4th CENTRAL EUROPEAN SYMPOSIUM ON BUILDING PHYSICS

PROGRAMME DRAFT

DAY 1 (Monday, September 2)

ATRIUM LOBBY	
18:00 – 21:00	Registration & Welcome reception

END OF DAY 1

DAY 2 (Tuesday, September 3)

	ROOM D1122
9:00 – 9:20	Opening ceremony
9:30 – 10:15	**Keynote lecture** *Internal insulation for historic buildings – Materials, opportunities and challenges* Karim Ghazi Wakili

	ATRIUM LOBBY
10:15 – 10:45	Coffee break

	ROOM D1122 **Session 1: Materials characterization I** **Session chair: Staf Roels**
10:45 – 11:00	*A round robin campaign on the hygric properties of porous building materials* Chi Feng
11:00 – 11:15	*Comparison of different methods for determining the moisture diffusivity of porous building materials* Peng Ren
11:15 – 11:30	*Centrifuge experiments for the determination of the moisture storage and transport properties in the overhygroscopic range* Evy Vereecken
11:30 – 11:45	*Characterization of the diffusivity function through water uptake tests* Michele Bianchi Janetti
11:45 – 12:00	*Generative reverse-modelling approach to hygrothermal material characterization* Paul Klõšeiko
12:00 – 12:15	*A novel and flexible test setup to measure the vapour diffusion resistance of building materials and wall components* Staf Roels

	ROOM C204 **Session 2: Building enclosures & components I** **Session chair: Stig Geving**
10:45 – 11:00	*Evaluation of heat transfer in humidification phenomena – Comparison between infrared thermography and numerical simulation* Eva Barreira

11:00 – 11:15	*The response of clay plaster to temperature and RH sinusoidal variations* Valeria Cascione
11:15 – 11:30	*Impact of diffuse solar radiation on HAM simulation accuracy* Peter Juráš
11:30 – 11:45	*Parametric study on the hygrothermal performance of timber frame walls with external airtightness membranes in a temperate maritime climate* Valentina Marincioni
11:45 – 12:00	*Predicting the hygrothermal behaviour of building components using neural networks* Astrid Tijskens
12:00 – 12:15	*Compact wooden roofs with smart vapour barriers – effect of wooden joists on drying of built-in moisture* Stig Geving

ROOM C208	
Session 3: Wall retrofitting	
Session chair: Peep Pihelo	
10:45 – 11:00	*Experimental characterization of the thermal performance of a school building prototype before and after refurbishment* Francisca Cavaleiro Barbosa
11:00 – 11:15	*Hygrothermal simulation assessment of internal insulation systems for retrofitting a historic Danish building* Ernst Jan de Place Hansen
11:15 – 11:30	*Suitability of Time Domain Reflectometry (TDR) for moisture content monitoring in historic building walls* Teresa Freitas
11:30 – 11:45	*Energy consumption and seismic retrofitting interventions in the Architectural Heritage: building performance simulations of a historical building in Italy* Mariangela de Vita
11:45 – 12:00	*Research on optimization and assesment of protection shed for the Sun Wu tomb based on microbiological damage control* Yumai Feng
12:00 – 12:15	*Commissioning of thermal performance of prefabricated timber frame insulation elements for nZEB renovation* Peep Pihelo

ATRIUM LOBBY	
12:30 – 14:00	Symposium lunch

ROOM D1122	
Session 4: Materials characterization II	
Session chair: Vasco Peixoto de Freitas	
14:00 – 14:15	*Determination of thermal conductivity of moist rigid polymer foams* Beata Backiel-Brzozowska
14:15 – 14:30	*Thermal conductivity of aerated concrete (AC) composites containing micro-encapsulated phase change materials* Shuaiqi Tian
14:30 – 14:45	*Thermal and moisture adsorption/desorption properties for a selection of vegetal insulation materials* Stanislavs Gendelis
14:45 – 15:00	*Thermal and moisture properties of calcium silicate insulation boards* Olli Tuominen
15:00 – 15:15	*Rammed earth hygric properties and evolution* Margaux Indekeu
15:15 – 15:30	*Hygric resistance in multilayer building materials – A prevision new methodology* Ana Sofia Guimarães

ROOM C204	
Session 5: Building energy & sustainability	
Session chair: Hua Ge	
14:00 – 14:15	*Passive conditioning of a large beverage ware-house by activating the buffer effect of the ground* Markus Leeb
14:15 – 14:30	*Analysis of building energy upgrade technologies for implementing the dual energy efficiency and demand response scheme for non-residential buildings* Olga Macías
14:30 – 14:45	*A low-cost wireless sensor network for long term monitoring of energy performance and sustainability of buildings* Jevgenijs Telicko
14:45 – 15:00	*Spaces in-between impacts on indoor environment and energy efficiency in dwellings* Catarina Ribeiro
15:00 – 15:15	*Comparison between calculated and billed building energy consumption values of schools and daycare centers* Anssi Laukkarinen

15:15 – 15:30	*Calculation of cost-optimal combination of building materials and technical systems for nZEB single-family house using global cost calculation method* Mikus Mikelsons
15:30 – 15:45	*Effect of climate change on the energy performance and thermal comfort of high-rise residential buildings in cold climates* Hua Ge

	ROOM C208
	Session 6: Hygrothermal performance & durability I
	Session chair: Hans Janssen
14:00 – 14:15	*Water vapor transport to material surfaces-Simplified analytical expressions for non-linear material properties* Carl-Eric Hagentoft
14:15 – 14:30	*Impact of radiation on hygrothermal behavior of ventilated cavity wall* Thibaut Colinart
14:30 – 14:45	*The effect of air velocity on moisture buffering* Valeria Cascione
14:45 – 15:00	*User-dependent hygrothermal assessment and material parameter optimization for a wood-based construction under climate conditions of South Korea* Jiwon Seo
15:00 – 15:15	*Overheating risk and cooling demand in residential buildings: Performance prediction and improvement using a prescriptive approach* Ulrich Pont
15:15 – 15:30	*Overheating mitigation in buildings: A computational exploration of the potential of Phase Change Materials* Ulrich Pont
15:30 – 15:45	*Impact of pore scale parameters on the thermal conductivity of porous building blocks* Hans Janssen

	ATRIUM LOBBY
15:45 – 16:00	Coffee break

	ROOM D1122
	Session 7: Materials characterization III
	Session chair: Leo Pel
16:00 – 16:15	*Calculation method to determine capillary properties of building materials with automatic free water intake test*

	Eero Tuominen
16:15 – 16:30	*Properties of magnesium oxide boards used as sheathing in exterior walls* Carsten Rode
16:30 – 16:45	*Study of behavior of insulation materials under extremely low pressure* Jiří Zach
16:45 – 17:00	*Internal hydrophobization of cement mortar by addition of siloxanes* Kalina Grabowska
17:00 – 17:15	*Hygric properties of hydrophobized building materials* Vasilis Soulios
17:15 – 17:30	*Investigation of thermal, moisture, and mechanical properties of wet and dry fired clay materials to assess frost damage risk* Kazuma Fukui
17:30 – 17:45	*Combined wicking and drying of a NaCl solution in porous building materials* Leo Pel

	ROOM C204 **Session 8: Building enclosures & components II** **Session chair: Ulrich Pont**
16:00 – 16:15	*Air change rate in ventilated attics – reality and input for simulations* Tessa Kvist Hansen
16:15 – 16:30	*The rising damp in two traditional clay-brick masonry walls and influence on heat transfer performance* Zhenyi Kong
16:30 – 16:45	*Dependencies of heat transmittance through the ventilated wall system on thermal conductivity of connectors crossing thermal insulation layer* Aurelija Levinskytė
16:45 – 17:00	*On the feasibility of watertight face-sealed window-wall interfaces* Stéphanie Van Linden
17:00 – 17:15	*A new method for detecting free liquid moisture on façade surfaces* *Ayman Bishara*
17:15 – 17:30	*Experimental field-trial design to investigate the effects of a defective internal vapour control layer on timber frame wall constructions* Lee Corcoran
17:30 – 17:45	*Recent progress in the development of windows with vacuum glass* Ulrich Pont

ROOM C208	
Session 9: Hygrothermal performance & durability II	
Session chair: Jaroslav Kruis	
16:00 – 16:15	*Experimental determination of length changes of autoclaved aerated concrete during the freeze-thaw cycle* Radoslav Sovják
16:15 – 16:30	*Evaluating the potential of freeze-thaw damage in internally insulated masonry under climate change using different models* Sahar Sahyoun
16:30 – 16:45	*Probabilistic assessment of the impact of material properties on the risk of frost damage in masonry constructions* Klaas Calle
16:45 – 17:00	*Quantitative evaluation of deterioration in West Wind-room in the Palace Museum* Yonghui Li
17:00 – 17:15	*Experimental investigation of frost induced damage of cement mortar* Alicja Wieczorek
17:15 – 17:30	*Impact of frost temperature and moisture content on the frost damage to ceramic bricks* Hans Janssen
17:30 – 17:45	*Numerical simulation of degradation of porous building materials caused by freeze-thaw cycles* Jaroslav Kruis

18:00 – 20:00	**SCIENTIFIC BOARD DINNER**

END OF DAY 2

DAY 3 (Wednesday, September 4)

ROOM D1122	
Session 10: Materials characterization IV	
Session chair: Dalia Bednarska	
9:00 – 9:15	*Determination of the properties of acoustic materials - Airflow resistance of cellulose based insulation material* Pavel Rubáš
9:15 – 9:30	*Empirical study on the sound insulation of wooden lightweight frame floors* Łukasz Nowotny
9:30 – 9:45	*Acoustic insulation properties of lime mortars with natural lightweight aggregate* Martin Vyšvařil
9:45 – 10:00	*Mechanical properties of concrete for radioactive waste repositories* Eva Vejmelková
10:00 – 10:15	*Pre and post-fire mechanical properties of structural steel and concrete in steel-concrete composite cellular beams* Pinar Sunar Bukulmez
10:15 – 10:30	*Monitoring the course of early-age reactions in alkali activated aluminosilicates* Miloš Jerman
10:30 – 10:45	*Comparison of various methods applied in porous materials microstructure analysis in regard to hardened cement paste* Dalia Bednarska

ROOM C204	
Session 11: Health, comfort & indoor quality	
Session chair: Shuichi Hokoi	
9:00 – 9:15	*Determining the mean year value of radon in the indoor air* Torben Valdbjørn Rasmussen
9:15 – 9:30	*Efficiency of the Chimney Effect Controlling Radon Levels Indoor* Britt Haker Høegh
9:30 – 9:45	*The Influence of Green Walls on Interior Climate Conditions and Human Health* Jitka Peterková
9:45 – 10:00	*Growth effectivity of molds during contact with methylxanthines* Klára Kobetičová
10:00 – 10:15	*Identification of biofilm composition covering lime-based materials* Jana Nábělková

10:15 – 10:30	*Assessing the indoor thermal comfort of a toll station* Ricardo Almeida
10:30 – 10:45	*Evaluation of Mould Growth Risks due to Air Leakage through Air Cavity of the Building Walls* Xinyuan Dang

	ROOM C208
	Session 12: Climate & environment
	Session chair: Piotr Kosiński
9:30 – 9:45	*Transition from n50 to actual air exchange dependent on climatic conditions* Tomasz Kisilewicz
9:45 – 10:00	*Freeze-thaw risk in solid masonry: are moisture reference years able to represent real climate conditions?* Isabeau Vandemeulebroucke
10:00 – 10:15	*Economic and ecological sustainability of the thermal building envelope: a cross-European perspective* Tillman Gauer
10:15 – 10:30	*The influence of climatic conditions on the thermal state of frame partitions insulated with loose fiber materials* Piotr Kosiński

	ATRIUM LOBBY
10:45 – 11:15	Coffee break

	ROOM D1122
11:15 – 12:00	**Keynote lecture** *Thermal and material characterization of fibrous aerogel blanket* Ákos Lakatos

	ATRIUM LOBBY
12:00 – 13:30	Symposium lunch
14:00 – 17:30	Social events (to be announced)

	BETHLEHEM CHAPEL (OLD TOWN OF PRAGUE)
18:00 – 23:00	Concert & Gala dinner

END OF DAY 3

DAY 4 (Thursday, September 5)

ROOM D1122	
Session 13: Building enclosures & components III	
Session chair: Peter Juráš	
9:00 – 9:15	*Parametric assessment of a building active façade by means of a combined metallic sandwich panel with an unglazed thermal collector* Peru Elguezabal
9:15 – 9:30	*Multi-objective parametric study of a wooden window* Klodian Gradeci
9:30 – 9:45	*A brief compendium of water entry results derived from laboratory tests of various types of wall assemblies* Michael Lacasse
9:45 – 10:00	*Behavior of capacitive humidity sensors in monitoring the drying of concrete walls* Tuomas Raunima
10:00 – 10:15	*Reliability and adequacy of current watertightness test standards used to evaluate the performance of facades* Maria Arce Recatala
10:15 – 10:30	*Wooden wall research: comparison of pavilion laboratory and climate chamber measurement* Peter Juráš

ROOM C204	
Session 14: Computational & numerical models	
Session chair: Igor Medveď	
9:00 – 9:15	*The use of proper orthogonal decomposition for the simulation of highly nonlinear hygrothermal performance* Tianfeng Hou
9:15 – 9:30	*Validation of pore network model for hygric property calculation* Hans Janssen
9:30 – 9:45	*Towards stochastic generation of 3D pore network models of building materials* Steven Claes
9:45 – 10:00	*Development of a three-dimensional hygrothermal model of a historic building in WUFI®Plus vs EnergyPlus* Guilherme Coelho
10:00 – 10:15	*Heat transport solutions in rectangular shields using harmonic polynomials* Mariusz Owczarek

10:15 – 10:30	*Transport of gadolinium in a cement composite* Igor Medveď

	ROOM C208
	Session 15: Health, comfort& indoor quality
	Session chair: Mark Bomberg
9:00 – 9:15	*Application of neural networks to lighting systems* Mirosław Dechnik
9:30 – 9:45	*Application of ANN for analysing a neighbourhood of single-family houses constituting an Energy Cluster* Marcin Zygmunt
9:45 – 10:00	*Modelling the disaggregated demand for electricity at the level of individual residential buildings with the use of artificial neural networks (deep learning approach)* Tomasz Jasiński
9:45 – 10:00	*Thermal mass and thermal comfort in offices – Experimental studies of a concrete floor* Steinar Grynning
10:00 – 10:15	*The potential of Personal Conditioning Systems* Nathan Van Den Bossche
10:15 – 10:30	*Efficiency and area demand of multi-layer ground heat exchanger using phase change of water* Hauke Hirsch
10:30 – 10:45	*Can artificial neuron networks be used for control of HVAC in environmental quality management systems?* Mark Bomberg

	ATRIUM LOBBY
10:45 – 11:15	Coffee break

	ROOM D1122
11:15 – 12:00	**Keynote lecture** *A view on future trends of hygrothermal and energy simulation of buildings* Nathan Mendes

	ATRIUM LOBBY
12:00 – 13:30	Symposium lunch

ROOM C208	
Session 16: Urban physics	
Session chair: Anna Bochenek	
13:30 – 13:45	*Experimental study on the impact of varying surface reflectance of wall and pavement on outdoor thermal comfort in a street canyon setup* Kiran Kumar D E V S
13:45 – 14:00	*Comparative Analysis of Simulation of Urban Radiation Field* Liu Dalong
14:00 – 14:15	*Influence of canyon aspect ratio on microclimatic conditions: case of Lodz, Poland* Anna Bochenek
14:15 – 14:30	*The urban heat island effect on frost damage of natural building stones* Daphne Guilbert

ATRIUM LOBBY	
14:35 – 14:45	Closing ceremony

END OF DAY 4

**The programme draft is subject to change*

**The registration desk will be open daily from 8:30 to 15:00 (Tuesday – Thursday)*

Parametric assessment of a building active façade by means of a combined metallic sandwich panel with an unglazed solar collector

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Abstract. The building sector has a poor performance in terms of energy efficiency and is looking for alternatives to reduce the use of fossil fuels on building use stage. Renewables are unlimited and solar thermal energy is a technology with a demonstrated potential. The façade is a key element able to harness renewable energy coming from the sun becoming in an Active Solar Thermal Façade (ASTF). The main purpose of this study is the development of a parametric study using a numerical model to analyze the behavior of an unglazed solar collector. Thus, evaluating different design and meteorological parameters to show their influence on the heat transfer and the efficiency. The study shows that solar irradiation and mass flow are the most influential on thermal difference. However, for the efficiency ambient temperature and inlet temperature both are the most influencing ones. In brief, a set of parameters have a significant influence on the behavior of the ASTF that are fully governed by environmental conditions. Nevertheless, there are some other parameters that can be controlled during the operation. The challenge is to make a continuous configuration of this adaptable values depending on the external situation to achieve a higher performance for the ASTF.

1. Introduction

Being a sector with still a very poor performance in terms of energy efficiency, the building industry has recently been looking for several alternatives to improve the carbon footprint caused by the building's use stage. The development in the next years of new and modern buildings equipped with the latest technologies, should contribute to Nearly Zero Energy Buildings (NZEB). Nevertheless, the intervention in the current building stock should be one of the main priorities.

Solar thermal energy is a technology with demonstrated potential that is being widely developed, thanks to the pull of renewable industry. Highly significant and promising systems and technologies have been developed, focused into reducing the total amount of fossil fuels associated with energy consumption in buildings as well as minimizing the demand.

[4] J. Duffie, & W. Beckmann, Solar Engineering of Thermal Processes, fourth Ed., Hoboken, New Jersey, 2013
[5] S. Kumar, S.C. Mullick, Wind heat transfer coefficient in solar collectors in outdoor conditions, Sol. Energy. 84 (2010) 956–963. doi:10.1016/J.SOLENER.2010.03.003.
[6] D.G. Gunjo, P. Mahanta, P.S. Robi, CFD and experimental investigation of flat plate solar water heating system under steady state condition, Renew. Energy. 106 (2017) 24–36. doi:10.1016/j.renene.2016.12.041.
[7] R. O'Hegarty, O. Kinnane, S.J. McCormack, Parametric investigation of concrete solar collectors for façade integration, Sol. Energy. 153 (2017) 396–413. doi:10.1016/J.SOLENER.2017.05.092.
[8] M.C. Rodríguez-Hidalgo, P.A. Rodríguez-Aumente, A. Lecuona, G.L. Gutiérrez-Urueta, R. Ventas, Flat plate thermal solar collector efficiency: Transient behavior under working conditions. Part I: Model description and experimental validation, Appl. Therm. Eng. 31 (2011) 2394–2404. doi:10.1016/J.APPLTHERMALENG.2011.04.003.
[9] M.C. Rodríguez-Hidalgo, P.A. Rodríguez-Aumente, A. Lecuona, G.L. Gutiérrez-Urueta, R. Ventas, Flat plate thermal solar collector efficiency: Transient behavior under working conditions part II: Model application and design contributions, Appl. Therm. Eng. 31 (2011) 2385–2393. doi:10.1016/J.APPLTHERMALENG.2011.04.002.