

Safe Use of Lasers in Construction

"LASER" is an acronym for Light Amplification by Stimulated Emissions of Radiation.

Engineering Controls

Engineering controls, such as protective housings, remote controls, or enclosed laser-beam paths ensure protection for laser operators except when the operator is setting up, adjusting or maintaining the beam.

Eye Safety

Light is radiant energy and is defined as electromagnetic radiation. It is measured in wavelengths and described in nanometers (nm). A laser produces an intense beam of light of a single wavelength (or color) and frequency. Laser intensity varies from low power (Class 1, 2, and 3A lasers), to medium (Class 3B) to high power (Class 4). The American National Standards Institute (ANSI) classifies lasers into categories and gives guidelines on laser safety in the standard Z136.1. Following are laser categories as outlined by ANSI.

- Class 1:** Cannot emit laser radiation at known hazard levels. Users of Class 1 lasers are generally exempt from radiation hazard controls during operation and maintenance, but not necessarily during service. Most Class 1 industrial lasers consist of a higher class laser enclosed in a properly interlocked and labeled protective enclosure.
- Class 2:** Low-power visible lasers. Emit laser radiation above Class 1 levels and radiant power not above 1mW. The human aversion reaction to bright light will protect the person from this low level. Example: a supermarket laser scanner.
- Class 3A:** Intermediate-power lasers. Only hazardous for intrabeam viewing. Some limited controls are usually recommended. Example: a helium-neon laser used in the construction industry.
- Class 3B:** Moderate-power lasers. Not generally a fire hazard and not capable of producing a hazardous diffuse reflection, except in instances of intentional staring at distances close to the diffuser. Specific controls are recommended.
- Class 4:** High-power lasers. Hazardous to view under any condition (directly or diffusely scattered). Potential fire hazard and a skin hazard. Significant controls are required for Class 4 laser facilities. Example: an Excimer laser operating in the ultraviolet.

A laser's danger varies depending on which area of the light spectrum it is generating. The ultraviolet radiation laser (180-400nm) causes corneal burns. Lasers in the near-infrared region (780-1800nm) cause retinal damage. These are usually Class 2, 3A, 3B and 4 lasers. The high-powered lasers, Class 3B and 4, can also cause electrical shock and skin burns. A skin cover, like opaque gloves and tightly woven fabrics, and or a "sun screen" may be recommended.

A laser consists of a resonant optical cavity filled with an active medium. The medium is acted upon by some source of excitation energy. The media could be one of three types: a solid state, a gaseous state, or a semiconductor or injection-type. Solid lasers use a crystal, e.g., ruby, glass or a semiconductor (argon) as the light amplifying substance, producing a pulsating laser beam. A gaseous state laser (helium-neon) produces a continuous beam.

For information on the laser's wattage or power of the laser, refer to the instruction/maintenance manual.

LASER USE IN THE CONSTRUCTION INDUSTRY

The construction industry uses lasers for many applications. Lasers may be a concern to people who do not understand the effects and the level of power in the beam. In construction, the laser is used primarily as a leveling device. It may be set up to indicate elevation, direction, or both. A laser used for this purpose will probably be a Class 1 laser, which is generally considered incapable of producing damaging levels of laser emission.

In its regulation for Non-Ionizing Radiation (29 CFR 1926.54), the Occupational Safety and Health Administration (OSHA) provides the standard for safe laser use. All lasers used in construction are covered by this standard. However, OSHA recognizes that the degree of hazard associated with low power lasers used in construction is relatively low, and that Class 1 lasers are generally not hazardous.

Here are some good operating guidelines. Safety Rules for Class 1 Lasers in Construction

- ☐ Only qualified and trained people should set up, operate, or adjust the laser.
- ☐ The operator must be in the area and have proof of qualifications on his or her person.
- ☐ The laser beam should be set up over the heads of people in the area, when possible.
- ☐ Never direct the laser beam at people.
- ☐ When working with lasers, use your head for thinking, not as a laser target.
- ☐ The laser operating area should be posted with laser warning placards.
- ☐ The laser should be capped or shut off when not in use.
- ☐ Use only mechanical or electronic means for laser beam detectors.
- ☐ Avoid using lasers in heavy dust, snow, rain, or fog conditions.
- ☐ The laser must have the maximum beam output tag attached.