PROGRAMME

HEALTHY BUILDINGS 2023 EUROPE

BEYOND DISCIPLINARY BOUNDARIES

JUNE 11-14, AACHEN, GERMANY

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Content

From the President of Healthy Buildings 2023 Europe

Dear all, welcome to Healthy Buildings 2023 Europe, welcome to Aachen!

Healthy Buildings 2023 Europe is the continuation of the renowned ISIAQ Healthy Buildings conference series travelling around the world and connecting international and local experts.

The last decades offered a multitude of knowledge gained and solutions developed within individual disciplines. The sensible application thereof however requires a holistic understanding of interdependencies between and across disciplines. At the same time, current crises, such as climate change and the COVID-19 pandemic, show the need for inter- and transdisciplinary collaboration to shape the future of healthy and stimulating built environments – a task all of us, organizing and attending this conference are striving for. This rationale also led to this year's conference theme „Beyond disciplinary boundaries – Transdisciplinary perspectives on multisensory stimulation for innovative and creative solutions in a post-Covid era" and we hope you will engage with participants beyond your own disciplinary background to exchange knowledge, methods and ideas.

We, the organizing committee, are honoured by the extraordinary interest demonstrated by more than 400 registered participants, over 390 abstracts submitted leading to 256 contributions presented as oral or poster presentations, 13 interactive workshops, 6 keynotes and 1 panel, all taking place during the 3 main conference days. This interest also shows the need and desire to get together on-site, to support established contacts and to create new ones, to present and to discuss the latest results and to give and to receive feedback from peers. These numbers and the desired compactness also provide some challenges, e.g., with respect to the time available for presentations and poster sessions. We made the greatest effort to accommodate everyone's wishes and hope you will enjoy your conference visit.

We would like to thank all the volunteers and our sponsors; such event would not be possible without their support. At the same time, we already thank all of you for your contributions and active participation in this conference to make it a great success for everyone.

Also, on behalf of the organizing committee

Marcel Schweiker,

President Healthy Buildings 2023 Europe

University Hospital RWTH Aachen

Maps and guidance

Overview map

Main Venue

DAS LIEBIG
Liebigstrasse 19, 52070 Aachen

Welcome Reception

The Healthy Buildings 2023 Europe Welcome Reception will be held at the SuperC building.

SuperC
Templergraben 57, 52062 Aachen

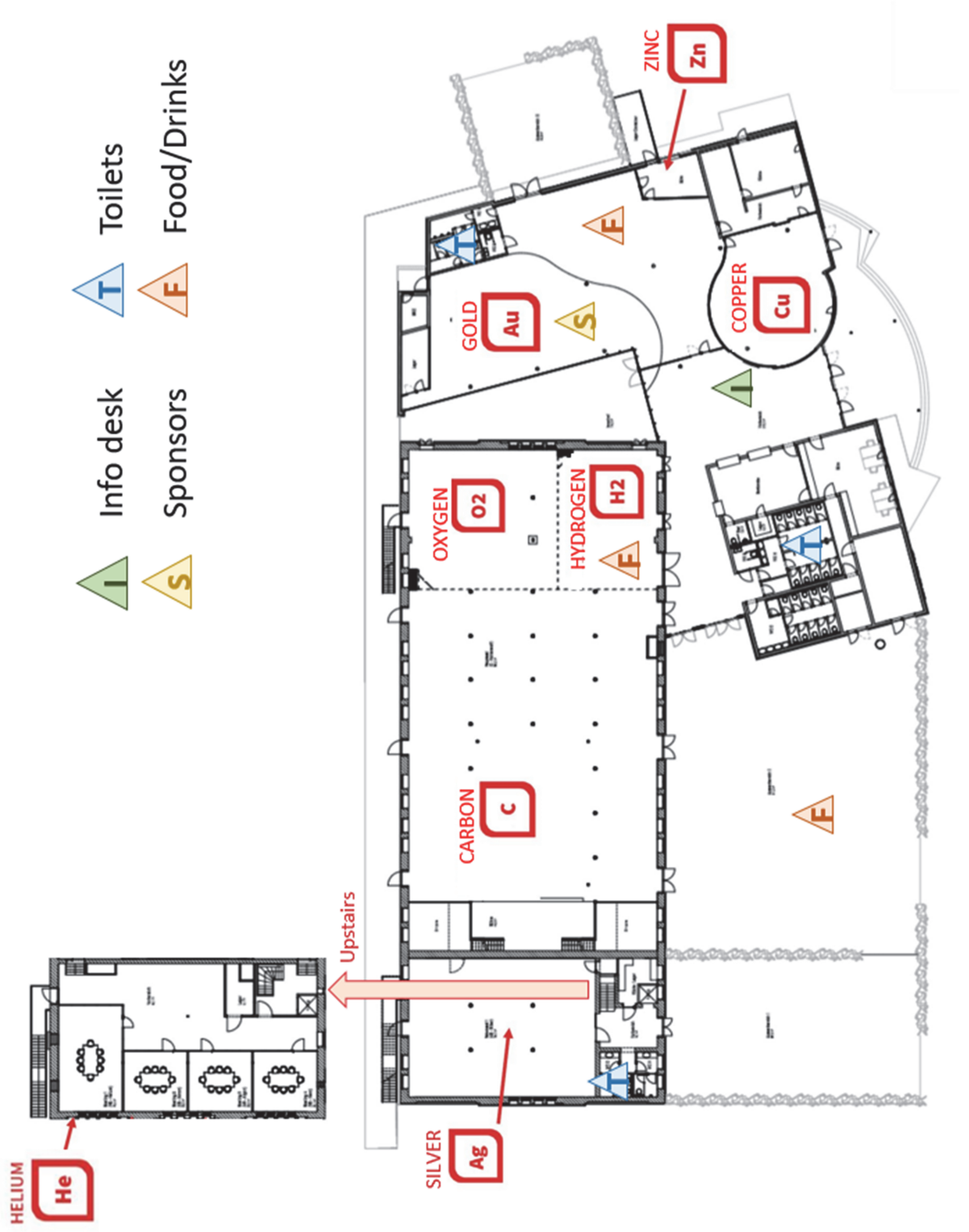
Banquet

Erholungs-Gesellschaft Aachen 1837 (Stadtpalais)
Reihstraße 13, 52062 Aachen

Directions:

Starting from Das LIEBIG, the closest bus stop is Liebigstraße. From there, you can take any bus (11,21,31) going to the bus stop Elisenbrunnen. Alternatively, you can take a bus going to Aachen Bushof (1, 220, SB20) and walk approximately 500 meters to the Erholungs-Gesellschaft Aachen 1837.

Conference Venue DAS LIEBIG



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Institute for Energy Efficient Buildings and Indoor Climate, RWTH Aachen University, Germany

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Chair of Scientific Committee: Hannah Pallubinsky

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- Xiaolei Yuan, Aalto University, Espoo, Finland
- Luca Zaniboni, Technical University of Denmark, Kgs. Lyngby, Denmark
- Wim Zeiler, TU Eindhoven, Eindhoven, Netherlands
- Jiaxu Zhou, University College London, London, United Kingdom
- Yiding Zhou, The Chinese University of Hong Kong, Shatin, N. T., Hong Kong
- May Zune, Brunel University London, London, United Kingdom

Tours

Technical tours

Melaten campus lab tour

The heart of the tour will be the Urban Energy lab 4.0 (UEL 4.0), a joint facility by the Institute for Energy Efficient Buildings and Indoor Climate (EBC) and the Institute of Energy Efficiency and Sustainable Building (E3D). The Urban Energy lab aims to simulate city's energy systems into the laboratory setting to explore user comfort (for more information, please visit: www.uel4-0.de). Highlights of this tour include an indoor climate laboratory, an innovative heat pump system based on geothermal energy coupled with a photovoltaic power plant and the iCare test bench, in which the institute uses Augmented Reality to evaluate individual user comfort.

Uniklinik & City center lab tour

The heart of this tour will be the immersion into different experiences. First step, the Aachen workplace simulation laboratory offers the possibility to simulate realistic occupational conditions, in which thermal, lighting and air quality properties can be controlled, to explore how indoor environmental conditions could influnce participants' comfort, health and well-being. Additionally, a visit will be offered to the Perception lab situated in the University Hospital RWTH Aachen (UKA), one of the historical landmarks in Aachen and one of Europe's largest hospital buildings. The Perception lab aims to investigate human perception processes of low frequency and static electric fields.

Cultural tours

Guided tour of the old town

During the tour around Aachen's historic old town you will get to see historical places and buildings such as Aachen cathedral, old town houses and beautiful fountains. During the guided tour you will learn lots of exciting history facts and stories about Aachen.

Networking-Walk to the "Dreiländereck"

After a short bus ride to Vaals in the Netherlands, a guide will lead you to the "Dreiländereck" – the tri-state-area where the Netherlands, Belgium, and Germany meet. While you can learn about the history about the Dreiländereck once you have arrived, this walk is meant to be a networking-walk where you will have the opportunity to get in touch with other HB23 Europe attendees. In the spirit of the Dreiländereck, why don't you join this networking-walk to come together and establish new contacts?

Conference programme

Programme overview

Start	Sunday	Monday	Tuesday	Wednesday
08:30		Welcome note		Parallel sessions
08:45				
09:00	PhD Summer School Day	Keynote 1	Keynote 3	
09:15				
09:30		Q&A Keynote 1	Q&A Keynote 3	
09:45		Keynote 2	Keynote 4	room changes
10:00				Parallel sessions
10:15		Q&A Keynote 2	Q&A Keynote 4	
10:30		Coffee break	Coffee break	
10:45				
11:00		Parallel sessions	Parallel sessions	
11:15				Coffee break
11:30				
11:45				
12:00	Pre-conference meetings			Keynote 5
12:15				
12:30				Q&A Keynote 5
12:45		Lunch	Lunch	Keynote 6
13:00				
13:15				Q&A Keynote 6
13:30		Poster session + Sponsor worksh.	Parallel sessions	Closing session
13:45				
14:00		Parallel sessions		Farewell lunch
14:15				
14:30				
14:45			room changes	
15:00	Pre-conference cultural and technical tours		Parallel sessions	
15:15				
15:30		Coffee break		
15:45				
16:00		Parallel sessions	Coffee break + poster session	Post-conference cultural and technical events (external)
16:15				
16:30			Parallel sessions	
16:45				
17:00				
17:15				
17:30				
17:45			room changes	
18:00	Welcome reception	Banquet (Erholungs-gesellschaft, Stadtpalais)	ISIAQ AGM	
18:15				
18:30				
18:45				
19:00				
19:15				
19:30			Chair dinner (Room Gold or external)	
19:45				
20:00				

Sponsor Workshop HTx

Monday, 12.06.2023 13:15-14:00 Room O2 Oxygen

Heinz Trox Foundation: 'Good Learning in schools' and cooperation opportunities

HEINZ TROX STIFTUNG

This workshop presents the non-profit Heinz Trox Foundation which has been promoting scientific activities in the field of air-conditioning and ventilation technology and supporting social and cultural activities since 1991. The main recipient of funding in the scientific field is the Heinz Trox Wissenschafts gGmbH (HTG), also a non-profit research institute based in Aachen, which deals with the "well-being of people in indoor spaces" within the framework of externally funded as well as independently conducted research projects with changing thematic focuses.
After a brief overview of HTG's research activities, the workshop will focus on the topic "Good Learning Climate in Schools" and the presentation of the HTxCube including a live demo:

Research focus "Good Learning Climate in Schools".
Schools are a particularly important area of research with regard to indoor environment quality (IEQ). Results will be presented from

1) a field study in about 50 classrooms, which revealed deficits in all aforementioned areas
2) an intervention study in which four classrooms were refurbished with a ceiling ventilation unit, acoustic ceiling and modern lighting.

Based on these studies, HTG is working on a guideline for classroom refurbishment that takes a modular and integral approach. The aim is to show that there is a way to simultaneously improve air quality, thermal comfort, acoustics and lighting for every classroom in the existing building with satisfactory results!

HTxCube
The HTxCube is a mobile measurement unit that was developed to collect comfort-relevant data in various indoor spaces to compare objective measured data with subjective user feedback. It is equipped with sensors for air quality, thermal comfort, lighting and acoustics as well as a touch screen for user surveys. Measurement results from a school will be presented as an example. An HTxCube will be available for demonstration in the event room.
We look forward to networking and discussing the use and further development of HTxCubes as well as finding multipliers in the field of school refurbishment.

Our speakers:
Minsheng Xu, Tobias Burgholz, Christine Roßkothen

Sponsor Workshop Swegon

Monday, 12.06.2023 13:15-14:00 Room Ag Silver

The impact of relative humidity indoors on human health – workshop and opposing discussion with Swegon

Low relative humidity levels indoors in winter should be discussed more thoroughly in the IAQ scientific community. In Northern Europe and areas in higher altitudes in Central Europe the relative humidity indoors can drop below 20% for long periods. In many regions the relative humidity indoors drops below 30% RH when the temperature outside drops under 5°C. Especially in modern buildings with mechanical ventilation. The more we ventilate, the dryer indoor air during winter. Humans do not have humidity sensors. Yet, low relative humidity may have consequences for our health as documented through physiological measurements. Should the physiological effects be more taken into account when talking about IAQ and healthy buildings? This workshop will try to initiate such a discussion with two speakers taking opposing view – one from the medical side and one from the engineering side

Our two speakers:
Dr. Med. Walter Hugentobler who has long experience studying the impact of dry indoor air on human health. He will take the position that low RH should be avoided and show data of the physiological impacts of the respiratory tract.
Assoc. Prof. Pawel Wargocki , DTU . He will take the opposite position by presenting the results from studies performed in the buildings.

After their presentation there will be time for Q&A with the audience.

The workshop will be chaired by Mr Timo Schreck from Swegon.

Sponsor exhibition

Time:
Monday through Wednesday

Room: Au Gold

Visit the sponsor booths to get informed about latest developments in industry.

Keynotes

Monday, 12.06.2023 09:00-09:45 Room C Carbon

From planetary boundaries to human behaviour in buildings: reflections on the human dimension

Hubacek, Klaus

University of Groningen, Netherlands

Human activities have resulted in the exceeding of several planetary boundaries, such as the loss of biosphere integrity, land system alteration, biogeochemical cycle disruption, chemical pollution, and the most frequently discussed issue - climate change. These impacts are driven by human production and consumption activities, as well as an ever-growing human technosphere that encompasses buildings, infrastructure, and artifacts interacting with their natural environments. To address these issues, a variety of technical solutions have been developed to tackle one problem at a time, often neglecting the interactions with other issues, long-term consequences, and human behavior, aspirations, and limitations, which may conflict with the proposed solutions. In this talk, we will investigate the role of human behavior and its potential to reinforce or counteract such solutions in optimized systems. We will explore potential trade-offs related to time, space, and the economic, social, and environmental impacts of these decisions. Additionally, we will examine the effects of these decisions on various social groups, recognizing that normative considerations are often present, even if unintentionally. We will also delve into the importance of involving a wide range of diverse people in the planning process and draw insights from past research experiences.

Monday, 12.06.2023 09:45-10:30 Room C Carbon

The Luminous Environment, Well-being and Health

Heschong, Lisa

FIES, Santa Cruz, California

Over twenty years ago we began to learn about the key contribution that the light received at our eyeballs made to our body's overall circadian rhythm, such as daily patterns of sleep and alertness. We are now learning how the interaction of the luminous environment with our physiology reaches far beyond sleep quality to include, for example: eye health, mood, temporal and spatial orientation, memory formation, metabolic and thermal regulation, and immune response. Scientists are rapidly decoding the neural, molecular and genetic mechanisms involved to reveal both surprising complexity and logical elegance.

However, our modern luminous environment is very different than the conditions under which humans evolved. Previously, just like all other life forms, our lives were largely spent outdoors under the bright daytime skydome and the inky black night sky. The naturally rhythmic light signals provided by the sun and moon varied enormously in intensity and spectrum, by time of day, month and season. But now, most of us spend a majority of our lives under electric lighting, both dimmer during the day and brighter at night, with a restricted spectrum, determined primarily by technological efficiency. Thus, the biological signals we receive from the planet's luminous rhythms have been greatly diminished.

As designers, engineers, and policy makers, we must ask: how can the luminous design of future cities and buildings best support our fundamental biological needs? Planetary health? How should we prioritize our luminous design strategies? First and foremost, our daytime environments must provide equitable, population-wide access to sunlit outdoor spaces, brightly daylit interior spaces, and ample window views to the sunlit world beyond. We need to figure out how to achieve this most effectively via urban planning, building design, and glazing technologies, while balancing pressing needs for more housing, greater energy efficiency, and climate resilience. Secondly, at night we all need biologically dark homes and places to sleep; both humans and animals! Growing levels of light pollution are having major biological consequences. Thus, we should look for ways to minimize the use of electric lighting, both day and night. Likewise, whenever possible, we should try to reduce the unintended negative consequences of electric lighting and digital devices, indoors and out. Finally, we can consider supplementary electric lighting strategies for unusual circumstances, such as underground buildings, artic research stations, or extended shift work, where humans must function far removed from their evolutionary native habits and habitat.

Given both the predominance of visual information for human cognition, and our deep biological ties to light signals, creating both a beautiful and healthful luminous environment should be one of our top environmental design priorities.

Tuesday, 13.06.2023 09:00-09:45 Room C Carbon

How hot do you feel? Novel insights on individual variability in thermosensing in health and disease

Filingeri, Davide

THERMOSENSELAB, Skin Sensing Research Group, School of Health Sciences, The University of Southampton, Southampton, United Kingdom

For the first time in history, we have an ageing population faced by the threat of climate change. This means that we are all going to experience extreme weather events such as heat waves, more often and for longer in our lives. Hot weather and heat extremes severely limit people's work and exercise capacity, with consequent detrimental effects on individuals' health, comfort, and productivity. This is translating in a growing social and economic burden on healthy and vulnerable groups, as well as on businesses and health services worldwide.
Our thermal behaviours (e.g., changing the thermostat's temperature in an office) represents the most effective mechanisms to maintain thermal comfort and ensure heat-stress resilience. Remarkably, these behaviours are entirely dependent on the ability to detect variations in our internal (i.e., body) and external environment, via sensing changes in body temperature and skin wetness. Over the past 30 years, we have seen a significant expansion of our understanding of the molecular, neuroanatomical, and neurophysiological mechanisms that allow humans to sense temperature and wetness, i.e., thermo- and hygro-sensing. However, we still lack comprehensive knowledge on how perceptual and behavioural responses to temperature and wetness vary at an individual level, for example as a function of sex, age, and clinical status.
The knowledge gaps highlighted above pose a significant challenge to the development of sustainable thermal comfort solutions, particularly within the built environment. In 2021, the built environment sector alone was responsible for ~40% of global energy-related CO2 emissions, with a large amount of these emissions arising from heating and cooling buildings to maintain occupants' thermal comfort. While thermal comfort models for building occupants are available, these do not often and fully capture how individual differences in thermosensing contribute to our responses, preferences, and vulnerability to different thermal environments. As a result, we are still far from reaching thermal comfort, thermal health, and thermal safety for all in buildings.
This keynote talk will present both established and novel evidence on the physiological and perceptual mechanisms underpinning thermo- and hygro-sensing in healthy individuals as well as in those affected by pathology such as neurodegeneration. It is hoped that this overview will stimulate the development of novel approaches and solutions to sustainable, person-centred thermal comfort in the built environment at a time of climate change.

Tuesday, 13.06.2023 09:45-10:30 Room C Carbon

Links Between Indoor Acoustic Conditions and Human Well-Being and Performance

Wang, Lily

University of Nebraska–Lincoln, United States of America

In current times, humans spend much of their time within built environments, and the acoustic conditions within those environments can have significant impacts on human comfort and performance. Existing acoustic guidelines for assorted types of spaces (offices, classrooms, hospitals, etc.) typically recommend upper limits for background noise levels and reverberation times, but much of the guidance in the past has been set empirically rather than supported by direct evidence-based research. Recent investigations at the University of Nebraska have focused on obtaining more data linking acoustic conditions to human performance outcomes to guide the acoustic design of built spaces. Two main research thrusts will be reviewed: 1) linking in-situ measurements of classroom acoustics to student learning outcomes; 2) investigating how room acoustics impact speech comprehension by non-native English-speaking listeners (a group that includes 21% of children in the United States K-12 school systems) and of non-native English-speaking talkers (commonly found in the professoriate at English-speaking universities), compared to native English-speaking listeners and talkers. Concluding thoughts are presented on how we should move from setting guidelines of acceptability instead to designing multi-sensory environmental conditions, including acoustics, for human well-being.

Wednesday, 14.06.2023 12:00-12:45 Room C Carbon

Relating the exposome to child mental health and cognitive development: methodological challenges

van Kamp, Irene

National Institute for Public Health and the Environment, The Netherlands

There is increasing evidence that a complex interplay of factors within environments of children contributes to children's mental health and cognitive development. The concept of the life-course exposome allows for studying the holistic impact of the physical and social environment on mental health and cognitive development over time. The H2020 project Equal-Life develops and tests combined exposures and their effects on children's mental health and cognitive development. A distinction is hereby made between external (physical and social) and internal exposome. The main domains discerned are indoor and outdoor environmental quality, the built and natural environment, lifestyle and social circumstances at family, neighbourhood and societal level. The main challenge is on the one hand how to unravel the influence of these different exposures on mental health and cognitive development and on the other hand how to integrate the combined/cumulated effects of different exposures. To obtain a full picture of child exposures, activities, settings, periods and social groups should be accounted for. The advantages and disadvantages of different approaches will be discussed. Taking urban environmental quality and mental health as a point of departure, some examples will be presented of how to deal with these challenges.

Wednesday, 14.06.2023 12:45-13:30 Room C Carbon

Impact of climate change on indoor air quality from regional and global perspectives

Salthammer, Tunga

Department of Material Analysis and Indoor Chemistry, Fraunhofer WKI, Germany

Today, serious discussions do no longer deal with the question of whether climate change will happen, we are already in the midst of it. One also has to realize that the goal of a maximum global warming of 1.5 °C by 2100 is at the lower end of the actual forecast by the International Panel on Climate Change (IPCC) and can probably not be achieved. It is therefore advisable to consider the possibility of more pessimistic scenarios. The fatal thing about the situation is that we know very well what climate change will do to the ecosystem and thus to human society. There are enough examples of the consequences of extreme and slowly developing weather events.
Various organizations have drawn up action plans to protect humans from extreme heat. This is certainly a step into the right direction, but the information chain often requires complex logistics, what takes time and makes such procedures unnecessary difficult. Ultimately, it is local authorities who must implement the appropriate measures. However, the latter often do not even know that such plans exist. In addition, most of the available recommendations only refer to the temperature, but the human heat balance and heat stress is also dependent on the air humidity. There are many other events associated with climate change and affect the indoor environment. This includes extreme cold, the risk of mold formation through condensing water, the formation of photo smog, in particular tropospheric ozone and OH radicals through UV radiation as well as other air pollutants such as NOx, particles and organic compounds. In order to be able to meet short and long-term climate events with regard to the living environment, valid predictions and recommendations are necessary. In the short term, residents need to know how to protect themselves against extreme temperatures, moisture and air pollutants in the current situation. If necessary, decisions have to be made on a daily basis as to whether it is better to stay at home, how and at what time of day the living space can be ventilated. In the medium and long term, practically implementable information on structural thermal insulation ventilation and heating as well as protection from mold and bioaerosols is required. Reliable estimates can be made with the help of suitable models, which provide valuable assistance for a better assessment of upcoming climate events and for the development of preventive measures.

Panel discussion

Wednesday, 14.06.2023 10:00-11:15 Room C Carbon

Using Health based metrics to improve IAQ management strategies

Laverge, Jelle (1); De Jonge, Klaas (1); Jones, Benjamin (2); Wargocki, Pawel (3)

1: Ghent University, Belgium; 2: University of Nottingham, UK; 3: Danish Technical University

ID: 493 Workshop and practice session suggestions - final
Topics: 09. Public health, occupational & environmental health
Keywords: IAQ metrics, Health, IAQ management

Since the landmark paper by Logue et al. (2012), the use of DALY's been adopted as the most comprehensive way of shifting the focus of the discussion on the appropriate levels of IAQ to an approach based on health outcomes. The paper quantified the expected burden of disease related to exposure to indoor air pollutants and thereby allowed to compare the impact of IAQ to other causes of reduced health. For this application, the proposed methodological framework that was borrowed from epidemiology is relatively straightforward and proved to be extremely valuable in identifying priority pollutants.

Using this framework to assess the potential of strategies to improve IAQ, however, is problematic. The epidemiological and or toxicological background knowledge that underpins the non-linear dose-response relationships for the pollutants, does not allow to compare the impact of a peak exposure to a constant exposure with the same total dose without making assumptions that are not evidence-based.

Secondly, the burden of disease, expressed as DALY's / 100 000 per year on population level, needs to be approached stochastically when applied to a specific building, occupant or household when comparing IAQ management strategies and options. Therefore, this requires an inherently stochastic assessment method and associated UA/SA techniques to discuss the results.

In this panel discussion, we outline these methodological issues based on an illustrative example for a single flat in Belgium and, based on these results, map the research challenges to be addressed in order to implement health based metrics to improve IAQ management strategies and discuss with the audience what the priorities need to be.

Workshops

W1_Mon_Cu: Workshop 1 Monday Copper - Costs of unhealthy buildings
Monday, 12.06.2023 11:00-12:30 Room Cu Copper

Who bears the costs of an (un)healthy building?

Flagner, Stefan (1,2); Durán, Nicolás (3); Christoforou, Rania (4); Eilts, Jacob (4)

1: Department of Nutrition and Movement Sciences, Faculty of Health, Medicine, and Life Sciences, Maastricht University, The Netherlands; 2: Department of Finance, School of Business and Economics, Maastricht University, The Netherlands; 3: Bartlett Real Estate Institute University College London, United Kingdom; 4: Healthy Living Spaces, Uniklinik RWTH Aachen, Germany

This workshop aims to expose participants to and invite them to reflect about the financial costs of owning and occupying a building which does not fulfil specific health standards for landlords, tenants and occupiers. We will present a Harvard business case study titled “A Tower for the People: 425 Park Avenue[1]” to facilitate the discussion. This case study presents the trade-offs inherent to investing in bringing an office building to a higher health standard from an engineering, health, and financial perspective. Participants should take productivity benefits for workers into account and how these benefits can be translated into financial results. This should stimulate the discussion about the costs of a healthy building from the perspective of its owner (investor), the firm that operates in it (tenant), and the workers that work in it (occupiers). A central question is who has the strongest incentive to make a building healthier. While there is a vast amount of research about the negative health effects of a suboptimal building environment, rarely is this knowledge considered in financial returns. However, this step is necessary to incentivize financial markets and corporations to invest in the building design and ultimately the health of workers.

The workshop is targeted to everyone who wants to understand how to promote investments in healthy buildings and make them attractive for corporations and investors and to apply for funding for related research. Health and engineering scientists are invited to join because the workshop stimulates them to discuss how their knowledge about healthy buildings can be translated into financial returns. To create a diverse group and thus a fruitful discussion, economics and finance researchers are invited as well to learn more about the health and technological aspects of healthy buildings.

The workshop will start with a 10 minutes presentation about the case study. Nicolás and Stefan will give auxiliary knowledge on the basics of finance. Rania and Jacob will present current research on the impact of buildings on human productivity. Then, participants work together on the case in small groups for 30 minutes. After this, the groups will present their results (20 minutes in total).

Learning objectives of the workshop

1. How do we make investments into healthy office buildings attractive for employers and real estate investors?
2. How do the different stakeholders (investor, employer, occupants) benefit from a healthy building design? Who benefits the most, who the least?
3. How do we translate the benefits of a healthy building into financial figures?

Agenda with speakers

1. Introduction presentation – 10 minutes
2. Presentation on basics of investment decision-making by Stefan Flagner and Nicolás Durán – 10 minutes
3. Presentation on productivity benefits of healthy buildings by Rania Christoforou and Jacob Eilts – 10 minutes
4. Participants go into small groups (max 3 different groups, 3 to 5 person per group, a diverse expertise background of participants within a group is preferable) – 30 minutes
5. The groups present their solutions – Each group has 7 minutes to present and 3 minutes if questions, thus the block takes 30 minutes assuming 3 groups

References

[1] John D. Macomber, Joseph G. Allen, Emily Jones, A Tower for the People: 425 Park Avenue, Harvard Business School, Mar 5, 2020, New York, https://hbsp.harvard.edu/product/220065-PDF-ENG

W2_Mon_He: Workshop 2 Monday Helium - Resilience & design framework
Monday, 12.06.2023 11:00-12:30 Room He Helium

Design frameworks to improve the indoor thermal resilience of low energy buildings using ventilative cooling approaches

Sohail, Maha (1,2); O'Donovan, Adam (1,2); O'Sullivan, Paul D. (1,2)

1: Department of Process, Energy and Transport Engineering, Munster Technological University, Cork, Ireland; 2: MaREI, the SFI Research Centre for Energy, Climate and Marine, Ireland

A critical review of building design processes studied in the context of ventilation in the built environment reflects a lack of consensus among building design stakeholders in properly accounting for cooling needs of the building against future climate threats, such as heatwaves, at conceptual and pre-design phases, in advance of the detailed design. Participatory methods, which offer a better mode of understanding the context of how a non-domestic building is designed and at what stage the decision about "cooling the building" is taken, have received less attention in this perspective. For instance, RIBA Plan of Work (2020) shows various stages of the Architectural Design Process as pre-design, schematic design to design development stages but it does not indicate a stage where cooling or indoor thermal resilience is considered. Likewise, Polat Darcin (2020) developed a conceptual architectural design process for ventilation in the built environment from a research perspective but did not apply it to design practice. Ahmed A.Y. Freewan (2018) showed an integrated design approach for passive cooling devices by a design matrix named SARS (Storing, allowance, removal or slowing) but did not demonstrate its application in architectural practices. A brief review of building design and airflow modelling tools (Building Energy Software Tools, 2023) also suggests that there is no clear design process developed that can be followed in design practices that would improve the uptake (and by extension performance) of ventilative cooling strategies from early design stages. Therefore the workshop will aim to bring together approximately 10 building design practitioners with hands on experience in building design at architectural practices/engineering consultancies to replicate the design process through a focus group activity.

Target audience: Building design stakeholders such as Architects, Building Performance Engineers/Analysts, HVAC Engineers, Design Managers, Researchers, former or current architects with experience in building design, technical groups involved in updating resilient cooling standards.

The key areas to be explored in the focus group session and a few examples of questions which would be asked from participants are listed below;

1. Discussion of the early stage conceptual framework. Can a process developed for early stages in the building design like this facilitate all stakeholders for resilient cooling in built environment? Why or why not?
2. What innovative cooling solutions do you use for resilient natural ventilation or resilient cooling in your building designs?
3. Should all stakeholders be part of the early stage conceptual building design process? Why or why not? Would the approach described in the diagram suit all stakeholders in practice? How might the approach differ across different stakeholder groups?
4. On from this, what are the key gaps to implementing the framework in design practice? and important areas for future research?

Agenda

15 minutes: A brief introductory presentation by the PhD researcher and workshop co-persons on the topic and purpose of the workshop. The PhD student will also give an overview of the findings of a recent survey directed at building design practitioners on the same topic.

5 minutes : Explanation of the debriefing procedure of the workshop, such as activities to be followed and ethical considerations to be fulfilled. For example, the workshop will be audio recorded but no pictures of participants themselves will be taken. The pictures of design activities may be taken

25 minutes: The participants will be asked to sketch their conceptual design framework as a design team; to design a case study building (such a small dental clinic built inside a home) if they were to improve the ventilative cooling uptake through its design without the use of simulation or advanced design tools. In considering the case study building they will develop a VC strategy and document how they arrived at this strategy and what tacit sources of knowledge were used. This activity will promote an interactive discussion between people from interdisciplinary backgrounds.

25 minutes: In this stage, the participants will be presented a brief framework developed by the research team based on work from IEA EBC Annex 62, the ongoing CEN/TC 156 Technical Writing Groups and findings from initial survey conducted by PhD student. They will be asked to comment on its applicability in an architectural design practice.

W3_Mon_Cu: Workshop 3 Monday Cupper - Thermal comfort for children
Monday, 12.06.2023 14:00-15:30 Room Cu Copper

Thermal comfort for children: can we adopt the evaluation framework used for adults?

Babich, Francesco (1); Torriani, Giulia (1); Lamberti, Giulia (2); D'Avignon, Katherine (3); Kazanci, Ongun Berk (4)

1: Institute for Renewable Energy, Eurac Research, Bolzano, Italy; 2: School of Engineering, University of Pisa, Pisa, Italy; 3: École de technologie supérieure, Montreal, Quebec, Canada; 4: Technical University of Denmark, Lyngby, Denmark

Thermal comfort has been extensively studied leading to the development and evidence-based evaluation of thermal comfort models such as adaptive and PMV/PPD models. Despite being considerably different in terms of underlying assumptions, inputs and outputs, these models have one big common point: they have all been developed for adults. However, standards and regulations dealing with thermal comfort requirements largely refer to these models, and little to no adaptation is included for children even when applied to schools.

Thus, the overall research question tackled in this workshop is: “Can the evaluation framework used for adults be adopted for children?”. To do so, the workshop will be divided into five sections plus conclusions. A 10-minute presentation by Francesco Babich will open the workshop to provide background on international standards, review of recent and ongoing research on pupils’ thermal comfort and information about age and educational stages in different countries. Then, four 15-minute sections will aim at interactively discussing four themes. In each section, an initial 3-minute presentation by one speaker will introduce the research question, and then the attendees will work (supported by all speakers) on a possible answer with the support of tools such as sticky notes, pens, and measurement devices. To include multiple perspectives, the target audience will be both researchers and practitioners. To ease the answering process, the attendees will be split into different groups, who will each be invited to empathize with a specific child (e.g. a sample child from each age category) or with a given actor (e.g. teacher, pupil, facility manager). Lastly, a recap (by Francesco Babich) of the main outcomes and possible future directions will be done to close the workshop. Thus, 64% of the workshop time will be dedicated to interaction (12x4 minute), presentation time (10+3x4+5 minute) accounting for the other 36%.

The first interactive session, led by Katherine D'Avignon, will focus on one of the most used thermal comfort models, namely the PMV/PPD model (Fanger, 1970), and discuss the question: “To what extend is the PMV/PPD model applicable to children?”.

After an initial 3-minute presentation introducing the model, participants will be asked to calculate the PMV for a specific room and sample child, and discuss the difficulties encountered. The expected outcomes are: (i) highlight PMV/PPD limitations and possible solutions, (ii) spot discrepancies between academics/researchers and practitioners, and (iii) identify tools/info needed by practitioners.

The following section, led by Ongun Berk Kazanci, will discuss the complexity of getting subjective feedback from children on their thermal environment, asking: “Which are the most effective means to collect personal feedback from children?”. Participants will be introduced to different techniques and asked to evaluate their usability for different children’s age. The discussion will seek to highlight pros and cons per means per age group and identify the most “likely to be effective” means at each age.

In the third section, led by Giulia Lamberti, adaptive opportunities in different educational stages will be explored considering also the fact that pupils share their spaces with adults (teachers, etc.) that might have different views. Focus questions will be: “What are the most common means for adaptation in the different educational stages/ages? How much are these influenced by teachers and by school regulations? Which adaptive features make an indoor environment thermally suitable for both children and teachers?”. Participants will be asked to think about different adaptive actions (e.g. clothing behaviours, window and door operation, etc.) that sample children of different ages may adopt to achieve comfort. The discussion is expected to lead to the following outcomes: (i) ranking of means for adaptation in order of likelihood, and (ii) identifying potential conflicts between teachers’ and children’s needs.

The fourth theme, led by Giulia Torriani, will centre on the control that children have and perceive to have over their thermal environment, answering the questions: “Is there any correlation between students’ control over their thermal environment and their thermal comfort? Do the standard methods of HVAC control make sense for schools?”. In this section, participants will be split into three groups and assigned a given actor (i.e. pupil, teacher, facility manager of a school). They will be asked to highlight the different perspectives about control of the indoor parameters by means of post-it attached on a poster (different colours for pupils/teachers/facility managers). As a result, this section will enable the comparison of pupils, teachers, and facility managers perspectives about the control of indoor parameters in schools, and to identify possible solutions to guarantee both means of thermal comfort control in schools and energy savings.

W4_Mon_Cu: Workshop 4 Monday Copper - INCHEM-PY
Monday, 12.06.2023 16:00-17:30 Room Cu Copper

An interactive introduction to INCHEM-Py

Shaw, David; Carter, Toby J; Harding-Smith, Ellen; Carslaw, Nicola

Department of Environment and Geography, University of York, United Kingdom

This workshop will interactively introduce the capabilities of INCHEM-Py (the INdoor CHEMical model in Python) and is aimed at anybody who would like to add to or enhance the modelling aspect of their indoor air chemistry research. No modelling or coding experience is needed. Participants are required to have a computer with Python installed to fully participate in the workshop and will require an internet connection to download INCHEM-Py and dependencies. Those without access to a computer with Python can still attend and gain an insight into the model.

INCHEM-Py is an open-source community model that simulates atmospheric chemical concentrations and reactions in the indoor environment. It tracks over 6,500 species through over 20,000 reactions and processes including photolysis transmitted through windows and from indoor lighting, surface deposition and air exchange with outdoors. The core of the model is the MCM (Master Chemical Mechanism), an explicit chemical mechanism that considers the step by step degradation of around 150 common volatile organic compounds.

At time of writing INCHEM-Py is the core modelling component of over £3.5 million of UK Research Innovation funding and is being utilised by research groups in both Europe and the United States. As the code is fully available online there is no restriction on numbers of users or community developers.

Within the 75 minute session users will download INCHEM-Py, change settings and inputs, create custom emissions and processes, run simulations and access and interpret outputs. Throughout this interactive session, the model processes and functions will be described in detail, alongside model validation studies and comparisons with experimental data.

This workshop aims to grow the INCHEM-Py community and make modelling easier to access for indoor air chemists and experimentalists. The workshop will be facilitated by Dr David Shaw, the author of INCHEM-Py, aided by current model users. Time will be allocated for participants to feedback on the model and prioritise future developments that they would like to see.

The demonstrations will be done using the Spyder IDE and an Anaconda install of Python 3. To download Anaconda go to www.anaconda.com/products/distribution where a download link is found, once installed you will have both the Spyder IDE and Python 3 and be able to run INCHEM-Py. A quick start guide for INCHEM-Py is available in the manual at https://github.com/DrDaveShaw/INCHEM-Py

W5_Mon_He: Workshop 5 Monday Helium - Indoor winter warmth
Monday, 12.06.2023 16:00-17:30 Room He Helium

Indoor winter warmth: what is good enough and how do we achieve it?

Hellwig, Runa (1); Teli, Despoina (2); Ly, Cynthia (3); Luo, Wei (4)

1: Aalborg University; 2: Chalmers University, Sweden; 3: Maastricht University; 4: Eindhoven University of Technology

Upper indoor temperature limits for summer and lower indoor temperature limits for winter have long been the subject of thorough investigation and inclusion in standards, guides and regulations due to their assumed impact on health and well-being and their fundamental importance in HVAC design. These limits have also been debated, following the emergence and influence of adaptive comfort theory. It is now clear that buildings' indoor climate and human comfort are the result of multiple influencing factors, including technical, socioeconomic, geographical, climatic as well as cultural, and therefore one solution does not fit all. At the same time, thermophysiological research has found positive responses from repeated mild cold and warm exposures such as increase in metabolism and insulin sensitivity, showing benefits from indoor thermal variations. In this context, the proposed workshop wishes to ask the questions: What is good enough when it comes to winter warmth? Where do we draw the line? Should we even draw the line, if no issues of cost (environmental or else) exist? What is sufficient? What is healthy? What is comfortable? What is convenient? Is there such thing as "winter overheating"?

Initial short presentations will cover topics such as:

- Current trends on winter indoor temperature around the world (geographical/climatic aspects) and technical aspects [introduction]
- Health aspects and temperature as a lifestyle factor
- Social and cultural aspects/history of heating

The workshop will involve 3 short presentations of research experiences and discussion based on questions and points/statements prepared by the workshop chairs and speakers. The subject will be discussed from a transdisciplinary perspective, exploring how indoor winter warmth is seen through different lenses. The proposed workshop has links to previous work within IEA-EBC Annex 69 and activities within the ongoing IEA-EBC Annex 79.

Depending on the number of participants, we intend to use online polling/ interaction to discuss a specific scenario and come up with possible approaches to address it from different perspectives. The scenario will be centred around the context of the 2021-23 energy crisis and the associated impacts on household heating.

Presentations will be given by the chairpersons (short introduction) and invited speakers:

- Jenny Palm, Professor and Jenny von Platten, Postdoc, IIIEE, Lund University, Partner in project “Looking back to move forward: a social and cultural history of heating (JUSTHEAT)”.
- Wouter van Marken Lichtenbelt, Professor and leader of the research group Thermophysiology & Metabolism Maastricht University.

Time allocation

- 10 min introduction
- 10 minutes slots for presentations
- 45 min interactive discussion, scenario setting, polling (mentimeter, Wooclap, possibly Jeopardy style answer and question)

Target audience

Researchers, practitioners, engineers, facility managers, real-estate owners, building product suppliers, architects, building designers, HVAC engineers, policy makers.

W6_Tue_Cu: Workshop 6 Tuesday Copper - PECS
Tuesday, 13.06.2023 11:00-12:30 Room Cu Copper

Personalised Environmental Control Systems: Potentials for Well-being and Energy in Buildings

Khovalyg, Dolaana (1); te Kulve, Marije (2); Boerstra, Atze (2,3); Kazanci, Ongun (4); Luna Navarro, Alessandra (3); Bivolarova, Mariya (4)

1: École polytechnique fédérale de Lausanne EPFL, Switzerland; 2: bba binnenmilieu, Netherlands, The; 3: Technical University of Delft; 4: Technical University of Denmark DTU, Denmark

Comfort provisions in buildings are supposed to serve occupants; however, the entire building industry has focused so far on conditioning spaces rather than people. Such a practice is mainly due to the average consideration of people in the current building design practice that is guided by the standards on ergonomics of the indoor environment. An alternative approach to increase the rate of satisfaction of building occupants, comfort and well-being is targeted conditioning by using personalized environmental control systems (PECS) that can successfully address inter-individual differences that arise from individualized physiological and psychological responses to environmental stimuli. Creating a localized environment around each occupant could also be beneficial in reducing the energy demand of buildings by better matching the supply and the need. The energy benefits are greatest when there is relatively low occupancy. The present trend of working remotely and from home is causing office occupant density to decrease, thereby increasing this energy potential as compared to total volume conditioning.

In the past, a people-centered approach to the indoor environment was limited by the lack of technologies capable of tracking individuals and their physiological and psychological parameters. These limitations are less pertinent nowadays with the advancement of IoT devices, wearable sensors, and computer vision-based non-invasive recognition of individuals, thus, opening the possibility to use the real-time data from occupants to advance the development of PECS.

This interactive workshop aims to introduce the efforts of IEA EBC ANNEX 87 “Energy and Indoor Environmental Quality Performance of Personalised Environmental Control Systems” and to discuss the evidence from laboratory and field studies that support the benefits of PECS regarding comfort, health, and productivity of occupants, along with the energy reduction potential. Then, the objective of this interactive workshop is to discuss the issues that stand in the way of widespread implementation with experts from different fields to obtain an integral perspective on how to address these.

Therefore, we strive for a broad audience, including indoor climate specialists, physiologists, psychologists, designers, architects, HVAC specialists, and experts in the field of lighting and acoustics, both from research institutions and from the practical field, to participate in this workshop.

The detailed planning of the workshop is following:

- Welcome & Introduction (~5 min). Moderator - Atze Boerstra1. Definition of Personal Environmental Control System. Introduction on the potential for occupant comfort and energy efficiency and aim of Annex 87.
- Presentation on the advancements in PECS research (~7 min). Presenters - Dolaana Khovalyg2 & Alessandra Luna Navarro3. Recent advancements in technology for heating, cooling, ventilation, lighting and facades, control and user interaction strategies. For each application, summary of benefits, limitations and challenges for each system.
- Presentation on the application of PECS in actual buildings (~7 min). Presenters - Ongun Berk Kazanci4 & Marije te Kulve2. Example of applications of PECS in real buildings, preliminary feedback from case studies and results.
- Interactive discussion with the audience (~30 min). Moderator - Atze Boerstra. Open questions for the audience along the three following themes by the moderator: (i) current experience with PECS from the audience; (ii) perceived limitations and barriers, (iii) perceived potential, (iv) information and knowledge needs to expand application of PECS.
- Summary and wrap-up of the workshop (~5 min). Moderators - Atze Boerstra and Dolaana Khovalyg. Summary of the discussions, invitation to join the Annex 87 expert meeting in Fall'2023.

W7_Tue_He: Workshop 7 Tuesday Helium - Audio-visual perception in VR
Tuesday, 13.06.2023 11:00-12:30 Room He Helium

Portable lab to study audio-visual perception in virtual reality

Heck, Jonas; Llorca-Bofí, Josep; Aspöck, Lukas; Loh, Karin; Breuer, Carolin; Seitz, Julia; Dreier, Christian; Schäfer, Philipp; Yadav, Manuj; Vorländer, Michael; Fels, Janina

Institute for Hearing Technology and Acoustics, RWTH Aachen University, Germany

Noise and its multifarious effects on productivity, wellbeing, and health within the built environment are general knowledge. Within the continuum of ecological validity, transferring the 'in the wild' noise scenarios to laboratory conditions offers a tremendous degree of control that is generally offset by the accompanying lack of 'realness' of laboratory simulations. At our institute (IHTA), we have been pushing the boundaries of what is possible in laboratory conditions, in terms of representing the complexities of human interactions with noise in certain contexts.

This is made possible by integrating state-of-the-art audio-visual simulation methods. The visual models run on game engines, e.g., Unreal Engine, while the acoustic simulation is performed with the open-source software Virtual Acoustics (VA), which has been developed at our institute. Regarding the visuals, the game engine can apply physics-based renderings (PBR), which allow photorealistic rendering of materials, direct and indirect illumination, and weather effects. From the acoustic perspective, VA includes the main effects of sound propagation in the atmosphere as well as reflection, absorption, and diffraction due to ob-jects. By using a head-mounted display and headphones for the immersive audio-visual playback and by running the software on a portable computer, the whole laboratory becomes highly portable.

Participants of the workshop will be able to interactively explore the lab. Examples are:

Urban planning: Urban planners and architects are interested in the effects the environment they design has on inhabitants, clients or future users. The lab can be used to collect subjective evaluations of different designs of an urban area, e.g., a public space or a park surrounded by buildings. For this purpose, study participants are shown a graphical user interface (GUI) within the virtual scene which allows for interaction, e.g., change the design or weather conditions, and to answer embedded questionnaires.

Classroom / open-plan office acoustics: In the context of indoor scenarios, we focus on characterizing the effect of noise and other indoor environmental quality factors on the cognitive development and mental health of children in classroom conditions in Germany. Our approach is to characterize auditory distraction and speech

communication for office employees within audio-visual simulations of the respective contexts. Using the lab, virtual classroom or open-plan office representations can be used to put study participants in the position of a plausible learning/working environment. In such an environment, the performance of cognition tasks (via a GUI) under multiple auditory stimuli can be studied in detail.

W12_Tue_Cu: Workshop 12 Tuesday Copper - IEQ & schools
Tuesday, 13.06.2023 13:30-14:45 Room Cu Copper

Indoor environmental quality in schools

Carslaw, Nicola (1); Burridge, Henry (2); Fabian, Patricia (3); Roberts, Katherine (2,4)

1: University of York; 2: Imperial College London; 3: Boston University School of Public Health; 4: TAPAS, University of Cambridge, United Kingdom

The Tackling Air Pollution at School (TAPAS) Network brings together over 300 stakeholders across academia, education, public policy, civil society and business. We are working together to develop the research base to support the development of healthy schools by improving air quality. Our wide breadth of expertise and connections internationally puts us in the perfect position to host this workshop and showcase the various indoor environmental projects our members are involved with in the UK and across the globe.

We propose to host a workshop to discuss ‘Indoor Environmental Quality in Schools'. Speakers could cover a range of indoor air research in schools – IAQ and interventions, IAQ and energy (sustainability), exposure and health disparities, and community engagement and communications.

This workshop is targeted at delegates who have an interest in designing healthy schools, improving air quality in schools, enhancing education on air quality, and changing behaviour in schools.

For this workshop, we propose holding 4 x 7 min talks followed by a panel discussion to allow the audience to ask questions and share their experiences from their own school research projects. The session will be chaired by Nicola Carslaw, Professor in Indoor Air Chemistry at the University of York; Henry Burridge, Senior Lecturer in Civil and Environmental Engineering at Imperial College London; and Patricia Fabian, Associate Professor of Environmental Health, Boston University School of Public Health. This conference workshop provides a fantastic opportunity for the international air quality community to hear about the school projects being undertaking in our research community and will facilitate a cross-border transfer of knowledge.

Additional information on speakers and workshop content:

The first half of the workshop will be presentations from 4 invited speakers.

- Speaker 1: Dr Sarah West, Director of SEI York, UK, a Centre of the Stockholm Environment Institute, a science-to-policy research institute based at the University of York. Sarah is currently leading the schools engagement part of the SAMHE project (Schools Air quality Monitoring for Health and Education) in the UK and will talk on the project.

- Speaker 2: Professor Runming Yao, Prof in Sustainable Built Environments, University of Reading, UK, and Guest Professor of Chongqing University, China. Prof Yao will talk on 'Prioritising actions for improving school classroom air quality based on the Analytic Hierarchy Process – Case studies in China and the UK'.
- Speaker 3: Professor Jørn Toftum, Professor in ventilation at the technical University of Denmark. Prof Toftum will summarize the results of some intervention studies he has done in the past years, how the interventions affected pupil well-being and performance, and how the wider benefits from the improvement compare against pupil's well-being and running costs. Suggested talk title: “Effects on pupil well-being of improving classroom ventilation".
- Speaker 4: Dr Koen Tieskens, Postdoctoral Associate at the Boston University School of Public Health. Dr Tieskens will talk on indoor air quality projects as part of the Boston Public Schools programme.

The remaining half of the workshop will be a panel discussion involving questions and discussion from the audience, chaired by Dr Burridge, Dr Fabian, and Prof Carslaw.

W9_Tue_Cu: Workshop 9 Tuesday Copper - Thermal physiology database
Tuesday, 13.06.2023 15:00-16:15 Room Cu Copper

Global Database of Thermal Comfort Physiological Responses

Wu, Zhibin (1); Wagner, Andreas (1); Jia, Hongyuan (2); Schiavon, Stefano (3); Wargocki, Pawel (4); Schweiker, Marcel (5); Dong, Bing (6); Koth, Sebastian Clark (7); Kobas, Bilge (7); Vellei, Marika (8); Pigliautile, Ilaria (9); Toftum, Jørn (4); Rupp, Ri

1: Karlsruhe Institute of Technology, Building Science Group, Karlsruhe, Germany; 2: Chongqing University of Science and Technology, Chongqing, China; 3: Center for the Built Environment, University of California, Berkeley, CA, USA; 4: International Centre for Indoor Environment and Energy, Technical University of Denmark, Denmark; 5: Institute for Occupational, Social and Environmental Medicine, Medical Faculty, RWTH Aachen University, Germany; 6: Mechanical and Aerospace Engineering, Syracuse University, NY, USA; 7: Technical University of Munich, Munich, Germany; 8: Laboratoire des Sciences de l'Ingénieur pour l'Environnement (LaSIE) - UMR CNRS 7356, France; 9: Department of Engineering Department, University of Perugia, Italy; 10: Department of Civil and Mechanical Engineering, Technical University of Denmark, Denmark

We aim to develop a global database of physiological responses in the built environment. This workshop aims at creating a coordination about this and attracting new participants. This workshop will summarize the current state-of-the-art research on physiological responses to changing thermal environments and discuss it with the participants. Perspectives and challenges for this topic will also be discussed and delineated.

Having prior knowledge of thermal comfort is essential for building an optimal indoor climate. Merging real-time thermal comfort votes from occupants and physiological responses may lead to better models because there is a close association between human thermal comfort and physiological responses. Setpoint temperature adjustment with occupants' feedback and personal comfort system for individual thermal comfort have been widely investigated, but based mainly on the feedback of occupants. Many researchers have been developing personal comfort models using various physiological responses. Skin temperature has been widely investigated and its feasibility as a thermal comfort indicator will be discussed. Recent studies indicate that several physiological responses, such as pulse rate and skin conductance, could be used to model thermal comfort, and thus potentially also to control HVAC systems. Existing research exploring physiological responses in the built environment is not

sufficiently systematic or conclusive and is limited to local characteristics. Hence standard approaches and the development of a global database on physiological responses in the built environment are needed to improve the generalizability of findings.

The workshop is split into two parts: The first half will have inputs from the workshop chairs highlighting the current state of knowledge and of the database. In the second half, a guided discussion with participants will engage interaction regarding existing knowledge, limitations of the approach, and future needs directed to the database.

Key learnings:

1. Getting insights into work done so far on the global database, its logic, and future steps;
2. Gaining knowledge of the fundamental, mechanism and application of physiological responses in built environments;
3. Providing perspectives to help formulate more effective control strategies of HVAC systems with physiological responses.

Target audience:

Researchers who are interested in the interdisciplinary area in the built environment (i.e., psychology, physiology, and data science). Practitioners who would like to learn new insights on building design, construction, and operation.

W13_Tue_He: Workshop 13 Tuesday Helium - Well-being network
Tuesday, 13.06.2023 15:00-16:15 Room He Helium

An International Network of Networks for Well-being in the Built Environment (IN2WIBE)

O'Neill, Zheng (1); Becerik-Gerber, Burçin (2); Wen, Jin (3); Hoque, Simi (3); Wu, Teresa (4); Pedrielli, Giulia (4)

1: Texas A&M University, United States of America; 2: University of Southern California; 3: Drexel University; 4: Arizona State University

Building design, construction, operation, and use strategies that benefit occupant health and wellbeing is recognized as a grand challenge, thus calling for convergent efforts from multiple disciplines. These include building science and technology, public health, medicine, measurement and data science, design and architecture, human-building interaction, social science, systems design and control, and computer science. This workshop will present the ongoing efforts of the International Network of Networks Wellbeing in the Built Environment (IN2WIBE) to promote and coordinate research on healthy buildings across the globe. The effort is supported by the US National Science Foundation (NSF) AccelNet project (https://in2wibe.net/). IN2WIBE aims at connecting and educating future building scholars, at the crossroad between well-being and built environment, for informed decisions (building design, construction, operation, and use). IN2WIBE leverages resources from 33 existing networks and partners in 5 continents (N. America, Africa, Europe, Australia, and Asia), comprising a total of 17 countries. The goal of IN2WIBE has been to foster international collaboration and this workshop presents an opportunity to further strengthen our network and scholarly exchange among international scholars.

The workshop will include three themes, i.e., Artificial Intelligence for Healthy Buildings (AI4HB), Future of Workspace for Well-being and Productivity, and Well-being Centric Building Operations and Controls. For each theme, we will present the state of the research and future directions within the theme followed by interactive break-out sessions. The interactive sessions will be planned to solicit ideas from the international participants about synergies between IN2WIBE and European healthy building initiatives, including collaborative projects and funding opportunities. The sessions will be documented and the results will be disseminated in a white paper.

At the end of the proposed workshop, we hope to expand our network initiating new directions and opportunities and further expanding the scope and reach of healthy buildings. The IN2WIBE will support up to 8 U.S. scholars to attend the Health Buildings Europe 2023.

Workshop schedule:

1. Introduction (10 minutes, IN2WIBE steering committee and scholars)
    a. Briefly introduce the topic of healthy buildings and the application of artificial intelligence (AI) in that domain.
    b. Provide a brief overview of the different types of buildings (care home for the elderly, residential buildings, schools, hospitals, and office spaces) and their unique health and well-being considerations.
    c. Discuss how AI can be leveraged to improve health and well-being outcomes in each of these building types.
    d. Outline the objectives of the workshop and what participants will be doing.
2. Small Group Activity (40 minutes, workshop participants)
    a. Divide participants into small groups (ideally 4-6 people per group) and assign each group a specific building type to focus on.
    b. Provide each group with sticky notes and other materials (such as markers or pens) to help them brainstorm and develop their proposed solution.
    c. Provide each group with a set of general problem prompts (office space, schools, hospitals, retirement home, residential house) for their specific building type that focus on health and well-being outcomes. Encourage groups to explore the use of AI and other technologies in their proposed solutions.
    d. Allow time for each group to discuss and develop their proposed solution.
3. Group Presentations and Discussion (20 minutes, workshop participants)
    a. Each group presents their proposed solution for their assigned building type, including the use of AI and other technologies to improve health and well-being outcomes.
    b. After each presentation, encourage other groups to ask questions and provide feedback on the proposed solution.
    c. Summarize the key takeaways from the group presentations and discussion and highlight any remaining questions or areas of further exploration.
4. Conclusion (5 minutes, IN2WIBE steering scholars)
    a. Recap the main themes and insights from the workshop.
    b. Provide any next steps or actions that participants can take to continue learning and exploring the intersection of healthy buildings and AI.

W10_Tue_Cu: Workshop 10 Tuesday Copper - Smart buildings & comfort
Tuesday, 13.06.2023 16:45-18:15 Room Cu Copper

ARE YOU COMFORTABLE?: People's Comfort and Health in Smart Buildings through Monitoring IEQ and Interacting with the Environmental Control Systems

Di Santo, Nicole (1); Guglietti, Ambra (2); Sarran, Lucile (2); Kacel, Seda (3)

1: Politecnico di Milano - VELUXlab, Italy; 2: VELUX A/S, Knowledge Centre for Daylight, Energy & Indoor Climate, Denmark; 3: UCLouvain, Belgium

People experience and interact with the indoor environment, which affects their comfort and health. Human comfort is a complex concept in which individual differences, personal preferences and adaptive behaviour play significant roles. In the face of the current energy crisis and climate change, comfort is sometimes considered to be "sacrificed" in favour of energy efficiency and reducing emissions. Can we achieve an indoor environment promoting human comfort and environmental sustainability? Indoor Environmental Quality (IEQ) is a measure of a building related to thermal, air, acoustic and visual environments and the spatial context. The Internet of Things (IoT) devices can play an essential role in mediating the relationship between people and IEQ, measuring and monitoring the indoor environment, and ensuring that people experience comfort and health indoors while enabling co-benefits such as energy efficiency. Smart buildings can provide real-time IEQ data, allowing occupants and stakeholders to make informed decisions and to adapt their behaviour to improve IEQ.

The proposed workshop aims to enhance the understanding of the communication between users and indoor spaces and to identify the role of smart devices and digitalisation in promoting healthy, sustainable, and smart buildings. Participants will discuss; i) human factors and IEQ in energy-efficient and smart buildings, including inter-individual differences that affect comfort, ii) the concept of "active users", and iii) brainstorm solutions to provide occupants with reliable and actionable information and recommendations. The integration of these concepts into legislation and investments to promote healthy, sustainable, and smart buildings will also be debated. This discussion is essential because we occupy 90% of our time indoors, and 90% of the operational costs of buildings are related to people (Allen and Macomber, 2020).

Workshop activities

The workshop will consist of four main activities:

- "Introduction" features icebreaker activities (e.g., short quizzes) using interactive tools like Mentimeter and Miro.
- "Lectures" consist of three presentations given by the workshop convenors covering the following topics:
  - Lecture 1: Human factors and IEQ in buildings
  - Lecture 2: Digitalisation and IoT in smart buildings
  - Lecture 3: Building design practices for sustainable living
- "Brainstorming" will allow us to discuss some opportunities for monitoring the indoor environment using smart devices. For each small breakout group organised and facilitated by the workshop convenors, some devices (e.g., sensors, wearables) and their user platforms (e.g., smartphone applications) will be provided to support the simulation of real-life situations. The usability of devices will be discussed. Participants will explore their physiological parameters through real-time monitoring. Personal comfort systems (PCS) will be provided to discuss adaptive opportunities. Participants will fill in surveys to evaluate their comfort, adaptive behaviour, and spatial experience before and after interacting with these devices and systems. Participants are expected to share their case studies and experiences to learn from each other. The integration of these concepts into legislation, such as the revision of the Energy Performance of Buildings Directive (EPBD), will be discussed. Paper-based tools like posters and post-its, as well as digital tools like Miro and XMind, will be used by each group.
- "Plenary discussion" will allow each breakout group to present elaborations and outcomes. All workshop participants will comment on these outcomes and discuss the topics as a larger group. A short online questionnaire will request participants` feedback on the workshop.

Learning outcomes

Learning about human factors, IEQ, and smart and energy-efficient buildings will be facilitated. Participants will be able to test different devices and observe real-time data to enhance their understanding of future research and practices.

Target audience

The target audience includes architects, engineers, facility managers, researchers, and end-users.

11_Wed_Cu: Workshop 11 Wednesday Copper - Soundscape & ventilation
Wednesday, 14.06.2023 08:30-09:45 Room Cu Copper

Indoor soundscape and ventilation: how to cross disciplinary boundaries

Torresin, Simone (1); Harvie-Clark, Jack (2)

1: University of Trento, Department of Civil Environmental and Mechanical Engineering, Italy; 2: Apex Acoustics Ltd, UK

Indoor soundscape research addresses people's perception of the acoustic environment in order to design buildings that 'sound good' to their occupants. Moving beyond a focus on 'noise' and 'noise annoyance' requires a new mindset in the design and evaluation of buildings, which can lead to novel acoustic indicators and design solutions, or the reinterpretation of existing ones, with a focus on 'sound as a design resource' for people's health and well-being.

Natural ventilation can be a sustainable strategy for building ventilation. However, the soundscape inside buildings can be impacted by the outdoor acoustic environment. Even in the case of mechanical ventilation, this comes with consequences for the acoustic environment. Despite the interrelationships between indoor soundscape and ventilation, the two domains are often dealt with independently, by different professionals, and with often distinct assumptions.

Picking up on the conference theme, the workshop aims to establish a discussion among researchers, designers and practitioners on the urgency of crossing disciplinary boundaries between acoustics and ventilation and integrating the soundscape approach into a multi-domain research perspective for healthy building design.

Objectives

1) to raise awareness of indoor soundscapes among those working in the field of indoor environmental quality design
2) to promote a discussion on regulatory harmonization in acoustics, ventilation and thermal comfort, across disciplinary boundaries
3) to illustrate examples of multi-domain integration from both research and practice.

Questions addressed by the workshop include: how to 'measure' the soundscape in the built environment? How to integrate acoustics and window opening requirements for ventilation and thermal comfort? Can natural ventilation be adopted to improve indoor soundscapes?

Program

After a workshop introduction, short talks will introduce the concept of indoor soundscape, previous experiences of soundscape evaluation in real buildings and in virtual reality, examples of regulatory integration, and results from multi-domain research in the field of indoor soundscape and ventilation. This will be followed by an interactive session in which participants will take part in an indoor soundwalk in two indoor spaces within the venue with different acoustic characteristics (e.g., a quiet area, and a lively space near the café area). The soundwalk will be organised in two groups of up to thirty people. Each participant will listen to the surrounding sound environment and express their evaluation in a soundscape questionnaire through an online form from their cell phones. This will be combined with in-situ binaural recordings.

The workshop will conclude with a collective discussion, highlighting the potential of soundscape methods in relation to current protocols of post-occupancy evaluation of buildings, and outlying current challenges and a future agenda for research and practice in the fields of acoustics and ventilation. Digital tools (e.g., online blackboards) will be used to collect and organize ideas and comments from the participants.

Target audience

The workshop is designed to be multidisciplinary, and participation is encouraged for students, researchers, and practitioners working in the fields of building physics and architecture, indoor environmental quality and social sciences, acoustics and building services design.

Detailed schedule

- 5 min: Welcome and introduction by the workshop chairs
- 30 min: Short talks
    - Dr. Simone Torresin, University of Trento

      “Indoor soundscape in the built environment: definition and measurement methods”
    - Jack Harvie-Clark, Apex Acoustics

      “Acoustics, ventilation and overheating: from standardization to practice”
    - Dr. Chiara Visentin, Eurac Research (online/in-person)

      “Indoor soundscape and ventilation in schools: results from experimental campaigns”
- 25 min: Indoor soundwalks
- 15 min: Interactive discussion, closing of the workshop

W8_Tue_Cu: Workshop 8 Tuesday Copper - Occupant behaviour
Wednesday, 14.06.2023 08:30-09:45 Room He Helium

Occupant-centric building design and operation – Discussion on lessons learned from IEA EBC Annex 79

Wagner, Andreas (1); Mahdavi, Ardeshir (2); Day, Julia (3); Dong, Bing (4)

1: Karlsruhe Institute of Technology, Germany; 2: Technical University of Graz; 3: Washington State Ubiversity; 4: Syracuse University

It is common sense that occupants have a strong influence on building performance. Research has provided insight into this topic from different angles since many years and various occupant behavior models for buildings simulation are principally available. However, design and building operation practice shows that many of the models do not represent the manifold human interactions with a building appropriately enough, and that there is no guidance for designers and building managers on how to apply occupant behavior models in standard practice. To overcome this deficit IEA EBC Annex 79 focused on the integration and implementation of knowledge and models of occupancy and occupant behavior into the design process and building operation. With the overall goal to improve both energy performance and occupant comfort, Annex 79 established four working groups (subtasks) to address the following research fields:

1. Multi-aspect environmental exposure, building interfaces, and human behavior
2. Data-driven occupant modeling strategies and digital tools
3. Applying occupant behavior models in a performance-based design process
4. Development and demonstration of occupant-centric building operating strategies

This workshop will provide an opportunity to critically assess and discuss some of the major outcomes of the Annex, which are related to the conference themes. The workshop will be structured into three main blocks, which will address the following topics:

1. Do we need new paradigms / standards / codes to implement occupant behavior sustainably in building design? How would they have to look like? (Moderated by Ardeshir Mahdavi, TU Graz, Austria)

Work in the Annex has highlighted a number of essential gaps in our understanding of the occupants' role in buildings' energy and indoor-environmental performance, corresponding to the following questions: To what level of detain must building design and operation professionals know about occupants' needs, preferences, and actions?

What factors, both physical and psychological, influence occupants' perception and evaluation of indoor environments? Do building codes, standards, and guidelines provide sufficient information to guide practitioners in accommodating occupants' requirements? Do standards provide explicit scientific evidence for the indoor-environmental quality mandates they entail? Where do we need more research, and how can we more effectively transport research results into practice?

2. How do building interfaces influence interactions between occupants and buildings, and how can we better design interfaces to facilitate comfort, health, and energy savings? (Moderated by Julia Day, Washington State University, USA)

There are many points in a building where occupants may interact with interfaces or controls (e.g. windows, doors, thermostats, etc.). Work in the Annex further expanded on human-building interaction (HBI) research while offering insights into current challenges of incorporating interfaces (and related occupant behaviors) into simulation. This segment of the workshop aims to spark discussion surrounding how current building interfaces may not support the needs or health of building occupants. What can we do better from both a design and operation standpoint to support building occupants? Energy goals? Comfort? What are the key characteristics of building interfaces that must be addressed or defined? What is needed in the field to further advance this domain?

3. What are the requirements (hardware, e.g. sensors, BMS, organizational, etc.) needed to implement data-based, occupant-centric control strategies successfully in building operation? (Moderated by Bing Dong, Syracuse University, USA)

Prior research in both Annex 79 and 66 showed that there have been many efforts to develop accurate occupancy sensing systems, collect occupancy behavior data and use those data for building controls. Based on those efforts, we would like to discuss a few research gaps: What are the minimum requirements (sensors, hardware and software) to implement for occupant-centric control strategies? How urgent is this issue and/or do facility mangers/building managers desire or need such system? How much effort are facility managers willing to spend to setting up such system (within a day or a week or a month)? What is the acceptable $/m² or ROI to implement such occupant-centric control system in buildings? How can we use what we learned in research studies for best practices?

After a short presentation of Annex 79, representatives of the different Annex Subtasks will shortly introduce into their topics and key questions, which is followed by a moderated interactive discussion of each block. The workshop participants will be asked to engage, discuss, and participate in lively conversations about each of the key topics Each topical block will last 20 minutes. Scientists from the fields of comfort and human behavior, as well as practitioners from building design and operation, are expected as the target audience.

ISIAQ Events

ISIAQ_STC34: ISIAQ STC 34: IEQ guidelines database updates
Tuesday, 13.06.2023 12:45-13:30 Room C Carbon

ISIAQ STC 34: IEQ guidelines database updates

Dudzińska, Marzenna Roza (1); Haverinen-Shaughnessy, Ulla (2)

1: Lublin University of Technology, Poland; 2: University of Oulu

Welcome to participate in our STC34 meeting! You will hear about latest updates on the expanding database and ongoing/future activities, including reviews of the existing guidelines. You can also sign up as a national contact point, become a working group member (outdoor air, ventilation, thermal conditions, acoustics, lighting) and/or become a member of the STC. Our meetings are open to everyone.

ISIAQ_Ch_Tue_He: ISIAQ Chapters meeting
Tuesday, 13.06.2023 16:45-18:15 Room He Helium

ISIAQ Chapters meeting

Hensen Centnerová, Lada

Eindhoven University of Technology, Netherlands, The

ISIAQ has five National Chapters who organize activities in their country for their members (a member of a National Chapter doesn't have to be a member of ISIAQ).

This meeting gives you the opportunity to meet representatives from the existing National Chapters, discuss the possibilities and benefits of Chapters or even get an advise how to set up a new National Chapter.

All ISIAQ members interested in knowing more about ISIAQ National Chapters are welcome.

Tuesday, 13.06.2023 18:30-19:30 Room C Carbon

ISIAQ Annual General meeting

Online only contributions

Time:
View pre-recorded videos anytime via conftool

Internet of Things and Machine Learning to address poor Indoor Air Quality in NZ schools.

Sallaber, Bastien (1); Boulic, Mikael (2); Mandin, Corinne (3); Cunningham, Chris (1)

1: Research Centre for Hauora and Health (RCHH), Massey University, Wellington, New Zealand; 2: School of Built Environment, Massey University, Albany, New Zealand; 3: Scientific and Technical Centre for Buildings (CSTB), France

Influence of sonic environment on the fruit juice drinking experience

ISTIANI, Noor Fajrina Farah (1); MASULLO, Massimiliano (1); RUGGIERO, Gennaro (2); MAFFEI, Luigi (1)

1: Department of Architecture and Industrial Design, University of Campania "Luigi Vanvitelli", Aversa, Italy; 2: Department of Psychology, University of Campania "Luigi Vanvitelli", Caserta, Italy

Examining the concentrations and trends in indoor air quality in existing UK social housing dwellings

Gupta, Rajat; Berry, Chloe

Low Carbon Building Research Group, Oxford Brookes University, United Kingdom

Poster session

Time:

Monday, 12.06.2023 13:30-14:00
Tuesday, 13.06.2023 16:15-16:45
And any other time as posters will be available throughout all days

Room: C Carbon and beyond

Monday, 12.06.2023 13:30-14:00 Room C Carbon

How the built environment is linked to mental health and wellbeing – results of a cross-sectional analysis using secondary data

Huebner, Gesche M (1,2); Oreszczyn, Tadj (1); Hamilton, Ian (1)

1: UCL Energy Institute, Bartlett School of Environment, Energy and Resources, Faculty of the Built Environment, University College London, London, UK.; 2: UCL Institute for Environmental Design and Engineering, Bartlett School of Environment, Energy and Resources, Faculty of the Built Environment, University College London, London, UK.

ID: 1122 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 09. Public health, occupational & environmental health
Keywords: wellbeing, mental health, buildings, households, neighbourhood

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Integrate bio-based concrete in wall panels: is it a practicable solution from an olfactive point of view?

Verriele, Marie (1); Aubourg, Allan (1); Perez, Cédric (1,2); Tinel, Liselotte (1); Lors, Christine (2); Becquart, Frédéric (2); Locoge, Nadine (1)

1: IMT Nord Europe, Institut Mines-Télécom, Univ. Lille, Centre for Energy and Environment, F-59000 Lille, France; 2: IMT Nord Europe, Université de Lille, Center for Materials and Processes, 59000, Lille, France

ID: 1142 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: flax fibers-based concrete; odorous VOC, GC-olfactometry, vapothermal curing

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Chamber comparison for the determination of initial VOC emissions from consumer products

Luise, Klein (1); Poelke, Birte (1); Olaf, Wilke (2); Alexander, Roloff (1)

1: Bundesinstitut für Risikobewertung (BfR), Germany; 2: Bundesanstalt für Materialforschung und -prüfung , Germany

ID: 1143 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 11. All other IEQ, ergonomics & health topics
Keywords: volatile organic compounds, exposure assessment, emission test chamber

Monday, 12.06.2023 13:30-14:00 Room C Carbon

The effect of the indoor environment quality (IEQ) on cognition and health

Ly, Cynthia (1); Pallubinsky, Hannah (1); Kramer, Rick (2); Plasqui, Guy (1); van Marken Lichtenbelt, Wouter D. (1)

1: Maastricht University, Netherlands; 2: Eindhoven University of Technology, Netherlands

ID: 1147 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: Humidity, Temperature, Cognition, Health, IEQ

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Health in growing districts – neighborhood as a prospect for well-being

Schulte, Helena; Förster, Agnes

RWTH University Aachen, Chair of Planning Theory and Urban Development, Aachen, Germany

ID: 1156 Extended Abstract
Topics: 09. Public health, occupational & environmental health
Keywords: Health in growing districts, neighborhood as a prospect for well-being, healthy living environment, urban and public health, user in the focus, inter- and transdisciplinarity, place-based & person-based perspective, multi layered planning approach

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Semi-volatile organic compounds (phthalates, alternative plasticizers and organophosphate flame retardants) and trace metals in air cleaner captured house dust

Lee, Kiyoung; Park, Ji Young; Kim, Donghyun

Seoul National University, Korea, Republic of (South Korea)

ID: 1159 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: alternative plasticizers, phthalates, air cleaner captured dust, OPFR

Monday, 12.06.2023 13:30-14:00 Room C Carbon

MQTT-based monitoring system for indoor environmental quality in multi-domain

Li, Shutong; Huang, Qirui; Syndicus, Marc; Frisch, Jérôme; van Treeck, Christoph

RWTH Aachen - Lehrstuhl für Energieeffizientes Bauen (e3D), Germany

ID: 1171 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: indoor climate, IEQ, sensor, voxel, spatial distribution

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Removal of bacterial and fungal bioaerosols using air purifiers under real room conditions – a case study

Staszowska, Amelia; Dudzińska, Marzenna; Siuta-Olcha, Alicja; Cholewa, Tomasz; Bocian, Martyna

Lublin University of Technology, Poland

ID: 1188 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: air purifier, bioaerosols, desinfection, HEPA filters, UVC, photocatalysis

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Reference products for quality assurance and quality control measures in material emissions testing

Strzelczyk, Rebecca Skadi; Grimmer, Christoph; Richter, Matthias; Horn, Wolfgang

Bundesanstalt für Materialforschung und -prüfung, Germany

ID: 1195 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: reference materials, emissions, air quality, VOC

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Evaluating the Impact of Natural Ventilation on Indoor Environmental Quality During the Heating Season in Energy-Efficient Residential Buildings

Alhindawi, Ibrahim (1); Byrne, Miriam A. (1); Sood, Divyanshu (2); O'Donnell, James (2); McGrath, James A. (1)

1: University of Galway; 2: University College Dublin

ID: 1199 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: IEQ, IAQ, Thermal Comfort, Natural Ventilation, Occupant Behaviour

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Determining Chemical Emissions from Paint Products in Singapore to Guide Source Control Measures

Ng, Choong Hey; Poh, Li Qing; Sim, Shuzhen; Ng, Lee Ching; Jin, Meng-Yi

Environmental Health Institute, National Environment Agency, Singapore

ID: 1206 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: Building materials, Emission rates, Chamber testing, Formaldehyde, VOCs, Emission test standard

Monday, 12.06.2023 13:30-14:00 Room C Carbon

A handy tool enhancing the general public's awareness of impact of climate change on IAQ - Interactive web information platform

Zhao, Jiangyue (1); Schieweck, Alexandra (1); Uhde, Erik (1); Schmidt, Simon (2); Antretter, Florian (2,3)

1: Fraunhofer WKI, Braunschweig, Germany; 2: Fraunhofer IBP, Valley, Germany; 3: C3RROlutions GmbH, Raubling, Germany

ID: 1211 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 07. Occupant behavior & controls
Keywords: Science communication, future indoor climate, resident behavior, building simulation, exposure

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Evaluating Indoor Environmental Quality and Comfort in the Pre-Retrofit Schools and Offices

Collison, Adam K.; McGrath, James A.; Byrne, Miriam A.

Physics, School of Natural Sciences and Ryan Institute's Centre for Climate & Air Pollution Studies, University of Galway, Galway, Ireland

ID: 1212 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Energy Efficient Building, Indoor Air Quality, Deep Energy Retrofit, Non-Domestic Building, Offices.

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Practical Demand Side Management: One Day Case Study

Köse, Ahmet (1,3); Nourollahi Hokmabad, Hossein (2); Belikov, Juri (2); Tepljakov, Aleksei (3); Petlenkov, Eduard (3)

1: R8 Technologies OÜ, Estonia; 2: Department of Software Science, Tallinn University of Technology, Tallinn, Estonia; 3: Department of Computer Systems, Tallinn University of Technology, Tallinn, Estonia.

ID: 1265 Full paper
Topics: 06. Heating, ventilation, air conditioning & cooling, 10. Community- and urban-scale challenges and solutions
Keywords: Demand Side Management, Artificial Intelligence, Energy Efficiency

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Case Study of the Dispersion of Exhaled Particles in a Graduate Student Office by Computational Fluid Dynamics Simulations

Xiao, Can; Chen, Chun

CUHK, Hong Kong S.A.R. (China)

ID: 1267 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Indoor air quality, computational fluid dynamics, exhaled particles, ventilation, partition

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Moisture damage in the most common risk structures in Finnish homes

Salmela, Anniina (1); Taylor, Jonathon (2); Täubel, Martin (1); Lahdensivu, Jukka (2); Pekkanen, Juha (1,3)

1: Finnish Institute for Health and Welfare, Finland; 2: Tampere University, Finland; 3: Helsinki University, Finland

ID: 1278 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: dwelling, moisture, mould, risk structure

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Analyzing different peak shaving control strategies of a short-term thermal energy storage in a district heated office building

Ju, Yuchen (1,2); Jokisalo, Juha (1,2); Kosonen, Risto (1,2,3)

1: Department of Mechanical Engineering, Aalto University, Espoo, Finland; 2: FinEst Centre for Smart Cities, TalTech, Tallinn, Estonia; 3: College of Urban Construction, Nanjing Tech University, Nanjing, China

ID: 1287 Full paper
Topics: 06. Heating, ventilation, air conditioning & cooling, 10. Community- and urban-scale challenges and solutions
Keywords: District heating; Thermal storage; Peak shaving

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Associations Between Residential Indoor Temperatures and Self-Reported Sleep Problems in UK adults: a cross-sectional study

Deng, Ruiwen; Ucci, Marcella; Garfield, Victoria

University College London

ID: 1291 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 09. Public health, occupational & environmental health
Keywords: Indoor temperature, sleep problems, self-report, residential, NSHD

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Combining consultation surveys with qualitative discussion and quantitative multi-criteria decision-making workshops to engage stakeholders within the design process for healthy net-zero whole life carbon buildings.

Vakeva-Baird, Simon James (1); Mumovic, Dejan (1); Tahmasebi, Farhang (1); Williams, Joe-Jack (2)

1: UCL, United Kingdom; 2: Feilden Clegg Bradley Studios, United Kingdom

ID: 1293 Extended Abstract
Topics: 05. Architecture, aesthetics, passive design, biophilia, 06. Heating, ventilation, air conditioning & cooling
Keywords: Net-zero, carbon, engagement, environment, social

Monday, 12.06.2023 13:30-14:00 Room C Carbon

A study of the user behavior and effects of local cooling equipment among the elderly.

Chen, Minzhou; Kilpeläinen, Simo; Velashjerdi Farahani, Azin; Kosonen, Risto

Department of Mechanical Engineering, Aalto University, Espoo, Finland

ID: 1300 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 07. Occupant behavior & controls
Keywords: Thermal comfort, elderly people, behavior, local cooling device

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Impact of UVC treatment devices on indoor air quality

RAILLARD, Cécile (1); CHARRIER, Corentin (1); KOZLIK, Vincent (2); HEQUET, Valérie (1)

1: IMT Atlantique, Nantes Université, CNRS, GEPEA, UMR 6144, Nantes Cedex 3, France; 2: LL-Ingenierie, 2, rue Charron, 44 800 Saint-Herblain, France

ID: 1302 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Indoor Air Quality (IAQ), UVC Air cleaners, Volatile Organic Compounds (VOCs), Formaldehyde

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Overheating risk assessment in elderly houses of Finland for current and future hot summers associated with climate change

Velashjerdi Farahani, Azin (1); Jokisalo, Juha (1,2); kosonen, Risto (1,2,3)

1: Department of Mechanical Engineering, School of Engineering, Aalto University, Finland; 2: Smart City Center of Excellence, TalTech, Estonia; 3: Department of HVAC, College of Urban Construction, Nanjing Tech University, China

ID: 1306 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: elderly house, overheating risk, climate change, hot summer

Monday, 12.06.2023 13:30-14:00 Room C Carbon

The role of CO2 and PM in the definition of IAQ in schools

Settimo, Gaetano (1); Indinnimeo, Luciana (2); Inglessis, Marco (1); di Coste, Annalisa (2); De Felice, Marco (1); Morlino, Roberta (1); Avino, Pasquale (3)

1: Italian National Institute of Health, Italy; 2: Department of Pediatrics and Child Neuropsychiatry, Policlinico Umberto I, University of Rome La Sapienza; 3: Department of Agriculture, Environmental and Food Sciences, University of Molise,

ID: 1308 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: iaq, CO2, PM, evaluation, guidelines

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Indoor humidity in Finnish day care in winter

Kuurola, Pentti; Fedorik, Filip; Haverinen-Shaughnessy, Ulla

University of Oulu, Finland

ID: 1317 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: Indoor humidity, cold season, winter, day care

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Are particle sensors able to correctly report different indoor air particle emission scenarios?

Umba, David (1,2); Locoge, Nadine (1); Crunaire, Sabine (1); Miranda, Luiz (1); Duc, Caroline (1); Herbin, Benoît (1); Verriele, Marie (1); Redon, Nathalie (1)

1: IMT Nord Europe, Institut Mines-Télécom, Univ. Lille, Centre for Energy and Environment, F-59000 Lille; 2: The French Agency for Ecological Transition, ADEME, 49000 Angers, France

ID: 1318 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 07. Occupant behavior & controls
Keywords: particulate matter, air quality sensors systems, PM exposure

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Real-Time Sensing of VOCs via PID and PTR-TOF-MS During Building Disinfection Events

Ding, Xiaosu (1); Lu, Hongbo (1); Jiang, Jinglin (1); Tasoglou, Antonios (2); Jung, Nusrat (1)

1: Purdue University, United States of America; 2: RJ Lee Group Inc., United States of America

ID: 1332 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: volatile organic compounds, online mass spectrometry, surface disinfection, low-cost sensors, chemical emissions

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Coupling an Olfaction Chamber with Proton Transfer Reaction Mass Spectrometry for Evaluating Human Response to Scented Product Emissions

Cross, Jordan N.; Magnuson, Brian H.; Limaye, Zachary; Boor, Brandon E.; Jung, Nusrat

Purdue University, United States of America

ID: 1333 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 08. Psychology, psychophysics, performance & productivity
Keywords: volatile organic compounds, olfaction, online mass spectrometry, human response, personal care products

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Evaluation of Long-Term Changes in HVAC Filtration Efficiency and Airflow Resistance

Huang, Chunxu; Jung, Nusrat; Boor, Brandon E.

Purdue University, United States of America

ID: 1334 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: particulate matter, aerosol filtration, building ventilation, HVAC systems, filter performance

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Indoor thermal environment and carbon dioxide concentrations seven years after energy retrofits

Leivo, Virpi (1); Sorsa, Elmeri (2); Kempe, Minna (2); Haverinen-Shaugnessy, Ulla (2)

1: Tampere University, Finland; 2: University of Oulu, Finnland

ID: 1341 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: Thermal conditions, CO2, energy retrofit

Monday, 12.06.2023 13:30-14:00 Room C Carbon

The impact of the classroom indoor environment quality on pupils with autism: A systematic review

alqutub, Rahaf (1,3); Luo, Zhiwen {Vincent } (2); Vasilikou, Carolina (1)

1: University of Reading, United Kingdom; 2: Welsh School of Architecture, Cardiff University, UK; 3: College of Design, Imam Abdulrahman bin Faisal University, Saudi Arabia

ID: 1347 Extended Abstract
Topics: 08. Psychology, psychophysics, performance & productivity, 11. All other IEQ, ergonomics & health topics
Keywords: Indoor environment, Autism, classroom, sensory processing, behaviour outcomes

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Multifaceted evaluation of the profitability of modernizing the heat supply system for multi-family residential buildings

Siuta-Olcha, Alicja; Cholewa, Tomasz; Bocian, Martyna; Dudzińska, Marzenna R.; Staszowska, Amelia

Faculty of Environmental Engineering, Lublin University of Technology, Poland

ID: 1356 Extended Abstract
Topics: 06. Heating, ventilation, air conditioning & cooling
Keywords: Energy efficiency, Modernization, Save energy, Heat losses, Pollutants emission

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Use of sensor systems to assess individual exposure to air pollution

Durand, Emmanuelle (1); Paillat, Amandine (1); Allard, Laurence (2); Debert, Christophe (3); Gabet, Stephan (4); Hanoune, Benjamin (5); Macé, Tatiana (6); Madelin, Malika (7); Ramalho, Olivier (8); Redon, Nathalie (9); Zeitouni, Karine (10)

1: ANSES (French agency for food, environmental and occupational health and safety), Risk Assessment Department. Air Risk Assessment Unit. 94701 Maisons-Alfort Cedex, France; 2: Université de Lille / Ircav-Sorbonne Nouvelle; 3: AirParif; 4: Université de Lille, CHU Lille, Institut Pasteur de Lille, ULR 4483-IMPacts de l'Environnement Chimique sur la Santé (IMPECS), 59000 Lille, France; 5: Université de Lille, CNRS, UMR 8522 – PC2A – Physicochimie des Processus de Combustion et de l'Atmosphère, F-59000 Lille, France; 6: Laboratoire national de métrologie et d'essais (LNE); 7: Université Paris Cité, UMR PRODIG, Paris, France; 8: Centre Scientifique et Technique du Bâtiment (CSTB), Observatoire de la Qualité de l'Air Intérieur (OQAI); 9: IMT Nord Europe, Institut Mines-Télécom, Univ. Lille, Centre for Energy and Environment, F-59000 Lille, France; 10: Université de Versailles Saint-Quentin-en-Yvelines (UVSQ), Université Paris-Saclay

ID: 1381 Extended Abstract
Topics: 09. Public health, occupational & environmental health
Keywords: sensor-system, air pollution, personal exposure

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Viral aerosol removal efficiency of upper-room ultraviolet germicidal irradiation (UVGI) system compared to increasing ventilation rate

Park, Seongjun (1); Rim, Donghyun (1); Pei, Gen (2)

1: Pennsylvania State University, United States of America; 2: Harvard T.H. Chan School of Public Health, United States of America

ID: 1384 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: Computational fluid dynamics (CFD), ultraviolet germicidal irradiation (UVGI), coronavirus, airborne infection, indoor air quality

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Indoor climate conditions with HVAC room unit integrated into the suspended ceiling or island ceiling

Mustakallio, Panu (1,2); Kanerva, Pekka (1)

1: Halton Oy, Finland; 2: Department of Mechanical Engineering, Aalto University, Finland

ID: 1391 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: Office, Radiant panel, Ceiling diffuser, Mixing ventilation

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Efficiency of a newly designed portable air purifier in reducing the SARS-CoV-2 airborne infection risk in close-proximity

Buonanno, Giorgio; Arpino, Fausto; Cortellessa, Gino; Stabile, Luca

University of Cassino and Southern Lazio, Italy

ID: 1392 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: SARS-CoV-2, air purifier, risk of infection, particles

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Adaptive thermal comfort behaviours in UK homes: results of a large survey

Gauthier, Stephanie; James, Patrick

University of Southampton, United Kingdom

ID: 1405 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 07. Occupant behavior & controls
Keywords: Thermal comfort, Adaptive behaviour, Latent heat, Energy literacy, Personality traits

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Effect of the time of bioaerosol emission on potential exposure to microorganisms in the class room with and without operating mechanical ventilation.

Przystaś, Wioletta; Zabłocka-Godlewska, Ewa; Nateghi, Seyedkeivan; Kaczmarczyk, Jan

Silesian University of Technology, Poland

ID: 1410 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: bioaerosol; indoor environment; microorganisms count

Monday, 12.06.2023 13:30-14:00 Room C Carbon

How adequate are the ventilation and thermal comfort levels of net-zero houses? A case study in the Pacific Northwest

Crosby, Sarah (1); Rogak, Steven (1); Adam, Rysanek (2)

1: Department of Mechanical Engineering, University of British Columbia, Vancouver, Canada; 2: School of Architecture and Landscape Architecture, University of British Columbia, Vancouver, Canada.

ID: 1414 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Ventilation assessment, net-zero house, fresh air, IEQ, CO2 levels

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Sensibility Analysis for Examining the Optimum Room Temperature for Nocturia based on a Multilevel Model

Takedomi, Reo (1); Ando, Shintaro (1); Umishio, Wataru (2); Ikaga, Toshiharu (3)

1: The University of Kitakyushu, Fukuoka, Japan; 2: Tokyo Institute of Technology, Tokyo, Japan; 3: Keio University, Kanagawa, Japan

ID: 1416 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: Nocturia, Room Temperature, Multi-level Analysis, Sensitivity Analysis

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Preliminary study of bioaerosol dispersion in classroom space

Zabłocka-Godlewska, Ewa; Przystaś, Wioletta; Kaczmarczyk, Jan; Nateghi, Seyedkeivan

Silesian University of Technology, Poland

ID: 1421 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: bioaerosol, bacteria number, indoor air, mixing ventylation system

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Design, development and performance evaluation of an electrostatic precipitator for indoor environment.

Kumar, Aiswarya; Moni, Mufaddal; Sahu, Manoranjan

IIT Bombay, India

ID: 1430 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Standard aerosols, real scenario, particle sources, byproduct, energy consumed/CADR

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Risk Assessment of Hazardous Chemicals in beauty clinics in Korea

Choi, In Woo (1); Cho, Sung Woo (1); Kim, Hyun Jung (1); Oh, Youn Hee (2); Choi, Jung Sook (3); Seo, Ji Hoon (4); Sohn, Jong Ryul (4)

1: Department of Health and Safety Convergnece Science, Korea University; 2: Graduate school of Particulate matter specialization; 3: ECOENO Co.; 4: Department of Health and Environmental Science, Korea University

ID: 1451 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: Beauty salon, risk assessment, aldehydes, VOCs, indoor air quality

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Children exposure to endocrine disruptors chemicals: what do we know until now and what can be done about it?

Madureira, Joana (1,2,3); Pereira, Maria C. (4); Teixeira, João P. (1,2,3); Dzúrová, Dagmar (5); Afonso, Ivete (6); Rodrigues, Ana (7); Bonassi, Stefano (8); Verhagen, Hans (9,10); Morawska, Lídia (11,12); Slezakova, Klara (4)

1: Environmental Health Department, National Institute of Health, Porto, Portugal; 2: EPIUnit, Institute of Public Health, University of Porto, Porto, Portugal; 3: Laboratory for Integrative and Translational Research in Population Health (ITR) Porto, Portugal; 4: LEPABE-ALiCE, Faculdade de Engenharia da Universidade do Porto, Porto, Portugal; 5: Department of Social Geography and Regional Development, Faculty of Science, Charles University, Prague, Czech Republic; 6: Department of Pediatric Endocrinology, Metabolism and Nutrition, Hospital Pedro Hispano, Matosinhos, Portugal; 7: Education, Social Sciences and Humanities Department Faculty of Human Kinetics University of Lisbon, Lisbon Portugal; 8: IRCCS San Rafaele, Pisana, Italy; 9: Food Safety & Nutrition Consultancy, The Netherlands; 10: National Food Institute, Technical University of Denmark, Lyngby, Denmark; 11: School of Earth and Atmospheric Sciences, Faculty of Science, Queensland University of Technology, Brisbane, Australia; 12: Global Centre for Clean Air Research (GCARE), University of Surrey, United Kingdom

ID: 1456 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: endocrine disruptors; indoor air quality; schools; children; neurocognitive development

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Performance of artificial neural network-based predictive controllers for thermal comfort in typical prefabricated movable buildings.

Ciervo, Antonio; Rosato, Antonio; Maffei, Luigi

SENS i-Lab, Department of Architecture and Industrial Design, University of Campania Luigi Vanvitelli, Via San Lorenzo 4, 81031 - Aversa, Italy

ID: 1462 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: Prefabricated movable buildings, Overheating, Predictive controller, Artificial neural networks, Building energy efficiency

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Preliminary investigations on the use of Net Promoter Score to measure occupant satisfaction in office spaces

Davalos Quevedo, Maria Victoria (1); Luna-Navarro, Alessandra (1); Pottgiesser, Uta (1); Blum, Ulrich (2)

1: TU Delft, the Netherlands; 2: FH Münster, MSA Münster School of Architecture, Germany

ID: 1474 Extended Abstract
Topics: 05. Architecture, aesthetics, passive design, biophilia
Keywords: occupant satisfaction, workspace design, Net Promoter Score, Human-Centric Design

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Field Survey of Microplastic in Different Indoor Environments of Japan

Lim, Eunsu (1); Takeuchi, Jinya (2); Ni, Yuan (3); Bai, Yifan (4); Ito, Kazuhide (3)

1: Department of Architecture, Toyo University, Japan, lim@toyo.jp; 2: Department of Architecture and Environment systems, Akita Prefectural University, Japan; 3: Faculty of Engineering Sciences, Kyushu University, Japan; 4: Department of Architecture, Toyo University, Japan

ID: 1482 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Microplastic, Indoor Environment, Field Intervention Survey, Semi-Volatile Organic Compounds

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Occupancy and personal exposure detection by using smart sensors in two office buildings

Yun, Seoyeon; Licina, Dusan

Human-Oriented Built Environment Lab, School of Architecture, Civil and Environmental Engineering, École Polytechnique Fedérale de Lausanne, Switzerland

ID: 1483 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 07. Occupant behavior & controls
Keywords: Low-cost IAQ sensor, Indoor air quality, Building occupancy, Human exposure, Spatio-temporal variation

Monday, 12.06.2023 13:30-14:00 Room C Carbon

Effects of solar control systems on human daylight-driven health potentials

Khanie, Mandana Sarey (1); Nielsen, Rasmus (1,2); Brembilla, Eleonora (3); Foldbjerg Rasmussen, Helle (2); Korsholm Andersen, Rune (1)

1: International Centre for Indoor Environment and Energy (ICIEE), Department of Environmental and Resource Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark; 2: MicroShade A/S, Denmark; 3: Department of Architectural Engineering and Technology, Faculty of Architecture and the Built Environment, Delft,University of Technology, Delft, Netherlands

ID: 2512 Extended Abstract
Topics: 03. Lighting, visual comfort, daylight, circadian lighting, views
Keywords: Spectral lighting simulation, non-visual effects, non-image forming, BSDF

Parallel sessions

Monday

Session 1 Monday Carbon - Sensor technology

Time:
Monday, 12.06.2023 11:00-12:30

Room: C Carbon

Chair:
van Treeck, Christoph
RWTH Aachen University

Co-Chair:
Laverge, Jelle
Ghent University

Monday, 12.06.2023 11:00-11:15 Room C Carbon

Non-invasive physiological parameters sensing for personalized human thermal comfort prediction

Rida, Mohamad (1); Abdelfattah, Mohamed (2); Allahi, Alexandre (2); Khovalyg, Dolaana (1)

1: Laboratory of Integrated Comfort Engineering (ICE), École polytechnique fédérale de Lausanne (EPFL), Fribourg, Switzerland; 2: Visual Intelligence for Transportation (VITA), École polytechnique fédérale de Lausanne (EPFL), Lausanne, Switzerland

ID: 1417 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 07. Occupant behavior & controls
Keywords: Human thermal comfort, non-invasive sensing, infrared images, feature extraction

Monday, 12.06.2023 11:15-11:30 Room C Carbon

Using machine learning methods for the development of an electronic nose (E-Nose) for detection of air quality in shopping centers

El-Mokadem, Mahmoud; Louca, Samy; Abdelrahman, Ali; Rewitz, Kai; Müller, Dirk

RWTH Aachen University, E.ON Energy Research Center, Institute for Energy Efficient Buildings and Indoor Climate

ID: 1166 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 07. Occupant behavior & controls
Keywords: indoor air quality, total volatile organic compounds, machine learning

Monday, 12.06.2023 11:30-11:45 Room C Carbon

Development of a semi-wireless measurement system for monitoring skin temperatures

Derwein, Dennis (1); Burgholz, Tobias Maria (2); Mhisen, Tareq (2); Rewitz, Kai (1); Müller, Dirk (1)

1: RWTH Aachen University, E.ON Energy Research Center, Institute for Energy Efficient Buildings and Indoor Climate, Germany; 2: Heinz Trox Wissenschafts gGmbH, Germany

ID: 1390 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 08. Psychology, psychophysics, performance & productivity
Keywords: thermal comfort, skin temperature measurement, proband studies, monitoring, thermophysiology

Monday, 12.06.2023 11:45-12:00 Room C Carbon

Spatial Mapping of Ultrafine Particle Concentrations in an Office HVAC System Using a Diffusion Charger Sensor Array

Wagner, Danielle N.; Jung, Nusrat; Boor, Brandon E.

Purdue University, United States of America

ID: 1337 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: ultrafine particles, building ventilation, HVAC filtration, building automation systems, indoor air sensors

Monday, 12.06.2023 12:00-12:03 Room C Carbon

Performance assessment of low-cost indoor environmental monitors for comfort control systems in office environments

Zimianitis, Petros; Zheng, Hailin; Walker, Shalika; Kramer, Rick; Zeiler, Wim

Eindhoven University of Technology, Netherlands, The

ID: 1124 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 07. Occupant behavior & controls
Keywords: comfort control systems, air quality measurements, thermal comfort, sensor comparisons

Monday, 12.06.2023 12:03-12:06 Room C Carbon

Developing of an infrared sensor based indoor occupant detection system using machine-learning algorithms

Rewitz, Kai; Seiwert, Paul; Kammerer, Vincent; Müller, Dirk

RWTH Aachen University, E.ON Energy Research Center, Institute for Energy Efficient Buildings and Indoor Climate, Germany

ID: 1286 Full paper
Topics: 06. Heating, ventilation, air conditioning & cooling, 07. Occupant behavior & controls
Keywords: occupant detection, infrared sensor, machine-learning, Convolutional Neural Network

Monday, 12.06.2023 12:06-12:09 Room C Carbon

Do Alcohols dominate the VOC measurement of low-cost sensors?

Schultealbert, Caroline (1); Baur, Tobias (1); Leidinger, Martin (1); Conrad, Thorsten (1); Amann, Johannes (2); Bur, Christian (2); Schütze, Andreas (2)

1: 3S GmbH - Sensors, Signal Processing, Systems, Germany; 2: Saarland University, Lab for Measurement Technology, Germany

ID: 1357 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: low-cost sensors, VOC, TVOC, monitoring, ventilation

Monday, 12.06.2023 12:09-12:12 Room C Carbon

Blurred-eyed sensor, show me my exposure to indoor air pollutants.

REDON, Nathalie (1); UMBA KALALA, David (1); PINTO, Thibault (2); CRUNAIRE, Sabine (1); VERRIELE, Marie (1); FRERE, Séverine (2); HELLEQUIN, Anne-Peggy (3); LOCOGE, Nadine (1)

1: IMT Nord Europe, Institut Mines-Télécom, Univ. Lille, Centre for Energy and Environment, F-59000 Lille, France; 2: Laboratoire TVES, Université du Littoral Côte d'Opale, France; 3: Laboratoire LADYSS, Université de Paris Nanterre, France

ID: 1303 Extended Abstract
Topics: 07. Occupant behavior & controls, 09. Public health, occupational & environmental health
Keywords: air quality sensor systems; individual exposure; pedagogic indicators

Session 2 Monday Silver - Occupant behaviour

Time:
Monday, 12.06.2023 11:00-12:30

Room: Ag Silver

Chair:
Mahdavi, Ardeshir
TU Graz

Co-Chair:
Luna Navarro, Alessandra
TU Delft

Monday, 12.06.2023 11:00-11:15 Room Ag Silver

Investigation of window operation behaviour in naturally ventilated classrooms during the COVID-19 pandemic

Brumer Franceschini, Paula (1); Schweiker, Marcel (2); Oliveira Neves, Leticia (1)

1: School of Civil Engineering, Architecture and Urban Design, University of Campinas, Campinas, SP, Brazil; 2: Healthy Living Spaces lab, Institute for Occupational, Social and Environmental Medicine, RWTH Aachen University, Aachen, Germany.

ID: 1223 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 07. Occupant behavior & controls
Keywords: Window operation, Occupant behaviour, Indoor air quality, Thermal comfort, COVID-19 pandemic

Monday, 12.06.2023 11:15-11:30 Room Ag Silver

Indoor environment in Danish apartments during the Covid-19 lockdowns

Andersen, Rune Korsholm; Rupp, Ricardo Forgiarini

Technical Univeristy of Denmark, Denmark

ID: 1354 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 07. Occupant behavior & controls
Keywords: Temperature, Dwellings, heating

Monday, 12.06.2023 11:30-11:45 Room Ag Silver

Optimizing Automated Shading System by Exploring Occupant Behaviour and Comfort in Office Environment: An Experimental Study

Derbas, Ghadeer Abdallah (1,2,3); Voss, Karsten (2)

1: Palestine Technical University – Kadoorie, Palestine; 2: Wuppertal University, Germany; 3: Forschungszentrum Jülich, Germany

ID: 1137 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 07. Occupant behavior & controls
Keywords: Automated shading system, Occupant behaviour, Thermal performance, Visual performance, User satisfaction, User preferences

Monday, 12.06.2023 11:45-12:00 Room Ag Silver

A cross country survey on occupants' use of natural ventilation in Brazilian homes

Buonocore, Carolina; André, Maíra; Castro, Luiza; De Vecchi, Renata; Lamberts, Roberto

Federal University of Santa Catarina, Brazil

ID: 1433 Full paper
Topics: 06. Heating, ventilation, air conditioning & cooling, 07. Occupant behavior & controls
Keywords: Natural ventilation, Brazilian homes, Thermal comfort

Monday, 12.06.2023 12:00-12:03 Room Ag Silver

Agent-based modeling for occupant behavior representation in building performance

Malik, Jeetika (1); Hong, Tianzhen (1); Mahdavi, Ardeshir (2); Berger, Christiane (3); Ouf, Mohamed (4)

1: Building Technology and Urban Systems, Lawrence Berkeley National Laboratory, USA; 2: Institute of Building Physics, Services, and Construction, Faculty of Civil Engineering Sciences, TU Graz, Austria; 3: Department of Architecture, Design and Media Technology at Aalborg University, Denmark; 4: Department of Building, Civil and Environmental Engineering, Concordia University, Canada

ID: 2484 Extended Abstract
Topics: 07. Occupant behavior & controls
Keywords: occupant behavior, agent-based modeling, building performance simulation, occupant representation

Monday, 12.06.2023 12:03-12:06 Room Ag Silver

Influence of personal comfort systems operability on thermal comfort and workplace productivity

Aono, Kazuki (1); Ukai, Masanari (1); Takehara, Daiki (1); Tanabe, Shin-ichi (1); Kimura, Kentaro (2); Shimizu, Akihiro (2); Aizawa, Naoki (2); Muto, Yuka (3); Hatori, Daisuke (3)

1: Waseda University, Japan; 2: Takasago Thermal Engineering Co.,Ltd, Japan; 3: Mitsubishi Jisho Design Inc., Japan

ID: 1176 Full paper
Topics: 06. Heating, ventilation, air conditioning & cooling, 07. Occupant behavior & controls
Keywords: Personal Comfort Systems, Operability, Thermal Comfort, Workplace productivity

Monday, 12.06.2023 12:06-12:09 Room Ag Silver

Developing a Framework to Assess the IEQ and Occupants' Comfort and Behaviour in Residential Buildings: A Pilot Study

Cao, Yuan; Touchie, Marianne; Lee, Seungjae

University of Toronto, Canada

ID: 1272 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: Occupant Comfort, Occupant Behaviours, Indoor Environmental Quality (IEQ), Residential Buildings

Monday, 12.06.2023 12:09-12:12 Room Ag Silver

Sensitivity Analysis of Occupant Behavior in energy models for data driven design decisions

Verghese, Sharon Susan; Hartmann, Timo

Technische Universität Berlin, Germany

ID: 1316 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 07. Occupant behavior & controls
Keywords: Occupant behavior, sensitivity analysis, data driven decisions

Session 3 Monday Oxygen - Mould & humidity

Time:
Monday, 12.06.2023 11:00-12:30

Room: O2 Oxygen

Chair:
Wiesmueller, Gerhard A.
Zentrum für Umwelt, Hygiene und Mykologie Köln

Co-Chair:
Luo, Wei
Maastricht University

Monday, 12.06.2023 11:00-11:15 Room O2 Oxygen

Assessing the hygrothermal performance of dormer attics for energy retrofit risk

Liu, Ying; Considine, Brian; McNabola, Aonghus

Trinity College Dublin, Ireland

ID: 1178 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: Dormer attics, Hygrothermal performance, energy retrofit, insulation, ventilation

Monday, 12.06.2023 11:15-11:30 Room O2 Oxygen

Modeling the full cycle of air-born spores in buildings

Ajib, Hiba (1,2,3); Wall-Ribot, Bénédicte (1,3); Labbé, Sébastien (1,3); Abadie, Marc (2,3); Limam, Karim (2,3); Duforestel, Thierry (1,3)

1: EDF R&D, Moret-sur-Loing, France; 2: Laboratory of Engineering Sciences for the Environment LaSIE (UMR CNRS 7356), La Rochelle University, France.; 3: 4evLab, CNRS, La Rochelle University, Electricité de France EDF, Avenue Michel Crépeau, 17042 La Rochelle Cedex 1, France

ID: 1375 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: air-born spores, mold growth, indoor air, modeling, office and residential buildings

Monday, 12.06.2023 11:30-11:45 Room O2 Oxygen

Exploring Effects of Environmental Factors on Pollutant Exposures via PM Monitoring and Microbial Analysis of Home Dust

Jarma, David A; Maestre, Juan Pedro; Kinney, Kerry

University of Texas, United States of America

ID: 1438 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Dust, Microbiome, PM Monitoring, Pollutant Exposure

Monday, 12.06.2023 11:45-12:00 Room O2 Oxygen

Potential microbial growth on bio-based insulation materials and their ability to emit microbial volatile organic compounds

ZINE-FILALI, Nouha (1); BRAISH, Tamara (2); LOCOGE, Nadine (2); ANDRES, Yves (1)

1: IMT Atlantique, France; 2: IMT Nord Europe, France

ID: 1404 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Fungi, mVOC emissions, aging process, bio-based insulation materials, antifungal treatments

Monday, 12.06.2023 12:00-12:03 Room O2 Oxygen

HUMIDITY IS AN INDISPENSIBLE PARAMETER OF INDOOR AIR QUALITY

Hugentobler, Walter

École Polytechnique Fédérale de Lausanne, Switzerland

ID: 1413 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: IAQ parameters, humidity impacts, moisture needs of occupants, indoor dryness

Monday, 12.06.2023 12:03-12:06 Room O2 Oxygen

Bio-based insulating materials and their influence on Indoor Air Quality

TINEL, Liselotte (1); Braish, Tamara (1); Delpechin, Laurence (1); Caudron, Cécile (2); Nadine, Locoge (1)

1: IMT Nord Europe, France; 2: Cerema, France

ID: 1151 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: VOC, bio-based materials, construction material, emission

Monday, 12.06.2023 12:06-12:09 Room O2 Oxygen

The effect of energy retrofits on indoor microbiota

Kempe, Minna (1); Haverinen-Shaughnessy, Ulla (1); Täubel, Martin (2)

1: University of Oulu, Finland; 2: Finnish Institute for Health and Welfare, Finland

ID: 1342 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: microbiota, energy retrofit, settled dust, amplicon sequencing, exposure

Monday, 12.06.2023 12:09-12:12 Room O2 Oxygen

In Vitro Test System for Assessing the Health Effects of Indoor Mould

Wolff, Anja (1); Klar, Stefanie (1); Reinert, Jessica (1); Valtanen, Kerttu (2); Jäckel, Udo (1)

1: Federal Institute for Occupational Safety and Health, Bioaerosols, Nöldnerstraße 40-42, 10317 Berlin, Germany; 2: Federal Environment Agency, Microbiological Risk Assessment, Corrensplatz 1, 14195 Berlin, Germany

ID: 1198 Extended Abstract
Topics: 09. Public health, occupational & environmental health
Keywords: Indoor mold, extracts, cell viability, cytokine release

Monday, 12.06.2023 12:12-12:15 Room O2 Oxygen

Supporting occupants in homes with mold growth - Findings from a Danish advisory service

Aalling, Lenette; Gunnarsen, Lars

Aalborg University, Denmark

ID: 1310 Extended Abstract
Topics: 07. Occupant behavior & controls
Keywords: Mold, fungi, indoor environment behavior, advisory service, occupants

Session 4 Monday Carbon - IAQ

Time:
Monday, 12.06.2023 14:00-15:30

Room: C Carbon

Chair:
Adlington, Martin Donald S
University of Derby

Co-Chair:
Bardey, Janine
Heinz Trox Wissenschafts gGmbH

Monday, 12.06.2023 14:00-14:15 Room C Carbon

Evaluation of indoor environmental quality and pupils' satisfaction in Flemish primary schools

Carton, Quinten (1); Mennes, Filip (2); Vanden Broeck, Sander (1); Van Roy, Vincent (1); Kolarik, Jakub (3); Breesch, Hilde (1)

1: KU Leuven, Department of Civil Engineering, Building Physics and Sustainable Design, Ghent Campus, Belgium; 2: Onderzoekskern ExploRatio, Odisee, Belgium; 3: Department of Civil and Mechanical Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark

ID: 1464 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: Indoor environmental quality, Occupant satisfaction, Classrooms, Nature of Science

Monday, 12.06.2023 14:15-14:30 Room C Carbon

Comparison of the resilient performance of different ventilation strategies in Belgian elderly care homes

Al Assaad, Douaa; Carton, Quinten; Breesch, Hilde

KU Leuven, Belgium

ID: 1116 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: Ventilation resilience, elderly care homes, natural ventilation, mechanical ventilation, indoor air quality

Monday, 12.06.2023 14:30-14:45 Room C Carbon

Algorithms for online CO2 baseline correction in intermittently occupied rooms

Vihman, Lauri (1,2); Parts, Tuule Mall (1,3); Aljas, Hans Kristjan (1,3); Thalfeldt, Martin (1,3); Raik, Jaan (1,2)

1: FinEst Centre for Smart Cities (Finest Centre), Tallinn University of Technology, Tallinn, Estonia; 2: Centre for Dependable Computing Systems, Department of Computing Systems, Tallinn University of Technology, Estonia; 3: Department of Civil Engineering and Architecture, Tallinn University of Technology, Tallinn, Estonia

ID: 1355 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Sensor auto-calibration, indoor air quality, data quality, CO2 sensors, CO2 monitoring

Monday, 12.06.2023 14:45-14:48 Room C Carbon

Evaluation of a nursing home by a mobile measurement pillar to record indoor ergonomics via sensors and questionnaire

Bardey, Janine (1,2,4); Burgholz, Tobias (1,2,3); Rewitz, Kai (3); Müller, Dirk (2,3)

1: shared first authorship, authors contributed equally to the presented work; 2: Heinz Trox Wissenschafts gGmbH, Aachen, Germany; 3: RWTH Aachen University, E.ON Energy Research Center, Institute for Energy Efficient Buildings and Indoor Climate, Aachen, Germany; 4: Research and teaching area Healthy Living Spaces, Institute for Occupational, Social and Environmental Medicine, Medical Faculty, RWTH Aachen University, Germany

ID: 1144 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 09. Public health, occupational & environmental health
Keywords: indoor ergonomics, participant studies, field study, indoor comfort, nursing home

Monday, 12.06.2023 14:48-14:51 Room C Carbon

Development of a CO2-based indoor air quality measurement box for classrooms

Huang, Qirui; Syndicus, Marc; Ehrt, Rainer; Sacic, Amra; Frisch, Jérôme; van Treeck, Christoph

RWTH Aachen University, Germany

ID: 1155 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: CO2, Air quality, Covid-19, Sensor calibration, Relay control

Monday, 12.06.2023 14:51-14:54 Room C Carbon

A Digital Twin of an Operating Theater

Gargiulo, Giovanna (1); Groth, Corrado (1); Biancolini, Marco Evangelos (1); Grigioni, Mauro (2); D'Avenio, Giuseppe (2)

1: University of Rome Tor Vergata, Department of Enterprise Engineering, Rome, Italy; 2: National Center for Innovative Technologies in Public Health, Italian National Institute of Health (ISS), Rome, Italy

ID: 1311 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 09. Public health, occupational & environmental health
Keywords: Operating Theater, CFD, ROM, Digital Twin

Monday, 12.06.2023 14:54-15:09 Room C Carbon

An appropriate environment for people with mental disabilities and challenging behaviour

Huisman, Emelieke (1); Mueller-Schotte, Sigrid (1); Huisman, Chantal (1,2); Kort, Helianthe (1,2)

1: University of Applied Science Utrecht (Hogeschool Utrecht), Research Centre Health and Sustainable Life, Research group Technology for Healthcare Innovations; 2: Eindhoven University of Technology, Department of the Built Environment, Unit Building Physics and Services, Netherlands

ID: 2503 Extended Abstract
Topics: 05. Architecture, aesthetics, passive design, biophilia, 07. Occupant behavior & controls
Keywords: indoor environment, indoor climate, quality of life, mental disabilities

Session 5 Monday Silver - Particles, IAQ & odour perception

Time:
Monday, 12.06.2023 14:00-15:30

Room: Ag Silver

Chair:
Ilacqua, Vito
US EPA

Co-Chair:
Maier, Laura
RWTH Aachen University, E.ON Energy Research Center, Institute for Energy Efficient Buildings and Indoor Climate

Monday, 12.06.2023 14:00-14:15 Room Ag Silver

INDAIRPOLLNET: Driving indoor air pollution research in Europe

Carslaw, Nicola (1); Beko, Gabriel (2); Langer, Sarka (3); Schoemaecker, Coralie (4); Mihucz, Victor (5); Dudzinka, Marzenna (6); Wiesen, Peter (7); Nehr, Sascha (8); Huttunen, Kati (9); Querol, Xavier (10)

1: University of York, United Kingdom; 2: Technical University Denamrk; 3: IVL, Sweden; 4: University of Lille; 5: Eotvos Lorand University; 6: University of Lublin; 7: Wuppertal University; 8: CBS International Business School, Brühl, Germany; 9: Finnish Institute for health and welfare; 10: Institute of Environmental Assessment and Water Research (IDÆA), Consejo Superior de Investigaciones Científicas (CSIC)

ID: 1363 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: indoor air quality, indoor air chemistry, VOCs, surfaces, buildings

Monday, 12.06.2023 14:15-14:30 Room Ag Silver

New Insights on Indoor New Particle Formation in Residential Buildings

Patra, Satya S. (1); Jiang, Jinglin (1); Huang, Chunxu (1); Ding, Xiaosu (1); Price, Paige (2); Kumar, Vinay (2); Keech, Connor (3); Steiner, Gerhard (4); Tasoglou, Antonios (5); Stevens, Philip S. (2); Jung, Nusrat (1); Boor, Brandon E. (1)

1: Purdue University, United States of America; 2: Indiana University, United States of America; 3: DURAG Inc., United States of America; 4: GRIMM Aerosol Technik Ainring GmbH & Co. KG, Germany; 5: RJ Lee Group Inc., United States of America

ID: 1335 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: ultrafine particles, volatile organic compounds, ozone, indoor chemistry, nanocluster aerosol

Monday, 12.06.2023 14:30-14:45 Room Ag Silver

Spatiotemporal Variations in Ozone and Carbon Dioxide Concentrations in a Ventilation System of an Office Building

Jiang, Jinglin (1); Huang, Junkai (1); Wagner, Danielle N. (1); Tasoglou, Antonios (2); Stevens, Philip S. (3); Boor, Brandon E. (1); Jung, Nusrat (1)

1: Purdue University, United States of America; 2: RJ Lee Group Inc., United States of America; 3: Indiana University, United States of America

ID: 1331 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: ozone, carbon dioxide, mechanical ventilation, occupancy, indoor chemistry

Monday, 12.06.2023 14:45-15:00 Room Ag Silver

Odour testing of building products: Examinations for an on-going development of the test standard ISO 16000-28

Brandt, Simone (1); Brozowski, Frank (2); Horn, Wolfgang (3); Müller, Birgit (1)

1: University of Applied Sciences (HTW Berlin), Germany; 2: German Environment Agency (UBA), Germany; 3: Bundesanstalt für Materialforschung und -prüfung (BAM)

ID: 1386 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Building materials, odour, emission, test chamber, perceived intensity

Monday, 12.06.2023 15:00-15:03 Room Ag Silver

Deposition of inhalable particles onto clothing: A manikin-based chamber study

Jhang, Han-Yun; Yang, Shen; Licina, Dusan

Human-Oriented Built Environment Lab, School of Architecture, Civil and Environmental Engineering, École Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland

ID: 1123 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Particle dynamics, Textile, Clothing contamination, Inhalation exposure

Monday, 12.06.2023 15:03-15:06 Room Ag Silver

Relationship of building material emissions and odour perception: perceived intensity, hedonic tone and reasonableness

Schieweck, Alexandra; Schulz, Nicole; Kohlhagen, Jennifer

Fraunhofer WKI, Germany

ID: 1129 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 07. Occupant behavior & controls
Keywords: Chamber tests, model rooms, airborne pollutants, indoor air quality, odour assessment

Monday, 12.06.2023 15:06-15:09 Room Ag Silver

Modeling the emission and transport of endocrine disrupters in French daycare centers

Wei, Wenjuan (1); Nicolas, Mélanie (1); Déoux, Suzanne (2); Maupetit, François (1)

1: CSTB, France; 2: MEDIECO Conseil & Formation, France

ID: 1186 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Semivolatile organic compounds, building materials, consumer products, phthalate, flame retardant

Monday, 12.06.2023 15:09-15:12 Room Ag Silver

Investigating the impacts of cooking and cleaning on indoor air quality under different room furnishing configurations

Harding-Smith, Ellen (1); Davies, Helen (1); O'Leary, Catherine (2); Shaw, David (1); Winkless, Ruth (2); Shaw, Marvin (2); Dillon, Terry (2); Carslaw, Nicola (1)

1: Environment & Geography Department, University of York, United Kingdom; 2: Wolfson Atmospheric Chemistry Laboratories, University of York, United Kingdom

ID: 1229 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: VOC, cooking, cleaning, indoor air chemistry

Monday, 12.06.2023 15:12-15:15 Room Ag Silver

Assessing Indoor Air Quality and ventilation systems to limit the spread of airborne pathogens - a review

Hobeika, Nadine; García-Sánchez, Clara; Bluyssen, Philomena M.

Delft University of Technology, Netherlands

ID: 1296 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: indoor air quality, aerosol dispersion, ventilation, numerical modelling, computational fluid dynamics, assessment

Session 6 Monday Oxygen - Urban setting & communities

Time:
Monday, 12.06.2023 14:00-15:30

Room: O2 Oxygen

Chair:
Touchie, Marianne
University of Toronto

Co-Chair:
Ju, Yuchen
Aalto university

Monday, 12.06.2023 14:00-14:15 Room O2 Oxygen

Data analytics as a cornerstone for healthy and sustainable buildings and communities

Lampkowski, Marcelo (1); Pan, Zhiyu (2); Hernández Moral, Gema (4); Marinakis, Vaggelis (3); Monti, Antonello (2)

1: ICLEI - Local Governments for Sustainability, Freiburg im Breisgau, Germany; 2: A E.ON Energy Research Center, RWTH Aachen University, Germany; 3: School of Electrical and Computer Engineering, Decision Support Systems Laboratory, National Technical University of Athens, Athens, Greece; 4: CARTIF Technology Centre, Parque Tecnológico de Boecillo, Boecillo, Valladolid, Spain

ID: 2511 Extended Abstract
Topics: 10. Community- and urban-scale challenges and solutions
Keywords: holistic, big data, analytics, energy efficiency, planning

Monday, 12.06.2023 14:15-14:30 Room O2 Oxygen

Developing radiative cooling paint to harvest renewable cooling for buildings

Yu, Xinxian (1); Yao, Fengju (1); Huang, Wenjie (1); Xu, Dongyan (1); Chen, Chun (1,2)

1: Department of Mechanical and Automation Engineering, The Chinese University of Hong Kong, Hong Kong S.A.R., China; 2: Shenzhen Research Institute, The Chinese University of Hong Kong, Shenzhen, China

ID: 1244 Extended Abstract
Topics: 06. Heating, ventilation, air conditioning & cooling, 10. Community- and urban-scale challenges and solutions
Keywords: Radiative cooling, Renewable energy, Cooling paint, Cool roof, Glass bubbles

Monday, 12.06.2023 14:30-14:45 Room O2 Oxygen

Incorporating Novel Desiccant Dehumidification Technologies into Conventional Air Conditioning Systems: Effects on Urban Microclimate and Energy Consumption

Younes, Jaafar; Ghaddar, Nesreen; Ghali, Kamel

American University of Beirut, Lebanon (Lebanese Republic)

ID: 1169 Full paper
Topics: 06. Heating, ventilation, air conditioning & cooling, 10. Community- and urban-scale challenges and solutions
Keywords: Desiccant dehumidification, energy conservation, urban heat island

Monday, 12.06.2023 14:45-15:00 Room O2 Oxygen

Research on the influence of building façade material design on micro-climate in building complex

Li, Zhengrong; Chen, Qianru; Wang, Heyu; Ma, Chenliang; Feng, Xiwen

Tongji University, China, People's Republic of

ID: 1163 Full paper
Topics: 10. Community- and urban-scale challenges and solutions
Keywords: Micro-climate, building façade, numerical simulation, wind-thermal coupling, thermal accumulation

Monday, 12.06.2023 15:00-15:03 Room O2 Oxygen

Research on quantitative description method of residential building group layout

Li, Zhengrong (1); Ma, Chenliang (1); Wang, Heyu (1); Chen, Qianru (1); Feng, Xiwen (1); Zhu, Han (2)

1: School of Mechanical and Engineering, Tongji University, Shanghai, China; 2: College of Electronic and Information Engineering, Tongji University, Shanghai, China

ID: 1164 Full paper
Topics: 10. Community- and urban-scale challenges and solutions
Keywords: Thermal environment, Layout of residential building group, Spatial characteristics, Image recognition

Monday, 12.06.2023 15:03-15:06 Room O2 Oxygen

Keeping warm in Northern China: Do rural households benefit from clean heating policy?

Wang, Shuye (1); Bleil de Souza, Clarice (1); Perisoglou, Emmanouil (1); Golubchikov, Oleg (2)

1: Welsh school of Architecture, Cardiff University, United Kingdom; 2: School of Geography and Planning, Cardiff University, United Kingdom

ID: 1202 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 10. Community- and urban-scale challenges and solutions
Keywords: Rural houses, Cold regions, Indoor thermal comfort, Thermal adaptation, Energy poverty

Monday, 12.06.2023 15:06-15:09 Room O2 Oxygen

Human Mobility Data as Proxy for Occupancy Information in Urban Building Energy Modelling

Hewamalage, Hansika (1); Chen, Kaixuan (1); Rana, Mashud (2); Sethuvenkatraman, Subbu (2); Xue, Hao (1); Salim, Flora (1)

1: University of New South Wales, Australia; 2: CSIRO

ID: 1179 Extended Abstract
Topics: 07. Occupant behavior & controls, 10. Community- and urban-scale challenges and solutions
Keywords: Energy Forecasting, Machine Learning, Foot Traffic Data

Monday, 12.06.2023 15:09-15:12 Room O2 Oxygen

A combined deep learning and physical modelling approach for characterizing contaminant source in street canyons

Zhou, Yiding (1); An, Yuting (1); Huang, Wenjie (1); Chen, Chun (1); You, Ruoyu (2)

1: Department of Mechanical and Automation Engineering, The Chinese University of Hong Kong, Shatin, N.T. 999077, Hong Kong SAR, China; 2: Department of Building Environment and Energy Engineering, The Hong Kong Polytechnic University, Kowloon, 999077, Hong Kong SAR, China

ID: 1294 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 10. Community- and urban-scale challenges and solutions
Keywords: Deep neural network, Computational fluid dynamics, Markov chain model, Air pollutant source, Street canyon

Session 7 Monday Carbon - VOCs

Time:
Monday, 12.06.2023 16:00-17:30

Room: C Carbon

Chair:
Wargocki, Pawel
Technical University of Denmark

Co-Chair:
Gaskin, Janet
National Research Council Canada

Monday, 12.06.2023 16:00-16:15 Room C Carbon

Plasticizer concentrations in indoor environments: a data inventory

Wei, Wenjuan (1); Duca, Radu-Corneliu (2); Zoutendijk, Sebastiaan L. (3); Minnema, Jordi (3); Langer, Sarka (4); Niculita-Hirzel, Hélène (5); Golja, Viviana (6); Santos, Osvaldo (7); Virgolino, Ana (7); Kumar, Vikas (8); Blassiau, Clément (9)

1: Scientific and Technical Center for Building (CSTB), France; 2: Laboratoire national de santé (LNS), Luxembourg; 3: National Institute for Public Health and the Environment (RIVM), the Netherlands; 4: IVL Swedish Environmental Research Institute, Sweden; 5: University of Lausanne, Switzerland; 6: NIJZ National Institute of Public Health, Slovenia; 7: Instituto de Saúde Ambiental, Faculdade de Medicina da Universidade de Lisboa, Portugal; 8: Universitat Rovira i Virgili, Spain; 9: French agency for food, environmental and occupational health & safety (ANSES), France

ID: 2488 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: Semivolatile organic compounds, building materials, phthalate, dust, air

Monday, 12.06.2023 16:15-16:30 Room C Carbon

Controlling PAH in indoor air by using an emissions barrier

Mattsson, Johan (1); Larsson, Lennart (2); Bloech, Henning (3)

1: cTrap, Ltd.,Sweden; 2: Lund University, Sweden; 3: The Sustaineer, Germany

ID: 1304 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: PAH, emissions barrier, adsorption, creosote, tar

Monday, 12.06.2023 16:30-16:45 Room C Carbon

Sensitivity analysis of parameters determining DEHP concentrations in indoor settings

Mansouri, Aya (1,2); Blondeau, Patrice (2); Wei, Wenjuan (1); Mandin, Corinne (1)

1: CSTB (Scientific and Technical Center for Building), Marne la Vallée, France; 2: LaSIE (Laboratoire des Sciences de l'Ingénieur pour l'Environnement), La Rochelle University, France

ID: 1165 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: DEHP, indoor concentration, climate change, modeling

Monday, 12.06.2023 16:45-17:00 Room C Carbon

Emission rates of bio-based building materials, a comparison between cork panels and reference building materials

de Kort, Janneke; Gauvin, Florent; Loomans, Marcel; Brouwers, Jos

Eindhoven University of Technology, Netherlands, The

ID: 1224 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: VOC, indoor air quality, GC-MS, toluene equivalent, group equivalent

Monday, 12.06.2023 17:00-17:03 Room C Carbon

Effect of Applying Alcohol to Wooden Surfaces on VOC Emissions and Perceived Air Quality

Akamatsu, Nami (1); Inasaka, Marina (2); Ikeuchi, Kosuke (1); Sugano, Soma (1); Kim, Hyuntae (3); Tanabe, Shin-ichi (1)

1: Waseda University, Japan; 2: Shimizu Corporation (Former Graduate Student, Waseda University), M. Eng.; 3: Yamaguchi University, Japan

ID: 1218 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Acetaldehyde, Alcohol Sterilization, Chemical Emission Rates, Sensory Evaluation, Solid Wood

Monday, 12.06.2023 17:03-17:06 Room C Carbon

Impact of relative humidity on uptake and release of indoor VOCs by fabrics

CARON, Florent (1); VERRIELE, Marie (1); NICOLAS, Melanie (2); THEVENET, Frederic (1)

1: IMT Nord Europe, Institut Mines-Télécom, Univ. Lille, Centre for Energy and Environment, F-59000 Lille, France; 2: Centre Scientifique et Technique du Bâtiment (CSTB), 38400 Saint-Martin-d'Hères, France

ID: 1139 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: indoor surfaces, adsorption, secondary emission, heterogeneous chemistry

Monday, 12.06.2023 17:06-17:09 Room C Carbon

What's new in formaldehyde emissions from household activities? Impact of biocidal formaldehyde releasers from cleaning products on IAQ

Verriele, Marie (1); Rossignol, Gabriel (1,2,3); Nicolas, Mélanie (2); Thevenet, Frédéric (1)

1: IMT Nord Europe, Institut Mines-Télécom, Univ. Lille, Centre for Energy and Environment, F-59000 Lille, France; 2: Centre Scientifique et Technique du Bâtiment (CSTB), 38400 Saint-Martin-d'Hères, France; 3: Agence de la transition écologique (ADEME), France

ID: 1146 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 07. Occupant behavior & controls
Keywords: formaldehyde releaser; full scale studies, cleaning activities, Bronopol

Monday, 12.06.2023 17:09-17:12 Room C Carbon

Residential radon concentrations before and after building code change in Winnipeg, Canada

Gaskin, Janet (1); Li, Karen (2); Zhou, Liang Grace (1)

1: National Research Council Canada, Canada; 2: University of California, Berkeley

ID: 1324 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: radon, building code, radon membrane, indoor air quality

Monday, 12.06.2023 17:12-17:15 Room C Carbon

Round robin tests of odour and VOC emissions from building products– what have we learned so far

Horn, Wolfgang; Wilke, Olaf; Richter, Matthias

Bundesanstalt für Materialforschung und -prüfung (BAM), Germany

ID: 1374 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: Emission, Building product, VOC, Odour, round robin

Session 8 Monday Silver - Healthy building concepts

Time:
Monday, 12.06.2023 16:00-17:30

Room: Ag Silver

Chair:
Bluyssen, Philomena
Delft University of Technology

Co-Chair:
Lorenz, Clara-Larissa
RWTH Aachen

Monday, 12.06.2023 16:00-16:03 Room Ag Silver

Indoor Air Management of Airborne Pathogens: A National Academy of Sciences Virtual Workshop Series

Thévenon, Audrey Davidson; Butler, David Alan

National Academies of Sciences, Engineering, and Medicine, United States of America

ID: 1194 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: infectious agents, ventilation, interventions, health

Monday, 12.06.2023 16:03-16:18 Room Ag Silver

Healthy Homes Barometer 2022: Its impact on health and life satisfaction, as well as its wider socio-economic costs

Christoffersen, Jens (1); Grollov, Sune Tobias (1); Philips, William (2); Hafner, Marco (2)

1: VELUX A/S; 2: RAND Europe

ID: 1174 Full paper
Topics: 09. Public health, occupational & environmental health
Keywords: Health, Sustainable, Indoor Climate, Life Satisfaction, Economic benefits

Monday, 12.06.2023 16:18-16:33 Room Ag Silver

Program of Requirements Healthy Dwellings

Loomans, Marcel (1); Hensen-Centnerova, Lada (1); Beuker, Tim (2); Jacobs, Piet (3)

1: Eindhoven University of Technology; 2: bba binnenmilieu; 3: TNO

ID: 1215 Full paper
Topics: 09. Public health, occupational & environmental health, 11. All other IEQ, ergonomics & health topics
Keywords: indoor environmental quality, performance criteria, user interaction

Monday, 12.06.2023 16:33-16:48 Room Ag Silver

Correlations between indoor conditions and human health: the methodology behind the development of a monitoring and warning system

Botto, Sara; Porta, Matteo; Spigliantini, Giorgia

RINA Consulting Spa, Italy

ID: 1297 Full paper
Topics: 06. Heating, ventilation, air conditioning & cooling, 09. Public health, occupational & environmental health
Keywords: Healthcare management system, IEQ, Healthcare facilities, Occupants health

Monday, 12.06.2023 16:48-16:51 Room Ag Silver

Healthy Building database connects scientifical analysis with comprehensive condition assessments of public buildings

Koskinen, Vesa (1,2); Murtoniemi, Timo (1); Lappalainen, Vuokko (1,3); Katajisto, Jouko (4); Vehviläinen, Tommi (1)

1: Sirate Group Oy, Finland; 2: University of Turku, Department of Physics and Astronomy, Finland; 3: University of Eastern Finland, Department of Environmental and Biological Sciences, Kuopio, Finland; 4: University of Turku, Department of Mathematics and Statistics, Finland

ID: 1361 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: condition surveys, Indoor air quality, database, risk assessment, public buildings

Monday, 12.06.2023 16:51-16:54 Room Ag Silver

Time marches on: Supporting holistic health in older adults through the built environment

Ruiz, Shelby; Rothlisberger, Sierra; Day, Julia K.

Washington State University, United States of America

ID: 1443 Full paper
Topics: 05. Architecture, aesthetics, passive design, biophilia, 11. All other IEQ, ergonomics & health topics
Keywords: senior living, holistic health, well-being, equitable design, narrative research

Monday, 12.06.2023 16:54-17:09 Room Ag Silver

Housing and health survey results from Finland indicate changes in exposure factors

Kempe, Minna; Haverinen-Shaughnessy, Ulla

University of Oulu, Finland

ID: 1184 Extended Abstract
Topics: 09. Public health, occupational & environmental health
Keywords: indoor environment, health, safety, homes, survey

Monday, 12.06.2023 17:09-17:12 Room Ag Silver

System-analytical economic assessment – Engineering a building strategy that balances health, economic and environmental impact

Hörhammer, Iiris (1); Halminen, Olli (1); Haverinen-Shaughnessy, Ulla (2); Karvonen, Anne (3); Kempe, Minna (2); Kuurola, Pentti (2); Lahdensivu, Jukka (4); Leivo, Virpi (4); Pakkala, Toni (4); Torkki, Paulus (1); Täubel, Martin (3); Pekkanen, Juha (1)

1: Helsinki University, Department of Public Health; 2: University of Oulu, Structures and Construction Technology; 3: Department of Health Security, The Finnish Institute for Health and Welfare; 4: Tampere University, Faculty of Built Environment

ID: 1393 Extended Abstract
Topics: 09. Public health, occupational & environmental health, 10. Community- and urban-scale challenges and solutions
Keywords: economic modeling, retrofit, moisture damange, asthma

Monday, 12.06.2023 17:12-17:15 Room Ag Silver

Affordability-led decisions impacting households' health and economic wellbeing - A transdisciplinary perspective

Elghandour, Aya

School of Architecture, The University of Sheffield, UK

ID: 1419 Extended Abstract
Topics: 08. Psychology, psychophysics, performance & productivity, 09. Public health, occupational & environmental health
Keywords: Design, Health, Wellbeing, Decision-making, Affordability of housing

Session 9 Monday Oxygen - Airborne transition & COVID-19

Time:
Monday, 12.06.2023 16:00-17:30

Room: O2 Oxygen

Chair:
Kort, Helianthe
Eindhoven University ofTechnology

Co-Chair:
Ding, Er
Delft University of Technology

Monday, 12.06.2023 16:00-16:15 Room O2 Oxygen

COVID-19 transmission risks associated with environmental contamination in workplace and public toilets

Higham, Ciara A. (1); Noakes, Catherine J. (2); López-García, Martín (3); Fletcher, Louise (2)

1: EPSRC Centre for Doctoral Training in Fluid Dynamics, University of Leeds, United Kingdom; 2: School of Civil Engineering, University of Leeds, United Kingdom; 3: School of Mathematics, University of Leeds, United Kingdom

ID: 1423 Extended Abstract
Topics: 09. Public health, occupational & environmental health
Keywords: Disease transmission, CFD, toilets

Monday, 12.06.2023 16:15-16:30 Room O2 Oxygen

Effects of COVID-19 pandemic control and prevention measures on ventilation in secondary schools in the Netherlands

Ding, Er; Zhang, Dadi; García-Sánchez, Clara; Bluyssen, Philomena M.

Delft University of Technology, Netherlands, The

ID: 1295 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: Classrooms, ventilation, children, COVID-19

Monday, 12.06.2023 16:30-16:45 Room O2 Oxygen

Regional Cohort Analysis of COVID-19 Outbreaks within British Columbia's Long-Term Care Homes: Comparing the Impact of Single-Person versus Multi-Person Bedrooms

Buchanan Dee, Brendan; Rysanek, Adam

University of British Columbia, Canada

ID: 1452 Full paper
Topics: 05. Architecture, aesthetics, passive design, biophilia, 09. Public health, occupational & environmental health
Keywords: long-term care, COVID-19 transmission, single-person bedroom versus multi-person bedroom, regional cohort analysis

Monday, 12.06.2023 16:45-17:00 Room O2 Oxygen

Experimental assessment of CO2 tracer gas and aerosol particles during breathing, coughing, and sneezing.

Nabilou, Fatemeh; Derwein, Dennis; Rewitz, Kai; Müller, Dirk

RWTH Aachen, Germany

ID: 1167 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: breathing coughing and sneezing, breathing manikins, CO2 tracer gas, aerosol particles, transport behavior

Monday, 12.06.2023 17:00-17:03 Room O2 Oxygen

Comparing the mitigation effects of fan configuration and operation on indoor airborne transmission risk

Yang, Fan (1); Cheung, Toby (1); Li, Jiayu (2); Tham, Kwok Wai (1)

1: National University of Singapore, Singapore; 2: Berkeley Education Alliance for Research in Singapore, Singapore

ID: 1309 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: airborne transmission, air movement, ceiling fan, desk fan

Monday, 12.06.2023 17:03-17:06 Room O2 Oxygen

Assessing the effects of transient weather conditions on airborne transmission risk in naturally ventilated hospitals.

Edwards, Alexander Jon (1); Noakes, Catherine (2); López-García, Martín (3); King, Marco-Felipe (2); Peckham, Daniel (4,5)

1: EPSRC Centre for Doctoral Training in Fluid Dynamics, University of Leeds, Leeds, UK; 2: School of Civil Engineering, University of Leeds, Leeds, UK; 3: School of Mathematics, University of Leeds, Leeds, UK; 4: School of Medicine, University of Leeds, Leeds, UK; 5: Leeds Teaching Hospitals NHS Trust, Leeds, UK

ID: 1162 Extended Abstract
Topics: 09. Public health, occupational & environmental health
Keywords: CONTAM, Transient, Weather conditions, Airborne Transmission, Hospital

Monday, 12.06.2023 17:06-17:09 Room O2 Oxygen

Evaluation of intervention strategies on controlling airborne respiratory particles in isolation wards

Huang, Wenjie (1); Chen, Chun (1,2)

1: Department of Mechanical and Automation Engineering, The Chinese University of Hong Kong, Shatin, N.T. 999077, Hong Kong SAR, China.; 2: Shenzhen Research Institute, The Chinese University of Hong Kong, Shenzhen 518057, China.

ID: 1221 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: COVID-19, Indoor environment, Computational fluid dynamics (CFD), particle transport, simulations

Monday, 12.06.2023 17:09-17:12 Room O2 Oxygen

Effectiveness of Airflow Generation and Extraoral Vacuum Suction as Infection Control Measures in a Dental Office

Hasama, Takamasa (1); Yumino, Saori (2); Kondo, Koji (2); Koga, Takashi (2); Watanabe, Keisuke (3); Shoji, Yoshio (3); Tanabe, Tomoki (3); Arata, Naoya (3); Fujii, Kazuyuki (4); Ishigaki, Yoshiki (4); Shibui, Takeo (4); Kobayashi, Ryutaro (4)

1: Kajima Technical Research Institute Singapore, Singapore; 2: Kajima Technical Research Institute, Japan; 3: TOKYO GIKEN, INC., Japan; 4: The Nippon Dental University, Japan

ID: 1280 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Dental office, COVID-19, SARS-CoV-2, airflow, circulator, extraoral vacuum suction

Monday, 12.06.2023 17:12-17:15 Room O2 Oxygen

CFD as a Tool for Preparing for the Next Pandemic

Karvinen, Aku

VTT Technical Research Centre of Finland, Finland

ID: 1284 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: COVID-19, CFD, pandemic, airborne decease

Parallel sessions

Tuesday

Session 10 Tuesday Carbon - Air supply systems

Time:
Tuesday, 13.06.2023 11:00-12:30

Room: C Carbon

Chair:
Wilde, Dominik
Viessmann Climate Solutions SE

Co-Chair:
El-Mokadem, Mahmoud
RWTH Aachen University

Tuesday, 13.06.2023 11:00-11:15 Room C Carbon

Experimental and numerical evaluation of the efficiency of an indoor air cleaner under different conditions

Sabanskis, Andrejs; Vidulejs, Dagis Daniels; Teličko, Jevgēnijs; Virbulis, Jānis; Jakovičs, Andris

Institute of Numerical Modelling, University of Latvia, Latvia

ID: 1418 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: air filtering, COVID-19, computational fluid dynamics, aerosol transport

Tuesday, 13.06.2023 11:15-11:30 Room C Carbon

The influence of colliding supply jets on predicted and perceived thermal comfort

Maula, Henna; Sivula, Arttu; Radun, Jenni; Tervahartiala, Iida-Kaisa; Hongisto, Valtteri

Turku University of Applied Sciences, Finland

ID: 1208 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: draught, thermal comfort, test chamber, PMV, perception

Tuesday, 13.06.2023 11:30-11:45 Room C Carbon

Dataset for Validating Complex Ventilation Flow Simulations: Post-processing and Analysis using Bootstrapping

Mamulova, Eugene (1); Al-Assaad, Douaa (2); van Hooff, Twan (1)

1: Department of the Built Environment, Building Physics, Eindhoven University of Technology (TU/e), Eindhoven, the Netherlands.; 2: Department of Civil Engineering, Building Physics and Sustainable Design, KU Leuven, Ghent, Belgium.

ID: 1231 Full paper
Topics: 06. Heating, ventilation, air conditioning & cooling
Keywords: validation data, displacement ventilation, indoor flows, field measurements, bootstrapping

Tuesday, 13.06.2023 11:45-12:00 Room C Carbon

Novel computational tool for indoor air quality

Siilin, Niko (1); Salmela, Hannu (2); Kulmala, Ilpo (2); Taipale, Aimo (2)

1: VTT Technical Research Centre of Finland, Espoo, Finland; 2: VTT Technical Research Centre of Finland, Tampere, Finland.

ID: 1252 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: Indoor air quality, Modelling, Ventilation, Filtration, Air purifier, Morbidity, Sick leave.

Tuesday, 13.06.2023 12:00-12:03 Room C Carbon

Air flow patterns and draught risk caused by the collision of supply jets

Sivula, Arttu; Maula, Henna; Koskela, Hannu; Hongisto, Valtteri

Turku AMK, Finland

ID: 1288 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: draught risk, thermal comfort, airflow pattern, air speed

Tuesday, 13.06.2023 12:03-12:06 Room C Carbon

Performance evaluation of desiccant cooling system with water coil combined with radiant ceiling panel through experiments

Jang, Hyusan (1); Liu, Shuo (2); Yeo, Myoung-Souk (3)

1: Department of Architecture and Architectural Engineering, Graduate School, Seoul National University, Institute of Construction and Environmental Engineering; 2: Department of Architecture and Architectural Engineering, Graduate School, Seoul National University; 3: Department of Architecture and Architectural Engineering, Seoul National University, Institute of Construction and Environmental Engineering

ID: 1368 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: Desiccant cooling system, Radiant ceiling panel, Dry coil operation, High-temperature chilled water coil

Tuesday, 13.06.2023 12:06-12:09 Room C Carbon

Numerical study of air supply positioning and its effect on Contaminant Removal Effectiveness in turbulent mixed air flow cleanrooms

Pfender, Ferdinand; Lange, Julia; Çetin, Yunus; Kriegel, Martin

Technical University of Berlin, Hermann-Rietschel-Institut, Germany

ID: 1373 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: cleanroom, energy efficiency, distribution of contamination, flow pattern, contamination control

Session 11 Tuesday Silver - Mould & microorganisms

Time:
Tuesday, 13.06.2023 11:00-12:30

Room: Ag Silver

Chair:
Lamberts, Roberto
UFSC

Co-Chair:
Hugentobler, Walter
École Polytechnique Fédérale de Lausanne

Tuesday, 13.06.2023 11:00-11:15 Room Ag Silver

Characterization of microbial secondary metabolites in floor dust of 50 public elementary schools in the US

Park, Ju-Hyeong (1); Sulyok, Michael (2); Cox-Ganser, Jean M. (1)

1: CDC/National Institute for Occupational Safety and Health, Respiratory Health Division, Morgantown, WV, USA; 2: University of Natural Resources and Life Sciences, Center for Analytical Chemistry, Department of Agrobiotechnology, Vienna, Austria

ID: 1268 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: Microbial secondary metabolites, School classrooms, Floor dust, School staff

Tuesday, 13.06.2023 11:15-11:30 Room Ag Silver

Laundry drying: a major interface of gas-surface exchanges indoors

CARON, Florent (1); VERRIELE, Marie (1); NICOLAS, Melanie (2); THEVENET, Frederic (1)

1: IMT Nord Europe, Institut Mines-Télécom, Univ. Lille, Centre for Energy and Environment, F-59000 Lille, France; 2: Centre Scientifique et Technique du Bâtiment (CSTB), 38400 Saint-Martin-d'Hères, France

ID: 1140 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: household activity, relative humidity, laundry, VOC transfer, hygrothermal

Tuesday, 13.06.2023 11:30-11:45 Room Ag Silver

selection of thresholds to prevent heat-related health risks

Alessandrini, Jean-Marie (1); Wei, Wenjuan (1); Molesin, Simon (2); Dominati, Thomas (2); Pelé, Charles (1); El Kadri, Mohamad (1); Sabre, Maéva (1); Gervasi, Pierrick (1)

1: CSTB, France; 2: RIVP, France

ID: 1205 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 09. Public health, occupational & environmental health
Keywords: Heat stress, heat strain, thermal-physiological model, temperature threshold, elderly people

Tuesday, 13.06.2023 11:45-12:00 Room Ag Silver

Update of the AWMF guideline for medical clinical diagnostics of indoor mould exposure

Hurraß, Julia (1); Heinzow, Birger (2); Walser-Reichenbach, Sandra (3); Aurbach, Ute (4); Becker, Sven (5); Bellmann, Romuald (6); Bergmann, Karl-Christian (7); Cornely, Oliver A. (8); Engelhart, Steffen (9); Fischer, Guido (10); Gabrio, Thomas (11); Herr, Caroline E.W. (3,12); Joest, Marcus (13); Karagiannidis, Christian (14,15); Klimek, Ludger (16); Köberle, Martin (17); Kolk, Annette (18); Lichtnecker, Herbert (19); Lob-Corzilius, Thomas (20); Mülleneisen, Norbert (21); Nowak, Dennis (22); Rabe, Uta (23); Raulf, Monika (24); Steiß, Jens-Oliver (25,26); Stemler, Jannik (8); Steinmann, Jörg (27); Umpfenbach, Ulli (28); Valtanen, Kerttu (29); Werchan, Barbora (30); Willinger, Birgit (31); Wiesmüller, Gerhard A. (4,32)

1: Department of Infection Control and Environmental Hygiene, Public Health Department Cologne, Germany; 2: Formerly: Landesamt für soziale Dienste (LAsD) Schleswig-Holstein, Kiel, Germany; 3: Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit München, Germany; 4: Labor Dr. Wisplinghoff und ZfMK - Zentrum für Umwelt, Hygiene und Mykologie, Köln, Germany; 5: Universitätsklinik für Hals-, Nasen- und Ohrenheilkunde, Kopf- und Halschirurgie, Universitätsklinikum

Tübingen, Germany; 6: Universitätsklinik für Innere Medizin I, Medizinische Universität Innsbruck, Austria; 7: Institute of Allergology, Charité – Universitätsmedizin Berlin, Berlin, Germany; 8: Translational Research, CECAD Cluster of Excellence, Universität zu Köln, Germany; 9: Institut für Hygiene und Public Health, Universitätsklinikum Bonn, Germany; 10: Landesgesundheitsamt Baden-Württemberg im Regierungspräsidium Stuttgart, Germany; 11: Formerly: Landesgesundheitsamt Baden-Württemberg im Regierungspräsidium Stuttgart, Germany; 12: Ludwig-Maximilians-Universität München, apl. Prof. „Hygiene und Umweltmedizin“ , Germany; 13: Allergologisch-immunologisches Labor, Lungen- und Allergiezentrum Bonn, Germany; 14: Fakultät für Gesundheit, Professur für Extrakorporale Lungenersatzverfahren, Universität Witten/Herdecke, Germany; 15: Lungenklinik Köln Merheim, Kliniken der Stadt Köln, Germany; 16: Zentrum für Rhinologie und Allergologie, Wiesbaden, Germany; 17: Klinik und Poliklinik für Dermatologie und Allergologie am Biederstein, Fakultät für Medizin, Technische Universität München, Germany; 18: Institut für Arbeitsschutz der DGUV (IFA), Bereich Biostoffe, Sankt Augustin; 19: Medizinisches Institut für Umwelt- und Arbeitsmedizin, MIU GmbH, Erkrath, Germany; 20: Wissenschaftliche AG Umweltmedizin der GPAU, Aachen, Germany; 21: Asthma und Allergiezentrum Leverkusen, Germany; 22: Institut und Poliklinik für Arbeits-, Sozial- und Umweltmedizin, Mitglied Deutsches Zentrum für Lungenforschung, Klinikum der Universität München, Germany; 23: Zentrum für Allergologie und Asthma, Johanniter-Krankenhaus Treuenbrietzen, Germany; 24: Institut für Prävention und Arbeitsmedizin der Deutschen Gesetzlichen Unfallversicherung, Institut der Ruhr-Universität Bochum (IPA), Germany; 25: Zentrum für Kinderheilkunde und Jugendmedizin, Universitätsklinikum Gießen und Marburg GmbH, Gießen, Germany; 26: Schwerpunktpraxis Allergologie und Kinder-Pneumologie, Fulda, Germany; 27: Institut für Klinikhygiene, Medizinische Mikrobiologie und Klinische Infektiologie, Paracelsus Medizinische Privatuniversität, Klinikum Nürnberg, Germany; 28: Arzt für Kinderheilkunde und Jugendmedizin Kinderpneumologie, Umweltmedizin, klass. Homöopathie, Asthmatrainer, Neurodermitistrainer, Viersen, Germany; 29: FG II 1.4 Mikrobiologische Risiken, Umweltbundesamt, Berlin, Germany; 30: Stiftung Deutscher Polleninformationsdienst – PID, Berlin, Germany; 31: Klinisches Institut für Labormedizin, Klinische Abteilung für Klinische Mikrobiologie – MedUni Wien, Austria; 32: Institut für Arbeits-, Sozial- und Umweltmedizin, Uniklinik RWTH Aachen, Germany

ID: 1276 Full paper
Topics: 09. Public health, occupational & environmental health
Keywords: Mould, indoor, clinical diagnostics, disposition, health assessment

Tuesday, 13.06.2023 12:00-12:03 Room Ag Silver

Relevance of indoor exposure to mycotoxins for human health

Teubel, Rabea (1); Heinzow, Birger (2); Wiesmueller, Gerhard A. (1,3); Hurraß, Julia (4)

1: Institut für Arbeits-, Sozial- und Umweltmedizin, Uniklinik RWTH Aachen, Aachen, Germany; 2: Formerly: Landesamt für soziale Dienste (LAsD) Schleswig-Holstein, Kiel, Germany; 3: Zentrum für Umwelt, Hygiene und Mykologie Köln, Germany; 4: Gesundheitsamt Köln, Abteilung Infektions- und Umwelthygiene, Köln, Germany

ID: 1277 Full paper
Topics: 09. Public health, occupational & environmental health
Keywords: Mould, indoor, mycotoxins, health effects, risk assessment

Tuesday, 13.06.2023 12:03-12:06 Room Ag Silver

Moisture damage/mold and the development of asthma: a systematic review and meta-analysis.

Täubel, Martin (1); Pekkanen, Juha (1,2); Juntunen, Miina (1); Mendell, Mark J (3); Karvonen, Anne M (1)

1: Environmental Health Unit, Finnish Institute for Health and Welfare, Finland; 2: Department for Public Health,University of Helsinki, Finland; 3: Air Quality Section, California Department of Public Health, CA, United States

ID: 1281 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 09. Public health, occupational & environmental health
Keywords: Moisture damage, mold, asthma development, review, meta-analysis

Tuesday, 13.06.2023 12:06-12:09 Room Ag Silver

Quantification and identification of microorganisms (bacteria, fungi, virus) onto an air-handling-unit filter

Pavard, Gaetan (1,2); Joubert, Aurélie (1); Le Cann, Pierre (2); Andres, Yves (1)

1: IMT Atlantique, GEPEA, CNRS UMR 6144, Nantes, France; 2: EHESP, Inserm, IRSET - UMR_S 1085, Rennes, France

ID: 1377 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: Indoor air quality, air handling units, fibrous filter, microorganisms, cultivable and molecular analysis

Tuesday, 13.06.2023 12:09-12:12 Room Ag Silver

AIRWAYS MUCOSAL DEFENSE OF ELDERLY AND SICK PEOPLE NEEDS SUPPORT FROM BUILDING SERVICES AGAINST AIRBORNE THREATS

Hugentobler, Walter

École Polytechnique Fédérale de Lausanne, Switzerland

ID: 1411 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 09. Public health, occupational & environmental health
Keywords: hygro-thermal indoor conditions, 1st line defense, mucosa of upper airways, air-conditioning by nose

Tuesday, 13.06.2023 12:12-12:15 Room Ag Silver

Risk assessment of mould contamination from flooding after remediation. The Australian Assurance program

Neumeister-Kemp, Heike Gudrun

Mycotec, Australia

ID: 2469 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: mould, risk assessment, assurance program, standarts

Session 12 Tuesday Oxygen - Productivity & sleep quality

Time:
Tuesday, 13.06.2023 11:00-12:30

Room: O2 Oxygen

Chair:
Toftum, Jørn
Technical University of Denmark

Co-Chair:
Syndicus, Marc
RWTH Aachen University

Tuesday, 13.06.2023 11:00-11:15 Room O2 Oxygen

Does pure CO2 affect sleep quality?

Matsuo, Kazuya (1,2); Fan, Xiaojun (2); Wargocki, Pawel (2)

1: Department of Architecture, Waseda University; 2: International Centre for Indoor Environment and Energy, Department of Environmental and Resource Engineering, Technical University of Denmark

ID: 1455 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: sleep quality, CO2 concentration, experiment, sleep capsule, human bioeffluent

Tuesday, 13.06.2023 11:15-11:30 Room O2 Oxygen

A 10-year Cohort Study for Validating Risk of Death from Cardiovascular Disease According to Indoor Environment

Wakiyama, Hayato (1); Ando, Shintaro (1); Umishio, Wataru (2); Ikaga, Toshiharu (3)

1: The University of Kitakyushu, Fukuoka, Japan; 2: Tokyo Institute of Technology, Tokyo, Japan; 3: Keio University, Tokyo, Japan

ID: 1415 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: Prospective cohort, Cox proportional hazards analysis, propensity score analysis

Tuesday, 13.06.2023 11:30-11:45 Room O2 Oxygen

Effects of changing ventilation on sleep quality and next-day work performance: a field intervention study in Belgium

Fan, Xiaojun (1); Liao, Chenxi (2); Matsuo, Kazuya (3); Verniers, Kevin (4); Laverge, Jelle (2); Neyrinck, Brecht (4); Pollet, Ivan (4); Fang, Lei (1); Lan, Li (5); Sekhar, Chandra (6); Wargocki, Pawel (1)

1: Technical University of Denmark; 2: Ghent University; 3: Waseda University; 4: R&D Department Renson Ventilation NV,; 5: Shanghai Jiao Tong University; 6: National University of Singapore

ID: 1319 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Bedroom, Mechanical ventilation, Air quality, Sleep quality, Next-day work performance

Tuesday, 13.06.2023 11:45-12:00 Room O2 Oxygen

A preliminary analysis of indoor air quality in work-from-home settings

Manu, Sanyogita; Rysanek, Adam

University of British Columbia, Canada

ID: 1322 Full paper
Topics: 09. Public health, occupational & environmental health, 11. All other IEQ, ergonomics & health topics
Keywords: . Indoor environmental quality, indoor air quality, monitoring, work-from-home, workspace at home, COVID

Tuesday, 13.06.2023 12:00-12:03 Room O2 Oxygen

Well-being and Workplace Productivity of Workers Combining Office Work and Working from Home

Shinno, Toshiki (1); Ukai, Masanari (1); Fukawa, Yuta (1); Murakami, Takuya (3); Iihara, Kosuke (4); Kiyota, Osamu (2); Kunitomo, Osamu (2); Nishida, Hiromichi (2); Tanabe, Shin-ichi (1)

1: Waseda University, Japan; 2: Tokyo GAS Co., Ltd., Japan; 3: Takenaka Corporation, Japan, (Former Graduate Student, Waseda University), M. Eng.; 4: Obayashi Corporation, Japan, (Former Graduate Student, Waseda University), M.Eng.

ID: 1326 Full paper
Topics: 08. Psychology, psychophysics, performance & productivity, 09. Public health, occupational & environmental health
Keywords: Office work, Working from home, Telework, Well-being, Workplace productivity

Tuesday, 13.06.2023 12:03-12:06 Room O2 Oxygen

Keeping Diverse Residents Healthy at Home during Power Outages in a Net Zero-Energy House

Imai, Minayo (1); Kim, Jungmin (1); Inaba, Manae (2); Akimoto, Mizuho (1); Amada, Kanta (1); Fukawa, Yuta (1); Tanabe, Shin-ichi (1); Kashihara, Seiichi (3); Chiba, Yosuke (3); Watanabe, Naoya (3)

1: Waseda University, Japan; 2: Former Graduate Student, Waseda University; 3: Asahi Kasei Homes Corporation

ID: 1372 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: net Zero Energy House, Resilience, Power Outage, Storage Battery, Vulnerable Groups

Tuesday, 13.06.2023 12:06-12:09 Room O2 Oxygen

The Relationship between Personal Attributes and Environmental Preferences upon Workers of Activity Based Working Offices

Seto, Minami (1); Saito, Yuki (1); Tanabe, Shin-ichi (1); Takahashi, Mikio (2); Wada, Kazuki (2); Tokumura, Tomoko (2); Takahashi, Hiroki (2); Kuwayama, Kinuko (2)

1: Waseda University, Japan; 2: Takenaka Corporation, Japan

ID: 1445 Full paper
Topics: 07. Occupant behavior & controls, 08. Psychology, psychophysics, performance & productivity
Keywords: workplace productivity, Activity-based working, office, environmental preference

Tuesday, 13.06.2023 12:09-12:12 Room O2 Oxygen

Influences of indoor thermal environment on occupant productivity: A brief review

Malik, Jeetika; Hong, Tianzhen

Lawrence Berkeley National Laboratory, United States of America

ID: 1323 Extended Abstract
Topics: 07. Occupant behavior & controls, 08. Psychology, psychophysics, performance & productivity
Keywords: productivity, thermal environment, indoor temperature, building control

Tuesday, 13.06.2023 12:12-12:15 Room O2 Oxygen

The impact of indoor carbon dioxide on human cognition and decision-making

Flagner, Stefan (1,2,3); Kuenn, Steffen (3); Meissner, Thomas (4); Plasqui, Guy (2)

1: Department of Finance, School of Business and Economics, Maastricht University; 2: Department of Nutrition and Movement Sciences, Faculty of Health Medicine and Life Sciences, Maastricht University; 3: Department for Macro, International & Labour Economics, School of Business and Economics, Maastricht University; 4: Department of Microeconomics and Public Economics, School of Business and Economics, Maastricht University

ID: 1299 Extended Abstract
Topics: 07. Occupant behavior & controls, 08. Psychology, psychophysics, performance & productivity
Keywords: CO2, CANTAB, oxygen consumption, risk preferences

Session 13 Tuesday Carbon - Air cleaning & air purifiers

Time:
Tuesday, 13.06.2023 13:30-14:45

Room: C Carbon

Chair:
Müller, Dirk
RWTH Aachen University

Co-Chair:
Rewitz, Kai
RWTH Aachen University, E.ON Energy Research Center, Institute for Energy Efficient Buildings and Indoor Climate

Tuesday, 13.06.2023 13:30-13:45 Room C Carbon

Can Air Cleaners Remove VOCs from Classroom Air? Insights from Time-resolved Field- and Laboratory Measurements

Sørensen, Sara Bjerre; Kristensen, Kasper

Department of Biological and Chemical Engineering, Aarhus University, Denmark

ID: 1213 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Indoor air quality (IAQ), school, clean air delivery rate (CADR), removal efficiency, proton-transfer-reaction mass spectrometer (PTR-MS)

Tuesday, 13.06.2023 13:45-14:00 Room C Carbon

Rating the Effectiveness of Air Purifiers on Aerosol Removal in a Classroom with Numerical Flow Simulations

Ostmann, Philipp; Derwein, Dennis; Kremer, Martin; Rewitz, Kai; Müller, Dirk

RWTH Aachen University, E.ON Energy Research Center, Institute for Energy Efficient Buildings and Indoor Climate

ID: 1126 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: SARS-CoV-2, classroom, window ventilation, numerical flow simulation, mobile air cleaners

Tuesday, 13.06.2023 14:00-14:15 Room C Carbon

Developing an Accessible, Low-Cost Air Cleaner for Safer Spaces During Wildfires

Stinson, Brett William; Gall, Elliott Tyler

Portland State University, United States of America

ID: 1150 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 10. Community- and urban-scale challenges and solutions
Keywords: air cleaning, wildfires, CADR, particulate matter

Tuesday, 13.06.2023 14:15-14:18 Room C Carbon

Quantitative Evaluation of the Effect of Portable Air Cleaners on Aerosol Transmission Control

XIANG, Yiming (1); OCHIAI, Ryo (2); TOMIZAWA, Yusuke (1); OGATA, Masayuki (3); HORI, Satoshi (4); TANABE, Shin-ichi (1)

1: Department of Architecture, Waseda University, Japan; 2: Takenaka Corporation (Former Graduate Student, Waseda University); 3: Tokyo Metropolitan University, Japan; 4: Juntendo University, Japan

ID: 1192 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: air cleaner, air change per hour, aerosol transmission, mechanical ventilation, COVID-19

Tuesday, 13.06.2023 14:18-14:21 Room C Carbon

Deep-Reinforcement-Learning Control of Window and Air Cleaner for Energy-Efficient Indoor Particle Removal

AN, Yuting; NIU, Zhuolun; CHEN, Chun

Department of Mechanical and Automation Engineering, The Chinese University of Hong Kong, Shatin, N.T., 999077, Hong Kong SAR, China

ID: 1230 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Deep reinforcement learning, Indoor PM2.5, Energy consumption, Window actuator, Air cleaner

Tuesday, 13.06.2023 14:21-14:24 Room C Carbon

Testing gas-phase air cleaners based on perceived air quality

Amada, Kanta (1,2); Vesth, Simon (2); Fang, Lei (2); Olesen, Bjarne Wilkens (2); Wargocki, Pawel (2)

1: Waseda University, Japan; 2: Technical University of Denmark, Demmark

ID: 1261 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Air cleaner, ionizer, activate carbon, ventilation, volatile organic compounds

Tuesday, 13.06.2023 14:24-14:27 Room C Carbon

The role of air cleaners beyond the pandemic

Schumacher, Stefan; Caspari, Anna; Varzandeh, Kiarash; Staack, Katharina; Asbach, Christof

Institut für Umwelt & Energie, Technik & Analytik e.V. (IUTA), Germany

ID: 1349 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: air cleaner, indoor air, ultrafine particles, infection risk, energy efficiency

Tuesday, 13.06.2023 14:27-14:30 Room C Carbon

Standardizing the testing of air cleaners against virus aerosols

Uhde, Erik (1); Clauß, Annette (1); Schulz, Jochen (2)

1: Fraunhofer WKI, Department of Material Analysis and Indoor Chemistry, Braunschweig, Germany; 2: Institute for Animal Hygiene, Animal Welfare and Farm Animal Behaviour, University of Veterinary Medicine Hannover, Foundation, Hannover, Germany

ID: 1394 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Air cleaning, performance, test organism, CADR

Session 14 Tuesday Silver - Interfaces & user engagement

Time:
Tuesday, 13.06.2023 13:30-14:45

Room: Ag Silver

Chair:
Andersen, Rune Korsholm
Technical Univeristy of Denmark

Co-Chair:
van Marken Lichtenbelt, Wouter
Maastricht University

Tuesday, 13.06.2023 13:30-13:45 Room Ag Silver

An Occupant-participatory Approach for Fault Detection and Diagnosis in Buildings

Nojedehi, Pedram; Gunay, Burak; O'Brien, William

Carleton University, Canada

ID: 1477 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 07. Occupant behavior & controls
Keywords: Fault detection and diagnosis, crowdsourcing, Participatory sensing, Occupant discomfort

Tuesday, 13.06.2023 13:45-14:00 Room Ag Silver

Energy use, indoor environment parameters and residents' engagement in indoor environment control in energy efficient homes - field study in Poland

Baborska-Narożny, Magdalena (1); Bandurski, Karol (2); Grudzińska, Magdalena (3)

1: Wrocław University of Science and Technology, Poland; 2: Poznan University of Technology, Poland; 3: Lublin University of Technology, Poland

ID: 1366 Full paper
Topics: 07. Occupant behavior & controls
Keywords: occupant-building interaction, energy performance gap, residential buildings, IEQ, low energy residential buildings, practice theory

Tuesday, 13.06.2023 14:00-14:15 Room Ag Silver

Methodology to develop interfaces to help office users better understand control strategies of climate systems

Spiekman, Marleen (1); te Duits, Noa (1); Lange, Vera (2); Jeurens, Jasper (2); Sluis-Thiescheffer, Wouter (2)

1: TNO, The Netherlands; 2: HAN University of Applied Sciences, The Netherlands

ID: 1117 Full paper
Topics: 07. Occupant behavior & controls, 08. Psychology, psychophysics, performance & productivity
Keywords: Feedback, interface, office climate systems, user centred design, co-creation.

Tuesday, 13.06.2023 14:15-14:18 Room Ag Silver

User centric assessment of comfort and health in offices

Jacobs, Piet (1); Hoogervorst, Coen (2); Rijs, Agata (2); van der Harst, Sander (3); Keyson, David (4)

1: TNO, Netherlands, The; 2: Spie Nederland; 3: Unica Groep; 4: Delft University of Technology

ID: 1336 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: voting box, thermal comfort, indoor air quality, offices

Tuesday, 13.06.2023 14:18-14:21 Room Ag Silver

Heat of the moment: Reshaping energy efficiency decisions made by building occupants

Colligan, Zachary; Ruiz, Shelby; Day, Julia

Washington State University, School of Design and Construction, United States of America

ID: 1441 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 07. Occupant behavior & controls
Keywords: tenant engagement, education, energy saving campaign, comfort, pro energy behaviors

Tuesday, 13.06.2023 14:21-14:24 Room Ag Silver

Use of equivalent indoor air temperature profiles by forecast control of a heating system

Cholewa, Tomasz; Siuta-Olcha, Alicja; Bocian, Martyna; Dudzińska, Marzenna R.; Staszowska, Amelia

Lublin University of Technology, Poland

ID: 1353 Extended Abstract
Topics: 06. Heating, ventilation, air conditioning & cooling, 07. Occupant behavior & controls
Keywords: Forecast control, Model predictive control, Building energy model, Building controls, Energy efficiency

Tuesday, 13.06.2023 14:24-14:27 Room Ag Silver

Definition of a methodology for occupants' feedback collection on perceived indoor environmental comfort

Fissore, Virginia Isabella (1); Saugo, Martina (2); Arcamone, Giuseppina (1); Puglisi, Giuseppina Emma (1); Shtrepi, Louena (1); Sassoli, Nicolas (3); Idone Cassone, Vincenzo (4); Paduos, Simona (5); Corrado, Vincenzo (1); Servetti, Antonio (2); Astolfi,

1: Department of Energy, Polytechnic of Turin, Turin, Italy; 2: Department of Control and Computer Engineering, Polytechnic of Turin, Turin, Italy; 3: Geoside S.p.A., Italgas Group, Bologna, Italy; 4: Ritsumeikan Center for Game Studies, Ritsumeikan University, Kyoto, Japan; 5: C2R Energy Consulting S.r.l., Turin, Italy

ID: 1407 Extended Abstract
Topics: 07. Occupant behavior & controls, 11. All other IEQ, ergonomics & health topics
Keywords: Indoor Environmental Comfort, Indoor Environmental Quality, subjective feedback, office.

Tuesday, 13.06.2023 14:27-14:30 Room Ag Silver

Rethinking building interfaces for resilience, health, and well-being

Day, Julia K. (1); Heschong, Lisa (2)

1: Washington State University, USA, School of Design + Construction, Integrated Design + Construction Laboratory; 2: Fellow Illuminating Engineering Society, architect, author

ID: 1449 Extended Abstract
Topics: 05. Architecture, aesthetics, passive design, biophilia, 07. Occupant behavior & controls
Keywords: building controls, human building interactions, interfaces, operational range, well-being

Session 15 Tuesday Oxygen - Thermal comfort & climate change

Time:
Tuesday, 13.06.2023 13:30-14:45

Room: O2 Oxygen

Chair:
Frijns, Arjan
Eindhoven University of Technology

Co-Chair:
Pigliautile, Ilaria
University of Perugia

Tuesday, 13.06.2023 13:30-13:45 Room O2 Oxygen

Response to sensorial stimuli of people with autism in an indoor well-being framework: a scoping review

Zaniboni, Luca; Toftum, Jørn

Technical University of Denmark, Denmark

ID: 1185 Extended Abstract
Topics: 09. Public health, occupational & environmental health, 11. All other IEQ, ergonomics & health topics
Keywords: autism, well-being, multi-domain, design

Tuesday, 13.06.2023 13:45-14:00 Room O2 Oxygen

Occupant Thermal Comfort in Educational Buildings

Disci, Zehra Nur; Sharples, Steve; Lawrence, Ranald

The University of Liverpool, United Kingdom

ID: 1314 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: Thermal comfort, Education buildings, Comfort temperature

Tuesday, 13.06.2023 14:00-14:15 Room O2 Oxygen

Thermal alliesthesia under whole-body cyclical conditions

Vellei, Marika (1,2); Le Dreau, Jérôme (1); Nicolle, Jérôme (3); Rendu, Manon (3)

1: Laboratory of Engineering Sciences for the Environment LaSIE (UMR CNRS 7356), La Rochelle University, France; 2: Indoor Environmental Quality Laboratory, School of Architecture, Design and Planning, The University of Sydney, Australia.; 3: TIPEE Platform, France

ID: 1113 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 08. Psychology, psychophysics, performance & productivity
Keywords: thermal sensation, thermal comfort, transient, dynamic, cyclical, thermal alliesthesia

Tuesday, 13.06.2023 14:15-14:18 Room O2 Oxygen

Seasonal differences in thermal responses and cognitive performance in AC and semi-outdoor environments in Singapore

MIHARA, KUNIAKI (1); CHEN, SHISHENG (2); HASAMA, TAKAMASA (1); TAN, CHUN LIANG (3); LEE, JASON KAI WEI (4); WONG, NYUK HIEN (2)

1: Kajima Technical Research Institute Singapore, Kajima Corporation, Singapore; 2: Department of the Built Environment, College of Design and Engineering, National University of Singapore, Singapore; 3: Department of Archtecture, College of Design and Engineering, National University of Singapore, Singapore; 4: Department of Physiology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore

ID: 1273 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 08. Psychology, psychophysics, performance & productivity
Keywords: Thermal adaptation, neutral temperature, comfort temperature, tropical climate, cognitive tests

Tuesday, 13.06.2023 14:18-14:21 Room O2 Oxygen

Evaluation of Thermal Comfort Considering Spatial Characteristics in Semi-outdoor Environments

Watanabe, Yuyuko (1); Fukawa, Yuta (1); Ogawa, Yutaro (2); Hisayama, Ryo (3); Nomoto, Akihisa (4); Akimoto, Mizuho (1); Nakano, Junta (5); Tanabe, Shin-ichi (1)

1: Department of Architecture, Waseda University, Tokyo, Japan.; 2: Former Graduate Student, Waseda University.; 3: Nihon Sekkei, Inc. (Former Graduate Student, Waseda University).; 4: University of California, Berkeley, United States of America.; 5: Department of Architecture, Tokai University, Kanagawa, Japan.

ID: 1313 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: Semi-outdoor Environment, Thermal Comfort, Thermal Adaptation, Spatial Characteristics

Tuesday, 13.06.2023 14:21-14:24 Room O2 Oxygen

Long-term prediction of the impacts of climate change on indoor climate and air quality using a new holistic model

Zhao, Jiangyue (1); Salthammer, Tunga (1); Schieweck, Alexandra (1); Uhde, Erik (1); Hussein, Tareq (1,2); Antretter, Florian (3,4)

1: Fraunhofer WKI, Braunschweig,Germany; 2: University of Helsinki, Helsinki, Finland; 3: Fraunhofer IBP, Valley, Germany; 4: C3RROlutions GmbH, Raubling, Germany

ID: 1210 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: Future indoor climate, building hygrothermal simulation, indoor air physicochemical model, particle exposure, temperature dependent emissions, mold growth

Tuesday, 13.06.2023 14:24-14:27 Room O2 Oxygen

Variations in subjective psychological responses to similar but distinct thermal environments

Pilehchi Ha, Peiman (1); Schweiker, Marcel (1); Kobas, Bilge (2); Koth, Sebastian (2); Auer, Thomas (2)

1: RWTH Uniklinik Aachen, Germany; 2: Technical University of Munich, Germany

ID: 1403 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 08. Psychology, psychophysics, performance & productivity
Keywords: pleasure, arousal, dominance, well-being, comfort

Tuesday, 13.06.2023 14:27-14:30 Room O2 Oxygen

Can thermal sensation during work hours influence the way we interact socially after work?

Christoforou, Rania (1); Pallubinsky, Hannah (1,2); Bardey, Janine (1,4); Rewitz, Kai (3); El-Mokadem, Mahmoud (3); Burgholz, Tobias Maria (3,4); Müller, Dirk (3,4); Schweiker, Marcel (1)

1: Healthy Living Spaces lab, Institute for Occupational, Social and Environmental Medicine, Medical Faculty, RWTH Aachen University, Aachen, Germany; 2: Department of Nutrition and Movement Sciences, School of Nutrition and Translational Metabolism Research (NUTRIM), Maastricht University, Maastricht, The Netherlands; 3: Institute for Energy Efficient Buildings and Indoor Climate, E.ON Energy Research Center, RWTH Aachen University, Aachen, Germany; 4: Heinz Trox Wissenschafts gGmbH, Aachen, Germany

ID: 1465 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 08. Psychology, psychophysics, performance & productivity
Keywords: thermal sensation, empathy, social connectedness

Session 16 Tuesday Carbon - Particulate matter

Time:
Tuesday, 13.06.2023 15:00-16:15

Room: C Carbon

Chair:
Shaw, David
University of York

Co-Chair:
Eilts, Jacob
University Hospital RWTH Aachen

Tuesday, 13.06.2023 15:00-15:15 Room C Carbon

Sensitivity analysis of the number of particles for indoor particle transport in a ventilated room with Lagrangian model

Eom, Ye Seul; Rim, Donghyun

Department of Architectural Engineering, College of Engineering, Pennsylvania State University, United States

ID: 1444 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: Indoor particles, Ventilation, Lagrangian particle tracking method, Computational Fluid dynamics (CFD)

Tuesday, 13.06.2023 15:15-15:30 Room C Carbon

Health Risks of Indoor Exposures to Fine Particulate Matter and Practical Mitigation Solutions - a U.S. National Academy of Sciences Study

Butler, David Alan

National Academies of Sciences, Engineering, and Medicine, United States of America

ID: 1193 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: PM2.5, exposure, health, mitigation, indoors

Tuesday, 13.06.2023 15:30-15:45 Room C Carbon

Development of high accuracy particle concentration prediction model - an application of remote sensing and machine learning

Moni, Mufaddal (1); Sahu, Manoranjan (1,2,3)

1: Aerosol and Nanoparticle Technology Laboratory, Environmental Science and Engineering Department, Indian Institute of Technology Bombay, Mumbai 400076, India; 2: Interdisciplinary Program in Climate Studies, Indian Institute of Technology Bombay, Mumbai 400076, India; 3: Centre for Machine Intelligence and Data Science, Indian Institute of Technology Bombay, Mumbai 400076, India

ID: 1428 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Indoor Air Quality, Developing Nations, AOD, MERRA-2, Machine Learning, PM2.5

Tuesday, 13.06.2023 15:45-15:48 Room C Carbon

Assessment of PM levels in urban residential homes in four cities in India

Vijay, Prince (1); Singh, Rajdeep (1); Sahota, Vinayak (1); Dubey, Shreya (1); Borse, Sonali (1); Phuleria, Harish (1,2)

1: Environmental Science and Engineering Department, IIT Bombay, Mumbai, 400076, India; 2: Interdisciplinary Programme in Climate Studies, IIT Bombay, Mumbai, 400076, India

ID: 1251 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Particulate matter, Low-cost sensors, Indoor air quality, Ambient concentration, Cooking.

Tuesday, 13.06.2023 15:48-15:51 Room C Carbon

Constituents of Human Particle, Microbial and Chemical Emissions and Exposures in Indoor Environments: An experimental overview

Merizak, Marouane (1); Yang, Shen (1); Bekö, Gabriel (2); Wang, Nijing (3); Mueller, Tatjana (3); Byron, Joseph (3); Zhang, Meixia (1,6); Lin, Yan (4); Zhang, Jim (4); Täubel, Martin (5); Wargocki, Pawel (2); Williams, Jonathan (3); Licina, Dusan (1)

1: Human-Oriented Built Environment Lab, École Polytechnique Fédérale de Lausanne, Switzerland; 2: Department of Environmental and Resource Engineering, Technical University of Denmark, Denmark; 3: Atmospheric Chemistry, Max Planck Institute for Chemistry, Germany; 4: Global Health Institute and Nicholas School of The Environment, Duke University, United States; 5: Department Health Protection, Finnish Institute for Health and Welfare, Finland; 6: School of Mechanical Engineering, Beijing Institute of Technology, Beijing 100081, China

ID: 1160 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: Human emissions, gas-phase chemistry, nanoparticles, bioaerosols, oxidative stress

Tuesday, 13.06.2023 15:51-15:54 Room C Carbon

Risk Exposure to Particles – including Legionella pneumophila – emitted during Showering with Water-Saving Showers

Niculita-Hirzel, Hélène (1); Morales, Marian (1); Parmar, Priyanka (1); Goekce, Sami (1); Pourchez, Jérémie (2); Allegra, Séverine (3)

1: Center for Primary Care and Public Health (Unisanté), University of Lausanne, Switzerland; 2: EVS-ISTHME UMR 5600, CNRS, University Jean Monnet of Saint-Etienne, F-42023 Saint-Etienne, France.; 3: Mines Saint-Etienne, University of Lyon, University Jean Monnet of Saint-Etienne, INSERM, U 1059 Sainbiose, Centre CIS, F-42023 Saint-Etienne, France.

ID: 1255 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: Legionella; bioaerosols; risk assessment

Tuesday, 13.06.2023 15:54-15:57 Room C Carbon

Residential indoor-outdoor PM measurements worldwide published between 1990 and 2019

Ilacqua, Vito; Scharko, Nicole; Zambrana, Jordan; Malashock, Daniel

US EPA, United States of America

ID: 1263 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: particulate matter, residential, indoor-outdoor, infiltration, indoor sources

Tuesday, 13.06.2023 15:57-16:00 Room C Carbon

Particulate matter concentration and distribution in occupational settings: case study of Portuguese fire stations

Slezakova, Klara (1); Esteves, Filipa (2,3,4,5,); Vaz, Josiana (6,7); Costa, Solange (2,3,4); Alves, Maria J. (6); Madureira, Joana (2,3,4); Barros, Bela (8); Fernandes, Adília (9); Teixeira, João P. (2,3,4); Morais, Simone (8); Pereira, Maria. C (1)

1: LEPABE-ALiCE, Faculdade de Engenharia da Universidade do Porto, Porto, Portugall; 2: Environmental Health Department, National Institute of Health, Porto, Portugal; 3: EPIUnit, Institute of Public Health, University of Porto, Porto, Portugal; 4: Laboratory for Integrative and Translational Research in Population Health (ITR) Porto, Portugal; 5: Department of Public Health and Forensic Sciences, and Medical School, Faculty of Medicine, University of Porto, Porto, Portugal; 6: CIMO, Instituto Politécnico de Bragança, Bragança, Portugal; 7: SusTEC, Instituto Politécnico de Bragança, Bragança, Portugal; 8: REQUIMTE-LAQV, Instituto Superior de Engenharia do Instituto Politécnico do Porto, Porto, Portugal; 9: UICISA: E, Politécnico de Bragança, Bragança, Portugal

ID: 1442 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: indoor air, PM, firehouses, exposure

Session 17 Tuesday Silver - Multi-domain environments

Time:
Tuesday, 13.06.2023 15:00-16:15

Room: Ag Silver

Chair:
Bandurski, Karol
Politechnika Poznańska

Co-Chair:
André, Maíra
Federal University of Santa Catarina

Tuesday, 13.06.2023 15:00-15:15 Room Ag Silver

Does the outside view affect the thermal perception? A preliminary study.

Vasquez, Natalia Giraldo; Friis, Lasse Vintersgaard; Gad, Stine Boe; Toftum, Jørn

Technical University of Denmark, Department of Environmental and Ressource Engineering, Denmark

ID: 1245 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 03. Lighting, visual comfort, daylight, circadian lighting, views
Keywords: thermal assessment, visual assessment, window view, living lab.

Tuesday, 13.06.2023 15:15-15:30 Room Ag Silver

A critical appraisal of recent research in multi-domain indoor-environmental exposure.

Mahdavi, Ardeshir (1); Berger, Christiane (2)

1: TU Graz, Austria; 2: Aalborg University, Denmark

ID: 1172 Full paper
Topics: 08. Psychology, psychophysics, performance & productivity
Keywords: Indoor environmental quality, multi-domain exposure, building desing and operation

Tuesday, 13.06.2023 15:30-15:45 Room Ag Silver

Multi-domain sensor's location and frequency of measurements: a preliminary investigation for living laboratory developments

Zhou, Kaiyue; Chinazzo, Giorgia

Northwestern University, United States of America

ID: 1177 Full paper
Topics: 11. All other IEQ, ergonomics & health topics
Keywords: Indoor environmental quality, multi-domain, sensors, measurement quality, sensor location

Tuesday, 13.06.2023 15:45-15:48 Room Ag Silver

An international Round Robin Test in test rooms: an opportunity to move forward together to understand in detail human environmental perception

Pigliautile, Ilaria (1); Jacoby Cureau, Roberta (2); Martins Gnecco, Veronica (2); Barna, Edit (3); Belussi, Lorenzo (4); Chinazzo, Giorgia (5); Danza, Ludovico (4); Deme Belafi, Zsofi (3); Deng, Zhipeng (6); Dong, Bing (6); Karimian, Hamidreza (7); Vince

1: Engineering Department, University of Perugia, Italy; 2: CIRIAF, Interuniversity research centre, University of Perugia, Italy; 3: Department of Building Services and Process Engineering, Budapest University of Technology and Economics, Hungary; 4: Construction Technologies Institute of the National Research Council of Italy (ITC-CNR); 5: Department of Civil and Environmental Engineering, Northwestern University, USA; 6: Department of Mechanical and Aerospace Engineering, Syracuse University, USA; 7: Department of Building, Civil and Environmental Engineering, Concordia University, Canada; 8: Department of Mechatronics, Optics and Mechanical Engineering Informatics, Budapest University of Technology and

Economics, Hungary; 9: Institute for Occupational, Social and Environmental Medicine, Medical Faculty, RWTH Aachen University, Aachen, Germany

ID: 1201 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 03. Lighting, visual comfort, daylight, circadian lighting, views
Keywords: Round Robin test, test room, multi-domain comfort, contextual, Hue-Heat Hypothesis

Tuesday, 13.06.2023 15:48-15:51 Room Ag Silver

Correlated color temperature of light: Cross-modal effects on thermal comfort in cold conditions

Luo, Wei (1,2); Kramer, Rick (2); Kompier, Maaike (3); Smolders, Karin (3); de Kort, Yvonne (3); van Marken Lichtenbelt, Wouter (1)

1: Department of Nutrition and Movement Sciences, Maastricht University; 2: Department of the Built Environment, Eindhoven University of Technology; 3: Department of Industrial Engineering and Innovation Sciences, Eindhoven University of Technology

ID: 1141 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 03. Lighting, visual comfort, daylight, circadian lighting, views
Keywords: thermal comfort, thermal sensation, hue-heat hypothesis, correlated color temperature

Tuesday, 13.06.2023 15:51-15:54 Room Ag Silver

Challenges and Solutions to Integrated Workflows for Multidomain Simulations assessed through a Teaching Experiment

Lorenz, Clara-Larissa (1); Schweiker, Marcel (2); Frisch, Jérôme (1); van Treeck, Christoph (1)

1: E3D Institute of Energy Efficiency and Sustainable Building, RWTH Aachen University, Germany; 2: Healthy Living Spaces lab, Institute for Occupational, Social, and Environmental Medicine, Medical Faculty, RWTH Aachen University, Germany

ID: 1257 Extended Abstract
Topics: 03. Lighting, visual comfort, daylight, circadian lighting, views, 05. Architecture, aesthetics, passive design, biophilia
Keywords: Multidomain simulation, Building performance, Daylight performance, Energy performance, Design challenges, Information exchange, Integrated design, Interoperability

Session 18 Tuesday Oxygen - Soundscape, acoustics & noise

Time:
Tuesday, 13.06.2023 15:00-16:15

Room: O2 Oxygen

Chair:
Fels, Janina
RWTH Aachen University

Co-Chair:
Hamida, Amneh
Delft University of Technology

Tuesday, 13.06.2023 15:00-15:15 Room O2 Oxygen

Students' experiences of the sound environment at their home study places

Hamida, Amneh; Eijkelenboom, Annemarie; Bluyssen, Philomena M.

Chair Indoor Environment, Faculty of Architecture and the Built Environment, Delft University of Technology, the Netherlands

ID: 1298 Extended Abstract
Topics: 04. Noise, acoustics, and soundscape control
Keywords: Indoor environmental quality (IEQ); sound environment; study places; sound perception; sound sources; students

Tuesday, 13.06.2023 15:15-15:30 Room O2 Oxygen

Play me a river: Can nature sounds during microbreaks improve attention restoration and stress recovery in office environments?

Frings, Katrin (1); Schiller, Isabel Sarah (1); Yadav, Manuj (2); Schlittmeier, Sabine (1)

1: Institute of Psychology, RWTH Aachen University, Aachen, Germany; 2: Institute for Hearing Technology and Acoustics, RWTH Aachen University, Aachen, Germany

ID: 1254 Extended Abstract
Topics: 05. Architecture, aesthetics, passive design, biophilia, 08. Psychology, psychophysics, performance & productivity
Keywords: nature sounds, micobreaks, attention recovery, stress recovery, performance

Tuesday, 13.06.2023 15:30-15:45 Room O2 Oxygen

Soundscape Assessment at a University Campus in Detmold, Germany

Balderrama, Alvaro (1,2); Erol, Aylin (3); Götz, Johanna (4); Luna-Navarro, Alessandra (1); Kang, Jian (5); Arztmann, Daniel (2); Knaack, Ulrich (1)

1: Architectural Façades and Products Research Group, Faculty of Architecture and Built Environment, TU Delft, Delft, The Netherlands; 2: Institute for Design Strategies, Detmold School of Architecture and Interior Architecture, University of Applied Sciences and Arts Ostwestfalen-Lippe (TH OWL), Detmold, Germany; 3: Faculty of Architecture and Design, Ozyegin University, Istanbul, Turkey; 4: Faculty of Music Pedagogy, Theory and Composition (FB3), Detmold University of Music, Detmold, Germany; 5: Institute for Environmental Design and Engineering, The Bartlett, University College London, London, UK

ID: 1466 Full paper
Topics: 04. Noise, acoustics, and soundscape control, 05. Architecture, aesthetics, passive design, biophilia
Keywords: Soundscape, soundwalk, acoustic environment, context, perception, ISO 12913

Tuesday, 13.06.2023 15:45-16:00 Room O2 Oxygen

Indoor soundscape in classrooms: a case study

Pellegatti, Matteo (1,2); Visentin, Chiara (1); Torresin, Simone (2); Prodi, Nicola (1)

1: University of Ferrara, Department of Engineering, Italy; 2: Eurac Research, Institute for Renewable Energy, Italy

ID: 1189 Extended Abstract
Topics: 04. Noise, acoustics, and soundscape control
Keywords: Soundscape, Indoor Soundscape, Schools, Classroom acoustics

Tuesday, 13.06.2023 16:00-16:03 Room O2 Oxygen

Impact of ventilation-related sounds in classrooms: a review

Pellegatti, Matteo (1,2); Torresin, Simone (2); Visentin, Chiara (1); Babich, Francesco (2); Prodi, Nicola (1)

1: University of Ferrara - Department of Engineering, Italy; 2: Eurac Research - Institute for renewable energy, Italy

ID: 1204 Extended Abstract
Topics: 04. Noise, acoustics, and soundscape control
Keywords: Sound, Ventilation, Student, Learning, Comfort

Session 24 Tuesday Carbon - Indicators, weighting, schemes & standards

Time:
Tuesday, 13.06.2023 16:45-18:15

Room: C Carbon

Chair:
Seduikyte, Lina
KTU

Co-Chair:
Olesen, Bjarne Wilkens
Intl. Center for Indoor Environment and Energy, Technical University of Denmark

Tuesday, 13.06.2023 16:45-17:00 Room C Carbon

Whole building algorithm for indoor air quality classification based on measured CO2 data

Aljas, Hans Kristjan; Parts, Tuule Mall; Thalfeldt, Martin

TalTech, Estonia

ID: 1431 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: indoor climate class, EN 16798-1:2019, indoor air quality, monitoring, algorithms

Tuesday, 13.06.2023 17:00-17:15 Room C Carbon

Integration of Human Comfort Indicators in a Holistic Framework of Next-Generation Energy Performance Certificates

Seduikyte, Lina (1); Kalamaris, Thanos (2); Morsink-Georgali, Phoebe-Zoe (3); Konatzii, Panagiota (3); Chatzipanagiotidou, Panagiota (4); Katsaros, Nikolaos (4); Stavros, Koltsios (4); Ioannidis, Dimosthenis (4); Stasiulienė, Laura (1); Spūdys, Paulius (1

1: Faculty of Civil Engineering and Architecture, Kaunas University of Technology, Kaunas, Lithuania; 2: Hypertech Energy Labs, Athens, Greece; 3: Frederick Research Center, Frederick University, Nicosia, Cyprus; 4: Centre for Research and Technology Hellas, Information Technologies Institute, Thessaloniki, Greece

ID: 1112 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: EPC, human comfort, KPIs, IAQ, thermal comfort, CO2, D^2EPC

Tuesday, 13.06.2023 17:15-17:30 Room C Carbon

Impact of different indoor environmental weighting schemes on office architectural design decisions in different climates

Fathi, Arefeh Sadat; O'Brien, William

Carleton University, Canada

ID: 1217 Full paper
Topics: 05. Architecture, aesthetics, passive design, biophilia
Keywords: Indoor environmental quality, weighting schemes, Building design elements, Parametric modeling

Tuesday, 13.06.2023 17:30-17:33 Room C Carbon

In search of a blueprint for indoor-environmental quality standards

Berger, Christiane (1); Mahdavi, Ardeshir (2)

1: Aalborg University, Denmark; 2: TU Graz, Austria

ID: 1241 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 03. Lighting, visual comfort, daylight, circadian lighting, views
Keywords: Indoor-environmental quality, standards, building design and operation

Tuesday, 13.06.2023 17:33-17:36 Room C Carbon

Heat Stress Indicators in Certification Schemes for the Built Environment

Cui, Yanghao; Shinoda, Jun; Bogatu, Dragos-Ioan; Olesen, Bjarne W.; Kazanci, Ongun B.

International Centre for Indoor Environment and Energy, Department of Environmental and Resource Engineering, Technical University of Denmark

ID: 1478 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 09. Public health, occupational & environmental health
Keywords: overheating, heat stress, indoor environmental quality, building certification schemes, resilience

Tuesday, 13.06.2023 17:36-17:39 Room C Carbon

Indoor air quality indices confronted to sensors measurement from field campaign

Miranda, Luiz (1,4); Duc, Caroline (1); Umba, David (1); Verriele, Marie (1); Crunaire, Sabine (1); Dorizzi, Bernadette (2); Boudy, Jérôme (2); Montalvão, Jugurta (3); Redon, Nathalie (1)

1: IMT Nord Europe, Institut Mines-Télécom, Univ. Lille, Centre for Energy and Environment, F-59000 Lille, France; 2: Telecom Sud-Paris; 3: Universidade Federal de Sergipe; 4: The French Agency for Ecological Transition, ADEME, France

ID: 1157 Extended Abstract
Topics: 07. Occupant behavior & controls, 09. Public health, occupational & environmental health
Keywords: Indoor air quality index, sensors, AQI, TAIL, CERBAIR

Tuesday, 13.06.2023 17:39-17:42 Room C Carbon

The need for occupant-related and building-related indicators next to dose-related indicators in our guidelines for indoor environmental quality

Bluyssen, Philomena

Delft University of Technology, Netherlands, The

ID: 1240 Extended Abstract
Topics: 07. Occupant behavior & controls, 09. Public health, occupational & environmental health
Keywords: Indoor environmental quality, new guidelines, new indicators

Session 19 Tuesday Silver - Air filtration & IAQ

Time:
Tuesday, 13.06.2023 16:45-18:15

Room: Ag Silver

Chair:
RAILLARD, Cécile
Nantes Université / IMT Atlantique /GEPEA UMR CNRS 6144

Co-Chair:
Mattsson, Johan
cTrap Ltd.

Tuesday, 13.06.2023 16:45-17:00 Room Ag Silver

INGENIOUS: Understanding the sources, tranformations and fates of indoor air pollutants

Shaw, David (1); Kumar, Ashish (2); Davies, Helen (1); Harding-Smith, Ellen (1); Hamilton, Jacqui (2); Dillon, Terry (2); Carslaw, Nicola (1)

1: Department of Environment and Geography, University of York, United Kingdom; 2: Wolfson Atmospheric Chemistry Laboratories, University of York, United Kingdom

ID: 1344 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: INCHEM-Py, Modelling, Emissions, Cooking, Cleaning

Tuesday, 13.06.2023 17:00-17:15 Room Ag Silver

Performance Assessment of Nanofiber Air Filters Modified with Optimal Metal-Organic Framework Loading for Indoor Air Quality Control

Niu, Zhuolun; Xiao, Can; Chen, Chun

Department of Mechanical and Automation Engineering, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong SAR, China

ID: 1226 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Indoor air quality, metal-organic frameworks, particulate matter, electrospinning, filtration efficiency

Tuesday, 13.06.2023 17:15-17:30 Room Ag Silver

Advanced prediction of the vapor pressure of volatile and semi-volatile organic compounds using quantum chemistry

Salthammer, Tunga (1); Stahn, Marcel (2); Grimme, Stefan (2); Hohm, Uwe (3); Palm, Wolf-Ulrich (4)

1: Fraunhofer WKI, Germany; 2: Mulliken Center for Theoretical Chemistry, Institute for Physical and Theoretical Chemistry, University of Bonn; 3: Institute of Physical and Theoretical Chemistry, University of Braunschweig; 4: Institute of Sustainable and Environmental Chemistry, Leuphana University Lüneburg

ID: 1145 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: vapor pressure, quantum chemistry, conformers, SVOCs, QSAR

Tuesday, 13.06.2023 17:30-17:45 Room Ag Silver

Indoor CO2 Direct Air Capture (iCO2 DAC): indoor air pollutants as renewable carbon source

López de León, Luis Rafael (1); Dessì, Paolo (1); Cabrera Codony, Alba (1); Soler, Irene (1); Bermejo, Joan (1); Jiménez, Kieran (1); Azzouzi, Íliass (1); Zamora, Pau (1); Kraakman, Bart (2,3); Balaguer, M. Dolors (1); Puig, Sebastià (1)

1: LEQUIA, Institute of Environment, Universitat de Girona, Campus Montilivi, carrer Maria Aurelia Capmany 69, Girona, Spain; 2: Jacobs Engineering, Templey Quay 1, Bristol BAS1 6DG, UK; 3: Institute of Sustainable Processes, University of Valladolid, Dr. Mergelina s/n., 47011 Valladolid, Spain

ID: 1121 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Indoor air quality, CO2 capture, renewable energy, biofuels, microbial electrosynthesis technologies

Tuesday, 13.06.2023 17:45-17:48 Room Ag Silver

Simulation models for material emissions and indoor air quality

Schieweck, Alexandra; Zhao, Jiangyue; Uhde, Erik

Fraunhofer WKI, Germany

ID: 1128 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: Chamber tests, model rooms, airborne pollutants, interdependencies, modelling

Tuesday, 13.06.2023 17:48-17:51 Room Ag Silver

Direct Air Capturing in the Built Environment

Nehr, Sascha; Baus, Lukas

CBS International Business School, Brühl, Germany

ID: 1132 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: Direct Air Capturing, Indoor Air Quality, energy-efficient ventilation, CO2-separation, HVAC

Tuesday, 13.06.2023 17:51-17:54 Room Ag Silver

Air cleaner based on heterogenic catalysis to be used in emergency rescue service

Gunschera, Jan (1); Kirsch, Ina (1); Noll, Matthias (2)

1: Fraunhofer WKI, Germany; 2: Coburg University of Applied Sciences and Arts, Institute for Bioanalysis, Germany

ID: 1153 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: air cleaning, heterogenic catalysis, rescue service, bioaerosol

Tuesday, 13.06.2023 17:54-17:57 Room Ag Silver

The Development of Indoor-Outdoor Exchange in an Indoor Air Chemistry Model

Carter, Toby J.; Shaw, David; Carslaw, Nicola

University of York, United Kingdom

ID: 1233 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants
Keywords: indoor air quality, outdoor air quality, air exchange, modelling, indoor air chemistry model

Tuesday, 13.06.2023 17:57-18:00 Room Ag Silver

Assessment of filtration & regeneration capabilities of a nonwoven activated carbon fabric (ACF

BOUHANGUEL, Ala; JOUBERT, Aurélie; THERON, Félicie; SUBRENAT, Albert; ANDRES, Yves

IMT Atlantique, GEPEA, CNRS UMR 6144, CS 20722, 44307, Nantes, France

ID: 1406 Extended Abstract
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: air filtration, nonwoven ACFs, aerosol generation & sampling, thermal inactivation, CFD

Session 20 Tuesday Oxygen - Building design & architecture

Time:
Tuesday, 13.06.2023 16:45-18:15

Room: O2 Oxygen

Chair:
Knudsen, Henrik N.
Aalborg University

Co-Chair:
Pilehchi Ha, Peiman
RWTH Uniklinik Aachen

Tuesday, 13.06.2023 16:45-17:00 Room O2 Oxygen

ZEB Test Cell Laboratory digital twins: assessing the textile SSF benefits in the Nordic region

Mokhtari, Niloufar (1); Ciampi, Giovanni (1); Spanodimitriou, Yorgos (1); Scorpio, Michelangelo (1); Nocente, Alessandro (2); Manni, Mattia (3); Lobaccaro, Gabriele (3); Sibilio, Sergio (1)

1: Department of Architecture and Industrial Design, University of Campania "Luigi Vanvitelli", Italy; 2: Department of Architecture, Materials and Structures, SINTEF Community, Trondheim, Norway; 3: Department of Civil and Environmental Engineering, Faculty of Engineering, Norwegian University of Science and Technology, NTNU, Trondheim, Norway

ID: 1440 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 05. Architecture, aesthetics, passive design, biophilia
Keywords: energy saving, passive and lightweight solutions, second skin facades, textile materials, energy-efficient buildings

Tuesday, 13.06.2023 17:00-17:15 Room O2 Oxygen

Multiscale modeling and application of thermal properties in Polyurethane with phase change materials

Liu, Bokai (1); Lu, Weizhuo (1); Hu, Xiaoyue (2); Zhang, Chao (3,4,5,6); Wang, Cuixia (3,4,5,6); Qu, Yilin (7); Olofsson, Thomas (1)

1: Intelligent Human-Buildings Interactions lab (IHBI), Department of Applied Physics and Electronics, Umeå University, 90187 Umeå, Sweden; 2: Faculty of Architecture and Urbanism, Bauhaus-Universität Weimar, 99423 Weimar, Germany.; 3: Yellow River Laboratory, Zhengzhou University, Zhengzhou 450001, China; 4: Institute of Underground Engineering, Zhengzhou University, Zhengzhou 450001, China; 5: National Local Joint Engineering Laboratory of Major Infrastructure Testing and Rehabilitation Technology, Zhengzhou 450001, China; 6: Collaborative Innovation

Center for disaster prevention and control of Underground Engineering jointly built by provinces and ministries, Zhengzhou, 450001, China; 7: State Key Laboratory for Strength and Vibration of Mechanical Structures, Xi'an Jiaotong University, Xi'an 710049, Shaanxi, China

ID: 1385 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 05. Architecture, aesthetics, passive design, biophilia
Keywords: Polyurethane (PU), Phase Change Materials (PCMs), Thermal properties, Multi-scale modeling, Building energy.

Tuesday, 13.06.2023 17:15-17:30 Room O2 Oxygen

Comprehensive energy, technoeconomic and thermal comfort assessment of school premises in Cyprus and their proposed retrofit interventions.

Heracleous, Chryso; Michopoulos, Apostolos; Michael, Aimilios; Savvides, Andreas

Energy and Environmental Design of Buildings Research Lab, University of Cyprus, Cyprus

ID: 1118 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 05. Architecture, aesthetics, passive design, biophilia
Keywords: school premises, thermal comfort, energy performance, technoeconomic analysis, retrofit

Tuesday, 13.06.2023 17:30-17:45 Room O2 Oxygen

Passive Cooling Measures in Reducing Interior Overheating of Multi-Unit Residential Buildings

Bartko, Michal; Laouadi, Abdelaziz; Lacasse, Michael

National Research Council Canada, Canada

ID: 1119 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 05. Architecture, aesthetics, passive design, biophilia
Keywords: Multi-Unit Residential Buildings, Resiliency, Interior Overheating, Passive Cooling Measures

Tuesday, 13.06.2023 17:45-17:48 Room O2 Oxygen

Passive design for reducing carbon emissions of residential and commercial buildings in cold climate zone, China

Liang, Yumin (1); Yuan, Xiaolei (1,2); Pan, Yiqun (1); Kosonen, Risto (2)

1: Tongji University, Shanghai, China; 2: Aalto University, Espoo, Finland

ID: 1239 Full paper
Topics: 05. Architecture, aesthetics, passive design, biophilia, 06. Heating, ventilation, air conditioning & cooling
Keywords: Passive design; carbon emission reduction; building shape coefficient; passive volume ratio; residential and commercial buildings

Tuesday, 13.06.2023 17:48-17:51 Room O2 Oxygen

A comparative study on the embodied carbon and operational carbon of a radiant cooling system and an all-air system

Shindo, Kan (1,2); Shinoda, Jun (2); Kazanci, Ongun B. (2); Bogatu, Dragos-Ioan (2); Tanabe, Shin-ichi (1); Olesen, Bjarne W. (2)

1: Department of Architecture, Waseda University, Tokyo, Japan; 2: International Centre for Indoor Environment and Energy, Department of Environmental and Resource Engineering, Technical University of Denmark, Denmark

ID: 1340 Full paper
Topics: 05. Architecture, aesthetics, passive design, biophilia, 06. Heating, ventilation, air conditioning & cooling
Keywords: embodied carbon, operational carbon, thermally active building system (TABS), embedded surface system (ESS), radiant panel

Tuesday, 13.06.2023 17:51-17:54 Room O2 Oxygen

Research on thermal performance index of resilient building envelopes based on RC network

Li, Zhengrong; Si, Yang

Tongji University, China, People's Republic of

ID: 1376 Full paper
Topics: 05. Architecture, aesthetics, passive design, biophilia
Keywords: Building resilience, envelope, disturbance, RC network

Tuesday, 13.06.2023 17:54-17:57 Room O2 Oxygen

Pilot trial on early-building design method considering trade-off of upfront and operational carbon.

Matsumura, Ryota (1); Shindo, Kan (1,2); Tanabe, Shin-ichi (1)

1: Faculty of Architecture, Waseda University, Tokyo, Japan; 2: International Centre for Indoor Environment and Energy, Faculty of Environmental and Resource Engineering, Technical University of Denmark, Denmark

ID: 1269 Extended Abstract
Topics: 05. Architecture, aesthetics, passive design, biophilia
Keywords: Early building design, Upfront carbon, Operational carbon, Life cycle assessment

Parallel sessions

Wednesday

Session 21 Wednesday Carbon - Resilience & measurements

Time:
Wednesday, 14.06.2023 08:30-09:45

Room: C Carbon

Chair:
Loomans, Marcel
Eindhoven University of Technology

Co-Chair:
Manu, Sanyogita
University of British Columbia

Wednesday, 14.06.2023 08:30-08:45 Room C Carbon

Assessment of mechanical ventilation performance in Finnish daycare buildings

Lastovets, Natalia (1); Luoto, Anni (2); Sormunen, Piia (1,2); Elsayed, Mohamed (1); Mäkinen, Antti (3); Juvela, Jussi-Pekka (3); Uusitalo, Sakari (3); Sanmark, Enni (4)

1: Faculty of Built Environment, Tampere University, Tampere, Finland; 2: Department of Construction and Property Development, Granlund Ltd, Helsinki, Finland; 3: School of Built Environment and Bioeconomy, Tampere University of Applied Sciences, Finland.; 4: Department of Otorhinolaryngology and Phoniatrics, Head and Neck Surgery, Helsinki University Hospital, University of Helsinki, Helsinki, Finland

ID: 1426 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: Indoor air quality, mechanical ventilation performance, daycare buildings, ventilation strategies

Wednesday, 14.06.2023 08:45-09:00 Room C Carbon

A survey of indoor air quality conditions in bedrooms of Dutch daycare centers

Wang, Zhijian (1); Zheng, Hailin (1); Walker, Shalika (2); Loomans, Marcel (1); Zeiler, Wim (1)

1: Department of Built Environment, Eindhoven University of Technology, The Netherlands; 2: Kropman Gebouwautomatisering. Lagelandseweg 84, 6545 CG Nijmegen

ID: 1312 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: Indoor air quality, daycare center, ventilation

Wednesday, 14.06.2023 09:00-09:15 Room C Carbon

Evaluation of the performance of Low-Cost Monitors for their use in Fault Detection and Diagnosis

Gopalan, Srinivasan (1); Zheng, Hailin (1); Walker, Shalika (2); Kramer, Rick (1); Zeiler, Wim (1)

1: Eindhoven University of Technology, The Netherlands; 2: Kropman Gebouwautomatisering

ID: 1149 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: Low-Cost Monitors, Indoor Air Quality Monitoring, Fault Detection and Diagnosis, Offices and Commercial Buildings

Wednesday, 14.06.2023 09:15-09:18 Room C Carbon

Low cost-effective measurements for schools.

Mohammed, karzan (1); Krishnan, Vinayak (2); Zheng, Hailin (1); Walker, Shalika (2); Kramer, Rick P. (1); Zeiler, Wim (1)

1: Eindhoven University of Technology, The Netherlands; 2: Kropman Gebouwautomatisering

ID: 1173 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: Smart buildings, indoor air quality, indoor environmental quality, measurements.

Wednesday, 14.06.2023 09:18-09:21 Room C Carbon

Resiliency and Performance Evaluation Indicators of Personalized Environmental Control Systems (PECS)

Shinoda, Jun (1); Bogatu, Dragos-Ioan (1); Watanabe, Futa (2); Kaneko, Yosuke (2); Olesen, Bjarne W. (1); Kazanci, Ongun B. (1)

1: Technical University of Denmark; 2: Mitsubishi Electric Corporation

ID: 1182 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: Thermal Comfort, Indoor Air Quality, Resiliency, Personalized System, Key Performance Indicators

Wednesday, 14.06.2023 09:21-09:24 Room C Carbon

Sustainable renovation solutions for Finnish apartment buildings

Wang, Yangmin (1); Hirvonen, Janne (1,2); Jokisalo, Juha (1,3); Kosonen, Risto (1,3,4)

1: Aalto University, Finland; 2: Tampere University, Finland; 3: FinEst Centre for Smart Cities, Estonia; 4: Nanjing Tech University, China

ID: 1289 Full paper
Topics: 06. Heating, ventilation, air conditioning & cooling
Keywords: Residential building, Energy renovation, Primary energy, CO2 emissions

Wednesday, 14.06.2023 09:24-09:27 Room C Carbon

Long-term performance analysis of a hybrid GSHP system for a large educational building in Finland

Xue, Tianchen (1); Jokisalo, Juha (1,3); Kosonen, Risto (1,3,4); Ju, Yuchen (1); Vuolle, Mika (2); Nadas, Viktoria (2); Marongiu, Federica (2)

1: Department of Mechanical Engineering, Aalto University, Espoo, Finland.; 2: Equa Simulation Finland Oy, Espoo, Finland.; 3: Smart City Center of Excellence, TalTech, Tallinn, Estonia.; 4: College of Urban Construction, Nanjing Tech University, Nanjing, P.R. China.

ID: 1364 Full paper
Topics: 06. Heating, ventilation, air conditioning & cooling
Keywords: Borehole free cooling, Ground source heat pump, Energy efficiency

Session 22 Wednesday Silver - Modelling & human variability

Time:
Wednesday, 14.06.2023 08:30-09:45

Room: Ag Silver

Chair:
Vellei, Marika
La Rochelle University

Co-Chair:
Christoforou, Rania
University Hospital RWTH Aachen

Wednesday, 14.06.2023 08:30-08:45 Room Ag Silver

Effect of short-term thermal history on human physiological and psychological responses: A pilot study

Wu, Zhibin (1); Schiavon, Stefano (2); Wagner, Andreas (1)

1: Karlsruhe Institute of Technology, Building Science Group, Karlsruhe, Germany; 2: Center for the Built Environment, University of California, Berkeley, CA, USA

ID: 1425 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: Short-term thermal history, Thermal sensation, Physiological response, Psychological response

Wednesday, 14.06.2023 08:45-09:00 Room Ag Silver

Evaluation and comparison of the prediction accuracy of thermophysiological comfort models

Koczorek, Nicole; Derwein, Dennis; Rewitz, Kai; Müller, Dirk

RWTH Aachen University, Germany

ID: 1214 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: thermal comfort, thermophysiological comfort models, accuracy comparison, skin and core temperature simulation

Wednesday, 14.06.2023 09:00-09:15 Room Ag Silver

Advancing a health-model linked smart control framework to improve occupant health and comfort in residences

Cooper, Elizabeth; Wang, Yan; Stamp, Samuel; Mumovic, Dejan

University College London, United Kingdom

ID: 1242 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 09. Public health, occupational & environmental health
Keywords: air purifier, health impact assessment, smart building controls, PM2.5

Wednesday, 14.06.2023 09:15-09:18 Room Ag Silver

Validation of human thermo-physiology models for personalized predictions of thermal responses

Rida, Mohamad (1); Frijns, Arjan (2); Khovalyg, Dolaana (1)

1: Laboratory of Integrated Comfort Engineering (ICE), École polytechnique fédérale de Lausanne (EPFL), Fribourg, Switzerland; 2: Energy Technology group, Eindhoven University of Technology (TU/e), Eindhoven, Netherlands

ID: 1388 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 11. All other IEQ, ergonomics & health topics
Keywords: Human thermal comfort, Human thermophysiology modelling, skin temperature

Wednesday, 14.06.2023 09:18-09:21 Room Ag Silver

Variability of human metabolism: sex, thermal exposure, season, and activity effect

Khovalyg, Dolaana

Laboratory of Integrated Comfort Engineering (ICE), École polytechnique fédérale de Lausanne (EPFL), Fribourg, Switzerland

ID: 1395 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 11. All other IEQ, ergonomics & health topics
Keywords: human metabolic rate, thermal comfort, personalized comfort

Wednesday, 14.06.2023 09:21-09:24 Room Ag Silver

Sex differences in metabolic rate at different activity levels

Rupp, Ricardo Forgiarini (1,2); Piil, Jacob Feder (3); Cubel, Claes (3); Nybo, Lars (3); Toftum, Jørn (1)

1: International Centre for Indoor Environment and Energy, Department of Environmental and Resource Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark; 2: Department of Civil and Mechanical Engineering, Technical University of Denmark, Kgs. Lyngby, Denmark; 3: Department of Nutrition, Exercise and Sports, University of Copenhagen, Copenhagen, Denmark

ID: 1127 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: metabolism, individual differences, thermal comfort, design, sustainability

Wednesday, 14.06.2023 09:24-09:27 Room Ag Silver

Protective facemask-induced facial thermal stress and breathing burden during exercising in gyms

Zhong, Qilong; Song, Jiyun; Shi, Dachuan

Department of Mechanical Engineering, The University of Hong Kong, Pokfulam Road, Hong Kong SAR, China

ID: 1274 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness
Keywords: Thermal stress, breath comfort, indoor exercise, simulation

Wednesday, 14.06.2023 09:27-09:30 Room Ag Silver

The effects of wearing different kinds of masks on human physiological responses

Lang, Xiaoyue (1); Liu, Weiwei (2); Wargocki, Pawel (3)

1: School of Energy Science and Engineering, Central South University, Changsha, China; 2: School of Architecture and Art, Central South University, Changsha, China; 3: International Centre for Indoor Environment and Energy, Department of Environmental and Resource Engineering, Technical University of Denmark, Copenhagen, Denmark

ID: 2489 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 09. Public health, occupational & environmental health
Keywords: Physiological response, Surgical mask, N95 mask

Session 23 Wednesday Oxygen - HVAC & thermal comfort

Time:
Wednesday, 14.06.2023 08:30-09:45

Room: O2 Oxygen

Chair:
Rawal, Rajan
CEPT University

Co-Chair:
Burgholz, Tobias Maria
Heinz Trox Wissenschafts gGmbH

Wednesday, 14.06.2023 08:30-08:45 Room O2 Oxygen

Addressing overheating in Swiss apartments using controlled natural ventilation

Belias, Evangelos; Licina, Dusan

Human-Oriented Built Environment Lab, School of Architecture, Civil and Environmental Engineering, École Polytechnique Fédérale de Lausanne, CH-1015 Lausanne, Switzerland

ID: 1190 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: multifamily buildings, overheating, smart controls, renovated buildings

Wednesday, 14.06.2023 08:45-09:00 Room O2 Oxygen

Building occupants-centered HVAC system management via integration of a multi-domain model of the human body for comfort assessment

Barone, Giovanni (1); Buonomano, Annamaria (1); Forzano, Cesare (1); Martins Gnecco, Veronica (2); Pigliautile, Ilaria (2); Pisello, Anna Laura (2); Russo, Giuseppe (1)

1: University of Naples Federico II, Italy; 2: University of Perugia, Italy

ID: 1400 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: Thermal sensation; Wearable sensors; Physiological signals; Machine learning; Personal comfort model; Energy savings.

Wednesday, 14.06.2023 09:00-09:15 Room O2 Oxygen

Two-wave intervention study to measure and improve ventilation in classrooms

Syndicus, Marc; Huang, Qirui; Frisch, Jérôme; van Treeck, Christoph

RWTH Aachen University, Germany

ID: 1154 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: CO2, Ventilation behavior, Covid-19, Classroom, School

Wednesday, 14.06.2023 09:15-09:18 Room O2 Oxygen

Predicting the Distribution of Room Temperature in Office Buildings Using Deep Learning: Verification of Improvements in Prediction Accuracy with Temperature and Position Sensors

KADOKAMI, Masaki (1); HAYASHI, Tatsuya (2); KADO, Keita (3); YOKOTA, Takefumi (4); OURA, Masamichi (5)

1: Graduate Student, Graduate School of Science and Eng., Chiba University; 2: Asoc Prof. School of Engineering, Chiba University, Dr. Eng.; 3: Asst Prof. School of Engineering, Chiba University, Dr. Eng.; 4: Nikken Sekkei Ltd., Dr. Eng; 5: Nikken Sekkei Ltd.

ID: 1232 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: Deep Learning, Thermal Comfort, Room Temperature Distribution, Activity-based Working, Office Environment

Wednesday, 14.06.2023 09:18-09:21 Room O2 Oxygen

Quantifying the Health Effects of Retrofit Intervention in Buildings: An Exploratory Review

André, Maíra (1,2); Dias, Marcelo (1); Brianti, Laisa (1); Dias, Ana Carolina (1); Nicolletti, Mariana (3); Gaudereto, Felipe (3); d'Obrenan, Honorine van den Broek (3); Berensson, Markus (3); Sarran, Lucile (4); Christoffersen, Jens (4)

1: Mitisi; 2: Federal University of Santa Catarina; 3: C40 Cities; 4: VELUX A/S

ID: 1325 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 09. Public health, occupational & environmental health
Keywords: Retrofit, Health Impact, Cost-benefit, city

Wednesday, 14.06.2023 09:21-09:24 Room O2 Oxygen

Operational Improvements for Energy Efficiency and Thermal Comfort in a Zero-Energy Government Building in Japan.

Nakanishi, Ryo (1); Ukai, Masanari (1); Kanie, Shino (4); Iihara, Kosuke (5); Itoh, Anri (2); Maruyama, Jun (2); Kobayashi, Hikaru (3); Tanabe, Shin-ichi (1)

1: Department of Architecture, Waseda University, Japan; 2: MHS Planners, Architects & Engineers Ltd; 3: Department of Architecture and Building Science, Tohoku University, Miyagi, Japan; 4: Tokyo Electric Power Company Holdings, Inc. (Former Graduate Student, Waseda University), M.Eng.; 5: Obayashi Corporation (Former Graduate Student, Waseda University), M.Eng.

ID: 1352 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: Zero-energy building, Local government building, Operational Improvement, Energy Efficiency, Thermal comfort

Wednesday, 14.06.2023 09:24-09:27 Room O2 Oxygen

Energy implications of implementing adaptive thermal comfort models: A case study of a nursing home

Verges, Roger; Forcada, Núria

Department of Project and Construction Engineering (DPCE), Group of Construction Research and Innovation (GRIC), Universitat Polit`ecnica de Catalunya. (UPC), Colom, 11, Ed. TR5, 08222, Terrassa, Barcelona, Spain

ID: 1250 Extended Abstract
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: thermal comfort, eldery, energy efficency, adaptive thermal comfort.

Session 25 Wednesday Silver - Ventilation & thermal control

Time:
Wednesday, 14.06.2023 10:00-11:15

Room: Ag Silver

Chair:
Leivo, Virpi
Tampere University

Co-Chair:
Huang, Qirui
RWTH Aachen - Lehrstuhl für Energieeffizientes Bauen (e3D)

Wednesday, 14.06.2023 10:00-10:15 Room Ag Silver

Natural Ventilation System for Office Buildings with Perforated Metal Ducts on Ceiling

Yamanaka, Toshio (1); Kobayashi, Tomohiro (1); Momoi, Yoshihisa (2); Choi, Narae (3); Tanaka, Hiroaki (4); Fujii, Takuro (4); Mori, Masatoshi (4); Wakasa, Miho (4)

1: Graduate School of Engineering, Osaka University, Japan; 2: Faculty of Engineering, University of Fukui, Japan; 3: Faculty of Science and Engineering, Toyo University, Saitama, Japan; 4: NIKKEN SEKKEI LTD, Japan

ID: 1480 Full paper
Topics: 06. Heating, ventilation, air conditioning & cooling
Keywords: Natural Ventilation, Perforated Metal Duct on Ceiling (PMDC), Network Model, Gauss-Seidel Method, Ventilation Shaft

Wednesday, 14.06.2023 10:15-10:30 Room Ag Silver

Resilient cooling strategies: a preliminary study of an all-air system application

Carnieletto, Laura (1,2); Corazza, Laura (1); Bogatu, Dragos-Ioan (3); Shinoda, Jun (3); Kazanci, Ongun Berk (3); De Carli, Michele (1); W. Olesen, Bjarne (3)

1: Department of Industrial Engineering, University of Padova, Padova, Italy; 2: Department of Environmental Sciences, Informatics and Statistics, Cà Foscari University of Venice, Venice, Italy; 3: Department of Environmental and Resource Engineering Indoor Environment, Technical University of Denmark, Lyngby, Denmark

ID: 1387 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: Resilient cooling, heatwave, power outage, all-air system, thermal comfort

Wednesday, 14.06.2023 10:30-10:45 Room Ag Silver

Development of a Rule-based Control for Hybrid Ventilation Systems and Evaluation by Field Test

Jiang, Jun; Wu, Yue; Rewitz, Kai; Müller, Dirk

RWTH Aachen University, E.ON Energy Research Center, Institute for Energy Efficient Buildings and Indoor Climate

ID: 1168 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: hybrid ventilation, rule-based control, multivariable control system, field test

Wednesday, 14.06.2023 10:45-10:48 Room Ag Silver

Effectiveness of a novel hybrid ventilation system in enhancing the air quality in highly occupied spaces.

Karam, Jennifer; Ghali, Kamel; Ghaddar, Nesreen

American University of Beirut, Lebanon (Lebanese Republic)

ID: 1170 Full paper
Topics: 01. Indoor air quality, particles, aerosols, chemical pollutants, 06. Heating, ventilation, air conditioning & cooling
Keywords: ultraviolet germicidal irradiation, indoor air quality, cross-contamination, classroom, pulsating jet ventilation

Wednesday, 14.06.2023 10:48-10:51 Room Ag Silver

Experimental study on thermal performance and feasibility of heat pump assisted hybrid desiccant cooling system under different load conditions

Liu, Shuo (1); Jang, Hyusan (2); Yeo, Myoung-Souk (3)

1: Department of Architecture and Architectural Engineering, Graduate School, Seoul National University, Seoul, South Korea; 2: Department of Architecture and Architectural Engineering, Graduate School, Institute of Construction and Environmental Engineering, Seoul National University, Seoul, South Korea; 3: Department of Architecture and Architectural Engineering, Institute of Construction and Environmental Engineering, Seoul National University, Seoul, South Korea

ID: 1339 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: indoor humidity, various load pattern, dehumidification system, thermodynamic processes, thermal performance

Wednesday, 14.06.2023 10:51-10:54 Room Ag Silver

Analysis of the effectiveness of opening windows to control infection risk and thermal comfort in school classrooms taking into account climate change

Nateghi, Seyedkeivan; Grygierek, Krzysztof; Kaczmarczyk, Jan; Ferdyn-Grygierek, Joanna

Silesian University of Technology, Poland

ID: 1437 Full paper
Topics: 02. Thermal comfort, temperature, hygro-thermal, humidity, dampness, 06. Heating, ventilation, air conditioning & cooling
Keywords: Natural ventilation; window opening; climate change; indoor environment; Infection risk.

Session 26 Wednesday Oxygen - Lighting & visual environment

Time:
Wednesday, 14.06.2023 10:00-11:15

Room: O2 Oxygen

Chair:
Wienold, Jan
Ecole Polytechnique Fédérale de Lausanne

Co-Chair:
Vasquez, Natalia Giraldo
Technical University Of Denmark

Wednesday, 14.06.2023 10:00-10:15 Room O2 Oxygen

Boosting Productivity of Remote Workers with Biodynamic Lighting

SHARP, NINA (1); FANI, MAHYA (1); ALRAHYANI, MOHAMMED (1,2); YAGUE, NDEYE (1)

1: Arizona State University, United States of America; 2: Qassim University, Saudi Arabia

ID: 1180 Extended Abstract
Topics: 03. Lighting, visual comfort, daylight, circadian lighting, views, 08. Psychology, psychophysics, performance & productivity
Keywords: Dynamic lighting, Remote Workers, sleep quality, Alertness, Home-based Offices

Wednesday, 14.06.2023 10:15-10:30 Room O2 Oxygen

WINDOW VIEW QUALITY IN BUILDINGS: STATE OF ART AND FUTURE DEVELOPMENTS

Sabet, Parinaz; Ciampi, Giovani; Scorpio, Michelangelo; Sibilio, Sergio

Università degli studi della Campania Luigi Vanvitelli, Italy

ID: 1412 Full paper
Topics: 03. Lighting, visual comfort, daylight, circadian lighting, views
Keywords: user's wellness, daylight, visual perception, view out, building efficiency

Wednesday, 14.06.2023 10:30-10:45 Room O2 Oxygen

Study on the lighting requirements of indoor ornamental plants using a growth chamber

Sugano, Soma (1); Ishii, Masahisa (2); Tanabe, Shin-ichi (1)

1: Department of Architecture, Waseda University, Tokyo, Japan; 2: Institute for Rural Engineering, National Agriculture and Food Research Organization, Tsukuba, Japan

ID: 1220 Full paper
Topics: 03. Lighting, visual comfort, daylight, circadian lighting, views, 05. Architecture, aesthetics, passive design, biophilia
Keywords: Biophilic Design, Indoor greenery, Growth analysis, Photosynthesis, Daily Light Integral

Wednesday, 14.06.2023 10:45-10:48 Room O2 Oxygen

Towards realistic lighted virtual environments in head-mounted displays: transfer functions effects on luminance representation

Scorpio, Michelangelo; Teimoorzadeh, Ainoor; Ciampi, Giovanni; Sibilio, Sergio

Department of Architecture and Industrial Design, University of Campania, Luigi Vanvitelli, Aversa, Italy

ID: 1378 Full paper
Topics: 03. Lighting, visual comfort, daylight, circadian lighting, views
Keywords: Head Mounted Displays (HMD), Immersive Virtual Reality, Luminance Distribution, Experimental Measurements, Light Distribution

Wednesday, 14.06.2023 10:48-10:51 Room O2 Oxygen

Healthy View Review: A Study on Impacts of View to Outdoor on Human Health.

Nasrollahzadeh Mehrabadi, Elham (1); Pilehchi Ha, Peiman (2,3)

1: Pars University of Art and Architecture Architecture, Tehran, Iran; 2: Teaching and research area Healthy Living Spaces; 3: institute for Occupational, Social and Environmental Medicine

ID: 1379 Extended Abstract
Topics: 03. Lighting, visual comfort, daylight, circadian lighting, views, 08. Psychology, psychophysics, performance & productivity
Keywords: Mental health, Physical health, Architecture, Well-being

Wednesday, 14.06.2023 10:51-10:54 Room O2 Oxygen

Is there a Hierarchy in visual effects? A preliminary investigation on Occupant Preferences with Dynamic Façades

de la Barra Luegmayer, Pedro (1); Luna-Navarro, Alessandra (1); knaack, Ulrich (1); Prieto Hoces, Alejandro (2); Vásquez, Claudio (3)

1: Delft University of Technology, Netherlands, The; 2: Universidad Diego Portales; 3: Pontificia Universidad Católica de Chile

ID: 1467 Extended Abstract
Topics: 07. Occupant behavior & controls
Keywords: Dynamic façade, control strategy, laboratory experiment, preferences, occupant satisfaction

Wednesday, 14.06.2023 10:54-10:57 Room O2 Oxygen

Urban forest views for stress level reduction

Llaguno-Munitxa, Maider; Edwards, Martin; Grade, Stephane; Agudo-Sierra, Elena; Letesson, Clement

UCLOUVAIN, Belgium

ID: 1468 Extended Abstract
Topics: 08. Psychology, psychophysics, performance & productivity, 10. Community- and urban-scale challenges and solutions
Keywords: Urban Health, Urban Comfort, Urban Green Infrastructure, Stress Level Reduction, Immersive Media, Bio-environmental Sensing

Practical information

Banking

Although card payments are accepted in most occasions, there are places that accept only EC-cards or cash. Therefore, we advise you to carry cash with you. You can find several ATM machines in the city centre – however, withdrawing cash from your account might be subject to fees. An ATM is located next to Aachen Hauptbahnhof (the main station, right-hand side when leaving through main doors) and close to the location of the Welcome reception (Pontstraße 91-93, 52062 Aachen).

Currency

Germany is part of the many countries that use Euros.

Electricity

Electricity outlets in Germany take type C and F type 220/240V plugs.

Emergency Medical and first aid

Please contact the registration desk or any person from the organizing committee if you have an emergency, medical or first aid need. The University Hospital is 16 minutes away from the conference venue by taxi/car.

Emergency numbers

Police: 110

Fire & ambulance: 112

Language

The official language of the conference is English.

Lost and Found

If you lost something, please contact the registration desk first, send an email to:hbe2023@ukaachen.de or ask any person from the organizing committee. If you found something, please return it to the registration desk or give it to someone from the organizing committee.

Lunch

Daily lunch will be provided in the main hall and allows you to have a look at the posters and the sponsor presentation in the meantime. Please assure to wear your badge visibly. We tried to provide for special dietary requirements (clearly visible) as well, please ask the staff if you are uncertain. During the breaks, coffee/tea and/or refreshments are served.

Mobile Phone

Please switch them off or have them in 'silent' mode while present at any of the sessions during the conference.

No smoking

Smoking is prohibited in all public buildings, restaurants and cafes, including the trains and railway stations.

Parking

The venue has its own free parking space. However, for our environment, we suggest you to use public transport.

Refreshments

Refreshments (soft drinks, tea and coffee) are available for registered participants during the breaks.

Registration desk

The registration desk will be open on Monday June 12th, Tuesday June 13th and Wednesday June 14th between 07:30 and 10:00 at the conference venue (Das Liebig).

On Sunday, June 11th, a registration desk will be set up at the Welcome Reception venue (SuperC) between 18:00 and 21:00.

Fur urgent aspects, you can also call our conference office: +49 241 80 - 96652

Social media

We plan to use Twitter during the conference.

Speaker's room

A speaker's room is available near the registration desk to upload your PowerPoint file. However, we urge you to upload the presentation file before the start of the conference. This is obligatory for poster presentations (see the information provided to you by e-mail and the website). In case needed, you should upload your PowerPoint-file at least 4 hours before your presentation.

Tipping

Tipping generally is expected in restaurants and cafes. Most commonly you would round up your bill. Of course, if you experience good service you may tip more. For hotels tipping is not expected.

Transport options

We recommend you to use public transport for traveling around Aachen. Tickets for public transport will be provided for those who need them at the reception desk during registration. Detail information on route times and bus numbers are provided on the AVV app (website also available: https://avv.de/de - only in German) or on the DB app (website also available: www.Bahn.com/en - available in English and other languages).

In case, you purchased a day-pass via conftool, make sure to have a valid ID and your name badge with you.

Wifi / Internet access

Free Wifi is available. Access information will be available on-site.

Disclaimer

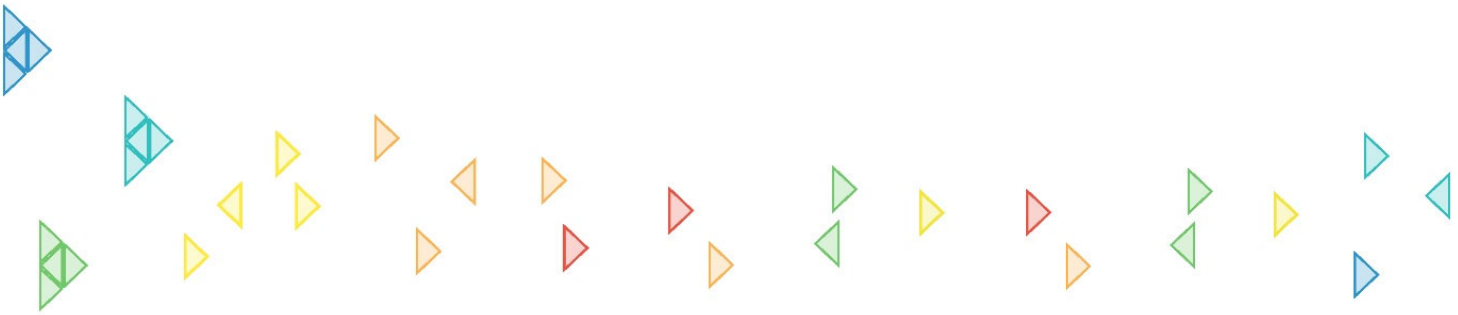
While we aim to ensure that all information provided is correct and the conference programme will take as scheduled, the Organization reserves the right to make changes at any time if this is deemed necessary.

Liability

The Organization will not be liable for any personal accident and/or loss or damage to the property of participants during the Conference. Participants should make their own arrangements with respect to personal insurance.

NOTES

NOTES



HEALTHY BUILDINGS 2023 EUROPE