Measurement of Building Airtightness in the EPB Context: Specific Procedure and Sources of Uncertainties

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ABSTRACT

The building airtightness is a crucial aspect towards a higher energy performance of buildings (EPB). The fan pressurization method, described in the European standard NBN EN 13829, must be used to quantify the leakage flow rate across the building envelope, in the scope of the EPB regulation in Belgium (already applicable in Flanders since the beginning of 2006, and taking effect in Wallonia and Brussels in the course of 2009).
In the EPB calculation method, a reduction of the E-level between 5 and 15 points (the total E-level should not exceed 100) can be achieved thanks to a good result of an airtightness measurement, resulting in lower heat losses by in/exfiltration. It is thus necessary to assure that the **same procedure** is used by everyone and that the **uncertainties** on the result are limited.

Specific procedure in the EPB context
On the request of the 3 Regions (in charge of the EPB-implementation in Belgium), additional specifications to the standard were developed in the scope of the EPB regulation. The most relevant are:

- use of **method A** (defined in the standard), i.e. airtightness of the building in real conditions; this implies closing only the normal **ventilation openings**, and sealing the mechanical ventilation ducts; but leaving other openings involved in in/exfiltration as such;
- two series of measures required: **pressurisation and depressurisation**.

All the additional specifications are detailed in this paper and compared to the usual practices in other European countries. Note that in the EPB calculation method, the airtightness is expressed as the specific leakage flow rate per envelope surface area.

Sources and estimation of the uncertainties
In this paper, the main sources of uncertainties for airtightness are described in detail: the **random errors** (variability of experimental conditions), the **systematic errors** (instrument calibrations and corrections used in calculations), and other **uncertainties related to the calculation and interpretation** of the final result (divergence between overpressure and underpressure, error from volume or area calculation, etc).
The random error has been examined in a sample of about 20 measurements in different buildings, and seemed to slightly increase with the total flow rate, while wind and temperature conditions seemed to have limited effect in the conditions tested.
Finally, the random error seems quite limited in comparison with the estimated uncertainties for the volume or area calculations or the divergence between overpressure and underpressure measurements.

KEY WORDS: airtightness, leakage flow rate, accuracy, precision, air change rate.