



venticool
the platform for resilient ventilative cooling

TightVent
Europe
BUILDING AND DUCTWORK AIRTIGHTNESS PLATFORM

42nd AIVC

10th TightVent
& 8th venticool
Conference

Ventilation challenges
in a changing world

October 5-6,
2022

Rotterdam

The Netherlands
Hilton Hotel

www.aivc2022conference.org

FINAL
PROGRAMME



42nd AIVC 10th TightVent & 8th venticool Conference



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Congress Venue

Hilton Rotterdam, Weena 10, Rotterdam, 3012 C, Netherlands

Registration Desk Hours

Registration Desk will be open during the following dates and times:

Tuesday 4 October, 2022 / 19:00 – 20:00

Wednesday 5 October, 2022 / 08:00 – 18:30

Thursday 6 October, 2022 / 08:30 – 17:00

Poster display information

- Posters should be set up on Wednesday 5 October, 2022 from 09:30
 - Dismantling of posters should be finished by **Thursday 6 October 2019 at 17:00**
- Professional Congress Organizer and Organizers have no liability for posters left behind

Poster dimensions

(A0) size, 120CM Height x 80CM Width

Poster presentation session

Authors are expected to be in front of their poster in order to reply to any questions as per schedule below:

Wednesday 5 October 2022, at 18:30 - 20:00

Long & Short Oral Presentations information

- Long Oral Presentations (indicated within the programme) are expected to last 12 minutes; another 3 minutes are foreseen for questions and answers (15 minutes in total)
- Short Oral Presentations (indicated within the programme) are expected to last 3 minutes; another 2 minutes are foreseen for questions and answers (5 minutes in total)

Social Events

Welcome Reception

Tuesday 4 October, 2022

19:00 – 20:00

Hilton Rotterdam Hotel

*(*all registered delegates are welcome to participate)*

Gala Dinner

Thursday 6 October, 2022

19:00 – 22:00

Hotel New York, Koninginnenhoofd 1,
3072 AD Rotterdam

(Dinner is not included in the
conference registration fees)

Tickets are available at the registration
desk at the cost of € 79 per ticket



Tuesday October 4th, 2022

19:00-20:00 Registration & Welcome reception



ROOM A / LE JARDIN

Wednesday October 5th, 2022

08:00-09:00 Registration

09:00-10:30 Opening - Plenary session

Chairs: Arnold Janssens, Peter Wouters

Welcome on behalf of AIVC, venticool, TightVent

Arnold Janssens, *INIVE, Ghent University*
& Peter Wouters, *INIVE*

Welcome on behalf of TNO

Machteld de Kroon, *Director of Unit Buildings, Infrastructure and Maritime*

**Challenges in transition towards a sustainable built environment
from a European and National perspective**

Robert Dijksterhuis, *Ministry of the Interior and Kingdom Relations*

Ventilation & IAQ in the Energy Performance of Buildings Directive (EPBD)

Pau Garcia Audi, *European Commission*

What we know and should know about air cleaning

Pawel Wargocki, *DTU*

In memory of François Rémi Carrié

Valerie Leprince, *Cerema*

10:30-11:00

Coffee Break

11:00-12:30 Session 1A - Topical Session
(Post-pandemic building ventilation: what have we learned and what is next?)

Chairs: Arnold Janssens, Wouter Borsboom

Understanding and controlling building ventilation can improve the quality of the air we breathe and reduce the risk of indoor health concerns including prevent viruses spreading indoors. The COVID-19 pandemic showed that many buildings are not equipped to achieve adequate ventilation and limit exposure to infected aerosols in occupied spaces.

During the pandemic, various societies and countries have established taskforces to develop COVID-19 ventilation guidance and tools, including on complementing ventilation with air cleaning, and monitoring indoor air quality. Also new research, standardization and regulatory programmes have been initiated to make sure cross contamination in indoor environments is better controlled in the future.

Looking back at these experiences, this workshop discusses the role of ventilation systems in pandemic control, the lack of well-performing ventilation systems in the building stock, and the actions needed to reduce the risk of contamination, now and in the future. The workshop will give a better understanding of recent and on-going initiatives, and of knowledge gaps needed to be filled to come to more resilient building ventilation.

The session is part of the AIVC-project "Ventilation, airtightness and COVID-19" which aims to collect, discuss and disseminate information about COVID-19 in relation to ventilation and airtightness. It was prepared in collaboration with the Indoor Environmental Quality Global Alliance (IEQ-GA) COVID-19 Task force. The mission of IEQ-GA is to provide an acceptable indoor environmental quality to occupants in buildings and places of work around the world and to make sure the knowledge from research on IEQ get to be implemented in practice.

The objective of this session is to present ongoing developments in ventilation and indoor air quality research, design, standardisation and regulation in response to the COVID-19 pandemic, to define knowledge gaps and challenges for the research community.

Introduction and problem statement

Arnold Janssens, Ghent University, Belgium

Infection risk-based ventilation design method

Jarek Kurniowski, Tallinn University of Technology, Estonia

AIRBODS: Airborne Infection Reduction through Building Operation and Design for SARS-CoV-2

Benjamin Jones, University of Nottingham, UK

Indoor Carbon Dioxide Position Document: What's Next?

Andy Persily, NIST, USA

Start of the Pandemic Preparedness Program through Ventilation - Knowledge Gaps and application of the results

Roberto Traversari, TNO, the Netherlands

Revision of the ventilation part of EN16798-1 and -2

Bjarne Olesen, DTU, Denmark



Wednesday October 5th, 2022



ROOM B / ROTTERDAM

11:00-12:30 Session 1B-Long & Short Oral Presentation Session
(Airtightness measurements)

Chairs: Ian Walker, Laure Mouradian

Air Leakage Detection in Building Façades by Combining Lock-In Thermography with Blower Excitation (Long Oral Presentation)
Benedikt Kölsch, *German Aerospace Center (DLR), Germany*

Determining infiltration from the Pulse tests – the establishment of an evidence base of utilising a low-pressure approach for measuring building airtightness and energy modelling (Long Oral Presentation)
Xiaofeng Zheng, *University of Nottingham, UK*

Measuring airtightness of 100-meter high-rise buildings (lessons learned) (Long Oral Presentation)
Stephanie Rolfsmeier, *Blowerdoor GmbH, Germany*

French building airtightness database after 10 years of operation: statistical analyses of about 500,000 measurements (Long Oral Presentation)
Bassam Moujalled, *Cerema, France*

Air Leakage and the Building Enclosure - Energy Codes, Testing, and Practical Limitations (Long Oral Presentation)
Sean Obrien, *Simpson Gumpertz & Heger, Inc., USA*

Empirical validation of infiltration models based on different wind data (Short Oral Presentation)
Gabriela Bastos Porsani, *University of Navarra, Spain*

Computational analysis of room pressure control in airtight cleanrooms (Short Oral Presentation)
Rick Kramer, *Eindhoven University of Technology, Netherlands*

RENOVAIR: A study of the evolution of airtightness, ventilation, comfort and indoor air quality in 7 energy efficient refurbishment operations of social housing in France (Short Oral Presentation)
Andrés Litvak, *Cerema, France*



ROOM C / COOLSINGEL

11:00-12:30 Session 1C-Long Oral Presentation Session
(Ventilative cooling & climate change)

Chairs: Hilde Breesch, Regina Bokel

Methodology for the constitution of a restricted set of heatwaves, derived from climate projections, that can be used for building performance simulations
Adrien Toesca, *UCB Lyon 1 - CETHIL, France*

Wednesday October 5th, 2022

11:00-12:30

Assessing natural ventilation strategies to improve thermal resilience to extreme temperatures of the residential buildings in Barcelona

Elisenda Clèries Tardío, IREC, Spain

Climate correlation model to forecast thermal comfort and IAQ in naturally ventilated residential buildings

Maria Kolokotroni, Brunel University London, UK



The effect of airflow guiding components on effective ventilation rates in single-sided ventilation applications

Nima Najafi Ziarani, Munster Technological University, Ireland

Assessing the "sufficient ventilation" requirement for Austrian buildings - Development of a Monte Carlo based spreadsheet calculation to estimate airing intervals and mould risk in window ventilated buildings

Gabriel Rojas, University of Innsbruck, Austria

Better Estimation of Cross-ventilation through Roof Windows in an Attic - Possible Improvement for EN 16798-7:2017

Valerie Leprince, Cerema, France

12:30-13:30

Lunch Break



ROOM A / LE JARDIN

13:30-14:45

Session 2A-Topical Session

(Designing buildings ventilation to reduce the risk of airborne pathogens)

Chairs: *Jesica Fernández-Agüera*

The change of paradigm ushered in by COVID 19, along with similar challenges that may arise in the future, has highlighted the importance of designing safe and healthy buildings, deploying (occupancy, ventilation, filtering ...) strategies that lower the risk of disease caused by air-borne pathogens.

The change in paradigm necessitates changes in buildings if occupants are to continue to be able to use them safely for the purposes for which they were built education, work and domestic life. The primary objectives of this session are therefore to identify future trends for designing safe and healthy buildings and to create a platform for debating measures to mitigate the spread of virus aerosols in buildings.

The session is organised around four lectures and an open panel discussion in which brainstorming is welcome.

The lectures will be followed by a Wooclap-mediated online panel discussion to conceptually map session participants' proposals for measures to mitigate the spread of virus aerosols, including: event duration (exposure time); occupancy (proportion of allowable); facemasks: use and type; ventilation; impact of purifying the air.

13:30-14:45 Minimising Hospital Acquired Infections using Good Design: Future Trends

Susan Roaf, *Heriot Watt University, UK*

Covid airborne risk: online tool to develop healthy buildings

Miguel Ángel Campano, *University of Seville, Spain*

Design and Indoor Air Quality in kindergartens in Italy

Samuel Domínguez-Amarillo, *University of Seville, Spain*

Panel Discussion



ROOM B / ROTTERDAM

13:30-14:45 Session 2B-Topical Session
("Towards Smart Ventilation" in Mid-sized buildings)

Chairs: **Hilde Breesch, Jelle Laverge**

This interactive session is an outcome of the collaborative work of the Flemish VLAIO Flux50 strategic basic research (SBO) project "Towards Smart Ventilation in mid-sized buildings" and the International Energy Agency (IEA) Energy in Buildings and Communities Programme (EBC)'s Annex 86 for energy efficient IAQ management strategies. The objective of this seminar is to have an interactive discussion between HVAC experts and building designers on the requirements of highly energy-efficient "Smart Ventilation" systems in mid-sized buildings. Such systems can continually adjust their operation to provide the desired indoor air quality (IAQ) while minimizing energy use, utility bills, thermal discomfort and noise. They should also be responsive to e.g., occupancy shifts, dynamic outdoor conditions, contaminants' sources and can provide information about e.g., IAQ, energy use.

For mid-sized buildings, where the system complexity exceeds the typical 'all-in-one-box' solutions that are available for single-family dwellings, the design of ventilation systems is very conservative and inefficient. Moreover, no method exists today to select the most optimal system and room layout in a specific building based on a coherent set of indicators. This interactive session will aim to address the knowledge gap by presenting a performance assessment framework consisting of a general economic indicator. The indicator can be integrated as an objective function in the design optimization of air distribution networks. The indicator is tailored for different room types, and IEQ parameters (acoustics, resilience, occupant behaviour, sleep).

The use of a global economic indicator is an improvement on the current ventilation design methods, which are driven by minimum requirements for IAQ, energy consumption and/or investment costs. The key takeaway from this seminar is to acknowledge the importance of establishing such an assessment framework for ventilation systems in mid-sized buildings. This seminar will allow participants to interact, through polls and room discussions on the research objectives, methods as well as the possible outcomes and valorization paths.

Wednesday October 5th, 2022

13:30-14:45

Project contents, objectives and structure, organization and work plan

Hilde Breesch, *KU Leuven, Belgium*

General economic indicator for performance assessment of smart ventilation systems

Jelle Laverge, *Ghent University, Belgium*

Occupant-centric control in non-residential buildings

Quinten Carton, *KU Leuven, Belgium*

Discussion with the attendees



ROOM C / COOLSINGEL

13:30-14:45

Session 2C-Topical Session

(Resilient Cooling in a Changing Climate)

Chairs: **Maria Kolokotroni**, **Peter Holzer**

This topical session provides insights into the challenges of resilient cooling in a changing climate. Research outcomes from the EBC Annex 80 as well as findings from topical related research work will be presented. Annex 80 sought to provide a sound basis for the assessment of cooling technologies by creating concise sets of future weather data and heat waves. Agnese Salvati together with Maria Kolokotroni are taking this approach further by assessing the impact of urban microclimate on ventilation and thermal performance of multi-family residential buildings. The definition of Key Performance Indicators (KPI) for resilient cooling has been an important task of Annex 80 since its start in 2019. Abantika Sengupta and Adam O'Donovan present two papers where these definitions are applied in the evaluation of case study buildings in Ireland and Belgium.

Introduction to EBC Annex 80 Resilient Cooling

Peter Holzer, *Institute of Building Research & Innovation, Austria*

Urban microclimate impact on ventilation and thermal performance of multi-family residential buildings: two case studies in different climates and urban settings.

Maria Kolokotroni, *Brunel University London, UK*

Evaluating the present day ambient warming resilience of passively cooled dwellings in Ireland: A data-driven approach

Adam O'Donovan, *Munster Technological University, Ireland*

Evaluation of thermal resilience to overheating for an educational building in future heatwave scenarios

Abantika Sengupta, *KU Leuven, Belgium*



14:45-15:00

Room Change



Wednesday October 5th, 2022



ROOM A / LE JARDIN

15:00-16:30

Session 3A-Long Oral Presentation Session
(Air filtering, cleaning and control)

Chairs: Bjarne Olesen, Alireza Afshari

The role of ventilation in the penetration of outdoor air pollutants
Sara Verheyleweghen, *BBRI, Belgium*

Real-life ventilation filter performance: final results of an in-depth study
Joris Van Herreweghe, *BBRI, Belgium*

Supply air filtration and fine particle levels in indoor air of occupied dwellings
Benoit Golaz, *CETIAT, France*

Tracing of Sars-CoV-2 aerosols with tracer gases in an occupied classroom with mobile air cleaners
Willigert Raatschen, *Tracertech GmbH, Germany*

A novel model based approach of an integrated ventilation and heating model for monitoring and control
Wouter Borsboom, *TNO, Netherlands*



ROOM B / ROTTERDAM

15:00-16:30

Session 3B-Long Oral Presentation Session
(Inspection of ventilation systems, including ductwork airtightness)

Chairs: Samuel Caillou, Valérie Leprince

Ductwork leakage: practical estimation of the impact on the energy overconsumption and IAQ
Nolwenn Hurel, *INIVE/PLEIAQ, France*

Air leakage and pressure loss measurements on calcium silicate ductwork ~
Wolf Bracke, *Ghent University, Belgium*

Field experience with ductwork airtightness improvement after installation in Europe
Nolwenn Hurel, *INIVE/PLEIAQ, France*

Improving Design, Commissioning, Operation and Maintenance in New Residential Ventilation Systems
Michael Lubliner, *Oak Ridge National Labs, USA*

Impact of ventilation non conformities: calculation methodology and on-site examples
Nolwenn Hurel, *INIVE/PLEIAQ, France*

Inspection of ventilation systems - Summary of existing protocols and technical survey
Nolwenn Hurel, *INIVE/PLEIAQ, France*

Wednesday October 5th, 2022



ROOM C / COOLsingEL

15:00-16:30

**Session 3C-Long Oral Presentation Session
(Ventilation performance assessment)**

Chairs: Jelle Laverge, Marcel Loomans

**The monitored performance of the combination of balanced ventilation
with post-conditioning by an air-to-air heat pump**

Bart Cremers, Zehnder Group, Netherlands

**Quantification of the Impact of Indoor Temperature Gradients in Dwellings
on Useful Recovered Heat of Ventilation Systems**

Josué Borrajo Bastero, Ghent University, Belgium

**Multi-nodal model for predicting vertical temperature profile in the
stratum-ventilated large retail facility**

Natalia Lastovets, Tampere University, Finland

**Prediction of Temperature and Contaminant Concentration Profiles
in a Room with Impinging Jet Ventilation System by Zonal Model**

Haruna Yamasawa, Kyushu University, Japan

**Sensitivity analysis on the effects of inhabitant behaviour on the performance of
ventilation systems**

Axel Deturck, Vero Duco, Belgium

16:30-17:00

Coffee Break



Wednesday October 5th, 2022



ROOM A / LE JARDIN

17:00-18:00

**Session 4A-Short Oral Presentation Session
(Ventilation, IAQ and health)**

Chairs: Simon Jones, Pilar Linares

**Effectiveness of personalized ventilation in reducing airborne infection risk
for long-term care facilities**

Marcel Loomans, *Eindhoven University of Technology, Netherlands*



**Indoor Temperature and CO2 in Educational Buildings during a Pandemic Winter
in Spain**

Libertad Manglano, *IETcc- CSIC, Spain*



**How to reduce Covid-19 transmission in a small meeting room using
a Mixed Ceiling Ventilation system**

Regina Bokel, *TU Delft, Netherlands*

**Relationship Between IAQ And Indoor Temperatures of Different Dwellings
In A Temperate Climate During A Pandemic Summer**

Aurora Monge, *University of Navarra, Spain*

Testing positive pressurization technique against radon indoor accumulation

Arturo Martinez, *IETcc-CSIC, Spain*

**Monitoring of air quality and indoor environment in rooms occupied
by houseplants**

Arturo Martinez, *IETcc-CSIC, Spain*

**Impact of Ventilation Type on Indoor Generated PM and VOC Levels
for Different Indoor Activities**

Kevin Verniers, *Agoria/Renson, Belgium*

Air Quality in car parks: regulations

Pilar Linares-Alemparte, *IETcc-CSIC, Spain*

**The indoor environmental quality and energy savings potential of room
ventilation units compared to exhaust-only ventilation systems in France**

Vasileios Filis, *CETHIL, INSA-LYON, CNRS, France*

**Optimal Control of Indoor Environmental Devices for Indoor Air Quality
Using Reinforcement Learning**

Hyeun Jun Moon, *Dankook University, Republic of Korea*

Wednesday October 5th, 2022



ROOM C / COOLSINGEL

17:00-18:00

Session 4C-Short Oral Presentation Session
(Ventilative and resilient cooling)

Chairs: Jaap Hogeling, Samuel Caillou



Evaluating thermal resilience to overheating in a Belgian apartment in thermal shock scenarios

Hanne Vanwynsberghe, *KU Leuven, Belgium*

Evaluating resilient cooling control approaches to climate change in passively cooled low energy primary schools

Elahe Tavakoli, *Munster Technological University, Ireland*

Using trickle ventilators coupled to fan extractors to achieve a suitable airflow rate in an Australian apartment: a CFD modelling approach

Mikael Boulic, *Massey University, New Zealand*



Experimental analysis and design of hydraulic thermoelectric radiant cooling panel

Minseong Kim, *Hanyang University, Republic of Korea*

The effect of draught on performance, comfort and stress – a laboratory study

Henna Maula, *Turku University of Applied Sciences, Finland*

Optimal control of TABS in hot and humid regions

Kiyoto Koga, *The University of Kitakyushu, Japan*



Optimal Control of Circuit-type Double Skin Façade using Air Conditioning Exhaust in a Cascade Manner

Yuko Morishige, *The University of Kitakyushu, Japan*

Integration of domestic ventilation systems with vertical axis wind turbine ventilation technology

Jirayut Sitthipuk, *Edinburgh Napier University, UK*



Performance and Costs of Air Sealing and Ventilation Measures for Home Decarbonization in the US

Iain Walker, *LBNL, USA*



ROOM A / LE JARDIN

18:00-18:15 90 seconds industry presentations

Presented by:

- ACIN instrumenten
- Agoria/Duco
- Agoria/Renson
- Blowerdoor Gmbh
- Dooapp
- Lindab
- Retrotec
- Soudal
- WindowMaster

18:30-20:00 Poster presentations & Student competition – Industry stands

- Cocktail reception with snacks



ROOM A / LE JARDIN

09:00-10:30 Session 5A-Topical Session
(Smart ventilation strategies for residences - practical applications)

Chairs: Jakub Kolarik, Gabriel Rojas-Kopeinig

The IEA EBC Annex 86 Energy Efficient IAQ Management in residential buildings aims to propose an integrated rating method for the performance assessment and optimization of energy-efficient strategies of managing the indoor air quality (IAQ) in new and existing residential buildings.

The fourth subtask of the Annex organizes this topical session focused on "Ensuring performance of smart ventilation." We want to present and discuss the smart ventilation strategies being currently in use in practice.

According to the AIVC: "Smart ventilation is a process to continually adjust the ventilation system in time, and optionally by location, to provide the desired IAQ benefits while minimizing energy consumption, utility bills and other non-IAQ costs (such as thermal discomfort or noise). (...)". Several ventilation producers offer "smart ventilation control" packages as accessories to their home ventilation products. It seems that "smart ventilation" is the future trend. The subtask aims to develop a methodology for assessing and comparing smart ventilation strategies. There are many aspects to consider – the smart ventilation strategies, which already function in practice, suitable rating criteria (preferably performance-based) to evaluate their performance, quality and feasibility of their implementation, durability during operation, and occupant interaction.

The subtask includes all these aspects. We want to show and discuss examples that illustrate this broad range of issues in the topical session. We are also very interested in the views and opinions of the audience.

Thursday, October 6th, 2022



Introduction: Presentation of the IEA-EBC Annex 86 and ST4-smart ventilation subtask

Jakub Kolarik, DTU, Denmark

Energy savings and exposure to VOCs of different household sizes with a smart ventilation system

Klaas De Jonge, Ghent University, Belgium

Smart ventilation toward an assessment of airflow imbalance and supply temperature set-points

Kevin Michael Smith, DTU, Denmark

The durability of performances of humidity-based ventilation after 15 years of operation in French residential buildings

Adeline Mélois, Cerema, France

Demonstration of an innovative room based mechanical ventilation system in a renovated Danish apartment building

Jakub Kolarik, DTU, Denmark

Assessing demand-controlled ventilation strategies based on one CO2 sensor

Gabriel Rojas-Kopeinig, Innsbruck University, Austria

Discussion - exploring opinions, challenges, and barriers related to the application of smart ventilation strategies in practice



ROOM B / ROTTERDAM

09:00-10:30 Session 5B-Topical Session (Building and ductwork airtightness regulations in Europe)

Chairs: Hurel Nolwenn, Jiří Novák

The current trend in most European countries regarding building ventilation is to follow the "build tight, ventilate right" strategy. New energy efficient buildings are indeed getting more and more airtight to avoid energy losses through uncontrolled air leakages. Instead, mechanical ventilation systems are installed to ensure a good indoor air quality (IAQ) with controlled ventilative air flowrates.

In some European countries, minimum requirements for building airtightness are included in EP-regulations, with sometimes a mandatory justification required by testing or applying certified approach, such as in France, Ireland and United Kingdom. As a result, building airtightness tests are getting commonly performed on new buildings in many European countries to quantify and limit air leakage through the envelope.

On the other hand, if the significant impact of leaky ventilation ductworks on energy use and IAQ has been well established in the literature, the awareness on this issue is raising more slowly.

In 2008 a series of Ventilation Information Papers – VIPs were published by the AIVC, detailing the "Trends in the building ventilation market and drivers for changes" for 10 countries. Regulations have however evolved a lot in most countries since then. A new series of VIPs is being published to get an update on the current regulations in European countries regarding building and ductwork airtightness. They include for both, when relevant, information on: national requirements and drivers: airtightness indicator, requirements in the regulation, energy programs, airtightness justifications, sanctions, etc.; if it is included in the energy calculations and how; the airtightness test protocol: qualification for the testers, guidelines, requirements on measuring devices; tests performed: tested buildings/ductworks, database, evolution with time; guidelines to build airtight buildings/ductworks.

09:00-10:30 Intro: Presentation of the series of AIVC VIPs on building and ductwork airtightness regulations

Nolwenn Hurel, INIVE/PLEIAQ, France

Building and ductwork airtightness in Belgium: national trends and requirements
Liesje Van Gelder, BCCA, Belgium

Building and ductwork airtightness in the Czech Republic: national trends and requirements

Jiří Novák, Czech Technical University in Prague, Czech Republic

Building and ductwork airtightness in Estonia: national trends and requirements
Jaanus Hallik, Tallinn University of Technology, Estonia

Building and ductwork airtightness in France: national trends and requirements
Bassam Moujalled, Cerema, France

Airtightness versus local mentality in Greece
Theodoros Sotirios Tountas, FUV, Greece

10:30-11:00

Coffee Break

Thursday, October 6th, 2022



ROOM A / LE JARDIN

11:00-12:30

Session 6A-Long Oral Presentation Session
(Role of ventilation in epidemic preparedness)

Chairs: Arnold Janssens, Pawel Wargocki

Using a solar air heater to ventilate classrooms during the winter season in New Zealand: a potential alternative solution to assist during COVID 19 outbreaks

Mikael Boulic, *Massey University, New Zealand*

A CFD-based framework to assess COVID-19 airborne infection risk and the effect of openings

Giulio Vita, *Wirth Research, UK*

Evaluation of ventilation performance and compliance with Belgian covid-19 ventilation guidelines in sport infrastructure

Arnold Janssens, *Ghent University, Belgium*

Application of Indoor Carbon Dioxide During the COVID-19 Pandemic

Andrew Persily, *NIST, USA*

Comparing indoor air quality in naturally ventilated and air-conditioned hospitals in the tropics

Ben Roberts, *Loughborough University, UK*

The role of ventilation on aerosolized virus in multizone buildings

Gaelle Guyot, *Cerema, Univ. Savoie Mont Blanc, France*



Thursday, October 6th, 2022



ROOM B / ROTTERDAM

11:00-12:30

Session 6B-Topical Session (Durability of building airtightness - on-site and laboratory studies)

Chairs: Valérie Leprince, Andrés Litvak

Air leakages have an increasing impact on the overall energy performance of new buildings. Therefore, since the early 2000's, regulations in many countries explicitly account for airtightness, sometimes with mandatory requirements, as a consequence of Europe's ambition to generalize nearly zero energy buildings by 2030. However, having a requirement on building airtightness is relevant only if the airtightness level is durable. Nevertheless, studies have shown that a mandatory level of airtightness leads to last-minute taping and mastic setting that is most probably not durable.

The durability of airtightness products and assemblies at mid- and long-term scales is, therefore, a pending question. Indeed, this subject remains very complex, since it covers in the meantime the modelling of the mechanisms of buildings' and products' loads and deformations, the accelerated ageing in laboratory-controlled conditions and, the performance characterization from field measurements results.

In the past years, several studies have focused on this issue using two different approaches. Some studies seek to characterize the evolution over time of the airtightness by field measurements in real buildings. The other studies are based on laboratory measurements in order to test the accelerated ageing of airtightness products.

Lesson learnt from the state of the art of the durability of airtightness: on-site measurements

Nolwenn Hurel, INIVE/PLEIAQ, France

Field study on the evolution of air tightness in 30 Belgian dwellings

Stijn Verbeke, University of Antwerp, Belgium

Lesson learnt and new protocol for the Durabilit'air 2 project

Bassam Moujalled, Cerema, France

Lesson learnt from the state of the art of the durability of airtightness: laboratory measurements

Valerie Leprince, Cerema, France

Impact of implementation conditions on the durability

Nolwenn Hurel, INIVE/PLEIAQ, France

Lesson learnt and new protocol for the Durabilit'air project: laboratory measurement

Andrés Litvak, Cerema, France

Discussion with the audience

Thursday, October 6th, 2022



ROOM C / COOLSINGEL

11:00-12:30

Session 6C-Topical Session

(New IEA EBC Annex 87 on Personalized Environmental Control Systems (PECS))

Chairs: Bjarne W. Olesen, Ongun Berk Kazanci

Personalized Environmental Control System (PECS) with the functions of heating, cooling, ventilation, lighting and acoustic has advantages of controlling the localized environment at occupant's workstation by their preference instead of conditioning an entire room. This improves personal comfort, health and energy efficiency of the entire heating, ventilation and air-conditioning (HVAC) system substantially. Personalized ventilation will also protect against cross contaminations, which are critical in open-plan offices and work places with close distance. There will in the future be an increasing interest and market for PECS as buildings will need to be pandemic-proofed. The application is for work places with mainly sedentary activity such as offices (such as open-plan, banks, control centers). Due to the pandemic, where many people worked at home, there will be an increase in home working places where PECS may be a solution.

A new IEA EBC Annex (Annex 87 – Energy and Indoor Environmental Quality Performance of Personalised Environmental Control Systems) has recently started and has the overall objective to establish design criteria and operation guidelines for PECS and to quantify the benefits regarding health, comfort, energy, and cost 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 includes all types of PECS for local heating, cooling, ventilation, air cleaning, lighting and acoustic. It includes desktop systems, which are mounted on desks or integrated in furniture or chairs with heating/cooling and ventilation functions. It also includes wearables, where heating/cooling and ventilation are included in garments or devices attached to occupants' body.

The session will introduce the new Annex and discuss several aspects related to the new Annex to gather input from the conference audience.

Introduction to IEA EBC Annex 87

Bjarne W. Olesen, DTU, Denmark

Advantages and limitations of Personalized Environmental Control Systems (PECS)

Ongun Berk Kazanci, DTU, Denmark

Past and Recent Developments of Personalized Environmental Control Systems

Jun Shinoda, DTU, Denmark

A qualitative evaluation of the resiliency of Personalized Environmental Control Systems (PECS)

Jun Shinoda, DTU, Denmark

12:30-13:30

Lunch Break



ROOM B / ROTTERDAM

13:30-15:00

Session 7B-Long Oral Presentation Session (IEQ evaluation)

Chairs: Andy Persily, Simon Jones

Health impacts of indoor air contaminants determined using the DALY metric
Gioberti Morantes, *University of Nottingham, UK*

Indoor environmental quality rating using the TAIL scheme
Pawel Wargocki, *DTU, Denmark*

The challenge of rating energy efficient IAQ management strategies: welcome to IEA-EBC Annex 86
Jelle Laverge, *Ghent University, Belgium*

Hemp concrete walls: evaluation of the relationship between CO2 and TVOC
Irene Lara-Ibeas, *Eurac Research, Italy*

Archetypes of public secondary schools in Mediterranean climate. Indoor air quality and comfort field studies
Jesús Llanos Jiménez, *University of Seville, Spain*

How to collect reliable information regarding occupants' behavior during IAQ campaigns? Performance 2 project first feedbacks
Adeline Mélois, *Cerema, France*



ROOM C / COOLSINGEL

13:30-15:00

Session 7C-Topical Session

(Ventilative cooling to reduce overheating in buildings in ventilation related standards and legislation in the context of well-being, sustainability and energy)

Chairs: Christoffer Plesner, Jannick K. Roth

Ventilative cooling (VC) is widely used as a key element when designing a building to cope with overheating. This part focuses on the indoor climate aspects. However, the focus towards well-being, sustainability and energy use are now on the agenda in many countries. VC can, when designed correctly, tap into these three aspects and promote buildings with higher degree of well-being, be a part of the sustainability agenda and result in a reduced energy use. It should be noted that there to some extent is an overlap of the three mentioned aspects; well-being, sustainability and energy use.

VC can under the right conditions be a very good main alternative, supplementary solution to mechanical cooling systems.

Thursday, October 6th, 2022

13:30-15:00 *Low energy buildings are highly insulated and airtight and therefore subject to overheating risks, where VC might be a relevant solution. VC is an application (distribution in time and space) of air flow rates to reduce cooling loads and overheating in spaces using outside air driven by natural, mechanical or hybrid ventilation strategies. Ventilative cooling reduces overheating in both existing and new buildings – being both a sustainable and energy efficient solution to improve indoor well-being, hereunder thermal comfort. VC is further an important topic supported by the International Energy Agency (IEA) – where the project, IEA Annex 62 Ventilative cooling had a special focus on this area finishing the project in 2018.*

The purpose of this workshop is to evaluate and discuss how ventilative cooling is a mean to reduce overheating in buildings to achieve good well-being in ventilation related standards and legislation in the context of well-being, sustainability and energy.

13:30-15:00 Introduction

Christoffer Plesner, VELUX A/S, Denmark & **Jannick Roth**, WindowMaster International A/S, Denmark

Upcoming European and International technical documents on "Ventilative cooling systems - Design" in CEN/ISO

Christoffer Plesner, VELUX A/S, Denmark & **Jannick Roth**, WindowMaster International A/S, Denmark

How is VC a part of resilient cooling strategy and what to be aware of in the early-stage design?

Paul O'Sullivan, Munster Technological University, Ireland

How does well-being and the revision of EN 16798-1 fits into VC?

Bjarne W. Olesen, DTU, Denmark

Is VC a renewable energy solution and how does it fit into the sustainability agenda?

Ivan Pollet, Renson, Belgium

Is VC a relevant and future proof cooling solution?

Peter Holzer, Operating Agent EBC Annex 80, Institute of Building Research & Innovation, Austria

Why choose hourly calculation procedures - and the relation to the VC potential tool?

Dick van Dijk, EPB Center, Netherlands

Questions and open Discussion

Facilitated by **Christoffer Plesner**, VELUX A/S, Denmark & **Jannick Roth**, WindowMaster International A/S, Denmark

15:00-15:15 Room Change



Thursday, October 6th, 2022



ROOM A / LE JARDIN

15:15-16:45 Closing Session

Chairs: Arnold Janssens, Peter Wouters

Digital tranformation for energy neutral building with a healthy environment

Lieve Declercq, SPIE Nederland B.V., Netherlands

Summing up of the "Smart ventilation, IAQ & Health" track

Benjamin Jones, University of Nottingham, UK

Summing up of the "Airtightness" track

Valerie Leprince, Cerema, France

Summing up of the "resilient ventilative cooling" track

Hilde Breesch, KU Leuven, Belgium

Best paper/poster award & Student Competition awards

Announcement of 2023 conference

Closing

17:00

End of Conference

October
5-6, 2022

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