


Building and ductwork airtightness in Belgium: National trends and requirements



Liesje Van Gelder, Maarten De Strycker (BCCA), Christophe Delmotte (Buildwise), Arnold Janssens (UGent)
 AIVC & TightVent Webinar | Building and ductwork airtightness trends and regulations in France, Belgium and Greece | 4 May 2023

1

BCCA – WHAT WE ARE – WHAT WE DO



- Belgian Construction Certification Association = non-profit organisation founded in 1992
- Third party for construction sector – independent, impartial and competent
- Criteria based on cooperation with and consensus within stakeholders
- Accreditation from BELAC (the official Belgian Accreditation Agency) and Notified Body
- Internationally active, international network, participation in standardisation
- www.bcca.be
- Approval, assessment and certification of products and systems
- Certification of management systems
- Certification of construction enterprises
- Quality Frameworks: surveillance processes
- **Reliable measurement results for EPBD!**
- ...

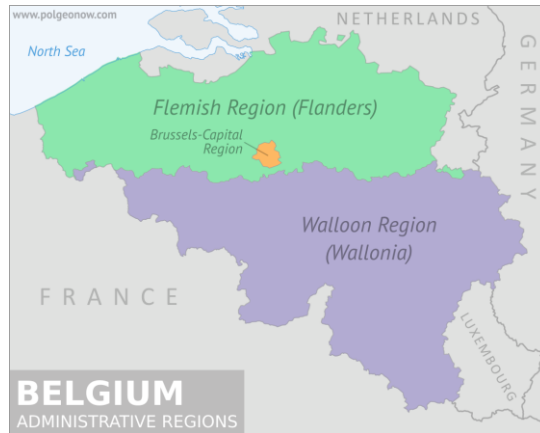



BCCA npo safeguards and strengthens the quality, confidence and performances in the construction sector. Independent, impartial and competent.

2

BELGIUM

- Three Regions



- Building energy performance regulation is regional matter – similar but some deviations
- Standards and technical guidelines are on national level

3



3

BUILDING AIRTIGHTNESS TESTS IN FLEMISH REGION

- No minimum requirement for airtightness, 2 options in EPBD regulation:
 - Default value of $12 \text{ m}^3/\text{h}$ per m^2 heat loss area (v_{50}) $\neq q_{e50}$
 - Leakage rate measured in quality framework (since 1 January 2015)
- Quality framework organised by BCCA
 - Reference document in Belgium: STS-P 71-3 (referring to European standard)
 - Initial qualification of testers:
 - Optional theoretical course (1 day – building physical background, STS-P 71-3 and operational aspects of quality framework)
 - Theoretical exam (1.5h – 50 questions multiple choice)
 - Practical exam (3 h – full test on site and measurement report)
 - Random inspections:
 - 10 % inspections on site to verify correctness and reliability of measurements
 - 10 % inspections of test reports to verify correctness and completeness of test report

4



4

BUILDING AIRTIGHTNESS TESTS IN OTHER REGIONS

- No minimum requirement for airtightness, 2 options in EPBD regulation:
 - Default value of 12 m³/h per m² heat loss area (v₅₀)
 - Leakage rate measured
- No quality framework
- Brussels Region: independance of testers since 1 january 2018

5



5

BUILDING AIRTIGHTNESS IN THE EPC - HEATING

- Monthly heat losses through ventilation in an energy sector [MJ]:

$$Q_{v,heat,seci,m} = H_{v,heat,seci} \cdot (18 - \theta_{e,m}) \cdot t_m$$

- Heat transfer coefficient [W/K]:

$$H_{v,heat,seci} = H_{v,inf/exfil,heat,seci} + H_{v,hyg,heat,seci} + H_{v,over,heat,seci}$$

- Heat transfer coefficient through in- and exfiltration [W/K]:

$$H_{v,inf/exfil,heat,seci} = 0,34 \cdot \dot{V}_{in/exfil,heat,seci}$$

- In- and exfiltration flow [m³/h]:

$$\dot{V}_{in/exfil,heat,seci} = 0,04 \cdot \dot{V}_{50,heat} \cdot A_{T,E,seci}$$

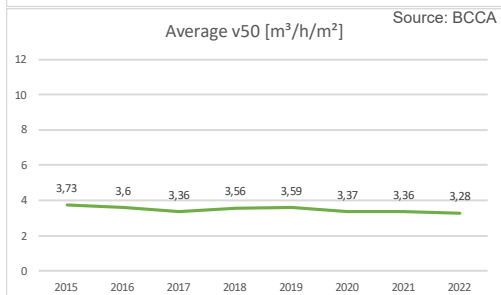
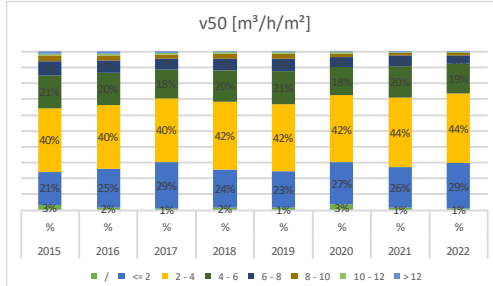
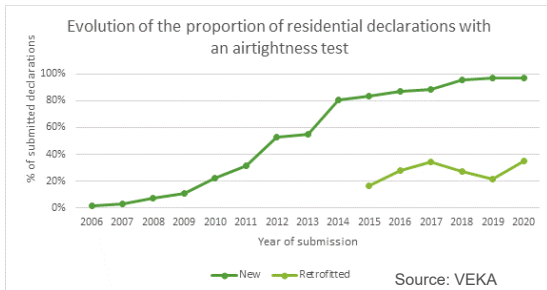
- v₅₀ measured airtightness indicator [m³/(h.m²)] – or default value
- A_T heat loss area [m²]
- 0,04 depends on wind exposure, but conservative value for built environment in Belgium

6



6

TESTS PERFORMED IN FLANDERS REGION



7

7

DUCTWORK AIRTIGHTNESS TESTS

- Impact of ductwork airtightness is limited in Energy Performance Regulation
- No differences between Regions
- Only few ductwork airtightness measurements (<1% of residential ductwork)
- NBN EN 14134: total leakage flow for all ducts [m³/h]
- However, quality framework on residential ventilation in Flanders. Flow measurements are obligated.
 - Belgian reference document STS-P 73-1
- No data available

8



8

DUCTWORK AIRTIGHTNESS IN THE EPC - HEATING

- Only valorised for residential buildings
- Monthly heat losses through ventilation in an energy sector [MJ]:

$$Q_{v,heat,sec i,m} = H_{v,heat,sec i} \cdot (18 - \theta_{e,m}) \cdot t_m$$

- Heat transfer coefficient [W/K]:

$$H_{v,heat,sec i} = H_{v,inf/exfil,heat,sec i} + H_{v,hyg,heat,sec i} + H_{v,over,heat,sec i}$$

- Heat transfer coefficient through hygienic ventilation [W/K]:

$$H_{v,hyg,heat,sec i} = 0,34 \cdot T_{preh,heat,sec i} \cdot \dot{V}_{hyg,heat,sec i}$$

- Hygienic ventilation flow [m³/h]:

$$\dot{V}_{hyg,heat,sec i} = \left[0,2 + 0,5 \cdot e^{\left(\frac{-V_{EPR}}{500} \right)} \right] \cdot f_{reducvent,heat,sec i} \cdot m_{heat,sec i} \cdot V_{sec i}$$

- V_{EPR} total volume calculated unit [m³]
- f_{reduc} reduction factor ventilation due to demand-controlled ventilation [-]
- V volume of the considered energy zone [m³]

multiplication factor [-] related to the type of ventilation system and its installation quality

9



9

DUCTWORK AIRTIGHTNESS IN THE EPC - HEATING

- Multiplication factor m dependent of
 - adjustment of valves
 - the degree of self-regulation of the natural inlets and/or outlets
 - the airtightness of the ducts
- Default value 1,5
- Minimal value 1

10



10

CONCLUSIONS

- Building airtightness
 - Disadvantageous default value
 - Implementation of quality framework in Flanders in 2015
 - Tests in Brussels Region by independent testers since 2018
 - No further improvements in number of tests
 - No significant improvement of airtightness (v_{50} values) seen last years
- Ductwork airtightness
 - Less promoted
 - No requirements
 - Only few tests
 - No evolution expected
 - Only valorised in EPC for residential buildings



MORE INFORMATION

- VIP paper is online

The screenshot shows the AIVC website interface. At the top, there is a navigation menu with links for 'About', 'Events', 'Resources', 'Focus Fields & Projects', and 'Contact & Join'. To the right, there is an 'EBC' logo and a search bar. Below the navigation, a dark red banner displays the title 'VIP 45.4: Trends in building and ductwork airtightness in Belgium'. Underneath, the document is identified as a PDF file named 'VIP_45.4.pdf' (706kb). The main content area features a thumbnail of the document cover, which includes the AIVC logo and the title 'Trends in building and ductwork airtightness in Belgium'. To the right of the thumbnail, the author information is listed as 'Liesje Van Gelder, Maarten De Strycker, Christophe Delmotte, Arnold Janssens'. Below this, the document details are provided: 'Building airtightness, ductwork airtightness', 'Year: 2023', 'Languages: English | Pages: 14 pp', and 'Bibliographic info: AIVC VIP 45.4, 2023'. A short summary of the paper's content is also visible, stating that it summarizes current knowledge on trends in building and ductwork airtightness in Belgium.



Thank you for your attention
Questions?

ASBL BELGIAN CONSTRUCTION CERTIFICATION ASSOCIATION VZW

www.bcca.be · mail@bcca.be

Hermeslaan, 9 - 1831 Diegem

T +32 (0)2 238 24 11

