Feedback from the 42nd AIVC-10th TightVent & 8th venticool Conference: Summary of the airtightness track

The AIVC – TightVent - venticool 2022 joint Conference “Ventilation Challenges in a Changing World", organized by the International Network on Ventilation and Energy Performance (INIVE) on behalf of the Air Infiltration and Ventilation Centre (AIVC), the Building and Ductwork Airtightness Platform (TightVent Europe), the international platform for ventilative cooling (venticool) & the Dutch Organization for Applied Scientific Research (TNO), was held on 5-6 October in Rotterdam, Netherlands. The event drew just over 140 participants - researchers, engineers & architects, policy makers or regulatory bodies, manufacturers & stakeholders and international organizations from 22 countries.

The programme included 3 parallel tracks of structured sessions with around 130 presentations covering the main conference topics namely: Smart Ventilation, Indoor Air Quality (IAQ) and Health; Building & Ductwork Airtightness; Ventilative cooling – Resilient cooling. A special session i.e. “90 seconds industry presentations” was also organized and devoted to the sponsors of the event.

The event has also been a major discussion place for on-going projects such as, the IEA EBC annex 87 “Energy and Indoor Environmental Quality Performance of Personalized Environmental Control Systems”, and the IEA EBC Annex 80 “Resilient Cooling of Buildings”.

The airtightness track at the AIVC 2022 conference consisted of 24 presentations organised in 4 sessions of which 2 were topical sessions with a number of invited presentations. Three main topics were discussed: what are the national regulations regarding building and ductwork airtightness? How to check the implementation? And what about the building airtightness durability over time?

National regulations regarding building and ductwork airtightness

A topical session was held to present a series of AIVC Ventilation Information Papers on building and ductwork airtightness regulations, with 5 presentations from 5 European countries with different strategies:

- airtightness requirements with mandatory justification in France (since 2013 for residential buildings; 2022 for non-residential ones) (Moujalled & Mélois, 2022);
- penalizing airtightness default values for energy calculations: very high default leakage rates in Flanders resulting in almost 100% new buildings tested (Van Gelder, De Strycker, Delmotte, &

Janssens, 2022); less penalizing default values in Estonia with roughly a quarter of new buildings tested (Kalamees, Hallik, & Mikola, 2022);
- financial subsides in the Czech Republic with less than 15% of new residential buildings tested (Novák, Adamovský, & Vitouš, 2022);
- no regulation and no incentives in Greece, with a population that has a bad opinion on building airtightness, and very few tests performed (Tountas , 2022).

Checking airtightness and ventilation systems

Building airtightness tests can be challenging for some buildings. Stephanie Rolfsmeier presented the lessons learned from an airtightness measurement of a 100-meter high-rise building (Rolfsmeier, Mairinger, Neubig, & Gayer, 2022). They encountered difficulties, for example to handle the stack effect (inducing a difference of about 100 Pa between bottom and top) and create a relatively uniform pressure; nevertheless, the test was successful and can provide hints to improve standard ISO 9972.

In addition to measuring the global envelope airtightness, locating leakages is also important. Bassam Moujalled mentioned that in France a visual detection of leakage is mandatory but it is time consuming. He presented statistics on frequency of occurrence, as all test results must be uploaded to the national database but mentioned that it is difficult to quantify their impact (Moujalled, Mélois, Leprince, & Guyot, 2022). As an alternative to the classic IR thermography, Benedikt Kölsch presented a leakage detection method combining lock-in thermography with 3 blower excitations at a known frequency (Kölsch, Pernpeintner, Schiricke, & Lüpfert, 2022). Fourier transforms result in amplitude and phase images highlighting the areas affected by leaks and reducing unwanted artefacts.

With airtight buildings comes the necessity of good ventilation systems to ensure proper indoor environmental quality. Nolwenn Hurel presented a summary of 21 inspection protocols, showing that they are very different from one another (Hurel & Leprince, 2022). As stressed by Michael Lubliner the more elaborated the system and the tighter the house, the more important it is to check the system on a regular basis (Lubliner, 2022).

One quality of a good ventilation system is its airtightness. The awareness on this issue is still low compared to building airtightness. Nolwenn Hurel presented a simplified method to estimate the impact of ductwork leakage (Hurel & Leprince, 2022) with application on real buildings as well as 4 other ventilation non-conformities (Hurel & Leprince, 2022). She also showed the good performance of the Aeroseal process on a large variety of buildings across Europe, using an aerosol to seal leaky ductworks (Hurel, Leprince, & Tölke, 2022). Wolf Bracke showed that calcium silicate ductwork used for their fire properties have similar airtightness levels as metallic ductworks (ATC leakage class 4 on average) and could reach class 2 using this Aeroseal process (Bracke, Janssens, Annerel, & Van Maele, 2022).

Airtightness durability

In a Topical Session dedicated to airtightness durability, the literature review published in AIVC's Technical Note 71: Durability of building airtightness (Leprince, Hurel, & Moujalled, 2022) was presented. On-site measurements show a large variability depending on the tested houses, but with an average leakage increase of 24%, which seems to occur mainly during the first year(s) after completion. This tendency was confirmed by Lukas Vandenbogaerde (Vandenbogaerde , Verbeke , Swinnen, & Audenaert, 2022) with a study on 30 Belgian dwellings. The lack of standardized protocols to test airtightness durability in laboratory with artificial ageing was outlined, as well as the significant impact of implementation conditions. The on-going Durabilit'air 2 French research project is investigating these points and the developed protocols for both on-site (Moujalled & Berthault, 2022) and laboratory measurements (Litvak, 2022) were presented for discussion with the audience.

Note: All cited papers will be available on AIVC's AIRBASE (https://www.aivc.org/resources/collection-publications/aivc-conference-proceedings-presentations) in March 2023

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