VENTILATION AND INFILTRATION MEASUREMENTS IN THE EFFINERGIE LABEL

APPROACH TO QUALITY ISSUES AND IMPLICATIONS FOR COMPLIANCE

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1 INTRODUCTION

In 2006, France was little behind other European countries regarding low energy buildings. At that time, no definition of low-energy buildings existed in France, while Germany and Switzerland had been talking about Passiv'haus and Minergie Label for about 10 years. Thus, local initiatives began to emerge to go beyond energy performance regulation 2005 and promote low and very low-energy buildings.

Stake holders from various origins gathered around the necessity to develop energy efficiency in the building sector. Thereby, the Association Effinergie was created in March 2006 with a strong network of 70 members including almost all the French regions and also technical and research centers, banks, industrials, syndicates and professional federation, architects and engineering consultants and training centers.

The objective was to develop a dynamics for energy efficiency in new and refurbishment building sector in order to generalize positive energy buildings.

The aim of Effinergie is to

- Develop building references and tools
- Unite all the actors of the sector
- Ensure coordination between governmental authorities and regional initiatives
- Show the technical-economic feasibility of low energy buildings

Effinergie has then created references for low-energy buildings labels, and this, with a commission of experts in accordance with the French ministry for construction.

2 THE LABELS

Labels are consistent with the thermal regulations and thereby use the same calculation method, which is, in France, a very elaborate dynamic calculation tool. The energy is counted

in kWh of primary energy per square meter per year, it takes into account heating, domestic hot water, heating and ventilation auxiliaries, cooling and lighting.
The first label was “BBC-Effinergie” it has been operational from 2007 and till the end of 2012. In that time around 300 000 dwellings had been certified. At the end of 2012 it represented 60% of new dwellings.
January 1st, 2013 the new energy performance regulation (RT2012) came into force, imposing the BBC-Effinergie level as the mandatory one.
A new label “Effinergie+” has been created to fit with this new regulation. It imposes, among other things, to consume 20% less than the required level. In 2013, 9000 dwellings applied for the certification.

3 MEASUREMENTS IN LABELS

3.1 Requirements and reason behind

Label BBC-Effinergie has imposed, since 2007, a minimum requirement for building airtightness that has to be proved by testing. Reasons behind this requirement where:

- Hypothesis on the airtightness value was used in the energy performance calculation but never checked and not always respected.
- Low-energy labels was the perfect way to work on building airtightness as it is a voluntary approach, certified by a third part with a small amount of project (at the beginning).
- To prove by measuring and not only by calculation the building’s performance.

To make sure tests were performed correctly, Effinergie set, with the technical support of ministry for construction, a mandatory qualification process for testers.
Setting the qualification process was a difficult work but it eventually can be considered as a success because:

- It positively improved measurement quality,
- It gave credit to the approach,
- Perform a building airtighness test by a qualified tester is now required by the French regulation for all new residential buildings.

With this successful experience Effinergie decided to extend measurements in its new label “Effinergie +”. Indeed the label Effinergie + tends to

- Improve building airtightness by
    - Promoting measurement of whole multi-family buildings instead of sampling apartments (by setting the requirement at $1 m^3/h/m^2$ if the measure is done on the whole building instead of 0.8 if it is done by sampling)
    - Requiring measurement on non-domestic buildings under 3000 m^2
    - Requiring training of craftsman on single houses construction or an airtightness level of $0.4 m^3/h/m^2$ (instead of 0,6 in the regulation)
- Improve the ventilation efficiency and air quality by
    - Requiring airtightness testing of the ventilation network and a level of at least Class A
    - Requiring a visual control of the ventilation system.

To be allowed to perform airtightness test in the context of Effinergie + label, testers have to be qualified. That is to say, they have to

- Validate an approved training program
- Justify a certain amount of test
- Apply for qualification from a certification body
- Fill a database

3.2 Difficulties

When testing is required it is necessary to ensure the reliability of tests. The qualification process ensures that testers are able to respect a protocol. Nevertheless a protocol first has to be clearly defined.
For building airtightness testing, Effinergie involved in the drafting of a new standard: GA-P 50-784, specific to French context that spell out EN 13829.
For ductwork airtightness various standards deal with measurements (EN 1507, EN 12237, EN 2599, EN 13403) especially a specific French one FD E 51-767 that is under revision to improve consistency with other standards and fit with Effinergie requirements.

Major difficulties came with the control of ventilation system. Indeed, at first "Effinergie +" was supposed to require measurement of ventilation flowrate to check the efficiency of the ventilation system. But it has been abandoned as standards dealing with ventilation flowrate measurement (NF 12 599, NF-X10-112, PR NF EN 16211):

- Are not consistent one to another
- Do not match with Effinergie needs: it is important to have non-destructive intervention of the tester (no drilling).
- Do not include measurement at air terminal devices.

This lead to major difficulty to establish a control protocol as:

- The reliability of flowrate measurement devices at air terminal were unknown
- The specific case of humidity sensitive ventilation was difficult to handle.

The requirement on measuring ventilation airflowrate was then abandoned, and only a visual control of the ventilation system is performed.
However in 2014 starts a research project aiming at testing the reliability of ventilation flowrate measurement at air terminal devices. The final purpose of this project is to test protocols and measurement devices and to transcript a reliable protocol in a standard.

4 CONCLUSIONS

Label BBC-Effinergie and then Effinergie + have required airtightness measurement to prove the energy performance of certified buildings not only by calculation but also by measuring.
To ensure the reliability of measurement, specific protocols were developed and competent tester schemes were set.
This was possible for building and ductwork airtightness, however regarding control of ventilation flowrate measurement, requirements had to be abandoned because of the lack of applicable standards.
Ongoing research projects shall lead to the development of reliable and widely applicable protocols.

5 REFERENCES

Relevant websites:
www.effinergie.org
www.rt-batiment.fr
http://www.observatoirebbc.org/