ZENON

Estimating for Daylight Factors

Definition

The Daylight Factor is the illuminance on a horizontal surface inside a building expressed as a percentage of the illuminance on a horizontal surface under an unobstructed grey sky. It is a measure of how bright or gloomy the inside of a building will generally appear, when naturally lit and is used to overcome the problem of the extreme variability of natural lighting. A Daylight Factor can be measured for a specific point or expressed as an average.

The likely Daylight Factor or required rooflight area can be approximated by using a simple rule of thumb calculation. We say 'rule of thumb' because local topography, roof orientation and roof pitch, framing factors, internal fixtures, fittings and finishes can all influence the actual internal lighting levels experienced.

In addition to the above factors, a Maintenance Factor allowing for dirt and other causes of deterioration of the rooflights should be applied:

Location of building	Type of work	Inclination of glazing	Maintenance factor
Non-industrial / clean industrial	Non-industrial / clean industrial work	sloping	0.8
		horizontal	0.7
	Dirty industrial work	sloping	0.7
		horizontal	0.6
Dirty industrial	Non-industrial / clean industrial work	sloping	0.7
		horizontal	0.6
	Dirty industrial work	sloping	0.6
		horizontal	0.5

Daylight Factor Example Calculation

This approximation is made by taking the available daylight as 100%.

Multiply by rooflight area (say 20%) = 100 x 20% (or 0.2) = 20%

Multiply by the light transmission of the rooflight (say 55%), = 20% x 55% (or 0.2 x 0.55) = 11%

Multiply by the Maintenance Factor (say 0.6) = 11 x 0.6 = 6.6%

Daylight Factor	Appearance
< 2%	Room looks gloomy, artificial lighting required for most tasks
2% to 5%	Predominantly day-lit appearance, but supplementary artificial lighting is needed
>5%	Room appears strongly day-lit, minimising the need for artificial lighting

Rooflight Area Example Calculation

To determine the approximate rooflight area required by transposing the preceding calculation:

Minimum Daylight Factor required = 6%

Proposed rooflight specification light transmittance = 55%, maintenance factor = 0.6 (or 60%)

$$\text{Rooflight area required} = \frac{0.06}{0.55 \times 0.6} \times 100\% = 18.2\%$$

It should be remembered that in current highly insulated buildings, the most significant energy savings that can be achieved by reducing the artificial lighting loads with a combination of greater daylight transmission into the building combined with fully automated lighting controls can offer the greatest energy saving potential.

For further information on Daylight Factors and other daylight design considerations, please see the Zenon Rooflights Technical Manual, section 06.