UV PPE

PERSONAL PROTECTIVE EQUIPMENT

The Effects of Light Radiation in Modern Cultivation Environments

www.UVPPE.com

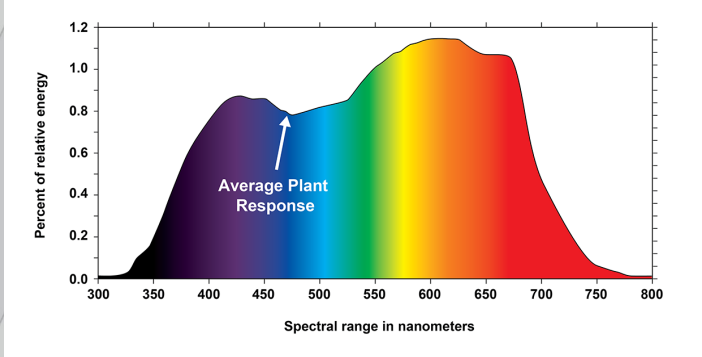
The Environment

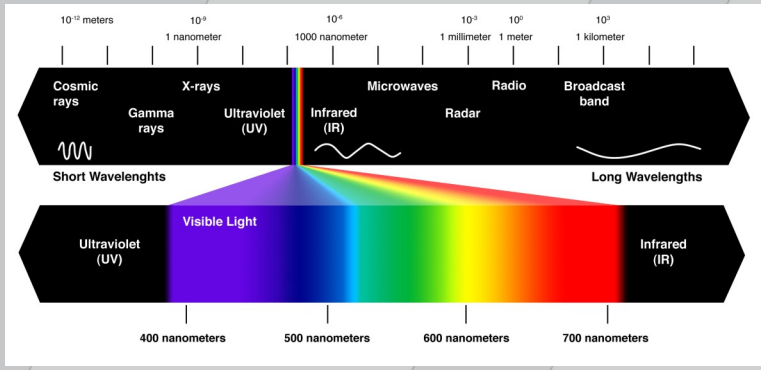
The cannabis industry is growing at the speed of light, literally. New technologies, advances in lighting and innovations in horticulture have revolutionized the process and speed at which cannabis is cultivated, harvested, and sold. This process has moved many operations indoors. The ability to control all aspects of the grow cycle is maximizing industry potential. However, despite all these amazing advances, the industry has all but ignored a sobering fact. The same lights that are revolutionizing the cultivation process are also exposing those working around them to significant light radiation. While much of the attention has been placed on sanitation and efficiency, next to no thought has been given to protecting employees from hazardous and unavoidable UV, visible and infrared light exposure.

No longer are the days of mercury vapor lamps and simple wave lengths. We are now seeing complex lights focused on energy efficiency and photosynthetic active radiation (PAR). PAR is the set of specific light waves that trigger biological responses. We have essentially created tanning beds for plants. Modern grow rooms are designed specifically with reflective surfaces to maximize the amount of light reaching the plants. While this is great for operational efficiency, it is placing workers at great risk of light radiation exposure.

Light Spectrum/UV Index

Modern grow lights are designed specifically to capitalize on the most effective aspects of the McCree Curve. The McCree Curve is the average photosynthetic response by plants to light energy. This curve usually spans from 360nm to 760nm on the light spectrum range.





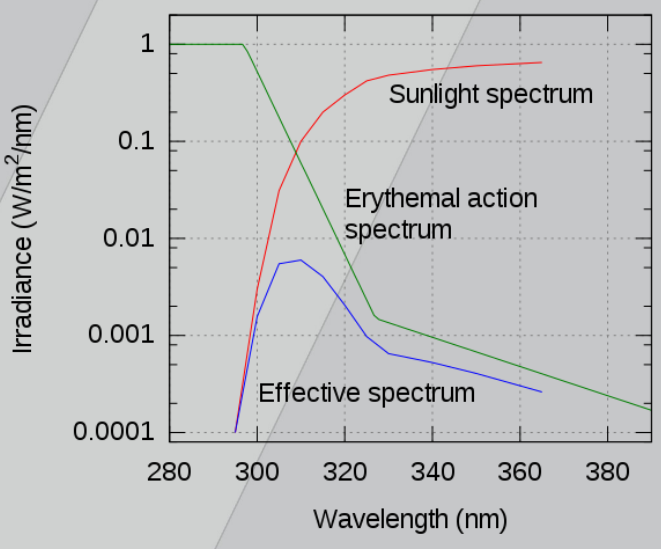
When you look at the EMR (electromagnetic radiation) spectrum, you see that the McCree Curve spans three specific sub categories. Ultraviolet (UV), visible and infrared (IR) values are all represented.

The UV Index is a number linearly related to the intensity of sunburn-producing UV radiation at a given point on the earth's surface. It cannot be simply related to the irradiance (measured in W/m2) because the UV of greatest concern occupies a spectrum of wavelength from 295 to 325 nm. Skin damage from sunburn, however, is related to wave length, the shorter wavelengths being much more damaging. The UV power spectrum (expressed as Watts per square metre per nanometre of wave length) is therefore multiplied by a weighting curve known as the erythemal action spectrum, and the result integrated over the whole spectrum.

This index will allow you to effectively read light charts according to relative intensity. This index provides an accurate value assessment of light radiation exposure.

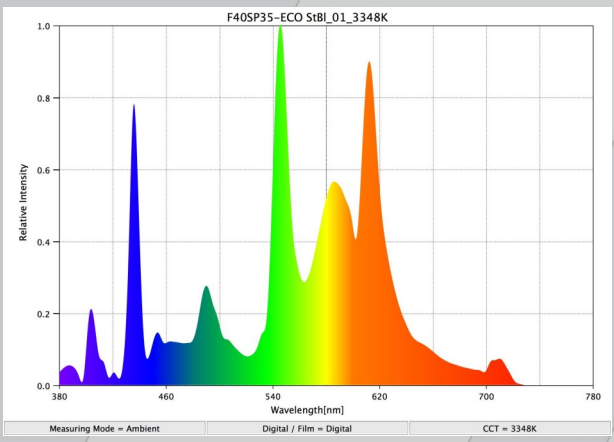
https://www.epa.gov/sunsafety/calculating-uv-index-0

UV Index	Exposure Level
2 or less	Low
3 to 5	Moderate
6 to 8	High
8 to 10	Very High
11+	Extreme

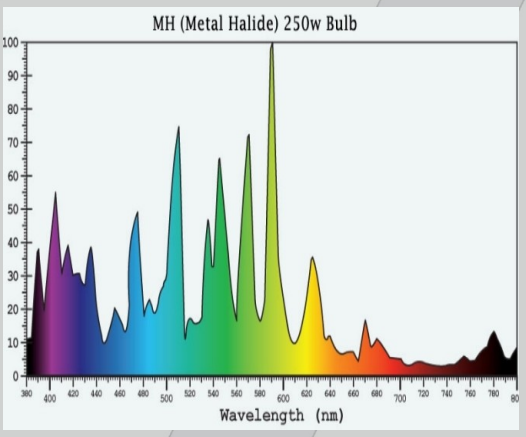


Modern Grow Lights

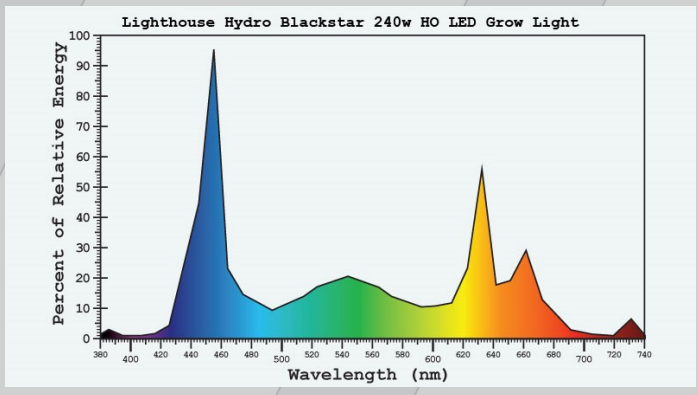
These are a few examples of modern grow lights and the light intensity they produce. When you consider the relative intensity, proximity to workers and the average duration of exposure, you begin to understand the potential health risks involved.



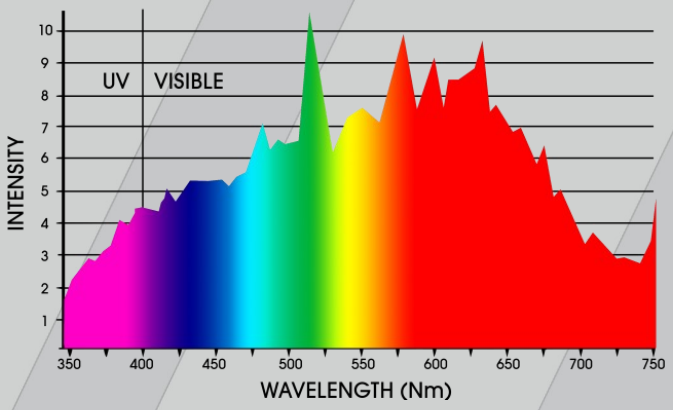
Compact Fluorescent Lightbulbs (CFL)



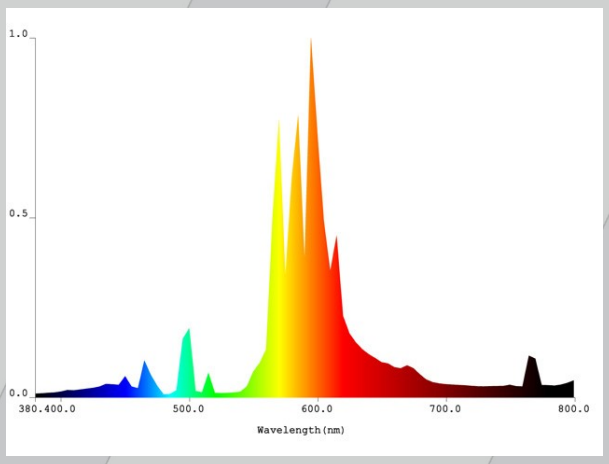
Metal Halide (MH)



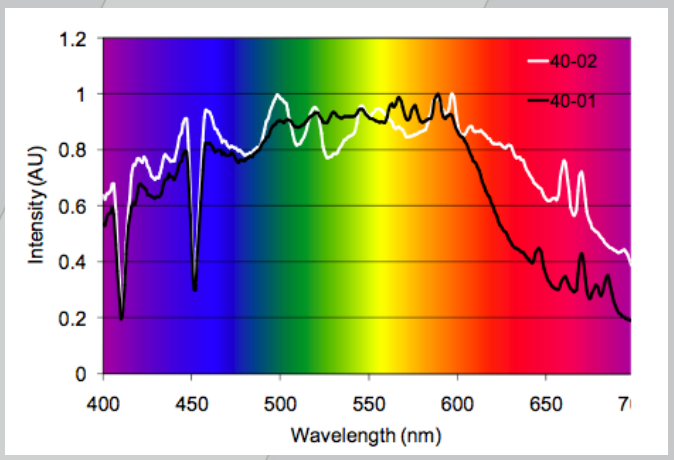
Light Emitting Diode (LED)



Ceramic Metal Halide (CMH)



High Pressure Sodium (HPS)



Plasma

Health Risks

With UV, Visible and IR radiation, we encounter serious health risks for each spectrum.

Ultraviolet (UV) Light Radiation:

Exposure to ultraviolet (UV) radiation is a major risk factor for most skin cancers. Sunlight is the main source of UV rays. Tanning lamps and beds are also sources of UV rays. Excessive exposure to UV exposure from these sources are at greater risk for skin cancer. Even though UV rays make up only a very small portion of the sun's rays, they are the main cause of the sun's damaging effects to the skin. UV rays damage the DNA of skin cells. Skin cancers start when this damage affects the DNA of genes that control skin cell growth.

According to the Skin Cancer Foundation, one in five Americans will develop skin cancer in the course of a lifetime. Over the past 31 years, more people have been diagnosed with skin cancer than all other cancers combined. Nearly 13 million are living with a history of either Basal cell carcinomas (most common type of skin cancer…appear as small fleshy bumps or nodules on the head and neck) or Squamous cell carcinomas (tumors that may appear as nodules or as red, scaly patches), while nearly 800,000 are living with a history of Melanoma (the most serious form of skin cancer). Between 40 and 50 percent of Americans who live to age 65 will be diagnosed with at least one of these two types of cancer. Melanoma, the most serious form of skin cancer, is now one of the most common cancers among adolescents and young adults ages 15-29 according to recent studies from the EPA. While melanoma accounts for about three percent of skin cancer cases, it causes more than 75 percent of skin cancer deaths.

http://www.skincancer.org/skin-cancer-information/skin-cancer-facts

Visible Light Radiation:

As a result of advances in the understanding of skin optics, combined with comprehensive studies regarding the absorption spectrum of endogenous and exogenous skin chromophores, have shown to be exerted by visible light radiation including erythema, pigmentation, thermal damage and free radical production. [It has also been shown that visible light can induce indirect DNA damage through the generation of reactive oxygen species. Furthermore, a number of photodermatoses have an action spectrum in the visible light range.]

https://www.ncbi.nlm.nih.gov/pubmed/18248499

Infrared (IR) Light Radiation:

Recent research has shown that IR and heat exposure induce cutaneous angiogenesis and inflammatory cellular infiltration, disrupts the dermal extracellular matrix by inducing matrix metalloproteinases, and alters dermal structural proteins, thereby adding to premature skin aging.

https://www.ncbi.nlm.nih.gov/pubmed/19675547

The Current Reality

Unfortunately, some work environments are more hazardous than others. Depending on the job, there are inherent risks assumed by employees and employers. In these circumstances, it is imperative that we do everything we can to protect all parties involved.

The modern cultivation operation has few, if any, safety standards focused on protecting workers from light radiation. Many operations have implemented sanitation inspired uniforms (hairnets, shoe covers, etc.) or medical inspired uniforms (scrubs, lab coat, etc.) to create a cosmetic effect of health and wellness. This is providing a false sense of confidence for employee's safety.

The clothing worn by most workers in these environments fails dramatically at protecting against light radiation. The Skin Cancer Foundation has done extensive research on the protective qualities of clothing the average person is wearing. In simple terms, your average cotton t-shirt ranges from 4-12 Ultraviolet Protection Factor (UPF). These numbers will vary per thickness of material, color, moisture in the air, moisture from your body, chlorine, amount the garment has been washed, along with many other factors. A common misconception is that because your skin isn't tanned or burned that you are not affected by the rays. This simply isn't true.

Cultivation on this level is a new reality for most states and it's legislation. Industry and technology will always move faster than safety and regulation.

We are in a unique position to see the future of cultivation, recognize the health risks and act accordingly. We can get ahead of this issue to prevent causing harm to our workers and protect businesses from devastating lawsuits.

The Solution

UVPPE is a family owned and operated company created to protect business owners and the workers they employ. We were conceived out of a passion for personal and environmental responsibility. Our goal is to educate employers on the inherent and growing health risks within the cultivation industry, while providing effective and affordable solutions that protect workers.

Our custom fabrics are of the highest quality, manufactured with cutting-edge technology, utilizing organic “green” fibers that carry an unparalleled level of light protective factors. All of our fabrics are tested over 50+ UPF (Ultraviolet Protective Factors), which is the highest rating a fabric can achieve. Our fabrics also reduce visible light transmission by up to 99% and significantly reduce IR radiation.

We take the utmost care to ensure that the fabrics we use for all our products are of the highest quality. We have an intense passion for what we do and oversee every step of the process when creating our safety options. We take great pride in that we are 100% made in America, protecting other American companies and workers. We use only U.S. manufacturers, allowing us to frequently visit their locations, ensuring our standards of craftsmanship and quality are upheld.

Our products offer the most complete protection available to ensure the safety and health of your team. By partnering with us, not only will you be protecting your team, you will be protecting the future of your business and the future of cannabis.

Your Protection is Our Passion.

References

https://www.epa.gov/sunsafety#uv

http://www.who.int/uv/en/

http://www.skincancer.org/prevention/uva-and-uvb/shining-light-on-ultraviolet-radiation

http://www.dermascope.com/sun/a-guide-to-light-protection#.WimkHEqnHuo

http://www.skincancer.org/prevention/uva-and-uvb

https://www.cancer.org/cancer/cancer-causes/radiation-exposure/uv-radiation/uv-radiation-does-uv-cause-cancer.html

https://www.cancercouncil.com.au/63295/cancer-prevention/sun-protection/sun-protection-sport-and-recreation/sun-protection-information-for-sporting-groups/how-ultraviolet-uv-radiation-causes-skin-cancer/

https://www.ncbi.nlm.nih.gov/pubmed/20883261

https://www.ncbi.nlm.nih.gov/pubmed/10711242

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3709783/

http://www.cancerresearchuk.org/about-cancer/causes-of-cancer/sun-uv-and-cancer/how-the-sun-and-uv-cause-cancer

https://www.iarc.fr/en/publications/pdfs-online/wrk/wrk1/ArtificialUVRad&SkinCancer.pdf

http://www.cell.com/cell-stem-cell/fulltext/S1934-5909(17)30368-5

https://www.epa.gov/sunsafety/health-effects-uv-radiation

https://www.ncbi.nlm.nih.gov/pubmed/18248499

http://www.who.int/uv/faq/uvhealtfac/en/

https://www.ishn.com/articles/94815-dangers-of-overexposure-to-ultraviolet-infrared-and-high-energy-visible-light

https://www.researchgate.net/publication/5602881_Effects_of_Visible_Light_on_the_Skin

http://ec.europa.eu/health/scientific_committees/opinions_layman/artificial-light/en/index.htm

https://www.health.harvard.edu/staying-healthy/blue-light-has-a-dark-side

http://physics.bu.edu/~duffy/PY106/Reflection.html

http://www.physicsclassroom.com/class/light/Lesson-2/Light-Absorption,-Reflection,-and-Transmission

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2627884/

https://www.maximumyield.com/eye-care-growroom/2/1458

https://www.epa.gov/sunsafety/calculating-uv-index-0

https://en.wikipedia.org/wiki/Ultraviolet_index