Lesson learnt and new protocol for the Durabilit'air project: laboratory measurements

Andrés Litvak, Cerema (andres.litvak@cerema.fr)

Cerema Sud-Ouest/DT/GBD, Rue Pierre Ramond, 33165 Saint Médard en Jalles, FRANCE

FOREWORD

This work is part of two French research projects "Durabilit'air1" (2016-2019) and "Durabilit'air2" (2021-2024), that aim at improving our knowledge on the variation of buildings envelope airtightness through onsite measurement and accelerated ageing in laboratory-controlled conditions.

During a past AIVC conference, a publication of the Durabilit'air1 project has presented and discussed an experimental protocol for characterizing assembly of products for buildings' airtightness in laboratory controlled conditions.

FINDINGS FROM DURABILIT'AIR1 PROJECT

The overall objective of our work is to define and develop an experimental protocol capable of testing and quantifying the airtightness evolution of assembled airtightness products samples and comparing the relative ageing of the samples.

During the first study "Durabilit'air1", a state-of-the-art showed that there is no standardised protocol to characterise in laboratory-controlled conditions the durability of product assemblies regarding airtightness performance. As a matter of fact, due to the diversity of airtightness products, it is difficult – and even, perhaps impossible – to define an accelerated ageing universal protocol that would be equivalent to a known amount of years of natural ageing. From the light of the state of the art results, we defined the exposure conditions of a relative ageing test, through thermal, humidity and pressure variation cycles. We developed a 1 m^3 environmental chamber and exposed three different 1 m^2 samples of assembled products to the defined exposure conditions cycles.

The tested samples represent three different treatments of airtightness of the joints between windows and walls: 1) impregnated foam; 2) sealant with backing foam and 3) adhesive and membrane complex. During each exposure cycle, we have measured the evolution of the airtightness of the sample.

The ageing tests of the samples 2 and 3 showed a significant degradation of the airtightness performance after the ageing cycle, whereas air permeability of sample 1 could not be assessed by our experimental protocol. We concluded that modifying the duration and the characteristics of the exposure cycles (humidity, temperature and pressure) would certainly allow more differentiating results in future works.

EXPERIMENTAL PROTOCOL DEFINED FOR DURABILIT'AIR2 PROJECT (ON GOING RESEARCH)

In the light of these preliminary results, we defined a new experimental protocol for the on-going research Durabilit'air2. The main changes, as compared to Durabilit'air1 project are the following:

- an increase up to 100 l/min of the airflow rate in the environmental chamber (instead of 50 l/min)
- the adjustment of exposure times after implementation,
- the wind exposure cycle, with an increase in maximum pressure between 205 and 240 Pa (instead of 150 Pa)
- a new protocol for dust measurement of the samples

Finally, three sample types have been defined to be tested as assembly products for buildings' envelope airtightness, namely:

- gypsum plasterboard (drywall) / seal / PVC material
- gypsum plasterboard (drywall) / seal / wood
- membrane / adhesive tape / staple / wood

Prior to every test, each sample will be implemented according to the following conditions:

- in normal conditions (18-20°C), with measurement of temperature and relative humidity

- in cold conditions (2-5°C), with measurement of temperature and relative humidity
- in dusty conditions at normal room temperature 20°C, with measurement of temperature and relative humidity

KEYWORDS

Airtightness, durability, laboratory measurements, accelerated-ageing, literature review

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REFERENCE

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