CANADIAN STANDARDS ASSOCIATION

A440.2-09/A440.3-09

Fenestration energy performance/ User guide to CSA A440.2-09, *Fenestration energy performance*

CSA Standard

A440.2-09/A440.3-09
***Fenestration energy performance/ User guide to CSA A440.2-09,* Fenestration energy performance**

CANADIAN STANDARDS ASSOCIATION

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Preface

This is the fifth edition of CSA A440.2/A440.3, *Fenestration energy performance/User guide to CSA A440.2-09,* Fenestration energy performance. It supersedes the previous editions published in 2004, 1998, 1993, and 1991 under the title *Energy performance of windows and other fenestration systems* (and associated user guides). This edition incorporates CSA A453-95, *Energy Performance Evaluation of Swinging Doors*, which is considered superseded by this Standard.

CSA A440.2 applies to the determination of energy performance properties for a variety of fenestration systems, including fixed windows, operable windows, sliding glass doors, hinged doors, skylights with flat glazings, and curtain walls. It includes the following energy performance properties, which are applicable to all building types (residential, commercial, and other):

(a) overall coefficient of heat transfer (U-factor);
(b) solar heat gain coefficient (*SHGC*); and
(c) visible transmittance (*VT*).

These properties, along with a visible transmittance, can be evaluated using either computer simulation or measurement.

In addition, CSA A440.2 provides a means for determining a comparative Energy Rating (*ER*) for fixed and operable windows, sliding doors, and hinged doors to be used in low-rise residential housing. The *ER* combines the U-factor, *SHGC*, and heat losses resulting from air leakage into a single rating that allows the energy performance of fixed and operable windows, sliding doors, and hinged doors to be compared over an average heating season. Assumptions have been made about the size of the fixed and operable windows, sliding doors, and hinged doors in order to develop the *ER*.

CSA A440.3, the user guide to CSA A440.2, has been prepared to explain the content and use of CSA A440.2. CSA A440.3 allows the knowledgeable user to develop specific energy performance properties that apply to fenestration systems of different sizes in specific geographic locations and orientations. CSA A440.3 is divided into three parts. In Section I, the energy performance of fenestration systems is discussed in general terms to provide an overview of the issues that should be considered in the selection of fenestration systems. Section I also explains some of the content of CSA A440.2. In Section II, technical explanations are provided for specific clauses of CSA A440.2. In Section III, the concepts of Specific Energy Rating (*ERS*) and Energy Rating for the cooling season (*ERC*) are explained for more advanced users.

CSA acknowledges that the development of these Standards was made possible, in part, by the financial support of Natural Resources Canada (NRCan).

CSA A440.2 is considered suitable for use for conformity assessment within the stated scope of the Standard.

CSA A440.2 was prepared by the Subcommittee on Energy Evaluation of Fenestration Systems, under the jurisdiction of the Technical Committee on Performance Standards for Fenestration Systems and the Strategic Steering Committee on Building Products and Systems, and has been formally approved by the Technical Committee. CSA A440.3 is not a consensus publication and is intended for information only. CSA A440.2 will be submitted to the Standards Council of Canada for approval as a National Standard of Canada.

August 2009

Note:
(1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*
(2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*
(3) *This publication was developed by consensus, which is defined by* CSA Policy governing standardization — Code of good practice for standardization *as "substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity". It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this publication.*

(4) *CSA Standards are subject to periodic review, and suggestions for their improvement will be referred to the appropriate committee.*

(5) *All enquiries regarding this Standard, including requests for interpretation, should be addressed to Canadian Standards Association, 5060 Spectrum Way, Suite 100, Mississauga, Ontario, Canada L4W 5N6.*

Requests for interpretation should

(a) define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;

(b) provide an explanation of circumstances surrounding the actual field condition; and

(c) be phrased where possible to permit a specific "yes" or "no" answer.

Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization *and are published in CSA's periodical* Info Update*, which is available on the CSA Web site at www.csa.ca.*

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A440.2-09
Fenestration energy performance

1 Scope

1.1
This Standard applies to
(a) fenestration systems covered by AAMA/WDMA/CSA 101/I.S.2/A440, including
  (i) vertically sliding windows;
  (ii) horizontally sliding windows;
  (iii) dual-action windows;
  (iv) casement windows, both fixed and operable;
  (v) projecting (awning/hopper) windows;
  (vi) fixed windows;
  (vii) sidelites;
  (viii) transom windows;
  (ix) sliding glass doors;
  (x) side-hinged doors;
  (xi) dual-action side-hinged doors;
  (xii) architectural terrace doors;
  (xiii) unit skylights and roof windows;
  (xiv) greenhouse or garden windows; and
  (xv) tubular daylighting devices; and
(b) curtain walls.

Note: *Unless otherwise specified, the term "fenestration system" is used to apply to all products listed in Clause 1.1.*

1.2
This Standard specifies both measurement and calculation methods for establishing the following fenestration system properties for both residential and commercial applications:
(a) overall coefficient of heat transfer (U-factor);
(b) solar heat gain coefficient (*SHGC*); and
(c) visible transmittance (*VT*).

This Standard also specifies measurement methods for establishing the Temperature Index (I) for fenestration systems for both residential and commercial applications.

Note: *The fenestration properties established in accordance with this Standard are for specific indoor and outdoor conditions and will vary slightly under actual conditions. The values obtained by the methods specified in this Standard are considered to provide an acceptable basis for comparing performance in use.*

1.3

1.3.1
This Standard specifies a method for determining an energy performance rating for vertical fenestration systems, under heating conditions, for use in low-rise residential applications. The Energy Rating (*ER*) includes factors for
(a) solar heat gain;
(b) heat loss by conduction, radiation, and convection; and
(c) heat loss by air leakage.

1.3.2
The *ER* allows for a comparison of different fenestration systems on the basis of their effect on the energy supplied annually by the heating system. The *ER* calculation assumes vertical installation in low-rise residential buildings and is based on average conditions for
(a) incident solar radiation on fenestration systems facing the four cardinal compass directions (north, east, south, and west); and
(b) representative climate zones in Canada.

1.3.3
The *ER* should not be used to rate
(a) any sloped glazing (residential or commercial); or
(b) fenestration products that will be installed in commercial, industrial, or high-rise residential buildings.

1.4
CSA A440.3 is a user guide to this Standard. It provides guidance on determining
(a) a specific Energy Rating (*ERS*) for particular locations, orientations, and vertical fenestration system sizes; and
(b) an *ER* for residential cooling (*ERC*).

1.5
This Standard does not apply to
(a) fixed glazing cast into precast concrete panels;
(b) overhead doors;
(c) revolving doors;
(d) doors intended for indoor use; and
(e) storm doors.

Note: *While these products have not been considered in the development of this Standard, simulation procedures given in the Standard may be used to evaluate the U-factor and the SHGC of these products.*

1.6
This Standard does not address the retention of thermal and optical properties and airtightness by fenestration systems over time and under conditions of use.

1.7
In CSA Standards, "shall" is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; "should" is used to express a recommendation or that which is advised but not required; and "may" is used to express an option or that which is permissible within the limits of the standard; and "can" is used to express possibility or capability. Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material. Notes to tables and figures are considered part of the table or figure and may be written as requirements. Legends to equations and figures are considered requirements. Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

2 Reference publications
CSA A440.2 and CSA A440.3 refer to the following publications, and where such reference is made, it shall be to the edition listed below, including all amendments published thereto.

CSA (Canadian Standards Association)
AAMA/WDMA/CSA 101/I.S.2/A440-08
NAFS — North American Fenestration Standard/Specification for windows, doors, and skylights