

Selecting Energy-Efficient Windows

conserve

it starts with me



E N E R G Y I N F O A D V I S O R S E R I E S

Key Points

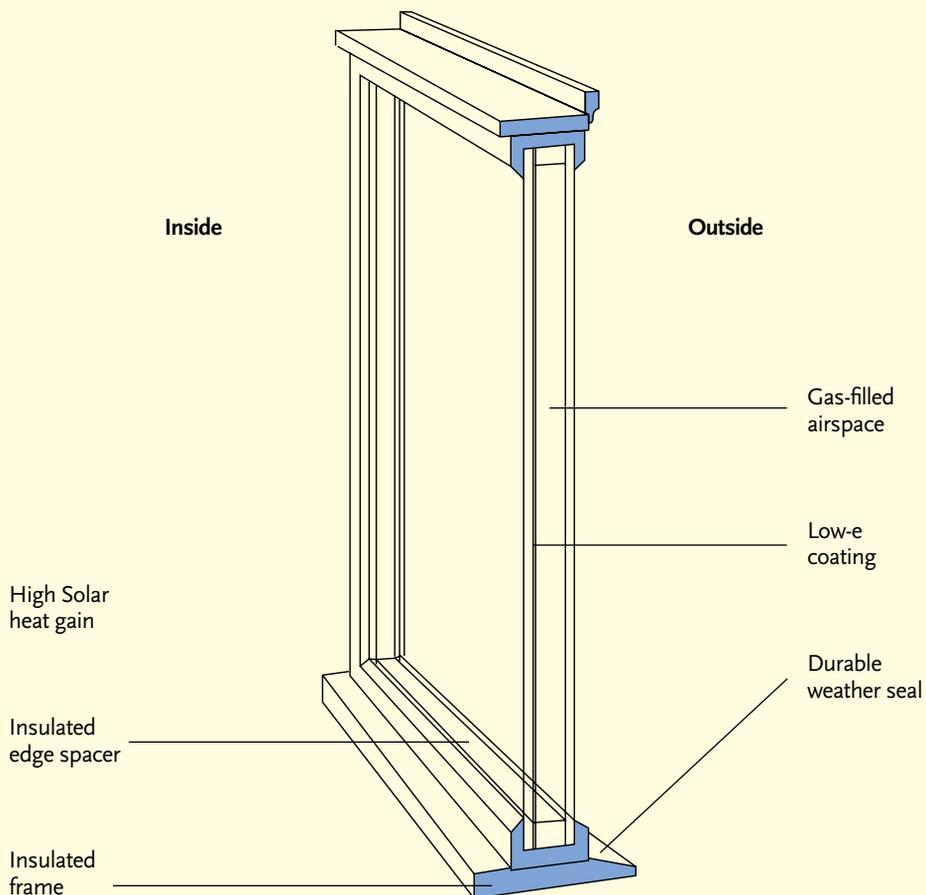
- Improving the energy performance of windows is important, since windows are the least insulated surface of most homes.
- Energy features such as low-e coatings, argon gas fill and insulated spacers can double the insulation value of a standard double-pane window.
- Energy-efficient windows improve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

Introduction

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

Energy-Efficient Window Features



Why Does Condensation Appear on Windows?

Condensation appears on windows because they are usually a home's coldest interior surface during the winter months. If the window glass cools interior air below its dew point, water droplets from the air begin to appear on the glass.

Window condensation can seriously damage window frames, trim, and drywall. In homes with low-quality windows, increasing ventilation rates alone may not solve window condensation problems without reducing humidity below healthy levels. High ventilation rates also increase heating costs.

The higher insulating value of an energy-efficient window "warms up" the glass, making condensation much less likely. Warmer glass is also more comfortable to sit near on cold days.



Window condensation after tight-fitting curtains are raised. The window pane on the left has low-e with argon gas fill. The fogged-up window pane on the right is conventional glass.



Avoid mould and moisture damage from condensation by choosing energy-efficient windows.

What is a “Low-e” Window?

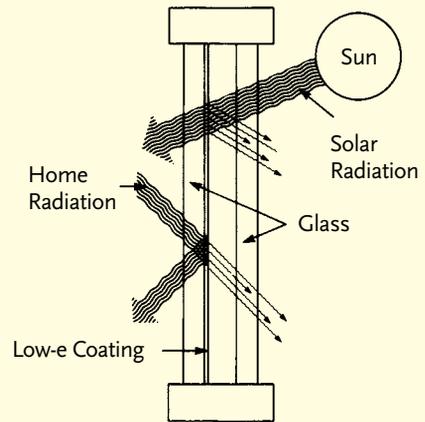
Low emissivity, or “low-e” coatings, are extremely thin selective metal films applied to one of the inner surfaces of thermopane window units (usually the interior pane in heating climates). Low-e coatings are engineered to block heat from radiating out of the home, yet still allow solar energy to enter. Capturing as much solar energy as possible is especially important for south, southeast, and southwest facing glass. Low-e coatings are also available as a film suspended between glass panes.

Low-e coatings should be specified for all new or replacement windows. The R-value of a low-e thermopane is approximately 50 per cent higher than a standard thermopane’s R-value.

Why Use Argon Gas?

Replacing the air in a sealed window unit with a heavy inert gas, usually argon, decreases window heat loss by reducing air circulation (convection) between the glass panes. Argon gas increases a

Low-e Window



thermopane unit’s R-value by about 30 per cent. The leakage rate of argon gas fill is much too low to affect window performance unless the thermopane unit’s edge seal fails.



Argon gas being added to sealed window units.

Why Use Insulated Spacers?

Condensation usually begins at the bottom edge of the window and then extends up the sides. This occurs because the metal spacer between the glass panes of a conventional thermopane window unit conducts heat very well. As a result, temperatures at the edge of the glass are much lower than the temperature in the middle.

Most window manufacturers now offer insulated spacers. Insulated spacers raise the temperature of the glass near the frame, saving energy and reducing edge condensation.

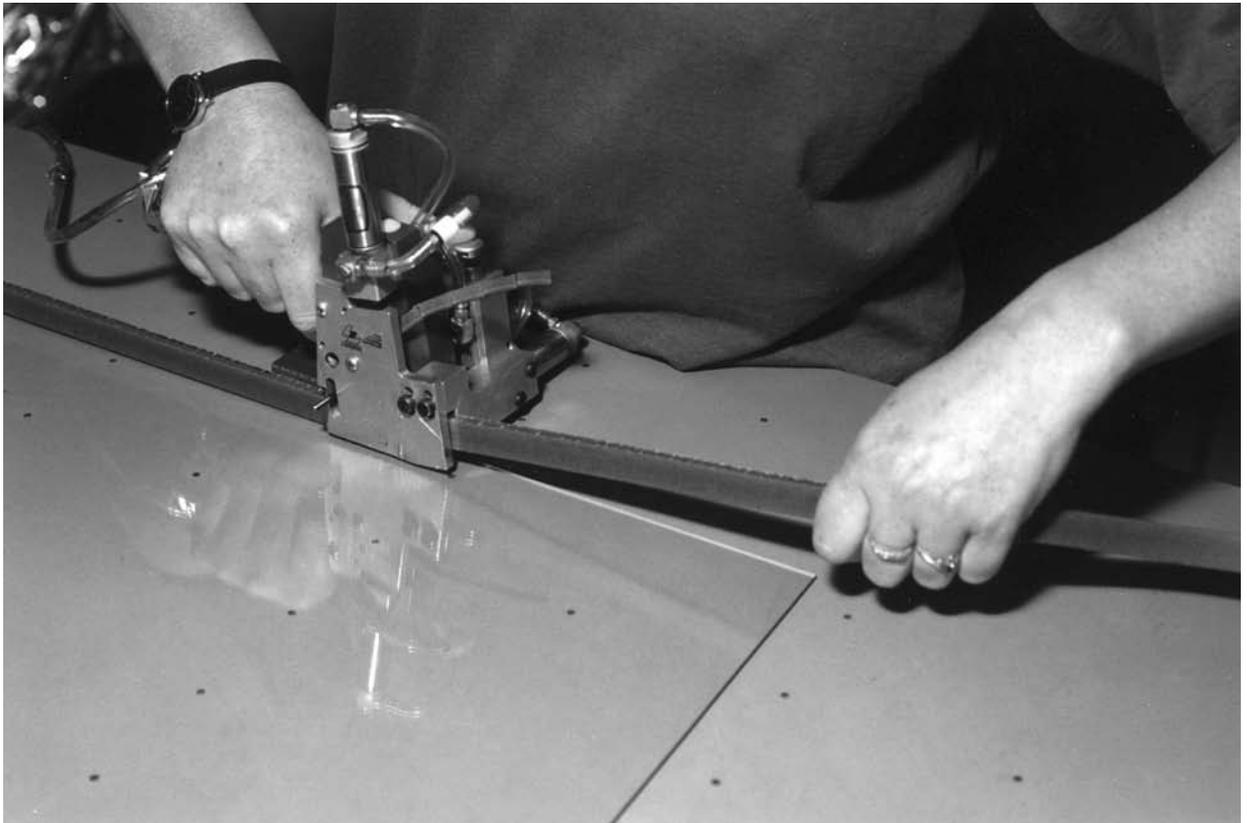
Type	R-Value ¹	Solar Heat Gain Coefficient ²
Double	2.0	.78
Double, low-e ³	2.9	.75
Double, low-e, gas filled	3.7	.75
Triple	3.1	.70
Triple, low-e, gas filled	6.0	.50

All windows include insulated spacers

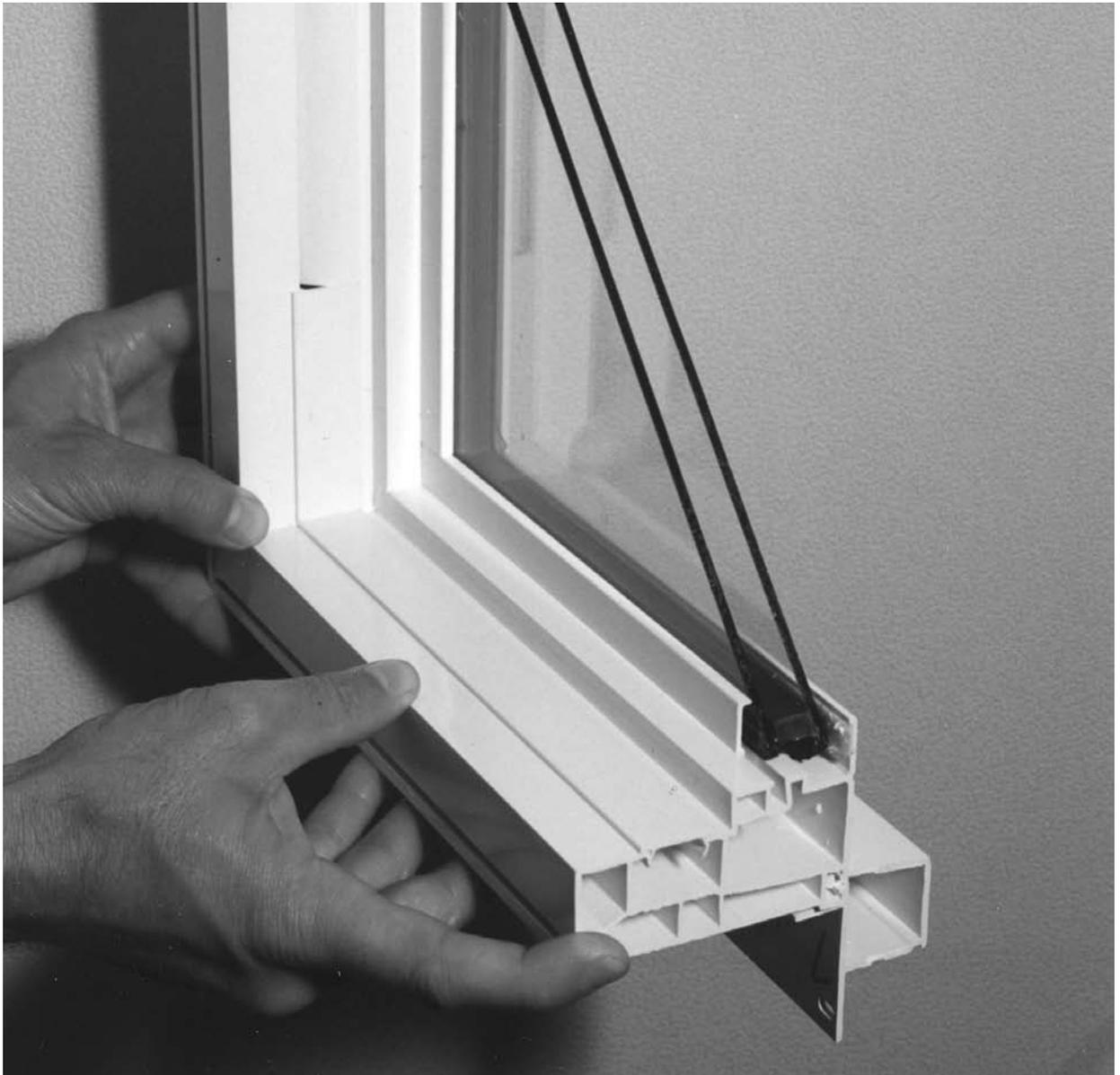
1. R-Value is for centre of glass

2. The higher the number, the greater percentage of solar energy admitted

3. Low-e film emissivity is .20



Window glass units being assembled using insulated spacers.



Cut-away view of a vinyl window frame.

Is Triple Glazing Still Worthwhile?

Double-glazed thermopane window units with low-e, argon gas, and insulated spacers have a better energy rating than conventional triple-glazed windows.

Triple-glazed windows are also more expensive, since a heavier frame and sturdier hardware are required to accommodate the extra thickness and weight of the third layer of glass. Very high performance triple-glazed windows with low-e-coatings and gas fills are available but are usually not an economical choice for Nova Scotia's relatively mild climate.

Are All Frames the Same?

No. Frames can affect a window's energy performance. Standard wood and vinyl frames have a similar insulation value. Insulated fiberglass frames or foam-filled vinyl frames have higher R-values. Window frames made of several materials, such as fiberglass and wood or fiberglass and vinyl, are also available. Metal and metal-clad frames generally have the lowest insulating value.

Are Some Window Styles More Efficient?

Air leakage, particularly between the sash and frame, affects a window's energy performance. Fixed windows are nearly always tighter than similar windows that open. Specify as many fixed windows as possible, keeping in mind the need for summer ventilation and fire safety. Operable windows usually cost \$50 to \$100 more than a fixed window of the same size. Some clever homebuyers offset the small added cost of high-performance glass with the money saved by buying fewer operable windows.

Casement and awning windows with compression seals offer positive closure and seal better than vertical or horizontal sliders with sliding seals. They have lower air leakage rates and are more energy efficient, particularly as the seals of sliding windows wear over time.

When shopping for windows, examine the weather-stripping system carefully. Is the weather stripping flexible? Is it replaceable? Is there more than one layer of weather stripping between the sash and the frame?

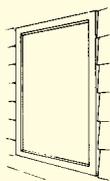
Should I Replace My Existing Windows?

When purchasing a new window, the additional cost of upgrading to energy-efficient thermopane units is a sound investment that will be quickly repaid. However, savings are usually not large enough to justify replacing a serviceable window solely to conserve energy. Common reasons for window replacement include breakage, moisture damage, rot, seal failure, excessive condensation, or uncomfortable drafts.

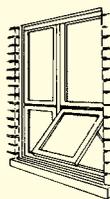
If the basic window frame is sound, many homeowners choose custom-made vinyl inserts sized to fit within the existing window frame. Inserts usually reduce the size of the glass opening by one to two inches in each direction. Window inserts can be installed without disturbing the existing interior and exterior window trim and make a window upgrade quick, inexpensive, and neat. However, inserts cannot correct any air leakage between the outside of the existing window frame and the rough framing. Additional air sealing must be undertaken to cure any air leakage around the perimeter of the existing window frame.

Air Leakage

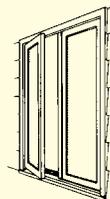
Quality windows are tested and rated for air leakage, wind resistance and water penetration. When comparing windows, ask for an air leakage rating of A₃, the highest rating.



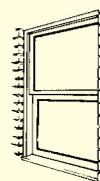
Fixed



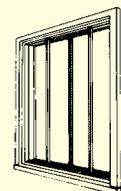
Awning



Casement



Vertical Slider



Sashless Slider

Very Good ←

Good ←

→ Poor

Is There an Energy Rating System for Windows?



The international Energy Star® symbol helps consumers identify products that are among the most energy efficient on the market. Choosing an Energy Star®-labelled product over a conventional model is nearly always a sound investment and reduces energy costs, outside noise, and condensation, while also improving home comfort. Only Energy Star®-qualified windows are eligible for rebates under the federal Eco-Efficiency and the Nova Scotia EnerGuide programs.

There is also an energy rating (ER) system that assigns a specific number to a window, incorporating performance parameters such as low-e coatings, gas filling, air space width, spacer type, number of layers of glazing, etc. The higher the ER score, the better the window will perform. ER numbers make it easy to compare window performance, but unfortunately, few windows sold in Atlantic Canada have been rated under this system.

What is the A440 Rating System for Windows?

The Canadian Standards Association (CSA) A440 standards allow window manufacturers to test and rate their windows against specific performance criteria. The higher the number attached to each letter, the better the performance of the tested window will be.

- “A” rating for air tightness has three categories, A1, A2, and A3.
- “B” rating for water has categories from B1 to B7.
- “C” rating for wind load resistance has categories from C1 to C5.

This rating system is a useful tool for accessing important window performance measures. Windows with the highest ratings available (A3, B7, and C5) are wise choices for homes in windy, exposed, or coastal locations with unusually harsh weather conditions.

How Much Can I Save?

Computer software developed to calculate energy ratings can compare the heat loss of a standard thermopane to a low-e gas-filled window for Halifax’s climate. Annual savings for a window with a glass area of 1 square metre range from \$9.94 if it faces south to \$12.21 if it faces north. Replacing an older, less airtight window in an existing home would save much more.

Window orientation	Estimated annual savings per window with low-e gas fill
North facing	\$12.21
East facing	\$10.62
Southeast facing	\$9.94
South facing	\$9.38
Southwest facing	\$9.94
West facing	\$10.62

Based on electric heat and a 1 square metre window area.

TIP:

For more information about rebates for Eco-Efficiency and EnerGuide programs visit www.conservens.ca or call 1-800-670-4636

How Can I Prevent Air Leakage Around the Window?

Comfort and window performance will suffer unless the gap between the window and rough framing is sealed with a material that prevents air leakage. Glass-fibre insulation does not prevent air leakage unless it is combined with another material that can stop air movement. Methods builders use to seal this area include the following:

- **Backer rod and caulking:** Lengths of round foam rod (available in different diameters) are tightly wedged in the rough opening between the outside of the window and the framing. Any remaining gaps are caulked.
- **Expanding foam:** Select a low-expansion foam with a delivery system, usually some type of gun, that allows for accurate and neat application of the foam. Spray cans of foam can be very difficult to work with. High-expansion foam can damage glass or distort the window frame enough to keep the window from opening and closing properly.



Low-expansion foam used to air-seal gap between rough opening and window frame.

- **Drywall or plywood return:** Drywall or plywood is installed as close to the window as possible, and any remaining gap is sealed to the window frame to create a continuous air barrier.

- **Contractors sheathing tape:** Air barrier tape is used to connect the plastic or drywall to the window frame. The tape is then covered with window casing. This system depends on the tape continuing to stick properly over the long term.
- **Poly wrap:** A 25- to 30-cm (10"–12") strip of polyethylene is sealed to the side of the window frame and then wrapped back and sealed to the wall's air barrier. This approach works very well for window installations in new homes but is labour intensive.

How Do I Avoid Water Leaks?

It is extremely important that windows be properly installed in both new and retrofit situations. Poorly installed windows can lead to frustrating and destructive leaks that can ruin drywall and nearby wood surfaces. Steps recommended for trouble-free window installation include the following:

- To shed water properly, all horizontal joints in sheathing paper must be lapped by at least 10 cm (4") with the upper layer installed to the exterior side of the lower layer.
- Avoid unflashed horizontal butt joints at the top, bottom, and/or corners of the window frame.
- Flashing above the window must direct water running down the wall out and over the window. The top of the flashing must be underneath the building paper.
- Windowsills must have drip edges that extend at least 1 cm (1/2") beyond the material below them.
- A sheet-metal pan or flexible waterproof membrane under the window offers inexpensive insurance against water seeping through window joints.

Summary

Windows are the weakest link in your home's defence against cold. Energy-efficient window technology is proven and widely available for little or no extra cost. Purchasers should ensure that all new or replacement windows include energy-efficient features such as low-e glass, argon gas fill, and insulated edge spacers.

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Other Information Sources

Canada Mortgage and Housing Corporation
www.cmhc-schl.gc.ca

Energy Star® Canada
<http://oee.nrcan.gc.ca/energystar/>

Office of Energy Efficiency
http://oee.nrcan.gc.ca/oee_e.cfm

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www.conservens.ca

or write:

Conserve Nova Scotia
PO Box 153, Halifax, NS B3J 2M4
Fax: (902) 424-0799
conservens@gov.ns.ca



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