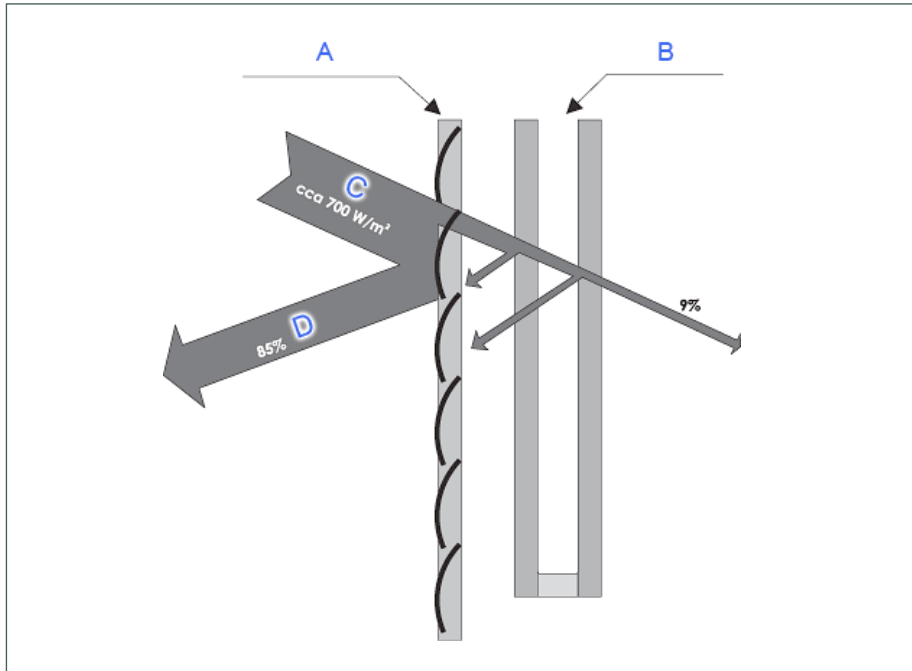


## EFFECTIVENESS OF EXTERNAL VENETIAN BLINDS

Assessing the impact of window blinds on levels of heat gain through glass



Heat gains that occur within internal spaces can be classified on the basis of their origin. These may result directly from internal sources of heat or from the external environment.

**A** External Blinds –  
Slats angled at 45 degrees

**B** Double Glazing

**C** Sun's Radiation

**D** Reflection

Many countries have established and created legislation to prevent and reduce this type of energy inefficiency.

Heat sources produce thermal energy which acts to directly increase air temperature.

Internal sources of heat gain production include, but are not limited to, body heat, lighting, machinery and heat passage between rooms.

Heat gains from the external environment may result from the passage of solar radiation through mediums and structures such as walls, ceilings, glazed window surfaces, doors and the infiltration of external air.

**External Heat Gains** have a decisive impact on the thermal load of buildings. Window design, surface area and orientation are all factors which affect this loading dramatically.

### 1. External versus Internal Shading Systems

Many reputable studies have been conducted into the efficiency of external and internal shading systems. Most of the research has been carried out in Europe where high energy costs make effective insulation of glass areas a requirement.

Research findings by Australian Institutions and summary figures are available through the **CSIRO**.

The objective with any shading device is of course to keep the inside **temperature in a range where our bodies feel comfortable and perform at their best.**

It has been well established that these temperatures range between **18° and 25° Celsius**.

To achieve and maintain this level of comfort we are required to utilise valuable energy resources and to invest in **cooling and heating** our homes and workplaces.

### 2. Shading & Insulation Costs

External shading systems are able to reduce a buildings or households energy expenditure in two ways:

**1. The upfront investment into a smaller cooling and heating unit.**

**2. Ongoing savings in running and maintenance costs.**

In case of an environmentally friendly design, cooling or heating may not even be necessary by using external shading and insulation devices (Olympic Village Design).



# external venetian blinds

### 3. External versus Internal Shading Devices

Benchmarks set by the “German Industry Standard VDI” show external venetians outperform internal venetian or vertical blind systems.

External shading over glass areas, particularly where there is a **northerly aspect, can potentially reduce heat gains by 85%**. Internal systems, on the other hand, do little to minimise this heat transfer.

To achieve and maintain similar temperatures with internal shading devices larger cooling systems are required.

**It costs, on average, 115% more to maintain and 140% more to run larger units.**

Another important factor when considering these matters is that External Venetian Blinds, whilst acting to decrease energy expenditure and inefficiency, reduce the entrance of daylight/ natural light into the building by only 20%.

### 4. Limits of Internal Applications

To achieve similar cooling results internally a ventilated space between the surface of the glass and the blind needs to be created. The air between the glass and the internal blind needs exchanging in excess of 20 times per hour. In situations where the glass area is more than 65% of the total wall area satisfactory results cannot be achieved by means of internal solar control.

**These results clearly favour external solar control systems.**

	NO SOLAR PROTECTION	INTERNAL VENETIANS	EXTERNAL LOUVRES	REFLECTIVE GLASS 66/44 WITH INTERNAL VENETIANS	REFLECTIVE GLASS 36/26 WITH INTERNAL VENETIANS
HEAT PENETRATION	90%	63%	13.50%	34%	20%
LIGHT PENETRATION	100%	80%	80%	66%	36%
INVESTMENT WITH AIR CONDITIONING SYSTEM PER M2 OF WINDOW	\$1,257	\$1,114	\$552	\$940	\$722
ANNUAL SERVICE COSTS OF AIR CONDITIONING PER M2 OF WINDOW	\$400	\$349	\$161	\$255	\$199
YEARLY ENERGY COSTS OF AIR CONDITIONING PER M2 OF WINDOW	\$125	\$106	\$43	\$68	\$49

### 5. Passage of heat flow through windows by convection and solar radiation

The greatest contributor to heat flow through windows is solar radiation. Heat passage is calculated by determining the area of the windows surface exposed to the sun and its shading coefficient (s).

The shading coefficient expresses the percentage of radiation passing through a window in comparison to one which is single glazed. The value of this coefficient is determined by the type of glazing and shading affecting the window.

Heat passage by convection is determined by the window surface and the heat passage coefficient ( the higher the quality of glazing, the lower the coefficient ) and is negligible in this instance.



The table on the right clearly demonstrates that the use of a light coloured External Venetian Blind will reduce the heat passage through glass by 85% compared to utilising no shading at all.

( Please refer to Bibliography for References)

**Please Note :** The amount of decrease in the internal temperature of the space cannot be unambiguously determined by calculation. This value can only be ascertained by measuring the internal temperature before and after installation of shading equipment.

Table of shading coefficients for various glazing types:

Glazing Type	S	Shading Method	S
Single glazing	1.0	Internal blinds, slats 45 - light	0.56
Double Glazing	0.90	Internal blinds, slats 45 - mid	0.65
Single Dethermal Glazing	0.70	Internal blinds, slats 45 - dark	0.75
Internal Standard Glazing	0.60	External Blinds, slats 45 -light	0.15
Reflective Single Glazing	0.70	External Blinds, slats 45 - bright	0.13
Reflective Single Glazing, superior quality	0.24	External Awnings, inner space ventilated	0.30
External Reflective Glazing	0.60	Internal Blinds, inter space ventilation	0.50
Double Reflective Glazing, superior quality	0.30	Reflective Curtains - light external reflective layer	0.60
Coloured Glazing - Light	0.80	Reflective Curtains - dark external reflective layer	0.70
Coloured Glazing - Dark	0.70	Cotton Drapery – artificial fibre	0.80
Reflective foil- Dark	0.25		
Reflective foil - Light	0.42		
Glass with wire insert	0.80		

### 6. How does the S co-efficient affect a six square metre window facing the sun for four hours per day?

The dollar values provided are based on approximate costs of electrical power per kW and values will vary according to the supply type.

Single Glazing				Sn	Glazing 6m <sup>2</sup> x 700W/m <sup>2</sup> x 4 hours	
1.0	x		=	1.0	16.80 kW of solar gain \$3.35 AUD of air con @ 70% efficiency	
Single Glazing		External Blinds, slats 45 Bright		Sn	Glazing 6m <sup>2</sup> x 700W/m <sup>2</sup> x 4 hours	
1.0	x	0.13	=	0.13	2.184 kW of solar gain \$0.50 of air con @ 70% efficiency	
Single Glazing		External Blinds, slats 45 Bright	Artificial Drapery	Sn	Glazing 6m <sup>2</sup> x 700W/m <sup>2</sup> x 4 hours	
1.0	x	0.13	x	0.8	0.104	1.75 kW of solar gain \$0.33 of air con @ 70% efficiency

**The annual air conditioning energy cost saving will be in excess of \$ AUD 800.00 per year and this is only for one window!**

**Solar Heat Gain is not appreciably reduced by using either single or double glazing if the glazing is unprotected.**

**Double Glazing provides the additional benefit, over single glazing, of a more stable and lower ambient temperature environment when used in conjunction with an External Venetian Blind. Light and highly reflective slat colours will act to provide maximum solar heat gain protection.**

Other non-variable external shading, such as fabric blinds, window films, performance glazing or fixed shading, either block the entrance of natural light, retain and reflect heat and limit or obscure external views.

Fully Retractable External Venetian Blinds provide the perfect solution.

These Blinds are:

- Adjustable for maximum exclusion of solar radiation relative to the suns position
- Adjustable to reflect light internally whilst also excluding heat.
- Adjustable to maintain a high degree of direct view.
- Adjustable to manage natural light without glare.
- Adjustable to maintain a high degree of privacy whilst excluding heat.
- Retractable to allow entire views through windows.
- Able to allow and maximise winter solar heat gain
- Retractable for maintenance or window cleaning.
- Self Cleaning