



GS-13
Green Seal™ Environmental Standard for
Windows

Second Edition

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THE MARK OF ENVIRONMENTAL RESPONSIBILITY

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GREEN SEAL™

Green Seal is a non-profit organization devoted to environmental standard setting, product certification, and public education. Green Seal's mission is to work towards environmental sustainability by identifying and promoting environmentally responsible products, purchasing, and production. Through its standard setting, certification and education programs, Green Seal:

- identifies products that are designed and manufactured in an environmentally responsible manner;
- offers scientific analyses to help consumers make educated purchasing decisions regarding environmental impacts;
- ensures consumers that any product bearing the Green Seal Certification Mark has earned the right to use it; and
- encourages manufacturers to develop new products that are significantly less damaging to the environment than their predecessors.

The intent of Green Seal's environmental requirements is to reduce, to the extent technologically and economically feasible, the environmental impacts associated with the manufacture, use and disposal of products. Set on a category-by-category basis, Environmental Standards focus on significant opportunities to reduce a product's environmental impact.

Green Seal offers certification to all products covered by its Standards. Manufacturers may submit their products for evaluation by Green Seal. Those which comply with Green Seal's requirements may be authorized to use the Green Seal Certification Mark on products and in product advertising. Manufacturers authorized to use the Green Seal Certification Mark on their product are subject to an ongoing program of testing, inspection, and enforcement.

For additional information on Green Seal or any of its programs, contact:

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FOREWORD

A. Certification. This Environmental Standard contains the basic requirements for certain products (as defined in the Scope section below) to be certified by Green Seal™ and for their manufacturers to receive authorization to use the Green Seal Certification Mark on products and their packaging, and in product advertising. The requirements are based on an assessment of the environmental impacts of product manufacture, use, and disposal and reflect information and advice obtained from industry, trade associations, users, government officials, environmental and other public interest organizations, and others with relevant expertise. These requirements are subject to revision as further experience and investigation may show is necessary or desirable.

B. Compliance with the Standard. Compliance with this Standard is one of the conditions of certification of a product by Green Seal.

C. Compliance with Government Rules. In order to be authorized to use the Green Seal Certification Mark, the manufacturer of the certified product must disclose all governmental allegations or determinations of violation of federal, state, or local environmental laws or regulations with respect to facilities in which the product is manufactured. Certification will be denied any product manufactured in violation of environmental laws or regulations if, in Green Seal's judgment, such violations indicate that the environmental impacts of the product significantly exceed those contemplated in the setting of the standard.

D. Limitations on Purpose of Standard. Green Seal's Standards provide basic criteria to promote environmental quality. Provisions for product safety have not been included in this Standard because government agencies and other national standard-setting organizations establish and enforce safety requirements.

E. Substantially Equivalent Products. Products that are substantially similar to those covered by this standard in terms of function and environmental impact may be evaluated and certified by Green Seal against the intent of the requirements of this standard.

F. Unanticipated Environmental Impacts. A product which complies with this Standard will not necessarily be certified by Green Seal if, when examined and tested, it is found to have other features which significantly increase its impact on the environment. In such a situation, Green Seal will ordinarily amend its standards to account for the unanticipated environmental impacts.

G. Certification Agreement and Green Seal Rules. In order to be authorized to apply the Green Seal Certification Mark to a product or its packaging, or to use the Green Seal Certification Mark in product advertising, the manufacturer of the product must (1) undergo an initial product evaluation to determine that the product complies with Green Seal's requirements, (2) sign a Green Seal Certification Agreement that, among other things, defines how and where the Green Seal may be used, (3) pay fees to cover the costs of testing and monitoring, (4) agree to an ongoing program of factory inspections and product testing, and (5) comply with the requirements found in the most recent version of "Rules Governing the Use of the Green Seal Certification Mark."

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H. Disclaimer of Liability. Green Seal™, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. Green Seal shall not incur any obligations or liability for damages, including consequential damages, arising out of or in connection with the interpretation of, reliance upon, or any other use of this Standard.

I. Care in Testing. Many tests required by Green Seal's Standards involve safety considerations. Adequate safeguards for personnel and property should be employed in conducting such tests.

J. Referenced Standards. Standards referenced in this document may have been superseded by a later edition, and it is intended that the most recent edition of all referenced standards be used in determining compliance of a product with this standard.

K. Labeling Requirements. This standard neither modifies nor supersedes government labeling requirements. Labeling language which varies in form from the requirements of this section may be used with the written approval of Green Seal.

ENVIRONMENTAL STANDARD

1. Scope

This standard establishes environmental requirements for the following residential fenestration products:

1.1 Windows

1.2 Skylights

1.3 Glazed Exterior Doors

1.4 Storm Doors.

Products specifically *excluded* from this standard: (1) curtain walls, (2) glazing cast into precast concrete, (3) greenhouse windows, and (4) glass blocks.

2. Definitions

2.1 Air Infiltration: The exchange of indoor air and outdoor air through product components.

2.2 Air Leakage Rate: The volume of air flowing per unit time through leakage paths in the closed product under specified temperature and pressure conditions on the indoor and outdoor sides of the product.

2.3 Frame: The associated head, jamb, sill, and where applicable, mullion and muntin which, when assembled, house the sash or fixed glazing.

2.4 Glazed Exterior Door: Any glazed exterior partition (other than as noted in Section J) having movable parts, installed on a building wall, capable of admitting solar radiation into the building area, and intended for human entrance and exit from the building with glazed areas greater than 144 square inches per panel.

2.5 Glazing: Product components which are transparent or semi-transparent to solar radiation.

2.6 Heat Transfer Coefficient (U-value): Overall heat transferred, on average in units of time per unit area (ft²) of the entire product when the temperature differential between the indoor and outdoor sides of the product is one degree F. The U-value is expressed in Btu/hr/ft²/degree F. The U-value multiplied by the indoor-outdoor temperature difference and the projected area of the entire product yields the rate of heat transfer through the entire product in Btu/hr.

2.7 Sash: Structural product component which provides peripheral support for the window glazing.

2.8 Skylight: Any glazed partition having fixed or movable parts, installed on a building roof, and capable of admitting solar radiation into the building.

2.9 Solar Heat Gain Coefficient (SHGC): The ration of solar energy transmitted through a product, from the products outdoor side to the indoor side, to the solar energy striking the outdoor side of the product, for a given angle of incidence and for a given set of environmental conditions (indoor/outdoor temperatures, outdoor wind speed, insolation). Included are directly transmitted solar radiation as well as solar energy absorbed and then re-radiated/conducted toward the indoor side.

2.10 Storm Door: Any glazed partition having movable parts, installed on a building wall, capable of admitting solar radiation into the building area, and intended for human entrance and exit from the building.

2.11 Window: Any glazed partition (other than noted in Section 1) having fixed or movable parts, installed on a building wall, and capable of admitting solar radiation into the building.

2.12 Visible Light Transmission Coefficient (VLTC): The ration of intensity of visible light (wavelength range of 0.38 to 0.78 μm) transmitted through a product glazing from the product's outdoor side to the indoor side, to the intensity of the visible light striking the outdoor side of the product, for a given angle of incidence, a given set of environmental conditions (indoor temperature and outdoor temperature), and a given visible light source.

2.13 Product: a window, skylight, glazed exterior door, or storm door.

2.14 Operable product: any product that can be opened for ventilation.

2.15 Fixed product: any non-operable product.

3 Product Characterization

3.1 The overall heat transfer coefficient, or U-value, representative of an entire product shall be determined according to the provisions of National Fenestration Rating Council (NFRC) Standard No. 100-91: *Procedure for Determining Fenestration Product Thermal Properties (Currently Limited to U-values)*.¹ NFRC Attachment A: *Interim standard test method for measuring the steady state thermal transmittance of fenestration systems using hot box methods*.

¹ National Fenestration Rating Council, 1300 Spring street, Suite 120, Silver Spring, MD 20910

3.2 The Solar Heat Gain Coefficient, SHGC, representative of an entire product shall be determined according to the provisions of NFRC Standard No. 200-93: *Procedure for Determining Fenestration Product Solar Heat Gain Coefficients at Normal Incidence*.

3.3. The Visible Light Transmission Coefficient, VLTC, representative of an entire product shall be determined according to the provisions of NFRC Standard No. 300-93: *Procedure for Determining Fenestration Product Optical Properties*.

3.4 The Air Leakage Rate, ALR, representative of an entire product shall be measured at a wind speed of 25 MPH according to Test Procedure ASTM Standard No. E283-89 (04.07): Rate of Air Leakage Through Exterior Windows/Curtain Walls/Doors-Test, American Society for Testing and Materials (ASTM). When final, NFRC 400 may be used.

3.5 Products with adjustable components, including but not limited to mechanical, electronic, or thermal integrated shades, shall be tested at fixed settings of these adjustable components designated by the product's manufacturer as most favorable for the product's performance in its designated class.

4. Product Specific Performance Requirements

The ratio of the product's visible light transmission coefficient (VLTC) over its solar heat gain coefficient (SHGC) shall be greater than 1.

5. Product-Specific Environmental Requirements

5.1 U-value: glazed exterior doors and windows shall have U-values for NFRC Model Size AA no greater than 0.36. Skylights shall have a U-value for NFRC Model Size AA no greater than 0.44. Exception: storm doors are exempt from the U-value requirement.

2. Air Leakage: fixed products shall have an ALR no greater than 0.10 scfm/ft.²
Operable products shall have an ALR no greater than 0.30 scfm/lfc.

5.3 Product Frame and Sash Material: the product manufacturer shall demonstrate that the product frame and sash materials have not been formulated with the heavy metals lead, cadmium, arsenic, mercury, or hexavalent chromium. Exception: Products with aluminum parts treated for anti-corrosivity with organic conversion coatings containing chromate are exempted from this requirement.

² When final, NFRC 400 may be used.

6 Product Packaging Requirements

6.1 The corrugated box used to package the product must contain at least 25% post-consumer material. The percentage of post-consumer material is to be based on fiber weight and calculated according to the following formula:

$$\% \text{ post-consumer material} = \frac{[\text{PCFil}(\text{FWil}) + \text{PCFol}(\text{FWol}) + \text{PCFm}(\text{FWm})]}{[\text{FWil} + \text{FWol} + \text{FWm}]}$$

where

PCFil = % Post-consumer fiber in the inner liner
 PCFol = % Post-consumer fiber in the outer liner
 PCFm = % Post-consumer fiber in the medium
 FWil = Fiber weight of inner liner
 FWol = Fiber weight of outer liner
 FWm = Fiber weight of medium

6.2 The sum of the concentration levels of lead, cadmium, mercury, and hexavalent chromium present in the corrugated shipping box or other packaging directly in contact with the product shall not exceed 100 parts per million by weight.

7 Consumer Education Requirements

7.1 Pre-sales education materials meeting the following requirements must be made available to the consumer:

7.1.1 Materials to recommend to the consumer the manufacturer's most appropriate product for a variety of U.S. climate zones and all cardinal orientations within each climate zone. This recommendation shall be based upon annual energy performance and/or annual energy cost optimization as predicted by window simulation software like RESFEN - *A Prototype PC Program for Calculating Residential Fenestration Heating and Cooling Energy Use and Cost*, Lawrence Berkeley Laboratory.³

7.1.2. Materials must clearly state the U-value and the SHGC of all recommended products.

7.2 In order to minimize long-term product air infiltration, proper installation instructions must be provided with the product.

³ Building Technologies Program, Lawrence Berkeley Laboratory, Berkeley, CA 94720

Appendix: Labeling Requirements for Certification by Green Seal™

1. The Green Seal Certification Mark shall appear on the product packaging.
2. The Green Seal Mark shall not be used in conjunction with any modifying terms, phrases, or graphic images that might mislead consumers as to the extent or nature of the certification.
3. Whenever the Certification Mark appears on a package or product, the product or package must contain a description of the basis for certification. The description shall be in a location, style, and typeface that are easily readable by the consumer. Unless otherwise approved in writing by Green Seal, the description shall read as follows:

This product meets Green Seal's environmental standards governing energy efficiency, heavy metals in the frame and sash materials, packaging, and consumer education materials.