The Laser Hazards Survey form is a basic risk analysis that enables a lab and the EHS Laser Safety Office to identify and prioritize the risks associated with laser use in the lab. The survey encompasses personnel using and with access to the lab, training, the lasers being used, the laser types and features, lab setup, tools available, and an entry level assessment of the behavior-based performance within the lab. The Laser Hazards Survey does not take the place of a Laser Lab Inspection, but rather supplements it by giving the lab owner a starting point in addressing the specific risks present within their laser lab. This form is ideally completed along with the laser registration form at the time of purchasing a laser and before putting the laser into operation. Forward the completed copy to EHS for review.

**Laboratory Information:**

|  |  |  |  |
| --- | --- | --- | --- |
| Laboratory PI Name: |  | Date: |  |
| Building & Room #: |  | Department: |  |

**Laser Hazard Survey:**

|  |  |  |  |
| --- | --- | --- | --- |
| **General Information** | | | |
| **#** | **Question:** | **Answer:** | **Control Measure / Corrective Action:** |
| 1 | What class of laser is being used within the lab (i.e. Class 3B or 4)? |  | If Class 4 lasers are used, diffuse reflection hazards, skin exposure hazards, and fire hazards will need to be accounted for. |
| 2 | Will the laser setup be open beam or enclosed? |  | For open beam use, contact EHS for additional control measures such as lab entry barrier (curtain), eyewear use, reflection control. |
| 3 | How often will the laser setup be used (i.e. daily, weekly, monthly)? |  | Information Only – The more often the laser system is used, the greater the chance of injury/incident. |
| 4 | How many people will be using the laser setup? |  | All personnel using the laser system must complete OH-304 Laser Safety training. |
| 5 | How many people have unescorted access to the laser lab? |  | All personnel with unescorted/unrestricted access to the laser lab mush complete OH-304 Laser Safety training. |
| 6 | How is the laser lab secured (i.e. lock & key, key pad, badge access, unsecured)? |  | The laser lab must remain closed while the laser is in operation, and secured at all times. |
| 7 | Is the room posted and identified as a laser lab space (i.e. ANSI Z136 signage)? |  | Laser postings alert personnel entering the lab of the laser hazard. Contact EHS for laser signage. |
| 8 | If the laser lab contains a Class 4 laser, does the entrance have a visual indicator (i.e. lighted sign) to identify when a laser is in use? |  | The illuminated sign alerts personnel entering the lab of the Class 4 laser hazard. Contact EHS for illuminated signage installation. |
| 9 | Has EHS been notified of the presence of all lasers within the lab space? |  | Complete the Laser Registration Form from the laser safety webpage and forward to EHS along with the laser data sheet, manual, and/or operating parameters. |
| 10 | Has a hazard analysis been performed and documented by EHS including determination of the MPE, Eyewear OD, NOHD, NHZ? |  | Forward the laser data sheet and operating parameters to EHS for completion of the hazard analysis. |
| 11 | Has the hazard analysis been completed for both a worst-case scenario (i.e. max power) as well as for planned operating conditions? |  | Forward the laser operating parameters (wavelength, power/energy, pulse width, rep rate, beam diameter, divergence) to EHS for a hazard analysis based on the operating conditions. |

|  |  |  |  |
| --- | --- | --- | --- |
| **Training** | | | |
| **#** | **Question:** | **Answer:** | **Control Measure / Corrective Action:** |
| 1 | Have all personnel with unescorted access to the laser lab space been identified and assigned laser safety training by EHS? |  | Forward a list of all personnel with access to the laser lab space to EHS to assign OH-304 Laser Safety training. |
| 2 | Have all personnel with access to the laser lab completed the assigned OH-304 Laser Safety training? |  | Contact personnel directly for completion of training. Access to lab space will not be granted without successful completion. |
| 3 | Has the laser lab owner developed lab specific training to address the specific risks associated with their lab space? |  | The laser owner (e.g. P.I.) is to develop and document laser specific training for the safe operation of their system. |
| 4 | Has the laser lab owner developed a standard operating procedure (SOP) for safe operation of the laser system? |  | See the laser safety webpage for the SOP template and completed examples. Forward the completed SOP to EHS for review. |
| 5 | Will laser alignments be performed? |  | Laser alignments require additional protocols that must be reviewed and approved by EHS such as an alignment SOP. |
| 6 | Who will be performing laser alignments? |  | Lab specific laser alignment training must be completed by all personnel performing alignments. |
| 7 | How often is laser alignment expected to be performed (i.e. daily, weekly, monthly, never)? |  | Information Only – The more often personnel are interacting with the beam, the greater the risk of injury/incident. |
| 8 | Does the SOP include protocols for the safe alignment of their laser system (e.g. power reduction, use of shutter, use of beam blocks)? |  | The laser owner (e.g. P.I.) must develop an SOP including protocols for alignment if alignments are to be performed. See the Laser Safety webpage for SOP templates and examples. |
| 9 | Does the SOP include protocols for the safe startup and shutdown of the laser lab? |  | The SOP must include protocols for the safe startup and shutdown of the laser lab. |
| 10 | Does the SOP include protocols for the safe operation of the laser system (i.e. how you conduct your experiment)? |  | The SOP must include safety protocols for the regular operation of the laser lab. |

|  |  |  |  |
| --- | --- | --- | --- |
| **Personal Protective Equipment** | | | |
| **#** | **Question:** | **Answer:** | **Control Measure / Corrective Action:** |
| 1 | Has the lab purchased eyewear for laser use? |  | All Class 3B or 4 open beam laser labs must utilize approved laser unless specifically authorized by EHS. |
| 2 | Has the eyewear been reviewed and approved by EHS taking into account the worst-case scenario and the operating conditions of the laser system? |  | Contact EHS for review of the laser eyewear under worst case and normal operating conditions. Forward the laser eyewear data sheet to EHS along with request. |
| 3 | Has the lab purchased adequate pairs of eyewear for all personnel present within the lab while the laser is in operation? |  | All personnel in the lab must have approved laser eyewear, otherwise they must be excluded. |
| 4 | Is the laser eyewear labeled with the applicable wavelength range and optical density? |  | Contact EHS for review of the eyewear if not done so already. Eyewear labeling will be reviewed as part of their approval. |
| 5 | Has a storage location been designated for laser eyewear? |  | Designate a laser eyewear storage area with labeling according to the applicable laser system. |
| 7 | Is the eyewear stored under the lab’s control but outside the NHZ (see EHS hazard analysis) to allow users to don the eyewear before entering a hazardous area? |  | Ensure there is a physical barrier between the storage location and the optic table (e.g. laser curtain). |
| 8 | Does the storage location clearly identify which eyewear is to be used for which laser? |  | Label each eyewear storage area with the laser unit’s Make/Model/Wavelength/OD that the eyewear is approved for. |

|  |  |  |  |
| --- | --- | --- | --- |
| **Laser & Optic Table Setup** | | | |
| **#** | **Question:** | **Answer:** | **Corrective Action:** |
| 1 | Will the primary laser aperture be pointed towards an entrance or any commonly occupied area? |  | During the planning process, ensure the primary laser aperture is pointed towards an unoccupied area. Mirrors can be used to direct the beam to the working area. |
| 2 | Is there a direct line of sight from the lab entrance to the surface of the optic table? |  | A barrier (i.e. laser curtain) must be installed to prevent the laser beam or a reflection from entering an uncontrolled area. See EHS for curtain recommendations. |
| 3 | Will the laser setup utilize blocks or barriers to separate the optic table from occupational space (i.e. partial enclosure, optic table walls)? |  | The primary beam and reflections must be blocked from working areas such as desks, benchtops, doorways. Contact EHS for barrier recommendations. |
| 4 | Is an optical shutter present? |  | The laser beam must be blocked prior to introducing an optic or altering the beam path. If a shutter is not present on the laser itself, an external shutter is needed. Contact EHS for shutter recommendations. |
| 5 | How is power reduced when interacting with the beam (e.g. variable power control, ND filter, pump shutoff/blocking, attenuation by polarization, beam splitting)? |  | Power must be reduced to the lowest usable setting prior to interacting with the beam. Power reduction method and settings must be specified by the laser owner prior to releasing the laser for operations. |
| 6 | Will the laser setup utilize optics with expected secondary specular reflections (e.g. ND filters, Polarizers, Beam Splitters, Wedge Mirror/Windows, Retro Reflectors, Prisms, Gratings)? |  | All reflections must be accounted for and blocked using an appropriate blocking material. The location of these reflections should be demarcated on the table or within the operating procedure. |
| 7 | Will hazardous opto-mechanics be used in the laser setup (e.g. flipper mirrors, periscopes, rotational filters)? |  | All reflections must be accounted for and blocked using an appropriate blocking material. The location of these reflections should be demarcated on the table or within the operating procedure. |
| 8 | Will optics be introduced into a live beam as part of the laser operation? |  | Introduction of optics and/or materials into a live beam path requires EHS approval prior to performing, otherwise the shutter must be used along with the steps for introducing an optic as stated in the Laser Alignment Guide. |
| 9 | Will any sequential optics be separated by long distance (>1m)? |  | Specific protocols for aligning long distance optics are to be specified within the SOP by the laser owner. |
| 10 | Will multiple wavelengths be present simultaneously (e.g. pumping, harmonic generation)? |  | Contact EHS with all beam parameters to complete the hazard analysis. Control measures such as blocking and enclosing, as well as eyewear, will be approved by EHS prior to operation. |
| 11 | Will the beam be amplified (e.g. Q-switching)? |  | Contact EHS with the beam parameters (e.g. optical gain and output) to complete a hazard analysis. |
| 12 | Will the beam be expanded or condensed (e.g. focusing lens, OAP, grating)? |  | Contact EHS with the beam parameters (e.g. beam diameter, divergence) to complete a hazard analysis. |

|  |  |  |  |
| --- | --- | --- | --- |
| **Tools** | | | |
| **#** | **Question:** | **Answer:** | **Control Measure / Corrective Action:** |
| 1 | Have viewing cards with the appropriate wavelength been purchased? |  | Review the applicable wavelength range stated on the viewing card. Users should be trained on the beam paths, how to use a viewing card, and power reduction to prevent injury/incidents. |
| 2 | Have an adequate number of beam blocks been purchased to contain the planned specular reflections from optics? |  | All reflections must be contained to the optical table. The laser owner should plan on acquiring an adequate number of blocks to accommodate the reflections generated in their laser setup. |
| 3 | Is a power meter readily available for use within the lab? |  | The power output of the laser system should be measured at least annually. Contact EHS for a power measurement if needed. |
| 4 | For lasers operating in the infrared region, is an IR viewer readily available for use after optics are aligned or introduced to the beam path? |  | An IR viewer is much more efficient and thorough than using viewing cards when detecting reflections. If the lab does not own an IR viewer, access to one should be established by the lab owner. |
| 5 | Are mounted Irises available for alignment? |  | If alignments are to be performed, the steps must be specified within the laser SOP. Irises allow for a proven effective means of alignment. |

|  |  |  |  |
| --- | --- | --- | --- |
| **Non-Beam Hazards** | | | |
| **#** | **Question:** | **Answer:** | **Control Measure / Corrective Action:** |
| 1 | Have all items (i.e. optics, tools) been designated a storage location other than the optic table? |  | Excess materials and optics may not be stored or left on the optic table while the laser is in operation. The lab owner must provide and designate a storage area for all materials. |
| 2 | Will high voltage be used or accessible in the laser setup (e.g. pockel cell controller)? |  | Laser users must be trained in electrical safety prior to working with voltages above 50V. Contact EHS for electrical safety training. |
| 3 | Will the optic table be grounded? |  | Laser optic tables are to be grounded. Contact EHS for grounding options. |
| 4 | Will cables and power cords traverse walking paths creating a trip hazard? |  | Walking paths must be kept clear of trip hazards such as cables. Cable bridges and covers may be used. |
| 5 | Will chemicals (e.g. laser dyes) be used in the laser setup? |  | Contact EHS for chemical use approval. |
| 6 | Will compressed gases or cryogenics (i.e. NO2, He) be used in the laser setup? |  | Contact EHS for compressed gas approval. |
| 7 | Will any biological materials be used in the laser setup? |  | Contact EHS for biological material approval. |
| 8 | Will flammable or combustible materials be used on the optic table? |  | Contact EHS for flammable or combustible material use and approval. |

|  |  |  |  |
| --- | --- | --- | --- |
| **Behavior Based Performance** | | | |
| **#** | **Question:** | **Answer:** | **Control Measure / Corrective Action:** |
| 1 | Do laser users know to keep the entrance closed and secured at all time while in operation? |  | Laser users are to be instructed on lab security during their lab specific OJT conducted by the laser owner. |
| 2 | Will the laser ever be left unattended while in operation? |  | The lab owner shall specify the conditions which it is acceptable to leave a laser unattended within the SOP. EHS must approve the measures prior to operation. |
| 3 | Will laser operations ever be performed overnight or after working hours? |  | The lab owner shall specify the conditions which it is acceptable to leave a laser unattended within the SOP. EHS must approve the measures prior to operation. |
| 4 | Do users understand the importance of housekeeping and maintaining lab organization? |  | The lab owner shall ensure housekeeping is maintained by users within their lab. Storage locations for all materials shall be designated by the lab owner. |
| 5 | Do users know to visually verify their eyewear is adequate prior to entering a laser lab space? |  | To be conducted by the lab owner during OJT. |
| 6 | Do users know to never introduce an object to a live beam? |  | See the Laser Alignment Guide. To be conducted by the lab owner during OJT. |
| 7 | Do users know how to operate the optical shutter and when to do so? |  | To be conducted by the lab owner during OJT. |
| 8 | Is the shutter controller readily accessible, or does it require the user to walk around the table for each use? |  | Users should be aware of the risks of taking shortcuts such as not shuttering the beam prior to introducing an optic. To be covered by the lab owner during OJT. |
| 9 | Do users know to never bring the beam to eye level (i.e. keep the beam parallel to the table)? |  | The beam is to remain parallel to the table at all times unless using approved measures such as periscopes and vertical breadboards. Contact EHS with any plans to bring the beam to eye level. |
| 10 | Do users know to announce their plans of interacting with the beam to other personnel prior to performing the action? |  | Laser users interacting with the beam are to announce their actions to other personnel present to ensure they are able to protect themselves (i.e. ensuring eyewear is being worn properly) |
| 11 | Do the users know how to properly use an alignment card (i.e. sweep the bottom end of the card downwards from the downstream direction putting the specular reflection into the optic table; never orient the viewing card reflection towards the eye) |  | To be conducted by the lab owner during OJT. |
| 12 | Do users know to never peak or lift eyewear to view the beam including reflections (e.g. viewing the visible portion of an 800nm beam)? |  | To be conducted by the lab owner during OJT. |