger, W Hofbauer, D Zirkelbach

16:00-16:15 [Novel functional materials capable of humidity regulation and thermal storage for building energy conservation](#), Pu Ming Hou and Menghao Qin

19:00 Conference dinner

at Restaurant Fusion

Wednesday 14th of June

8:15–8:45 Registration and coffee

8:45–9:20 Keynote: Jens Dons

"A way to increase quality in housing construction"

The purpose of the the Building Defect Fund is to inspect new and renovated housing estates that is publicly supported (social housing), as well as to cover and limit construction damage. In order to create a basis for improvements, the Building Defect Fund contributes knowledge and experience that can increase quality and efficiency in the building process. The speech will go in to detail and exemplify how it is done.

Jens Dons is a qualified architect from the Royal Danish Academy of fine Arts, School of Architecture in 1977. He has worked as an architect and Building Inspector in various municipalities in greater Copenhagen.



For more than 20 years he has been Technical Manager of the Building Defect Fund in Copenhagen and is now working as Technical Senior Advisor at the same place.

9:20–10:00 Keynote: Nathan Van Den Bossche

Research in the field of Building Physics often focuses on modelling approaches to predict the performance of materials, building components, or whole buildings. Simulations can help to explain pathologies, allow to conduct sensitivity analyses, and offer the potential to study the impact of alternative scenarios and future climates. Validation often requires very controlled experiments to reduce the uncertainty associated with reality. However, the proof of the pudding is in the eating. What can we learn from building pathologies?



On the one hand there is the land of Building Physics, where hygrothermal simulations indicate that a design either fails or will last forever. On the other hand, the field of building maintenance studies how building components systematically degrade over time due to e.g. exposure and a lack of maintenance. This presentation aims to provide a perspective of combining research on pathology, building physics, and maintenance.

Nathan Van Den Bossche is associate professor in building science at the Faculty of Engineering and Architecture at Ghent University in Belgium.

In 2013 he finished his PhD at Ghent University on watertightness of building components. Exploring other interests, he also obtained a teacher's degree in Art Science, a certificate as carpenter, a bachelor in real estate, and a post-graduate in law for court experts. In 2010 he received a grant for a 4 month internship at the National Research Council Canada, and in 2021 he was appointed as guest professor at Politecnico di Milano for a year.

His research interests are building technology, watertightness, airtightness, thermal optimization of building components, and building pathology based on the modelling of heat, air and moisture transfer in buildings. He is in charge of the Test Centre for Façade Components at Ghent University. He is author and co-author of over 150 research articles published in international journals, proceedings of international conferences and books. As a consultant he was involved in projects by Zaha Hadid Architects, Neutelings Riedijk, Renzo Piano, Jean Nouvel, Ian Simpson, Stephane Beel, and others.

10:00–10:30 Coffee break

10:30–12:00 Track I - Building modelling (Room 1: Auditorium)

Session Chair: Nuno Ramos, University of Porto, Portugal

10:30-10:45 [Using Adaptive Behaviour Patterns of Open Plan Office Occupants in Energy Consumption Predictions](#), Himanshu Patel Tuniki, Gabriel Bekö, Andrius Jurelionis

10:45-11:00 [Numerical test bench to evaluate the influence of heat gains on the estimation of Heat Transfer Coefficient under occupied conditions](#), A Pacquaut, S Rouchier, A Jay, A Challansonnex, S Juricic, E Wurtz

11:00-11:15 [Development of Plugins for seamless Integration of the SIMULTAN Meta Data Model with IDA-ICE and RFEM 6](#), Bernhard Steiner, Andreas Sarkany, Zsombor J'arosi, Galina Paskaleva, Thomas Bednar and Christoph Bauer

11:15-11:30 [Towards automated stochastic Grey-Box Model Calibration for Heat Transfer Coefficient Inference](#), Gäelle Faure, Sarah Juricic, Mickäel Rabouille, Simon Rouchier, Arnaud Challansonnex and Arnaud Jay

11:30-11:45 [Archetype Building Energy Models for Residential Sector: Importance of Uncontrolled Inputs in Predictive Control and Energy Flexibility](#), S M Abtahi, A K Athienitis and B Delcroix

10:30–12:00 Track II - Retrofitting and conservation of buildings (Room 2)

Session Chair: Kristina Mjörnell, RISE, Sweden

10:30-10:45 [Renovation of 20th century modern buildings: Some common challenging architectural details analysed to find optimal insulating solutions](#), Csaszar, Bernadett; Kinnane, Oliver; O'Hegarty, Richard

10:45-11:00 [Modular retrofitting approach for residential buildings](#), Anatolijs Borodinecs, Aleksandrs Zajacs, Arturs Palcikovskis

11:00-11:15 [PRELUDE Roadmap for Building Renovation: set of rules for renovation actions to optimize building energy performance](#), Bernard PAULE, Flourentzos FLOURENTZOU, Tristan de KERCHOVE d'EXAERDE, Julien BOUTILLIER, Nicolo FERRARI

11:15-11:30 [Integration of smart building technologies costs and CO2 emissions within the framework of the new EPIQR-web application](#), Nathalie DUMAS, Flourentzos FLOURENTZOU, Julien BOUTILLIER, Bernard PAULE, Tristan de KERCHOVE d'EXAERDE

11:30-11:45 [Influence of Energy-saving Renovation Plan on the Hygrothermal Distribution Inside Kyo-machiya Soil Walls Considering their Moisture Buffering Effect](#), P Liu and C Iba

11:45-12:00 [Practical Solutions for Building Envelope Retrofitting of Historic Buildings in Cold Climates](#), L C Felius, A Brandser, F Smits

10:30–12:00 Track III - Hygrothermal performance of building envelope and elements (Room 3)

Session Chair: Folke Björk, Royal Institute of Technology, Sweden

10:30-10:45 [Capturing Building Fabric Thermal Performance and Solar Heat Gains Through a Whole House Heat Loss Test – an In-Situ Study in Poland](#), Baborska-Narożny, Magdalena, Grudzińska, Magdalena, Bandurski, Karol

10:45-11:00 [Numerical investigation of mould growth risk in a timber-based facade system under current and future climate scenarios](#), Guilherme B. A. Coelho, Dimitrios Kraniotis

11:00-11:15 [Thermal performance of two different PV-ETICS integration solutions in a real environment](#), Dariusz Heim, Dominika Knera, Michał Krempski-Smejda, Anna Wieprzkowicz, Targo Kalamees

11:15-11:30 [Hygrothermal Performance of simple intensive Green Roofs with Different Irrigation Schemes](#), P. Freudenberg, P. Hänicke, J. Kuzmanovska

11:30-11:45 [Estimating time-dependent solar gains through opaque building envelope parts: an explorative study on a test box](#), Xiang Zhang, Dorit Aviv, Dirk Saelens and Staf Roels

11:45-12:00 [Analysis of Thermal Bridges with an Automated Framework using BIM](#), M. Bollez, R. Klein and D. Saelens

10:30–12:00 Track IV - Air movement inside and outside buildings (Room 4)

Session Chair: Peter V. Nielsen, Aalborg University, Denmark & Aileen Yang, SINTEF, Norway

10:30-10:45 [Laser-Doppler Anemometry for detection of the velocity field in the ventilated, asymmetrically heated channel - a case study](#), O K Larsen, C Zhang, S P Melgaard, I T Nikolaisson, L Liu, T S Larsen

10:45-11:00 [Measurement of air change behaviour at Finnish apartment rooms](#), Genku Kayo, Nobue Suzuki

11:00-11:15 [Validating a Building Performance Simulation Model of a naturally ventilated Double Skin Façade](#), M Schaffer, L A Bugenings, O K Larsen

11:15-11:30 [Openings in ventilated Attics](#), E B Møller, M Morelli & T Hansen

12:00–13:00 Lunch

13:00–14:30 Track I - Building modelling (Room 1: Auditorium)

Session Chair: Juha Vinha, Tampere University, Finland

13:00-13:15 [Assessment of wind-driven rain \(WDR\) on buildings in an urban area: comparison of different CFD frameworks](#), P Gholamalipour, H Ge and T Stathopoulos

13:15-13:30 [Predicting the performance of hybrid ventilation in buildings using a multivariate attention-based biLSTM Encoder – Decoder](#), Gaurav Chaudhary, Hicham Johra, Laurent Georges, Bjørn Austbø

13:30-13:45 [Modelling Rain Water Ingress in Hygrothermal Simulations](#), Nathan Van Den Bossche, Stéphanie Van Linden

13:45-14:00 [Quantifying energy-saving measures in office buildings by simulation in 2D cross sections](#), Andreas Witzig, Franziska Schranz, Camillo Tello, Johannes Bruderer, Matthias Haase

14:00-14:15 [Assessing Statistical Indices for Calibrating Building Performance Simulation Models via Continuous Time Series](#), P. Freudenberg, M. D. Dresel, Z. Batayneh

13:00–14:30 Track II - Retrofitting and conservation of buildings (Room 2)

Session Chair: Lies Vanhoutteghem, Danish Technological Institute, Denmark

13:00-13:15 [NIR reflective Paints as an Alternative for Sustainable Façade Renovation](#), Andrea R. Souza, Rita Carvalho Veloso, Joana Maia, Inês Flores-Colen, Nuno M. M. Ramos

13:15-13:30 [Quantification of Building Envelope Heat Losses on a District Level for Comparative Renovation Strategies Assessment](#), Endrik Arumägi, Jaanus Hallik, Ergo Pikas, Targo Kalamees, Innar Liiv, Einari Kisel

13:30-13:45 [Effect of abnormal weather on the microenvironment of Mogao Cave 285](#), Dunhuang, X Y Jiang, H R Xie, R H Zhang, Z H Luo, Z M Zhang and Y H Li

13:45-14:00 [Assessment of Deterioration Risk of the Wooden Columns of Historical Buildings in Southern China Based on HAM Transfer Model](#), Z C Li, H R Xie, Z Y Kong, Q L Yuan, R H Zhang, S Hokoi and Y H Li

14:00-14:15 [Assessing the deterioration risk of mural paintings in Cave 98 of Mogao Grottoes based on the hygrothermal behavior](#), X Q Hu, Z M Zhang, R B Zhang, Z X Yang, S Hokoi and Y H Li

14:15-14:30 [Internal Insulation – four systems in one historic residential building](#), Panagiota Pagoni, Eva B. Møller and Tessa K. Hansen

13:00–14:30 Track III - Hygrothermal performance of building envelope and elements (Room 3)

Session Chair: Arnkell Jonas Petersen, Norwegian University of Life Sciences, Norway

13:00-13:15 [Infrared thermography application for in-situ determination of the building envelope thermal performance](#), L Moga, I Moga, T Şoimoşan, I Moldovan, M Rădulescu, A Rădulescu, I Iancu

13:15-13:30 [Use of Thermography for Quantitative Building Envelope Thermal Performance Analysis](#), P Mukhopadhyaya, M Mahmoodzadeh, V Gretka, Ivan Lee

13:30-13:45 [Innovative Integration of Phase Change Materials and Conceptual Design of Test Cases – New Products for the Building Envelope](#), Asmaa Ali, Esther Kieseritzky, Anna Bogacz, Vaia Tsiokou, Susana, P.B. Sousa

13:00–14:30 Track IV - Indoor air quality, air movement inside and outside buildings (Room 4)

Session Chair: Peter V. Nielsen, Aalborg University, Denmark & Aileen Yang, SINTEF, Norway

13:00-13:15 [Dynamic modeling of airflow rate through window openings based on CO2 data](#), Cédric Schreck, Simon Rouchier, Aurélie Fouquier and Etienne Wurtz

13:15-13:30 [Experimental study of adsorption characteristic of novel pyrazole-based metal-organic frameworks for volatile organic compounds](#), Dong Ding, Lei Fang and Menghao Qin

13:30-13:45 [Effect of demand-controlled ventilation strategies on indoor air pollutants in a classroom: A Norwegian case study](#), Aileen Yang, Kamilla Heimar Andersen, Claudia Hak, Tomas Mikoviny, Armin Wisthaler and Sverre B. Holøs

14:30–15:00 Coffee break

15:00–16:00 Awards and Closing session

Summary & Thanks: **Ruut Peuhkuri**, Conference Chair

Awards: **Hicham Johra**, Scientific Committee Chair