

These application notes are for general guidance and information only. Users will need to undertake independent analysis for specific sites.

Summary

Heat transmission loss or gain can be varied either through modification of the existing glazing systems or by the addition of insulation.

Glazing Systems - Heat Gain

- Preferential treatment should be given to those windows most exposed to direct sunlight such as eastern and western elevations, or high levels of reflected sunlight, particularly from other buildings. Building orientation is crucial to controlling thermal gain. To achieve full solar gain benefits the window orientation should be free from obstructions with an area below the 30° angle from the base of the window and a 90° arc in the plane kept open. Shading by the use of appropriately designed eave overhang can control summer heat gain.
- Consider the use of double glazing systems for southern elevations and low "e" glazing systems for northern, eastern and western elevations. Combination low "e"/double glazing is effective for summer/winter thermal control. Consider adding reflective film to existing windows to reduce internal solar heat gains, bearing in mind that these films substantially reduce the natural lighting. These films also have the advantage of reducing unwelcome glare and deterioration of furnishings.
- Depending on the degree of direct or reflected sunlight, consideration can be given to the addition of light coloured or reflective outdoor shading devices. These reflect solar heat before it has a chance to enter the building and dissipate any absorbed heat outdoors rather than indoors. Adjustable sunshades enable entry of solar radiation during the heating season as well as permitting optimisation of available daylight.
- The use of outdoor shading devices are recommended as they are more efficient than indoor treatment. Awnings are preferable because they also maintain natural light and desirable heat gain during the winter.
- Provide curtains and blinds, if not already existing, choosing light coloured or reflective materials preferably with proven thermal properties. Use see through fabrics for daytime use.
- Keep indoor shading devices such as curtains or blinds clean and in good repair. These can reduce heat gain by as much as 50%. Consider application of reflective materials to window side of drapes.
- Provide pelmets over drapes and extend drapes to the floor with adequate fullness to enclose the surface between window and drape.
- When reglazing is proposed, thermal analysis (multiple run heat load calculations to optimise glazing materials) should be carried out to determine whether double glazing - with the outside pane having heat absorbing and/or reflective glazing material - should be used.
- Also avoid the use of dark coloured metal mullions. The dark metal absorbs solar radiation and then radiates heat into the building. When metal window frames are used the installation of mullions with conduction breaks are recommended.

Glazing Systems - Heat Loss

Apart from double glazing and provision of pelmets as recommended for heat gain, care should be taken to ensure that the drapes, curtains and blinds are drawn in accordance with the time of day or night.

Insulation

All roofs and walls of heated and cooled buildings should be insulated, unless the construction gives a minimum transmission co-efficient of 3.0 w/m^2 and 1.0 w/m^2 respectively. Technical assistance may be necessary before installing insulating materials to help ensure that the proper type and correct amount of insulation is installed, that cost effectiveness will result, and that any potential problems such as moisture condensation can be avoided.

- If recladding the roof or walls, consider the introduction of reflective foil laminate to reduce solar gain.
- To maintain desired internal conditions investigate use of insulating materials
 - below roof slabs
 - on exposed external walls
 - above top floor ceilings
 - on walls between conditioned and non conditioned spaces.
 - below exposed floors.

Thermal resistance values for buildings should be a minimum of:

- Walls and windows > $0.4 \text{ m}^2 \text{ K/W}$ (average value for walls and glazing)
- Floors > $1.0 \text{ m}^2 \text{ K/W}$
- Roof / ceiling space > $3.0 \text{ m}^2 \text{ K/W}$

To reduce heat gains and losses through glazing, the percentage of glazing to wall ratio should be limited.

Landscape

Consider the use of additional planting in the east and west to achieve sun control and protection from prevailing weather. Trees and shrubs with known shapes and heights may be used to block solar radiation from selected directions. The choice of deciduous plants gives an opportunity to admit winter sun whilst shading in summer. Further planting, together with existing, or additional landscaped mounds and banks may be used as a wind shield and as such will assist in the reduction of heat losses in winter.

Integrated Roof Solar Shading / Solar Collectors

Solar shading can also be achieved by integrating solar energy collection technology into the shade. This can be in the form of photovoltaic cells for generating electricity and solar heat pumps for domestic hot water.

References

IHEA/VHA. Energy conservation guidelines. Vol 1. Design and management checklist for existing buildings. 1984.

Sustainable Energy Authority Victoria. Building energy brief for commercial and public buildings. 2003