CWA Occupational Safety and Health Fact Sheet #17

Lasers & the Workplace

Many products of post-World War II technology have been widely implemented within the United States. Several of these innovations have occurred within the telecommunications, health care, and manufacturing industries. One such product is the laser. Although initially developed during the 1950's, laser equipment, in particular, laser-based fiber optic equipment and medical devices have only recently been introduced into the telecommunications, health care, and manufacturing industries. Within the telecommunications industry, CWA members should expect to see lasers in the form of fiber optic cables introduced at an increasing rate due to the fact that laser equipment can carry many more communications messages and require less maintenance than lead and polyurethane-encased cables. In the health care field, laser medical devices are being widely introduced and used for enhanced medical treatment. In manufacturing, lasers are frequently used in welding, cutting, and sealing operations. Union members also utilize laser equipment in medical micro-machinery, optical alignment, surveying, and writing operations.

CWA members employed as telecommunications installers, outside plant technicians, cable splicers, service technicians, manufacturing workers, and health care workers who use laser components or test equipment may be exposed to potentially hazardous laser equipment. In addition, members working at construction sites should be careful that they do not enter the path of a laser beam.

Laser means light amplification by stimulated emission of radiation. Lasers produce visible and invisible (ultraviolet and infrared) radiation in the non-ionizing portion of the electromagnetic spectrum. Lasers are made up of electromagnetic waves of the same wavelength and frequency that travel in one direction and are monochromatic (one color). Thus lasers are referred to as coherent light.

There are three types of laser beam generating media: solid state, gaseous state, and semi-conductor. Solid state lasers are used in such operations as tunneling and mining. The most common type of solid state laser is the ruby crystal. Gaseous state lasers, such as a helium neon laser, are most widely utilized in the construction industry for the purpose of establishing a reference line for dredging, tunneling, pipe laying, bridge building, and marine construction equipment. Semi-conductor lasers are most widely used in the transmission of communications signals. Because of the inability of semi-conductor laser beams to penetrate fog, rain, or snow very well, they are enclosed within telecommunications cables. In addition, solid state and gaseous state laser technology is widely utilized within the health care and manufacturing industries.

Lasers are categorized into five different classifications: Class I, Class II, Class III-a, Class III-b, and Class IV. These classifications reflect the ability of the laser beam to cause damage to the eyes or skin with Class I categorized as the least hazardous and Class IV the most hazardous. Class I lasers do not emit hazardous levels of radiation under normal operating conditions.

(However, direct eye exposure should be avoided.) Therefore, they are ruled to be exempt from guidelines established by the U.S. Center for Devices and Radiological Health (CDRH) and the American National Standards Institute (ANSI), a non-governmental organization involved in developing occupational safety and health standards.

Class II lasers are low-power devices that do not produce enough power to injure a person except when the source of the laser is stared at for a lengthy period. CDRH regulations require that employers put a caution label on Class II equipment.

Class III-a lasers include (visible) lasers that cannot cause injury to the unprotected eye except when viewing the laser with magnifying equipment such as a microscope. CDRH requires that a caution label be affixed to Class III-a lasers.

Class III-b laser equipment emits radiation that can cause injury to the eye if viewed directly or from a reflected beam. As with Class II and Class III-a lasers, caution labels must be displayed upon Class III-b laser equipment. Technically, laser equipment that is used for telecommunications transmissions is categorized as Class III-b. However, since under normal operation the laser beam is totally enclosed and protected, the CDRH classifies such equipment as a Class I laser system and, thus, is exempt from CDRH regulations. Of importance, when light-guide or laser telecommunications cables become disconnected or broken, they should be considered as Class III-b.

Class IV lasers produce radiation that may cause eye damage by direct viewing and/or from reflections. In addition, Class IV lasers may present a fire hazard. Thus where possible, the laser beam path should be controlled. When the beam path is not enclosed, a safety latch or interlock system should be used. Such a system would prevent operation unless the laser equipment is furnished with the proper enclosures. Class IV lasers must have a warning label affixed to them.

Health Effects

Lasers and laser equipment may be potentially hazardous to the eyes and skin. The degree of risk depends upon the type of laser beam, the frequency or power of the laser, beam divergence, as well as the intensity and duration of exposure.

The eye is the most susceptible to damage from laser radiation. Upon exposure, the cornea and the lens of the eye (located at the front of the eye) magnify and focus the radiation on the retina (located at the back of the eye). Direct exposure to a laser beam or a reflection of a laser beam may burn the retina causing partial or complete blindness. When a worker suffers eye damage, she/he should have an eye examination as soon as possible. Factors determining the amount of damage to the eye include the reaction of the cornea and lens, the presence or absence of reflective materials between the laser source and the eye, and the distance from the laser to the retina.

When working with lasers or laser equipment, optical aids like microscopes and binoculars should not be used (unless beam intensities are so low as to be absolutely safe). This practice should be followed because such optical aids serve as magnifiers of the laser beam, thus

increasing the intensity of the beam.

Skin exposure to laser radiation may cause mild reddening and swelling, blistering, or charring. The degree of harm is dependent upon the duration of exposure, radiation wavelength, and the amount of radiation absorbed.

In addition, the health hazard of electrical shock exists when CWA members are working with high voltage laser transmission components. Highly powered lasers also set off electrical discharges into the atmosphere, emitting ozone. Hazardous exposure to ozone may result in eye and upper respiratory irritation.

CWA members employed as light guide manufacturing workers are exposed to several unique and potentially hazardous working conditions. Not only do these employees encounter safety and health hazards associated with lasers, i.e., potential damage to the eyes and skin, they are also exposed to a variety of toxic chemicals and solvents, broken glass, electrical hazards, hazards associated with working on ladders and platforms, radio frequency radiation hazards, substances that can cause severe burns, and potential air contaminant hazards from chemical spills. Manufacturing employees who work directly with laser equipment should not look directly into the laser beam or reflection beam. Such exposure may result in partial or total blindness. Employers should ensure that manufacturing workers are provided with the necessary safeguards to ensure that all potential harmful exposures may be minimized/eliminated.

Controlling the Hazard

Laser hazard controls should be designed to eliminate or minimize potential eye/ocular hazards resulting from a direct laser beam or a reflection of the beam, as well as skin burns. Employers should utilize proper engineering controls to minimize/eliminate harmful occupational exposures. Engineering controls may depend on whether the laser equipment is used in or out-of-doors. As required, backstops and shields should be utilized to protect workers from possible exposure.

Employees should also be provided with necessary personal protective equipment such as gloves, eyewear, and clothing. Warning signs should be affixed to laser equipment that indicate the type of laser and potential eye and skin hazards. All surfaces in the laser area should be non-reflective and the work area should be brightly lit to prevent the dilation of the pupils. All flammable materials should be stored in proper containers and shielded from the laser beam. All electrical hazards should be safeguarded. Where possible, audible signals should be used to indicate when the laser equipment is in operation. Employers should also establish and maintain effective maintenance programs.

In addition, employers must provide CWA members who operate and/or are exposed to laser equipment with comprehensive training and education detailing the potential hazards of lasers. Only trained personnel should work with or near laser equipment.

Employers should establish a medical surveillance program for all CWA members working with or around laser equipment. Such a program would consist of a pre-placement medical

examination that should include opthamologic (eye) and dermatologic (skin) tests as well as a review of the worker's medical and work history. Information obtained from these medical examinations would allow for accurate detection and documentation of medical problems. Also, medical information and test results should be made available to all employees upon request.

OSHA's Laser Standard

Except for the construction industry, OSHA does not presently have a standard for lasers. However, CDRH regulations contain a series of control measures for Classes I - IV lasers. Included in the regulations are requirements such as proper eye protection, protective laser filters, limitations for eye and skin exposure, and visible and audible warning indicators. (A copy of the guidelines can be obtained by contacting the CWA Occupational Safety and Health Department).

In addition, ANSI has set recommended maximum permissible exposure levels for lasers. These guidelines should be used to determine hazardous exposure levels. (A copy of the guidelines can be obtained by contacting the CWA Occupational Safety and Health Department).

Since OSHA does not have a laser standard for General Industry work, we should refer to the CDRH and ANSI guidelines when investigating potential overexposure. Therefore, CWA members should use these guidelines to determine and prevent hazardous work operations.

What Can You Do?

All CWA members should make sure that their employer is maintaining a safe and healthful workplace. The key to making the workplace safe for all CWA members is strong, active, local safety and health committees. The committee can identify dangerous conditions at the workplace and discuss them with management. If the employer refuses to cooperate, the committee can request an OSHA inspection. The committee should always coordinate its activities through the local officers, the CWA Representatives, and negotiated safety and health committees.

In addition, CWA members may obtain information and assistance by contacting the:
CWA Occupational Safety and Health Department
501 Third Street, NW
Washington, D.C. 20001-2797
Webpage: www.cwasafetyandhealth.org
Phone: (202) 434-1160.

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