Webinar

Air Infiltration and Ventilation Centre

Personalised Environmental Control Systems (PECS): State of Research and Development

Friday 18 September 2026

13:30-15:00 (Brussels, BE)

12:30-14:00 (London, UK)

07:30-09:00 (New York, USA)

20:30-22:00 (Tokyo, JP)

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Registration is required: A link to join the webinar will be included in the email confirmation

Personalised Environmental Control Systems (PECS) allow occupants to adjust their immediate surroundings without affecting others, offering the potential to enhance comfort, health, and well-being while improving building energy efficiency. This webinar presents the state of research and development across the four environmental domains PECS address, drawing on activities developed within IEA EBC Annex 87. It opens with the human benefits of thermal and indoor air quality PECS, then examines the methods used to evaluate their thermal comfort, air quality, and energy performance. Two further talks extend the concept beyond its established thermal and air quality roots into the emerging visual and acoustic domains. Together, the presentations map current evidence, evaluation approaches, and knowledge gaps in personalised environmental control.

This webinar is organized by the IEA-EBC Annex 87, the AIVC & venticool and facilitated by INIVE.

Programme (CEST)

- 13:30 | Welcome & Introduction, Ongun Berk Kazanci (Operating Agent, IEA EBC Annex 87 / DTU, Denmark)
- 13:40 | Human benefits of thermal and indoor air quality PECS, Dolaana Khovalyg (EPFL, Switzerland)
- 13:55 | Q & A
- 14:00 | Advancing Performance Assessment and Standardization of PECS, Ilaria Pigliautile (CIRIAF, Italy)
- 14:15 | Q & A
- 14:20 PECS for Day (Lighting): Human benefits and energy savings, Pedro de la Barra (TU Delft, the Netherlands)
- 14:35 | Q & A
- 14:40 Acoustic PECS: Personalising indoor soundscapes, Simone Torresin (University of Trento, Italy)
- 14:55 | Q & A
- 15:00 | End of webinar

AIVC venticool the platform for resilient ventilative cooling EBC Energy in Buildings and Communities Programme INIVE

Cost and registration

Participation to the webinar is free but requires you to register for the event. The webinar will be limited to a maximum of 1000 persons. To register, please click on the “Register now” button above.

What is a webinar?

A webinar is a conference broadcasted on internet. To follow a webinar you must have a computer with a sound card and speakers or headphones. Once logged in the "webinar room", you will be able to see the slides of the presentation and to hear the panellists’ comments. You will also be able to ask written questions to the speakers, and to answer on-line surveys.

Hardware, software

Our webinars are powered by WebEx. The only thing you need is a computer with a sound card and speakers or a smartphone or tablet. Before you can log in the "webinar room", WebEx will install the required application. If you are not a WebEx user, please visit: https://help.webex.com/en-us/article/8l0y08/Join-a-webinar to check the system requirements and be informed on how to join a webinar. We recommend you join the event 5…10 minutes in advance.

About IEA EBC Annex 87 - Energy and Indoor Environmental Quality Performance of Personalised Environmental Control Systems

Annex 87 Energy and Indoor Environmental Quality Performance of Personalised Environmental Control Systems (https://annex87.iea-ebc.org/) is an international research project of the IEA Energy in Buildings and Communities (EBC) Programme. The objective of this project is to establish design criteria and operation guidelines for PECS and to quantify the benefits regarding health, comfort and energy performance. This includes also control concepts and guidelines for operating PECS in spaces with general ambient systems for heating, cooling, ventilation, and lighting. The scope of the project includes all types of PECS for local heating, cooling, ventilation, air cleaning, lighting, and acoustics. It includes desktop systems, which are mounted on desks, or integrated into furniture, chairs with heating / cooling and ventilation, and other types that can be found during the study. It also includes wearables, where heating, cooling, and ventilation are included in garments or devices attached to an occupant's body.

About AIVC

Created in 1979, the Air Infiltration and Ventilation Centre is one of the projects/annexes running under the International Energy Agency's Energy in Buildings and Communities (IEA-EBC) Programme. With the support of its member countries as well as key experts and various associations (REHVA, IBPSA, ISIAQ), the AIVC offers industry and research organisations technical support aimed at better understanding the ventilation challenges and optimizing energy efficient ventilation.
The AIVC activities are supported by the following countries: Australia, Belgium, Canada, Denmark, France, Greece, Italy, Ireland, Japan, Netherlands, New Zealand, Norway, Republic of Korea, Spain, UK and USA.

About venticool

The platform for resilient ventilative cooling, venticool supports better guidance for the appropriate implementation of resilient ventilative cooling strategies as well as adequate credit for such strategies in building regulations. The platform philosophy is to pull resources together and to avoid duplicating efforts to maximise the impact of existing and new initiatives. venticool has been initiated by the International Network for Information on Ventilation and Energy Performance (INIVE) with the financial and/or technical support of the following partners: Agoria, Reyaners Aluminum, Velux and WindowMaster.

About INIVE

The International Network for Information on Ventilation and Energy Performance (INIVE) was created in 2001 to establish a worldwide network of excellence for knowledge gathering and dissemination. Its current member organisations are Buildwise, Cerema, CETIAT, Ghent University, IBP-Fraunhofer and KU Leuven.
The organisation coordinates and/or facilitates various international projects, including AIVC, TightVent, venticool and Dynastee. It also operates the EBC Executive Committee Support and Services Unit (ESSU), on behalf of the Executive Committee of the Energy in Buildings and Communities (EBC) Technology Collaboration Pro-gramme (TCP) of the International Energy Agency (IEA). In addition, INIVE has coordinated the ASIEPI project dealing with the evaluation of the implementation and impact of the EU Energy Performance of Buildings Directive, the QUALICHeCK project aiming towards improved compliance and quality of the works for better performing buildings, BUILD UP — the European portal on Energy Efficiency — and the EPBD feasibility study 19a.

Programme Details: Abstracts & Biographies

Human benefits of thermal and indoor air quality PECS

Speaker: Dr. Dolaana Khovalyg (EPFL, Switzerland)

Abstract: Personalised Environmental Control Systems (PECS) aim to enhance comfort, air quality, health, and productivity through user-centered designs that condition an occupant's immediate surroundings rather than the entire space. Developed within IEA EBC Annex 87, this systematic review examines 324 journal articles published between 1988 and 2023, focusing on the thermal and indoor air quality (IAQ) domains and classifying devices by mobility: building-attached, semi-detached, detached, and wearable. It assesses their effects on thermal comfort, IAQ, health outcomes (e.g., Sick Building Syndrome, heat stress), and human performance (e.g., cognition, productivity). Building-detached PECS most consistently improve thermal sensation, comfort, and acceptability, with combined devices yielding better ratings, while personalised ventilation enhances IAQ by delivering clean air to the breathing zone. Evidence on health and performance benefits remains limited but promising. The talk highlights the need for standardized evaluation methods, real-world and long-term testing, and clearer quantification of human benefits.

Bio: Dr. Dolaana Khovalyg is an Assistant Professor at the École Polytechnique Fédérale de Lausanne (EPFL) and founding director of the Laboratory of Integrated Comfort Engineering (ICE). Her research bridges energy engineering, building physics, and human physiology to advance human-centric built environments. Spanning scales from whole-building systems to individual thermal responses, her work challenges the long-standing "*one-size-fits-all*" paradigm of climate control, advocating instead for personalised thermal environments and occupant-centric system design. Within IEA EBC Annex 87, she co-leads Subtask A "Fundamentals."

Advancing Performance Assessment and Standardization of PECS

Speaker: Dr. Ilaria Pigliautile (Interuniversity Research Center on Pollution and Environment "Mauro Felli", Italy)

Abstract: Personal Environmental Control Systems (PECS) can simultaneously enhance occupant comfort and energy efficiency by delivering environmental stimuli directly to the occupied microenvironment, reducing the conditioned area and energy demand compared with conventional whole-space systems. Despite significant research advances, PECS market uptake remains limited due to the lack of standardized performance assessment methods and metrics. Within IEA EBC Annex 87, two complementary studies address this gap. The first, a systematic review of 302 non-wearable PECS studies, synthesizes evaluation methods for thermal comfort, indoor air quality, and energy performance, proposing best-practice guidance within a multi-method assessment framework. The second, a focused review of 81 papers covering 113 wearable thermal PECS, develops a seven-level classification scheme to support device design based on expected benefits. Among 86 experimentally evaluated devices, key gaps were identified in sensing, automation, durability, and sustainability assessment. Together, these outcomes aim to support future standardization and regulatory acceptance of PECS.

Bio: Ilaria Pigliautile, Ph.D., is a member of the Scientific Committee of the Interuniversity Research Center on Pollution and Environment “Mauro Felli” – CIRIAF. She is passionate about the existing mutual relationship between people and the built environment, at different scales: from deepening indoor comfort theories and occupants’ behavior affections, up to urban morphology and metabolism impact on the environment and citizens' well-being. Graduated cum laude in Building Engineering and Architecture at the University of Perugia in 2015. PhD in Energy and Sustainable Development in 2020 at the CIRIAF Institute, University of Perugia.

PECS for Day(Lighting): human benefits and energy savings

Speaker: Pedro de la Barra (TU Delft, the Netherlands)

Abstract: Personalised Environmental Control Systems (PECS) are gaining prominence as buildings move toward more user-centered, data-driven operation, allowing occupants to tailor their immediate environment, while cutting energy demand from unnecessarily conditioned space. This talk extends and operationalizes that definition for lighting and daylighting, covering systems such as individually controllable task luminaires, workstation-level dimming and spectral tuning, and locally addressable shading or façade systems. Drawing on a systematic review of 46 peer-reviewed studies, the talk presents the current evidence on how these systems perform. More than two-thirds of studies report positive occupant outcomes compared to non-personalised conditions — most often improved visual satisfaction and comfort, reduced override behaviour, and greater perceived control. Energy savings are consistent across the literature, typically 10–40% in simulations and 10–50% in lab or field studies, especially for electric-lighting PECS in offices; personalised daylighting and façade systems remain comparatively under-examined.

Bio: Pedro de la Barra Luegmayer is a Postdoctoral Researcher in the Department of Architectural Engineering & Technology at Delft University of Technology (TU Delft). His research lies at the intersection of architectural technology, smart building systems, and human-building interaction. Pedro's work focuses on bridging the gap between automated building performance and occupant comfort. He recently completed his PhD at TU Delft, where his doctoral research investigated interaction requirements and user acceptance of automated façade systems in office environments. Leveraging his background in architecture and environmental design, Pedro specializes in developing occupant-centered control strategies that balance multi-domain indoor comfort (thermal, visual, and lighting) with optimal building energy efficiency.

Acoustic PECS: Personalising indoor soundscapes

Speaker: Simone Torresin (University of Trento, Italy)

Abstract: Personalised Environmental Control Systems (PECS) let occupants adjust their immediate surroundings without affecting others, potentially boosting people's comfort and well-being, as well as buildings' energy efficiency. While well established for thermal and air quality management, this presentation focuses on the first systematic exploration of PECS in the acoustic domain, developed within IEA EBC Annex 87. Following PRISMA guidelines, a review of 38 studies identifies technologies enabling local acoustic control—active and passive systems, building-attached, furniture-integrated, and wearable devices—relevant to office environments. Findings show promising benefits in challenging acoustic settings, including reduced annoyance, improved work performance, masking or cancellation of intrusive noise, and gains in short-term memory. However, technological and methodological limitations, along with a limited evidence base, constrain current conclusions. This talk introduces the formal definition of Acoustic PECS, maps the state of the art, and outlines a research agenda to guide the development and evaluation of these systems—offering a foundation for designers, researchers, and practitioners aiming to advance occupant-centered acoustic comfort.

Bio: Dr Simone Torresin is an Assistant Professor in Architectural Engineering at the University of Trento (Italy) and an Honorary Lecturer at UCL (UK). His research explores the relationships between the built environment and human perception, advancing research on indoor soundscapes and multi-domain environmental quality. He contributes to IEA EBC Annex 87 on Personalised Environmental Control Systems, sits on the Management Committee of COST Action CitySenZ, and serves on the editorial boards of several leading journals in the field, including Building and Environment, Indoor Environments, and Building Acoustics. He is a member of several international associations and working groups, including the Acoustical Society of Italy, the International Society of Indoor Air Quality and Climate, and ISO/TC 159/SC 5/WG 4 on Integrated Environments.
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