

Laser Safety Factsheet

Lasers are classified to describe the capabilities of a laser system to produce injury to personnel. This classification rates from Class 1 lasers like laser printers to Class 4 lasers like 2000 Watt carbon dioxide laser used to cut steel. The manufacturer is required to label Class 2, 3 and 4 lasers with a warning label which will also have the laser's classification printed on it.

Class 1 lasers are low powered devices that are considered safe from all potential hazards. Some examples of Class 1 laser use are: laser printers, CD players, DVD devices, geological survey equipment and laboratory analytical equipment. No individual, regardless of exposure conditions to the eyes or skin, would be expected to be injured by a Class 1 laser. No safety requirements are needed to use Class 1 laser devices. Class 1 devices are likely to contain a class 2 or greater laser, but due to the device configuration the exposure potential has been eliminated. If a Class 1 device is modified, laser exposures are possible.

Class 2 lasers are low power ($< 1\text{mW}$), visible light lasers that could possibly cause damage to a person's eyes. Some examples of Class 2 laser use are: classroom demonstrations, laser pointers, aiming devices and range finding equipment. If class 2 laser beams are directly viewed for long periods of time damage to the eyes could result. Avoid looking into a Class 2 laser beam or pointing a Class 2 laser beam at a person. Be aware of reflective surfaces that could reflect the beam at a person. Avoid viewing Class 2 laser beams with telescopic devices. Realize that the bright light of a Class 2 laser beam into your eyes will cause a normal reaction to look away or close your eyes. This response is expected to protect you from Class 2 laser damage to the eyes.

Class 3R lasers are continuous wave (CW), intermediate power ($1\text{-}5\text{ mW}$) devices. Some examples of Class 3R laser uses are the same as Class 2 lasers with the most popular uses being laser pointers and laser scanners. Direct viewing of the Class 3R laser beam could be hazardous to the eyes. Avoid viewing Class 3R laser beams directly. Avoid point a Class 3R laser beam at a person. Avoid viewing a Class 3R laser beam with telescopic devices; this amplifies the problem.

Class 3B lasers are intermediate power (CW $5\text{-}500\text{ mW}$ or pulsed 10 J/cm^2) devices. Some examples of Class 3B laser uses are spectrometry, stereolithography, and entertainment light shows. Direct viewing of the Class 3B laser beam is hazardous to the eye and diffuse reflections of the beam can also be hazardous to the eye. Avoid viewing the Class 3B laser beam directly. Avoid viewing a Class 3B laser beam with telescopic devices. Whenever occupying a laser controlled area, wear eye protection suited for the wavelength and power of the laser. Refer to the Iowa State University Laser Safety Manual for complete instructions on the safety requirements for Class 3B laser use.

Class 4 lasers are high power (CW. $>500\text{mW}$ or pulsed $>10\text{J/cm}^2$) devices. Some examples of Class 4 laser use are surgery, research, drilling, cutting, welding, and micromachining. The direct beam, specular and diffuse reflections from Class 4 lasers are hazardous to the eyes and skin. Class 4 laser devices can also be a fire hazard depending on the reaction of the target when struck. Most laser eye injuries occur from reflected beams of class 4 laser light, so keep all reflective materials away from the beam. Remember it is the roughness of the surface relative to wavelength that determines the reflectivity of the surface. Whenever occupying a laser controlled area, wear eye and skin protection appropriate for the wavelength and power of the laser(s) in use. Greater controls are required to ensure the safe operation of this class of laser devices. Refer to the Iowa State University Laser Safety Manual for complete instructions on the safety requirements for Class 4 laser use.

Be mindful of all lab personnel when using laser devices; *laser safety only works when precautions are utilized.*