Newsletter
Air Infiltration and Ventilation Centre

Foreword

@AIVCnews

We are very pleased to announce that the Executive Committee of the International Energy Agency (IEA) Energy in Buildings and Communities (EBC) Programme approved the continuation of the AIVC for the period 2022-2026. This extension will give us the opportunity to continue developing, collecting and disseminating the knowledge needed to address emerging challenges, concerns and opportunities in the field of air infiltration and energy efficient ventilation.

In this issue you will find links and information on major upcoming AIVC events and newly released AIVC publications as well as an article on the development of daytime radiative cooling materials. Moreover, this issue will inform you on the on-going AIVC COVID-19 project and redirects to more detailed information available on our website.

We wish you a pleasant reading and look forward to seeing you in our future events. We would also like to encourage you to visit our website, follow us on twitter and LinkedIn and subscribe to our monthly newspaper "Energy Efficiency and Indoor Climate in Buildings".

Peter Wouters, Operating Agent AIVC

no 19
March 2021

13 -15 September 2021 – 41st AIVC - ASHRAE IAQ joint conference in Athens, Greece

The conference "IAQ 2020: Indoor Environmental Quality Performance Approaches Transitioning from IAQ to IEQ", organized by ASHRAE and AIVC, will be held on September 13-15, 2021 in Athens, Greece. The conference will also be the 9th TightVent and 7th venticool conference. Indoor Air Quality (IAQ) has been the core of ASHRAE'S IAQ series of conferences for the past 30 years.

This conference will expand from Indoor Air Quality to Indoor Environmental Quality (IEQ). IEQ includes air quality, thermal comfort, acoustics, and illumination and their interactions. The particular focus of this conference is on performance approaches including the metrics, systems, sensors and norms necessary to implement them.

Conference topics

• Health and Well-being: Appropriate technical and operational definitions • Performance Metrics: For all aspects of IEQ • Interactions: Interactions between IEQ parameters • Occupant Behavior: How behavior impacts IEQ and how IEQ impacts behavior - psychological dimensions of IEQ • Smart Sensors and Big Data: Sensor properties, data management, cybersecurity, applications • Smart Controls: Equipment properties, commissioning, equivalence • Resilience and IEQ: Responding to climate change and disasters • Ventilation: Mechanical, passive, natural and hybrid systems • Air Tightness: Trends, methods and impacts • Thermal Comfort: Dynamic approaches, health impacts and trends • Policy and Standards: Trends, impacts, implications • Role of ventilation and building airtightness in epidemic preparedness • Filtration and disinfection options to control COVID19 • Face-covering impacts on indoor air quality • HVAC and IEQ in a post-COVID world

For more information, please visit:

https://www.ashrae.org/conferences/topical-conferences/indoor-environmental-quality-performance-approaches

or contact: hblauridson@ashrae.org

In this issue

Air Infiltration and Ventilation Centre

AIVC 2022-2026

On November 11, 2020, the executive committee of the IEA Technical Collaboration Programme Buildings and Communities (EBC TCP), approved a new extension period for the AIVC starting from 2022 till 2026, i.e. a 5 years extension. Peter Wouters (INIVE-BBRI) and Arnold Janssens (INIVE-UGent) will be on behalf of INIVE the operating agents for this new period.

Through its activities as an international high-quality information centre on air infiltration and energy efficient ventilation, and by facilitating information exchange between experts in research, industry and policy making, AIVC will continue to be extremely valuable to develop, collect and disseminate the knowledge needed to address emerging challenges, concerns and opportunities in the field.

AIVC will continue its focus on the challenges of energy efficient ventilation in near-zero energy buildings. Specific topics of interest include design and rating tools (including LCA and BIM-integration), regulations and standards, smart controls, healthy and comfortable buildings, and disaster preparedness. AIVC will also focus on improving ventilation performance in existing buildings. Specific topics of interest include the current status of existing ventilation systems, installation/renovation/replacement of ventilation systems, procedures for commissioning, inspection and maintenance.

For this new operating period, the approach adopted during the previous operating period will be continued. AIVC's activities are to a large extent structured around collaborative projects to collect and disseminate knowledge on specific topics of interest. The AIVC will in this next operating period continue to play a role in the identification of topics for new EBC ventilation related annexes, facilitating the process for annex preparation and, if requested by the ExCo, in monitoring progress. This was done for annex 68 on Design and Operational Strategies for High IAQ in Low Energy Buildings, and annex 78 on Supplementing Ventilation with Gas-phase Air Cleaning, during the present operating period.

AIVC & EBC Annex 86 upcoming webinars

The Air Infiltration and Ventilation Centre & the IEA EBC Annex 86 "Energy Efficient Indoor Air Quality Management in Residential Buildings" are organizing a workshop consisting of a series of four webinars on:

- April 1st, 2021 (17:00-18:30 CET) – Building ventilation: How does it affect SARS-CoV-2 transmission? (Register here)
- April 8th, 2021 (09:00-10:30 CET) – IAQ and ventilation Metrics (Register here)
- April 13th, 2021 (17:00-18:30 CET) – Big data, IAQ and ventilation – part 1 (Register here)
- April 21st, 2021 (17:00-18:30 CET) – Big data, IAQ and ventilation – part 2 (Register here)

Detailed information on each event can be found at: https://www.aivc.org/events/webinars

Feedback from AIVC Webinars of November 2020 to January 2021

During the period November 2020 to January 2021, the Air Infiltration and Ventilation Centre (AIVC) organized 4 webinars.

1. 20 November 2020: COVID-19 Ventilation related guidance by ASHRAE and REHVA: 406 participants; Organizer: AIVC with support from ASHRAE and REHVA;Recordings & Slides: https://www.aivc.org/event/20-november-2020-webinar-covid-19-ventilation-related-guidance-ashrae-and-rehva

2. 30 November 2020: Better Quantifying and Locating Building Leakages; 145 participants;Organizer: AIVC with support from TightVent;Recordings & Slides: https://www.aivc.org/event/30-november-2020-webinar-better-quantifying-and-locating-building-leakages

3. 9 December 2020: Resilient Ventilative Cooling in practice;194 participants; Organizer: AIVC & venticool with support from IEA EBC Annex 80 Resilient Cooling of Buildings , the IEA-EBC Annex 62 Ventilative Cooling; Slides: https://www.aivc.org/event/9-december-2020-webinar-resilient-ventilative-cooling-practice

4. 19 January 2021: Building airtightness improvements of the building stock- Analysis of European databases; 179 participants; Organizer: AIVC with support from TightVent; Recordings & Slides: https://www.aivc.org/event/19-january-2021-webinar-building-airtightness-improvements-building-stock-analysis-european

The full collection of past events' recordings and slides can be found at https://www.aivc.org/events/webinars. Check them out and subscribe to our YouTube channel to receive our latest video updates!

AIVC's latest publications

In March 2021 the AIVC released Ventilation Information Paper (VIP) #41, "Impact of wind on the airtightness test results". This paper was the result of the work of the AIVC Working Group (WG) "Integrating uncertainties due to wind and stack effect in declared airtightness results".

The paper aims to: present and discussing the calculation method of standard ISO 9972 regarding the uncertainty induced by wind; gather published knowledge and determining what further research is needed on the quantification of the wind impact on airtightness tests results. This includes numerical simulations, laboratory and on-site measurements studies;give guidance for minimizing and better estimating the wind impact on airtightness tests results.

Access to the publication is free upon registration. Please use the links provided below to download the document: https://www.aivc.org/resource/vip-41-impact-wind-airtightness-test-results

New AIVC website

After several months of hard work and dedication, we are happy to introduce you to our brand new website (www.aivc.org/), launched in January 2021. Since 2013, the AIVC website had the same look and feel and we thought it was time for a fundamental change. Some of the major changes are: new design; easy navigation; new content; improved search for AIRBASE. At present, AIRBASE contains abstracts of 22754 publications and more than 16200 related full documents while access to the publications is free of charge upon registration!

Air Infiltration and Ventilation Centre

AIVC COVID-19 Working Group Outcomes

The AIVC board decided in their last (online) meeting of September 2020 to start a project to collect, discuss and disseminate information about COVID-19 in relation to ventilation and airtightness. A working group(WG) was created to define the activities and outputs of the project with the title 'Ventilation, airtightness and COVID-19'.

One of the outcomes of the project is the development of a number of questions and answers by WG members to address issues in relation to COVID-19 and building ventilation in line with most recent scientific understanding. In November 2020 & February 2021, the WG released 2 special issues of the AIVC newsletter presenting questions and answers provided by the WG (more elaborate answers are also available on the FAQ-section of the AIVC-website).

The AIVC WG also organizes a number of webinars in line with the project objectives. The webinar "COVID-19 Ventilation related guidance by ASHRAE and REHVA" was held on November 20th, 2020 with support from ASHRAE (https://www.ashrae.org/) and REHVA (https://www.rehva.eu/). 406 people from 42 countries attended the webinar. A new webinar, digging deeper into the role of building ventilation on COVID-19 transmission is planned on April 1st, 2021.

We would like to encourage you to check the detailed outcomes of the project listed here:

• Frequently Asked Questions developed by AIVC addressing issues in relation to COVID-19 available at: https://www.aivc.org/resources/faqs

• The first special issue of the AIVC newsletter released in November 2020 available at: https://www.aivc.org/content/aivc-newsletter-special-issue-covid-19-november-2020

• The second special issue of the AIVC newsletter released in February 2021 available at: https://www.aivc.org/content/aivc-newsletter-special-issue-covid-19-february-2021

• The slides and recordings of the webinar "COVID-19 Ventilation related guidance by ASHRAE and REHVA held in November 2020 available at: https://www.aivc.org/event/20-november-2020-webinar-covid-19-ventilation-related-guidance-ashrae-and-rehva

• AIVC Webinar on Building ventilation: How does it affect SARS-CoV-2 transmission? - 1 April 2021 (17:00-18:30 CET). Register at: https://www.aivc.org/event/1-april-2021-webinar-building-ventilation-how-does-it-affect-sars-cov-2-transmission

If you have specific questions related to COVID-19 and ventilation, please let us know by writing an email to info@aivc.org.

The development of daytime radiative cooling materials

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Remark*: This article has no direct link with ventilation, but the technology of radiative cooling materials is important when considering resilient ventilative cooling. It allows to reduce the urban heat island effect (lower external temperatures) and, when applied on the building envelope, reduce the thermal load to the building. Overall, it can increase the potential of ventilative cooling.*

Driven mostly by increased CO_2 emissions into the atmosphere and other anthropogenic activities, our planet's average surface temperature has risen about 1.18 °C since the late 19th century [1]. From a regional perspective, due to the higher density of population, buildings, and the aggregation of living and industrial activities in the urban area, it is experiencing up to 10 °C higher temperature than the surrounding suburban region, which is referred to as Urban Heat Island (UHI) [2]. Overheating in cities exacerbates energy problems, deteriorates thermal comfort conditions, brings health problems to vulnerable populations, and causes tremendous economic losses [3]. Daytime radiative cooling is a passive cooling technique and is a widely researched field with very high potential. To achieve effective radiative cooling, a device needs to have a high reflectance in the shortwave range to minimize the absorption of solar radiation, and high emittance in 8-13 µm to maximize the heat dissipation as the transparent atmospheric window is located here. Night-time sub-ambient performance has long been demonstrated. But daytime sub-ambient cooling has only been reported broadly in recent years as nanotechnology and photonic structures have developed [4]. In 2014, a photonic radiative cooler was measured in Stanford, California [5]. It was a photonic structure fabricated using electron beam evaporation. When exposed to solar radiation over 850 W/m^2, its surface temperature reached 4.9 °C lower than that of the ambient. Using a thin polyethylene cover as a windshield, its cooling capacity could reach 40.1 W/m^2. In another research, in winter at Stanford, direct shading and vacuum chambers were used to eliminate non-radiative heat transfer [6]. When the photonic surface was exposed to the sun, it presented a maximum 42°C sub-ambient temperature when solar radiation reached its peak.

However, the high cost and the inability of photonic structures to be scalable manufactured greatly limits their large-scale application in practice. The latest advances in low-cost and scalable radiative coolers, such as the application of polymers, sprays, or paints, have shown a very promising image in the real world and can make significant long-term cost savings. Increasingly, more scalable polymers are being tested and proved to be potential emitters for radiative cooling purposes. They are materials with an intrinsic eligible emissivity for radiative cooling, like those with some functional groups (C-F, C-N, C-Cl, and C-O) like polyvinylidene fluoride (PVDF) [7], poly(methyl methacrylate) (PMMA) [5], polymethylpentene (TPX) [8], polytetrafluoroethylene (PTFE) [9], etc. Among the newly reported scalable radiative cooling devices, silica has been proposed as the emitter in a large part due to the emissivity peak at around 9 µm. Silica at its nano or micro-scale can be randomly dispersed in a uniform transparent medium or suspended independently in the air to form a scalable emitter, as shown in Figure 1. In 2017, a hybrid structure consisting of silica spheres distributed in the TPX matrix was produced by scalability. When combined with silver coating, it was demonstrated to generate an average cooling power larger than 110 W/m^2 over

72-hour continuous measurements in Cave Creek, Arizona [10].

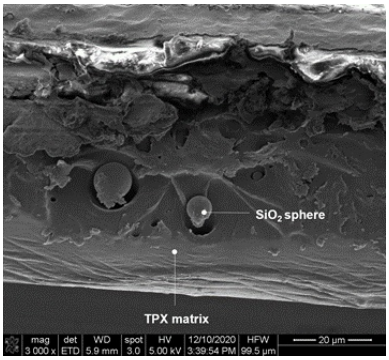

Figure 1: Scanning electron microscopy image of silica spheres randomly dispersed in a 50µm-thick transparent TPX medium.

For more info see also www.coolroofcouncil.eu and www.coolroofs.org.

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