



# ENERGY STAR® Product Specification Residential Windows, Doors, and Skylights

## Eligibility Criteria Draft 2 Version 7.0

Following is the **Draft 2** Version 7.0 ENERGY STAR product specification for Windows, Doors, and Skylights. A product shall meet all the identified criteria if it is to earn the ENERGY STAR.

- 1) **DEFINITIONS:** Below are the definitions of the relevant terms in this document. Most definitions are based on or pulled directly from the National Fenestration Rating Council (NFRC) 600 except where otherwise noted.

### 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. Includes Transoms.
- B. Door: A sliding or swinging entry system designed for and installed in a vertical wall separating conditioned and unconditioned space in a Residential Building. Includes Sidelites. ENERGY STAR recognizes three categories of Doors and Sidelites:
- i) Opaque: A Door or Sidelite with no glazing (per NFRC 100).
  - ii) ≤ ½-Lite: A Door with ≤ 900 in<sup>2</sup> (0.581 m<sup>2</sup>) of glazing or a Sidelite ≤ 281 in<sup>2</sup> (0.181m<sup>2</sup>) of glazing (per NFRC 100). Includes ¼- and ½-lite Doors and Sidelites.
  - iii) > ½-Lite: A Door with > 900 in<sup>2</sup> (0.581 m<sup>2</sup>) of glazing or a Sidelite with > 281 in<sup>2</sup> (0.181m<sup>2</sup>) of glazing (per NFRC 100). Includes ¾-lite and fully glazed Doors and Sidelites.
- 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.

### Product Subcategories

- D. Sliding Glass Door: A Door that contains one or more manually operated glass panels that slide horizontally within a common frame, categorized with the NFRC product code DDSG.
- E. Swinging Door: A Door system having 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. Swinging Doors include NFRC codes EDSL and DDFR.
- F. Sidelite: A fenestration product with the NFRC product code FXSL.
- G. Transom: A fenestration product with the NFRC product code FXTR.
- 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. 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), or Visual Transmittance. 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

61 their optical properties, including active materials (e.g., electrochromic and Suspended Particle  
62 Device/SPD) and passive materials (e.g., photochromic, thermochromic, etc.).  
63

- 64 ii) Internal Shading System: Operable blinds or shades positioned between glass panes in a Window,  
65 Door, or Skylight.  
66

67 **Performance Metrics**

- 68  
69 J. U-Factor: The heat transfer per time per area and per degree of temperature difference (Btu/h ft<sup>2</sup>·°F).  
70 The U-Factor multiplied by the interior-exterior temperature difference and by the projected fenestration  
71 product area yields the total heat transfer through the fenestration product due to conduction,  
72 convection, and long-wave infra-red radiation.  
73  
74 K. Solar Heat Gain Coefficient (SHGC): The ratio of the solar heat gain entering the space through the  
75 fenestration product to the incident solar radiation.  
76  
77 L. Air Leakage: The volume of air flowing per unit time per unit area (cfm/ft<sup>2</sup>) through a fenestration system  
78 due to air pressure or temperature difference between the outdoor and indoor environment.  
79

80 **Other**

- 81  
82 M. Residential Building: A structure used primarily for living and sleeping that is zoned as residential and/or  
83 subject to Residential Building codes. For the purposes of ENERGY STAR, Residential Building refers  
84 to buildings that are three stories or less in height.  
85  
86 N. Insulating Glass Unit (IGU): A preassembled unit, comprising lites of glass, which are sealed at the  
87 edges and separated by dehydrated space(s).  
88  
89 O. North American Fenestration Standard (NAFS): The common name for the American Architectural  
90 Manufacturers Association (AAMA)/Window & Door Manufacturers Association (WDMA)/Canadian  
91 Standards Association (CSA) 101/I.S.2/A440 testing standard.  
92

93 2) **SCOPE:**

- 94  
95 A. Included Products: Products that meet the definition of a residential Window, Door, or Skylight as  
96 specified herein are eligible for ENERGY STAR certification, with the exception of products listed in  
97 Section 2.B. Products that are covered under other ENERGY STAR product specifications are not  
98 eligible for certification under this specification. The list of specifications currently in effect can be found  
99 at [www.energystar.gov/specifications](http://www.energystar.gov/specifications) .  
100  
101 B. Excluded Products: Products that are assembled onsite, including but not limited to sash packs or sash  
102 kits; Windows, Doors, or Skylights that are intended for installation in non-Residential Buildings;  
103 Window, Door, or Skylight attachments that are not included in a product's NFRC-certified rating.  
104

105 3) **CERTIFICATION CRITERIA:**

- 106  
107 A. Energy Efficiency Requirements: Products shall have NFRC-certified U-Factor and, where applicable,  
108 SHGC ratings at levels which meet or exceed the minimum criteria specified in Tables 1 through 3.  
109 Windows, sliding glass doors, and skylights shall meet the criteria for a given ENERGY STAR Climate  
110 Zone. Swinging doors shall meet the criteria for a given glazing level. Dynamic Glazing Products shall  
111 meet the criteria while in the minimum tinted state for Chromogenic Glazing products or the "fully open"  
112 position for Internal Shading Systems.  
113

114 **Table 1: Energy Efficiency Requirements for Windows**  
115

Climate Zone	U-Factor	SHGC
Northern	≤ 0.22	≥ 0.17
North-Central	≤ 0.24	≤ 0.40
South-Central	≤ 0.28	≤ 0.23
Southern	≤ 0.32	≤ 0.23

116  
117

118 **Table 2: Energy Efficiency Requirements for Doors**

119

Glazing Level	U-Factor	SHGC	
Opaque	≤ 0.17	No Rating	
≤ ½-Lite	≤ 0.23	≤ 0.23	
> ½-Lite	≤ 0.25	Northern and North-Central	≤ 0.40
		South-Central and Southern	≤ 0.23

120 **Note:** EPA received stakeholder feedback requesting that aligning the sliding glass door criteria with the  
 121 window criteria was too aggressive and that the sliding glass door criteria should continue to be aligned with  
 122 swinging door criteria. EPA sees the benefit of aligning the criteria for all full glass doors. Further, EPA's  
 123 analysis recognizes there is opportunity to make some improvement in product performance in the > ½-Lite  
 124 door category. In response to the stakeholder feedback and considering the opportunity to gain some  
 125 additional performance improvement, EPA proposes that the sliding glass door criteria be re-aligned with  
 126 the swinging door criteria. To accomplish this, the criteria from Table 2 in Draft 1 has been merged with  
 127 Table 3 in Draft 1. The new combined criteria are in Table 2 of Draft 2. All doors are now covered by these  
 128 criteria. The U-factor requirement for > ½-Lite doors has been reduced to ≤ 0.25 to improve the insulating  
 129 power of the door category. This makes the criteria less stringent than proposed in Draft 1 for the sliding  
 130 glass door category and more stringent than proposed in Draft 1 for swinging > ½-Lite door criteria so that  
 131 they align and meet the same criteria.

132 **Table 3: Energy Efficiency Requirements for Skylights**

133

134

Climate Zone	U-Factor	SHGC
Northern	≤ 0.45	Any
North-Central South-Central Southern	≤ 0.50	≤ 0.25

- 135
- 136
- 137 B. Equivalent Energy Performance: Windows may also have NFRC-certified U-Factor and SHGC ratings at  
 138 levels which meet or exceed the equivalent energy performance criteria specified in Table 4. These  
 139 criteria allow Windows with energy performance equivalent to the prescriptive criteria to be certified for  
 140 the Northern Zone. Equivalent performance criteria are not applicable to the North-Central, South-  
 141 Central, or Southern Zones or to Doors or Skylights.

142 **Table 4: Equivalent Energy Performance for Windows**

143

144

145

Climate Zone	U-Factor <sup>1</sup>	SHGC <sup>2</sup>
Northern	= 0.23	≥ 0.35
	= 0.24	≥ 0.35
	= 0.25	≥ 0.40
	= 0.26	≥ 0.40

146

147 **Note:** EPA received stakeholder feedback on the use of EnergyPlus for the Version 7.0 analysis. EPA  
 148 appreciates all who brought attention to significant updates made in more recent versions of the modeling  
 149 software. In the early stages of this analysis, EnergyPlus V8.9 was the common version in use. To address the  
 150 concerns raised, EPA and LBNL elected to rerun the initial analysis and expand it to address lower SHGCs  
 151 using EnergyPlus V9.5. The results can be found in the data package files released with this document and in  
 152 the summary tables in Appendix section III of the Draft 2 Response to Comments. The results of the EnergyPlus  
 153 9.5 analysis showed very similar results in the North and North-Central Zones and improved results in the  
 154 South-Central and Southern Zones. Based on these results, EPA has opted not to change the prescriptive  
 155 values for windows. EPA has modified the equivalent energy trade-offs in the Northern zone, however.

156 EPA reviewed the Northern Zone Energy Savings table and found that the energy savings values that were  
 157 equivalent the prescriptive value (U=0.22, SHGC=0.30) had changed. Therefore, EPA is proposing a change in  
 158 the trade-offs to match the revised results. EPA has successfully allowed trade-offs in previous criteria revisions  
 159 which have not led to confusion in the market. A similar approach is also used in other countries such as  
 160 Canada. The trade-offs allow flexibility to manufacturers in meeting the proposed criteria and allow consumers  
 161 to use high-gain products when appropriate in their homes. The trade-offs are based upon energy savings  
 162 equivalency and not energy cost savings equivalency. Additionally, although higher U-factor, high-gain products  
 163 may have lower energy savings, they may also be less expensive than lower U-factor alternatives leading to a  
 164 shorter payback period. EPA plans to update its buying guidance to include information on considerations when  
 165 buying high-gain products. The new trade-off levels do not have as high a SHGC as the previous proposal due  
 166 to the results from the Draft 2 modeling. The new revised proposal (Draft 2) allows products with an SHGC  $\geq$   
 167 0.35 to be certified with a U-factor of 0.23 and 0.24 and products with an SHGC  $\geq$ 0.40 to be certified with a U-  
 168 factor of 0.25 and 0.26. This revision allows for more options and ensures that ENERGY STAR remains aligned  
 169 with 2021 IECC codes for IECC zone 5.

170  
 171 C. Air Leakage Requirements: Products shall have Air Leakage ratings at levels which meet or exceed the  
 172 minimum criteria specified in Table 5 and adhere to the labeling requirements laid out below.  
 173

174  
 175 **Table 5: Air Leakage Requirements**  
 176

Product	Air Leakage Rating
Window, Sliding Door, or Skylight	$\leq 0.3$ cfm/ft <sup>2</sup>
Swinging Door	$\leq 0.5$ cfm/ft <sup>2</sup>

- 177  
 178 i) Windows, Sliding Doors, and Skylights shall demonstrate adherence to this requirement by either  
 179 (1) Displaying " $\leq 0.3$ " in the Air Leakage portion of the NFRC temporary label.  
 180 OR  
 181 (2) Placing one of the following labels on the product:  
 182 (a) AAMA Gold Label  
 183 (b) Keystone Certifications, Inc. NAFS Structural Certification Label  
 184 (c) National Accreditation & Management Institute, Inc. (NAMI) NAFS Structural Certification  
 185 Label  
 186 (d) WDMA Hallmark Certification Label

187 NOTE: The U.S. Environmental Protection Agency (EPA) may consider similar labels offered by  
 188 other Certification Bodies on a case-by-case basis.  
 189

- 190 ii) Swinging Doors shall demonstrate adherence to this requirement by either:  
 191 (1) Displaying " $\leq 0.5$ " in the Air Leakage portion of the NFRC temporary label.  
 192 OR  
 193 (2) Placing one of the following labels on the product:  
 194 (a) AAMA Gold Label  
 195 (b) Keystone Certifications, Inc. NAFS Structural Certification Label  
 196 (c) NAMI NAFS Structural Certification Label  
 197 (d) WDMA Hallmark Certification Label

198 NOTE: EPA may consider similar labels offered by other Certification Bodies on a case-by-case  
 199 basis.  
 200

- 201  
 202 iii) Manufacturers shall test and/or add the necessary labeling as their products come up for NFRC re-  
 203 certification.  
 204

205  
 206 D. Installation Instructions: Products shall have installation instructions readily available online or packaged  
 207 with the product. This information does not need to be included on product labels. Electronic versions of  
 208 instructions may be provided on the website of a retailer, manufacturer, and/or industry association.  
 209 Retailers, manufacturers, and industry associations may include in these instructions whatever  
 210 disclaimers they feel are necessary to limit their liability. EPA understands that the manufacturer cannot  
 211 write installation instructions for every situation and that generic instructions covering the most common  
 212 situations are acceptable to fulfill this requirement. The installation instructions shall include:  
 213

- i) A list of hardware and tools required for installation, including those provided by the manufacturer and those not provided by the manufacturer.
- ii) Diagrams/pictures and descriptions of the product or a typical product of similar type and parts provided by the manufacturer.
- iii) General guidance on safely removing old products and preparing the frame for installation. Guidance should direct consumers to relevant content on proper management of lead paint, such as [www.epa.gov/lead](http://www.epa.gov/lead). (Inclusion of diagrams/pictures is preferred, but optional.)
- iv) General information on proper disposal or recycling of products being removed.
- v) Detailed flashing instructions including diagrams/pictures or reference to the applicable flashing manufacturer's instructions, as applicable to the product.
- vi) Instructions on properly shimming the product to achieve an installation that is flush, level, and plumb. (Inclusion of diagrams/pictures is preferred, but optional.)
- vii) Guidance on sealing and weatherproofing to prevent air and water infiltration at the product-wall interface. (Inclusion of diagrams/pictures is preferred, but optional.)
- viii) Variations of the above based on whether the job is a pocket installation, rough opening installation with exterior sheathing intact, and/or rough opening installation with exterior sheathing removed, as applicable to the product.

Disclaimer: EPA makes no warranties, expressed or implied, nor assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of the contents of installation instructions, or any portion thereof. Further, EPA cannot be held liable for defects or deficiencies resulting from the proper or improper application of installation instructions.

4) **TESTING:**

- A. When testing residential Windows, Doors, and Skylights, the test methods shown in Table 6 shall be used to determine ENERGY STAR certification:

**Table 6: Test Methods for ENERGY STAR Certification**

ENERGY STAR Requirement	Test Method Reference
U-Factor	NFRC 100
SHGC	NFRC 200
Air Leakage	ASTM E283 in accordance with NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440-11

- B. All products containing IGUs shall have them certified according to NFRC procedures.

- 5) **EFFECTIVE DATE:** The ENERGY STAR Version 7.0 Residential Windows, Doors, and Skylights specification shall take effect on **TBD**. To meet the ENERGY STAR criteria, a product model 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.

**Note:** EPA anticipates that the Version 7.0 will take effect 1 year after the new criteria is finalized.

- 6) **CONSIDERATIONS FOR FUTURE REVISIONS:** ENERGY STAR 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 stakeholder discussions. In the event of a specification revision, please note that the ENERGY STAR certification is not automatically granted for the life of a product model.

# ENERGY STAR Certification Criteria for Residential Windows, Doors, and Skylights

## Windows

Climate Zone	U-Factor <sup>1</sup>	SHGC <sup>2</sup>	
Northern	≤ 0.22	≥ 0.17	Prescriptive
	= 0.23	≥ 0.35	Equivalent Energy Performance
	= 0.24	≥ 0.35	
	= 0.25	≥ 0.40	
	= 0.26	≥ 0.40	
North-Central	≤ 0.24	≤ 0.40	
South-Central	≤ 0.28	≤ 0.23	
Southern	≤ 0.32	≤ 0.23	

280

## Doors

Glazing Level	U-Factor <sup>1</sup>	SHGC <sup>2</sup>	
Opaque	≤ 0.17	No Rating	
≤ ½-Lite	≤ 0.23	≤ 0.23	
> ½-Lite	≤ 0.25	Northern & North-Central	≤ 0.40
		Southern & South-Central	≤ 0.23

281 Air Leakage for Sliding Doors ≤ 0.3 cfm/ft<sup>2</sup>

282 Air Leakage for Swinging Doors ≤ 0.5 cfm/ft<sup>2</sup>

283

284

## Skylights

Climate Zone	U-Factor <sup>1</sup>	SHGC <sup>2</sup>
Northern	≤ 0.45	Any
North-Central		
South-Central	≤ 0.50	≤ 0.25
Southern		

285 Air Leakage ≤ 0.3 cfm/ft<sup>2</sup>

274 Air Leakage for windows and sliding glass doors ≤ 0.3 cfm/ft<sup>2</sup>

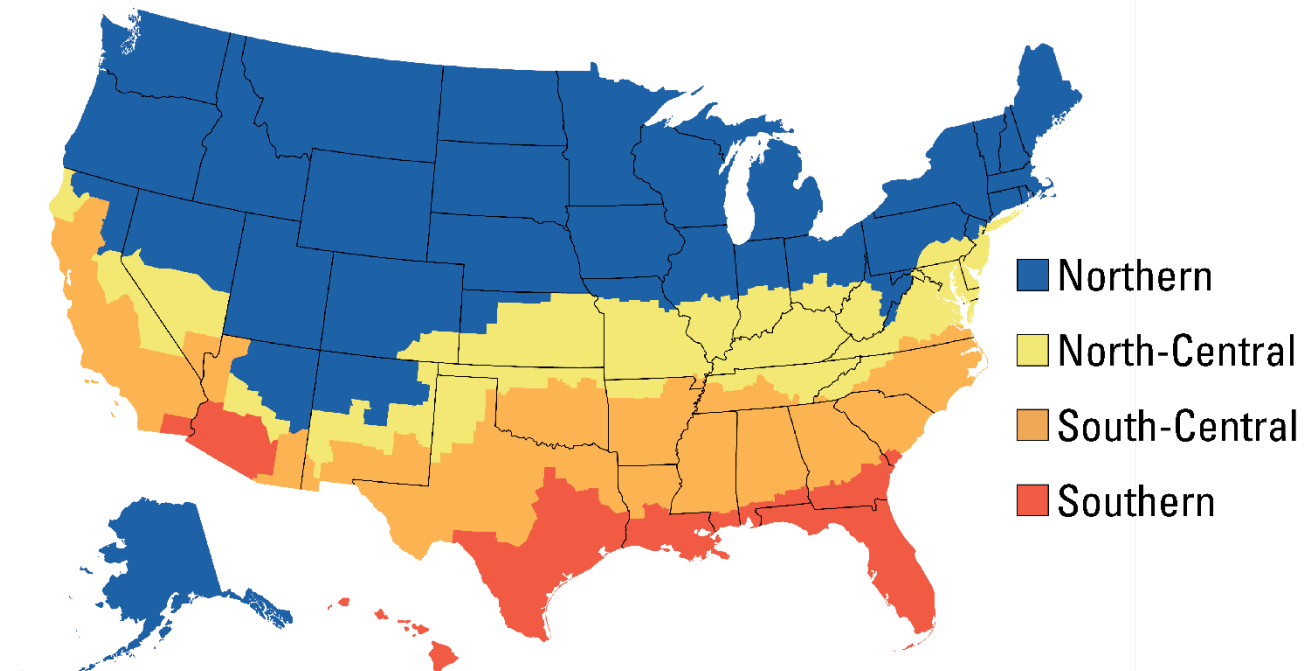
275 <sup>1</sup> Btu/h ft<sup>2</sup>·°F

276 <sup>2</sup> Solar Heat Gain Coefficient

277

278

279



286

287

288 **Note:** A complete list of ENERGY STAR Climate Zones by state and county or, where applicable, zip code is available at  
289 [www.energystar.gov/products/building\\_products/residential\\_windows\\_doors\\_and\\_skylights/climate\\_zone/search](http://www.energystar.gov/products/building_products/residential_windows_doors_and_skylights/climate_zone/search).

290

291

**Note:** The ENERGY STAR Climate Zone map has changed to reflect various counties across the U.S. moving into a different International Energy Conservation Code (IECC) zones as a result of changing climate patterns. Please see the Criteria Analysis Report for more information.

292

293