Waterford Energy Bureau -Energy Efficiency/Renewable Energy

Fact Sheet No.3

Upgrades of Windows and External Doors: How to cut heat loss while also saving money

Single Glazing
The glass that's used in homes is critical to the energy efficiency of a house. Traditional windows are constructed using a single pane of glass in them, have a U value in excess of 5 (W/m²K). Typical window glass ranges from 3mm to 10mm, which doesn't provide adequate insulation. There are many upgrades to single glazed windows as discussed below.

Double Glazing
A good time to consider permanent double & triple glazing is when the existing windows and external doors need replacing. At this time, the extra cost of the most energy efficient double-glazing over ordinary glazing is fairly small. The objective is to put in place materials that will achieve a level of performance in the home that is in excess of the required standard of the most recent update of Part L of the Building Regulations.

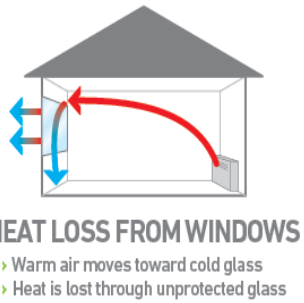
Double glazed windows come in a large variety of styles and sizes. The most efficient style is the "Sealed Unit" which consists of two sheets of glass with a small (argon filled) gap between them. At a small extra cost you can get low-emissivity glass. This gives a much more efficient glazing system since more of the heat is reflected back into the room rather than escaping to the outside. This helps you stay cool in the summer and warm in the winter.

Double glazing initially had a U value of 3, but, over the years, the manufacturing process has undergone a number of improvements and currently the Building Regulations insist that any window you install today should have a U value of 1.1 or less.

Triple Glazing
Triple glazed windows are typically more energy efficient than double-glazed windows and can achieve a U-value as low as 0.6 W/m^{2}K versus a U-value for a high efficiency double-glazed window of 1.2 W/m^{2}K.

As an alternative option Triple glazed windows can be examined but obviously come at a higher cost. Generally Triple glazed windows suit houses that have comprehensive insulation throughout to include the walls, roof etc. so that the benefit gained by the triple glazed windows is not lost through other parts of the house.

Triple glazed windows not only retain heat better than single and double glazed windows but during summer days they reduce solar gain thus maintaining a more comfortable overall room temperature. As well as heat insulation triple glazed windows have a further benefit of noise insulation. Noise pollution from transport can be very disturbing and triple glazed windows offers a solution to that problem.



Window Frames
The consideration of window frames is an important area when examining heat loss in a home. Most energy lost through a frame is through conduction.

Wood Frames: Wood window frames insulate relatively well but they also expand and contract in response to weather conditions. Wood frames also require regular maintenance although aluminium cladding reduces maintenance requirements.

Aluminium or Metal Frames: Although the frames are very strong, light and almost maintenance free, these frames conduct heat very rapidly which makes metal a very poor insulating material. To reduce heat loss metal frames should have an insulating strip placed between the outside and inside of the frame and sash.

Composite Frame: Composite window frames consist of composite wood products. These composites are very stable, they have the same or even better structural and thermal [properties as conventional wood and they have better moisture and decay resistance.

Fiberglas Frames: Fiberglas window frames are dimensionally stable and have air cavities that can be filled with insulation, giving them superior thermal performance compared to wood and vinyl.

Vinyl Frames: Vinyl window frames have ultraviolet stabilizers to keep sunlight from breaking down the material. Vinyl window frames do not require painting and have good moisture resistance. The hollow cavities of vinyl frames can be filled with insulation, which makes them thermally superior to standard vinyl and wood frames.

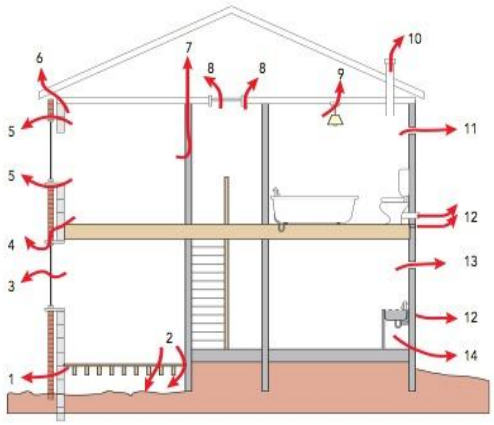
Gaps between the frame and the wall should be sealed with low expanding foam backed-up with a single-sided, pre-folded high performance adhesive tape to provide an airtight bond between the window frame and the wall/vapour control layer.

The energy efficiency of existing windows can be improved by adding storm windows, caulking and weather-stripping and using window treatments or coverings. The addition of storm windows can reduce

air leakage and improve comfort. Caulking and weather-stripping can reduce air leakage around windows. Window treatments or coverings can reduce heat loss in winter and heat gain in the summer.

Infiltration Heat Loss

Infiltration is the unintentional or accidental introduction of outside air into a building, typically through cracks in the building envelope and through use of doors for passage. Infiltration is also known as air leakage. Infiltration rate varies greatly depending on climate and the tightness of construction.



Possible Paths of Draughts

Heat Loss Through Single Glazed Window Air Tightness

Effective draught proofing will not only save money on fuel bills, but will also make the home more comfortable to live in. One way of checking for draughts is to carry out an air tightness test (also commonly referred to as a blower door test, an air leakage test or air permeability test). The test will pinpoint areas of heat loss. The blower door fan is used to blow air into or out of the building, creating either a positive or negative pressure differential between inside and outside. This pressure difference forces air through all holes and penetrations in the building enclosure. The tighter the building (e.g. fewer holes), the less air is needed from the blower door fan to create a change in building pressure.

LOW-E Glazing

A major development in the market of window and window frames is that of Low-E glass. By coating the face of the inner pane of glass with metal or metal oxide, short wave radiation from the sun is permitted to enter the building, whilst long wave radiation in the form of heat from inside is reflected back into the room. There are two types of Low-E coatings: soft and hard. Soft coating is applied after the manufacturing process and has a lower U-value than the hard coating, which is applied during the manufacturing process. As well as a lower U-value, soft coatings tend to degrade when exposed to air and moisture therefore they have a limited shelf life.

External Door Heat Loss

External doors can account for almost 11% of air leakage in a home due to the doors being old, un-insulated, improperly installed or air sealed. When selecting doors it is important to consider the energy performance ratings of the door. The benefits of having an A-rated door are:

- Reduces heat loss in the home,
- Maximises insulation,
- Improves house thermal efficiency,
- Reduces heat costs by reducing heating bills.

A common type of exterior door has a steel skin with a foam insulation core. It usually includes a magnetic strip as weather-stripping. Steel and fibreglass-clad entry doors can offer up to five times the insulating value of a solid wood door of the same size.

Glass or patio doors lose much more heat than other types of doors because glass is a very poor insulator. Most modern glass doors with metal frames have a thermal break. Some models have several layers of glass and low-emissivity coatings between the glass panes.

Benefits of Upgrading Windows and External Doors in the Home

- If you upgrade your doors and windows you'll start to feel the benefits straight away. Instead of sitting in a room with a cold draught, you'll instead be seated in a nice warm and cosy room.
- Single-glazed windows and some old doors tend to let the warm air in your house escape out into the open world. This is because they can be poorly draught proofed, or has become damaged over time.

- By comparison, many new windows and doors have new advanced features that deliver large energy savings because they've been tried and tested. That's why it's best to invest in double or triple glazed windows.

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