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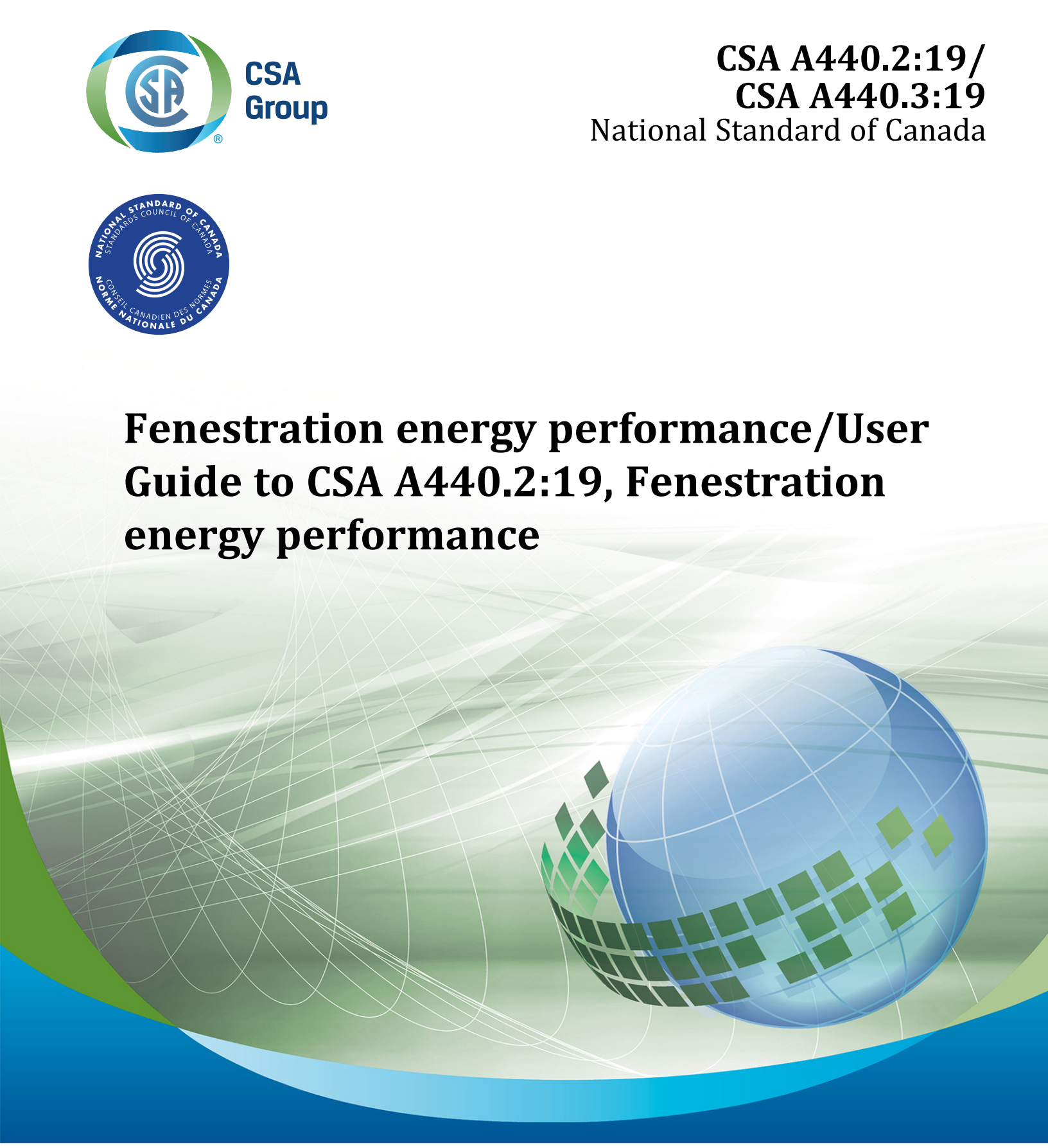
Fenestration energy performance/User Guide to CSA A440.2:19, Fenestration energy performance



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Preface

This is the seventh edition of CSA A440.2/CSA A440.3, *Fenestration energy performance/User guide to CSA A440.2:19, Fenestration energy performance*. It supersedes the previous editions published in 2014 and 2009 under the title *Fenestration energy performance/User guide to CSA A440.2* and in 2004, 1998, 1993, and 1991 under the title *Energy performance of windows and other fenestration systems (and associated user guides)*.

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 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*.

Annex B provides some information on how climate change can affect fenestration product design and application.

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

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

This Standard was prepared by the Subcommittee on Energy Evaluation of Windows, under the jurisdiction of the Technical Committee on Performance Standards for Windows and the Strategic Steering Committee on Construction and Civil Infrastructure, and has been formally approved by the Technical Committee.

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CSA A440.2:19
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 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;
b) curtain walls; and
c) garage (vehicular access/rolling) doors.

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.*

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Section I — Understanding fenestration energy performance

I.1 Purpose of CSA A440.2

I.1.1
CSA A440.2 was developed to allow comparison of the energy performance of different fenestration systems. In the past, the energy performance information provided by the manufacturer was often limited to the R-value or the U-factor for the centre-of-glass area. Because the effects of the frame and sash were not taken into account, the energy performance of the fenestration system was usually overrepresented. CSA A440.2 specifies a procedure for evaluating the energy performance parameters of the total fenestration system, including the glass, frame, and sash.

I.1.2
The properties that affect the energy performance of fenestration systems are
a) solar heat gain;
b) heat losses resulting from conduction, radiation, and convection; and
c) heat losses resulting from air leakage.

CSA A440.2 provides methods for determining the solar heat gain coefficient (*SHGC*) and the heat losses resulting from conduction, radiation, and convection (U-factor). The procedure for determining air leakage is specified in AAMA/WDMA/CSA 101/I.S.2/A440.

I.1.3
CSA A440.2 also provides a method for calculating the overall Energy Rating (*ER*) for a fenestration system to be used in a self-contained low-rise residential building by combining, into a single overall rating, the following three properties:
a) solar heat gain coefficient (*SHGC*);
b) overall coefficient of heat transfer (U-factor); and
c) air leakage.

The *ER* provides a means to compare the energy performance of fenestration systems used in low-rise residential buildings. However, because of the manner in which the *ER* is determined, there are limitations to its applicability. As explained in Clause I.6, *ER* is only applicable when comparing fenestration systems that are to be used in houses under heating conditions.

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