Building airtightness: Towards improved and reliable declared performances

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Energy Performance Regulation
Airtightness in the EPB

Airtightness is taken into account in the calculation of the EP BUT there is no requirement

- If a test is not realized the energy consumption for heating and cooling is calculated with quite unfavourable $v_{50}$ air permeability default values.

  - Heating calculations: $v_{50} = 12 \text{ m}^3/(\text{h m}^2)$
  - Risk of overheating and cooling calculations: $v_{50} = 0 \text{ m}^3/(\text{h m}^2)$
Energy Performance Regulation

Airtightness in the EPB

Airtightness is taken into account in the calculation of the EP 
BUT there is no explicit requirement

- If a test is realized the result can be used as input data for new buildings (residential buildings, offices and schools).

Energy Performance Regulation

Significant influence of the airtightness on the EP calculation

- Current requirements (for dwellings, offices and schools)
  - In Flanders: E60
  - In Wallonia: E80

- Influence of the airtightness

<table>
<thead>
<tr>
<th>Decreasing of the $v_{50}$ ($\text{m}^3/(\text{h.m}^2)$)</th>
<th>Decreasing of EP calculated</th>
</tr>
</thead>
<tbody>
<tr>
<td>From 12 to 8</td>
<td>Around 5 points</td>
</tr>
<tr>
<td>From 8 to 2</td>
<td>Between 5 and 10 points</td>
</tr>
<tr>
<td>From 2 to 1</td>
<td>Between 1 and 3 points</td>
</tr>
</tbody>
</table>
Pressurization test

Objectives

A pressurization test could be done:

- to achieve a better EP calculation result
- to obtain a passive building
- to check the compliance with a design airtightness specification
- To find and fix air leakage that could create condensation problems

Pressurization test

Standard and reference document

- NBN EN 13829 (ISO 9972)

Additional specifications
What is the reliability of the measurements?

Very heterogeneous…

According to the ISO 9972:2006:
- correlation coefficient: \( r \geq 0.98 \)
- air flow exponent \( n \): \( 0.5 < n < 1 \)

A quality framework

Pressurization test must be reliable!

- A quality framework has been developed in Belgium

  1. Qualification of testers
  2. Technical criteria for the measurements
  3. Controls
A quality framework (1/3)
Qualification of testers

- Accreditation
  - National accreditation body

- or Qualification examination
  - Theory
    - 50 multiple choice questions
  - Practice
    - Test of a dedicated building
    - 5 reports in accordance with the technical criteria

A quality framework (2/3)
Technical criteria for the measurements

- Mainly based on EN 13829 (ISO 9972)

- Periodic calibration of the measurement system

- Preparation of the building
  - Method A + further details

- Mode of test
  - Depressurization & pressurization
Technical criteria for the measurements

Software

- Any software can be used
  - It must have been tested with a specific set of input values
  - Statement that it has passed the test

Test report

- Any format can be used
  - Minimum content is required
    - Building info
    - Pictures
    - Measurement devices
    - Software
    - Measured values...
  - Statement that all requirements have been met
A quality framework (3/3)

Controls

- Control of the report

- On site control
  - SMS when starting the test
  - SMS at the end of the test + air leakage rate
  - Controller can come on site
    - New measurement with tester’s system
    - Check building preparation
    - New measurement with own system

→ Declaration of conformity
Reference documents
Unified technical specifications - STS

- Documents published by the Federal Public Service Economy
- The quality framework is described in an annex of the STS

Reference documents
Unified technical specifications - STS

- Reference documents
  - Not constraining by themselves
  - Can be referred to by regulation
    - Mandatory in the Flemish region since January 1st 2015
  - Can be referred to by private contracts
Financial aspect

Extra cost for the client and for the tester

- An extra cost charged to the customer has to be provided.
  - around 40€ per dwelling;
  - in the case of apartments: 40€ for the first apartment and 10€ for the other ones in the same building.

- For testers cost (and extra-time) is needed:
  - the training (optional)
  - the theoretical exam: 150 € (half day)
  - the practical exam: 475 € (one day)
  - the encoding of the results in order to build up a database (half hour per measure)
Advantages for the actors

◘ For the clients and the final user
  ▪ Availability of a list of recognised competent professional
  ▪ Assurance of results and quality

◘ For the authorities
  ▪ Reliable input data
  ▪ Less control needed at the moment of EP declarations

◘ For the airtightness testers
  ▪ Higher confidence of the owners
  ▪ Value for higher quality

Return of experience

First figures

Effective date in Flanders: January 1st 2015

◘ Certified companies: 167
◘ Measures done in this framework: 650
◘ Measures controlled: 260
◘ Declaration of conformity: 200
Current performances
In Wallonia

- 78% of the final EP declaration use the default value for airtightness (12 m³/(h.m²))
- 22%: airtightness is tested

| Average v₅₀ (m³/(h.m²)) | 2.87 |

Current performances
In Flanders

<table>
<thead>
<tr>
<th>Year</th>
<th>Average v₅₀ (m³/(h.m²))</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>3.45</td>
</tr>
<tr>
<td>2007</td>
<td>3.64</td>
</tr>
<tr>
<td>2008</td>
<td>3.91</td>
</tr>
<tr>
<td>2009</td>
<td>3.66</td>
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<td>2010</td>
<td>3.46</td>
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<tr>
<td>2011</td>
<td>3.72</td>
</tr>
<tr>
<td>2012</td>
<td>3.52</td>
</tr>
</tbody>
</table>
Improvement of the performances
Guide of good practice

- Practical guide “How build airtight buildings?”
- Technical details
- Videos

Overview of the tools for airtightness

- Private contracts
  - Specifications
- Quality framework (STS)
- Standards + EP Regulation
- Guide of good practice

→ Towards improved and reliable declared performances
Thank you for your attention

And thanks for their contribution:  Xavier Loncour, Christophe Delmotte (BBRI)
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