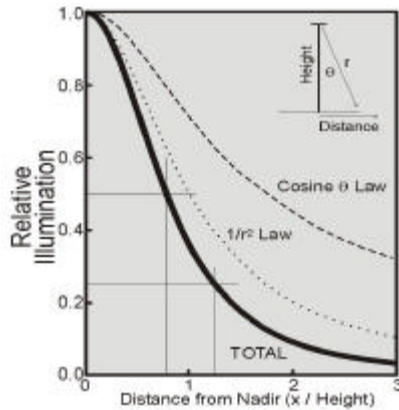


## Shielding of Luminaires

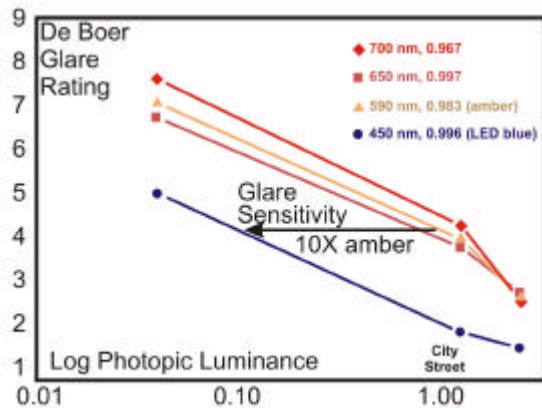
Shielding of the luminaire is critical for limiting the light's impact on the environment beyond the target areas and improving visibility. It reduces the impact of glare and limits the extent of the affected area.



Although unshielded lights will illuminate a very large area, the illumination level more than 6 mounting heights from nadir is, quite literally, negligible -  $<1/10$  that at nadir, due to the cosine law and the  $1/r^2$  law. So without appropriately designed optics, to "throw light" from nadir into the periphery, the total useful spread of the light is only 1.5 X mounting height from nadir.

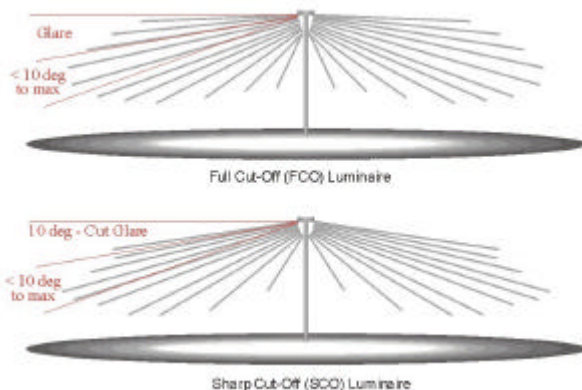
However the light that shines within  $10^\circ$  below the horizon can affect the aesthetic appearance of the night for more than a kilometre and can undermine our night vision more than 100 meters away. Full cut-off fixtures limit the amount of light in this glare zone to  $<10\%$ . And, Sharp cut-off fixtures limit it to  $<1\%$ .

Have you wondered why the white-light luminaires seem to produce more glare than the amber-light luminaires? There is a physiological reason for this.



Amber light (spectrum is  $>500$  nm) provides low exposure to the action spectrum of our sensitive night vision and the cells that cause our iris to constrict in bright light. So amber light results in relatively low impact on our night vision. Wavelengths  $<500$  nm (blue spectral components) cause about 10X the impact of glare. This is the reason that white light luminaires seem to be much more "glaring" than the older HPS in their flat-glass fixtures. Therefore the amount of blue light in the glare zone should be reduced to  $1/10$  that

of amber light. The bright points of the LED emitters compared to the much larger HPS bulb exacerbate the effect of glare.



The blue spectral components also impact plant biology and the vision of wildlife so the affected area must be reduced as much as practical to minimize its ecological impact. Therefore, white-light lamps require at least Sharp Cut-off shielding for them to equal the effect of glare by amber light. Existing commercial luminaires (Ref. circ 2016)

approach FCO but extra shields are required to convert them into Sharp cut-off.