TEAMSTERS
Safety & Health FACTS
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LASERS

Once seen as exotic and high tech, lasers are now safely being used in industry, construction, medicine, and a variety of other everyday locations. Technology has created uses for all types of lasers - from those found in compact disc players to those used in surgical procedures. Since there are such a variety of lasers in use, each laser must be classified according to the hazards it poses and handled accordingly.

Description:

The term LASER is an acronym for Light Amplification by Stimulated Emission of Radiation. These devices emit an intense, coherent, directional beam of light by stimulating electronic or molecular changes in a substance called the lasing medium. The lasing medium is a substance that can generate and emit laser energy and can be solid, liquid, gas or a semiconductor. The *type* of laser will indicate the lasing medium i.e., ruby, carbon dioxide, helium, etc.

Laser energy, technically described as radiation, is characterized by its *wavelength* usually measured in nanometers (nm). The wavelength indicates the region of the electromagnetic spectrum in which the output energy can be found. The electromagnetic spectrum includes visible light, ultraviolet light and infrared light, as well as the other 'radiations' such as x, gamma, microwave, and radiowave. Laser energy is limited to the region of the electromagnetic spectrum between ultraviolet and infrared, which includes visible light.

A laser's output varies based on its *operating mode* and *energy*. There are typically two operating modes for lasers: brief pulses (pulsed wave) and continuous emission (continuous wave). The energy of the laser is measured in joules for a pulsed wave laser and watts for continuous wave lasers.

The hazards associated with a laser depend on the characteristics described above. Type, wavelength, operating mode and energy are some of the characteristics that a professional will use to determine what safety controls are necessary and whether personal protective equipment is essential.

Hazard Classifications:

Class I - This laser is the least harmful of any laser. There is no hazard associated with direct beam viewing, reflected beam viewing, or skin contact. While there is no hazard in looking directly into this beam, it is still recommended that this practice be avoided.

Class IIA - This laser is a visible laser operating on a continuous basis and is not intended for viewing. Viewing for longer than 1000 seconds will result in eye injury.

Class II - This laser will produce eye injury if viewed longer than 0.25 seconds. This laser is a visible laser operating on a continuous basis and is not intended for viewing.

Class IIIA - See IIIB for description. Some limited controls are recommended to limit exposure.

Class IIIB - Both IIIA and IIIB can produce eye damage if viewed. Certain wavelengths of this class of laser will also cause skin damage. Class IIIA lasers are technically of lower energy than class IIIB, however, from a practical stand point they both can do damage. Viewing and beam contact with skin should be avoided. Specific controls are recommended to limit exposure to a class IIIB laser.

Class IV - This is the most dangerous class of laser and will cause eye damage if the beam enters the eye either directly or through reflection. This beam can burn the skin and can pose a fire hazard. Significant controls are required when a class IV laser is used.

The class of laser, as well as the energy output of the laser, must be designated on the label. This is the easiest way to determine what hazard class the laser falls under.

REMEMBER!!

AVOID LOOKING DIRECTLY INTO A LASER BEAM REGARDLESS OF ITS CLASS!!!

Potential Injury:

The eye and the components that make up the eye are at risk of injury when laser light is viewed. The cornea (the outer layer of the eye), the lens and the retina (the inner lining of the eye) are all potential sites for damage. The wavelength and energy of the laser, as well as the length of time exposed and whether appropriate personal protective equipment was worn, will determine the extent of the damage. Damage can range from minor, small burns and vision spots to something as serious as large burns and blindness. Remember that a

laser is concentrated light and the lens of the eye is designed to focus light. Therefore it is extremely important to avoid looking directly at a laser beam.

Skin damage may also occur from exposure to either a class IIIB or a class IV laser. These lasers may be intense enough to produce burns. The severity of the injury is dependent upon the wavelength of the laser, the energy output of the laser and the length of time exposed.

Protective Equipment:

Avoiding exposure to laser radiation involves choosing and using the appropriate personal protective equipment. A rating system known as optical density (OD) is used to rate laser safety eyewear. The system is based on the amount of laser energy that is prevented from passing through the eyewear. The higher the number (1-6, 6+) the more protective the eyewear since less energy can pass through. The laser safety eyewear should be chosen according to the type of laser, the laser energy output and the wavelength of the laser energy. The eyewear that is protective for a specific laser may not be very effective protection from another laser.

Standard operating procedures should be developed for beam alignment and maintenance on class IV lasers. Warning signs, beam enclosures, safety interlocks and controlled areas are some of the other types of protective measures, which will help reduce exposure to laser energy.

Exposure Guidelines:

A number of guidelines have been published to provide recommendations for the safe handling and use of lasers. The American Conference of Governmental Industrial Hygienists (ACGIH) and the American National Standards Institute (ANSI) have published two such guidelines. The ACGIH guideline provides exposure limits called Threshold Limit Values (TLVs), which are based on information from experimental studies. The ANSI guideline, the American National Standard for Safe Use of Lasers, ANSI Z136.1-1993, is an extremely detailed and technical reference. OSHA does not have a standard that specifically regulates laser exposures. The Occupational Safety and Health Administration consult the ANSI standard when a situation warrants.

Laser Safety Officer:

It is recommended that every facility that uses lasers have a properly trained individual responsible for the laser and its safe use. This person is typically called the Laser Safety Officer and is responsible for designing, implementing and maintaining a Laser Safety Program. This program should include training for any personnel involved in operating, or maintaining a laser system.

For More Information:

For more information please contact the IBT Safety and Health Department.