Airpath50 – Characterization of infiltration and exfiltration at building component scale (air paths) based on in-situ testing and numerical models.

A few years ago, worldwide political leaders recognized the need to set ambitious challenges in energy consumption. Among other performances, airtightness is probably the most underestimated. Indeed, air infiltration can be responsible for up to 30% of the heating demand in winter and is poorly mastered by designers and contractors. Furthermore, it impacts insulation thermal performances, hygrothermal performances, occupant comfort, ventilation system efficiency and acoustic insulation. Unfortunately, at a time when all building actors should get involved in the challenge to reduce energy consumption, contractors cannot rely on effective tools to help them meet requirements specifications.

This project aims to develop a tool to give contractors information about the impact, the time and the complexity of different corrective measures taken during building construction. In this project, the researcher creates a catalogue based on in-situ testing (blowerdoor test) and numerical modeling (Computational Fluid Dynamics). For example, the contractor could predict the improvement in m^3/h if he adjusts the bottom joint of the front door. He can also decide if he has to undertake other retrofit measures.

In this project the researcher has to tackle three important issues. First, uncertainties on blowerdoor measurements are important and have to be assessed to make results reliable. Ways to reduce measurement uncertainties must be developed in this work. Second, nowadays the CFD is not used in the description of single building components regarding air infiltration. Nothing has been done yet, and the researcher has to take the first steps in this field. Last important point is the classification and understanding of different air leakage paths. Indeed, air infiltration phenomenon at component scale is poorly developed by researchers and equally mastered by designers and contractors.

Keywords: Airtightness ; Component leakage ; Air infiltration ; Blowerdoor test ; Airtightness modelling ; CFD