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## Proposed Change 1954

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<b>Code Reference(s):</b>	<b>NBC20 Div.C 2.2.8.2.(1) (first printing)</b>
Subject:	Airtightness
Title:	Using NLR <sub>50</sub> in Administrative Documents
Description:	This proposed change modifies the airtightness metric required on drawings and specifications for the proposed house.
Related Proposed Change(s):	PCF 1819

This change could potentially affect the following topic areas:

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| <input type="checkbox"/> Division A                                | <input type="checkbox"/> Division B                        |
| <input checked="" type="checkbox"/> Division C                     | <input type="checkbox"/> Design and Construction           |
| <input type="checkbox"/> Building operations                       | <input checked="" type="checkbox"/> Housing                |
| <input checked="" type="checkbox"/> Small Buildings                | <input type="checkbox"/> Large Buildings                   |
| <input type="checkbox"/> Fire Protection                           | <input type="checkbox"/> Occupant safety in use            |
| <input type="checkbox"/> Accessibility                             | <input type="checkbox"/> Structural Requirements           |
| <input checked="" type="checkbox"/> Building Envelope              | <input checked="" type="checkbox"/> Energy Efficiency      |
| <input type="checkbox"/> Heating, Ventilating and Air Conditioning | <input type="checkbox"/> Plumbing                          |
|  | <input type="checkbox"/> Construction and Demolition Sites |

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## Problem

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Where an airtightness test is used to determine the airtightness of a proposed house, the measured airtightness of the building envelope must be reported in ACH<sub>50</sub> (air changes per hour at 50 Pa pressure differential) on the drawings and specifications for the proposed house as required by the National Building Code of Canada (NBC) 2020. A related proposed change (PCF 1819) uses NLR<sub>50</sub> (normalized leakage rate at 50 Pa pressure differential) as the regulated airtightness metric in the NBC.

To prevent confusion and enforcement issues associated with PCF 1819, the administrative provisions of the Code should also be revised to require the NLR<sub>50</sub> metric to be provided on the drawings and specifications for the proposed house.

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## Justification

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$NLR_{50}$  (in  $L/(s \times m^2)$ ) is an airtightness metric that is based on the airtightness of assemblies and surfaces, which is in turn directly aligned with the materials used and the assemblies built by the builders during construction. The prescriptive requirements in Subsection 9.25.3. address the airtightness of materials and assemblies as a means of achieving a continuous air barrier system that is a part of the building envelope. The required airtightness of this system should not vary with the size or geometry of the house being constructed, yet relying on a volumetric target such as  $ACH_{50}$  effectively does just that.  $ACH_{50}$  is a volumetric measurement that is calculated as an output of the measured effectiveness of the air barrier assemblies and varies by house size, even where assembly airtightness is consistent. Conversely,  $NLR_{50}$  is a normalized metric, meaning that it is more consistently applicable to a wide variety of housing geometries.

PCF 1819 proposes maintaining the use of  $ACH_{50}$  in Section 9.36. as a calculated value for input into energy models, but  $ACH_{50}$  would be calculated as an output value based on an  $NLR_{50}$  input value and building geometry rather than an assumed value. PCF 1819 would also remove  $ACH_{50}$  from all tables in Section 9.36., which would simplify the requirements.

Using  $NLR_{50}$  instead of  $ACH_{50}$  as the metric to report the measured airtightness on the drawings and specifications for the proposed house would align the administrative requirements with the proposed revision to the technical requirements found in PCF 1819.

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## PROPOSED CHANGE

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### **[2.2.8.2.] 2.2.8.2. Information Required on Drawings and Specifications**

- [1] 1)** Except as provided in Sentences (2) to (4), the drawings and specifications for the proposed house shall include
- [a] a) the effective thermal resistance values and respective areas of all opaque *building* envelope assemblies, including all above-ground and below-ground roof/ceiling, wall, and floor assemblies,
  - [b] b) the overall thermal transmittance (U-value), solar heat gain coefficient and respective areas of all fenestration and door components,
  - [c] c) the ratio of total vertical fenestration and door area to gross wall area,
  - [d] d) the performance rating, energy source, and types of all equipment required for space-heating and -cooling and service water heating,
  - [e] e) the design basis for the ventilation rates,
  - [f] f) the design normalized leakage rate of the *building* envelope at 50 Pa pressure differential ( $NLR_{50}$ ) in  $L/(s \times m^2)$ , with a pressure exponent of 0.67, where a test is to be used to determine the airtightness of the house, ~~the measured airtightness of the~~

- ~~building envelope in air changes per hour~~, and
- [g] g) any additional features used in the energy model calculations that account for a significant difference in house energy performance.

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## Impact analysis

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PCF 1819 revises Section 9.36. to use  $NLR_{50}$  as the regulated airtightness metric, which provides a more representative assessment of the performance of the air barrier system. Making this change (PCF 1954) would align the requirements for drawings and specifications with airtightness testing practices. Since the Code requires builders to construct assemblies that are airtight, it makes sense to measure the airtightness of these assemblies, aligning technical requirements and enforcement requirements through the use of the  $NLR_{50}$  metric.

Because the conversion between  $ACH_{50}$  and  $NLR_{50}$  requires only the exposed area and volume as inputs (both known quantities when performing a blower door test), and the  $NLR_{50}$  metric is already specified in existing Code requirements, this proposed change would have no additional implementation costs for Code users. The authority having jurisdiction would need to be familiar with the airtightness requirements using the  $NLR_{50}$  metric (i.e., the targeted  $NLR_{50}$  values for different airtightness levels) when reviewing the drawings and specifications for proposed projects.

Using the  $NLR_{50}$  metric instead of the  $ACH_{50}$  metric as a measure of airtightness performance on the drawings and specifications for a proposed house would align the administrative requirements in Division C of the NBC with the revised technical requirements (as proposed in PCF 1819) in Division B.

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## Enforcement implications

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This proposed change could be enforced using existing Code enforcement infrastructure.

Authorities having jurisdiction would need to become familiar with the  $NLR_{50}$  metric if they are not already using it regularly.

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## Who is affected

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Designers, engineers, architects, building officials, manufacturers, suppliers and energy advisors.