External Shading Devices in Commercial Buildings

The Impact on Energy Use, Peak Demand and Glare Control

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The Alcoa Building in Pittsburgh, PA uses exterior shading devices.
Architect: The Design Alliance Architects; Photo: Courtesy of Viracon

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Introduction

Benefits of External Shading Devices

Exterior shading devices such as overhangs and vertical fins have a number of advantages that contribute to a more sustainable building. First, exterior shading devices result in energy savings by reducing direct solar gain through windows. By using exterior shading devices with less expensive glazings, it is sometimes possible to obtain performance equivalent to unshaded higher performance glazings. A second benefit is that peak electricity demand is also reduced by exterior shading devices resulting in lower peak demand charges from utilities and reduced mechanical equipment costs. Finally, exterior shading devices have the ability to reduce glare in an interior space without the need to lower shades or close blinds. This means that daylight and view are not diminished by dark tinted glazings or blocked by interior shades. With exterior shading devices, glare control does not depend on user operation.

Using This Publication

This publication shows the impact of external shading devices on the energy use, peak demand, and glare conditions in commercial office buildings.

This publication is intended to help the designer quickly narrow the range of possibilities and understand the approximate impacts in commercial office buildings in order to provide general guidance during early stages of design. If there is more time and budget, this can be followed by a more detailed computer simulation of the specific building and the design conditions.

In the following sections, results are presented for six cities with differing climates: Minneapolis, Chicago, Washington DC, Houston, Phoenix and Los Angeles. Within each climate, results are shown for east-, south-, and west-facing orientations. The north orientation is not shown since the impacts of external shading devices are small. Within each orientation, there are results for both moderate (WWR=0.30) and a large (WWR=0.60) window areas (WWR is the window-to-wall ratio). For each set of conditions, there are six window types and five shading conditions. As shown in Figure 1, the five shading conditions include: no shading (none), vertical fins (fins), shallow overhang (ov1), deep overhang (ov2), and deep overhang with fins (ov2f).

For each location, orientation and window area, there is a table summarizing the impacts of external shading devices. An example of one of these tables is shown in Table 1 for a perimeter office zone in Houston, Texas with a south facing orientation and large glazing area. For a given glass type, there are five lines of data—one for each shading condition. The “Energy” column shows the actual energy use for each shading condition and the “Energy % Save” shows the percent savings compared to the unshaded case (none). Similarly, the “Peak” column shows actual peak demand and the “Peak % Save” shows the percent savings compared to the unshaded case (none). The “Glare” column shows the weighted glare index for each shading condition and the “Glare % Red.” shows the percent glare reduction compared to the unshaded case (none).

In comparing different sections of the publication, it is clear that the impacts of external shading devices are different depending on the building location, the window orientation, and window size. In addition, as shown in Table 1, the type of glazing and shading device used also impact the results.