ABOUT YOUR HOUSE

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WINDOWS

Windows are an essential ingredient in house design. Besides providing natural light and ventilation, they add greatly to the character of a home and create pleasant interior spaces and outdoor views.

The development of energy-efficient windows has resulted in significant reductions in home heat loss, especially when these improved windows are placed carefully in a house that is properly oriented.

What types of windows are available? How do they compare for energy-efficient design?

Windows consist of glazing (one or more panes of glass), a sash which holds the glazing, spacers that hold panes of glass apart in this sash, and a frame which holds the sash.

Conventional windows are fixed, casement, awning, single-hung and double-hung or sliding. The following is a brief description of each type and its relative energy efficiency:

Fixed windows to do not open. They are the most energy-efficient since draft and air leakage can be minimized.

Casement windows are hinged on one side and swing open like a door. This design provides the best seal and has the lowest air leakage for a window that opens.

Awning windows are hinged at the top and open out from the bottom. With an effective seal, this design minimizes air infiltration.

Single-hung and double-hung windows are not as energy-efficient as casement or awning windows. However, their appearance may be more appropriate for certain housing styles.

Double-hung windows have offset upper and lower sashes which can both move up and down in the frame. Single-hung windows have one fixed sash (usually the top one) and one that moves up and down in the frame.

Horizontal sliders have two sashes, one or both of which slide horizontally in the frame. They are the least energy-efficient of the window types listed here.

Is energy efficiency worth the extra cost?

Windows that are more energy-efficient usually cost more to purchase.

According to studies, payback time for the energy efficient upgrades—the amount of time it takes to recover the additional cost from savings on heating and cooling costs—can be as little as six years.

Apart from energy savings, other possible benefits include greater comfort, reduced maintenance, a more attractive appearance and better home resale value. Energy-efficient windows allow higher humidity levels in the home before condensation becomes a problem. When properly installed and

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maintained, they should last from 20 to 30 years.

However, greater energy efficiency is possible even without replacing your windows. You can improve the efficiency of older windows by making repairs to caulking, adding storm windows or installing acrylic sheets to the interior window frame. These measures may not be as effective as installing new, energy-efficient replacement windows, but, properly done, they can make significant improvements at relatively little cost.

How has design changed to improve energy efficiency?

There have been many innovations in window energy efficiency. You can now select windows for specific needs, such as capturing the warmth of the sun, blocking its heat or filtering ultraviolet rays. Windows are also now available in a variety of materials, each with its own advantages and disadvantages.

Consult a window dealer or contractor for details on the product lines of different manufacturers.

GLAZING

Recent innovations in insulating glass make it possible to have custom solutions for various windows in the home. Consider these glazing design options when selecting windows.

Double-glazed windows, with two layers of glass, are the minimum to consider for the Canadian climate. Air trapped between the layers provides some insulating value. Double-glazed windows are most effective on southern exposures, where they capture warmth from the sun in winter.

Triple-glazed windows have three layers of glass, or two layers with a low-emissivity film (see below) between them. The additional layer and air space give triple glazing a better insulation value. It is a good choice where extremes in weather are the norm.

ADDITIONAL FEATURES

(Note: Features may be marketed under different names or trademarks.)

Low-emissivity (Low-E) usually consists of a thin layer of metal oxide applied to the exterior face of the interior glazing in a double-glazed window. This coating allows sunlight to pass through, but keeps heat from passing out. It keeps inside window surfaces warmer, reducing the potential for condensation.

Low-E coatings can also be applied to a thin polyester film. The film is suspended between two panes of glass, creating triple-glazing for greater insulating qualities.

Special Low-E glazing blocks the sun's heat, rather than capturing it. It is appropriate for unshaded south- or west-facing windows which would otherwise allow rooms to overheat.

Low-E glazing also filters out the sun's ultraviolet rays, which can fade curtains, upholstery and pictures. The coating reduces the amount of visible light coming into a room and can sometimes add a tint to the glass, which may or may not be a concern, depending on circumstances and personal preference.

Gas-filled windows contain an inert gas, usually argon or krypton, sealed between the panes of a double-glazed or triple-glazed window. The gas is heavier and has a lower conductivity than air, so the window has greater insulating value than conventional double-glazed or triple-glazed windows.

High-performance triple-glazed windows consist of two panes of glass with one or more layers of low-emissivity (Low-E) film and with the spaces between each filled with gas (see above). This type of window provides the highest insulating value and energy efficiency.

SPACERS

Spacers are a key ingredient in window energy efficiency. They hold the panes of glass apart to create the layer of insulating air in between. They also make the seal between the panes and the window sash.

Energy-efficient spacers reduce "edge heat loss." This occurs when heat transfers through the edges of the glass to the sash. The spacers must be well sealed to prevent air infiltration from the outside. They should be a minimum of 12 mm (1/2 in.) in width.

Various materials are used as energy-efficient spacers. These include rigid foam, and wood or fiberglass strips.

In the past, most spacers were made of metal (usually aluminum). However, metal tends to transfer heat more readily than other materials and so is less energy-efficient.

Window manufacturers often use trademark names to describe their spacers, so ask your window supplier for details on the material used.

Energy-efficient spacers also improve the life-span of the sash and frame by holding down condensation (moisture) on the inside surface of the window. Absorbent material, or desiccants, can be added to the spacer to reduce moisture present from manufacturing and to absorb a limited amount of moisture that may leak in.

FRAMES AND SASHES:

The window frame is the framework which holds the sash in place. The sash is the movable part of a window. Frame and slash design and construction are important for both energy efficiency and appearance. Several materials are commonly used:

Wood frames have high insulating properties and can be painted or stained any colour. They require ongoing maintenance to prevent moisture damage. They are usually less expensive than frames made of other materials.

Clad wood frames have the advantage of wood's natural insulating qualities, but they require less maintenance. The cladding is usually aluminum or vinyl, available in limited colours. Moisture problems can be reduced if the cladding is applied properly to the wood. If moisture gets between the cladding and the wood, damage and rot can occur unseen.

Vinyl frames are available in two types. One is made of solid vinyl. The other has a reinforcing inner structure of another material, usually wood or metal. Wood is preferable because it has better insulating qualities than metal. Vinyl frames are very durable. They have good to excellent insulating properties.

Glass-fibre frames are a relatively new product. They are light, durable and strong, even in narrow sizes. They are relatively expensive.

Aluminum frames are strong and durable, but they readily conduct heat. To avoid heat loss and condensation, aluminum frames must have a thermal barrier inside, made from rigid foam, polyurethane or wood, to reduce heat transfer.

Determining energy efficiency

To evaluate the energy efficiency of various brands of a particular type of window, consider their ratings according to the **Canadian Energy Rating (ER) System**. The ER system has been adopted by the Canadian Standards Association. It is also used by the Canadian Window and Door Manufacturers Association (CWDMA).

The ER system rates windows based on three factors: solar gain (ability to capture the sun's heat), transmission loss (insulation capability) and infiltration loss (ability to resist air leakage).

The rating ranges from -50 to +15, with 0 being a 'neutral' window—a window that captures as much heat as it releases to the outside over the course of the heating season. A plus (+) rating shows that the window actually admits more heat than it releases. Look for a CWDMA certification label which gives the ER rating.

Specific ratings (ERS) have been established in order to make it easier to select the best window type for the climate, house type, window size and orientation for a specific house. These ratings are useful for special applications such as ultra-low energy or passive solar homes.

There is also a R-value system which is familiar to most homeowners concerned with home insulation. The R-value system rates windows on a scale of R-1 to R-5, based on insulating properties. This system is not as useful as the ER system, however, since it evaluates only the glass, not the frame, spacers or the amount of air infiltration.

How do you know that a window will perform as advertised?

The Canadian Standards Association (CSA) standard CSA-A440 applies to windows. It considers resistance to air leakage, water, wind, condensation, forced entry and other requirements.

Certification labels on a window unit can tell you if it has met CSA and other performance standards. The two labels to look for are:

- The **Canadian Window and Door Manufacturers Association (CWDMA) certification label** specifies the Energy Rating (ER) of the window, and indicates that it has met or exceeded Canadian Standards Association (CSA) requirements. The higher the ER rating number, the better the window performance.

- The **Insulating Glass Manufacturers Association of Canada (IGMAC)** certifies insulating glass units from various manufacturers. If the insulating glass meets quality control and edge seal standards, it will have a label on the spacer or etched on the glass bearing the IGMAC name and that of the manufacturer, along with the date and place of manufacture.

- The **Canadian Construction Materials Centre (CCMC) Evaluation Listings** contain current descriptive information and results of tests of performance and conformance to standards for more than 400 different brands and types of windows available in Canada. You may wish to check the listings for products you are considering when visiting your dealer.

- The **CCMC Evaluation Listing** is available from the Institute for Research in Construction at the National Research Council of Canada.

Manufacturers' warranties are also an important consideration. Some offer a 10-year warranty against air-seal failure of the insulating glass. Also, check for warranties on the window hardware, including hinges, cranks, levers and locks.

Proper installation of an energy-efficient window is as important as the window design. To work effectively, windows must be installed according to the manufacturer's specifications. They must be properly insulated, and sealed to the house's vapour barrier or air barrier.

Remember, installing energy-efficient windows and weather sealing your home may alter air flows in the home and affect the proper functioning of the furnace. Have an expert check your home heating system as part of the renovation project.

If you are hiring a contractor to install your windows, ask about experience, trade association membership, referrals, licences and an installation warranty.

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