

Genesis: Performance project

Smart ventilation, using humidity-based demand-controlled ventilation, was studied during the "Performance" project, with the support of ADEME (PREBAT, 2007–2010). The Performance project included a large-scale monitoring on thirty-one new occupied apartments in two buildings, respectively situated in Lyon and Paris in France, and equipped with humidity-based demand-controlled ventilation systems. The dwellings were equipped with low-cost CO₂, relative humidity and temperature electronic sensors and ventilation terminals were instrumented with Hall effect (for aperture) and in-duct pressure sensors. Those sensors are still operational today, which provided the opportunity for a follow-up project.

Overview of the Performance 2 project (2020-2024)

Winner of the call for projects of ADEME "Towards responsible buildings – 2020 edition", Performance 2 project aims to qualify the durability of smart ventilation systems with humidity-based demand-controlled ventilation, and especially their resiliency regarding long-term use by various tenants. This study relies on various on site measurements (flow rates and pressure in air ducts, CO₂, relative humidity, temperature, VOC, formaldehyde and particulate matter) in two multi-family buildings. These buildings, one in Paris and the other in Villeurbanne (near Lyon), were monitored since their construction during the 2007-2010 Performance project. The measurements are taken from in situ sensors in the air terminal devices (directly inside the ATD and with circuit board near the ATD), and additional air quality sensors arrays in the living areas of the housing units (living room and bedroom) and outside (on the roof of the buildings). This program includes 4 different technical tasks:

- ◆ **2 winter campaign on-site:** measurements in the dwellings of ventilation performance, the comfort parameters, and the indoor air quality, with interviews of the tenants
- ◆ **Laboratory campaign:** evaluation of the air terminal devices' performance before and after cleaning, calibration of the sensors and study of the reliability of the indoor air quality sensors.
- ◆ **Results analysis:** assessment of the performance of the ventilation systems regarding indoor air quality, energy input, and their robustness compared to their use by the tenants.
- ◆ **Development of technical recommendations,** with a possible inclusion of such recommendations into IAQ regulations.

Performance 2 Consortium

Cerema, leader of this project, has a hand in each task through their teams from the Centre-Est, Île-de-France, Hauts-de-France and Ouest local directions.

The **Aereco** Company takes an interest and shares their expertise, especially in the study of the building in Paris.

The **Anjos** group offers their support in every tasks, especially regarding the building in Villeurbanne.

LOCIE, an UMR (Unité Mixte de Recherche – an association between the CNRS and another organization, here the Savoie University Mont-Blanc), actively contributes to the preparation of the campaigns and the measurements, both on-site and in their lab.



Immeuble Paris



Immeuble Villeurbanne

Campaign preparation work – the key role of the tenants

When indoor pollutants measurements are performed, the analysis of the results requires information on the possible sources of those pollutants, including but not limited to: floorings, walls and ceilings, furniture, heating and air conditioning systems, and human activities such as cooking, cleaning, personal care, craft work, use of ambient scents... It is also important to gather information on the habits of the tenants regarding how often they open their windows. Feedback from previous such campaigns shows that it is often hard to get reliable and complete information, in part because the questions are seen as intrusive. To alleviate such psychological holdbacks, the teams in charge of the interviews worked with the Psycap research team to develop 3 tools:

- **A technical questionnaire** on the dwelling itself, to be filled by the Cerema teams while in the dwellings, with a simple visual check,
- **A weekly log** to be filled by the tenant during the duration of the measurements, with easily readable tables and checkboxes to avoid having to write more than the bare essentials,
- **An interview guide**, with questions written in the most open way to avoid biasing the answers of the tenants.

Those documents were used during the campaigns on the two buildings. Feedback from the teams involved and a deeper analysis of the collected data will allow for the optimization of those tools for the second winter campaign. They will then be made more widely available to help future IAQ campaigns.



Jour de la semaine	Heure de début	Durée (en minutes)	Mode de cuisson		
Lundi					
Mardi					

This project has been possible thanks to the participation of Paris Habitat (owner of the building in Paris) and Lyon Métropole Habitat (owner of the building in Villeurbanne), and thanks to the tenants of the dwellings who volunteered their time during each campaign.

Contact

The newsletter of the Performance 2 project, put together by the Cerema, is mainly meant for the partners, coworkers, and funders of the project, as well as other professionals interested by indoor air quality management. It is written mainly by Adeline Mélois, from the Cerema.

performance2@cerema.fr

