

# 4 | BUILDING ENVELOPE

# EDMONTON'S GREEN HOME GUIDE

## The Building Envelope: Your Home's Magic Membrane

The building envelope is the physical separator – the walls, roof and foundation – between the inside and outside of the building. Just like the skin on your body, it serves a number of complex functions and interacts with all the various activities that go on in and around it.

The design, configuration and performance of the building envelope has a direct impact on your comfort, your home heating bills and your home maintenance costs. The cost to heat your home is affected by your home's overall surface-area-to-volume ratio, the number of projections such as balconies and dormers and the quality and design of the envelope itself.

The envelope is also the longest lasting and most difficult piece of a home to change, so it should be a top priority when building a home.

## Does Your Building Envelope Deliver Outstanding Energy Performance?

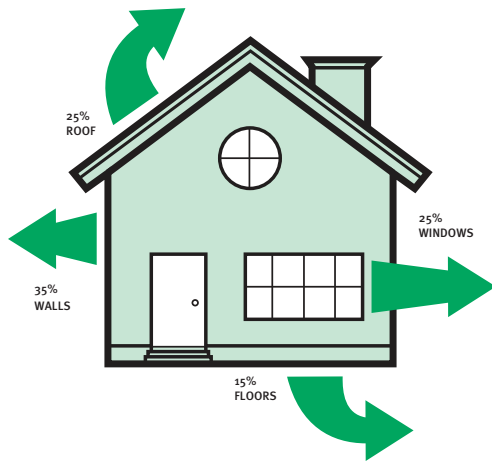
If you're looking to buy or renovate an existing home, an EnerGuide energy rating (ER) confirms the performance of the envelope and provides recommendations on where to make improvements. You can ask the seller if they've completed an EnerGuide test, or make it a condition of sale. Please refer to the **EnerGuide Rating System** section for more details, or visit the EnerGuide website at: [nrcan.gc.ca/energy/products/energguide/12523](http://nrcan.gc.ca/energy/products/energguide/12523)

## Insulation R-Value (or RSI)

Insulation effectiveness is measured using the R-value or RSI (please refer to the Glossary of Terms for more information). The Alberta Building Code specifies minimum insulation standards, but insulation levels that exceed the building code are recommended if you want to reduce your home's energy consumption and costs.

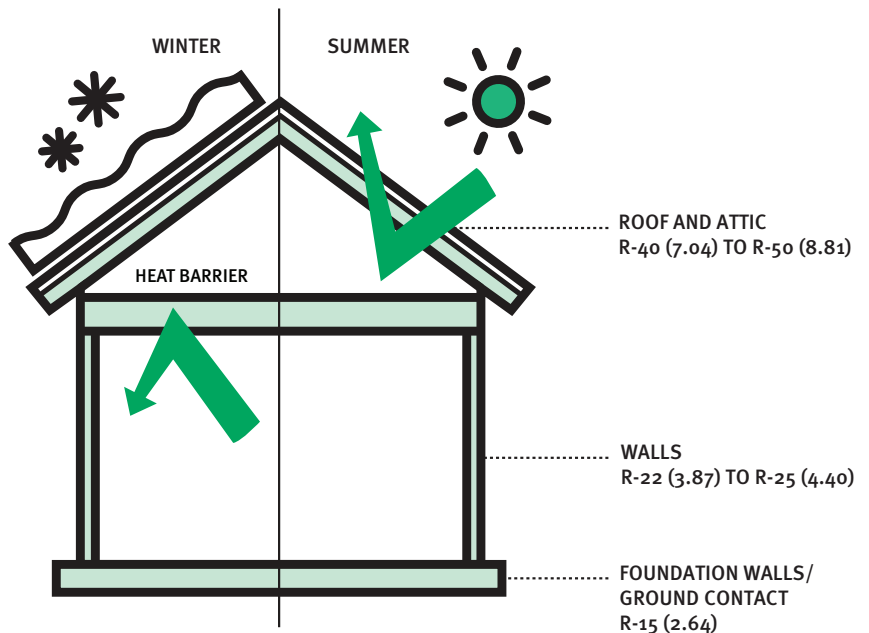
## An Energy-Efficient New Home (EnerGuide 80) Achieves the Following R-values (RSI):

### Where Does the Heat Go?



## Efficient Envelopes Deliver Good News for Our Future

Ensuring that your home's envelope is air-tight and well-insulated improves the energy efficiency of your home. Whenever less energy is used in Edmonton, it helps us contribute to our goals of reduced fossil fuel use and greenhouse gases which helps to mitigate climate change.



## Window Location and Size

Windows and doors are generally the least thermally efficient areas of the building envelope, so the location and size of windows need to be carefully designed to maximize natural daylight and views while minimizing heat loss and ambient noise.

## Window Performance:

### What to Look for

A number of factors affect window performance. Ask your builder for the following technical details about the windows (as provided by the manufacturer):

- » **U-Value:** The amount of heat loss a window allows. The lower the value, the better the window performance. A double-paned, argon-filled low-E window has a U-value of 0.33.
- » **Solar Heat Gain Coefficient (SHGC):** The amount of heat from sunlight that passes through windows. In the Edmonton climate, generally a higher SHGC allows more solar heat to be captured, lowering energy consumption for heating. SHGC is expressed as a fraction of a number between 0 and 1. In the context of passive solar building design in Edmonton, the aim of the designer is normally to maximize solar gain within the building in the winter so a number closer to 1 is better. This of course means you will also maximize solar gain in the summer months. So combining this approach with shading strategies in the summer months (for example, a deciduous tree in front of a south-facing window) works to minimize winter heating bills and summer overheating.
- » **Energy Rating (ER):** The energy rating (ER) value is calculated using a formula that balances a product's U-value with its potential solar heat gain coefficient (SHGC) and its airtightness. The higher the number, the more energy-efficient the product. ER values normally range from 0 to 50, with an ENERGY STAR-qualified window in Edmonton's climate being 29.

Learn more about these ratings in the **Glossary of Terms**.

## Other Window Choices

Other window choices include the following:

- » Triple-pane windows are more energy-efficient than double-pane windows and can reduce outside noise, reduce temperature fluctuations and increase comfort near windows in the summer and winter.
- » Low-E glass coatings reflect both infrared and ultraviolet light. This helps to reduce heat transfer and prevent furnishings from fading.
- » Argon gas-filled panes are better insulated than those filled with air.

## An Energy-Efficient Building Envelope: Save up to 90% in Heating Costs

A well-insulated home with energy-efficient windows provides optimal comfort with no drafts or cold spots. An energy-efficient home is a "future-proofed" home, giving you peace of mind in a world of rising energy prices. Space heating is the single largest consumer of energy in your home, accounting for over 2/3 of the total annual energy consumption. A high-performance, efficient building envelope can save up to 90% of your home heating costs.

## The Blower Door Test Shows if Your House is Leaking Heat

With your EnerGuide test results, you receive a report that explains where the heat is being

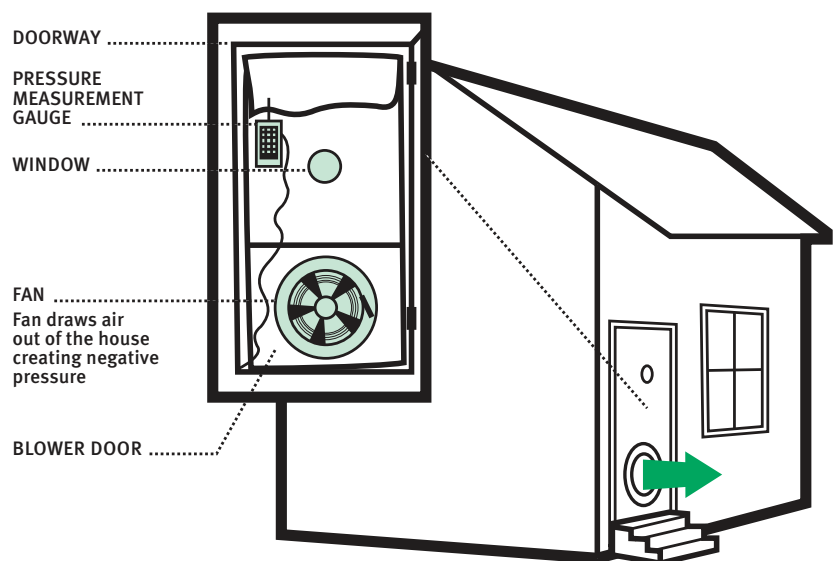
lost from your house. A blower door test is the only accurate way to measure air tightness; it shows how leaky your house is by measuring the number of air changes per hour (ACH) while pressurized.

A reading of 2.5 ACH is considered current good practice, whereas an R-2000 home will have a reading of 1.5 ACH and local net zero energy homes are achieving less than 0.5 ACH. Older homes can have readings over 10 ACH. That's like money flying right out the window!

## Building Envelope and EnerGuide Modelling

The EnerGuide analysis also includes evaluation and modelling at the planning stages of building a new home. This evaluation can help the builder maximize the home's energy efficiency.

## Blower Door Test: How it Works



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## GREEN FACTS AND TIPS: BUILDING ENVELOPE

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### Insulation

Located inside the building envelope – the walls, roof and under the slab – insulation helps slow the transfer of heat through the building envelope. In practical terms, the insulation is primarily responsible for helping keep heat inside the home when it's cold outside and keeping it cool inside on warm days.

If you're looking to upgrade the insulation in an existing home, hiring a qualified professional to conduct a home energy audit is recommended. A home energy efficiency expert can test the levels of insulation and make suggestions on the type and amount of insulation needed.

Certain types of insulation are easier to retrofit than others. Types of insulation include blown-in cellulose for walls, sprayed foam, various types of batt and cellulose fibre. Seeking the advice of a qualified building envelope professional is strongly advised when you're planning to improve the insulation of your basement walls.

### Good Windows

Energy-efficient windows, doors or skylights, when combined with improved envelope insulation, can significantly reduce your home energy costs, while making your home quieter and more comfortable. Look for ENERGY STAR-qualified windows as an easy way to choose energy-efficient windows. For ENERGY STAR-rated windows, there are 4 climate zones in Canada (A, B, C and D), based on an average annual temperature indicator called a heating degree-day (HDD). Zone A is the mildest and Zone D is the coldest. ENERGY STAR Zone D-rated windows are more efficient than ENERGY STAR Zone C-rated windows (C is the minimum rating allowed in Edmonton for the window to meet the ENERGY STAR standard). Look for windows with the highest R-value.

### Ventilation

As homes become increasingly air-tight to reduce warm air escaping, the need to maintain sufficient fresh air becomes increasingly important. New homes built to EnerGuide 80 and above will usually have a heat recovery ventilator (HRV) that provides abundant fresh air into the home while minimizing heat loss. To learn more, please read the **Ventilation Information** section on the next page.

### Air Leaks

Airtightness (sealing) is critical to reducing leakage of air between indoors and out. In existing homes, caulking and weatherstripping are effective air-sealing techniques that offer quick returns on investment, often a year or less. Caulking is generally used for cracks and openings between stationary house components such as around door and window frames. Weatherstripping is used to seal components that move, such as doors and operable windows.

