“Impenetrable infiltration”

General project information

Project title:	Impenetrable infiltration	
Project initiators:	dr. ir. A.G. (Bram) Entrop[1]	University of Twente
	prof.dr.ir. J.L.M. (Jan) Hensen	Eindhoven University of Technology
Project members:	dr. ir. A.G. (Bram) Entrop	University of Twente
	prof.dr.ir. J.L.M. (Jan) Hensen	Eindhoven University of Technology
	ing. R.A. Brons	Nieuwenhuis Groep
	Ing. A. Veldhoff	Selekthuis Bouwgroep

Organisations: University of Twente - Department of Construction Management & Engineering
Eindhoven University of Technology - Department of Building Physics and Services
Nieuwenhuis Groep - Selekthuis Bouwgroep

Project content

Since the first oil crisis the energy use in buildings has caught the intention of many organisations. Regulations try to stimulate housing associations, architects, contractors and house owners to make sure measures are taken and efficient techniques are installed in houses. With the introduction of the Building Code in 1992 and Energy Performance Coefficient in 1995, the thermal resistance of buildings has been improved. Ventilation rates are nowadays better controlled then they used to be and thermal energy is being regained from shower water and stale air.

Although buildings have also become more airtight –due to improved connections between different building components–, we still have little insights in how much air is entering and leaving buildings exactly, because a significant part of the total airflow is uncontrolled. This form of uncontrolled ventilation related to the airtightness of a building, is called infiltration. In assessing the energy performance of a building design standard infiltration rates are considered, but often these theoretical infiltration rates ex-ante do not reflect the actual infiltration rates ex-post completion. Not many stakeholders seem to be bothered by this difference in expected and actual infiltration rates. However, due to a lack of fresh air in buildings every year people die after being poisoned by carbon oxides, and at the same time increasing energy prices push for lower ventilation rates, one can conclude that research on infiltration is of paramount importance. The 3TU Built Environment Center of Excellence is therefore asked to facilitate our aim *to improve the understanding of the air tightness of buildings by assessing the variables that have an impact on the infiltration rate of a building.*

A better understanding in the air tightness of buildings will help us to specify how to reduce the energy use of existing buildings and the design of new buildings without reducing comfort. A literature review is expected to provide input for a first map of variables influencing the infiltration rate. The construction industry will be asked to provide reports of blower-door-tests. Ex-post the infiltration rate is namely being assessed with a so called blower-door-test (see Figures 1 & 2) in

[1] Contact person; by email: a.g.entrop@utwente.nl or by phone: 053-4896860

which a fan in the door-opening of a sealed house provides the pressure to expose air leakage in the building envelope. By studying the provided reports an impression can be formed of what kind of houses have a relatively low and high infiltration rate. To determine what the impact of the individual variables is, enhanced blower-door-tests will be conducted at multiple old and new houses. In our enhanced test not only the infiltration rate of the whole house will be assessed, but also the air tightness of individual connections between building components.

Fig. 1: A fan mounted in the front door of a house for a blower-door-test.

Fig. 2: Smoke to check the infiltration around a bathroom window.

Project process

In the very beginning of the project, it is important to let the construction industry know that infiltration needs our interest and that we are looking for reports of blower-door-tests to analyse. This will be done for example by bringing a website online, by placing an announcement in the Cobouw and by letters via Bouwend Nederland. In Table 1 the different phases within the project are described.

Table 1: Project planning June – December 2014

Project phase	Time period
1. Developing project website with a first call for blower-door-tests.	June-July 2014
2. Literature research on infiltration to map variables involved.	August 2014
3a. Collect and register blower-door-tests provided by industry.	August-September 2014
3b. Analyse blower-door-tests in context of object and location.	September 2014
4a. Develop enhanced blower-door-test protocol and select cases.	September-October 2014
4b. Conduct enhanced blower-door-tests at selected cases.	October 2014
5. Analysing collected data from enhanced blower-door-tests.	November 2014
6. Finalizing research report and updating website.	December 2014