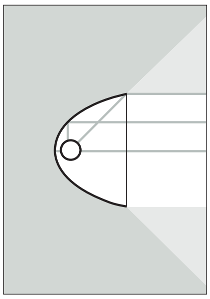
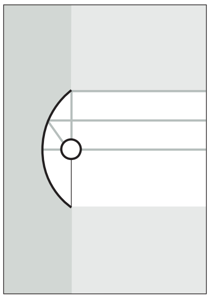
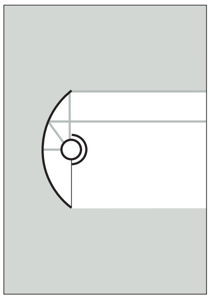
Parabolic reflector with short distance between focal point and apex of the reflector; reflector acts as a cut-off element.

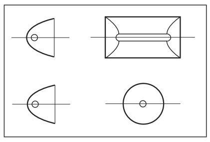


Parabolic reflector with greater distance between focal point and apex of the reflector; no shielding for direct rays.

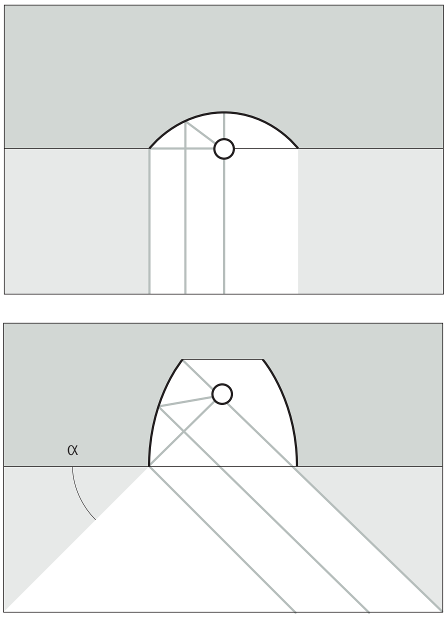


Parabolic reflector with greater distance between focal point and apex of the reflector, spherical reflector as a shielding element.

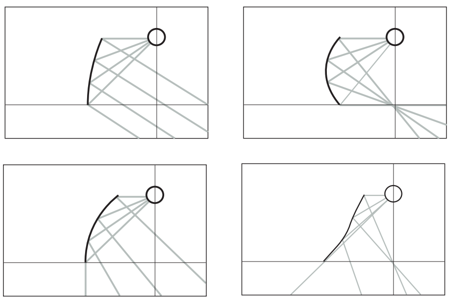




Parabolic contours of rectangular reflectors and rotationally symmetrical reflectors.



Parabolic reflector with intense directional light (above). Wide-angle parabolic reflector with cut-off angle α (below).



Reflector contours for parallel rays / parabola (top left), converging rays /ellipse (top right), diverging rays /hyperbola (bottom left) and converging-diverging rays (bottom right).

2.6.2.1 Parabolic reflectors

The most widely used reflectors are parabolic reflectors. They allow light to be controlled in a variety of ways – narrow-beam, wide-beam or asymmetrical distribution, and provide for specific glare limitation characteristics.

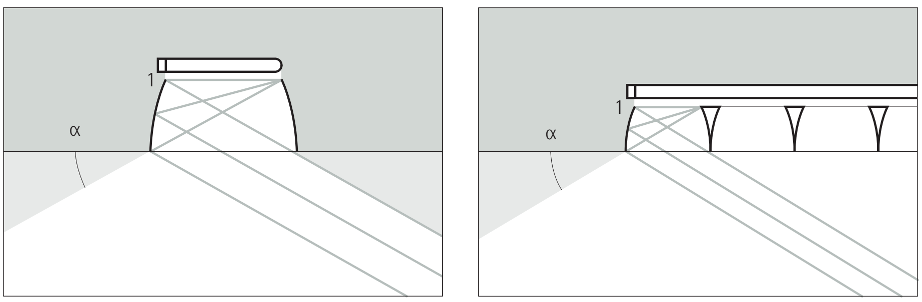
In the case of parabolic reflectors the light emitted by a light source located at the focal point of the parabola is radiated parallel to the parabolic axis. The more the light source deviates from the ideal point source – in relation to the diameter of the parabola – the more the rays of light emitted will diverge.

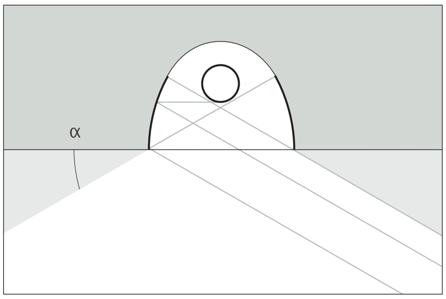
If the reflector contour is constructed by rotating a parabola or parabolic segment around its own axis, the result is a reflector with narrow-beam light distribution.
In the case of linear light sources a similar effect is produced when rectangular reflectors with a parabolic cross section are used.

If the reflector contour is constructed by rotating a parabolic segment around an axis, which is at an angle to the parabolic axis, the result is a reflector with wide-beam to batwing light distribution characteristics. Beam angles and cut-off angles can therefore basically be defined as required, which allows luminaires to be constructed to meet a wide range of light distribution and glare limitation requirements.

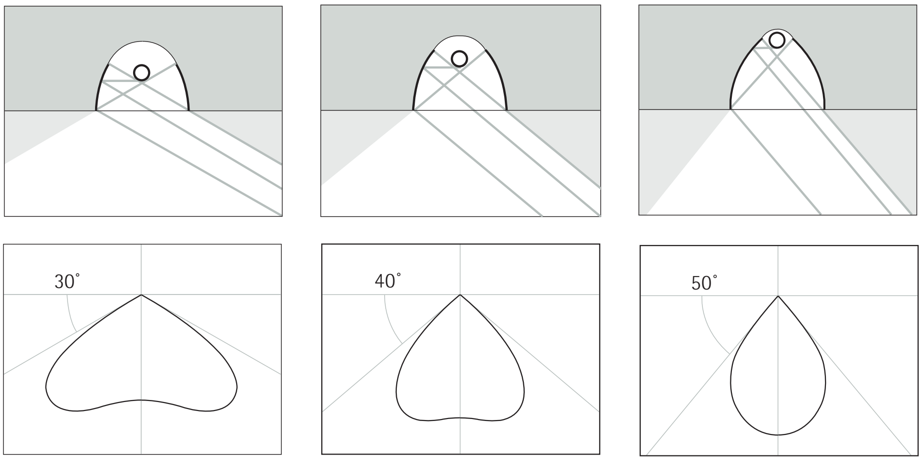
Parabolic reflectors can also be applied with linear or flat light sources – e.g. PAR lamps or fluorescent lamps, although these lamps are not located at the focal point of the parabola. In this case the aim is not so much to produce parallel directional light but optimum glare limitation. In this type of construction the focal point of the parabola lies at the nadir of the opposite parabolic segments, with the result that no light from the light source located above the reflector can be emitted above the given cut-off angle. Such constructions are not only possible in luminaires, but can also be applied to daylight control systems; parabolic louvres – e.g. in skylights – direct the sunlight so that glare cannot arise above the cut-off angle.

Parabolic reflector for glare limitation for flat and linear light sources. When the focal point is located at the nadir (1) of the opposite parabolic segment no light is radiated above the cut-off angle α.

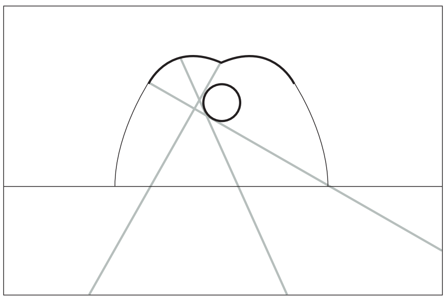




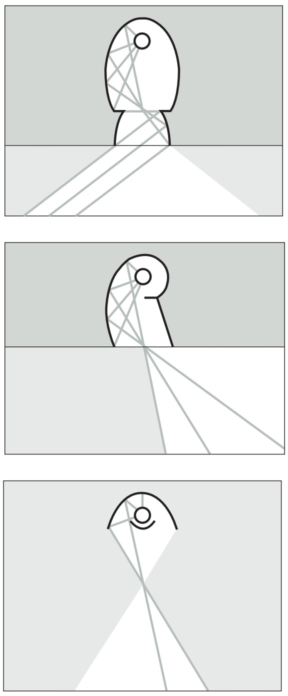
Darklight technology. By using reflectors with a variable parabolic focal point no light is radiated above cut-off angle α, especially in the case of volume radiating sources.



Through the calculation of specific reflector contours various cut-off angles and distribution characteristics can be obtained for the same ceiling opening and lamp geometry.



Involute reflectors: light radiated by the lamp is reflected past the light source.



Elliptical reflectors in double-focus downlights (above), wallwashers (centre) and spotlights (below).

2.6.2.2 Darklight reflectors

In the case of the above-mentioned parabolic reflectors clearly defined light radiation – and effective glare limitation – is only possible for exact, point light sources. When using larger radiating sources – e.g. frosted incandescent lamps – glare will occur above the cut-off angle; glare is visible in the reflector, although the lamp itself is shielded. By using reflectors with a variable parabolic focal point (so-called darklight reflectors) this effect can be avoided; brightness will then only occur in the reflector of larger radiating sources below the cut-off angle, i.e. when the light source is visible.

2.6.2.3 Spherical reflectors

In the case of spherical reflectors the light emitted by a lamp located at the focal point of the sphere is reflected to this focal point. Spherical reflectors are used predominantly as an aid in conjunction with parabolic reflectors or lens systems. They direct the luminous flux forwards onto the parabolic reflector, so that it also functions in controlling the light, or to utilize the light radiated backwards by means of retroreflection back towards the lamp.

2.6.2.4 Involute reflectors

Here the light that is emitted by the lamp is not reflected back to the light source, as is the case with spherical reflectors, but reflected past the lamp. Involute reflectors are mainly used with discharge lamps to avoid the lamps over-heating due to the retro-reflected light, which would result in a decrease in performance.

2.6.2.5 Elliptical reflectors

In the case of elliptical reflectors the light radiated by a lamp located at the first focal point of the ellipse is reflected to the second focal point. The second focal point of the ellipse can be used as an imaginary, secondary light source.

Elliptical reflectors are used in recessed ceiling washlights to produce a light effect from the ceiling downwards. Elliptical reflectors are also ideal when the smallest possible ceiling opening is required for downlights. The second focal point will be an imaginary light source positioned at ceiling level; it is, however, also possible to control the light distribution and glare limitation by using an additional parabolic reflector.