Proposed Change: Energy Step Code for Part 9 and Part 10

CHANGE NUMBER: BCBC2018-R502-ESC

CODE REFERENCE: British Columbia Building Code 2018 - Part 9 and Part 10 of Division B

BACKGROUND

Description

This change contains revisions to the Energy Step Code (ESC) metrics in Part 9 and Part 10 relating to airtightness of building envelope, and introduces a new energy performance compliance Table 9.36.6.3.-G. See also proposed code change BCBC2018-R501-EE and BCBC2018-R503-GHG for provisions relating to greenhouse gas emissions (GHG) and energy performance improvements for Part 9 and Part 10 buildings. This change references the 2019 edition of ANSI/ASHRAE/IES 90.1 and the 2020 edition of the National Energy Code of Canada for Buildings (NECB).

(Note: only code references that have been revised are included in the proposed code change)

Problem

The design and construction of buildings that are not equipped with energy efficient building systems will tend to use excessive amounts of energy for its desired function. In order to meet government mandates on improved energy efficiency, more stringent energy requirements are required for Part 9 and Part 3 buildings to meet these climate objectives.

Justification

The revised ESC metrics for both Part 9 and Part 3 buildings help to improve the energy performance of new and existing buildings. The introduction of Subsection 9.36.7. Airtightness of Building Envelope provides flexibility for designers in that it will allow the use of different airtightness metrics such as ACH_{50}, NLA_{10}, and NLR_{50} to meet the required airtightness. This acknowledges that there may be some inequities amongst buildings of different sizes. For example, smaller homes built to a high level of airtightness may have difficulty in meeting the ACH_{50}, but could meet NLA_{10} or NLR_{50}.

The new Table 9.36.6.3.-G uses a percent better approach for energy performance compliance and the metrics required for compliance depend on the size of the building based on the total volume of conditioned space in the building or house. The defined term 'house' is being introduced to provide further clarity on the application of the ESC. These changes are a result of a commitment to further align and harmonize with the 2020 National Building Code.

PROPOSED CHANGE

9.36.6. Energy Step Code

9.36.6.1. Application

1) Where a *building* contains more than one *dwelling unit*, the requirements of this Subsection shall apply to the energy performance of the *building* and not to individual *dwelling units*.

2) This Subsection is concerned with determining compliance with one of the energy

performance steps through modeling the energy performance of components, systems and assemblies that are installed in *buildings* and houses with or without a *secondary suite*, described in Sentence 9.36.1.3.(3).

9.36.6.2. Definitions

(See Note A-9.36.6.2.)

1) For the purpose of this Subsection, the term "mechanical energy use intensity" shall mean a metric of the energy used over a year by the *building*, estimated by using an energy model in accordance with Article 9.36.6.4., normalized per square metre of floor area of *conditioned space* and expressed in kWh/(m2•year), for all of the following combined:

a) space-heating equipment,
b) space-cooling equipment,
c) fans,
d) service water heating equipment,
e) pumps, and
f) auxiliary HVAC equipment (see Note A-9.36.6.2.(1)(f)).

~~**2)** For the purpose of this Subsection, the term "EnerGuide Rating % lower than EnerGuide Reference House" shall mean the metric that results when, using HOT2000 software, version 11 or newer and Natural Resources Canada's EnerGuide Rating System, version 15 or newer, the energy consumption of the following are compared:~~
~~a) the proposed *building*, not including the EnerGuide assumed electric base loads, and~~
~~b) the corresponding automatically generated reference house, not including the EnerGuide assumed electric base loads.~~

2) Notwithstanding 9.36.6.1, for the purpose of this Subsection, the term "house" shall mean all houses, with or without a *secondary suite*, that

a) have HVAC systems that serve only the house , only the *secondary suite*, or both the house and the *secondary suite* including their common spaces,
b) have service water heating systems that serve only the house , only the *secondary suite*, or both the house and the *secondary suite* including their common spaces, and
c) except for common spaces in a house with its *secondary suite*, do not share common spaces with other *dwelling units* or houses, except for a *secondary suite*.

(See Note A-9.36.6.2.(2)).

3) For the purpose of this Subsection, the term "thermal energy demand intensity" shall mean a metric of the annual heating required by the *building* for space conditioning and for conditioning of ventilation air, estimated by using an energy model in accordance with Article 9.36.6.4., normalized per square metre of floor area of *conditioned space* and expressed in kWh/(m2•year), taking into account all of the following:

a) thermal transmittance of above-ground walls and roof-ceiling assemblies,
b) thermal transmittance of floors and walls in contact with the ground, or with space that is not *conditioned space*,
c) thermal transmittance and solar heat gain of windows, doors and skylights,
d) air leakage through the *air barrier system*,
e) internal heat gains from occupants and equipment, and
f) heat recovery from exhaust ventilation.

4) For the purpose of this Subsection, the term "Step" shall mean a Step referred to in Tables 9.36.6.3.-A to 9.36.6.3.-~~G~~H.

~~**5)** For the purpose of this Subsection, the term "envelope performance improvement over the EnerGuide Reference House" shall mean the difference between the annual heating demand of the proposed *building* and the reference house, where~~
~~a) the reference house is generated using HOT2000 software, version 11 or newer and Natural Resources Canada's EnerGuide Rating System, version 15 or newer,~~
~~b) the proposed *building* is modelled with same space heating, space cooling, ventilation and service water heating equipment as the reference house, in accordance with the requirements of Articles 9.36.5.15 and~~

~~9.36.5.16., and~~
~~c) the difference between annual heating demand of the proposed *building* and the automatically-generated reference house is calculated in conformance with 9.36.6.3.(5).~~

9.36.6.3. Compliance Requirements

1) *Buildings* conforming to the requirements of any of Steps ~~1~~3 to 5 shall be designed and constructed to conform to the applicable energy performance requirements in
a) Tables 9.36.6.3.-A to 9.36.6.3.-~~G~~F and Table 9.36.6.3.-H., or
b) Table 9.36.6.3-G.

Table 9.36.6.3.-A
Requirements for Buildings Located Where the Degree-Days Below 18°C Value is less than 3000(1)
Forming Part of Sentence 9.36.6.3.(1)

Step	Airtightness(2) ~~(Air Changes per Hour at 50 PA Pressure Differential)~~	Performance Requirement of *Building* Equipment and Systems	Performance Requirement of *Building* Envelope
1	Reserved ~~N/A~~	Reserved ~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 0% lower energy consumption or conform to Subsection 9.36.5.~~	
2	Reserved ~~≤ 3.0~~	Reserved ~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 10% lower energy consumption or the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G~~	Reserved ~~thermal energy demand intensity ≤ 35 kWh/(m²•year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) or not less than 5% performance improvement over the EnerGuide Reference House~~
3	~~≤ 2.5~~ AL-1	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 20% lower energy consumption or~~ the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 30 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 10% performance improvement over the EnerGuide Reference House~~
4	~~≤ 1.5~~ AL-3	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 40% lower energy consumption or~~ the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 20 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 20% performance improvement over the EnerGuide Reference House~~
5	~~≤ 1.0~~ AL-4	the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 15 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 50% performance improvement over the EnerGuide Reference House~~

Notes to Table 9.36.6.3.-A:
(1) See Sentence 1.1.3.1.(1) and Table C-2 in Appendix C.
(2) See Table 9.36.7.4.

Table 9.36.6.3.-B
Requirements for Buildings Located Where the Degree-Days Below 18°C Value is 3000 to 3999[1]
Forming Part of Sentence 9.36.6.3.(1)

Step	Airtightness[2] ~~(Air Changes per Hour at 50 PA Pressure Differential)~~	Performance Requirement of *Building* Equipment and Systems	Performance Requirement of *Building* Envelope
1	~~N/A~~ Reserved	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 0% lower energy consumption or conform to Subsection 9.36.5.~~ Reserved	
2	~~≤ 3.0~~ Reserved	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 10% lower energy consumption or the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G~~ Reserved	~~thermal energy demand intensity ≤ 45 kWh/(m²•year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) or not less than 5% performance improvement over the EnerGuide Reference House~~ Reserved
3	~~≤ 2.5~~ AL-1	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 20% lower energy consumption or~~ the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 40 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 10% performance improvement over the EnerGuide Reference House~~
4	~~≤ 1.5~~ AL-3	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 40% lower energy consumption or~~ the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 30 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 20% performance improvement over the EnerGuide Reference House~~
5	~~≤ 1.0~~ AL-4	the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 20 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 50% performance improvement over the EnerGuide Reference House~~

Notes to Table 9.36.6.3.-B:
(1) See Sentence 1.1.3.1.(1) and Table C-2 in Appendix C.
(2) See Table 9.36.7.4.

Table 9.36.6.3.-C
Requirements for Buildings Located Where the Degree-Days Below 18°C Value is 4000 to 4999[1]
Forming Part of Sentence 9.36.6.3.(1)

Step	Airtightness[2] ~~(Air Changes per Hour at 50 PA Pressure Differential)~~	Performance Requirement of *Building* Equipment and Systems	Performance Requirement of *Building* Envelope
1	~~N/A~~ Reserved	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 0% lower energy consumption or conform to Subsection 9.36.5.~~ Reserved	

2	~~≤ 3.0~~ Reserved	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 10% lower energy consumption or the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G~~ Reserved	~~thermal energy demand intensity ≤ 60 kWh/(m²•year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) or not less than 5% performance improvement over the EnerGuide Reference House~~ Reserved
3	~~≤ 2.5~~ AL-1	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 20% lower energy consumption or~~ the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 50 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 10% performance improvement over the EnerGuide Reference House~~
4	~~≤ 1.5~~ AL-3	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 40% lower energy consumption or~~ the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 40 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 20% performance improvement over the EnerGuide Reference House~~
5	~~≤ 1.0~~ AL-4	the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 25 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 50% performance improvement over the EnerGuide Reference House~~

Notes to Table 9.36.6.3.-C:
(1) See Sentence 1.1.3.1.(1) and Table C-2 in Appendix C.
(2) See Table 9.36.7.4.

Table 9.36.6.3.-D
Requirements for Buildings Located Where the Degree-Days Below 18°C Value is 5000 to 5999(1)
Forming Part of Sentence 9.36.6.3.(1)

Step	Airtightness(2) ~~(Air Changes per Hour at 50 PA Pressure Differential)~~	Performance Requirement of *Building* Equipment and Systems	Performance Requirement of *Building* Envelope
1	~~N/A~~ Reserved	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 0% lower energy consumption or conform to Subsection 9.36.5.-~~Reserved	
2	~~≤ 3.0~~ Reserved	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 10% lower energy consumption or the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G~~ Reserved	~~thermal energy demand intensity ≤ 80 kWh/(m²•year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) or not less than 5% performance improvement over the EnerGuide Reference House~~ Reserved
3	~~≤ 2.5~~ AL-1	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 20% lower energy consumption or~~ the applicable	thermal energy demand intensity ≤ 70 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4)

		mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	~~or not less than 10% performance improvement over the EnerGuide Reference House~~
4	~~≤ 1.5~~ AL-3	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 40% lower energy consumption or~~ the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 55 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 20% performance improvement over the EnerGuide Reference House~~
5	~~≤ 1.0~~ AL-4	the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 35 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 50% performance improvement over the EnerGuide Reference House~~

Notes to Table 9.36.6.3.-D:
(1) See Sentence 1.1.3.1.(1) and Table C-2 in Appendix C.
(2) See Table 9.36.7.4.

Table 9.36.6.3.-E
Requirements for Buildings Located Where the Degree-Days Below 18°C Value is 6000 to 6999(1)
Forming Part of Sentence 9.36.6.3.(1)

Step	Airtightness(2) ~~(Air Changes per Hour at 50 PA Pressure Differential)~~	Performance Requirement of *Building* Equipment and Systems	Performance Requirement of *Building* Envelope
1	~~N/A~~ Reserved	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 0% lower energy consumption or conform to Subsection 9.36.5.~~ Reserved	
2	~~≤ 3.0~~ Reserved	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 10% lower energy consumption or the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G~~ Reserved	~~thermal energy demand intensity ≤ 100 kWh/(m²•year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) or not less than 5% performance improvement over the EnerGuide Reference House~~ Reserved
3	~~≤ 2.5~~ AL-1	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 20% lower energy consumption or~~ the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 90 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 10% performance improvement over the EnerGuide Reference House~~
4	~~≤ 1.5~~ AL-3	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 40% lower energy consumption or~~ the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 65 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 20% performance improvement over the EnerGuide Reference House~~

5	~~≤ 1.0~~ AL-4	the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 50 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 50% performance improvement over the EnerGuide Reference House~~

Notes to Table 9.36.6.3.-E:
(1) See Sentence 1.1.3.1.(1) and Table C-2 in Appendix C.
(2) See Table 9.36.7.4.

Table 9.36.6.3.-F
Requirements for Buildings Located Where the Degree-Days Below 18°C Value is greater than 6999(1)
Forming Part of Sentence 9.36.6.3.(1)

Step	Airtightness(2) ~~(Air Changes per Hour at 50 PA Pressure Differential)~~	Performance Requirement of *Building* Equipment and Systems	Performance Requirement of *Building* Envelope
1	~~N/A~~ Reserved	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 0% lower energy consumption or conform to Subsection 9.36.5.~~ Reserved	
2	~~≤ 3.0~~ Reserved	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 10% lower energy consumption or the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-G~~ Reserved	~~thermal energy demand intensity ≤ 120 kWh/(m²•year), thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) or not less than 5% performance improvement over the EnerGuide Reference House~~ Reserved
3	~~≤ 2.5~~ AL-1	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 20% lower energy consumption or~~ the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 105 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 10% performance improvement over the EnerGuide Reference House~~
4	~~≤ 1.5~~ AL-3	~~EnerGuide Rating % lower than EnerGuide Reference House: not less than 40% lower energy consumption or~~ the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 80 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 20% performance improvement over the EnerGuide Reference House~~
5	~~≤ 1.0~~ AL-4	the applicable mechanical energy use intensity requirements in Table 9.36.6.3.-~~G~~H	thermal energy demand intensity ≤ 60 kWh/(m²•year), or thermal energy demand intensity not exceeding the value calculated in accordance with Sentence (4) ~~or not less than 50% performance improvement over the EnerGuide Reference House~~

Notes to Table 9.36.6.3.-F:
(1) See Sentence 1.1.3.1.(1) and Table C-2 in Appendix C.
(2) See Table 9.36.7.4.

Table 9.36.6.3.-G
Energy Performance Steps for Buildings and Houses(4)
Forming Part of Sentences 9.36.6.3.(1) and (5) and Sentence 9.36.5.3.(2)

Total Volume of *Conditioned Space* Within the *Building* or House	Energy Performance Metrics	Step		
		3	4	5
		Airtightness Levels(3)		
		AL-1, AL-3 or AL-4	AL-3 or AL-4	AL-4
> 300 m³ and where volume is not determined	Percent Heat Loss Reduction (1)	≥ 10%	≥ 20%	≥ 40%
	Percent Improvement (2)	≥ 20%	≥ 40%	≥ 70%
≤ 300 m³	Percent Heat Loss Reduction (1)	≥ 5%	≥ 15%	≥ 25%
	Percent Improvement (2)	≥ 10%	≥ 30%	≥ 60%

Notes to Table 9.36.6.3.-G:
(1) See Sentence 9.36.6.5.(6)
(2) See Sentence 9.36.6.5.(7)
(3) See Table 9.36.7.4.
(4) When a "house" is a dwelling unit forming part of a multi-unit building, as per 9.36.6.1.(1), the requirements of 9.36.6. apply to the entire building.

Table 9.36.6.3.-~~G~~H
Mechanical Energy Use Intensity Requirements
Forming Part of Sentence 9.36.6.3.(1)

Heating Degree-Days of *Building* Location, (1) in Celsius Degree-Days	**Amount of the *Building*'s Conditioned Space Served by Space-Cooling Equipment**	**Step**	**Floor Area of *Conditioned Space* (m²)**					
			≤ 50	**51 to 75**	**76 to 120**	**121 to 165**	**166 to 210**	**> 210**
			Mechanical Energy Use Intensity, kWh/(m²•year)					
Less than 3000	Not more than 50%	~~2~~	~~135~~	~~120~~	~~90~~	~~75~~	~~65~~	~~60~~
		2	Reserved					
		3	120	100	75	63	53	50
		4	90	80	60	48	40	40
		5	65	55	40	30	25	25
	More than 50%	~~2~~	~~170~~	~~148~~	~~108~~	~~85~~	~~73~~	~~65~~
		2	Reserved					
		3	155	128	93	73	60	55
		4	125	108	78	58	48	45
		5	100	83	58	40	33	30
3000 to 3999	Not more than 50%	~~2~~	~~145~~	~~130~~	~~100~~	~~85~~	~~75~~	~~70~~
		2	Reserved					
		3	135	115	90	78	68	65
		4	100	90	70	58	50	50
		5	70	60	45	35	30	30
	More than 50%	~~2~~	~~180~~	~~158~~	~~118~~	~~95~~	~~83~~	~~75~~
		2	Reserved					
		3	170	143	108	88	75	70
		4	135	118	88	68	58	55
		5	105	88	63	45	38	35
4000 to 4999	Not more than 50%	~~2~~	~~160~~	~~145~~	~~115~~	~~100~~	~~90~~	~~85~~
		2	Reserved					

		3	145	125	100	88	78	75
		4	105	95	75	63	55	55
		5	80	70	55	45	40	40
	More than 50%	~~2~~	~~195~~	~~173~~	~~133~~	~~110~~	~~98~~	~~90~~
		2	Reserved					
		3	180	153	118	98	85	80
		4	140	123	93	73	63	60
		5	115	98	73	55	48	45
5000 to 5999	Not more than 50%	~~2~~	~~185~~	~~170~~	~~140~~	~~125~~	~~115~~	~~110~~
		2	Reserved					
		3	165	145	120	108	98	95
		4	120	110	90	78	70	70
		5	95	85	70	60	55	55
	More than 50%	~~2~~	~~220~~	~~198~~	~~158~~	~~135~~	~~123~~	~~115~~
		2	Reserved					
		3	200	173	138	118	105	100
		4	155	138	108	88	78	75
		5	130	113	88	70	63	60
6000 to 6999	Not more than 50%	~~2~~	~~205~~	~~190~~	~~160~~	~~145~~	~~135~~	~~130~~
		2	Reserved					
		3	185	165	140	128	118	115
		4	135	125	105	93	85	85
		5	105	95	80	70	65	65
	More than 50%	~~2~~	~~240~~	~~218~~	~~178~~	~~155~~	~~143~~	~~135~~
		2	Reserved					
		3	220	193	158	138	125	120
		4	170	153	123	103	93	90
		5	140	123	98	80	73	70
More than 6999	Not more than 50%	~~2~~	~~225~~	~~210~~	~~180~~	~~165~~	~~155~~	~~150~~
		2	Reserved					
		3	200	180	155	143	133	130
		4	150	140	120	108	100	100
		5	115	105	90	80	75	75
	More than 50%	~~2~~	~~260~~	~~238~~	~~198~~	~~175~~	~~163~~	~~155~~
		2	Reserved					
		3	235	208	173	153	140	135
		4	185	168	138	118	108	105
		5	150	133	108	90	83	80

Notes to Table 9.36.6.3.-~~G~~H:
(1) See Sentence 1.1.3.1.(1) and Table C-2 in Appendix C

2) Except as permitted by Sentence (3),
a) energy performance shall be calculated in conformance with Article 9.36.6.4.~~,~~ and 9.36.6.5.
b) airtightness shall be tested in accordance with Article ~~9.36.6.5.~~ 9.36.7.
~~(See Note A-9.36.6.3.(2).)~~

3) *Buildings* designed and constructed to conform to Step 5 of any of the Tables referred to in Sentence (1) and to the Passive House Planning Package, version 9 or newer, are deemed to comply with this Subsection if the energy model according to which the *building* is designed and constructed is prepared by a Certified Passive House Designer, or Certified Passive House Consultant, who is approved by the Passive House Institute.

4) For *buildings* conforming to the requirements of any of Steps ~~1~~3 to 5, thermal energy demand intensity requirements may be calculated using the applicable following formula

for *buildings* located where the degree-days below 18°C value is less than 3000
$TEDI_{adjusted} = TEDI_{step} + (TEDI_{higher} - TEDI_{step})(HDD_{actual} - HDD_{lowest})/500$
for *buildings* located where the degree-days below 18°C value is 3000 to 6999
$TEDI_{adjusted} = TEDI_{step} + (TEDI_{higher} - TEDI_{step})(HDD_{actual} - HDD_{lowest})/1000$
for *buildings* located where the degree-days below 18°C value is 7000 or greater
$TEDI_{adjusted} = TEDI_{step} + (TEDI_{step} - TEDI_{lower})(HDD_{actual} - HDD_{lowest})/1000$

where
$TEDI_{adjusted}$= thermal energy demand intensity requirement adjusted by heating degree-days,
$TEDI_{step}$ = applicable maximum thermal energy demand intensity requirement in Tables 9.36.6.3.-A to 9.36.6.3.-F,
$TEDI_{higher}$ = maximum thermal energy demand intensity requirement for the same Step as stated in the subsequent Table of Tables 9.36.6.3.-A to 9.36.6.3.-F,
$TEDI_{lower}$ = maximum thermal energy demand intensity requirement for the same Step as stated in the preceding Table of Tables 9.36.6.3.-A to 9.36.6.3.-F,
HDD_{actual} = actual degree-days below 18°C for the *building* location determined in accordance with Subsection 1.1.3.,
HDD_{lowest} = lowest degree-days below 18°C value within the range of the applicable Table of Tables 9.36.6.3.-A to 9.36.6.3.-F.
(See Note 9.36.6.3.(4).)

~~**5)** For compliance with Tables 9.36.6.3.-A to 9.36.6.3.-F, envelope performance improvement over the EnerGuide reference house shall be calculated by~~
~~a) computing the annual space heating energy use for both the reference house and the proposed house, and~~
~~b) expressing the difference between the reference house space heating energy use and proposed house space heating energy use as a percentage of the space heating energy requirement.~~

5) The energy performance of *buildings* and houses, when calculated in accordance with Article 9.36.6.5., shall conform to the applicable step in Table 9.36.6.3.-G based on the total volume of *conditioned space* within the *building* or house for the energy performance metrics indicated in Table 9.36.6.3.-G such that
a) the target "percent heat loss reduction" is met or exceeded, and
b) the target "percent improvement" is met or exceeded. (See Note A-9.36.6.3.(5)(b).)

9.36.6.4. Energy Modelling

1) Energy modelling shall be performed using a computer program that employs calculation methods that have been tested in accordance with ANSI/ASHRAE 140, "Evaluation of Building Energy Analysis Computer Programs" with variations in the computer program from the range recommended therein reported in accordance with Division C.

2) Energy modelling shall conform to
a) Subsection 9.36.5., or
~~b) the EnerGuide Rating System, version 15 or newer (see Note A-9.36.6.4.(2)(b)), or~~
~~c~~ b) Clauses 10.2.3.4.(1)(a) and (b) and Sentences 10.2.3.4.(3) and (4). (See Note A-9.36.6.4.(2)(b).)

~~**3)** The Performance Requirement of Building Equipment and Systems and the Performance Requirement of Building Envelope required under Sentence 9.36.6.3.(1) shall both be modelled using the same~~
~~a) energy modelling methods, and~~
~~b) climatic data, *soil* conditions, operating schedules and temperature set-points.~~

43) For *buildings* conforming to the requirements of any of Steps ~~2~~3 to 5, energy modelling shall account for the air leakage rate derived in accordance with Article ~~9.36.6.5.~~ 9.36.7.
(See Note A-9.36.6.4.(3).)

~~9.36.6.5. Building Envelope Airtightness Testing~~

~~**1)** *Buildings* shall be tested for airtightness in accordance with~~
~~a) CAN/CGSB-149.10, "Determination of the Airtightness of Building Envelopes by the Fan Depressurization Method",~~
~~b) ASTM E 779, "Standard Test Method for Determining Air Leakage Rate by Fan Pressurization", or~~
~~c) USACE Version 3, "Air Leakage Test Protocol for Building Envelopes", or~~
~~d) the applicable standards and requirements of the EnerGuide Rating System, Version 15 or newer.~~

~~**2)** Where airtightness is determined in accordance with Sentence (1) with intentional openings for mechanical equipment left unsealed, the airtightness rate shall be adjusted in the energy model calculations to account for air leakage through mechanical equipment.~~

~~**3)** *Buildings* shall be tested for airtightness to an induced test pressure of not less than 50 Pa.~~

~~**4)** The airtightness values in Table 9.36.8.4. A using the guarded method is to be used for a *dwelling unit* that is detached and Table 9.36.8.4. B using the unguarded method is to be used for a dwelling unit that is attached.~~

9.36.6.5. Energy Performance Improvement Compliance Calculations

1) Except where otherwise stated in this Article, the proposed and reference houses shall be modeled in accordance with Subsection 9.36.5. to determine

a) the annual energy consumption of the proposed house and the house energy target of the reference house,

b) the annual gross space heat loss of the proposed and reference houses calculated in accordance with Sentence (5), and

c) the peak cooling load of the proposed and reference houses. (See Sentence (4)).

(See Note A-9.36.6.5.(1).)

2) The peak cooling load for the proposed house shall not be greater than the peak cooling load for the reference house. (See Sentence (4).)

3) Where space heating is provided bya heat pump in the proposed house, the reference house shall be modelled using

a) equipment of the same type as the secondary or back-up system in the proposed house, but made to comply with the energy efficiency requirements of Article 9.36.3.10.,or

b) electric resistance heaters, where no back-up is provided in the proposed house.

4) Where cooling systems are not installed in the proposed house, both the proposed and reference houses shall have additional models using appropriately sized space-cooling equipment serving all *conditioned spaces* to determine the peak cooling load. (See Note A-9.36.6.5.(4).)

5) The annual gross space heat loss shall be calculated as the sum of the cumulative heat loss from

a) conduction across opaque and transparent elements of the *building* envelope,

b) air infiltration and exfiltration, and

c) mechanical ventilation.

(See Note A-9.36.6.5.(5).)

6) The percent heat loss reduction shall be calculated by subtracting the annual gross space heat loss of the proposed house from the annual gross space heat loss of the reference house and dividing the result by the annual gross space heat loss of the reference house.

7) The percent improvement shall be calculated by subtracting the annual energy consumption of the proposed house from the house energy target of the reference house and dividing the result by the house energy target of the reference-house.

8) Reserved.

9) The airtightness value used in the energy model for the proposed house shall be a design airtightness, until the airtightness has been measured in accordance with Sentence 9.36.7.3.(1)

9.36.7. Airtightness of Building Envelope

9.36.7.1. Scope and Application

1) This Subsection is concerned with

a) determining the airtightness of *buildings* and *dwelling units* and parts thereof

i) for use in the energy model calculations described in Subsections 9.36.5. and 9.36.6., and
ii) for use determining the Airtightness Level.

9.36.7.2. Definitions

1) For the purposes of this Subsection, the following terms shall have the meanings stated herein:
a) reserved,
b) reserved,
c) "ACH_{50}" refers to the air changes per hour at a reference pressure of 50 Pa,
d) "NLA_{10}" refers to the normalized leakage area at a reference pressure of 10 Pa, and
e) "NLR_{50}" refers to the normalized leakage rate at a reference pressure of 50 Pa.

9.36.7.3. Determination of Airtightness

1) Where airtightness is to be used as input to the energy model calculations, it shall be determined through a multi- point depressurization test carried out in accordance with CAN/CGSB-149.10, "Determination of the airtightness of building envelopes by the fan depressurization method," using the following parameters described therein:
a) as-operated, and
b) guarded or unguarded.

2) Reserved.

3) Determining NLA_{10} using a single-point test is not permitted.

9.36.7.4. Determination of Airtightness Level

1) Compliance with an Airtightness Level listed in Table 9.36.7.4. shall be determined in accordance with this Article using the value of ACH_{50}, NLA_{10}, or NLR_{50} determined in accordance with Article 9.36.7.3.

Table 9.36.7.4.
Airtightness Levels
Forming Part of Sentence 9.36.7.4.(1)

Airtightness Levels	Airtightness Metrics		
	ACH_{50}	NLA_{10}, cm^2/m^2	NLR_{50}, L/sxm^2
	Maximum Airtightness Values		
AL-1	2.5	1.20	0.89
AL-3	1.5	0.72	0.53
AL-4	1.0	0.48	0.35

A-9.36.6.2.(2) Term "House". The term "house" is used for consistency and is intended to be applied to both houses and buildings within the scope of Subsection 9.36.6. and Section 9.37. When a "house" is a dwelling unit

forming part of a multi-unit building, then, as per 9.36.6.1.(1) and 9.37.1.1.(3), the requirements of 9.36.6 and 9.37. are to apply to the entire building.

A-9.36.6.4.(3) Air Leakage Rate in Energy Model Calculations. ~~For Step 1 buildings, airtightness testing must be performed as required by Sentence 9.36.6.3.(2) and reported as required by Division C, but there is no minimum level of airtightness required. See Sentence 9.36.5.10.(9) for requirements for the airtightness value to be used in the energy model calculations for Step 1 buildings using Subsection 9.36.5.~~

For buildings that ~~must~~ conform to the requirements of any of Steps 3 to 5, higher than expected air leakage may require the building design to be altered and the energy model calculations to be repeated. Alternatively, the air leakage rate could be retested after making alterations to the air barrier system to attain the desired air leakage rate.

Note A-9.36.6.5.(1) Reference House and Proposed House.

The terms "reference house" and "proposed house" have the same meanings as in Subsection 9.36.5. and they apply to energy models for both houses and multi-unit residential buildings. The term "house" is used for consistency and is intended to be applied to both houses and buildings within the scope of Subsection 9.36.6.

Note A-9.36.6.5.(4) Peak Cooling Load.

The term "peak cooling load" refers to the highest hourly-averaged rate of mechanical cooling required to maintain the building or house at the cooling set-point temperature over the course of the year. The peak cooling load must reflect the rate of which heat is extracted from the conditioned space, and not the rate of energy consumption of any cooling equipment.

Some modelling software only report peak cooling loads when the building or house model is configured with an air-conditioner; in such cases, the model should include air conditioning for the purpose of computing the peak cooling load. If the modelling software does not report peak hourly loads, the design cooling load may be used instead.

The peak cooling load criteria is intended to reduce the risk that houses built under the Subsection 9.36.6. will overheat in summer. To meet this goal, the proposed house must achieve a peak cooling load that is no more than that of the reference house. Even so, this modeling requirement does not guarantee that a house will not overheat, as a reference house complying with Subsection 9.36.5 reference house may nevertheless be prone to overheating in some circumstances. Instead, houses complying with this modeling requirement should be no more prone to overheating than houses constructed under other energy efficiency compliance paths in the Code. This requirement does not prescribe the installation of cooling systems in new construction nor can installation of air conditioning be used as an alternative compliance path for houses not meeting this requirement.

Note A-9.36.6.5.(5) Annual Gross Space Heat Loss.

The annual gross space heat loss has been selected as a good proxy for heat loss due to building envelope performance. It is readily extracted from building simulation models and correlates well with the combined conductive (through both fenestration and opaque elements) and air leakage losses, while excluding solar and internal gains. The inclusion of ventilation losses is not strictly relevant to building envelope performance, but their contribution to the annual gross space heat loss is generally small and, given that unbalanced ventilation is permitted by the Code and thus may be modeled, disaggregating energy losses due to unintentional air leakage from those due to intentional ventilation can be difficult in most simulation models.

Note A-9.36.6.3.(5)(b) Percent Improvement.

The terms "percent improvement" express the energy performance of the proposed house relative to the reference house in terms of the energy use of the house or building for space heating, hot water and ventilation.

10.2.2. Design and Construction

10.2.2.1. Design and Construction

1) Except as permitted in Article 10.2.2.2. and sentence (3), *buildings* shall be designed and constructed to conform to

a) ANSI/ASHRAE/IES 90.1 [-2019], "Energy Standard for Buildings Except Low-Rise Residential Buildings" (except Subsection 8.4.2.),
b) the NECB [2020], or
c) Subsection 10.2.3.

2) Where a *building* contains one or more *major occupancies* listed in ~~that conform to~~ Subsection 10.2.3., those *major occupancies* shall conform to the requirements of any of Steps 2 to 4, and where the *building* contains *major occupancies* not listed in Subsection 10.2.3., those ~~the~~ remaining *major occupancies* shall comply with Clause(1)(a) or (b).

10.2.3.3. Compliance Requirements

1) *Buildings* and *major occupancies* conforming to the requirements of any of Steps 2 to 4 shall be designed and constructed to conform to the applicable energy performance requirements in Tables 10.2.3.3.-A ~~and~~ to 10.2.3.3.-J.

Table 10.2.3.3.-A
Energy Performance Requirements for Schools Other than Colleges
Forming part of Sentences 10.2.3.3.(1) and (2)

~~Degree-Days Below 18ºC~~	Step	Equipment and Systems – Maximum Total Energy Use Intensity, kWh/(m²•year)	*Building* Envelope – Maximum Thermal Energy Demand Intensity, kWh/(m²•year)
~~Less than 3000 - Greater than 4999~~	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	Conform to Part 8 of the NECB	

Table 10.2.3.3.-B
Energy Performance Requirements for Libraries
Forming part of Sentences 10.2.3.3.(1) and (2)

~~Degree-Days Below 18ºC~~	Step	Equipment and Systems – Maximum Total Energy Use Intensity, kWh/(m²•year)	*Building* Envelope – Maximum Thermal Energy Demand Intensity, kWh/(m²•year)
~~Less than 3000 - Greater than 4999~~	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	Conform to Part 8 of the NECB	

Table 10.2.3.3.-C
Energy Performance Requirements for Colleges
Forming part of Sentences 10.2.3.3.(1) and (2)

~~Degree-Days Below 18ºC~~	Step	Equipment and Systems – Maximum Total Energy Use Intensity, kWh/(m²•year)	*Building* Envelope – Maximum Thermal Energy Demand Intensity, kWh/(m²•year)
~~Less than 3000 - Greater than 4999~~	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	Conform to Part 8 of the NECB	

Table 10.2.3.3.-D
Energy Performance Requirements for Recreation Centres
Forming part of Sentences 10.2.3.3.(1) and (2)

~~Degree-Days Below 18ºC~~	Step	Equipment and Systems – Maximum Total Energy Use Intensity, kWh/(m²•year)	*Building* Envelope – Maximum Thermal Energy Demand Intensity, kWh/(m²•year)
~~Less than 3000 Greater than 4999~~	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	Conform to Part 8 of the NECB	

Table 10.2.3.3.-E
Energy Performance Requirements for Hospitals
Forming part of Sentences 10.2.3.3.(1) and (2)

~~Degree-Days Below 18ºC~~	Step	Equipment and Systems – Maximum Total Energy Use Intensity, kWh/(m²•year)	*Building* Envelope – Maximum Thermal Energy Demand Intensity, kWh/(m²•year)
~~Less than 3000 Greater than 4999~~	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	Conform to Part 8 of the NECB	

Table 10.2.3.3.-F
Energy Performance Requirements for Care Centres
Forming part of Sentences 10.2.3.3.(1) and (2)

~~Degree-Days Below 18ºC~~	Step	Equipment and Systems – Maximum Total Energy Use Intensity, kWh/(m²•year)	*Building* Envelope – Maximum Thermal Energy Demand Intensity, kWh/(m²•year)
~~Less than 3000 Greater than 4999~~	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	Conform to Part 8 of the NECB	

Table 10.2.3.3.-G
Energy Performance Requirements for Hotels and Motels
Forming part of Sentences 10.2.3.3.(1) and (2)

Degree-Days Below 18ºC	Step	Equipment and Systems – Maximum Total Energy Use Intensity, kWh/(m²•year)	*Building* Envelope – Maximum Thermal Energy Demand Intensity, kWh/(m²•year)
Less than 3000	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	170	30
	3	140	20
	4	120	15
3000 to 3999	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	170	30
	3	145	21
	4	130	16
4000 to 4999	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	170	30
	3	145	25
	4	130	18
Greater than 4999	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	170	32
	3	150	28
	4	145	20

Table 10.2.3.3.-H
Energy Performance Requirements for Other Residential Occupancies
Forming part of Sentences 10.2.3.3.(1) and (2)

Degree-Days Below 18ºC	Step	Equipment and Systems – Maximum Total Energy Use Intensity, kWh/(m²•year)	*Building* Envelope – Maximum Thermal Energy Demand Intensity, kWh/(m²•year)
Less than 3000	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	130	45
	3	120	30
	4	100	15
3000 to 3999	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	130	45
	3	120	35
	4	110	22
4000 to 4999	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	135	50
	3	120	35
	4	110	22
5000 to 5999	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	135	55
	3	120	40
	4	110	22
6000 to 6999	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	150	60
	3	140	50
	4	125	35
Greater than 6999	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	180	90
	3	160	75
	4	140	60

Table 10.2.3.3.-I
Energy Performance Requirements for Offices
Forming part of Sentences 10.2.3.3.(1) and (2)

Degree-Days Below 18ºC	Step	Equipment and Systems – Maximum Total Energy Use Intensity, kWh/(m²•year)	*Building* Envelope – Maximum Thermal Energy Demand Intensity, kWh/(m²•year)
Less than 3000	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	~~130~~ 110	30
	3	100	20
3000 to 3999	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	~~130~~ 110	30
	3	100	20
4000 to 4999	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	~~130~~ 110	30
	3	100	20
Greater than 4999	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	~~130~~ 115	30
	3	110	20

Table 10.2.3.3.-J
Energy Performance Requirements for Other Business and Personal Service or Mercantile Occupancies
Forming part of Sentences 10.2.3.3.(1) and (2)

Degree-Days Below 18ºC	Step	Equipment and Systems – Maximum Total Energy Use Intensity, kWh/(m²•year)	*Building* Envelope – Maximum Thermal Energy Demand Intensity, kWh/(m²•year)
Less than 3000	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	~~170~~ 145	30
	3	120	20
3000 to 3999	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	~~170~~ 145	30
	3	125	25
4000 to 4999	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	~~170~~ 145	45
	3	130	30
Greater than 4999	1	~~Conform to Part 8 of the NECB~~ Reserved	
	2	~~190~~ 170	55
	3	150	40

10.2.3.5. Building Envelope Airtightness Testing

1) Except as required by Sentence (2), *buildings* and *major occupancies* shall be tested for airtightness in accordance with

a) ASTM E 779, "Standard Test Method for Determining Air Leakage Rate by Fan Pressurization", ~~or~~

b) USACE Version 3, "Air Leakage Test Protocol for Building Envelopes"~~.~~, or

c) ASTM E3158, "Standard Test Method for Measuring the Air leakage Rate of a Large or Multizone Building."

(See Note A-10.2.3.5.(1).)

2) Where airtightness is determined in accordance with Sentence (1) with intentional openings for mechanical equipment left unsealed, the airtightness rate shall be adjusted in the energy model calculations to account for air leakage through mechanical equipment.

3) Buildings and major occupancies shall be tested for airtightness to an induced test pressure of not less than 75 Pa.