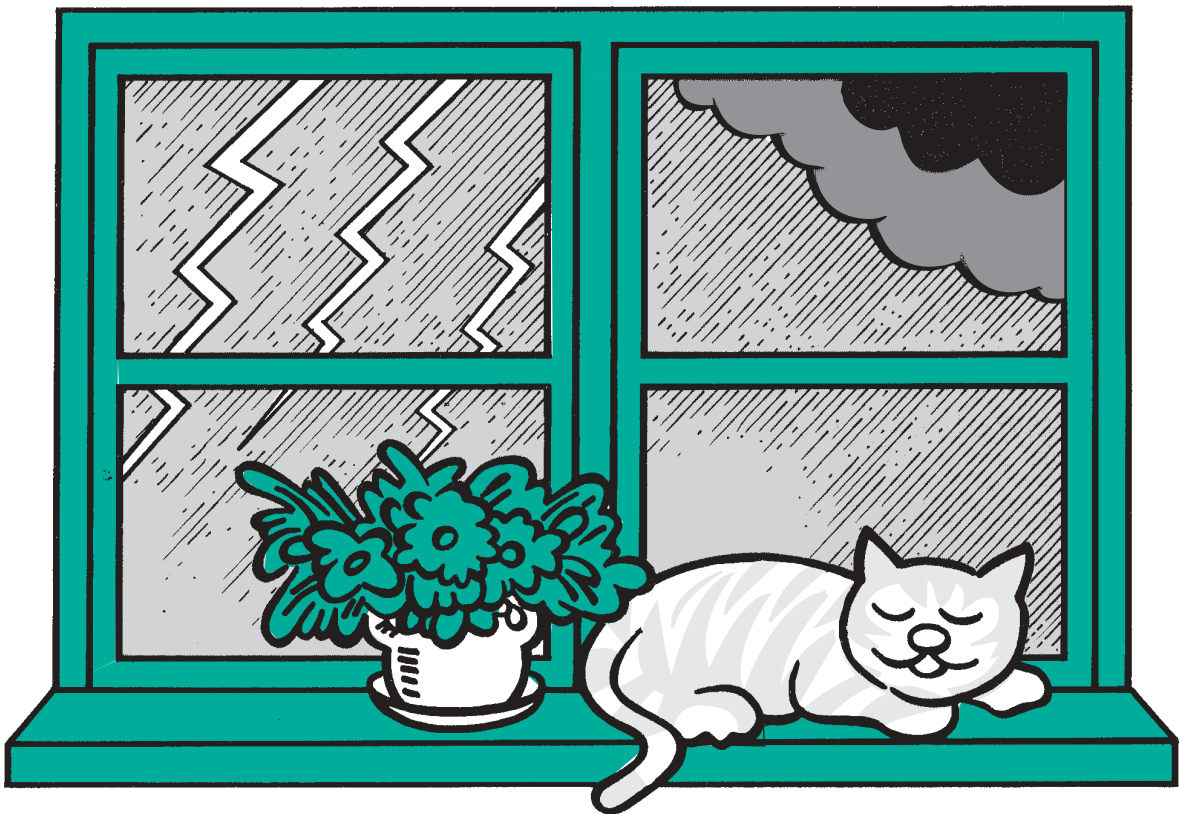


# Energy saving for windows



Windows are critical to the overall energy efficiency of a home—as much as 40% of the heat lost from a home is lost from windows and up to 50% of unwanted heat gain is through the windows. Poorly positioned or unprotected windows could cost the average home over \$500 extra in heating and cooling bills each year. Here is a simple guide to window treatments that will help you to save money and increase the comfort of your home all year round.

So if you are building a new home or renovating, get it right from the start. Contact the Energy Smart Information Centre for detailed advice on window types, sizing, location and other important features to maximise the energy efficiency of your home.

## Preventing winter heat loss

Unprotected, single panes of glass lose almost ten times more heat than the same area of insulated wall. Bare, unprotected glass causes three major problems in winter: heat loss, discomfort and condensation. See Figure 1.

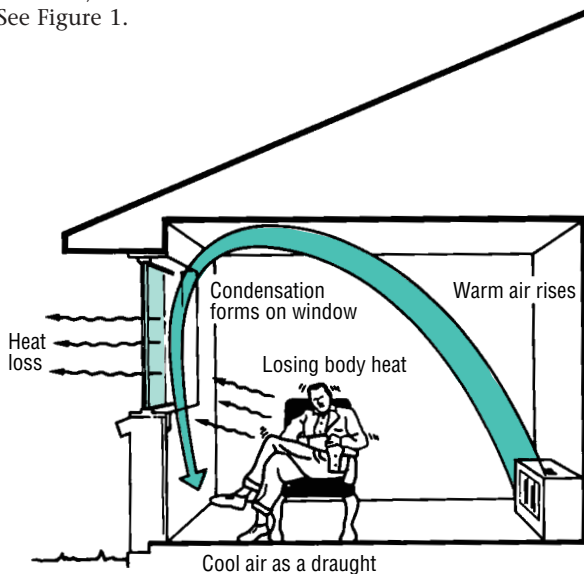


Figure 1: Heat loss through windows

Appropriate window selection and protection can reduce heat loss through windows by up to 70% and save you around \$200 each year in reduced heat loss and up to \$500 per year if heating and cooling costs are taken into account. There are a number of ways this can be achieved.

## Insulating Glass

### Double glazing

Double glazed windows consist of two panes of glass separated by a sealed air space typically between 6 mm and 20 mm wide (see Figure 2). A minimum air space width of 9 mm is recommended for optimum performance. Double glazing reduces the heat loss of a single pane of glass while still allowing natural light and views. When well shaded from direct sunlight in summer, it can also reduce heat gains. However, it is not effective in stopping direct sunlight entering the home.

Double glazing will improve the performance of any window, and it is especially crucial for windows which will not be covered with close-fitting drapes or blinds.

Double glazing also decreases noise transmission through windows and reduces the potential for condensation to form on the inside pane.

An additional pane of glass can be fitted to an existing window to form double glazing. Double glazing 'film' is also available.

A transparent film is fitted to the frame of an existing window, creating an air space between the film and the glass. The film is usually attached using double-sided tape. This is a cheaper alternative

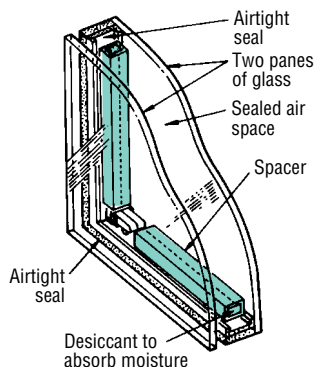


Figure 2: Section through a typical double glazing unit.

than installing an extra pane of glass, and will improve the performance of your windows. Suitable for do-it-yourself applications. It should last at least two seasons.

It is essential that the air space between the panes of glass has a desiccant added to absorb any moisture and is well sealed.

Glass bricks have a similar effect to double glazed windows and also reduce heat loss.

### Low-E glass (low emissivity glass)

Low-E glass has an invisible coating that reflects radiant heat back into the room. It is generally only available in double glazed windows and improves performance by up to 38% over conventional double glazing.

New, 'spectrally selective' low-E glass is available. This reduces solar heat gain but still insulates well against heat loss. However it is not recommended for northern aspects in cold climates where winter sun is desired.

### Curtains

Closely-woven, close-fitting curtains are an effective way to protect windows from heat loss at night. They also provide extra summer protection, especially with reflective linings, and of course provide privacy.

A snug fit on both sides of the window and at the top of the curtain stops warm air from moving down behind the curtain and cooling. Boxed pelmets or solid strips above the curtain rail are essential.

Curtain tracks which provide a return of curtain to the wall to give a seal achieve even better results.

If yours don't, consider attaching the drapes to the window frames using pins, hooks or velcro tape.

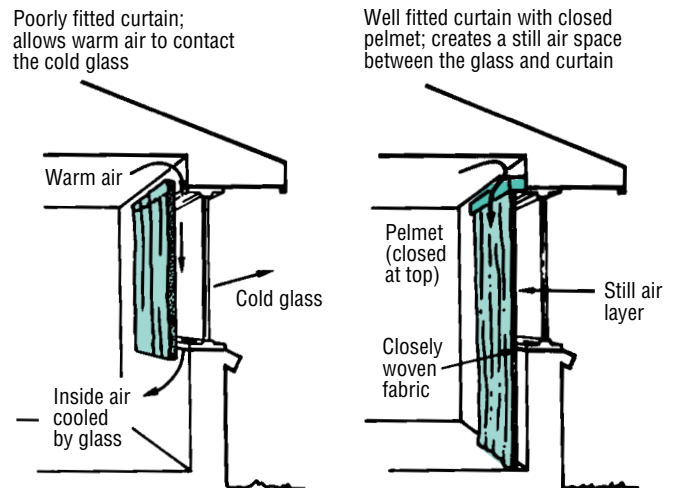


Figure 3: Features of an effective internal window covering.

### Internal blinds

Tightly fitting Holland or Roman type blinds using closely woven fabrics are also suitable for reducing heat loss through windows. Blinds must be tightly fitted against the window surrounds. Loose-fitting blinds are not suitable.

Figures 4, 5 and 6 show how this can be achieved.

### Insulated shutters

These are installed on the inside or outside of the window, and should fit tightly against the window frame forming a sealed air space. PVC, polystyrene and solid timber shutters can be used if they shut tightly and are not louvered.

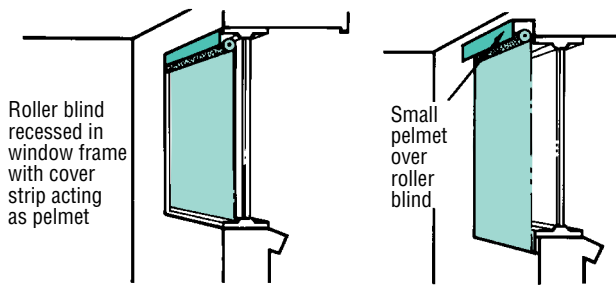


Figure 4: Correctly fitted Holland blinds.

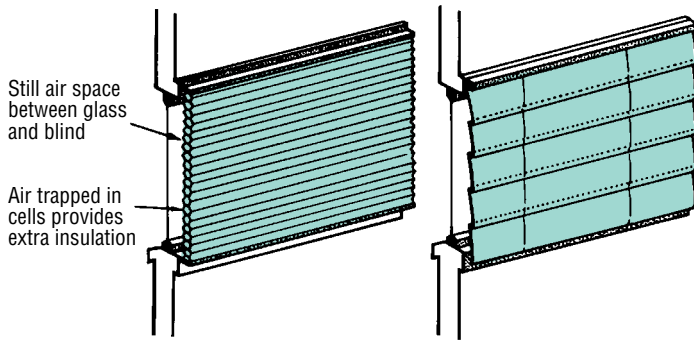


Figure 5: Multi-cell pleated blinds can be excellent window insulators. Figure 6 (right): Roman blind.

The following window treatments have little or no effect in reducing winter heat loss:

Louvre, venetian and vertical type blinds are not good insulators. They allow heated air to pass through the gaps between the slats and contact the cool glass.

'Laminated' and thicker glass have minimal effect in reducing winter heat transfer, although they can reduce noise transmission.

Reflective films and tinted glass also have a limited effect in reducing winter heat losses and can (if very dark) reduce internal light levels all year round.

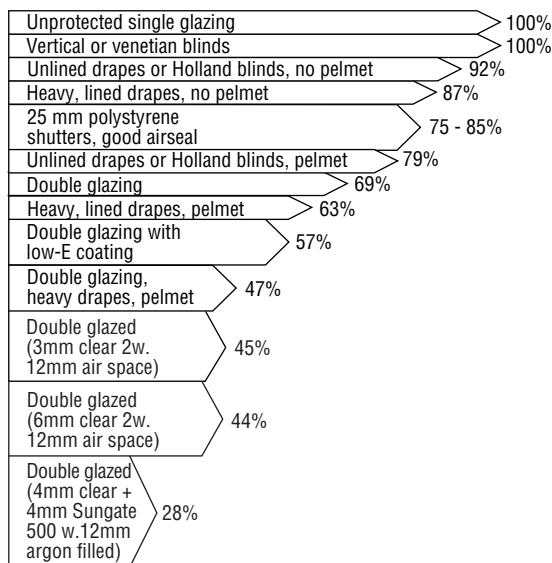
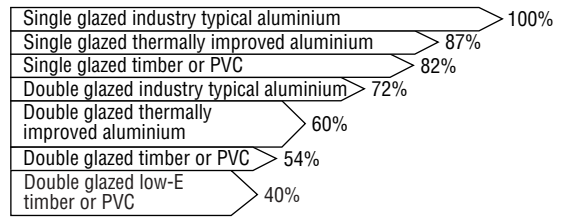


Figure 7: Comparison of heat loss through different window treatments in winter. % show comparison of heat loss

The type of frame chosen is also important to heat loss:



### Preventing summer heat gain

It is best to stop the sun's heat from reaching the glass, rather than deal with the problem once the heat has entered your home. So in summer, external shading is much more effective at keeping your home cool than internal blinds or curtains. Using both external and internal window coverings will, however, provide maximum protection.

The most appropriate method of shading your windows depends on which direction they face.

### Shading north facing windows

North facing windows should be shaded during summer. However, it is important that the shading devices do not reduce the amount of sun entering the house in winter. A number of suitable shading options are outlined below.

Blinds or opaque fabric mounted on pergola frames are inexpensive alternatives for providing shading when desired, while on cooler sunny days they can be retracted or rolled back to allow the sun through. See Figure 8.

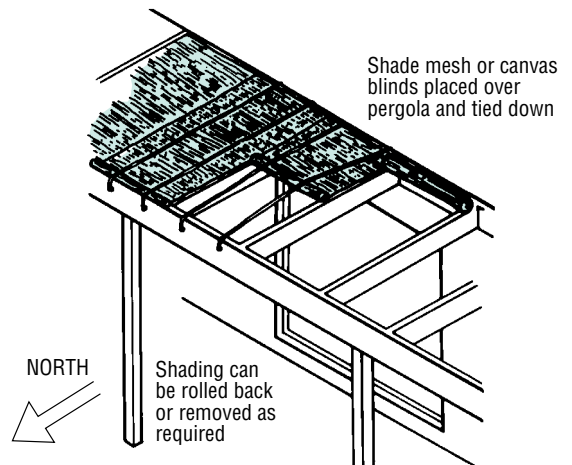


Figure 8: Shade mesh over a pergola frame.

Removable or adjustable vertical shading such as blinds, awnings and shutters allow you to let in pleasant morning and afternoon sun in winter or on cooler summer days.

Eaves and pergolas, properly designed, provide adequate shade from the high summer sun while allowing the winter sun to enter and warm your home. In NSW, the width of north facing eaves or pergola shading should be approximately 45% of the vertical height from the window sill to the underside of the horizontal shading device (see Figure 9). This provides shading from mid-October to mid-February.

It is also important to allow an adequate distance between the top of the window and the underside of the shading device to avoid partial shading of the window in winter. This should be about one third of the height of the window. (Ideally, horizontal shading should also extend past the edges of the window for at least the same distance as the width of the shading device. See Figure 9 inset).

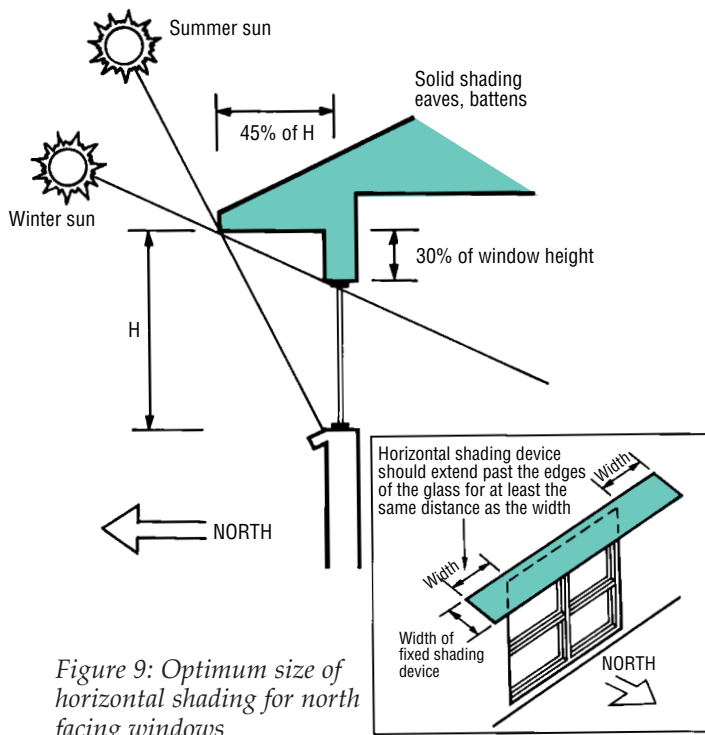


Figure 9: Optimum size of horizontal shading for north facing windows

**Shade battens on pergolas** are a commonly used shading device (see Figure 10). Although battens provide dappled light, they can still be effective at preventing summer heat gain. The amount of shading battens provide depends mainly on the spacing between them. This spacing should be no more than one third of the battens' width (see Figure 10). They are cheap and easy to install, and useful if some summer sunlight is required under the pergola for outdoor living.

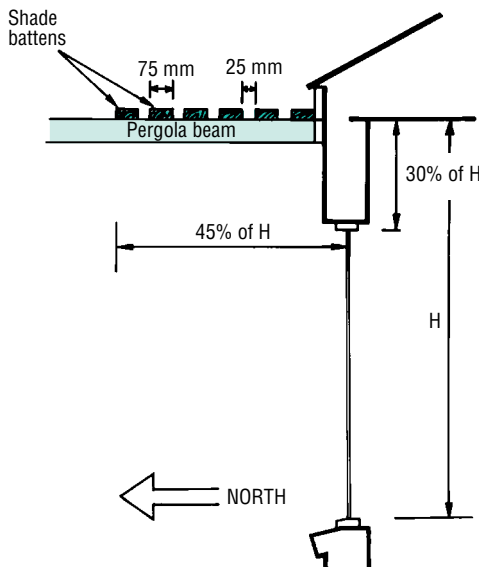


Figure 10: Shade battens arranged to provide 75% shading during summer but keep in mind that batten shading also reduces winter sun.

**Battens should not extend out further than the recommended horizontal shading overhang (shown in Figure 9), to prevent excessive winter shading.**

**Deciduous trees and vines** provide excellent summer shading, without obstructing the winter sun. However, avoid planting large evergreen trees close to the northern windows of your home. In mid-winter they cast a shadow up to three times their height, cutting the amount of heat and light entering the home (see Figure 11).

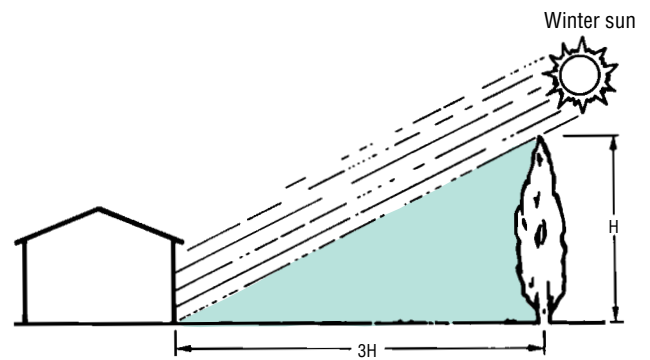


Figure 11: Shadow cast at midday in mid winter.

### Pergolas with angled louvres

Adjustable louvres are preferable to fixed louvres because they provide the flexibility to control the amount of sunlight and shade. Fixed louvres angled at  $25^\circ$  to  $30^\circ$  let in about 75% of the mid-winter sun, and also allow sunlight through upper parts of the windows (Figure 12). Most of the summer sun will be blocked out if the louvres overlap. However, they also block a significant amount of desirable autumn and spring sunlight. Louvres should be as thin as possible to allow maximum sunlight penetration. Like eaves and shade battens, fixed louvres should not extend out further than the recommended horizontal shading overhang, to prevent excessive winter shading.

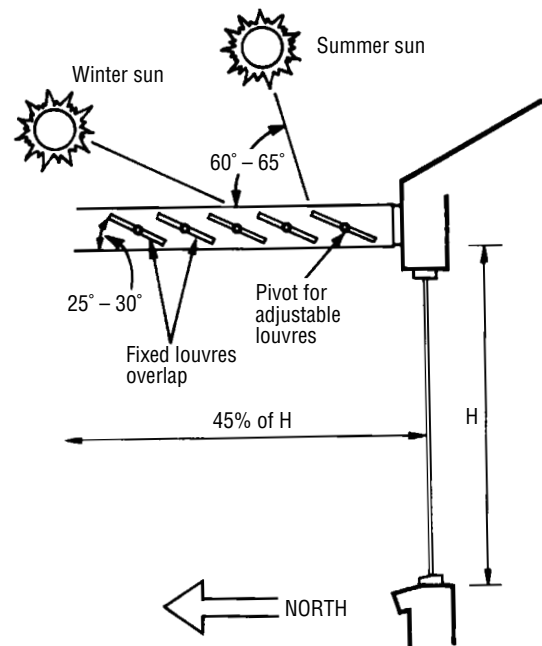


Figure 12: Louvres angled at  $25^\circ$  to  $30^\circ$  from the horizontal will provide shade from late spring through to early autumn. The amount of shade provided also depends greatly on the overlap between louvers.

**Wide verandahs** are not recommended over north facing windows. Although they are effective in keeping out the summer sun, they generally don't allow adequate winter sun to enter the home.

If you are considering using verandahs, modifications like cutting back their width or installing transparent roofing, e.g. polycarbonate sheeting, can allow more winter light through.



## Shading east and west facing windows

East and west facing windows should be well shaded from the morning and afternoon summer sun. Vertical shading devices, such as awnings, blinds and shutters that cover the entire face of the window are most suitable.

Horizontal-type shading like pergolas, eaves and verandahs may not provide adequate shading from the low rising or setting sun.

### Removable or adjustable vertical shading

such as blinds, awnings and shutters allow you to let in pleasant morning and afternoon sun in winter or on cooler summer days.

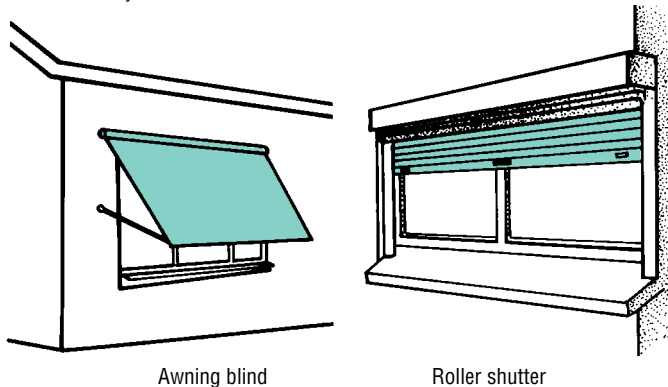


Figure 13: Adjustable shading for east and west windows.

**Fixed vertical shading** such as louvres, fences and walls can provide summer shading but will also block out views and winter sunlight.

**Landscaping and vegetation**, particularly deciduous trees, shrubs and vines can provide excellent shade in summer, without obstructing the winter sun. Low, dense trees and shrubs near windows provide shade from the early morning and late afternoon sun.

However, avoid planting evergreen trees close to the eastern and western windows of your home, as they can block out winter sunlight.

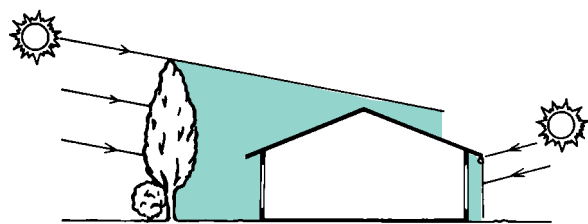


Figure 14: Blinds or deciduous trees will provide suitable shading for east and west facing windows.

## Shading for other windows

Windows that face north-east or north-west are best shaded by adjustable devices such as awnings or blinds, or combined with horizontal shading such as eaves and pergolas.

South facing windows, particularly those facing south-east or south-west may require shading from the low-angled early morning or late afternoon summer sun. Adjustable vertical shading or trees and bushes are suitable.

## Toned glass, reflective glass and reflective films

These glass treatments reduce heat gain into your home by reflecting and absorbing more heat than clear glass. Varying levels of effectiveness are available. Properly selected toned or reflective glass can reduce summer heat gain (while retaining light transmission) by around 70% when

compared to ordinary clear glass. Check with the Energy Smart Information Centre for the latest information on high performance glass.

They are useful for east and west facing windows that have views and where other shading systems may not be practical.

Reflective films and toned and reflective glass have a limited effect on reducing winter heat losses. One should also be cautious about using these products, especially on north facing windows, as they will reduce the amount of light and heat entering your home in winter, as well as in summer. Toned and spectrally selected low-E glass cut fading and solar heat gain substantially. However they reduce winter performance and are not recommended for north facing windows.

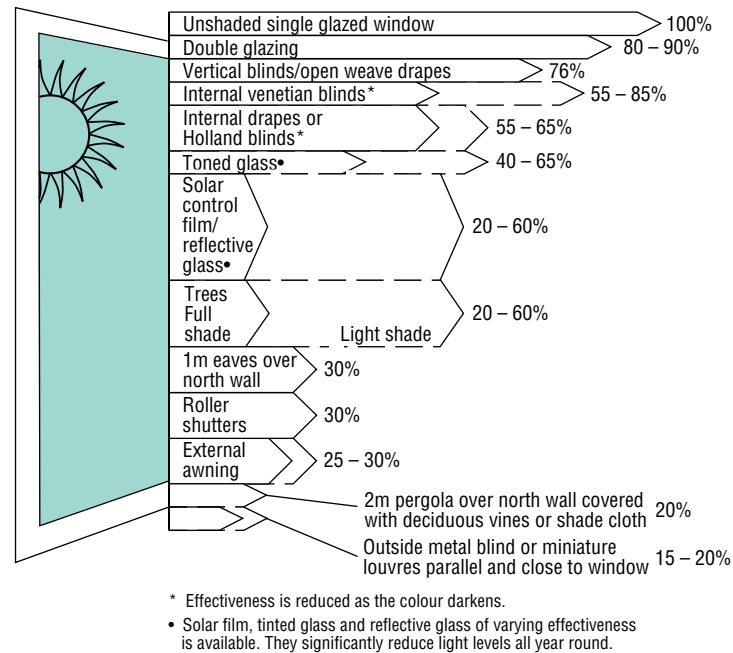


Figure 15: Comparison of heat gains through different window treatments in summer.

## Protecting roof windows, clerestory windows and skylights

Daylight is an abundant and complex source of light. It's optimum use requires heat flow management that can greatly improve the quality of life within buildings.

Skylights, roof windows and clerestory windows are an effective way to let light in, but careful consideration of the materials used is required to achieve a comfortable temperature in the room below.

Roof aspect, positioning and light well shape all need to be considered even before selecting the appropriate glazing and type of product.

The smaller specular or tubular type skylights should be considered for small rooms, passages, bathrooms, and toilets, reducing the need to turn on the lights during the daytime.

All major companies have a comprehensive range of solar control glazing and accessories that maximise light and minimise heat gain.

There are a variety of products that minimise the penetration of heat (infrared) and ultra violet rays (they fade fabrics).

There are also a number of independent companies with a range of blinds and shades that can be coupled with such windows.

## Double Glazing

Double glazing is often the easiest way to reduce heat loss.

However, to minimise heat gain double glazing in skylights needs a further solar coating.

Properly selected double glazing with commonly available low-emissivity glass can reduce heat loss from skylights or roof glazing by over 70% compared to ordinary clear glass.

New Energy Smart window products are being introduced all the time and there is a wide range of products available, so always check with a number of suppliers and the Energy Smart Information Centre to see the latest range of products available. There is sure to be a window to suit your needs.

## Window Energy Rating Scheme (WERS)

The Window Energy Rating Scheme (WERS) enables residential windows to be given a star rating as a guide to their energy performance.

It is an independent unbiased guide that takes into account heat loss, heat gain, sun protection and air leakage.

Star rated windows will make your home more comfortable as well as reducing the need for heating and cooling.

Rated windows carry a sticker that certifies their winter and summer energy efficiency, as well as their ability to provide furnishings with protection from fading.

For each of these three categories, a number of stars from one to five is given—the more stars, the better the performance.

## Points to consider with windows and skylights

### In winter:

- When choosing window coverings, remember that to minimise the loss of heat and reduce cold drafts, you need closeweave fabrics with a thick lining material and pelmets above.
- Typical double glazing will reduce the rate of heat loss through a window by up to 64% more than a single glazed window, and it works 24 hours a day. Window coverings such as curtains only work when they are drawn over the glass.
- Double glazing will improve comfort in the home by reducing heat loss and reduced cold draughts off the glass surface in winter.
- Many skylights are made with permanent venting. This venting should be blocked off for colder weather and opened in warmer weather as the vent allows considerable heat to escape (except where ventilation is required).
- Skylights will lose less heat if a diffuser panel is fitted below the skylight.

### In summer:

- Windows that let in the warm winter sun can also let in the hot summer sun, allowing your home to overheat unless you have high performance windows or the right shading.
- High performance windows can reduce heat by up to 80% over a single glazed glass window. Use horizontal shading devices on northerly facing glass. Use vertical blade shading or all-over shading fabrics on easterly and westerly facing windows.
- Most skylights need some form of summer sun control. The range of skylights available varies from special

double glazed panels that only let in the day light, blocking infrared (heat) and ultra violet rays (they fade fabrics), to a wide range of roller shades and blinds that can be operated manually or motorised for easy operation and control. Acrylic skylights should have an opal outer glazing and a clear inner glazing to minimise heat gain.

## Your role

Now that you have installed effective internal and external window treatments, use them!

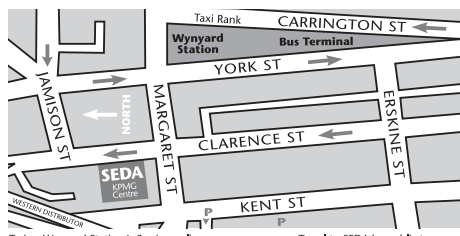
### In winter:

- On sunny winter days, leave windows facing the sun uncovered to let in the sunlight and warmth. This will help minimise the need to use your existing heating system.
- To retain warmth inside your home, close coverings on cold, cloudy days and especially at night when your heating system is running.

### In summer:

- Shade windows from the sun from sunrise to sunset, keeping the sun off the house for as long as possible. Close drapes or blinds in rooms that are not occupied.
- Keep all doors and windows closed as much as possible to keep out hot air.
- If your house becomes hotter inside than outside, open it up and use the breeze to flush the hot air out.
- Keep the house open through the night to cool it down, ready for the next day.

The Energy Smart Information Centre is a free advisory service provided by the NSW Government. Energy experts can provide information on a wide range of topics including Energy Smart design for new homes and renovations, appliance selection, solar and wind power systems, choosing heating and cooling systems, insulation, lighting and water saving devices.



[www.seda.nsw.gov.au](http://www.seda.nsw.gov.au)



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