Larson Electronics LLC www.LarsonElectronics.com sales@larsonelectronics.com
9419 E US HWY 175, Kemp, TX 75143 - P: (800) 369-6671 - F: (903) 498-3364

Eye Safety Infrared Illuminators

As the leading supplier of Infrared emitters for the military and security, Larson Electronics has an obligation to ensure its customers are given the knowledge to safely install and use our products. We takes this obligation very seriously and based upon the most up-to-date information have produced this document so that customers can be confident that their security system is installed and used in a safe manner.

Larson Electronics is not aware of any reported case of eye damage caused by radiation from LED Infrared lamps.

Larson Electronics designed our series infrared LED lamps to allow operation at safety levels that exceed the guideline safety standards of the ACGIH.

Background

People are often unwittingly exposed to high levels of Infrared radiation, in the making of steel or glass, by simply being out in strong sunlight, in fact anywhere an individual might be exposed to a hot object. Infrared gives a heating effect, which we sometimes use to keep us warm, but too much on the skin can cause blistering. Industry is well aware of the dangers of high intensity IR radiation and the risks and effects of over exposure to it are well known.

Bright natural light which contains Infrared causes the eye to blink, the iris to contract, and the viewer to look away. These normal defense mechanisms do not happen when the visible part of the light has been removed. The eyes are more sensitive than the skin, over exposure for long periods may give rise to retinal damage and cataracts, these are the hazards of over exposure to IR. The exposure limits [1,2,3] and fig.1 show that filtered IR is around 100 times less hazardous than visible blue light.

Other sources of IR are lasers, which produce high intensity beams; these intense beams have necessitated safety regulations. These regulations encompass conventional light sources. Larson Electronics has reviewed these regulations [1,2,3,] and have produced the following guidelines for the use of their products.

There are two scenarios which have to be considered with these security systems, *safety in use* which is long term and *safety during installation, testing and maintenance* which is shorter term. Details of the technical aspects which were used to arrive at these recommended minimum safe working distances are given later.

Safety in Use (Long Term Exposure)

If possible the lamp and camera should always be installed where they cannot be touched by passers-by, otherwise it is not a secure system, and somewhere that passers-by cannot stare at the lamp at distances closer than the Minimum Safe Working Distance (MSWD) shown in Table 1. The MSWD refers to the central part of the beam which is the most intense, and under conditions of continuous viewing for up to 8 hours.

Taking the most prudent and cautious approach fig.2 shows that even an exceptionally tall person whose eyes are 2m (6ft.6ins.) above ground would have to come within 3m (4ft.3ins) of the mounting post of a lamp mounted 3m (9ft.10ins) above ground before entering the *hazard zone* of a 500 spot. Even in the unlikely event that at the closest distance of 1m (3ft.3ins) and with the lamp shining directly downwards, an observer staring upwards into the lamp for up to 3 minutes is within the safety limits.

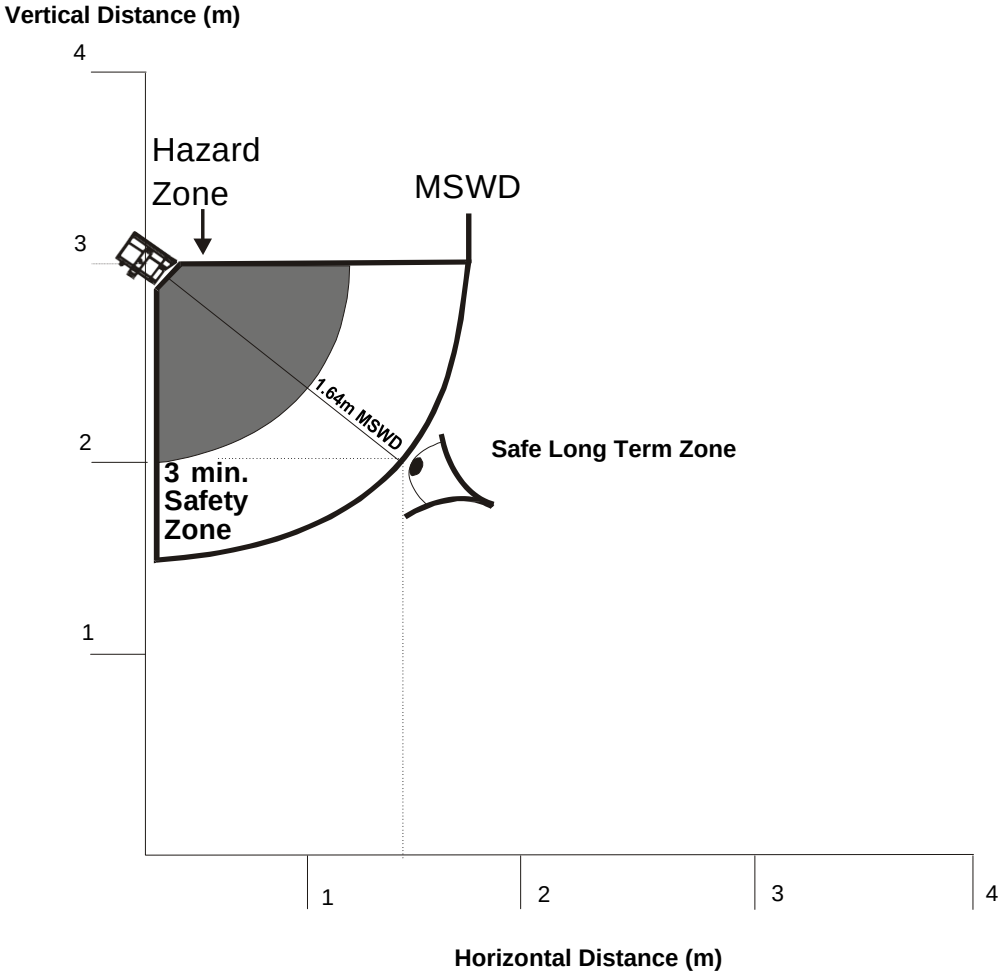


Table 1 – Larson Electronics Products – Minimum Safe Working Distances

Minimum safe working distances for up to 8 hours viewing		
Lamp type	LEDLB IR series	
	ft.ins.	m
SPOT	5'6"	1.64
10^{o}	4'6"	1.4
30^{o}	3'0"	0.9
FLOOD	3'0"	0.89

As a rule of thumb if you can feel the heat, don't stare or touch the lamp.

LED

The Larson Electronics range of LED emitters have a narrow band output and can be viewed continuously at even shorter distances with a MSWD of 0.3m (12ins.)

Installation, Testing and Maintenance (Short Term Exposure)

Although the ACGIH guidelines can be interpreted to suggest the Larson Electronics infrared LED emitters can be safely viewed at very close distances (fig.3). Larson Electronics discourage direct viewing at any distance below the MSWD. If the lamp is on the heat from it can be felt by passing a hand in front of the lens. A second observer at a distance greater than MSWD should be used to check if the lamp is functioning. During final adjustments a monitor linked to the camera is recommended, as described in the installation instructions supplied with the lamp. For regular maintenance at the camera head, the lamp should be extinguished. Multiple lamp systems have designed configurations so that overlapping intensities do not exceed the center beam intensity of a single lamp at the MSWDs.

Technical Aspects

The ACGIH publish the TLV (Threshold Limit Values) for various physical agents; they recommend a TLV of 10 $mWcm.^{-2}$ for the irradiance of near Infrared radiation under conditions of viewing for longer than 16mins. For shorter times and higher irradiances the following formula can be used to find the Maximum Permissible Exposure (MPE), this is based on guidance given in ref. 1.

$$\mathbf{MPE = 491\ t^{-0.25}\ Wm^{-2}}$$

Where the numerical factor 491 is specific to Larson Electronics lamps.

Together with the inverse square law and measurements of the center beam irradiances of Larson Electronics lamps, this formula has been used to produce fig. 3 which gives the time/distance relationship needed to maintain safe irradiance limits. Time/distance conditions within the MSWD should be regarded as unsafe and should be avoided.

EN 60825-1 1994-1996 gives Maximum Permissible Exposure limits of the radiance on the eyes for light of various wavelengths, these MPE values have been used to produce fig. 1 which indicates that visible blue light is around 100 times more hazardous than the filtered IR light used in our infrared emitters lamps.

References

1. American National Standards Institute (ANSI) Z136-1-1993.
2. European Standard EN 60825-1 1994-1996
3. American Conference of Government Industrial Hygienists (ACGIH) 'Threshold Limits Values' 1994.
4. Institute of Electrical and Electronic Engineers (IEEE) 0-7803-2627-X/95 1995 by H. Devereux and M. Smalley.

PLEASE NOTE

This document was produced in good faith by Larson Electronics for information only; Larson Electronics do not accept liability for any consequential damage, injury or loss arising from the use of Larson Electronics products.

fig.1

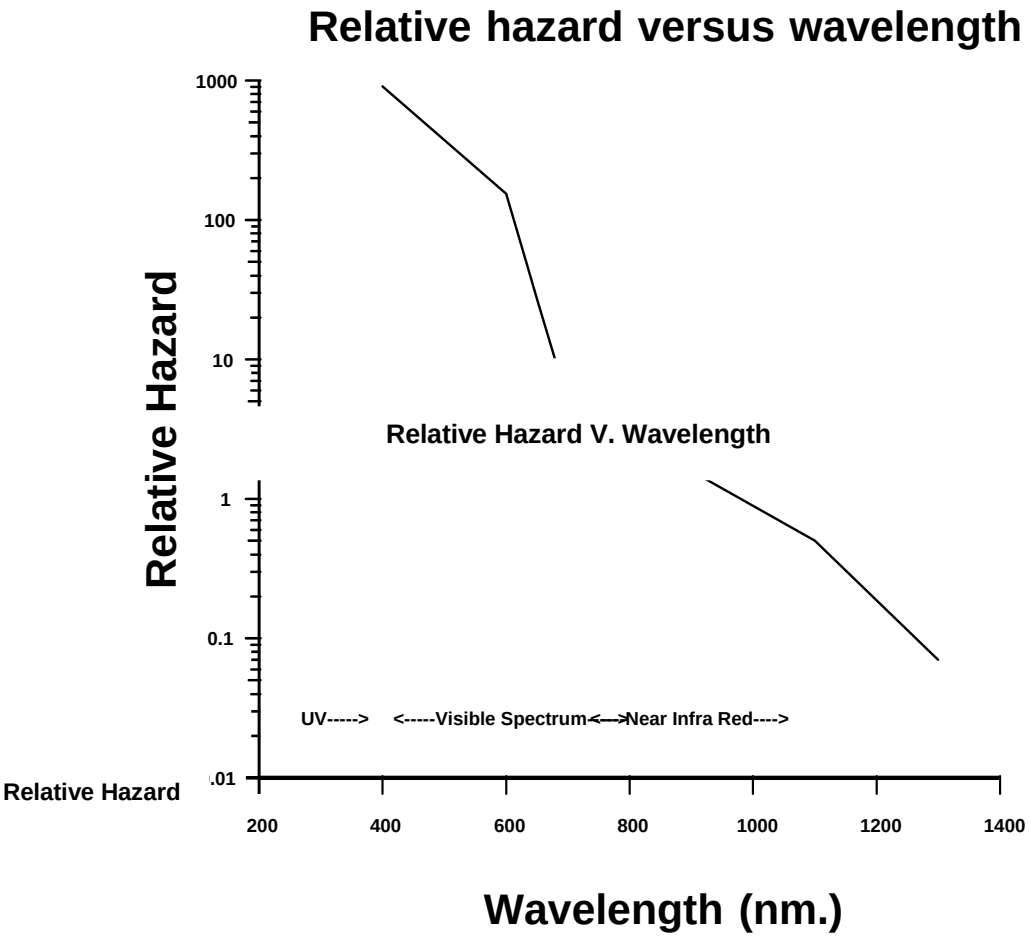
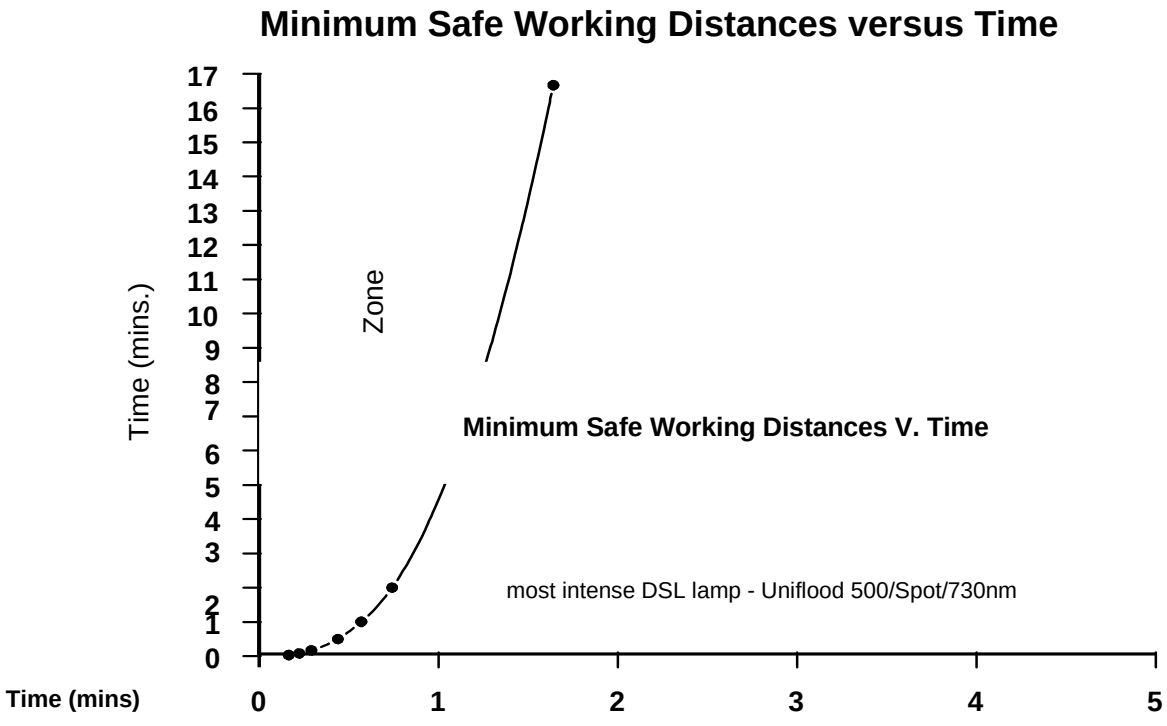

Relative hazard versus wavelength
Relative Hazard
1000
100
10
Relative Hazard V. Wavelength
1
0.1
.01
UV-----> <-----Visible Spectrum<—>Near Infra Red---->
Relative Hazard
200
400
600
800
1000
1200
1400
Wavelength (nm.)

fig.3


Minimum Safe Working Distances versus Time
Time (mins.)
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Zone
Minimum Safe Working Distances V. Time
most intense DSL lamp - Uniflood 500/Spot/730nm
Time (mins)
0
1
2
3
4
5