

8 Lamps, LEDs and Circuits

8.1 Choosing the right lamp

Part of the expertise of the lighting designer is the ability to find the most suitable combination of lamp and luminaire to light a given environment. Choosing the correct lamp depends upon what is required of the lighting. The relevant key lighting characteristics of lamps are given below.

Luminous flux/luminous efficacy

The total amount of light generated by the lamp. The rated luminous flux is measured under standard conditions at 25°C in units of lumen (lm). The ratio of luminous flux to electrical power consumption gives the luminous efficacy (lm/W). The system luminous efficiency also includes the power consumption of the control gear. The greater the efficacy for a given output, the lower the electricity cost, and therefore the lower the contribution of the power station to global warming.

Rated life

The average rated life is normally specified. This is the time by which statistically half of a test sample of lamps are still working (e.g. half have failed) under standardised conditions.

Light colour

The light colour relates to the correlated colour temperature (CCT) of a white light source. This describes the colour impression made by a light source; from relatively warm (low colour temperature with predominant red) to cool (high colour temperature with predominant blue).

Colour rendition

The spectral components present in light produced by a lamp determine how well the lamp reproduces object colours. The higher the colour rendition index (R_a or CRI), or the lower the colour rendition group number, the better the colour rendition.

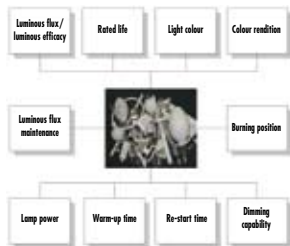


Fig. 8.1 Considerations in choosing a lamp

Colour rendering group	R_a
1A	90-100
1B	80-89
2	60-79
3	40-59
4	20-39
-	<20

↑ Increasing colour rendition

Table 8.1 Colour rendering groups linked to lamp R_a

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Burning position

Certain lamps only permit a restricted selection of mounting orientations for correct operation. Manufacturers specify these permitted burning positions for their lamps. For example for some metal halide lamps only certain burning positions are allowed to prevent unstable operating conditions, whilst compact fluorescent lamps may generally be mounted in any orientation (although luminous flux output may vary with burning position).

Dimming capability

Incandescent, tungsten halogen, fluorescent and compact fluorescent lamps may all be dimmed over almost any range. The output of high-pressure sodium and mercury vapour lamps may be varied, but in a more limited fashion and generally only by discrete levels. Metal halide lamps are not approved for dimming by most manufacturers due to the effect this may have on light quality and lamp life.

Warm-up time

Many lamps need between 30 seconds and several minutes to warm up and output their full luminous flux. These include high-pressure discharge lamps and fluorescent lamps.

Re-start time

When high-pressure discharge lamps (also known as high-intensity discharge lamps or H.I.D. lamps) are turned off they need to cool down for several minutes before they can be started again. This has implications in applications where after a dip in the power supply instant re-strike is required.

Lamp power

The electrical power consumed by the lamp, as opposed to the electrical power consumed by a system consisting of lamp and control gear.

Luminous flux maintenance

As a lamp ages through life the peak luminous flux output by the lamp decreases due to deterioration in the performance of the lamp chemicals and in the physical lamp structure. Manufacturers produce lumen maintenance curves for their lamps showing how the luminous flux depreciates over time.