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 m³/(h m²)
  - Risk of overheating and cooling calculations: v_{50} = 0 m³/(h m²)

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

Decreasing of the v_{50} ($m^3/(h.m^2)$)	Decreasing of EP calculated
From 12 to 8	Around 5 points
From 8 to 2	Between 5 and 10 points
From 2 to 1	Between 1 and 3 points

Pressurization test

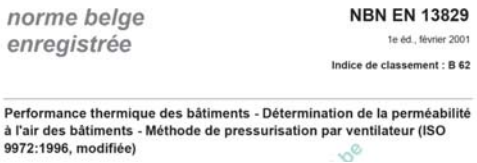
Objectives

- 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)


norme belge enregistrée

NBN EN 13829

1e éd., février 2001

Indice de classement : B 62

Performance thermique des bâtiments - Détermination de la perméabilité à l'air des bâtiments - Méthode de pressurisation par ventilateur (ISO 9972:1996, modifiée)

- Additional specifications

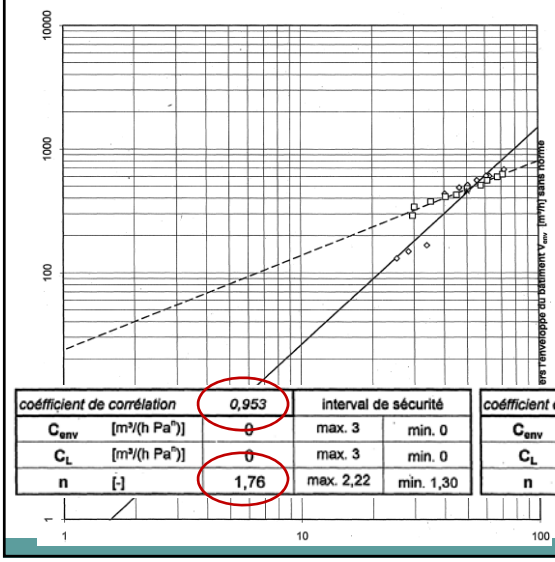

Wallonie

Vlaamse overheid

Spécifications supplémentaires
sur la mesure de l'étanchéité à l'air des bâtiments
dans le cadre de la réglementation PEB

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: $0,5 < n < 1$

coéfficient de corrélation		0,953	interval de sécurité	
C_{env}	[m³/(h Pa^n)]	0	max. 3	min. 0
C_L	[m³/(h Pa^n)]	0	max. 3	min. 0
n	[-]	1,76	max. 2,22	min. 1,30

coéfficient de corrélation		0,986	interval de sécurité	
C_{env}	[m³/(h Pa^n)]	24	max. 35	min. 16
C_L	[m³/(h Pa^n)]	24	max. 36	min. 16
n	[-]	0,77	max. 0,87	min. 0,66

A quality framework

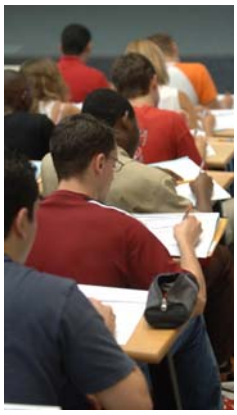
Pressurization test must be reliable !

- 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

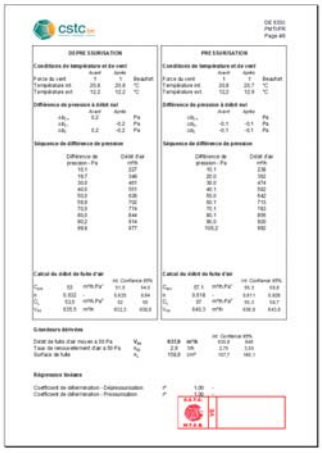
Technical criteria for the measurements

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

Technical criteria for the measurements

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

A quality framework (3/3)

Controls

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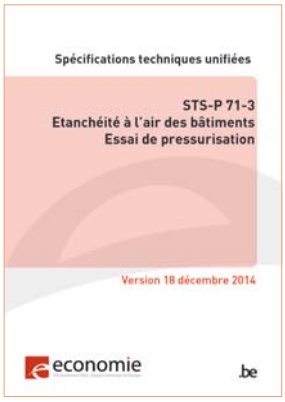
→ Declaration of conformity

Reference documents

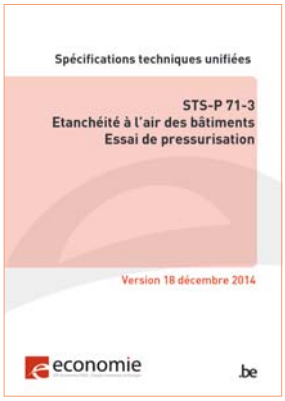
Unified technical specifications - STS



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

Reference documents

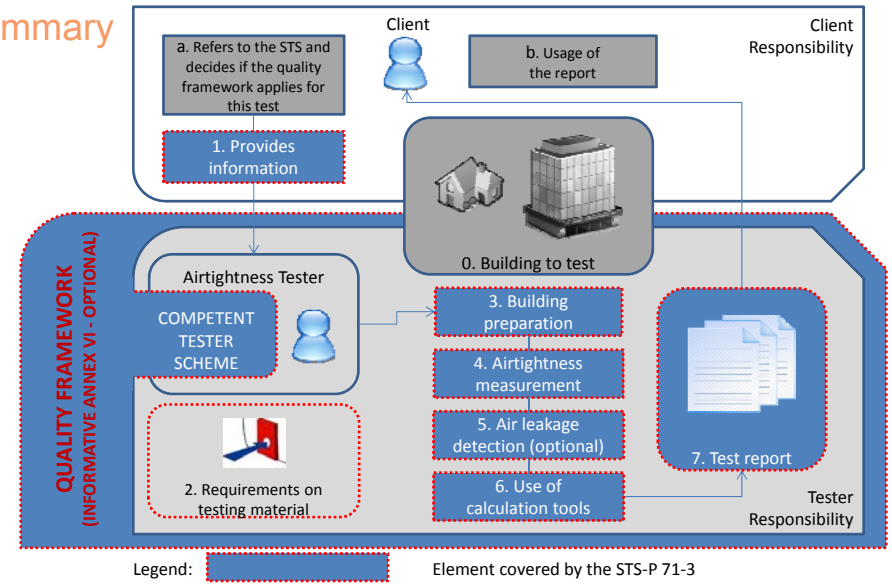
Unified technical specifications - STS



- 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

A quality framework

Summary



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

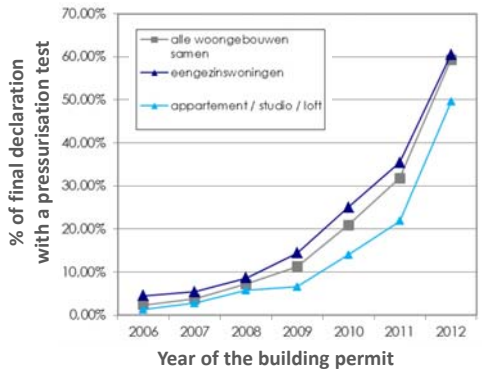
In Wallonia

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

Average v_{50} (m³/(h.m²))	2,87

Current performances

In Flanders

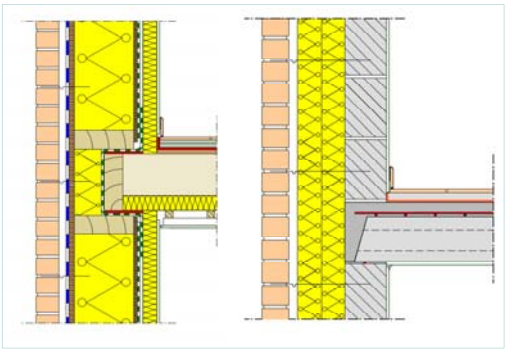


Year	Average v_{50} (m³/(h.m²))
2006	3,45
2007	3,64
2008	3,91
2009	3,66
2010	3,46
2011	3,72
2012	3,52

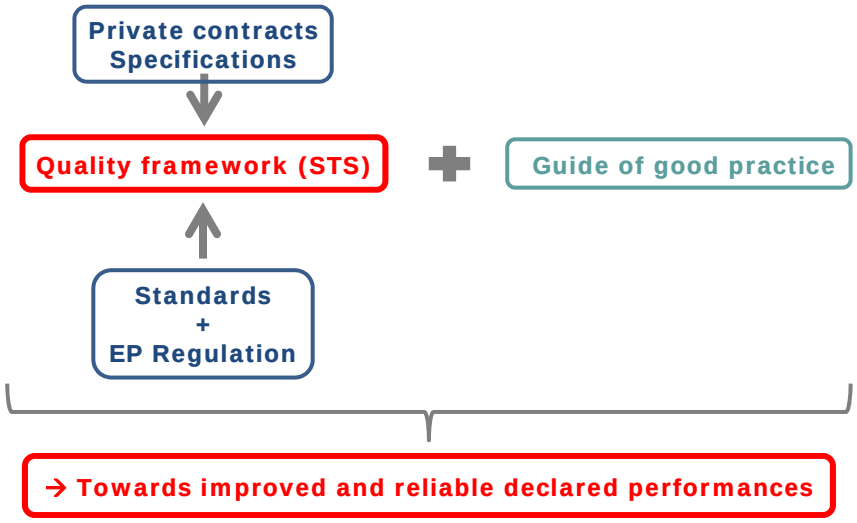
Improvement of the performances

Guide of good practice

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



Overview of the tools for airtightness



Thank you for your attention

And thanks for their contribution: *Xavier Loncour, Christophe Delmotte (BBRI)*
Maarten De Strycker (BCCA)