



## **ENERGY STAR® Technical Specification for Residential Windows, Doors, and Skylights Sold in Canada**

**Version 5.0 – January 1, 2020  
FINAL (Without Skylights)**

This technical specification determines how residential windows, doors, and skylights sold in Canada are certified for the ENERGY STAR program. This specification is issued by Natural Resources Canada (NRCan). NRCan has been authorized by the U.S. Environmental Protection Agency (EPA) to promote and administer the ENERGY STAR name and symbol in Canada. A product must meet this specification in order to be promoted as ENERGY STAR certified in Canada by its manufacturer or authorized agent. Manufacturers must also sign a Fenestration Administrative Arrangement with NRCan.

### **1) Definitions**

#### Product Types

- A. Window: An assembled unit consisting of a frame/sash component holding one or more pieces of glazing functioning to admit light and/or air into an enclosure and designed for a vertical installation in an external wall of a residential building. .
- B. Door: A sliding or swinging entry door system designed for and installed in a vertical wall separating conditioned and unconditioned space in a residential building. All door transoms and sidelites are considered part of the door system.
- C. Skylight: A window designed for sloped or horizontal application in the roof of a residential building, the primary purpose of which is to provide daylighting and/or ventilation. Tubular Daylighting Devices (TDDs) are considered skylights.

#### Product Subcategories

- D. Sliding Door: A door that contains one or more manually operated panels that slide horizontally within a common frame.
- E. Swinging Door: A door system having, at a minimum, a hinge attachment of any type between a leaf and jamb, mullion, or edge of another leaf or having a single, fixed vertical axis about which the leaf rotates between open and closed positions.

- F. Sidelite: A fenestration product consisting of a glazed frame or a sash within a frame that is used as a companion product installed on one or both sides of a door.
- G. Transom: A fenestration product consisting of a glazed frame or a sash within a frame that is used as a companion product installed above a door or a window. All transoms greater than 700 mm (27 in.) in height are considered windows. All transoms equal to or less than 700 mm (27 in.) in height are considered transoms.
- H. Tubular Daylighting Device (TDD) or tubular skylight: A non-operable device primarily designed to transmit daylight from a roof surface of a residential building to an interior ceiling surface via a tubular conduit. The device consists of an exterior glazed weathering surface, a light transmitting tube with a reflective inside surface and an interior sealing device, such as a translucent ceiling panel. Tubular Daylighting Devices (TDDs) are considered skylights.
- I. Dynamic Glazing Product: Any fenestration product that has the fully reversible ability to change its performance properties, including U-factor, Solar Heat Gain Coefficient (SHGC), Visual Transmittance (VT) or Energy Rating (ER). This includes, but is not limited to, shading systems between the glazing layers and chromogenic glazing.
  - i. Chromogenic glazing: A broad class of changeable glazings that have means to reversibly vary their optical properties, including active materials (e.g., electrochromic and Suspended Particle Device/SPD) and passive materials (e.g., photochromic, thermochromic, etc.).
  - ii. Internal Shading System: Operable blinds or shades positioned between glass panes in a window, door, or skylight.

Performance Metrics:

- J. U-Factor: The heat transfer per time per area and per degree of temperature difference in  $W/m^2 \cdot K$  ( $Btu/h \text{ ft}^2 \cdot ^\circ F$ ). The U-factor multiplied by the interior-exterior temperature difference and by the projected fenestration product area yields the total heat transfer through the fenestration product due to conduction, convection, and long-wave infra-red radiation. A U-factor in  $Btu/h \text{ ft}^2 \cdot ^\circ F$  multiplied by 5.678263 converts the value to  $W/m^2 \cdot K$ . The U-factor in  $Btu/h \text{ ft}^2 \cdot ^\circ F$  shall conform with Table 1 before the conversion to  $W/m^2 \cdot K$ .
- K. Solar Heat Gain Coefficient (SHGC): The ratio of the solar heat gain entering the space through the fenestration product to the incident solar radiation.
- L. Air leakage: the flow of air that passes through fenestration products in  $L/s/m^2$ . Air leakage infiltration is the flow of air into the building envelope

and exfiltration is the flow of air out of the building envelope. An air leakage in cfm/ft<sup>2</sup> multiplied by 5.08 converts the value to L/s/m<sup>2</sup>. The air leakage value in cfm/ft<sup>2</sup> shall conform with Table 1 before the conversion to L/s/m<sup>2</sup>.

M. Energy Rating (ER): a unitless value derived from a formula that balances heat loss (U-factor), air leakage loss and potential passive solar gain of a fenestration product. The ER is applied to fenestration systems intended to be installed in a vertical orientation in low-rise residential buildings. The simplified ER equation is as follows:

$$ER = (57.76 \times SHGC_w) - (21.90 \times U_w) - (1.97 \times L_{75}) + 40$$

where

- i. SHGC<sub>w</sub> = fenestration system solar heat gain coefficient
- ii. U<sub>w</sub> = fenestration system U-factor (W/m<sup>2</sup>)
- iii. L<sub>75</sub> = fenestration system air leakage rate at a pressure difference of 75 Pa, established in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 (North American Fenestration Standard) in L/s•m<sup>2</sup>. The L<sub>75</sub> shall be the average of the infiltration and exfiltration measurements.

A complete explanation of the ER equation may be found in the CSA A440.2 Standard.

N. Decimal Precision: If necessary, values will be rounded using the arithmetic method prior to any calculation and to the decimal precision defined in Table 1.

Table 1: Decimal Precision

Value	Decimal Precision
Air leakage (infiltration)	1
Air leakage (exfiltration)	1
L <sub>75</sub>	1
U-factor and SHGC	2
Energy Rating	0

Other Definitions:

- O. Residential: For the purposes of ENERGY STAR, “residential” refers to products designed to be installed into buildings that meet Part 9 of the National Building Code of Canada. These buildings are three stories or less in height and less than 600 square metres in area.
- P. Insulating Glass Unit (IGU): A preassembled unit, comprising of lites of glass, which are sealed at the edges and separated by dehydrated space(s).
- Q. North American Fenestration Standard (NAFS): The common name for the American Architectural Manufacturers Association (AAMA)/Window and

Door Manufacturers Association (WDMA)/Canadian Standards Association (CSA) 101/I.S.2/A440 testing standard.

- R. Private labeller: A company that markets under its own name window, door, or skylight models manufactured by a different company under its own name.
- S. Standards Council of Canada (SCC): a Canadian federal Crown corporation that accredits standards writing organizations, test laboratories, certification agencies, quality management and environmental management registration bodies.
- T. U.S. National Fenestration Rating Council (NFRC): an organization in the U.S. that develops energy performance standards for fenestration products and provides independent third party verification of energy performance and other related values for fenestration products.

2) **Scope**

- A. Included Products: Products that meet the definition of a residential window, door, or skylight as specified herein are eligible for ENERGY STAR certification, with the exception of products listed in Section 2.B.
- B. Excluded Products: Products that are assembled onsite, including but not limited to sash packs or sash kits; windows, doors, or skylights that are intended for installation in non-residential buildings; window, door, or skylight attachments that are not included in a product’s certified energy performance rating.

3) **Criteria for ENERGY STAR Certification**

- A. Energy Efficiency Requirements: Window and door models must meet or exceed the requirements in Table 2 or Table 3. Skylights must meet or exceed the requirements in Table 4. Dynamic glazing products shall meet or exceed the criteria in Tables 2, 3 or 4 while in the minimum tinted state for chromogenic glazing products or the “fully open” position for internal shading systems.

Table 2: U-factor Criteria for Residential Windows and Doors

Product	Maximum U-factor W/m <sup>2</sup> ·K	Maximum U-factor Btu/h·ft <sup>2</sup> ·F
Windows and Doors	1.22	0.21

Table 3: Alternate ER Criteria for Residential Windows and Doors

Product	Minimum ER (unitless)
Windows and Doors	34

Table 4: U-factor Criteria for Unit Skylights

Product	Maximum U-factor W/m <sup>2</sup> ·K	Maximum U-factor Btu/h·ft <sup>2</sup> ·F
Skylights	TBD	TBD

Note: NRCan is conducting further analysis of the comments made by the skylight industry.

- B. Air Leakage Requirements: Fenestration models must have an air infiltration rate and an air exfiltration rate less than or equal to 1.5 L/s/m<sup>2</sup>.

4) **Test and Certification Requirements**

- A. All models shall be certified for their energy performance using the following standards as indicated:

*CSA A440.2-14 or CSA A440.2-18 Fenestration Energy Performance*

and/or

*ANSI/NFRC 100-14 or ANSI/NFRC 100-17 Procedure for Determining Fenestration Product U-factors and ANSI/NFRC 200-14 or ANSI/NFRC 200-17 Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence*

- B. All models shall be tested to and meet the minimum requirements of the following standards:

*AAMA/WDMA/CSA 101/I.S.2/A440-08 North American Fenestration Standard/Specification for windows, doors, and skylights (NAFS)-08 and its Canadian supplement CSA A440S1-09*

and/or

*AAMA/WDMA/CSA 101/I.S.2/A440-11 North American Fenestration Standard/Specification for windows, doors, and skylights (NAFS)-11 and its Canadian supplement CSA A440S1-17 Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440-17 Standard/Specification for windows, doors, and skylights*

Note: certification to NAFS and the Canadian supplement is not a requirement.

- C. All Insulating Glass Units shall be certified using the following standards as indicated:

*ASTM E2190-10 Standard Specification for Insulating Glass Unit Performance and Evaluation*

and/or

*CAN/CGSB 12.8-17 Insulating Glass Units Standard*

- D. The model selected for testing or simulation shall be representative of that which is intended to be marketed and labeled as ENERGY STAR.
- E. Certification for energy performance must be done by an organization accredited by the SCC for the scope of the product being certified, or, by NFRC.
- F. Testing to NAFS and the Canadian supplement must be done by an organization accredited by the SCC or other signatories to the Asia Pacific Laboratory Accreditation Cooperation (APLAC) and/or the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement for the scope of the product being tested.

5) **Model Registration and Labelling**

- A. Product models must be registered with NRCan using the designated submission form in order to be labelled and considered ENERGY STAR certified in Canada.
- B. Product models registered with NRCan for ENERGY STAR must be labelled in accordance with the current [Guidelines for the labelling and promotion of ENERGY STAR® certified fenestration products sold in Canada](#) in order to be considered ENERGY STAR certified in Canada.

6) **Installation Instructions**

Products shall have installation instructions readily available online or packaged with the product. This information does not need to be included on product labels. Electronic versions of instructions may be provided on the website of a retailer, manufacturer, and/or industry association. Disclaimers may be included to limit liability. NRCan understands that the manufacturer cannot write installation instructions for every situation and that generic instructions covering the most common situations are acceptable to fulfill this requirement.

7) **Effective Date**

The effective date for Version 5.0 is January 1, 2020 and supersedes all previous versions. Models shall meet the ENERGY STAR specification in effect on the model's date of manufacture. The date of manufacture is specific to each unit and is the date on which a unit is considered to be completely assembled.

8) **Future Criteria Revisions**

NRCan reserves the right to change the specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through industry discussions. In the event of a specification revision, please note that ENERGY STAR certification is not automatically granted for the life of a product model.