To be useful and consistent, the U-factors should be measured over the entire fenestration assembly, not just the center of glass. Look for a National Fenestration Rating Council (NFRC) label (or NFRC Label Certificate for site-built fenestration) that denotes the fenestration product is rated, certified, and labeled in accordance with NFRC procedures. Thermal performance of field-constructed fenestration systems should be verified using procedures described in AAMA 507-03 (revised April 2004). The selection of high-performance window products should be considered separately for each orientation of the building and for daylighting and viewing functions.

EN23 Vertical Glazing Area as a Percentage of Gross Wall Area (Climate Zones: all)

This is the percentage resulting from dividing the total fenestration, including glazed doors, by the gross exterior wall area. For any area less than 40%, the recommended values for U-factor and SHGC contribute to the 30% savings target of the entire building. A reduction in the overall fenestration area will also save energy, especially if glazing is significantly reduced on the east and west façades.

EN24 Skylight Area as a Percentage of Gross Roof Area (Climate Zones: all)

This is the percentage resulting from dividing the total skylight product area of the building by the gross roof area. Skylights provide increased daylight and a potential reduction in lighting energy consumption at the expense of increasing cooling loads in warmer climates and increasing heating loads in cooler climates. To achieve the lighting energy savings, the lighting in fixtures within ten feet of the skylight edge must have automatic controls that dim the lighting in response to available daylight. (See DL9 for guidance.)

EN25 Fenestration Design Guidelines for Thermal Conditions

Uncontrolled solar heat gain is a major cause of energy consumption for cooling in warmer climates and thermal discomfort for occupants. Appropriate configuration of vertical glazing and skylights according to the orientation of the wall on which they are placed can significantly reduce these problems.

EN26 Solar Heat Gain Is Most Effectively Controlled on the Outside of the Building (Climate Zones: all)

Significantly greater energy savings are realized when sun penetration is blocked before entering the windows. Horizontal overhangs located at the top of the windows are most effective for south-facing façades, must continue beyond the width of the windows to adequately shade them, and need to be totally opaque. The vertical extension of the overhang depends on the height of the overhang from the bottom of the window sill (see Figure 5-17).

Note: Overhangs located directly above the window head need the least projection.

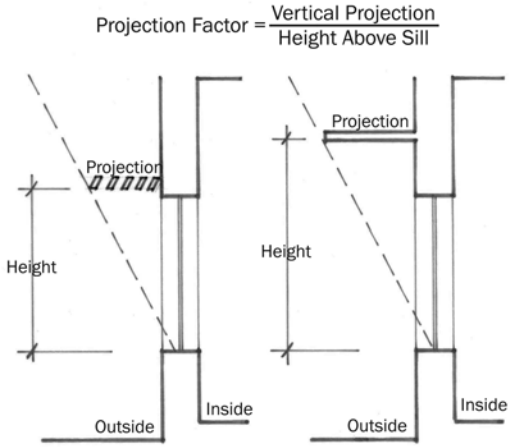
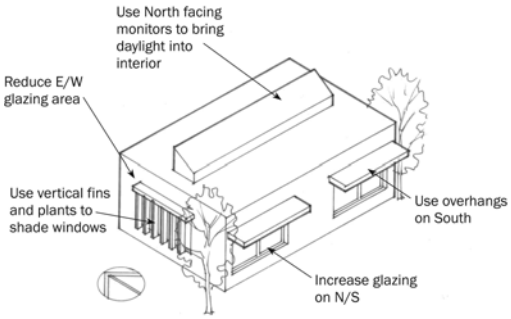


Figure 5-17. (EN26) Windows with overhang.



Vertical fins oriented slightly north are most effective for east- and west-facing façades (see Figure 5-18). Consider louvered or perforated sun control devices, especially in primarily overcast and colder climates, to prevent a totally dark appearance in those environments.

Figure 5-18. (EN26) Exterior sun control.

EN27 Operable versus Fixed Windows (Climate Zones: all)

Operable windows offer the advantage of personal comfort control and beneficial connections to the environment. However, individual operation of the windows not in coordination with the HVAC system settings and requirements can have impacts on the energy use of a building's system. Advanced energy buildings with operable windows should strive for a high level of integration between envelope and HVAC system design. First, the envelope should be designed to take advantage of natural ventilation with well-placed operable openings. Second, the mechanical system should employ interlocks on operable windows to ensure that the HVAC system responds by shutting down in the affected zone if the window is opened. It is important to design the window interlock zones to correspond as closely as possible to the HVAC zone affected by the open window.

In many retail spaces, large front doors can be opened and air relieved through dampers in the roof of the building. The relief dampers may be part of the HVAC system. In this case, natural ventilation can be achieved when exterior conditions warrant. The HVAC system should be turned off during such times. Many retailers like to open the doors and extend the retail environment to the sidewalk. This is an ideal time to deploy natural ventilation strategies.

Many smaller retail operations can benefit from operable windows to provide comfort control and natural ventilation. Like the previous example, the HVAC system should be turned off when natural ventilation is used.

EN28 Building Form and Window Orientation (Climate Zones: all)

In all climates, north- and south-facing glass can be more easily shielded and can result in less solar heat gain and less glare than can east- and west-facing glass. During site selection, preference should be given to sites that permit elongating the building in the east-west direction and that permit orienting more windows to the north and south (see Figure 5-19).

A good design strategy incorporates glass that contributes to the daylighting of the space. If possible, configure the building to maximize north-facing walls and glass by

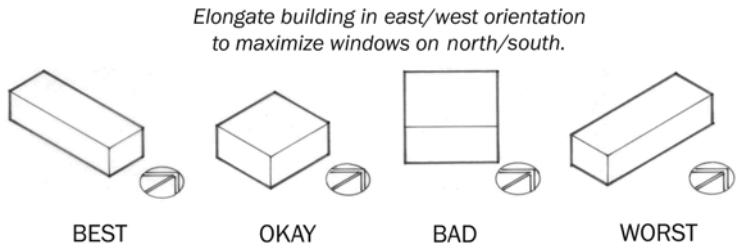


Figure 5-19. (EN28) Building and window orientation.