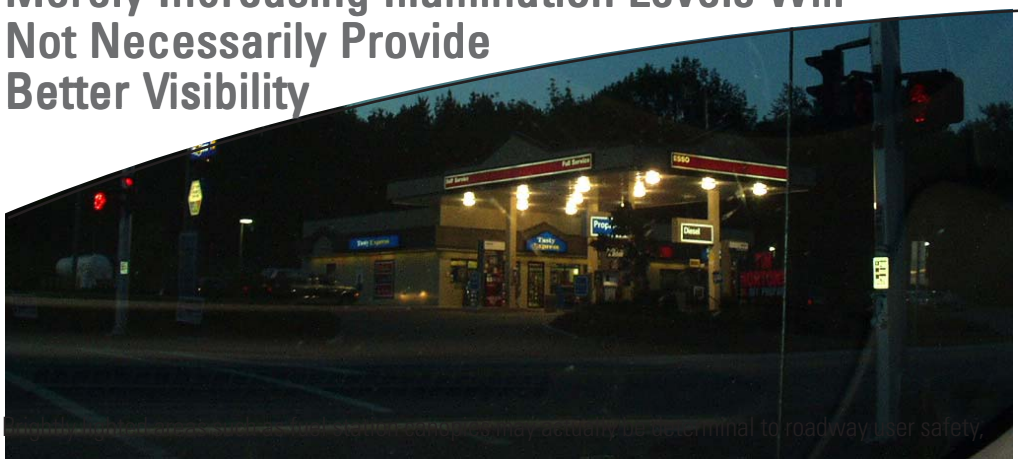
Visibility Issues in Lighting

Merely Increasing Illumination Levels Will Not Necessarily Provide Better Visibility



Lighting standards are typically focused on the amount of light. It is often assumed when designing lighting that more light is better. The thinking goes this way – if 20 lux (2 fc) is the recommended maintained average illumination within a given area then, 40 lux (4 fc) must be better, because the more light provided, the easier it will be to see and perform tasks requiring visual input. This is not always true as visibility is not always improved with additional illumination.

Visibility and visual perception are complex issues with many contributing factors, and increasing lighting levels may actually reduce visibility rather than enhance it. Among the factors that must be considered are the following.

Eye Adaptation – The eye adapts to varying levels of luminance, allowing the capability to see under different lighting conditions. This adaptation is not instantaneous, however, and moving from an area of low luminance to an area of high luminance (or vice-versa) can cause momentary sensations of loss of vision as the eye adapts. We all have had experience of stepping outdoors at night from a brightly lighted room and needing to pause to before our vision returns. High lighting levels in an area such as a fuel station canopy can be a significant public safety issue if the surrounding areas are lighted to a much lower level (or not lighted at all). The key is to transition the level of luminance or illumination to allow the eye adapt. Lighting should always transition from bright to dark, or visa versa to allow time for adapation.

Contrast – We perceive objects based on the difference between the luminance of an object and the luminance of its background. This is called contrast. The key to contrast is the difference, not the amount of light. If an object has higher luminance than the background, it possesses "positive contrast." If the object luminance is lower than that of the background, it is seen in silhouette and has "negative contrast." If the difference between the object and its background is small (whether positive or negative), the object is hard to see. Typically, objects viewed in positive contrast are easier to see. This is a key is a key in improving visibility. Achieving positive contrast is a product of properly positioned light sources, not simply the amount of light.

Glare – Bright sources of light in the visual field are called glare. Due to the human physiology glare causes light to be scattered in the eye, resulting in a phenomenon known as “veiling luminance.” This results in a visual haze within the eye, reducing vision. We have all experienced veiling luminance when bright oncoming headlights significantly reduce one's vision. By blocking the bright source from the visual field with one's hand, the haze associated with veiling luminance is reduced, partially restoring vision. Brightly lighted areas or high wattage luminaires may actually reduce vision rather than enhance it by increasing glare. Glare can be reduced through the use of proper luminaire mounting heights and luminaires with full cut-off optics.

Experienced lighting designers recognize situations where increased lighting levels deliver benefits or pose potential problems. Dealing with issues related to visibility and designing lighting systems that promote safety and increase efficiency is the fundamental task of the lighting designer.

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