Airtightness of large buildings in Japan: current situation and a proposal for the future

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ABSTRACT

The project of "Meiken Kogyo's headquarter office" won one of the 74th awards in 2022 from the Architectural Institute of Japan or AIJ, which is the most prestigious institute for Japanese architects.

Beside its excellent design, AIJ pointed out the building's high air tightness and the way to achieve the level. The plan was even described as a potential role model. It might be the first time in its long history of the award, "Airtightness" was highlighted in such a manner.

We did not only conduct an airtightness testing but also propose the idea of "Continuous Air Barrier", which is the main theme of "Building Enclosure Commissioning (BECx)".

Firstly, we are going to report, how we joined this project, what level the airtightness was achieved, and how good the indoor environment quality has become. Next, we would like to make a proposal to Japanese airtightness researchers.

Meiken Kogyo is one of the leading wood-processing-manufacturers in Japan. Their own-product CLT was used as the main structure in this project, with some traditional walls. The location is in mountainous area of western Japan, where the climate is not so mild. Meiken Kogyo has gathered data for 3 years in the office which shows two interesting facts: they don't have to run the heating-cooling air conditioner all the time, even in the most severe season. And the electricity bill is as low as 1/4 of that of other general Japanese offices, while keeping a comfortable indoor environment quality with total heat exchange ventilation system.

In Japan, airtightness tests for large buildings are rarely conducted, and the details are not made public due to non-disclosure agreements, if conducted. However fortunately, Meiken Kogyo is so generous that every information can be disclosed.

We started airtightness test business in 2002. After testing several hundreds of rooms protected by clean agent, and about 70 RC buildings for shelter, we started this type of test for large buildings in 2018. We currently have 9 test experiences, including this project. The first building was already constructed, so we just tested it. The others were newly constructed and we could participate in the shop drawing process. All of 8 passed required level successfully.

What we learned from the experience was effectiveness of "pen-check", which is simple but most important step in BECx.

North American Building Science has clarified that Airflow (air leakage) is the major cause of wall- condensation, not Diffusion (water vapor permeation), by a paper published in 1985 (The Difference Between a Vapour Barrier and an Air Barrier by R. L. Quirouette).

Then, they defined the word Air Barrier, which had been just a combination of common two nouns, as an architectural term with clear criteria. After that, they succeeded to establish the BECx method, which enhances building performance in eco purpose at almost all kinds of buildings.

We believe it is meaningful for all Japanese people in the construction industry to experience and understand BECx as soon as possible. We are going to make one proposal, in Tokyo, in May.

KEYWORDS

Blower Door Test, Pen check, Continuous Air Barrier, Building Enclosure Commissioning, Proposal