Proposal to promote airtightness in non-residential buildings in Japan

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This content is under study by the study group "Proposal for the Realization and Dissemination of a System for Airtightness in Non-residential Buildings Toward Carbon Neutrality" in the Consortium for Building Research and Development.

The Situation of Airtightness in Non-Residential Buildings in Overseas Countries

- Around 2000, the U.S. and the U.K. began to establish measurement and evaluation standards for airtightness in non-residential buildings.
- Since then, airtightness of non-residential buildings and accumulation of airtightness data have been progressing.

	Evaluation codes	Target building	Measurement Standard
U.S.A	ASHRAE 90.1-2016	Other than low-rise residential	ASTME779-10
	Washington State, Seattle Code	Buildings with more than 4 floors	
	USACE	large Build.	ASTME779-10, ASTME1827
U.K	ATTMA TSL2	Office	ATTMA TSL2
	ATTMA TSL2	Warehouse	ATTMA TSL2
DE	Passivhaus	All buildings	ISO9972, EN13829
UAE	Abu Dhabi Building Code(IECC)	Commercial	ASTME779-10, ASTME1827
JPN	No Codes Values are reference values	Tight	No Standards
		Average	
		Loose	

The Situation of Airtightness in Non-Residential Buildings in Japan

- In Japan, airtightness of high-rise buildings was measured in the 1980s, and reference values for airtightness were presented.
- However, no progress has been made since then.

	Evaluation codes	Target building	Measurement Standard
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・To change this situation and promote air tightness in non-residential buildings, the following proposals are made.

1 Proposal to create a network utilizing current airtightness testing businesses for residential buildings

2 Proposal to establish measurement and evaluation standards with reference to the U.S. and the U.K. standards

3 Proposal for training content

4 Proposal for setting airtightness performance requirements

5 Proposal to approach the Climate Citizens' Assembly

6 Recognition of a sense of speed in the proposed schedule for the start of the system's operation

1 Proposal to create a network utilizing current airtightness testing businesses for residential buildings

Airtightness Testing Certification System for Residential Buildings in Japan

■IBECs(Institute for Built Environment and Carbon Neutral for SDGs)

・In Japan, IBECs is an association that provides training, testing, and certification for airtightness testing for residential buildings.

・IBECs is an organization affiliated with the Ministry of Land, Infrastructure, Transport and Tourism.

■Qualification method

・Business operators are registered after training and passing the ″JIS A 2201 Airtightness performance test method for houses using a blower ″ course.

■ Registered Business Office

・About 1100 business offices are registered nationwide. (as of April 2023).

Questionnaire survey and community networking

■ Questionnaire survey

- We will conduct a questionnaire survey of these offices to see if they are also interested in airtightness measurement of non-residential buildings.

■ Community networking

- We will also encourage the creation of a community network.

- The objective is to have each region conduct a study session on airtightness testing methods and airtightness installation for non-residential buildings.

Questionnaire survey and community networking

- And, the objective is to have them take on the role of spreading the information to the local residents.

■Proposal for expensive test equipment

- In addition, since airtightness testing equipment is very expensive, for large buildings, it is necessary to consider a system in which multiple businesses in a region can take measurements together.

2 Proposal to establish measurement and evaluation standards with reference to the U.S. and the the U.K. standards

Measurement Standards in the U.S.

・In the U.S., ASTM standards have been developed for a variety of airtightness-related content.
・The 16 standards listed in the table below cover the areas of field and laboratory airtightness test methods, materials, and commissioning.

Fields			Standard number
Airtightness	Airtightness Testing Methods at Building Sites	1	ASTM E779-19
		2	ASTM E1827-22
		3	ASTM E3158-18
		4	ASTM E783-02(2018)
	Identification Methods for Leakage Points at Building Sites	5	ASTM E1186-22
	Fittings Laboratory Test Method	6	ASTM E283/E283M-19
		7	ASTM E1424-22
		8	ASTM E2319-22
		9	ASTM E1680-16(2022)
		10	ASTM D8052/ D8052M-22
	Test Specimen fabrication method	11	ASTM E2357-18
	Test Method (Material)	12	ASTM E2178-21a
	Calibration of air volume	13	ASTM E1258-88(2018)
Material	Specifications	14	ASTM E1677-19
Commissioning	Procedure	15	ASTM E2813-18
		16	ASTM E2947-21a

Measurement Standards in the U.K.

Standards in the U.K. were developed by ATTMA.
(The Air Tightness Testing & Measurement Association)

The standard is based on ISO 9972 and is classified into 4 categories according to the complexity of the building, as shown in the table below.

There are no standards except for airtightness testing standards in ATTMA.

	Standard No.	Classification
1	TSL1	Simple Building
2	TSL2	Nom-Simple Building
3	TSL3	Complex Building
4	TSL4	Passivhaus &Low Energy Building

Measurement Standards in Japan

- In Japan, there are no standards for airtightness testing of non-residential buildings at present.
- JIS A2201 is a modified version of ISO 9972 for Japanese residential buildings.
- JIS A1516 is a laboratory airtightness test method for fittings.
- JIS B9330 is the standard for calibration methods for general fan airflow.

	Standard No.	Field
1	JIS A 2201:2017	Airtightness Testing Methods at Building Sites
2	JIS A 1516：1998	Fittings Laboratory Airtightness Test Method
3	JIS B 9330：2000	Calibration of air volume

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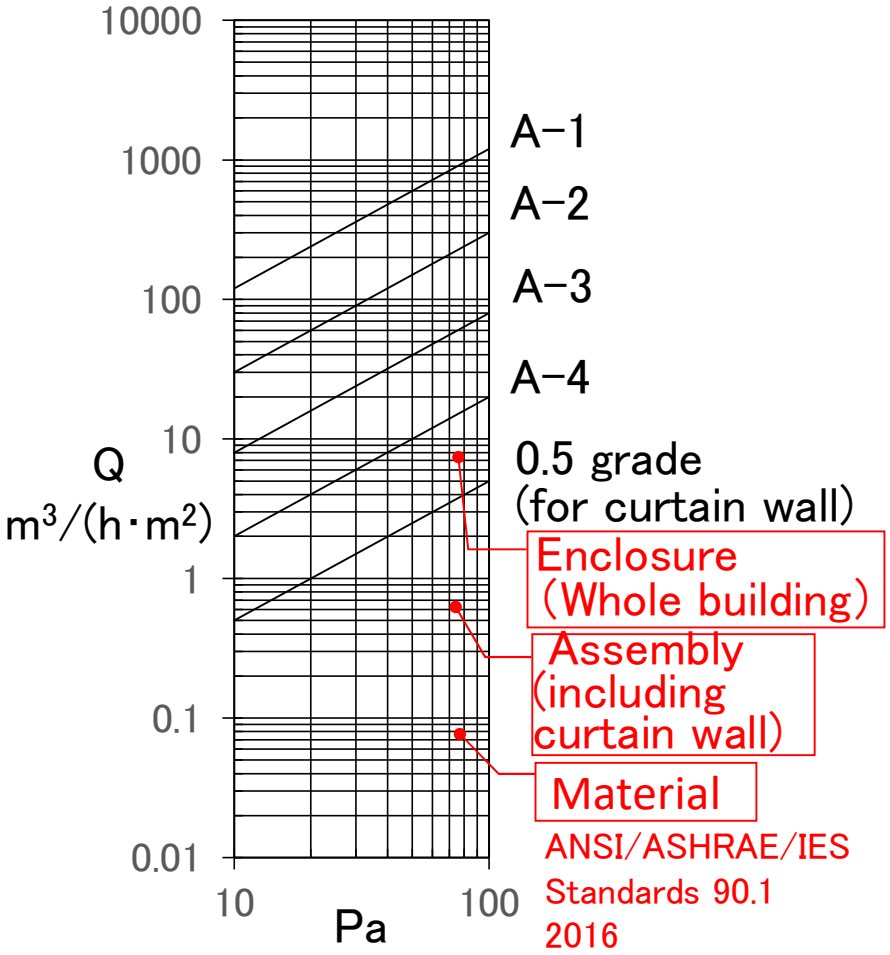
Proposal for development of measurement standards

- In Japan, there is a need to establish measurement and evaluation standards as soon as possible.
- In order to respond quickly, it is acceptable to initially introduce foreign standards basically as they are.
- Modifications will be made as necessary.
- A candidate for a standard would be ATTM, which is simpler and explains specific procedures.
- ATTMA is based on ISO 9972, which is the same as JIS A 2201.
- The ATTMA evaluation standards are for each building type.

Proposal for development of measurement standards

- In Japan, there is currently no accumulated data, so the same evaluation standards should be adopted as in the U.S.
- The standards for materials and commissioning should be supplemented with those of ASTM.
- The set pressure should be set from 50 Pa to 75 Pa in a stepwise manner, taking into consideration the number of test equipment required.
- The USACE 2012 wind-unaffected method should be adopted.
- For the purpose of dissemination, a pattern in which the ventilation openings are not closed should be adopted as the basis in order to reduce labor and cost.

Airtightness class for fittings



Japanese fittings standards JIS A 1516 and ANCI/ASHRAE/IES standards for airtightness performance are compared.

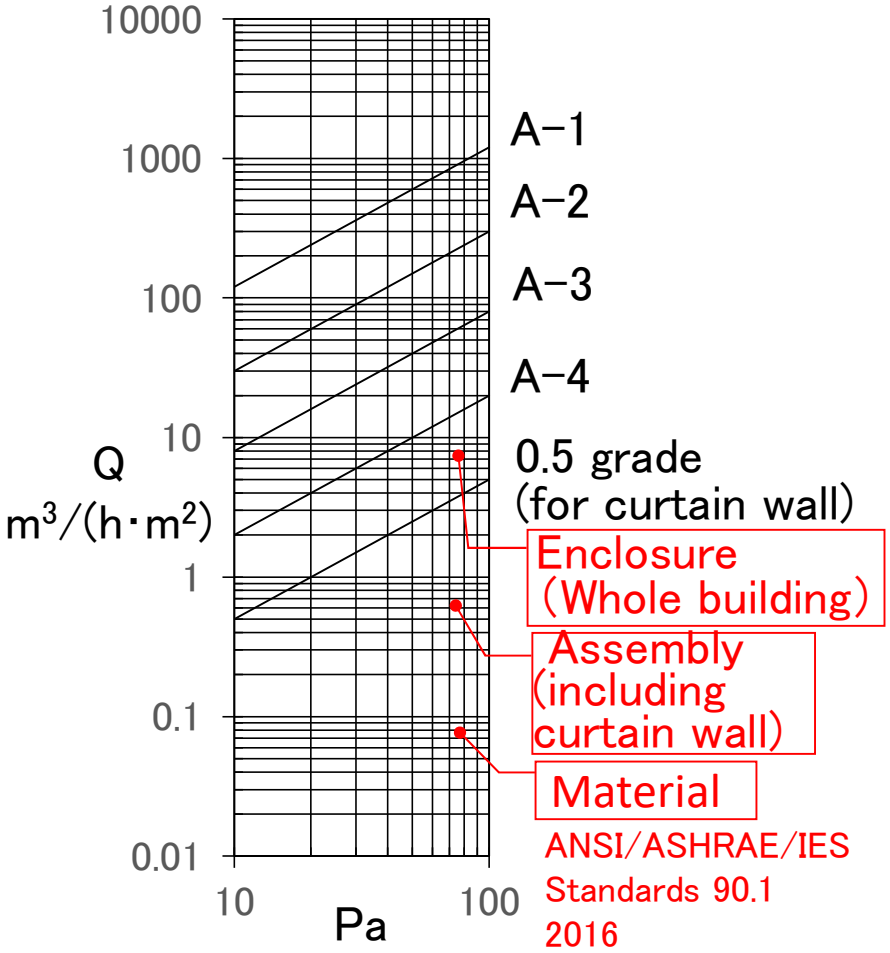
Japanese standards are classified as A-1 to A-4.

The standards are A-2 or lower for general buildings and A-3 for soundproofing, thermal insulation, and dustproofing buildings.

There is also 0.5 grade for curtain wall.

However, there are no standards for airtightness of materials and no standards for airtightness of the exterior envelope of non-residential buildings.

Airtightness class for fittings



The ANCI/ASHRAE/IES standards are stratified into three categories.

The standards for those assemblies have higher airtightness performance than the Japanese standards for fittings and curtain wall.

It is considered necessary to reconsider the Japanese standards for fittings and curtain wall.

3 Proposal for training content

Training Course in Japan

■Japan

・In Japan, IBECS conducts airtightness testing courses.

・This course is targeted at residential buildings, and there is no course for non-residential buildings.

Course Length – 3 hours
Classroom learning , Certification Examination and Registration – ¥28,050(About $200)

Training Course in the U.S.

■In the case of ABAA
(Air Barbour Association of America)
In the U.S., the case of the ABAA is mentioned as an example.

The ABAA has 3 types of training courses

(1) Whole Building Airtightness Technician Program
(Blower Door Technician Training)
(2) Auditor Courses (Field Auditor Training)
(3) Installer Course

Whole Building Airtightness Technician Program

- Whole Building Airtightness Technician Program is Comprehensive training program covering ASTM, CGSB, ISO Standards and USACE test methods.

Course Length: 5 Days

Conceptual Learning: 2Days

Hands-on Training: 2Days

Performing a Test: 1Day

Training Course Fees:

Members – $2,500.00 (About ¥340,000)

Non-Members – $2,850.00 (About ¥380,000)

Auditor Courses (Field Auditor Training)

■The role of the Field Auditor

The role of the Field Auditor is performing quality assurance audits of air barrier assemblies on new commercial and institutional construction projects during installation.

Course Length: 2.5 Days

Total Fees

(Training Course Fees, Certification Exam Certification Registration)

Members – $1245.00（About　¥170,000）

Non-Members – $1445.00(About ¥195,000)

Installer Courses

■Installer Courses (2 Courses)

(1) Self-Adhered & Fluid Applied Installer Training Course

(2) Spray Polyurethane Foam & Self-Adhered Installer Training Course

Course Length: 2.5 Days

Total Fees

(Training Course Fees, Certification Exam Certification Registration)

Members – $1445.00 (About ¥195,000)

Non-Members – $1945.00 (¥About 260,000)

Training Course in the U.K.

■The Case of ATTMA in the U.K.

ATTMA in the U.K. also has training courses for air tightness testers at each level, similar to ABAA.

Proposal for training courses in Japan

・Pre-planning for airtightness testing is important for non-residential buildings because they are larger and more complex than residential buildings.

⇒Therefore, it is important to have a training course that includes more detailed pre-planning methods and practical skills.

・Training on installation methods and supervisors is also necessary.

・In order to respond quickly, it is proposed that the content of training courses in the U.S. and the U.K., which have a proven track record, be introduced directly to Japan at first.

Proposal for training courses in Japan

- In order to increase the number of qualified personnel, subsidies for acquisition of qualifications are also proposed.

- In addition, subsidies for the purchase of expensive testing equipment are also proposed.

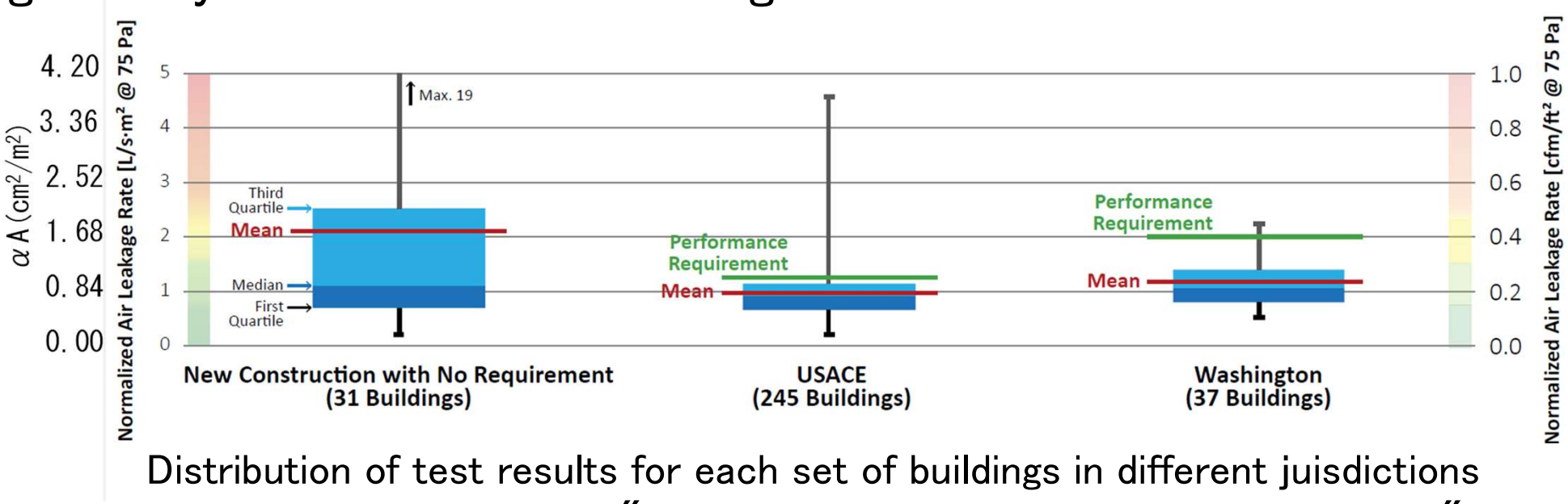
4 Proposal for setting airtightness performance requirements

Survey Results in the U.S.

In the study, new buildings in different jurisdictions with mandatory air tightness requirements were compared to new buildings without air tightness testing requirements.

The results showed that buildings built with the intent to meet the performance requirements for air tightness achieved the target values.

New buildings built without performance requirements were generally shown to be less airtight.



Distribution of test results for each set of buildings in different juisdictions

This figure was quoted from "Illustrated Guide Achieving Airtightness " published by BC Housing, Canada.

https://www.bchousing.org/research-centre/library/residential-design-construction-guides/illustrated-guide-achieving-airtight

Proposal for setting airtightness performance requirements

In Japan, the actual situation of airtightness performance has not yet been investigated.

It is important to accumulate airtightness performance data and set the required performance.

The number of non-residential airtightness testing companies will be increased and the understanding of the public will be deepened in order to accumulate data.

5. Proposal to approach the Climate Citizens' Assembly

Outline of the Climate Citizens' Assembly

Climate Citizens' Assemblies were held at the national political level in France and the U.K. in 2019–20.

This attempt is also spreading to local governments.

In Japan, the first one was held in Sapporo in 2020.

Recently, Musashino City and Tokorozawa City have also hosted the conference, and many local governments are planning to do so in the future.

Members are randomly selected from the general public and are gathered in proportions that represent a microcosm of society.

Outline of the Climate Citizens' Assembly

The number of members ranges from a few dozen to about 150.

Citizens spend weeks or months receiving information from various experts, deliberating, and making recommendations to the national and local governments.

The national and local governments will make use of the recommendations in their policies.

Questionnaires on visions of future life

- At Climate Assembly Sapporo 2020, participants were asked to complete a questionnaire regarding their visions for their future lives.

- An analysis was conducted on the results of the questionnaire, using the strength of support and the scattering of opinions as indicators.

- ″Improvement of residential thermal insulation″ and ″Spread of energy-efficient buildings″ were strongly supported, and there was little scattering in opinions.

Questionnaires on visions of future life

- However, awareness of airtightness is lower than that of thermal insulation.

→It is important to raise awareness of airtightness improvement

- It is important that a network of air tightness measurement companies in each region create a system to disseminate information to the public.

6 Recognition of a sense of speed in the proposed schedule for the start of the system's operation

Sense of schedule to be operational in 2030

- This is a proposed schedule for a target of having the system operational by 2030.
- We realize that it is a very tight schedule.
- It is necessary to start operation as soon as possible at a realistic speed.

		2023	2024	2025	2026	2027	2028	2029	2030
1	Examination of measurement standards								
2	Training of measurement experts								
3	Promotion of airtightness testing equipment								
4	Grasping the actual airtightness performance								
5	Acquisition of information on airtightness construction methods								
6	Training of construction engineers								
7	Consideration and establishment of assessment standards								
8	Dissemination to citizens' meetings								
9	Starting operation of the system (Step 1)								

Thank you for your attention.