LEVOLUX
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COMPARATIVE ANALYSIS OF SOLAR SHADING SOLUTIONS

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A Comparison of Solar Gain Factors

Control of solar gain is a central tenet of Approved Document L2. It will be necessary to pay greater attention to external solar shading.

Internal and external solar shading devices are sometimes provided to modify the daylight entering a building, and help reduce the glare potential of windows or to provide privacy. More normally they are required to control the admission of direct radiation from the sun. Internal and external solar shading devices can be specified by the degree of protection they offer against the admission of radiation, and the Comparative Analysis Table in the centre pages gives shading data in terms of solar gain factor (S factor) for a selection of glazing arrangements and shading devices.

Position of shading device

Internal shading devices can only intercept the solar radiation which has passed through the glass and can eliminate only that portion of the radiant energy which can be reflected back through the glass again. Some of the radiation striking an internal device is absorbed, some convected and some re-radiated into the room.

If the interception occurs at the surface of the glass, part of the radiation will be reflected back at the entry layer, part of it transmitted and a part absorbed. The absorbed portion will be convected and re-radiated to the outside and into the room.

External shading devices dissipate the convected and re-radiated heat to the outside air and therefore external solar shading devices will more effectively minimise solar heat gain than internal solar shading devices. As an overall value, one could conclude that the effectiveness is increased by about 30% by using an external shading device instead of an internal one. To provide the most effective protection, moveable external shading devices should be designed as a special requirement to meet the solar geometry of the latitude of the building and the orientation of the windows.

Colour

Bright metallic, white or light coloured solar shading is the best reflector of solar radiation. Dark colours will absorb a higher proportion of the incident radiation. The absorbed radiation will heat the shading device and if it is inside the building it will re-radiate heat into the room and also warm the air by convection. It can be seen from the Comparative Analysis Table that for internal venetian blinds the use of light colours gives about 20% more protection than dark ones. With roller blinds the effect is even more pronounced and light colours give about 30% more protection than dark ones.

Conversely dark coloured external devices give slightly more protection than light ones. Less energy is reflected through the glass while the heat absorbed by the device is lost by convection and re-radiation to the outside air.

Use

Fixed or moveable external shading devices such as Levolux fins or other types of louvres will reduce the amount of daylight entering the building.

Internal and external shading devices can be used to exclude direct rays of sun from all or part of the room. Adjustable devices can be set to intercept the direct rays of the sun and reflect some of it onto the ceiling and walls reinforcing the daylight at the back of the room, when direct daylight has been reduced by the device itself.

Lightweight or open weave blinds and curtains can be used to reduce the intensity of the direct solar rays by diffusion. When the sun angle is high, louvres unlike densely woven blinds, can be set to intercept the direct sunlight without restricting the view out or impeding natural ventilation. Open weave blinds, particularly those of darker colour also allow good view out and maintain natural ventilation.

Operation and control

The operation of solar shading systems can be manual, generally by hand, or motorised using some form of electric motor.

The control of these devices can be hand operated, by switch, remote control or through a fully automated electronic control system using the latest hardware and specially written software to control the system to follow the path of the sun.

Levolux offers a full design service to provide the most suitable controls for their shading systems, and to take numerous inputs including temperature, time, wind and any other special factors.

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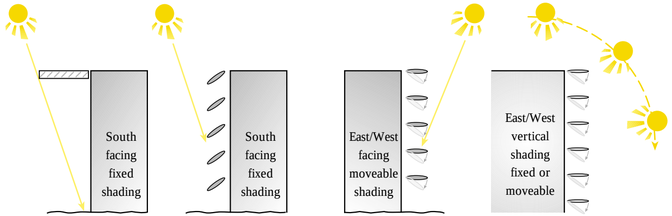
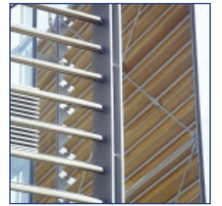
The need for effective solar shading is becoming more widely recognised as the way to reduce energy costs by providing natural ventilation and shading. Levolux's shading solutions control solar heat gain, which can significantly reduce a building's energy costs by limiting or even eliminating the need for air conditioning. The use of optimum daylight not only contributes to energy savings but also provides a better working environment.

It is imperative that the design process incorporating solar shading identifies the relationship between the building and the sun. The sun rises in the East and sets in the West, travelling in an arc throughout the day. Solar shading on a south facing façade will effectively only deflect the intense rays of the sun at its highest point of the day. Consideration must be given to shading on the East and West facades where the sun can still cause overheating.

Horizontal or vertical louvre systems can be used separately, or combined for maximum shading protection. See diagrams below. Louvres can be fixed at a point in conjunction with design of the building, ensuring that optimum protection from the angles of the sun is achieved. Alternatively, a moveable louvre system can be designed ensuring that the louvres react to the amount and direction of daylight that strikes them, producing the most effective systems shading when required yet making the best possible use of natural daylight when overcast.

Levolux thrives on providing solar shading solutions to technically demanding specifications and designs. Ongoing research and development programmes mean we shall continue to meet the most challenging specifications within a budget without compromising design or quality.





Fixed Horizontal

Moveable Horizontal

Moveable Vertical

For further information on Levolux sunscreening systems and effective ways to control light, heat and glare please contact:

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Solar Gain Factor (S Factor)

1.00 | 0.90 | 0.87 | 0.80 | 0.70 | 0.60 | 0.55 | 0.50 | 0.45 | 0.40 | 0.35 | 0.30 | 0.25 | 0.20 | 0.15 | 0.10 | 0.05 | 0.00

VENETIANS
LOUVRES
ROLLER BLINDS
FINS
LOUVRE BLINDS

4mm polished plate glass

Dark venetian blind fully drawn slats at 45°

Dark venetian blind fully drawn slats at 45°

Medium venetian blind fully drawn slats at 45°

Dark venetian blind slats closed

Light venetian blind slats at 45°

Light venetian blind, slats at 45° heat absorbing glass

Medium venetian blind slats closed

Dark venetian blind between panes slats at 45°

Medium venetian blind between panes slats at 45°

Light venetian blind between panes slats at 45°


Fixed vertical fins - east and west sides

Dark venetian blind between panes slats closed

Medium venetian blind between panes slats closed

Dark louvres blades closed

Light louvres blades closed

Dark Louvres blades at 45°

Dark Louvres blades at 45°

LOUVRES
FINS
VENETIANS

VENETIANS
LOUVRES
ROLLER BLINDS
FINS


Dark open weave roller blind fully drawn


Dark open weave roller blind fully drawn

White vertical louvre blind (P.V.C.) louvres at 45°

Medium venetian blind slats at 45°

Light venetian blind slats at 45°

White vertical louvre blind louvres at 45° heat absorbing glass

Medium venetian blind slats closed

Light venetian blind slats at 45° heat absorbing glass

Light venetian blind slats closed

Light venetian blind slats closed

Dark venetian blind slats at 45° heat absorbing glass

Medium or light venetian blind slats at 45° heat absorbing glass


Overhang continuous on south side


Light venetian blind between panes slats closed

Light louvres blades at 45°


Light louvres blades at 45°


Movable horizontal fins, light colour, blades at 45°

FINS
LOUVRES
VENETIANS
ROLLER BLINDS
LOUVRE BLINDS

ROLLER BLINDS
LOUVRE BLINDS
AWNINGS
FINS
VENETIANS

Dark ½ drawn roller blind


Dark fully drawn roller blind


Light ½ drawn roller blind


Medium fully drawn roller blind

White vertical louvre blind louvres at 45°

Dark venetian blind slats at 45° heat absorbing glass

Medium venetian blind slats at 45° heat absorbing glass

Awning or canopy ½ drawn

Light roller blind fully drawn

* Light roller blind fully drawn

Light venetian blind slats at 45° reflection glass

Dark roller blind woven plastic fully drawn

Dark roller blind woven plastic fully drawn

Movable horizontal fins light colour blades at 45°

Movable vertical fins, light colour, east and west sides

FINS
ROLLER BLINDS
LOUVRE BLINDS
AWNINGS
VENETIANS

CURTAINS
CANOPIES
AWNINGS
ROLLER BLINDS TREES

Medium ½ drawn roller blind

Tree performing light shade

Dark curtain fully drawn

Reflection curtain thin/loose or thick/loose

Reflection curtain thin/tensioned

Medium curtain fully drawn

Reflection curtain thick/tensioned

Light curtain fully drawn

Medium vertical louvre blind louvres at 45° reflection glass

4mm glass with polyester film, dense

Dense tree performing heavy shade

Medium awning or canopy

Medium awning or canopy

AWNINGS
CANOPIES
CURTAINS
ROLLER BLINDS
TREES

GLASS
SCREENS
FINS
FILMS
LACQUER

4mm polished plate glass

6mm polished plate glass

Double glazed polished plate glass 4 + 12 + 4

Medium lacquer coated glass

6mm heat absorbing glass

6mm heat absorbing glass, 12mm gap, 6mm polished plate glass

4mm glass with polyester film light density

White net curtain

4mm glass with polyester film medium density

6mm reflection glass 0.32 - 0.22

6mm reflection glass 12mm gap 6mm polished plate glass

Miniature shading screen, dark 45° cut off Standard

Miniature shading screen, dark 45° cut off Standard

Moveable vertical fins, light colour east and west sides

Miniature shading screen, dark 25° cut off Low angle sun

Miniature shading screen, dark 25° cut off Low angle sun

SCREENS
FINS
GLASS
FILMS
LACQUER

OUTSIDE OF BUILDING

INSIDE OF BUILDING

To calculate Shading Coefficient of each system divide Solar factor by 0.87 = shading coefficient S/C.
* ie Light roller blind fully drawn on double glazing

$$= \frac{0.29}{0.87} = 0.33$$

= shading coefficient of 0.33

1.00 | 0.90 | 0.87 | 0.80 | 0.70 | 0.60 | 0.55 | 0.50 | 0.45 | 0.40 | 0.35 | 0.30 | 0.25 | 0.20 | 0.15 | 0.10 | 0.05 | 0.00

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KEY:
Dark = a reflection of around 45%
Medium = a reflection of around 55%
Light = a reflection of around 70%
Blue = Single glazed
Yellow = Double glazed

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NOTE:
Care must be taken to choose a type of window which does not foul the operation of the blinds, rollers, awnings etc., by the opening lights.
Sliding windows present no problems in this respect. For existing buildings special arrangements can be made to accommodate opening lights.

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