

1.4.4 Illuminance, luminance and brightness

The calculation and measurement of the amount of luminous flux (lumens) per unit area reaching various surfaces is the basis of most lighting design. This is primarily because illuminance is relatively simple to calculate and measure. The disadvantage is that the visual system responds physiologically to the luminance distribution in the field of view, but does not perceive the image in this way. The viewer is able to interpret the scene by differentiating between surface colour, surface reflectance, and illumination. This process involves the phenomena known as brightness and colour constancy. For example, if a brown wall is illuminated from one side, resulting in a strong gradation of luminance across the wall, it will still be perceived as a wall of constant colour and reflectance with a variation in illuminance across it. If constancy did not apply, the colour of the wall would appear to change.

The quantity, luminance, depends on both the illuminance and the reflectance of the surface. Illuminance and luminance are both objective quantities but neither relate directly to the subjective response to the 'brightness', which is what the eye and brain 'see' (Figure 1.9).

Luminance, however, provides an important objective link between the illuminance provided and the apparent brightness of the scene.

Note: For a more formal definition of some of the terms involved, see Part 4, Glossary.

1.4.5 Luminance in the visual field

The lighting system will produce patterns of luminance over the task, the immediate surroundings and the peripheral field of view. For reasons of visual satisfaction, comfort and performance, the luminances within the visual field need to be correctly balanced. Too low a luminance surrounding a critical visual task that involves high-reflectance white paper can produce uncomfortable viewing conditions. Low-reflectance office desk tops can certainly give rise to this problem (see section 2.3.5.3, Floor and working plane). Similarly poor viewing conditions can result from the reverse situation of too high a luminance alongside the visual task, when for example the use of a high-reflectance wall finish in an art gallery reduces the detail that can be seen in a dark-coloured painting.

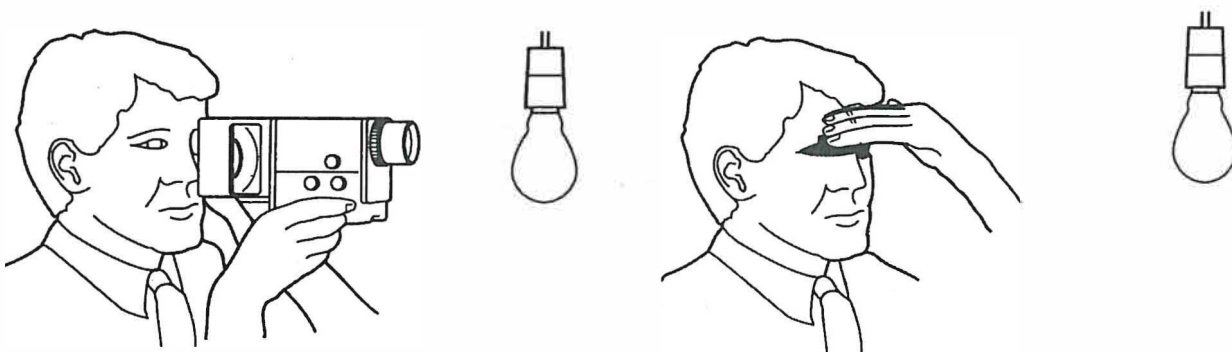


Figure 1.9 (a) Luminance is an objective quantity; (b) brightness is a subjective experience