Air Infiltration and Ventilation Centre

EBC ANNEX 5

EBC Annex 5 'Air Infiltration & Ventilation Centre' has been running since 1979. Its principal goal is to provide reference information on ventilation and air infiltration in the built environment regarding efficient energy use and good Indoor Environmental Quality (IEQ). Whereas in the early years, the focus was more on 'technical ventilation expertise', during the last decade increased emphasis has been given to 'ventilation networking' and 'advanced and innovative dissemination strategies.'

Objectives

The objectives of the AIVC are to:

- identify emerging issues on ventilation and infiltration in new and renovated buildings;
- facilitate better design, implementation, hand-over and maintenance of ventilation systems;
- provide discussion platforms, including conferences, workshops and webinars.

Deliverables

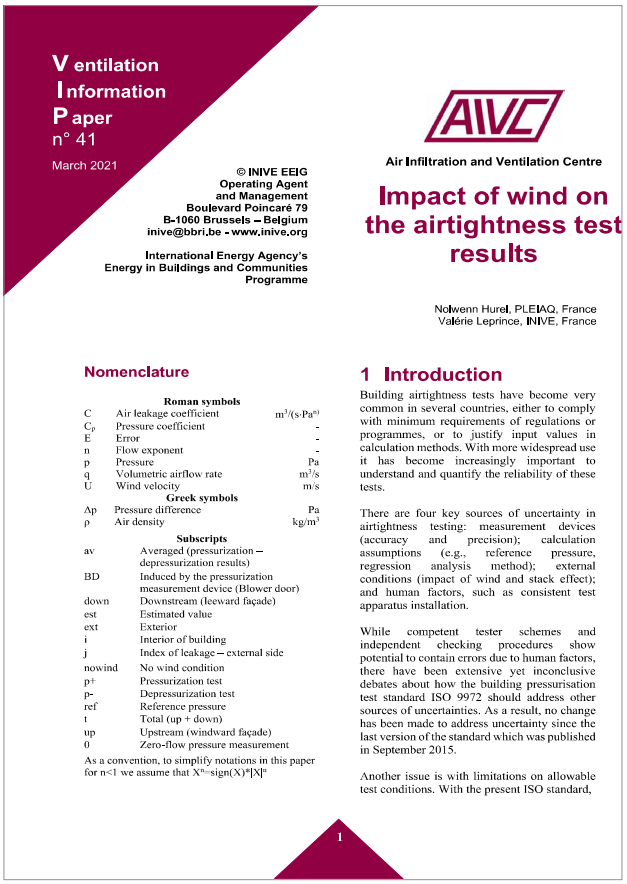
- Events: annual conference, one to two workshops per year on specific topics, and one to two webinars per year;
- Publications: conference and workshop proceedings, technical notes and contributed reports [one per year], and a biannual newsletter

Progress

In 2021, the AIVC focused its work mainly on fourteen projects, five of which were initiated in 2021. Due to the COVID-19 pandemic it was not possible to organise in-person events, including the annual AIVC Conference and planned workshop. Instead, this resulted in the organisation of ten webinars. Furthermore, the AIVC facilitated remote discussions and dissemination activities for EBC Annex 80 'Resilient Cooling of Buildings' and EBC Annex 86 'Energy Efficient Indoor Air Quality Management in Residential Buildings'.

The recently launched AIVC projects are entitled 'Energy recovery ventilation', 'Personalized environmental control systems (PECS)', 'Impact of IoT on ventilation systems', 'Airtightness status at country level' and 'Ventilation status at country level'.

Previously launched projects which were still running in 2021 include: 'Ventilation, airtightness and COVID-19', 'Temperature take-back effect in the context of energy efficient ventilation strategies', '40 Years of AIVC', 'Rationale behind ventilation requirements and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International Energy Agency's Energy in Buildings and Communities Programme

Air Infiltration and Ventilation Centre

Impact of wind on the airtightness test results

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Nomenclature

Roman symbols

C	Air leakage coefficient	$m^3/(s \cdot Pa^n)$
C_p	Pressure coefficient	-
E	Error	-
n	Flow exponent	-
p	Pressure	Pa
q	Volumetric airflow rate	m^3/s
U	Wind velocity	m/s

Greek symbols

Δp	Pressure difference	Pa
ρ	Air density	kg/m^3

Subscripts

av	Averaged (pressurization – depressurization results)
BD	Induced by the pressurization measurement device (Blower door)
down	Downstream (leeward façade)
est	Estimated value
ext	Exterior
i	Interior of building
j	Index of leakage – external side
nowind	No wind condition
p+	Pressurization test
p-	Depressurization test
ref	Reference pressure
t	Total (up + down)
up	Upstream (windward façade)
0	Zero-flow pressure measurement

As a convention, to simplify notations in this paper for n<1 we assume that $X^n = sign(X)*|X|^n$

1 Introduction

Building airtightness tests have become very common in several countries, either to comply with minimum requirements of regulations or programmes, or to justify input values in calculation methods. With more widespread use it has become increasingly important to understand and quantify the reliability of these tests.

There are four key sources of uncertainty in airtightness testing: measurement devices (accuracy and precision); calculation assumptions (e.g., reference pressure, regression analysis method); external conditions (impact of wind and stack effect); and human factors, such as consistent test apparatus installation.

While competent tester schemes and independent checking procedures show potential to contain errors due to human factors, there have been extensive yet inconclusive debates about how the building pressurisation test standard ISO 9972 should address other sources of uncertainties. As a result, no change has been made to address uncertainty since the last version of the standard which was published in September 2015.

Another issue is with limitations on allowable test conditions. With the present ISO standard,

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The AIVC Ventilation Information Paper Number 41 on the impact of wind on airtightness test results was published in March 2021.
Source: EBC Annex 5

regulations', 'Integrating uncertainties due to wind and stack effect in declared airtightness results', 'Indoor air quality metrics', 'Residential cooker hoods', 'Competent tester schemes for building airtightness testing' and 'Air cleaning as alternative for ventilation'.

During 2021, the AIVC published four Ventilation Information Papers: 'VIP 41: Impact of wind on the airtightness test results' in March; 'VIP 42: The concept for substituting ventilation by gas phase air cleaning' in April; 'VIP 43: Residential ventilation and health' in July and; 'VIP 44: Residential cooker hoods' in September. Moreover, in the framework of the AIVC's 'COVID-19' project, two AIVC newsletter special issues were published in February and July 2021. The first special issue was published in November 2020. The project '40 years of AIVC', is now close to completion following the delivery of two Technical Notes '40 years to build tight and ventilate right: From infiltration to smart ventilation' and '40 years to build tight and ventilate right: History of the AIVC', highlighting the progress and outcomes over these 40 years with contributions from various AIVC Board experts. The publications are soon to be published in the first quarter of 2022. The project 'Rationale behind ventilation requirements and regulations' is coming to the end, and a Technical Note will be published in 2022.

The AIVC organized ten webinars over the course of 2021 including one webinar on 'Building airtightness databases' (in the UK, Flanders and France) in January 2021; four webinars on 'Building ventilation & SARS-CoV-2 transmission', 'IAQ and ventilation metrics' and 'Big data, IAQ and ventilation' (part 1, part 2) in April 2021; one webinar on 'Resilient ventilative cooling' in June 2021; one webinar on 'Smart materials' in October 2021 and; three webinars on 'Smart ventilation,' 'Impact of wind on airtightness test results' and the 'Inspection of ventilation systems' in November 2021.

To gain more interaction with related organizations and a stronger societal impact, the AIVC is a founding member of the Indoor Environmental Global Alliance (www.ieq-ga.net). There is also ongoing close collaboration with the TightVent platform (www.tightvent.eu) and the Venticool platform (www.venticool.eu).

The Advisory Board of Practitioners, is also a new initiative from EBC Annex 80, AIVC and Venticool, launched in March 2021 and seeking to establish a format for regular exchange between EBC Annex 80 scientists and practitioners and planners as well as representatives from relevant industries.

Editions of the AIVC newsletter were published in 2021 as listed below:

- March 2021
- September 2021
- February 2021 (Special Issue on COVID-19)
- July 2021 (Special Issue on COVID-19)

Meetings

The AIVC Board organized two board online meetings in 2021, in March and October.

Project duration
1979–2026

Operating Agent
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Participating countries
Australia, Belgium, P.R. China, Denmark, France, Greece, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Republic of Korea, Spain, Sweden, UK and USA

Further information and reports
www.iea-ebc.org

www.aivc.org