

Laser Inspection Guidelines

Inspection category

Engineering Safety Controls

Administrative and Procedural Controls

Personal Protective Equipment (PPE)

Documentation

Emergency Response

Engineering Safety Controls:

L01: Laser generating machine secured:

All laser generating machines should be secured to avoid any accidental change in direction of beam path.

L02: Laser optics secured to prevent stray beams:

All optics used in a procedure should be secured to prevent any stray beams.

L03: The beam path not at eye level.

The laser beam height should be maintained at the appropriate height that is not at eye level for sitting or standing persons.

L04: Open beam:

Count the number of laser in the lab that have open beam and then check for their safety requirement.

L05: Enclosed beam:

Count the number of lasers in the lab that have enclosed beam and check for their safety requirements.

L06: Appropriate beam stops or attenuators in place.

When required by the Laser SOP, Class 4 lasers or laser systems must have permanently attached beam stops or attenuators.

L07: Protective housing with interlock present.

Protective housing interlocks must not be defeated or overridden unless the requirements of an LSO approved SOP are met.

L08: Emergency stop/key or Master switch present

A master switch present on a Class 3B or 4 laser or laser system. A master switch which will terminate the beam must be included on a Class 3B or 4 laser or laser system. It may be operated by a key or coded access.

L09: Activation warning system present

The activation warning system is not working. A visible and/or audible activation warning system must be present for Class 4 lasers or laser systems.

L10: Laser viewing optics:

All viewing optics used in a laser experiment should be designed to protect the user from direct exposure to laser beams.

L11: Windows covered:

Laser labs windows and door viewing panels should be covered with laser absorbing material. No beam should ever escape out of laser controlled area (LAC).

L12: Reflective material:

All reflective materials should be kept out of beam path.

L13: Fiber optics present:

Fiber optics present very low risk of laser radiation. However, all the connectors should be connected with a laser tag.

Administrative and Procedural Controls

L14: Laser safety training:

All persons operating a laser or laser system must complete and document the proper level of training.

L15: Laser Standard Operating Procedure:

The laser or laser system SOP was not up to date. The laser specific SOP must accurately reflect the current laser operations and characteristics. Changes to laser SOPs must be approved by the LSO prior to implementation. All the SOPs should be signed by all users in the lab.

L16: LSOP available in laser labs

A specific Laser Standard Operating Procedure (SOP) was not in place. An LSO approved SOP must be in place for each Class 3R, 3B and 4 (including embedded) lasers or laser systems.

L17: LCA posted:

The Laser Control Area (LCA) was not properly posted. For Class 3R, 3B and 4 lasers and laser systems, an appropriate warning sign must be posted at the LCA. The laser specific SOP will specify the posting requirements.

L18: Warning Labels

All laser machines should have a visible warning label present indicating class of laser and its power.

L19: Door sign posted:

All door that lead to the the laser labs should have door sign indicating type and power of laser as a part of Hazard Communication Standard.

L20: Laser beam alignment procedure present:

Laser beam alignment procedures were not followed. When performing beam alignment for Class 3B and 4 lasers, the control measures outlined in the specific laser SOP must be followed.

L21: Laser beam directed towards windows or entry points

The laser beam was directed at windows, across corridors or at LCA entry points. The laser beam must be oriented such that it is not directed at windows, across corridors or at LCA entry points.

L22: Laser safety guidelines:

Lab specific laser safety guidelines should be posted in all laser labs.

L23: Laser safety manual;

A Copy of laser safety manual should be available in laser labs

L24: Emergency contact list posted:

Emergency contact information should be posted in the lab with all necessary numbers for emergency. EH&S will provide a template.

L25: Fiber optics connector tag present

A fiber optic connector which would allow access to Class 3B or 4 laser radiation was not tagged appropriately. For fiber optic laser systems where laser power termination is not possible, a label or tag bearing the words "Hazardous Laser Radiation When Disconnected" must be attached to the fiber optic connector.

Personnel Protective Equipment

L26: Proper laser eye protection available

Laser safety eyewear available in good condition Laser protective eyewear was not being used by Laser Operators or individuals within the LCA. When required by the specific laser SOP, laser protective eyewear must be worn by laser operators and individuals present in the LCA. The eyewear may be required for routine use and/or beam alignment.

L27: Laser safety eyewear available in good condition

The laser protective eyewear was not in good physical condition. Laser protective eyewear must be kept in good condition. Examples of poor condition include loose or stretched straps, scratched lenses, unclear OD markings or inadequate frame integrity.

L28: The laser protective eyewear with correct Optical Density (OD) and for correct wavelength.

The laser specific SOP designates the proper OD protective eyewear which must be worn. The OD must be correct for the specific laser beam wavelength and be marked on the eyewear.

L29: Protection against UV laser available:

Ultraviolet (UV) laser personnel protection was not adequate. When required by the specific laser SOP, clothing (sleeves or gloves) or beam shields may be required to protect the skin from UV exposure.

L31: Laser protective barriers or curtains present.

Laser barriers or curtains used to prevent laser radiation exceeding the MPE from exiting the LCA must be appropriately rated. They must also be properly placed and in good condition.

Non-Beam Hazards

L32: Electrical Hazard:

Electrical hazard control measures were not properly implemented. High Voltage Power hazard and Optical tables properly grounded are common hazards that are observed in a laser lab. The laser specific SOP may list control measures for electrical hazards which must be implemented. Electrical hazards identified during the laser safety inspection must be addressed, and the appropriate control measures should be incorporated into the laser specific SOP.

L33: Collateral radiation hazard:

Collateral and/or plasma radiation hazard control measures were not properly implemented. The laser specific SOP may list control measures for collateral and/or plasma radiation hazards which must be implemented. Collateral and/or plasma radiation hazards identified during the laser safety inspection must be addressed, and the appropriate control measures should be incorporated into the laser specific SOP.

L34: Fire /Explosion hazard:

Fire and/or explosion hazard control measures were not properly implemented. The laser specific SOP may list control measures for fire and/or explosion hazards which must be implemented. Fire and/or explosion hazards identified during the laser safety inspection must be addressed, and the appropriate control measures should be incorporated into the laser specific SOP.

L35: Compressed gas hazard:

Compressed gas hazard control measures were not properly implemented. The laser specific SOP may list control measures for compressed gas hazards, which must be implemented. Compressed gas hazards identified during the laser safety inspection must be addressed, and the appropriate control measures should be incorporated into the laser specific SOP.

L36: Chemical hazard:

Laser dye and/or solvent hazard control measures were not properly implemented. The laser specific SOP may list control measures for laser dye and/or solvent hazards, which must be implemented. Laser dye and/or solvent hazards identified during the laser safety inspection must be addressed, and the appropriate control measures should be incorporated into the laser specific SOP.

L37: LGAC: Laser generated Airborne Contaminant:

The laser specific SOP may list control measures for LGAC such as small particle, fumes, nanoparticle hazards which must be implemented. Glass particle and/or nanoparticle hazards identified during the laser safety inspection must be addressed, and the appropriate control measures should be incorporated into the laser specific SOP.

L38: Cryogen Hazard:

Cryogens are used to cool down the atmosphere around laser for specific studies. Steps of Cryogen safety should be included while writing SOP for laser.

L39: Biological Hazard:

Biological agent hazard control measures were not properly implemented. The laser specific SOP may list control measures for biological agent hazards, which must be implemented. Biological agent hazards identified during the laser safety inspection must be addressed, and the appropriate control measures should be incorporated into the laser specific SOP.

Documentation

L40: All Class 3B and Class 4 lasers registered with EH&S:

The laser or laser system was not registered with the LSO. Each Class 3R, 3B and 4 laser or laser system (including embedded lasers) must be registered with the LSO. The registration form is available in the Environmental Health and Safety (EH&S) office and may be obtained from the EH&S website.

L41: All SOP's and alignment procedure submitted to EH&S

The Laser Standard Operating Procedure(s) does not accurately reflect the lasers and laser systems in use. Each laser or laser system requiring a SOP must have a specific SOP which accurately documents the laser characteristics (i.e., class, power, control measures etc.).

L42: Lab specific training documented

Laser Standard Operating Procedure (SOP) Training Record was not located at the time of inspection. This record must be located in the laser use area and be readily available for inspection.

The Laser safety training is mandatory for all users. This training is periodically conducted by the USC Laser Safety officer.

L43: All documents required for audit are present

Required Laser Safety Records were not available for audit. All laser safety records must be organized and kept in a central location. These records include the Laser Standard Operating Procedure (LSOP) and the Laser Standard Operating Procedure Training Record and must be:

Kept in a clearly labeled binder or binders.

Maintained in a central location

Available for inspection.