

## How Glare Reduces Safety

The human eye is pretty amazing...enabling us to see in a broad range of lighting conditions from bright sunlight to pale moonlight. But the eye cannot function well when confronted with widely varying light intensities *at the same time*, nor when it is disabled by glare. Glare is the criminal's friend.

How often have you turned out the light at night and noticed that after your eyes had a few minutes to "get used to the dark," you could see much more around your bedroom than you'd been able to when the light first went off? Formally termed "adaptation," this is the key to understanding how glare impairs vision and puts us in unnecessary danger.

Inside the eye are two different types of light receptors--"rods" and "cones." After the bedroom light went out, the pupils enlarged so that the eyes could make better use of what light was available. The extra-sensitive rods, which allow us to see in very faint light, were activated; they are located toward the edges of the retina, making them important to peripheral vision, and are especially sensitive to motion. Cones were at work while the light was still on, facilitating color discrimination and sharpness of vision; they are concentrated at the center of the eye.

Many people who have not had occasion to look into the matter tend to assume that safety and "security" can be improved by very bright lighting--which usually entails substantial glare. But research claiming to demonstrate such benefits has been shown to be flawed.\* The actual result of overbright, glary outdoor lighting is to *impair* our ability to see at night! The pupil contracts, and the rods shut down. As the eye struggles to adapt, the intense brightness forms a "veil" over the retina that interferes with the brain's ability to decipher the image there.

But the natural state of the world after sundown is darkness, and no matter how many watts are used, outdoor lighting can never duplicate the steady, even light of daytime. To *maximize* safety at night, therefore, the best lighting is that which *minimizes contrast* between the illumination and the ambient darkness. This means using the *least* amount of light that will do the job, aiming it down, and shielding it to prevent glare. Such lighting keeps adaptation requirements low; the pupil can more readily adjust, and the rods that provide peripheral vision can more swiftly alert you to possible danger approaching from less bright areas as you drive or walk.

In our homes we nearly always put shades on our lamps to prevent glare. But outdoors we have permitted bare bulbs in powerful floodlights and "decorative" fixtures and bright signs. The most common type of streetlight directs substantial amounts of glare out to the side and into the eyes of drivers and pedestrians.

You can see for yourself how glare impairs vision by taking this simple "arm test." Take an evening stroll on a street that has the common "sag lens" streetlights but not much other lighting. Pause and raise your arm to block direct view of the closest streetlights and as many others as possible. While giving your eyes a few minutes to adapt, carefully study the scene before you...making mental note of how much detail you can discern straight ahead and out the corners of your eyes. With that image set in mind, drop your arm. You will very likely find that you cannot see the scene as well once the glary streetlights are again in your field of vision.

To make the nighttime environment as safe and secure as possible, *the most important things we can do* are to shield outdoor lights to prevent glare and use the lowest wattage that will do the job.

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\* See *Outdoor Lighting and Crime, Part 1: Little or No Benefit*, available from the Astronomical Society of Victoria, <http://www.asv.org.au> (Light Pollution Issues page).