

Laser Hazard Assessment Guide

Evaluating a work operation for operational efficiency and potential safety hazards is one of the basic responsibilities of a lab manager and, in fact, is a basic component of Cal-OSHA's required Injury and Illness Prevention Program. Performing a hazard assessment to identify work hazards is essential to creating a safe work area. Before you can minimize risks, you need to know what the risks are. The chart below summarizes hazards and protective measures common to laser operations.

1. Examples of Hazard Assessments

a. Common Laser Beam Hazards

- Invisible beams (infrared, ultraviolet)
- Person leaning across beam path
- Contact from escaping beams
 - Damaged or burned clothing
 - Burned or damaged eyes
 - Escaping beam causing combustible materials to burn- fire hazard
 - Damage to walls and equipment
- Direct or reflected viewing of beam
 - Flash blindness
 - Temporary vision loss
 - Damaged cornea
 - Burned retina

b. Indirect Laser Hazards

- Reflective surfaces
 - Jewelry, mirrors, shiny metal objects
- Toxic or pressurized chemicals
 - Off gassing of dyes and chemicals
 - Hazardous chemical exposure
 - Compressed gases
 - Cryogenic fluids
 - Explosion of high pressure lamps
- Electrical
 - High voltage
 - Electric shocks
 - Electrical fires

c. Protective measures that minimize risk of injury

- Securing beam stops
- Shielding to contain stray beams
- Using low power alignment lasers
- Restricting access
- Wearing eye protection
- Warning signs clearly posted
- Mapping the beam path(s)

- Removing jewelry
- Using interlocks
- Training
- Locking out during maintenance
- Using lowest practical power
- Consistently enforcing safe practices

2. Note commonly observed unsafe practices that cause preventable laser accidents:

- Not wearing protective eyewear during alignment
- Misaligned optics and upwardly directed beams
- Malfunctioning equipment
- Improperly handling high voltage components of the laser system
- Lack of consideration for non-beam hazards- electric shock is the main cause of serious injury and death
- Intentionally exposing unprotected personnel- horseplay
- Bypassing interlocks and housing on doors and laser
- Turning on the power supply accidentally- not following required lockout procedures
- Wearing the wrong eyewear for the laser being used
- Operating unfamiliar equipment- lack of training and awareness of risks

3. Example of an SOP for alignment with included hazard assessment

Laser users can prevent laser-related accidents. According to a former LSO at Lawrence Berkeley National Laboratory, 60% of laser accidents in research settings occur during the alignment process.

Task: Alignment

Potential Hazards	Protective Measures	SAMPLE: Alignment Procedures
<ul style="list-style-type: none"> ▪ Beam hitting an eye ▪ Beam hitting flammable or combustible materials ▪ Injury to visitors ▪ Beam escaping confines of the optics table 	<ul style="list-style-type: none"> ▪ Isolate the area during alignment ▪ Choose the correct eye wear ▪ Wear the provided eye wear ▪ Mark the back side of each beam stop ▪ Double-check beam stop locations ▪ Use the lowest practical power setting ▪ Take off jewelry ▪ Set beam paths below eye level of people working in the area ▪ Clearly mark any beam directed out of a horizontal plane ▪ Don't allow unauthorized or unnecessary people in the room during alignments 	<ol style="list-style-type: none"> 1. Put up a shielding curtain 2. Make sure warning sign "Keep Out. Alignment in progress" is visible 3. Put on the orange UVEX laser goggles 4. Check beam stop locations and secure them 5. Power up the system 6. Take the He-Ne alignment laser and align the beam as required 7. Identify and terminate each and every stray beam coming from any optical component moved 8. Make sure beam paths are at a safe working height below the eye level of the user(s) before you leave