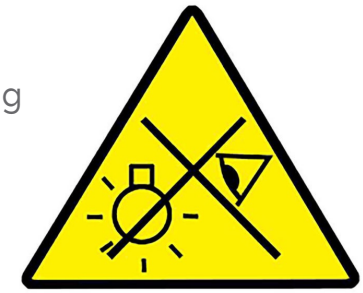
CASE STUDY

Photobiological Safety and Chalmit Lighting

Photobiological Safety is the study of the potential harmful interaction of optical radiation emitted by light sources on living organisms. It is our responsibility as Lighting manufacturers to ensure our products are photobiologically safe.



How do we test for Photobiological Safety

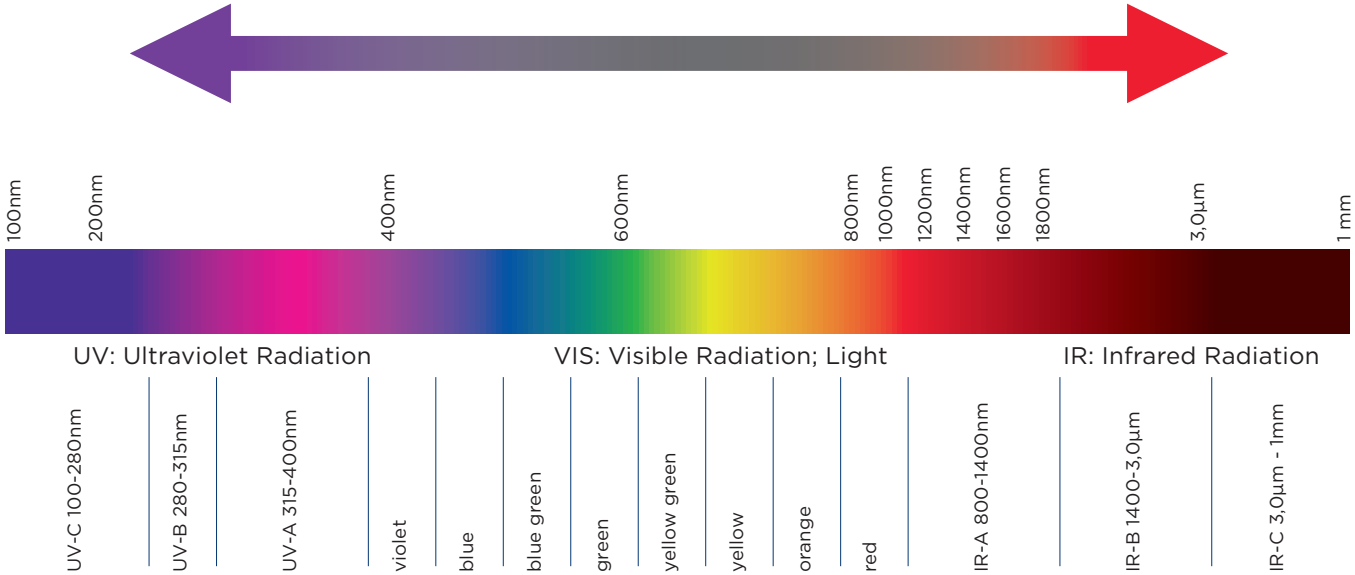
BS EN 62471 Standard details the testing and classifying limits of light sources regarding harmful interactions with biological organisms. The standard is very long and technical covering all kinds of light emitting sources.

BS EN 62471 references several other documents along the way making deciphering the details difficult. Here we try to outline plainly details related to our lighting.

What kind of light?

We are concerned with the electromagnetic spectrum range from Ultra-Violet (UV-200nm) through Visible Light to Infra-Red (IR-3000nm).

Lasers and radiation outside this range are covered in different documents.



What kind of Hazards?

There are various effects from over-stimulus of light spectra effecting biological organisms: some effects skin and some effect our eyes.

Actinic UV - Skin (200nm – 400nm)

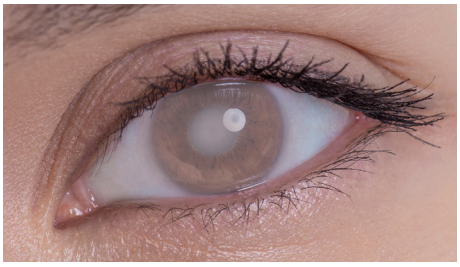
Causes Ultraviolet Erythema (sunburn): skin inflammation, chance of developing skin cancer.

Thermal – Skin (380nm – 3000nm)

Causes skin inflammation,
DNA damage

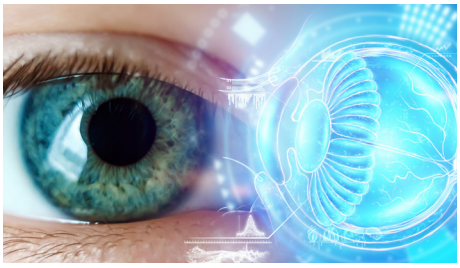
UV-A - Eye (315nm – 400nm)

Causes Photokeratitis: 'Ultraviolet Cataract' - lens proteins to modify leading to cataract formation.



Blue-light – Eye (300nm – 700nm)

Causes Photo-retinitis: damage to retinal cells, contribute to eye cancer, growths on the eye.



Infra-red – Eye (780nm – 3000nm)

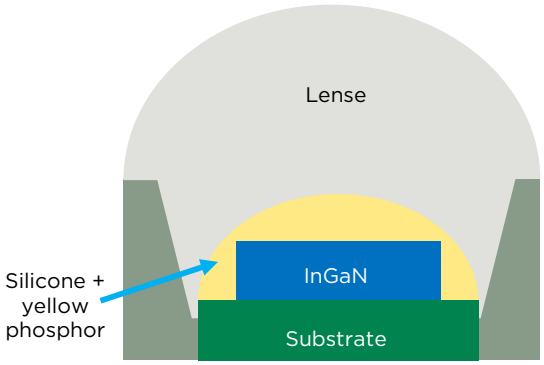
Causes Infrared Cataract: clouded vision - 'furnaceman's cataract'.

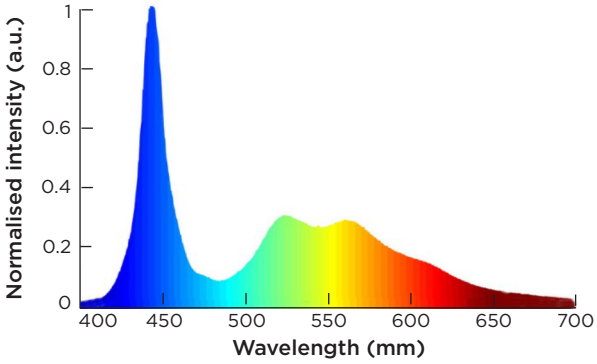
Causes Retinal Thermal Injury: burning of retina

What's in our LED's?

Our LED lighting is generally made up of many mid-power surface mounted LEDs. These consist of a Blue LED chip with yellow phosphor coating: mixing to create white light.

This gives a significant peak in the blue region of the emitted spectra.





Do we have to test for everything?

In short, the answer is no.

Here at Chalmit Lighting, we supply some of the best LED lighting for the Harsh and Hazardous community.

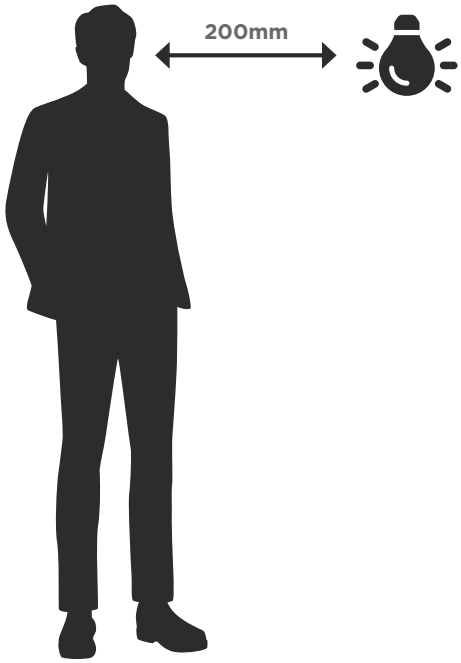
As directed by EN 62471 : white light LED lighting does not contain any risk of Infra-Red Hazard or any risk of Ultra-Violet Hazard. However, there may be a Blue-Light Hazard. Therefore, we must assess the Blue-Light hazard to determine the risk group of each of our products.

Measurement

TTR 62778 deals exclusively with Blue-light Hazard and brings clarification on the assessment of Blue-light Hazard of all lighting products which have their main emission in the visible spectrum.

TR 62778 is a summary of recommendations to assist in the consistent application of IEC 62471 for assessment of Blue-light hazard and recommends measurements at 200mm with RG1/RG2 boundary condition.

The basic premise of the measurement for General Service Lamps (GLS) is the extreme case of person 200mm away from a lighting source. We only need to examine a single LED as each LED in an array would produce an image on different parts of our retinas.

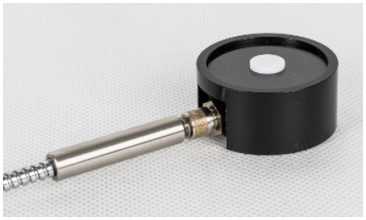


Photometric Laboratory

The Standard contains a lengthy discussion on the conditions and procedures needed to make measurements and apply risk groups designed to account for biophysical effects.

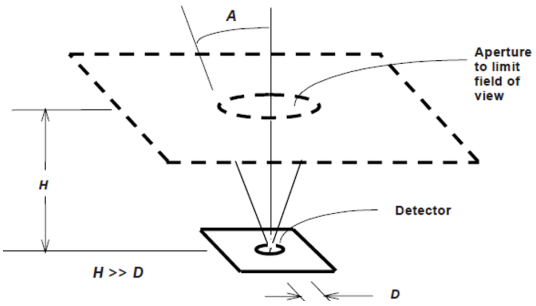
Practical measurement of spectral emissions is quite challenging. We make our tests with specialised measurement equipment in our Photometric Laboratory as part of our standard set of photometric testing.

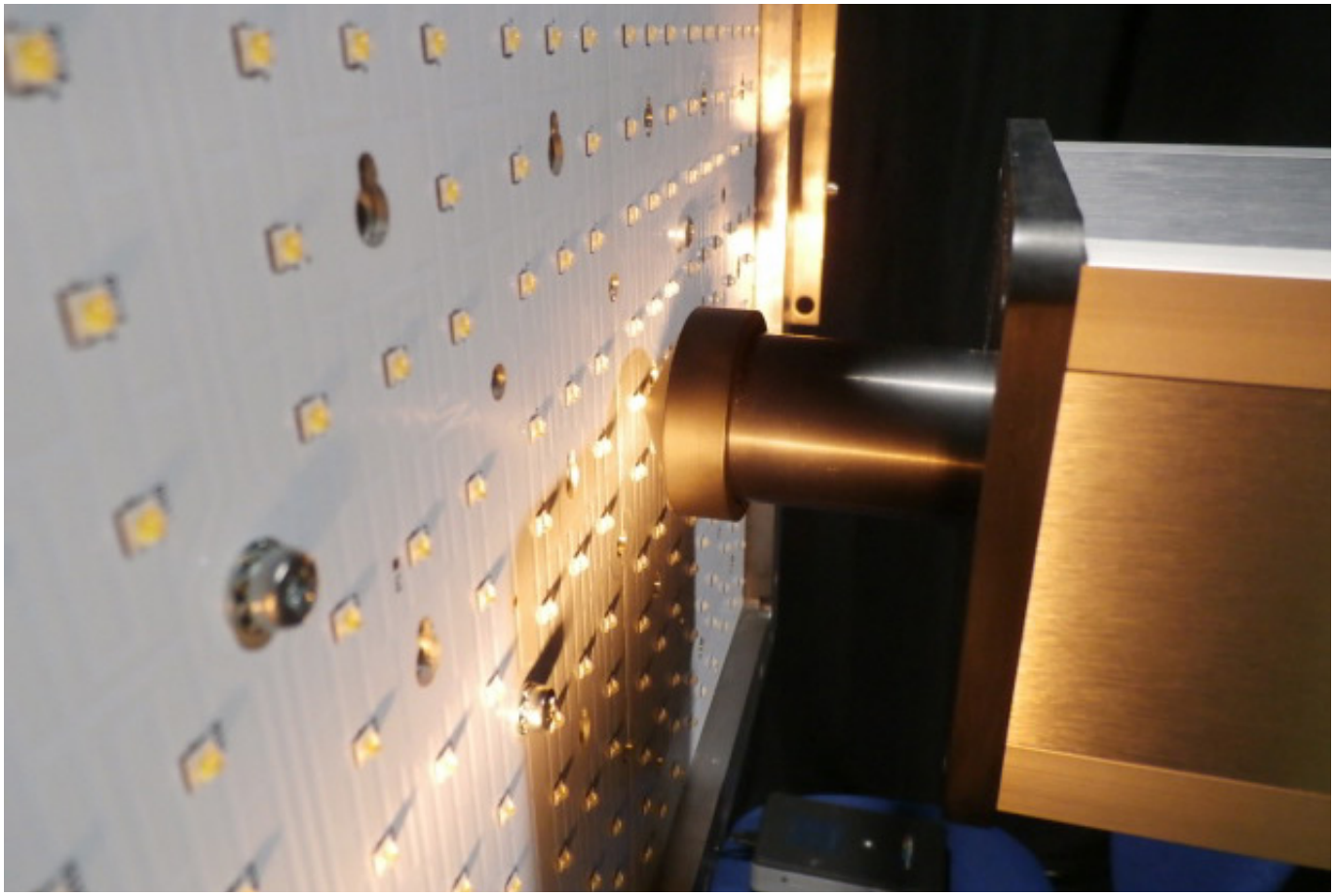
Photobiological Hazard is a function not only of intensity but of exposure time also. The Risk Classification System indicates only the potential risk. Depending on use and exposure, these may or may not become real hazards.



Verification at distance 2944.95 mm

Measure dmin = 2944.95 m
Ethr = 1131.17 lx





Risk Groups

BS EN 62471 sets out a set of Risk Groups based upon all hazard types. We may only concern ourselves only with Blue-Light Hazard.

Risk Group 0 – Exempt:
No photobiological hazard within 1000s Blue-Light exposure.

Risk Group 1 – Low Risk:
Exceeds Risk Group 0 but, under normal limitations, does not pose hazard within 100s Blue-Light exposure.

Risk Group 2 – Moderate Risk:
Exceeds Risk Group 1 but, due to aversion response, does not pose hazard within 0.25s Blue-Light exposure.

Risk Group 3 – High Risk:
Exceeds Risk Group 2 and may pose hazard for even a brief exposure.

How does Chalmit perform?

The majority of lighting products from Chalmit will be:

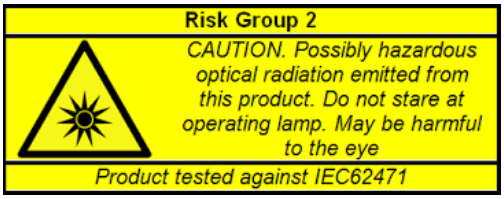
Risk Group 1 - Low Risk | **Risk Group 2 - Medium Risk**
Risk Group 2 becomes Risk Group 1 at a given distance.

No white light LED lighting is expected to ever be categorised within Risk Group 3 - High Risk.

Labelling

Risk Group 0 and **Risk Group 1** require no warning labelling.

Risk Group 2 requires product warning labelling

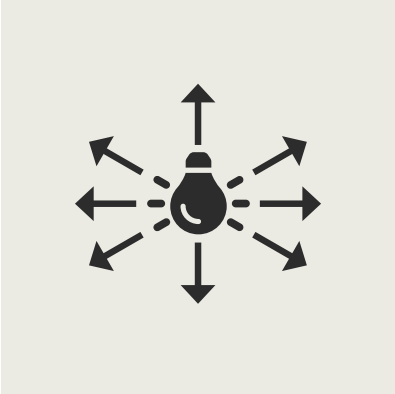


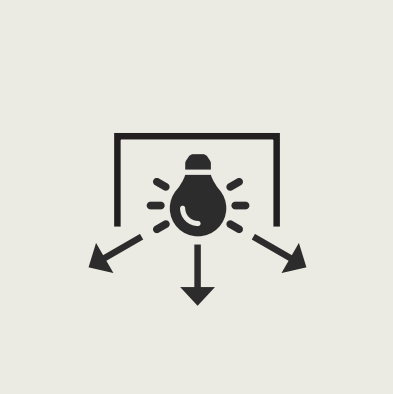
Mitigation of risk by design

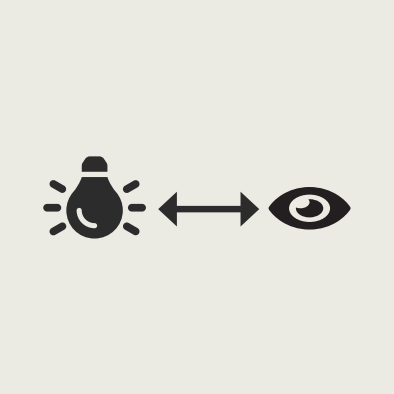
We can reduce the risk of potential injury by good Lighting Design.

- Optical Control: create cut-off angles in the output distribution
- Direct main beam downwards (avoid glare)
- Increase distance between lighting and personnel

In this way we reduce the amount of light entering the eye directly and any potential risk is mitigated.







Find out the risk group of Chalmit products

Contact Chalmit Technical for information relating to the Photobiological Risk Group of specific Chalmit products.

Email us at: hhinfo@hubbell.com

Karl Slingo, BEng (Hons)
Lighting Design

About the Author

Karl joined Chalmit in 2012, and has a total of 28 years experience within the lighting industry.

A developer of ChalmLite 6.0 lighting design calculation software, Karl is dedicated to all things lighting design.

To get in touch with Karl, email him via **kslingo@hubbell.com** or follow him on LinkedIn.

Chalmit®

Founded in 1910 in Glasgow, Scotland, Chalmit is a trusted and leading manufacturer of lighting solutions to the Harsh, Hazardous and Industrial markets.

GET IN TOUCH:

getintouchuk@hubbell.com

+44 (0) 141 882 5555

www.hubbell.com/chalmit

Ashton Road
Bredbury Park Ind. Estate
Bredbury, Stockport SK6 2QN

HHI-CHL-CH-UK-03299 | April / 2025

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