

No. B19 – 03  
April 30, 2019

## **Guidelines for Energy Advisors – Setting Airtightness Values for Energy Modelling of Part 9 Buildings for Compliance with the BC Energy Step Code**

*NOTE: This document was developed with the input of the Office of Energy Efficiency at Natural Resources Canada.*

This bulletin provides guidance to Energy Advisors<sup>1</sup> and other energy modellers who are modelling Part 9 buildings to comply with the BC Energy Step Code. It is also intended for building officials and others interested in compliance paths of the BC Energy Step Code. Other bulletins in the series include:

- B19 – 01: Complying with Step 1 of the BC Energy Step Code for Part 9 Buildings, and
- B19 – 02: Step 1 in the BC Energy Step Code: Airtightness, Enhanced Compliance and Compliance Paths.

Bulletin B18 – 03 (released July 2018) is a companion bulletin that provides information on the BC Energy Compliance Reports - Performance Paths for Part 9 Buildings.

### **Compliance Paths for Step 1**

Energy Advisors and other energy modellers can provide guidance to their clients to ensure that the design and construction of new Part 9 buildings meet the BC Energy Step Code energy performance requirements. Energy modelling for Step 1 may be performed using:

1. the EnerGuide Rating System (ERS) compliance path, or
2. Subsection 9.36.5. of the BCBC.

Only Energy Advisors may use the ERS compliance path. Airtightness testing is required for compliance.

### **Understanding the EnerGuide Rating System and Building Compliance**

The EnerGuide Rating System (ERS) is a national system developed by NRCAN to rate the energy performance of Part 9 residential buildings, including multi-unit residential buildings. The ERS is used to compare a proposed house<sup>2</sup> to the ERS reference house.<sup>3</sup> The reference house

<sup>1</sup> Energy Advisors, in the context of this Bulletin, are “individuals registered with Natural Resources Canada to deliver the EnerGuide Rating System Basic Service and additional services,” as per NRCAN’s “EnerGuide Rating System Standard Version 15.6,” p. 6.

<sup>2</sup> The proposed house, in the context of energy modelling, is the house as designed, with standard operating conditions, such as number of occupants, appliance and hot water loads, and operating schedules as defined either by HOT2000 or by Subsection 9.36.5.

<sup>3</sup> The reference house, according to the EnerGuide Rating System’s HOT2000 User Guide, is a “copy of the (proposed) house with standard operating conditions. It is then manipulated to represent the modelled house as if it were built to the National Building Code of Canada (NBC) Section 9.36 energy-efficiency requirements.” However, the reference house in the ERS “is not identical to the Reference House referred to in NBC 9.36.5, although it shares many of the same properties.” Further, there are differences between the reference house and the proposed house, which are defined in Bulletin B19 – 02.

refers to a building similar to one constructed to the minimum prescriptive requirements of the BC Building Code (BCBC) (for more details on the differences between a design house and a reference house, please see Bulletin B19 – 02). When designing a building that is following the EnerGuide Rating System, the Energy Advisor must submit two files to NRCan:

- the P file, an energy model of the proposed house, and
- the N file, an energy model of the as-constructed house.

This bulletin addresses setting an airtightness value for the P file. The N file represents the house as constructed, and must incorporate the airtightness value from an airtightness test performed in accordance with Sentence 9.36.6.5.(1) of the BCBC.

### **Step 1: The ERS Compliance Path**

When the construction team is following the ERS compliance path, the Energy Advisor should assess the past performance of the team on building airtightness, to set the airtightness value of a proposed house seeking to comply with Step 1 of the BC Energy Step Code. The Building and Safety Standards Branch (BSSB) suggests Energy Advisors make one of the following choices in their modelling:

- 1) Model the proposed house with an airtightness of 2.5 air changes per hour at 50 Pa Pressure Differential ( $ACH_{50}$ ). This path is recommended if the project team determines that the building as constructed can achieve an airtightness of 2.5  $ACH_{50}$  or better. If the builder can achieve this airtightness target, the building will likely comply if it is constructed to the prescriptive minimums of Subsections 9.36.2. through 9.36.4. of the BCBC, so long as the proposed house:
  - has the same design as the constraints for the reference house in the modelling software, such as window orientation and solar heat gain as described in Bulletin B19 – 02,
  - is energy modelled, and
  - can achieve the airtightness value of 2.5  $ACH_{50}$  in a blower door test.
- 2) Model the proposed house with an airtightness greater than 2.5  $ACH_{50}$ . This path is recommended if the project team does not expect the building to achieve an airtightness of 2.5  $ACH_{50}$ . In this case, if the characteristics of the proposed house and the reference house as described in Bulletin B19 – 02 are the same, then at least one element of the proposed building must be better than the prescriptive minimums of the BCBC, for the builder to achieve the required energy performance. This is to compensate for the higher air leakage rate of the proposed house than the reference house.

Project teams are encouraged to assign a proposed house airtightness value that is consistent with the expected performance of the builder, based on the builder's experience and/or builders' standard practice within the region. Values are suggested in Figure 1 below.

### Step 1: The Subsection 9.36.5. Compliance Path

If a building is unable to comply with the BC Energy Step Code by following the ERS and using the airtightness value returned through the ERS, the building team may choose to use Sentence 9.36.5.10.(9) of the BCBC to comply with the BC Energy Step Code.

Sentence 9.36.5.10.(9) sets two options for choosing an airtightness value for the proposed house:

- The first option, 4.5 ACH<sub>50</sub>, can be used if the building complies with Section 9.25. of the BCBC.
- If the building complies with Subsection 9.25.3. and Articles 9.36.2.9. and 10. of the BCBC, the second option of using 3.5 ACH<sub>50</sub> can be used.

The as-built house can use either airtightness targets listed.

The differences between the two paths leading to each option are described in detail in Bulletin B19 – 02. The decision path is shown in Figure 2 below.

### Steps 2 through 5: The ERS Compliance Path

When a builder is seeking to comply with Steps 2 through 5 of the BC Energy Step Code following the ERS path, the Energy Advisor may model the proposed building using the airtightness target of the respective step (Table 1). The building must achieve both the Performance Requirement of Building Equipment and Systems (either the Mechanical Energy Use Intensity or the % lower than EnerGuide Reference House target for the step) and the Performance Requirement of Building Envelope (the Thermal Energy Demand Intensity target for that step).<sup>4</sup> The decision path for ERS for Steps 2 through 5 is shown in Figure 3 below.

*Table 1. Airtightness targets for Steps in the BC Energy Step Code for all Climate Zones.*

Step	Airtightness (Air Changes per Hour at 50 Pa Pressure Differential)
1	N/A
2	≤ 3.0
3	≤ 2.5
4	≤ 1.5
5	≤ 1.0

<sup>4</sup> To view the specific targets, please view Technical Bulletin B18-08 on Revisions to the 2018 BC Building Code, at [https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/bulletins/b18\\_08\\_revision1\\_to\\_bcbc\\_stepcode.pdf](https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/construction-industry/building-codes-and-standards/bulletins/b18_08_revision1_to_bcbc_stepcode.pdf).

### **Steps 2 through 5: Subsection 9.36.5. Compliance Path**

Energy modellers following the Subsection 9.36.5. compliance path to achieve Steps 2 through 5 do not need to create a reference house. However, they must demonstrate compliance by meeting the MEUI (Mechanical Energy Use Intensity) and TEDI (Thermal Energy Demand Intensity) target for that Step. Further, they must continue to observe the airtightness values that are outlined in Sentence 9.36.5.10.(9) for the proposed house. The decision path for Subsection 9.36.5. for Steps 2 through 5 is shown in Figure 4 below.

### **Steps 2 through 5: Compliance through Part 8 of the National Energy Code for Buildings and the City of Vancouver Energy Modelling Guidelines**

Buildings pursuing Steps 2 through 5 using the applicable requirements of Part 8 of the National Energy Code for Buildings (NECB) and the City of Vancouver's Energy Modelling Guidelines (CoV EMG) shall use the infiltration/air leakage rates determined using Section 2.4 of the CoV EMG. The decision path for the NECB and the CoV EMG for Steps 2 through 5 is shown in Figure 5.

### **Step 5: The Passive House Compliance Path**

Buildings pursuing Step 5 may also use the Passive House compliance path. Passive House is a high-performance building standard that can reduce a building's heating and cooling energy needs by up to 90 percent compared to conventional buildings. To follow the Passive House compliance path under the BC Energy Step Code, a Certified Passive House Consultant or Designer must design the building to conform with the Passive House Planning Package (PHPP).

For buildings pursuing Step 5 following the Passive House compliance path, the airtightness of the design building shall be set to the PHPP's maximum allowable airtightness of 0.6 ACH<sub>50</sub>. The decision path for Passive House for Step 5 is shown in Figure 6.

### **More Information**

Please visit [www.gov.bc.ca/buildingcodes](http://www.gov.bc.ca/buildingcodes) or [www.energystepcode.ca](http://www.energystepcode.ca).

Questions related to this bulletin can be directed to [CodeQuestion@gov.bc.ca](mailto:CodeQuestion@gov.bc.ca).

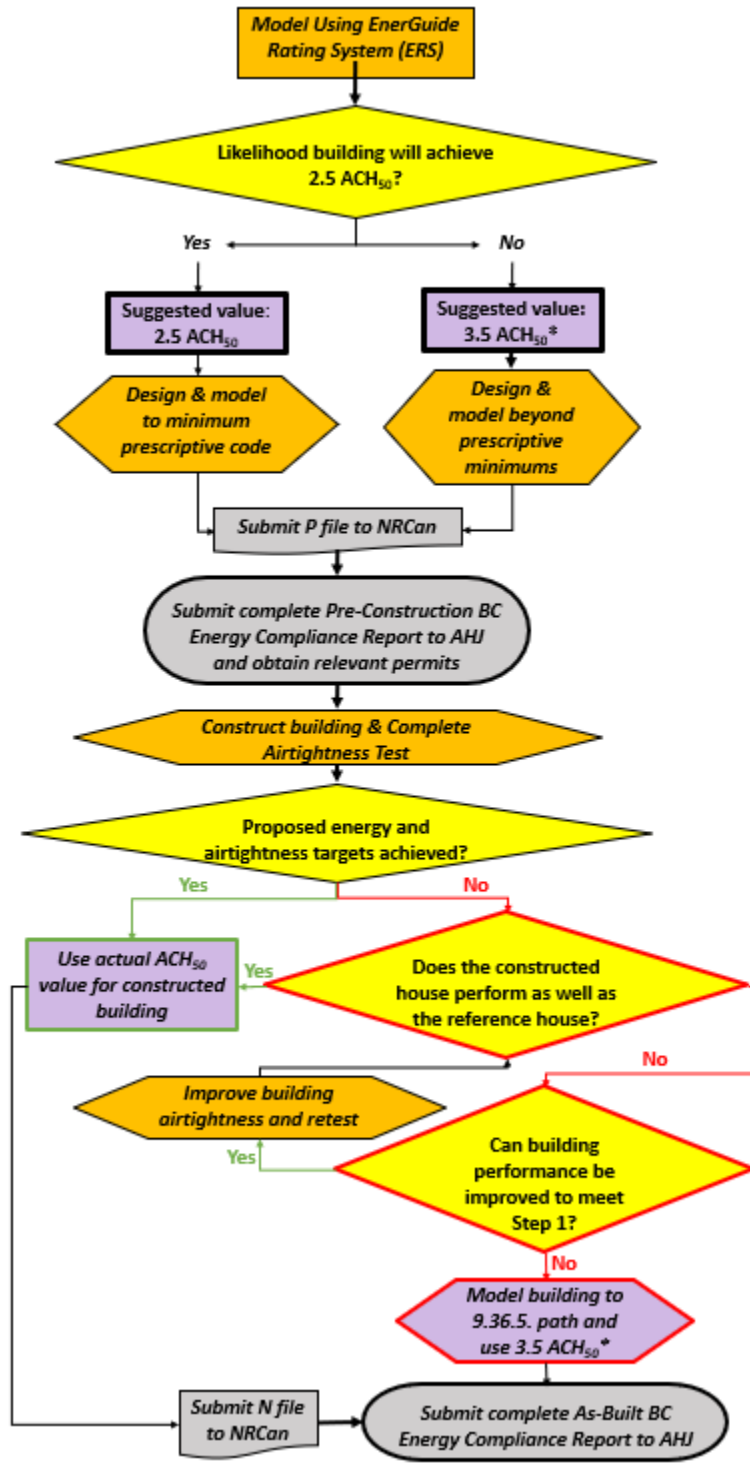
### **Acknowledgement**

This bulletin was made possible by a financial contribution from Natural Resources Canada.

## Legend for Figures 1 and 2:

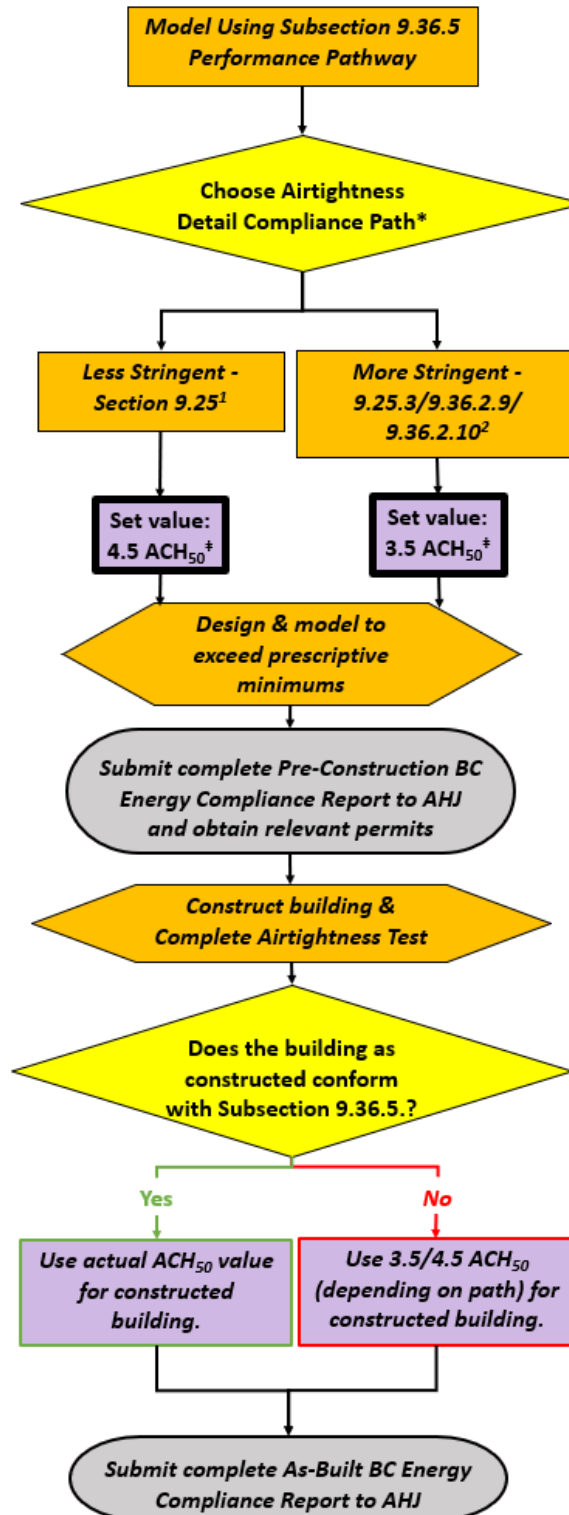
	Decision Point		Action		Recommended path
	<b>CAUTION - Potential additional requirements for compliance</b>		Assigned airtightness value for path chosen	-	Submission
* the Reference House airtightness value is dependent on airtightness construction path. If Articles 9.36.2.9. and 9.36.2.10. are followed, the energy modeller shall use 3.5 ACH <sub>50</sub> as the proposed house airtightness value. If they are not, the energy modeller shall use 4.5 ACH <sub>50</sub> .					
‡ Airtightness values of greater than 2.5 ACH <sub>50</sub> are higher than the reference building, which may require the building to be constructed to exceed Code prescriptive minimums.					
<sup>1</sup> Section 9.25. Heat Transfer, Air Leakage and Condensation Control (only where 9.36. air barrier requirements are not followed)					
<sup>2</sup> Subsection 9.25.3. Air Barrier Systems / Article 9.36.2.9. Airtightness / Article 9.36.2.10. Construction of Air Barrier Details					

Figure 1. Compliance Decision Path for Part 9 Building Airtightness following the ERS path to comply with Step 1 under the BC Energy Step Code



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Figure 2. Compliance Decision Path for Part 9 Building Airtightness following Subsection 9.36.5. to comply with Step 1 under the BC Energy Step Code



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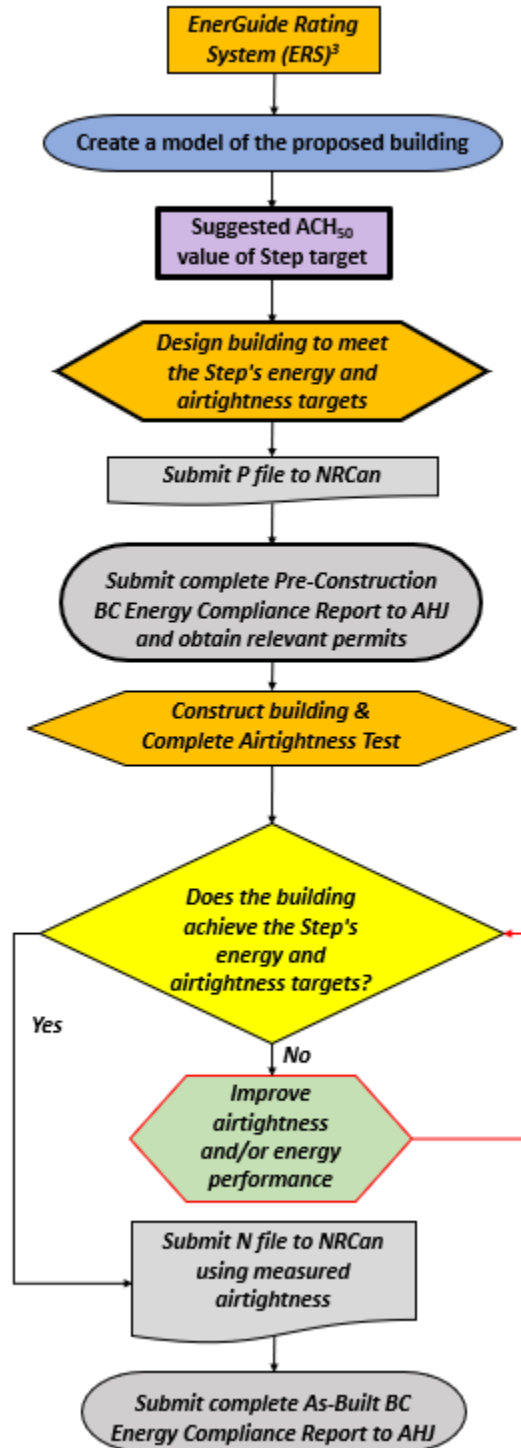
**Legend for Figures 3 through 6:**

Decision Point	Action	-	<b>Remedy required</b>
Airtightness value		-	Submission
<sup>1</sup> Section 9.25. – Heat Transfer, Air Leakage and Condensation Control (only where 9.36. air barrier requirements are not followed)			
<sup>2</sup> Subsection 9.25.3. – Air Barrier Systems / Article 9.36.2.9. – Airtightness / Article 9.36.2.10. – Construction of Air Barrier Details			
<sup>3</sup> % lower than EnerGuide Reference House is only applicable for Steps 1 through 4; it is not available as a compliance metric at Step 5			

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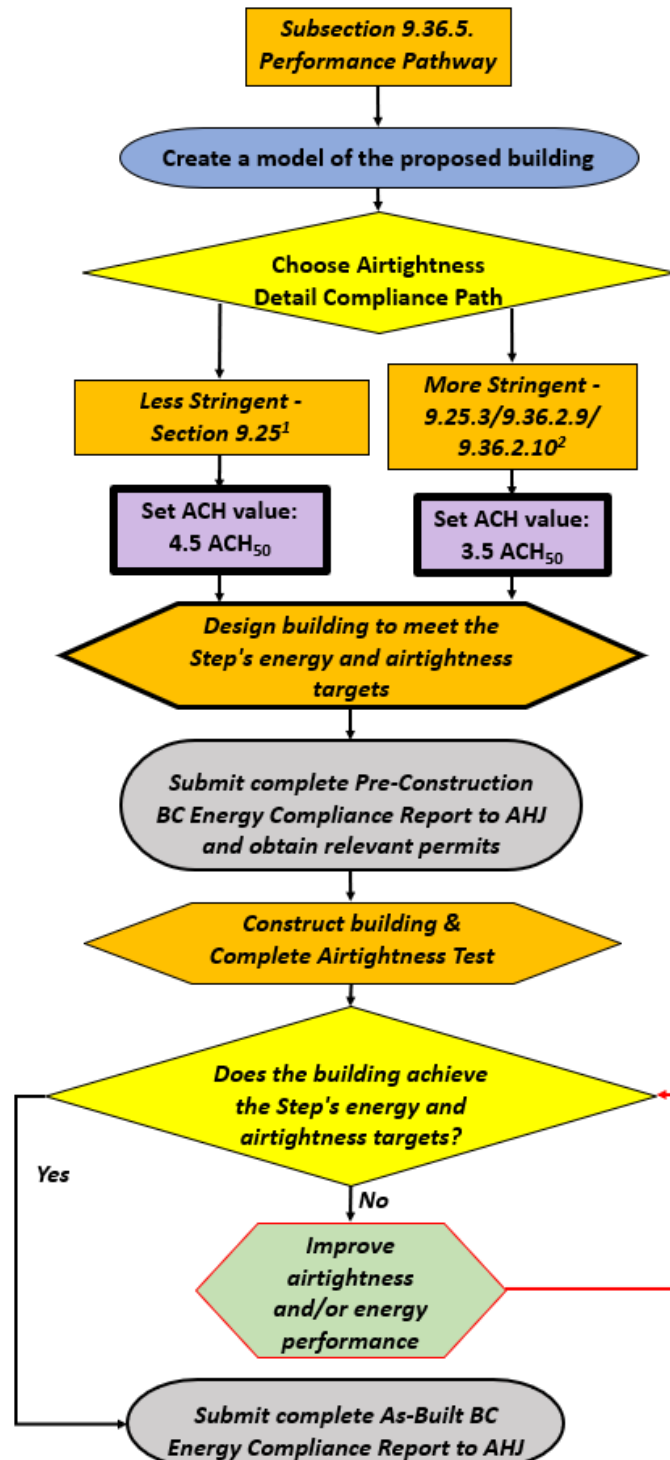


Figure 3. Compliance Decision Path for Part 9 Building Airtightness following the ERS path to comply with Step 2 through 5 under the BC Energy Step Code



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Figure 4. Compliance Decision Path for Part 9 Building Airtightness following Subsection 9.36.5. to comply with Steps 2 through 5 under the BC Energy Step Code



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Figure 5. Compliance Decision Path for Part 9 Building Airtightness following the applicable requirements of Part 8 of the National Energy Code for Buildings and the City of Vancouver's Energy Modelling Guidelines to comply with Steps 2 through 5 under the BC Energy Step Code

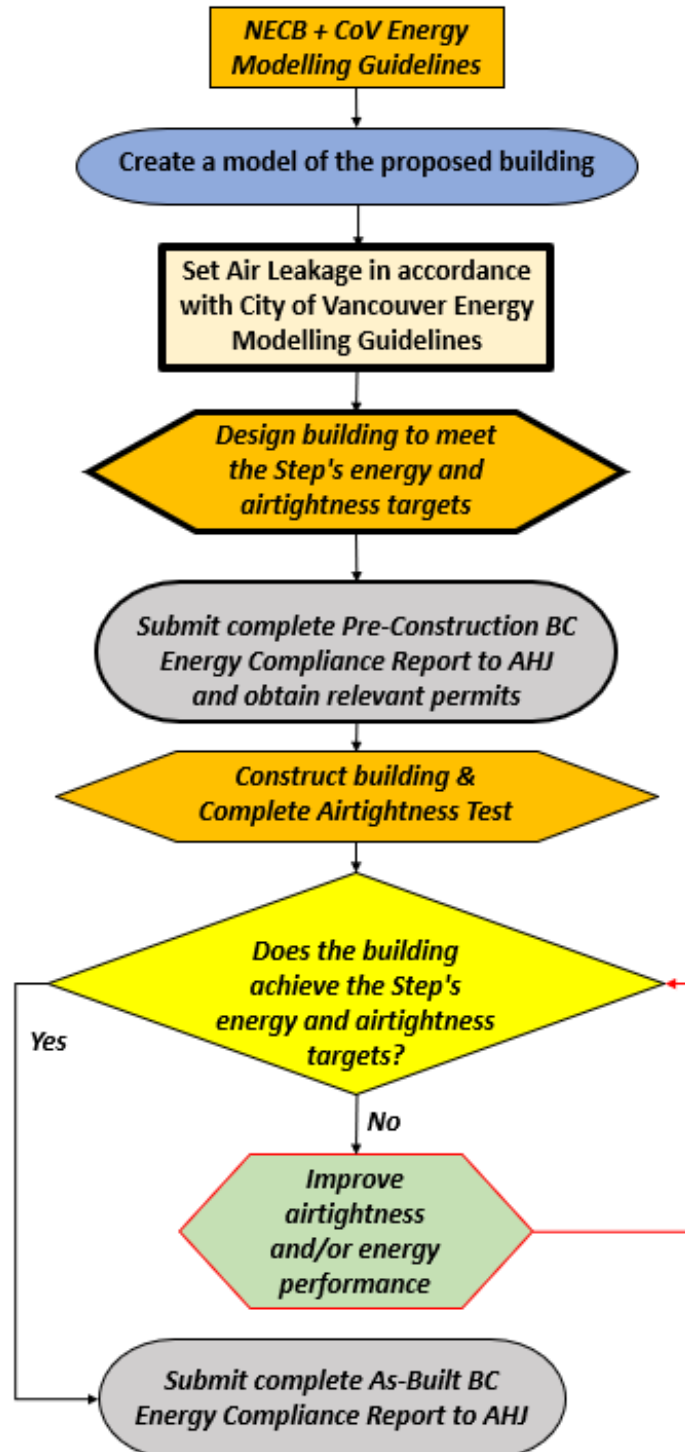
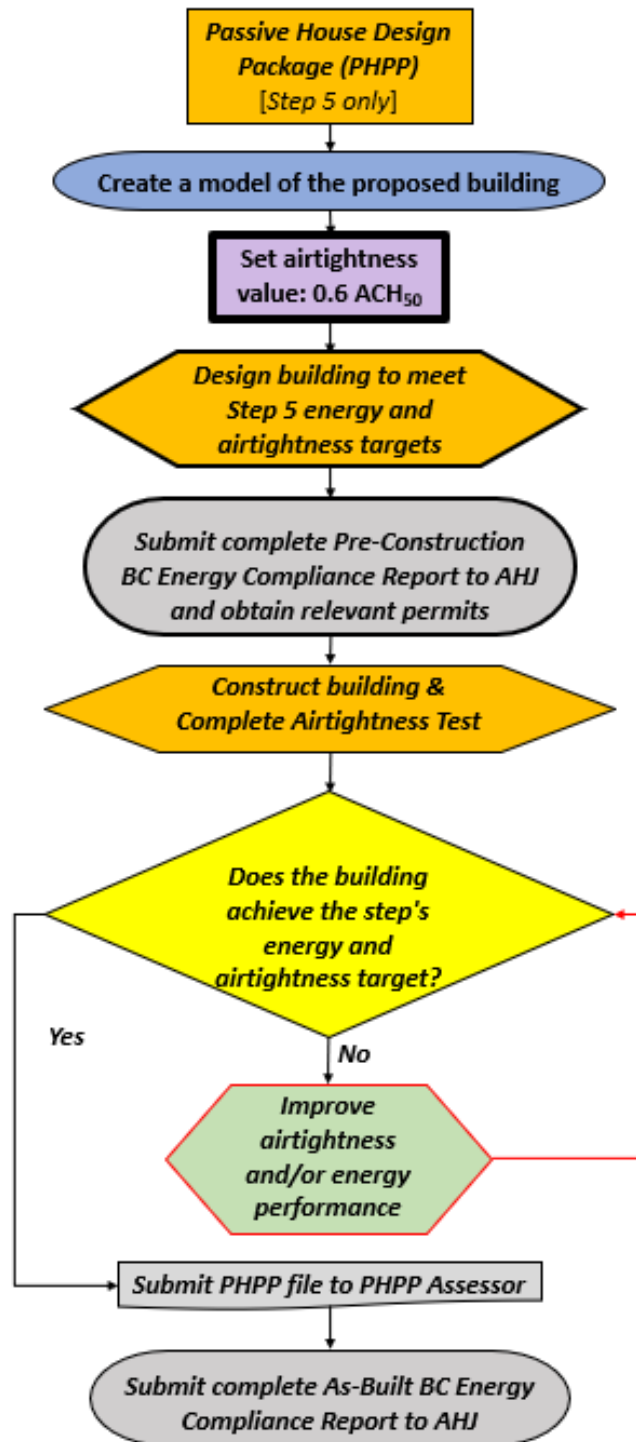


Figure 6. Compliance Decision Path for Part 9 Building Airtightness following the Passive House Design Package path to comply with Step 5 under the BC Energy Step Code



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