SAFETY MEMO

June 13th, 2022 – Laser Safety

DID YOU KNOW?

Background

What makes light from a laser different from other types of light? Light from a laser is of one wavelength (monochromatic), highly directional, and the light waves are in phase with each other (coherent). These properties of laser light allow it to have more energy within a small area and timeframe. Light emitted from other sources, like a light bulb or candle, emit photons of light in many directions away from the source and are a combination of multiple wavelengths.

Lasers are a widely used tools in manufacturing facilities and settings, and also for daily life.They can be used for cutting, drilling, welding, measurements, communication, sensors, etc. Althought most lasers are enclosed and should have built-in measure to prevent misuse, it is still important to understand how laser exposure affects you and the safety protocol in place.

Laser Hazards

Lasers are classified based on their wavelength of light, power, and pulse duration. The standard for laser classifcation is listed under **ANSI Z-136.1-2000**. The higher the classification of a laser, the higher the potential it has to cause biological damage. Lasers should never be looked at directly or pointed into another person or animal's eyes. High-power lasers can even cause damage from light reflecting off of surfaces. Laser are classified with the respect to their hazards based upon the wavelength, pulse duration and power, classifications are 1, 1M, 2, 2M, 3R, 3B and 4.

Non-beam hazards include:

- Electrical shocks
- Chemical exposure
- Explosion from components under pressure
- Ignition of flammable components

Hazard protection as per hiearchy of controls

- Protective housings to enclose laser (engineering control)
- Restricted areas, hazard zones, and caution signs for high class lasers (engineering control)
- Personnel training on lasers (administrative control)
- Personal protective equipment for eyes and skin (PPE)

Wearing PPE for lasers is the last line of hazard protection to protect a person's eyes and skin. It is not meant to be a permanent protection, but to provide the individual enough time to move away from the hazard and limit damage. The lens classification on safety glasses must match the wavelength of the light to ensure the glasses work effectively.

Figure 1: Examples of laser protective eyewear

"Laser irradiation of the eye may cause damage to the cornea, lens, or retina, depending on the wavelength of the light. Although the retina can repair minor damage, major injury to the retina may result in temporary or permanent loss of visual acuity or blindness" (Oregon State University).

"Skin is the largest organ of the body and, as such, is at the greatest risk for coming in contact with the laser beam. The most likely skin surfaces to be exposed to the beam are the hands, head, or arms" (Ibid.). Injury to the skin from a laser can either be a thermal injury or a photochemical effect (i.e. sunburn). The damage to the skin depends on power density, absorption, wave length and the time the beam is in the skin. Different wavelengths of light penetrate the skin in different ways as indicated below:

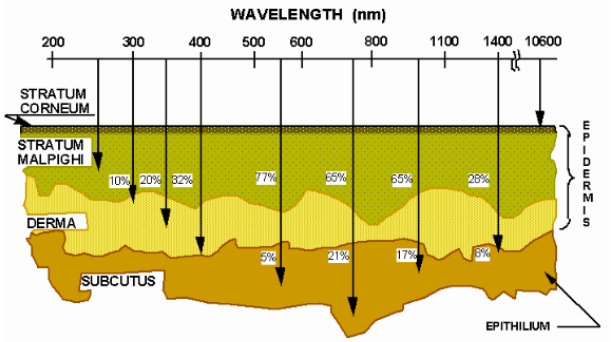

Figure 2: Laser depth on epidermis

References

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