

DL3 Control of Direct Sun Penetration (Climate Zones: all)

Daylighting utilizes light from the sky, not the direct sun. Patches of direct sunlight in the sales area will create unacceptable brightness and excessive contrast between light and dark areas.

- Use exterior and interior sun control devices. Exterior sun control and overhangs help reduce both direct sun penetration and heat gain from vertical glazing surfaces.
- Use continuous exterior overhangs and interior horizontal blinds or shades on south-facing glazing.
- Use interior vertical slat blinds or shades on east- and west-facing glazing and as required for northeast or northwest façades.
- An exterior overhang needs to be deep enough to shield windows above the light shelf (if used) from direct sun. The light shelf, or the overhang if the light shelf is not used, should also be deep enough to shield windows below the shelf from direct sun.
- For “toplighting,” use north-facing clerestories to avoid direct sun.
- For skylights, use light-reflecting baffles and/or diffusing glazing to control direct sun. Note that diffusing skylights can cause glare when the sun hits them.

DL4 Skylight Thermal Transmittance (Climate Zones: all)**Hot Climates**

- Use north-facing clerestories for skylighting whenever possible in hot climates to eliminate excessive solar heat gain and glare. Typically, north-facing clerestories have one-sixth the heat gain of skylights.
- Reduce thermal gain during the cooling season by using skylights with a low overall thermal transmittance (U-factor). Insulate the skylight curb above the roofline with rigid c.i.
- Shade skylights with exterior/interior sun control such as screens, baffles, or fins. See DL3.
- Use smaller aperture skylights in a grid pattern to gain maximum usable daylight with the least thermal heat transfer.

Moderate and Cooler Climates

- Use either north- or south-facing clerestories for skylighting but not east- or west-facing ones. East-west glazing adds excessive summer heat gain and makes it difficult to control direct solar gain. Clerestories with operable glazing may also help provide natural ventilation in temperate seasons when air conditioning is not in use. Typically, north-facing clerestories have one-sixth the heat gain of skylights.
- Reduce summer heat gain as well as winter heat loss by using skylights with a low overall thermal transmittance. Use a skylight frame that has a thermal break to prevent excessive heat loss/gain and winter moisture condensation on the frame. Insulate the skylight curb above the roofline with rigid c.i.
- Shade south-facing clerestories and skylights with exterior/interior sun control such as screens, baffles, or fins. See DL3.
- Use skylights with smaller apertures in a grid pattern to gain maximum usable daylight with the least thermal heat transfer. Do not exceed maximum prescribed glazing area.
- Splay skylight opening at 45° to maximize daylight distribution and minimize glare. See Figure 5-20.

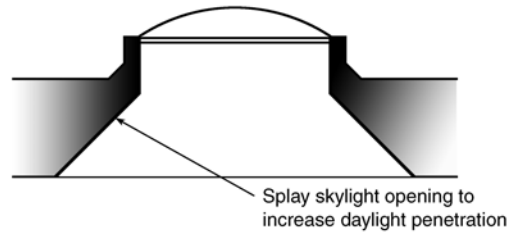
DL5 Interactions (Climate Zones: all)

Figure 5-20. (DL4 and DL5) Splayed skylight opening.

Thermal gains and losses associated with skylights should be balanced with daylight-related savings achieved by reducing electric lighting consumption.

Splay skylight opening at 45° to maximize daylight distribution and minimize glare. See Figure 5-20.

DL6 Expanded Recommendations for Electric Lighting Controls in Daylight Zone (Climate Zones: all)

The *daylight zone* is the area of the skylight plus the floor-to-ceiling dimension in all directions from the edge of the skylight. The daylight zone at the perimeter is 15 ft deep and 2 feet wider than the window (see Figure 5-21).

Dimming controls. In merchandise sales areas, continuously dim rather than switch electric lights in response to daylight to minimize customer/employee distraction. Specify dimming ballasts that dim down to at least 20% of full output. Automatic multilevel daylight switching may be used in non-sales environments such as hallways, storage areas, restrooms, lounges, etc. To maintain an adaptation zone (high light level during the daylight hours), dimming of the luminaires adjacent to the entry is not recommended. Control luminaires in groups around skylights, and if using a lighting system that provides an indirect component, do not dim below 20% to maintain a brightness balance between skylights and surrounding ceiling. If daylight zones overlap, a single control zone may be used. The daylighting control system and/or photosensor should include a five-minute time delay or other means to avoid cycling caused by rapidly changing sky conditions and a one-minute fade rate to change the light levels by dimming.

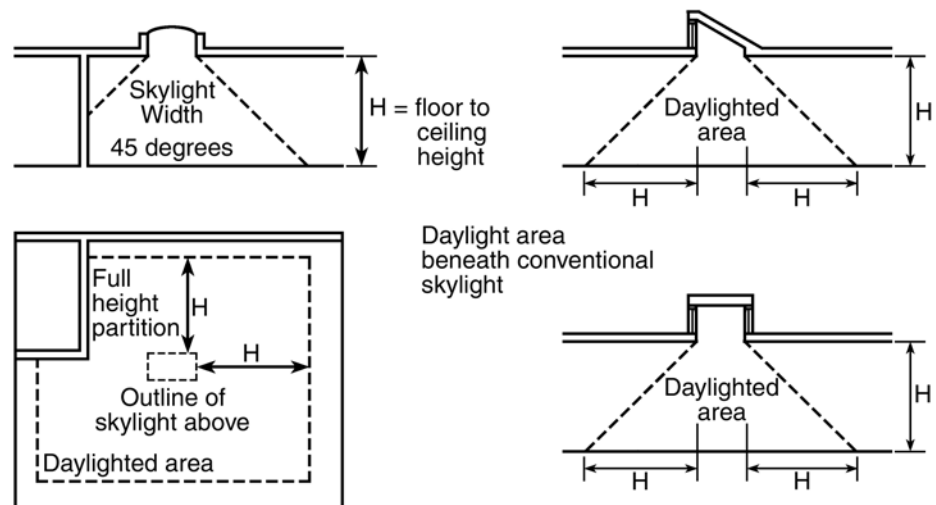


Figure 5-21. (DL6) Daylight zone.