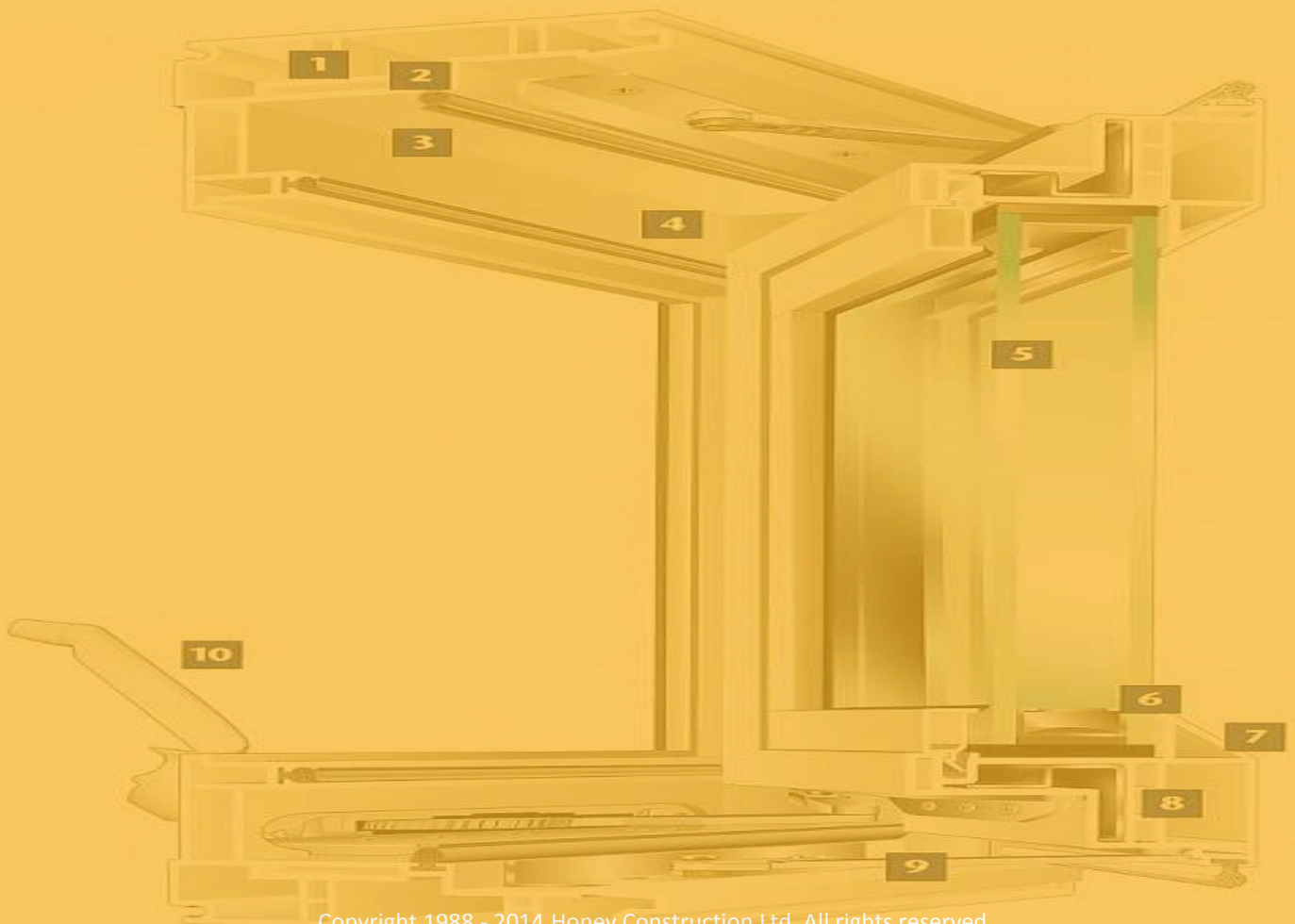


Be an Energy Efficient Windows Expert in 5 Minutes!



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Key Points to Energy Efficient Windows

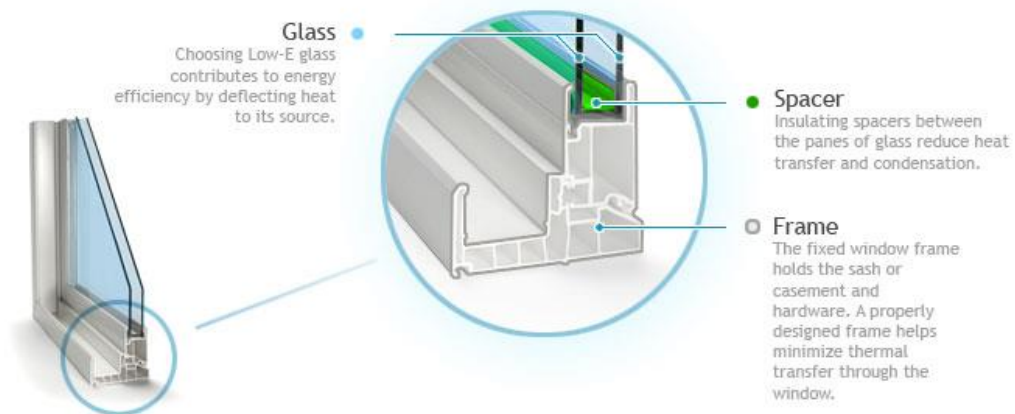
- Improving the energy performance of windows is important, since windows are the least insulated surface of most homes.
- Energy features such as low-e coatings, argon gas fill and insulated spacers can double the insulation value of a standard double-pane window.
- Energy-efficient windows improve comfort and experience less condensation.
- Savings from energy-efficient windows usually repay any additional purchase costs within a few years.

Introduction: Anatomy of Energy Efficient Windows

Windows are a long-term investment. Smart shoppers purchase energy-efficient windows to protect themselves from future energy cost increases and improve comfort for years to come. Today's energy-efficient windows offer superior performance at a reasonable price.

Energy-efficiency features available for new or replacement windows include:

- Low emissivity (low-e) coatings and films
- Inert gas between the panes of thermopane glass units
- Insulated edge spacers
- Insulated frames
- Additional layers of glazing



Window Energy Glossary – Understand the Lingo

Air Leakage Rating: A measure of the rate of infiltration around a window or skylight in the presence of a strong wind. It is expressed in units of cubic feet per minute per square foot (cfm/ft²) of window area or cubic feet per minute per foot (cfm/ft) of window perimeter length. The lower a window's air leakage rating, the better its airtightness.

Conduction: The flow of heat through a solid material, such as glass or wood, and from one material to another in an assembly, such as a window, through direct contact.

Convection: The flow of heat through a circulating gas or liquid, such as the air in a room or the air or gas between windowpanes.
Fenestration: A window or skylight and its associated interior or exterior elements, such as shades or blinds. The placement of window openings in a building wall is one of the important elements in determining the exterior appearance of a building.

Gas Fill: A gas other than air placed between window or skylight glazing panes to reduce the U-factor by suppressing conduction and convection.

Glazing: The glass or plastic panes in a window or skylight.

Infiltration: The inadvertent flow of air into a building through breaks in the exterior surfaces of the building. It can occur through joints and cracks around window and skylight frames, sash, and glazings.

Low-Emissance (Low-E) Coating: Microscopically thin, virtually invisible, metal or metallic oxide layers deposited on a window or skylight glazing surface primarily to reduce the U-factor by suppressing radioactive heat flow through the window or skylight.

Radiation: The transfer of heat in the form of electromagnetic waves from one separate surface to another. Energy from the sun reaches the earth by radiation, and a person's body can lose heat to a cold window or skylight surface in a similar way.

Window Energy Glossary – Understand the Lingo

R-Value: A measure of the resistance of a material or assembly to heat flow. It is the inverse of the U-factor ($R = 1/U$) and is expressed in units of $\text{hr}\cdot\text{ft}^2\cdot^\circ\text{F}/\text{Btu}$. A high window R-value, has a greater resistance to heat flow and a higher insulating value.

Shading Coefficient (SC): A measure of the ability of a window or skylight to transmit solar heat, relative to that ability for 1/8-inch clear, double-strength, single glass. It is equal to the Solar Heat Gain Coefficient multiplied by 1.15 and is expressed as a number without units between 0 and 1. A window with a lower Shading Coefficient transmits less solar heat, and provides better shading.

Solar Heat Gain Coefficient (SHGC): The fraction of solar radiation admitted through a window or skylight, both directly transmitted, and absorbed and subsequently released inward. The Solar Heat Gain Coefficient has replaced the Shading Coefficient as the standard indicator of a window's shading ability. It is expressed as a number without units between 0 and 1. A

window with a lower Solar Heat Gain Coefficient transmits less solar heat, and provides better shading.

Spectrally Selective Glazing: A specially engineered low-E coated or tinted glazing that blocks out much of the sun's heat while transmitting substantial daylight.

U-Factor (U-Value): A measure of the rate of heat flow through a material or assembly. It is expressed in units of $\text{Btu}/\text{hr}\cdot\text{ft}^2\cdot^\circ\text{F}$ or $\text{W}/\text{m}^2\cdot^\circ\text{C}$. Window manufacturers and engineers commonly use the U-factor to describe the rate of non-solar heat loss or gain through a window or skylight. Lower window U-factors have greater resistance to heat flow and better insulating value.

Visible Transmittance: The percentage or fraction of visible light transmitted by a window or skylight.

Window Checklist for Design, Specification, and Installation

This checklist guides property managers, architects, builders, and even homeowners in selecting commercial and residential windows and skylights.

Selecting the right window can be difficult because of the many factors involved and the great variations in climate, utility costs, and occupant needs.

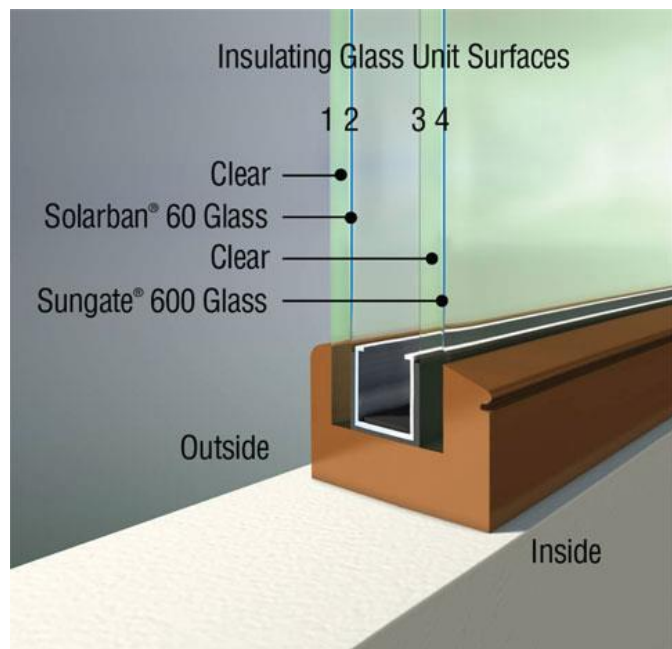
Check boxes are provided for marking entries during the selection or design process.

NOTE: Each entry below does not apply to all circumstances and that some general guidance may appear to be contradictory because all of the detailed conditions cannot be specified. Users should mark the items that apply to their particular needs.



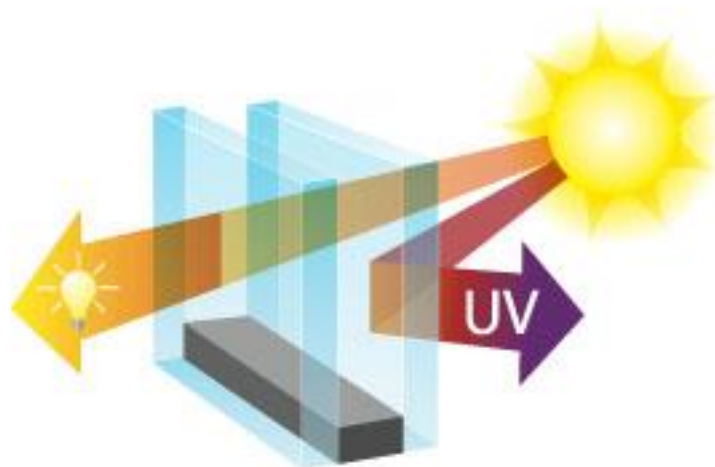
Insulating Value and Condensation Resistance

- ❑ Look for NFRC U-factor ratings and labels to guide window selection.
- ❑ Select double-pane windows in all climates where heating is needed. Select double- or triple-pane windows with low-E coatings and gas fills in cold climates to reduce heat losses and condensation.
- ❑ To reduce frame and edge heat losses and condensation in all climates where heating is needed, select windows with wood, vinyl, fiberglass, or properly designed, thermally broken aluminum frames.
- ❑ Use heavy drapes, thermal shades, or thermal shutters to provide additional window insulation in cold climates.



Solar Control and Ultraviolet Protection

- ❑ Look for NFRC Solar Heat Gain Coefficient ratings and labels to guide window selection.
- ❑ Select windows with spectrally selective glazings (special tints or modified low-E coatings) to reduce solar heat gains (SHGC less than 0.4) while maintaining high visible transmittance (glass transmittance greater than 0.6).
- ❑ Select tinted windows to reduce solar heat gains and control glare by lowering visible transmittance.
- ❑ Select special glazings (with plastic layers or low-E coatings) to reduce ultraviolet transmission in rooms with materials subject to fading. (If this is a critical concern, consult expert assistance.)



UV Protection

Daylight and View



- ❑ Look for NFRC Visible Light Transmittance ratings and labels to guide window selection.
- ❑ Select window size, location, and glass type to provide adequate daylight levels in each space.
- ❑ Select windows with high visible transmittances (greater than 50%) to maximize outward visibility.
- ❑ Specify window sizes and positions in walls to take advantage of desirable views.
- ❑ Position windows away from bright external surfaces that create glare

Ventilation and Airtightness



- Select operable windows for rooms requiring substantial ventilation during mild weather and to meet building code egress requirements.
- Select casement or awning windows to maximize effective ventilation area.
- Select awning windows to better exclude precipitation while ventilating.
- Position operable windows in opposite walls of living spaces to maximize cross-ventilation.
- Select fixed windows or windows with compression seals to minimize infiltration.
- Select windows and skylights with continuous edge seals to minimize infiltration.
- Seal and caulk around window and skylight frames and sash to reduce infiltration.

Sound Control

- ❑ Position windows away from external sources of extreme noise.
- ❑ Select double- or triple-pane windows with panes of unequal thickness, laminated glass, or gas fills to minimize noise from the exterior.

Privacy, Safety, and Security

- ❑ Select interior shading devices that obscure direct view for additional privacy.
- ❑ Check building codes on fire, wind-loading, and seismic safety before selecting and positioning windows and skylights.

Maintenance, Durability, and Lifetime

- ❑ Check warranties for indication of durability and lifetime before selecting windows and skylights.
- ❑ Check the quality of window construction.
- ❑ Use protective paints, stains, or sealants on wood window and skylight frames or select clad wood products.
- ❑ Follow the manufacturer's instructions to maintain glazing, sash, frame, and hardware in good repair.

Installation

- ❑ Check all applicable building codes before installing windows and skylights.
- ❑ Follow the manufacturer's installation instructions carefully.

Privacy, Safety, and Security

- ❑ Consider the relative effects on utility bills when selecting windows and skylights. Contact the NFRC or consult energy specialists or utility representatives for estimates of the energy and cost savings provided by energy-efficient windows and skylights.
- ❑ Consider the effects on the resale value of a home when selecting windows and skylights.
- ❑ Check local, provincial, and federal energy efficiency programs and utility energy conservation programs for economic incentives for installing energy-efficient windows and skylights.

SUMMARY - 10 Things Before You Make a Purchasing Decision

In summary, when choosing a replacement window, consider these 10 things BEFORE you make a purchasing decision:

1. Is the manufacturer reputable?
2. How long will the window last before you have to replace it?
3. What kind of warranty does the window have? Read the fine print.
4. What qualities are you looking for in a window?
5. How energy-efficient is the window?
6. Is the window Energy star approved? Does it qualify for the tax credit?
7. How many panes does the window have?
8. Does the window have multiple layers of soft coating?
9. Are the spaces between the panes filled with a gas that helps insulate the window?
10. Finally, consider the quality of the security locking system.

RESOURCES

In seeking information concerning windows and energy efficiency in general, there are several local resources worth investigating:

- Local utilities
- Federal, provincial and/or municipal energy agencies
- Regional universities with architecture, construction, or extension programs
- Bookstores
- Product literature at home improvement centers
- Local builder's associations
- Recommended Web Sites

Canadian Standards Association Customer Service Department

178 Rexdale Blvd.
Rexdale, ON M9W 1R3
Tel: (416) 747-4007
Fax: (416) 747-2475
www.csa.ca

Canadian Window and Door Manufacturers Association (CWDMA)

27 Goulburn Avenue
Ottawa, ON K1N 8C7
Tel: (613) 233-9804
Fax: (613) 233-1929
www.cwdma.ca

Siding and Window Dealers' Association of Canada (SAWDAC)

426 Queen Street West
Cambridge, ON N3C 1H1
Tel: (519)651-2812
Fax: (519) 658-4753

RESOURCES

Insulating Glass Manufacturers' Association of Canada (IGMAC)

27 Goulburn Avenue

Ottawa, ON K1N 8C7

Tel: (613) 233-1510

Fax: (613) 233-1929

www.igmac.ca

Association des manufacturiers de fenêtres d'aluminium (AMFA)

174 St-Laurent Street

Saint-Eustache, PQ J7P 5G4

Tel: (450) 623-6123

Fax: (450) 623-4788

www.amfa.com

American Architectural Manufacturers Association: <http://www.AAMAnet.org>

American Institute of Architects: <http://www.aia.org>

American Solar Energy Society: <http://www.ases.org/solar>

American Society of Heating, Refrigerating & Air Conditioning Engineers:

<http://www.ashrae.org>

Home Energy Magazine: <http://www.homeenergy.org>

National Association of Home Builders: <http://www.nahb.com>

National Fenestration Rating Council: <http://www.nfrc.org>

National Wood Window and Door Association: <http://www.nwwda.org>

National Research Council of Canada:

<http://www.cisti.nrc.ca:80/irc/irccontents.html>

Natural Resources Canada: <http://www.NRCan.gc.ca>

Passive Solar Industries Council: <http://www.psic.org>

U.S. Department of Energy: <http://www.eren.doe.gov>

Recommended Reading

Residential Windows: A Guide to New Technologies and Energy Performance,

By John Carmody, Stephen Selkowitz, and Lisa Heschong, W.W. Norton &

Company, 1996; <http://www.wwnorton.com>.