

Public Review

Vancouver Building By-law (VBBL)

Proposed change to Building and Dwelling Airtightness

Topic: Airtightness

Code change number: 24-0021

Code reference: Div B Part 10.2.2.21 Building and Dwelling Unit Airtightness Testing for 10.2.1.3. building types, and whole building airtightness for 10.2.1.2 building types, and 10.2.1.5. building types

Description of the proposed change

- 1) Add ASTM E3158-18 to list of reference standards to provide more guidance for projects, to align with BCBC and NECB 2020
- 2) Update Maximum Tested Air Leakage Rate for 10.2.1.3 buildings to align with NECB 2020
- 3) Update 10.2.2.21 tables to separate requirements for 10.2.1.5. and 10.2.1.2 buildings
- 4) Streamline requirement for 10.2.2.21 for buildings following 10.2.1.2. by removing similar requirements in referenced by ASHRAE and NECB

Justification

- 1) BCBC 2018 has been revised as of May 1, 2023 to include ASTM E-3158-18 as a reference standard for projects to meet building envelope airtightness testing requirements. This standard is not currently referenced in VBBL and provides additional useful guidance for industry. This standard is also referenced in NECB 2020.
- 2) NECB 2020 has introduced a new prescriptive building envelope requirement to test the air barrier system in accordance with ASTM E-3158 to a normalized air leakage rate not greater than 1.50 L/s/m² at a differential pressure of 75Pa. The current VBBL requirement is 2.0 L/s/m² at 75Pa and is proposed to align with NECB 2020.

Based on data from air leakage tests collected at building occupancy, 75% of applicable projects are already testing below 1.50 L/s/m² at 75 Pa. Industry feedback

indicates that this target is not difficult to achieve for a majority of projects under current typical envelope sealing practices and it does not indicate an unfeasible level of air tightness. Many current COV and BC Energy Step Code projects are already accomplishing this target.

- 3) (for 10.2.1.5. buildings) it is proposed to align with BC Step Code (BCBC 9.36.7. and Table 9.36.7.4.) and the AL-1 Step.

For 10.2.1.5. buildings, it is recommended that the City of Vancouver continue with the existing 2.5 ACH@50Pa requirement, given challenges with buildability of especially smaller and denser housing typologies, and broad builder skillsets to achieve lower airtightness values that higher BC Step Code levels require. It also aligns with the optional NLA and NLR values in AL-1 step, to provide valuable flexibility for small and dense typologies.

- 4) 10.2.1.2 buildings can choose between 10.2.2.2 (ASHRAE) or 10.2.2.3 (NECB) for energy compliance. Per the new BCBC, ASHRAE 90.1-2019 and NECB 2020 will also be referenced within the 2025 VBBL, where these updated standards now include whole building air leakage testing metrics, however the ASHRAE 90.1 requirement and differs slightly from NECB. For simplification purposes, the by-law proposes to exclude the air leakage testing requirements from both ASHRAE and NECB, and instead requires 10.2.1.2 buildings to follow the same air tightness testing metrics, compliance and documentation requirements of 10.2.2.21.

Buildings under 10.2.1.2. have the option to meet energy requirements based on 10.2.2.2. (ASHRAE 90.1) or 10.2.2.3. (NECB). ASHRAE 90.1-2019 and NECB 2020 (the updated versions being adopted for 2025 VBBL) introduces new airtightness testing requirements not found in previous versions referenced by VBBL 2019. This proposed change is to align both ASHRAE and NECB projects with the requirements of 10.2.2.21, and disregard the similar but potentially conflicting requirements of ASHRAE or NECB. This creates simplicity for all Part 3 projects to have a single set of limits to follow, and the same process should non-compliance occur.

For information, the ASHRAE 90.1-2019 5.4 Mandatory Provisions requires whole-building pressurization test not to exceed 2.0L/s/m² at 75Pa limit, with an exemption from whole building testing based on building geometry (but requires portions of the building to be tested), or for buildings that opt to perform air barrier design and installation verification instead. This differs from the NECB 2020 requirement through the prescriptive path for air barrier system to comply with the normalized air leakage rate not greater than 1.5 L/s/m² at 75 Pa (NECB 2020 Div B Sentence

3.2.4.2.(1)). However, this is a requirement only for projects following the prescriptive path and is not required for projects using the trade-off or performance paths, which creates multiple options for projects to consider. A single airtightness requirement for all Part 3 new construction under VBBL 10.2.2.21 resolves this lack of consistency and creates alignment for all new construction.

Proposed VBBL content

Legend

Black Text – 2019 Vancouver Building By-law content

Black Underlined Text – Proposed modification to Vancouver Building By-law content

10.2.2.21. Building and Dwelling Unit Airtightness Testing

- 1) In a *building* required to comply with this Article, the *building* and *dwelling units* shall be tested for airtightness in accordance with
- a) ASTM E 779, Standard Test Method for Determining Air Leakage Rate by Fan Pressurization,
 - b) USACE Version 3, Air Leakage Test Protocol for Building Envelopes, or
 - c) airtightness protocol recognized by Natural Resources Canada for use in homes and buildings labeled under the EnerGuide for New Homes program, or
 - d) ASTM E3158, “Standard Test Method for Measuring the Air Leakage Rate of a Large or Multizone Building.”
- 2) A *building* required to comply with this Article shall have, at time of final inspections, maximum tested air leakage rates in conformance with:
- a) Table 10.2.2.21.A, for buildings subject to Article 10.2.1.5.,
 - b) Table 10.2.2.21.B, for buildings subject to Article 10.2.1.2 or Article 10.2.1.3., or
 - c) sealed to the satisfaction of the Chief Building Official.

Table 10.2.2.21.A			
Maximum Tested Air Leakage Rates for Buildings complying with Article 10.2.1.5.			
Forming part of Clause 10.2.2.21.(2)(a)			
<u>Airtightness Levels</u>	<u>ACH₅₀</u>	<u>NLA₁₀</u> <u>(cm²/m²)</u>	<u>NLR₅₀</u> <u>(L/s-m²)</u>
<u>All buildings</u>	<u>2.5</u>	<u>1.20</u>	<u>0.89</u>

Table 10.2.2.21.B	
Maximum Tested Air Leakage Rates for Buildings complying with Article 10.2.1.2 or 10.2.1.3	
Forming part of Clause 10.2.2.21.(2)(b)	
<u>Building Classification</u>	<u>Maximum Tested Air Leakage Rate</u>
<u>Whole Building</u>	<u>1.5 L/s/m² at 75 pascals</u>
<u>Individual Dwelling Units</u>	<u>1.23 L/s/m² at 50 pascals</u>

Table 10.2.2.21. DELETED

Add whole building airtightness testing requirement for 10.2.1.2 buildings

Clause 10.2.1.2.(1)(j) shall provide airtightness testing in compliance with Article 10.2.2.21.,

Remove similar but potentially conflicting requirements in 10.2.2.2

10.2.2.2. ANSI/ASHRAE/IESNA 90.1

- 1) A *building* designed in accordance with this Article shall, be designed and constructed in accordance with ANSI/ASHRAE/IESNA 90.1, "Energy Standard for Buildings, except Low-Rise Residential Buildings".
- 2) A *building* designed in accordance with Sentence (1), shall be designed, as applicable, with

d) no requirement to comply with whole building air leakage testing of ASHRAE 90.1, Section 5.4.3.1.1.,

Remove similar but potentially conflicting requirements in 10.2.2.3

10.2.2.3. National Energy Code of Canada for Buildings

- 1) A *building*, other than a Part 9 *building*, designed in accordance with this Article shall be designed and constructed in accordance with the National Energy Code of Canada for Buildings (NECB), except that the provisions of this By-law shall apply where the NECB refers to the National Building Code of Canada (NBCC), and shall be designed, as applicable, with

g) no requirement to comply with whole building air leakage testing of NECB, Article 3.2.4.2.,

Add to Div B Acceptable Solutions Section 1.3 Referenced Documents and Organizations, Table 1.3.1.2:

Issuing Agency	Document Number	Title of Document	By-law reference
<u>ASTM</u>	<u>E 3158-18</u>	<u>Standard Test Method for Measuring the Air Leakage Rate of a Large or Multizone Building</u>	<u>10.2.2.21.(1)</u>

New note A.10.2.1.2.(1)(a)

A-10.2.1.2.(1)(a)

For projects complying with 10.2.1.2.(1)(a), note that whole building air leakage testing requirements of 10.2.2.21 supercede similar requirements in ASHRAE 90.1 or NECB.