
Adding solar shading inside

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Windows

What is the solution?

Traditional options for improving windows thermally are the insertion of internal solar shadings like shutters, blinds and curtains. Shutters and curtains are very common technical element in the original configuration of historic buildings, while blinds are recent elements and, in some cases, considered incongruous in historic buildings field from a typological, constructive and energetic point of view. The latter therefore require careful design. All these systems can result in significant reductions in thermal gains from solar radiation during the summer and in heat loss in winter, with no impact on existing window fabric. Well-fitted internal wooden shutters can decrease heat loss from both draughts and conduction through the window by up to 51%. Curtains, on the other hand, can control draughts and reduce heat loss by 14%, but care must be taken to ensure they do not obstruct radiators. It is evaluated that the combination of these systems can reduce heat loss by as much as 62%. Various range of solar shading with a variety of insulating and reflective layers are also available to further improve the energy efficiency of the opening system. An example for the internal side would be the modern insulated heavy lined curtains or reflective and/or insulated blinds. Some tests, discussed in the Historic England guidance, have shown that heavy curtains or ordinary blinds cut heat loss by around 40%; honeycombed roller blinds (made of much lighter materials, but with a cellular structure that traps air) cut losses by more than 50% and blinds with reflective surfaces on the window side have been found to cut losses by as much as 57%. In general, this intervention requires a careful evaluation of the compatibility with the building envelope, the local climatic variables, the building exposure, the orientation of the glass surfaces and the intended use of the building.

Why does the solution work?

The performance characteristics of solar shading depends on the type: shutters, blinds or curtains. Internal shutters have the function of insulating the window during the cold hours, maintaining heat inside the building. These devices help to increase the thermal resistance of the window creating an additional ventilated air gap between the window and the solar shading. However, these systems are not very effective in reducing summer heat gain because they intercept solar radiation only after passing through the glass pane. Internal shutters, once closed, improve users' safety and privacy, but they block the incoming natural daylight. In addition, they can also help to reduce external noise levels. The internal curtains and blinds, instead, have the purpose of mitigating the incidence of light radiation, distributing the light in space and avoiding glare. If curtains are made with a heavy fabric, they reduce heat losses caused by conduction, proving to be a good insulation system. They are also an excellent way of preventing draughts. The internal curtains should be set from floor to ceiling because even a small gap of few millimeters at the base of the curtain causes a leakage of cool air, hence affecting its functioning. Like the internal shutters, they do not offer any protection against radiation because they intercept sun's rays after passing through the glass surface. From the point of view of conservation, the addition of solar shading does not affect the historical material consistency and does not distort building characteristics so, if well designed, it is respectful of heritage.

Pros and cons of the solution:

Pros: internal shutters are good at reducing heat loss but are less effective against heat gain; internal shutters increase the thermal resistance of the window; internal shutters improve users' safety and privacy; internal shutters offer reasonable noise protection; internal curtains and blinds avoid glare; internal curtains and blinds distribute light in the indoor environment; internal curtains and blinds improve the conditions of visual comfort in indoor environments; internal curtains and blinds would usually be used anyway; internal curtains and blinds are cheap options to upgrade; internal curtains can provide excellent draught-proofing; low impact on heritage. Cons: closed shutters preclude the entrance of natural light; lack of privacy when shutters, curtains and blinds are open.