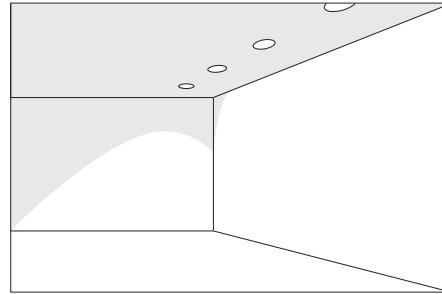


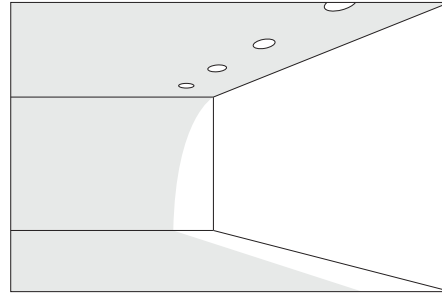
3.3.2.9 Ceiling lighting

Ceiling lighting can be the sole purpose of lighting this room surface, especially when the ceiling has an informative value of its own due to paintings or architectural structures. Ceiling lighting is generally used as a means for providing indirect general lighting of a space. This means that the ceiling becomes the brightest room surface and as such does not correspond to the relative information content. When users spend longer periods of time in the space the ceiling luminance – like an overcast sky – can therefore be felt to be disturbing or is ultimately a source of glare; this applies to luminous ceilings in particular, where it is not the ceiling that is illuminated, but where the ceiling itself becomes an extensive luminaire.

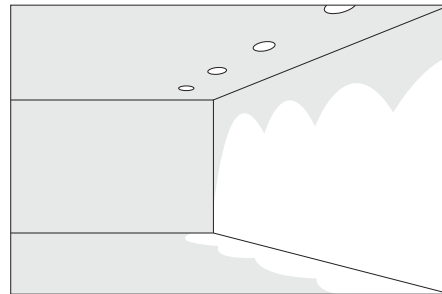
Ceiling lighting can be created using ceiling washlights for mounting on or into the wall; a particularly relevant form of ceiling lighting is cove lighting. If it is not possible to install luminaires on the walls, as is often the case in historical buildings, then free-standing ceiling washlights can be installed. Ceilings can also be illuminated using pendant luminaires or light structures that light the upper half of the space. This option is only applicable if there is sufficient room height, as all luminaires must be mounted above head height to avoid direct glare and they must be installed at a suitable distance from the ceiling to ensure uniform light distribution. If certain areas of the ceiling are to be accentuated, this can be achieved using uplights; this method is also suitable for rooms with low ceilings.



Wall lighting using washlights (above) and wallwashers (below).



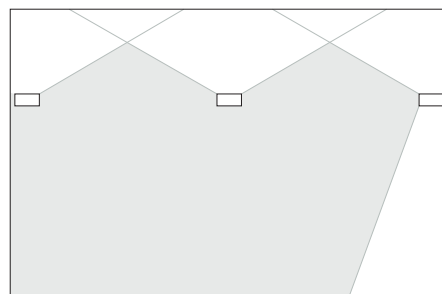
Application of narrow-beam downlights for grazing wall lighting with decorative scallops.



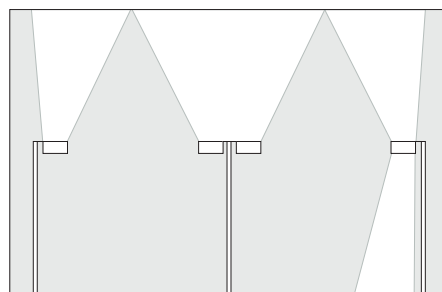
3.3.2.10 Luminance limitation

The question of how to control glare varies depending on whether the luminaires are stationary or movable. In the case of directional luminaires, such as recessed directional spotlights, glare does depend on the light distribution of the luminaire. The glare primarily occurs if the luminaire is not adjusted correctly and the light source becomes visible, either in the luminaire itself or through a reflection of the lamp from specular room surfaces.

In the case of stationary luminaires, such as downlights, louvred luminaires or light structures it is necessary to distinguish between the elimination of direct glare and reflected glare. In the case of direct glare the quality of glare limitation depends on the light distribution of the luminaire. Standards exist for the lighting of workplaces, which stipulate minimum cut-off angles or highest permissible luminances in the cut-off range. For workstations with VDTs there are specific requirements.






Ceiling lighting using wall-mounted ceiling washlights, pendant indirect luminaires and a wall-mounted direct-indirect luminaire (from left to right).



Free-standing luminaire providing asymmetrical indirect lighting, free-standing luminaire providing symmetrical indirect lighting, free-standing luminaire providing asymmetrical direct-indirect lighting (from left to right).

3.3 Practical planning
3.3.2 Luminaire selection

To ensure that luminaires are electrically safe they are required to meet specific safety standards. These standards require all metal parts which users can touch not to be live if a fault occurs. The protection class indicates the measures of safety provided.

Protect. class		Protection measures
I		The luminaire has a connection point for an earthed conductor, to which all metal parts with which users may come into contact must be connected. Connection to the mains earth conductor is imperative.
II		The luminaire is insulated such that there are no metal parts which users can touch that may be live if a fault occurs.
III		There is no earth conductor. The luminaire is operated on low-voltage up to 42 V, supplied via safety transformers or batteries.




Luminaires are protected against the ingress of foreign bodies and water. The Mode of Protection (IP) is an internationally recognised system comprising two digits XY, whereby X refers to protection against foreign bodies and Y protection against water. The minimum requirements laid down for luminaires in interior spaces is IP 20.



X	Degree of protection against foreign bodies	Y	Degree of protection against water
		0	No protection
		1	Drip-proof: water/spray from above
2	Protection against foreign bodies > 12 mm (protection against manual contact)	2	Drip-proof: water from an angle (up to 15° to the vertical)
3	Protection against foreign bodies > 2.5 mm	3	Protected against spray (up to 15° to the vertical)
4	Protection against foreign bodies > 1.0 mm	4	Protected against spray from all directions
5	Protection against dust	5	Protected against jets of water from all directions
6	Dust-proof	6	Water-proof: flooding
		7	Water-proof: immersible
		8	Water-proof: may be submerged

Conventional IP XY classification for luminaires.

X													
6						•			•			•	
5	•		•	•	•								
4	•		•	•									
3													
2	•		•	•									
	0	1	2	3	4	5	6	7	8	Y			

Symbols used to indicate special qualities and safety requirements.

	Luminaire with discharge lamp, suitable for mounting on parts of buildings comprising materials with an ignition point of >200°C (e.g: wooden ceilings)
	Luminaire with discharge lamp with a limited surface temperature, suitable for installation in areas exposed to dust or containing inflammable materials or in danger of explosion
	Luminaire suitable for installation in or surface mounting on furniture made of standard inflammable material (coated, veneered or painted wood)

	Luminaire suitable for installation in or surface mounting on furniture with unknown inflammable properties
	Safety distance (X) in the direction of beam