



CITY OF YELLOWKNIFE

BY-LAW NO. 5004

BB 39

A BY-LAW of the Municipal Corporation of the City of Yellowknife in the Northwest Territories to regulate the safety, health and welfare of people and the protection of people and property, pursuant to the relevant provisions of the *Cities, Towns and Villages Act*, S.N.W.T., 2003, c.22 as amended from time to time.

WHEREAS the Municipal Corporation of the City of Yellowknife has adopted Building By-law No. 4469, as amended;

AND WHEREAS the Municipal Corporation of the City of Yellowknife wishes to amend By-law No. 4469, as amended;

NOW, THEREFORE, THE COUNCIL OF THE MUNICIPAL CORPORATION OF THE CITY OF YELLOWKNIFE, in regular session duly assembled, enacts as follows:

APPLICATION

1. That By-law No. 4469, as amended, of the Municipal Corporation of the City of Yellowknife, is hereby amended by:
 - A. Amending Section 2: Definitions by deleting and replacing:

Building Code (NBC): means the National Building Code of Canada, version 2015

- B. Amending Section 2: Definitions by adding:

EnerGuide Rating System (ERS): The EnerGuide Rating System is a national system developed by Natural Resources Canada to rate the energy performance of houses. Users of the EnerGuide Rating System must be energy advisors registered and in good standing with Natural Resources Canada in accordance with the EnerGuide Rating System Administrative Procedures and must adhere to the technical standards and procedures of the ERS. These standards and procedures are available through Natural Resources Canada and include program requirements for energy modelling using the ERS. This By-law refers to ERS, version 15.

Mid-Construction: means the stage of construction, at which installation of the major components of the air barrier system has been substantially completed and the building can be tested for airtightness, and before interior finishes are installed.

National Energy Code of Canada for Buildings (NECB): means the minimum energy efficiency levels for all new buildings and offers more flexibility for achieving code compliance version 2017.

Normalized Leakage Area (NLA): The ratio of the equivalent leakage area at 10 pascals (ELA@10 Pa) to the area of the building envelope, where the area of the building envelope is defined as all floors, walls (including doors and windows) and ceilings (flat or sloping) that are correspondingly below, above and adjacent to unheated spaces and spaces heated to less than 10 °C (50 °F), and are based on interior dimensions; expressed in cm²/m² (sq.in./sq.ft.).

Minor Addition: means the design, alteration, reconstruction, demolition, removal, construction and occupancy of existing Part 9 buildings where the work occurs outside of the existing building area and is less than 10% of the existing floor area being altered.

C. Amending Section 6.1 by deleting and replacing with:

6.1 Part 9 Residential

1. This section applies to all Part 9 residential buildings:
 - a. Comply with Prescriptive Path or Performance Path, and all other requirements.
2. Prescriptive Path: The effective thermal resistance of building enclosure assemblies or portions thereof shall be not less than that shown in Tables 1.

TABLE 1: PART 9 PERSCRPTIVE PATH VALUES		
ASSEMBLY	EFFECTIVE RSI [m ² ·K/W]	EFFECTIVE R-VALUE [ft ² ·°F/btu]
Walls (above grade)	5.28	30
Walls (below grade)	4.96	28
Attic ceilings/roof	10.6	60
Cathedral ceilings/roof	7.0	40
Slab on ground	5.64	32
Exposed floor	7.0	40
Floors above unheated space	6.28	35
Insulation skirt extending out horizontally (1m out)	5.64	32
	EFFECTIVE USI [W/m ² ·K]	EFFECTIVE U-VALUE [btu/ft ² ·°F]
Doors excluding glazing	0.91	0.16
Windows and glazed doors	1.00	0.18

	OTHER
Maximum fenestration and door-to-wall ratio (FDWR)	15%

OR

3. Performance Path: Buildings conforming to the requirements of the performance path shall be designed and constructed to conform to the energy performance requirements in Table 2.

TABLE 2: PART 9 PERFORMANCE PATH VALUES	
METRIC	TARGET
TEDI	105 kWh/(m ² a)
%<Ref (no 9.36.5 or ERS base loads)	-25%

4. 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". Energy modelling shall conform to Subsection 9.36.5 of the NBC or the ERS.

AND

5. Buildings shall be tested for airtightness twice and meet a Mid-Construction target of 3.0 ACH50 (1.5 cm²/m² NLA for buildings with < 1,200 ft² floor area) during Mid-Construction test and 1.5 ACH50 (1.0 cm²/m² NLA for buildings with < 1,200 ft² floor area) during final post-construction test in accordance with
 - a) CAN/CGSB 149.10, "Determination of the Airtightness of Building Envelopes by the Fan Depressurization Method"; and
 - 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"; and
 - d) The applicable standards and requirements of ERS.
6. All housing types, as defined in the ERS, must have an EnerGuide rating label affixed somewhere visible in the home at the time of final inspection by the City.
7. A house performance compliance calculation report, in a form prescribed by the Senior Administrative Officer, shall be provided in accordance with Article 2.2.8.3 Division C of the NBC.

D. Amending Section 6.2 by deleting and replacing with:

6.2 Part 3 All Other Buildings

6.2.1 Part 3 Residential

- 1) This section applies to buildings containing Part 3 Residential occupancies.
- 2) All buildings shall be designed with ventilation in conformance with ASHRAE 62.1-2001 (except addendum n) and constructed to conform to:
 - a) ANSI/ASHRAE/IESNA 90.1-2010, "Energy Standard for Buildings, except Low Rise Residential Buildings"; or
 - b) the current version of the NECB, except that where NECB refers to the NBC, the provisions of this By-law shall apply.
- 3) Comply with Prescriptive Path or Performance Path, and all other requirements.
- 4) Prescriptive Path: The effective thermal resistance/transmittance of building enclosure assemblies or portions thereof shall be not less than that shown in Table 3.

TABLE 3: PART 3 RESIDENTIAL BUILDINGS PERSCRPTIVE PATH VALUES

ASSEMBLY	EFFECTIVE RSI [m ² ·K/W]	EFFECTIVE R-VALUE [ft ² ·°F/btu]
Walls (above grade)	6.82	38
Walls (below grade)	5.95	34
Ceilings/roof	8.80	50
Slab on ground	3.30	18
Exposed floor	8.75	50
Floors above unheated space	7.00	40
Perimeter insulation (1.0 m out)	3.30	18
	EFFECTIVE USI [W/m ² ·K]	EFFECTIVE U-VALUE [btu/ft ² ·°F]
Doors excluding glazing	1.4	0.25
Windows and glazed doors	1.4	0.25
	OTHER	
Maximum fenestration and door-to-wall ratio (FDWR)	17%	

OR

- 5) Performance Path: Buildings conforming to the requirements of the performance path shall be designed and constructed to conform to the energy performance requirements table 4 and air

leakage rate of 1.50 L/(s·m²) at 75 Pa (the Q/S term of the equation in (b) below, using the total surface area of the enclosure). Energy modelling shall conform to the above formula and used in the energy model.

- a) The applicable requirements of Part 8 of the NECB.
- b) the operating air leakage rate shall be calculated from the assumed or measured air leakage rate using the equation:

$$I_{AGW} = C \times Q/S \times S/A_{AGW}, \text{ where}$$

- i. I_{AGW} = infiltration rate [L/s·m²] to be used for energy modelling, and applied to the modelled above-ground wall area
 - ii. $C = (5\text{Pa}/75\text{Pa})^n$
 - iii. n = If whole building testing is done, then the calculated n shall be value. If no whole building test result is available then the default value for the flow exponent 'n' is 0.60.
 - iv. Q = volume of air in L/s flowing through the building envelope when subjected to a pressure differential of 75 Pa.
 - v. S = total surface area [m²] of the building envelope included in the air leakage test (i.e. the pressure boundary), including ground floors and roofs, and possibly below-grade walls.
 - vi. A_{AGW} = modelled area [m²] of above-ground walls (including windows)
- c) Good energy modelling practice and as described in the ASHRAE Handbooks and Standards, and other professional practice energy modelling guidelines.
 - d) Until air leakage determined by airtightness testing is available, an air leakage rate of 1.50 L/(s·m²) at 75 Pa shall be converted to operating pressure using the above formula and used in the energy model.

TABLE 4: PART 3 RESIDENTIAL BUILDINGS PERFORMANCE PATH VALUES	
METRIC	TARGET
TEDI [kWh/(m ² a)]	120
TEUI [kWh/(m ² a)]	225

AND

- 6) Building envelope airtightness testing.
 - a) The air barrier system shall have a normalized air leakage rate no greater than 1.50 L/(s·m²) when tested in accordance with;

- i. ASTM E 3158, "Standard Test Method for Measuring the Air Leakage Rate of a Large or Multizone Building"; or
- ii. USACE Version 3, "Air Leakage Test Protocol for Building Envelopes".

At a pressure differential of 75 Pa, where;

- i. the building is prepared in accordance with the building envelope test; and
- ii. the test is conducted for both pressurized and depressurized conditions; and
- iii. the air leakage rates measured in Clause (ii) are averaged and comply with Sentence 6.(a); and
- iv. when determining the normalized air leakage rate the normalize leakage area shall include all the surfaces separating the conditioned space from the exterior, above and below ground (i.e. the six sides of the box).

- b) Where airtightness is determined in accordance with Sentence (a) 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.
- c) Part 3 residential buildings shall be tested for airtightness twice in order to meet a Mid-Construction target. The first test will occur Mid-Construction.

- 7) Buildings shall use heat recovery systems in accordance with Article 5.2.10 Division B of the NEBC.
- 8) Mechanical equipment efficiency: Mechanical systems shall be designed in accordance with Article 5.2.12 of the NECB. Components of mechanical ventilation systems not specifically described in Article 5.2.12 of the NECB shall be designed, constructed, and installed in accordance with good engineering practice and as described in the ASHRAE Handbooks and Standards, HRAI Digest, TECA Ventilation Guideline, Hydronics Institute Manuals or the SMACNA manuals

6.2.2 Part 3 Other Buildings

All other Part 3 buildings must comply with the NECB.

- E. Amending Section 6.7 by deleting and replacing with:
 - a. Minor Additions must meet the energy efficiency requirements in the NBC.

EFFECT

- 2. That this by-law shall come into effect upon receiving Third Reading and otherwise meets the requirements of Section 75 of the *Cities, Towns and Villages Act*.

Read a First time this 26 day of AUGUST, A.D. 2019.

[Signature]
Mayor

[Signature]
City Administrator

Read a Second Time this 26 day of AUGUST, A.D. 2019.

[Signature]
Mayor

[Signature]
City Administrator

Read a Third Time and Finally Passed this 9 day of SEPTEMBER, A.D., 2019

[Signature]
Mayor

[Signature]
City Administrator

I hereby certify that this by-law has been made in accordance with the requirements of the *Cities, Towns and Villages Act* and the by-laws of the Municipal Corporation of the City of Yellowknife.

[Signature]
City Administrator

