

Johns Hopkins Safety Manual		
<i>Subject:</i>	<i>Last Review Date</i>	6 Nov 2013
Homewood Laser Safety Manual	<i>Page</i>	1 of 16

## Rationale

This Laser Safety Manual contains valuable information regarding policies and procedures for using laser-based equipment as part of activities at Johns Hopkins University (JHU) and directly reflects our institution's commitment to fostering of a culture of safety on the Homewood campus.

## Purpose

This manual is designed to be a framework to allow and encourage members of the JHU community to responsibly use and operate lasers as outlined in the following American National Standards Institute (ANSI) standards:

- ANSI Z136.1, American National Standard for Safe Use of Lasers
- ANSI Z136.5, American National Standard for Safe Use of Lasers in Educational Institutions
- ANSI Z136.8, American National Standard for Safe Use of Lasers in Research, Development and Testing

It establishes minimum standards for safe operation of experiments undertaken for the purposes of recognized scientific and engineering research and development. Where appropriate, the language of these standards is utilized though not explicitly cited.

The Laser Safety Program will include:

- The appointment of a Laser Safety Officer (LSO)
- An education program for all personnel and students who may be involved with lasers or exposed to laser hazards as a part of their involvement with JHU along with their training status.
- A program to track and monitor from entry to exit all Class 3A / 3R, 3B and 4 Lasers
- The medical monitoring of laser operators where appropriate.
- An incident / accident reporting and review process designed to encourage the reporting of even the most minor incidents so that they can be used as a tool to prevent reoccurrence or escalation of that incident.
- Establishment and maintenance of a Laser Safety Sub-committee as a central source of information on laser safety for the university and to review all laser incidents.

## References / Resources

### The JHU Health and Safety Manual –

- HSE 004- Injury and Incident Reporting
- HSE 007 - Use of Protective Eye and Face Equipment
- HSE 310 - Information Collection and Evaluation System (ICES)
- HSE 809 - Laboratory Clearance Policy
- HSE 808 – Response to Laboratory Emergencies
- HSE 810 - Laboratory Equipment Clearance Policy

### Informative references

- HSE G04 - Medical Surveillance
- HSE G05 - Guidance For Basic Safety Training For All Staff And Students Who Are To Work In Laboratories
- HSE G07 - Guidance and Prudent Practices for Chemical Use in Laboratories
- HSE G09 - Guidance For Laser Pointers

## Definitions

The ANSI Z136.1 contains a lengthy list of definitions. The Laser Safety Policies of JHU use those definitions. The following list contains definitions for those instances where exceptions occur, emphasis is required or additional definitions are used to supplement the ANSI list.

- ALO – Authorized Laser Operator – An ALO is a person who is recognized as having successfully completed laser safety training offered or authorized by the Homewood LSO and is recognized by the PI for a specific designated laser lab as being fully capable of running experiment(s) and making adjustments to those experiments inside the NHZ as cleared by the LSO in accordance with reviewed and accepted SOP'(s)
- ANSI – American National Standards Institute
- CFR – Code of Federal Regulations
- Controlled Lasers – As an educational institution the JHU Homewood campus track and controls all Class 3 4 lasers and unclassified lasers under development.
- Incident – For the purposes of the reporting requirement of the manual, an incident requiring reporting is one where injury did or could have occurred.
- HSC – Homewood Safety Committee
- HLMS-Homewood Laser Management System
- HLSS – Homewood Laser Safety Sub-committee
- HSE – The Johns Hopkins Department of Health Safety and the Environment
- JHMI – Johns Hopkins Medical Institutions
- LSO – Laser Safety Officer, a person who has the authority and responsibility to monitor and enforce the control of lasers hazards and effect the knowledgeable evaluation and control of laser hazards on the Homewood campus. This individual is appointed jointly by the Dean's offices for the Whiting School of Engineering and the Krieger School of Arts and Sciences.
- LU –Laser User – A LU is a person who is recognized as having successfully completed laser safety training offered or authorized by the Homewood LSO. is recognized by the PI for a specific designated laser lab as being fully capable of operating the laser from outside the NHZ.
- MOSH – Maryland Occupational Safety and Health. Enforces occupational safety and health laws within the state of Maryland.
- MPE – Maximum Permissible Exposure
- NHZ – Nominal Hazard Zone
- OSHA – Occupational Safety and Health Administration. OSHA is a federal agency charged with overseeing occupational safety and health on a national basis. OSHA may delegate their responsibility to a state (See MOSH).
- PI – Principal Investigator –The PI is the immediate supervisor for the safety of university employees and for students working in laboratories under their control.
- PLO - Principal Laser Operator – A PLO is any ALO who has sign-off authority and responsibility to approve a Laser SOP. The PLO usually is the PI who responsibility for operating a particular laser lab.
- The Standard – Refers to the appropriate section(s) of ANSI Z136.1-8
- Shall – understood as mandatory
- Should - understood as advisory [Note: In some cases JHU has decided to elevate SHOULD language from ANSI Z136.1 to be SHALL due to the nature of our institution and its educational responsibilities.]
- SOP – Standard Operating Procedure – Laser SOP's are meant to provide guidance as to how to set-up, calibrate / align, and run specific lasers experiments safely and in a manner which will yield reproducible experimental results.

## Responsibilities and Duties

**University / Departmental Administration** is responsible for ensuring that the necessary resources are made available to those individuals who are implementing this program.

**LSO (Laser Safety Officer)** – The LSO is appointed jointly by the Deans' offices of KSAS and WSE. This individual has the authority and responsibility to effect the knowledgeable evaluation and control of laser hazards, the implementation of appropriate control measures, as well as to monitor and facilitate compliance with recognized or required standards and regulations. Specific Duties and Responsibilities include:

- Establishing and maintaining adequate policies, procedures for the control of laser hazards.
- Establishing and maintaining a safety education and training program to ensure the safety of laser personnel.
- Developing plans to respond to incidents of actual or suspected exposure to potentially harmful laser radiation. These plans will include:
  - Provisions for providing prompt medical assistance to potentially exposed individuals.
  - The investigation of the incident and the documentation and reporting of the investigation results to the HSC and HSE.
- Determining which personnel should be evaluated by Occupational Health Services for possible medical monitoring
- Classifying and or verifying classifications of lasers and laser systems on the Homewood Campus.
- Hazard evaluation of laser work areas with a focus on minimizing risk, maintaining research quality to the greatest extent possible under that restriction.
- Assuring that prescribed control measures are implemented and operable. This includes:
  - Avoiding unnecessary or duplicate controls, and recommending or approving substitutes or alternate control measures when the primary ones are not feasible or practical.
  - Utilizing periodic audits, surveys and inspections to confirm the adequacy and functionality of safety control and measures.
- Reviewing and approving the safety aspects of:
  - All installations, facilities, and equipment involving Class 3B and Class 4 Lasers prior to use. When undergraduate students in teaching labs are involved this also includes all Class 3A/3R Lasers.
  - The purchase of all Class 3B and Class 4 lasers and Class 3A/3R lasers to be used by undergraduate students.
  - Written SOP's for all Class 3B and Class 4 laser systems and other procedures that may be part of the requirements for administrative and procedural controls. For lasers used by undergraduate students as part of a class laboratory this requirement extends to Class 3A/3R lasers
  - All protective equipment, for example, eyewear, clothing, barriers, screens, etc.
  - The wording of all area signs and equipment, to be in accordance with the Standards wherever possible.
- Assuring that the necessary records required by applicable JHU policies and that governmental regulations are maintained.
- Accompanying regulatory agency inspectors (e.g. OSHA, MOSH, FDA/CDRH, etc.) reviewing the laser safety program or investigating an incident and documenting any discrepancies or issues noted. Assuring that corrective action is taken, where required.

**PLO (Principal Laser Operator) / PI** – As the immediate supervisor PLO's are responsible for ensuring the safety of all individuals for whom they have responsibility for who may be exposed to laser radiation greater than Class I. As a result, they should have detailed understanding and knowledge of laser safety requirements. Their specific responsibilities include:

- Ensuring all personnel working in their labs are properly trained and supervised.
- Submitting plans for laser installations or modifications to the LSO for review prior to operating the equipment in their areas.
- Confirming to the LSO that relevant staff (administrative managers, purchasing, building management, etc.) is aware of the pending acquisition a Class 3 or 4 laser or laser system.
- Preparing and maintaining SOP's for all Class 3B and 4 lasers under their control. The SOP's shall be reviewed by the LSO before implementation.
- Maintaining records of individuals allowed and trained to work with lasers in their areas of responsibility and providing these to the LSO as requested for medical surveillance scheduling and training completion.
- Ensuring the safe and responsible disposition of all unused, unneeded, but potentially hazardous Class 3B or Class 4 lasers and components.
- Ensuring the proper reporting of incidents where injury did or could have resulted from an exposure to laser radiation for those lasers under their control. This includes implementing the JHU laser emergency response plan (see Appendix C and HSE 808), complying with JHU accident policies (refer HSE 004), and notifying the LSO.
- Implementing corrective actions to prevent reoccurrence of incidents when informed that they have occurred.
- Obtaining appropriate medical attention for any employee, student, or visitor involved in a laser accident (refer HSE-004).
- **Prohibiting** the operation of a laser in their area unless there are adequate controls of all laser hazards to employees, students, visitors, and the general public.
- **Prohibiting** the operation of a new or modified Class 3B or Class 4 laser installation under their authority without the approval of the LSO.
- **Prohibiting** the operation of a new or modified Class 3A laser installation by students under their instruction without the approval of the LSO.

**ALO / LU (Authorized Laser Operator / Laser User)** – The specific responsibilities of ALO's and LU's include:

- Completing laser safety training offered or authorized by the Homewood LSO before working with any laser system other than class 1 or 2.
- Using lasers safely while complying with safety rules and procedures as prescribed by the PLO and the LSO.
- Being familiar with all applicable SOP's they are expected to perform. ALO's are allowed to work inside the NHZ's, while LU's are only allowed to run experiments and processes outside the NHZ.
  - LU's shall not defeat system interlocks.
  - When working inside within the NHZ while lasers are active, ALO's shall ensure that others do not enter the area.
- Reporting suspected or actual incidents where injury did or could have resulted from an exposure to laser radiation they are operating /using to their supervisor or the Homewood LSO.

**Lab Instructors** - Those individuals actively involved teaching undergraduate and graduate lab courses where students are actively using controlled lasers shall

- Be qualified as ALO's; this includes Teaching Assistants (TA's) and Lab Technicians.
- Ensure that all students using the lasers in the labs have adequate training for the hazards they will face in the lab in accordance with HSE G05.
- Be present when students are using lasers unless formally authorized by the LSO.
- Secure Lasers used by the students after each use.
- Reporting suspected or actual incidents where injury did or could have resulted from an exposure to laser radiation of any person in the lab which they are responsible for to their supervisor or the Homewood LSO.
- **Prohibit** the operation of a new or modified Class 3A, 3B or 4 laser installations by students under their instruction without the approval of the LSO

**Students** - Students working with lasers Class 3A, 3B, or 4 as part any graduate or undergraduate class shall receive specific training as approved by the LSO before being allowed to work with the lasers.

- Students shall only operate Class 3A or higher lasers with an instructor present unless specifically authorized by the LSO.

**Homewood Laser Safety Sub-committee** – The HLSS will consist of at least three members plus the LSO. The LSO shall serve as chair of the committee. The three core members will be selected as follows:

- A PLO already sitting on the general HSC as appointed by the chair of the HSC.
- A PLO from KSAS as appointed by the Dean of KSAS.
- A PLO from WSE as appointed by the Dean of WSE.

The HLSS shall be responsible for:

- Establishing and maintaining adequate policies and practices for the evaluation and control of laser hazards, including the recommendation of appropriate laser safety training programs and materials
- Maintaining an awareness of all applicable new or revised laser safety standards. This includes communicating directly with staff and faculty of the various departments, centers and labs on the Homewood campus.
- Reviewing and auditing accident reports to verify compliance with applicable laser safety policies.
- Resolving conflicts or issues identified by PLO's, ALU's, LU's and other parties
- Performing annual Laser Safety Program reviews.

## Classes of Lasers

All lasers with the exception of Class 1 with rated power of less than 1mW have the potential to cause harm to the eye. To minimize the possibility of harm JHU follows the recommendations of the Standard with regard to tracking and monitoring lasers on the Homewood Campus.

The following laser classes are controlled on the Homewood campus and shall be registered using the Homewood Laser Monitoring System

- Class 4
- Class 3B
- Class 3A / 3R
- Class X – Lasers not specifically identified in accordance with ANSI standards. These lasers may be under development as new lasing sources.

The following laser classes are not controlled on the Homewood campus, but users of these lasers are expected to understand the risks associated with the lasers and for Class 2 and 2M (other than laser pointers) should receive Laser Safety Training

- Class 2
- Class 2M
- Class 1
- Class 1M

## Emergencies, Accidents, Incidents and Revocation

All laser accidents and incidents shall be reported in a timely fashion to the LSO. Failure to report accidents and incidents appropriately (refer HSE-004) may result in revocation of SOPs or permission to use lasers.

Accidents are defined as any incident where people are injured or equipment is damaged in a manner inconsistent with the approved SOP and /or not directly associated with the experiment.

Incidents are defined as any situation where:

- Individuals were potentially exposed to laser light in excess of acceptable standards even though no injury was immediately noticed.
- Lasers and / or associated equipment
  - **Did not** perform as indicated in the SOP
  - **Did not** perform as anticipated
  - Performed or was asked to operate in any way which may impact safety even if spelled out in the SOP.

Once incidents are reported they will be reviewed by the HLSS to determine the root cause for the incident and what should be done to prevent reoccurrence. This review should be completed within 10 business days.

Copies of the report shall be sent to:

- The PLO for the laser
- The Chair of the Department and or Center Director of the PLO
- The HSC
- HSE
- To the manufacturer of the laser and appropriate regulatory bodies as appropriate.

The information from such incidents should be included as a part of all future laser training programs at the discretion of the LSO.



## Laser Hazards and Control Measures

The focus of the Homewood Laser Safety Program will be to reduce the possibility of harm by the exposure to the eye and skin of laser radiation, or exposure to other hazards associated with lasers and laser systems during operation, servicing, maintenance and storage when not in use.

**Types of Hazards** – Laser irradiation is not the only hazard that exists with lasers. When considering the installation of a laser the following hazards shall be considered as part of the installation approvals and SOP's. The list presented in Appendix A is illustrative and should not be considered exhaustive.

JHU shall implement a hazard control program that utilizes the hierarchy of controls detailed in Figure 1:

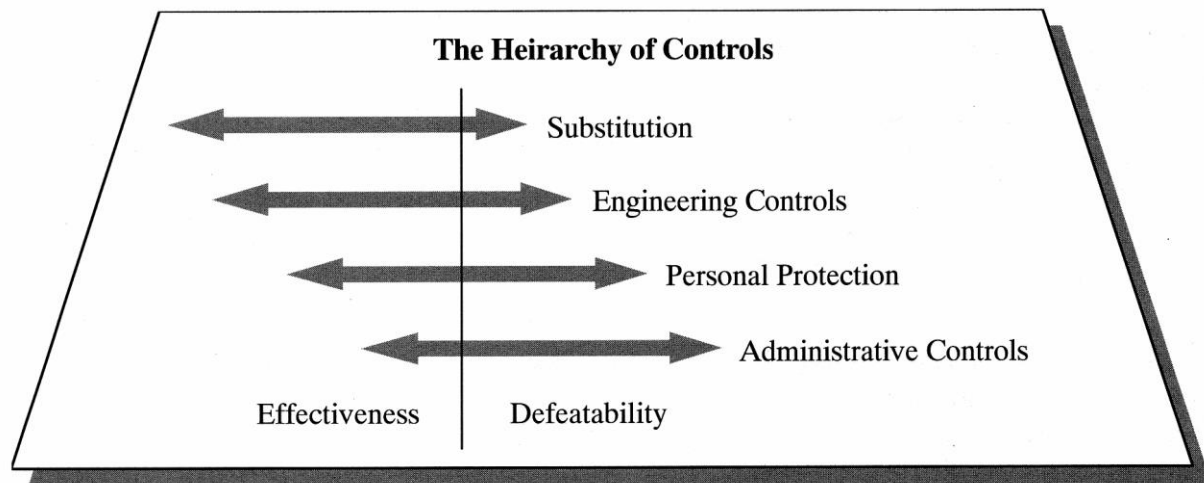


Figure 1: Hierarchy of Controls from LIA-Laser Safety Manual, 2007 (lia.org)

**Substitution** -Substitution is always the optimal method of control. Elimination of a risk totally ensures safety against that hazard. It is understood that risks cannot be eliminated, but they should never be greater than absolutely warranted (or than a level deemed acceptable).

The lowest power lasers necessary shall be utilized in existing or planned installations. If a higher power laser is selected because of planned future experiments, the SOPs shall be developed considering those hazards and experiments.

As a substitute to direct viewing a laser beam within the NHZ, alternate means of viewing the beam during alignment should be considered. Considerations include:

- Charge Coupled Devices (CCDs)
- Web cameras
- Thermal imagers
- Fluorescent papers and panels
- Disposable targets

**Engineering** – Engineering controls are features and other design characteristics of laser systems implemented to prevent the incidental over exposure by blocking or preventing laser light from escaping a defined path in an uncontrolled manner such that it could cause injury to people or damage equipment.

Engineering controls shall be the first line of defense in preventing over exposure to laser light. All engineering controls on the Homewood campus shall be implemented using the best practices of the Standard except where alternate methods and/or materials confer an equivalent degree of risk reduction.

## Personal Protection Equipment (PPE)

- Eyewear is primarily concerned with protecting the retina as well as other ocular structures from exposure to laser light. Laser glasses can protect the lens of the eye from ultraviolet (UV) light, and both the interior and exterior of the eye from infrared (IR) exposure. Properly selected eyewear will reduce the incident exposure to the eye to less than the Maximum Permissible Exposure (MPE) as defined by the Standard while maximizing Total Visible Light (TVL) transmission.
- All eyewear used on the Homewood Campus in conjunction with Class 3 and 4 lasers shall be reviewed and verified by the LSO. For details see Section 8 of the Standard.
- Other – Class 4 (especially IR and UV) lasers may require other PPE. The LSO shall verify that required PPE is present (see appendix A).
- Medical monitoring is required for all ALU's of Class 4 lasers and is recommended for Class 3B lasers. This medical monitoring shall start with a retinal examination and visual acuity study prior to working with lasers. Upon leaving the university JHU students and employees shall be given a second study upon request.

## Administrative Controls

It is recognized that due to the nature of research work undertaken on the Homewood Campus, it is not possible to implement engineering controls to design out or remove all hazards. This is especially true where lasers must be aligned to ensure that an experiment is properly set up.

- Training -All PLOs, ALOs, and LUs using systems containing controlled lasers shall receive training to ensure that they are fully cognizant of the laser hazards they will face and what precautions they must take to ensure the safety of themselves and others.

Initial training shall be given prior to using the laser system with a refresher training being given once per year for class 4 lasers and every other year for class 3B lasers.

- Undergraduate students shall receive laser training when operating or using any lasers Class 3 or Class 4. There shall be specific training modules tied to each class where the lasers are being used.
- SOP's - Proper training shall be supplemented with SOP's to ensure that ALO's take all necessary steps to ensure their own safety and the safety of others while aligning lasers or otherwise working inside the NHZ. [See appendix B]

SOP's shall anticipate the all known possible uses of the laser system being described, including but not limited to the fundamental emissions of the beam (frequency, power, rate), the specifications of the NHZ, or engineering controls to be used in order to minimize the need to resubmit the SOP for review.

Additionally SOP's shall be supplied to guide LU's to ensure that they can run experiments or other operations safely.

ALU's and LU's shall immediately inform the appropriate PI and the LSO when they suspect that a SOP's has been violated or when believe that an SOP is not meeting its intended safety objectives.

- Signage – Signage has two functions:
  - Inform spectators and other casual users of a space of the existence of lasers.
  - Act as a reminder to users of the space that lasers are present and what considerations are necessary to ensure safety.

All controlled laser installations on the Homewood campus shall be indicated with the appropriate signage as recommended by the Standard.

- Records –The following records shall be kept by JHU as noted for the duration indicated.

- Training Records – for as long as a long as the individuals involved are at the Homewood campus (PI and LSO).
- Laser Registrations - For a minimum of five years after disposal (see Laser Acquisition, Transfer and Disposal Section) (LSO).
- SOPs – For a minimum of five years after the laser facility has been taken out of service (see appendix B) (PI and LSO)
- Medical records (for those under medical surveillance) for a minimum of two years after the individuals involved have left the Homewood campus (Occupational Health).

## Laser Acquisition, Transfer, and Disposal

Laser Users have an obligation to ensure that lasers are used safely from before purchase through to final disposition and disposal. On the Homewood campus all Class 3 and 4 lasers shall be tracked and monitored using the HLMS. All other lasers should be purchased by the users with the understanding that they are responsible for ensuring that the lasers are disposed of properly as electronic waste to prevent injury to others.

- Acquisition or use of any new Class 3 or 4 lasers on the Homewood Campus shall be reported to the LSO. The LSO shall review all new laser installations to:
  - Evaluate the appropriateness from a laser safety standpoint for the planned application.
  - Confirm that the lowest power necessary for the intended use is purchased.
  - Determine what engineering controls should be implemented as part of the installation.

When purchasing Class 1, 1M, 2, 2M and 3A/3R lasers the user should have a plan for their proper use and eventual disposal.

- Once a new Class 3B or 4 laser is on campus it:
  - Should be registered with the HLMS within 24 hours.
  - Shall have preliminary (filed but not necessarily approved) SOP in place prior to being energized, this includes:
    - The names and training status of all certified ALO's and LU's.
    - Establishment of the NHZ.
    - Assurance that all personnel using the laser system have adequate PPE.
  - Shall have an SOP approved by the LSO in within two months of being first energized.
  - Shall have the SOP updated and reviewed on an annual or more frequent basis.
- When a laser is removed from service it can be:
  - Placed in safe secure storage under the control of the PI.
  - Placed in safe secure storage under the control of the LSO for the purpose of reassigning to other PI's and or Departments.
  - Sold or other donated to other responsible laser user outside the university.
  - Disposed as excess property.

In all cases lasers shall be handled following best practices for lasers and other electronics and in compliance with JHU laboratory equipment clearance policy (HSE 810). Wherever possible all laser components should be ultimately recycled.

## Appendix A

### List hazards associated with lasers from ANSI Z136.1-2007

- Physical Hazards
  - Electrical hazards
  - Fire and Explosion hazards
  - Mechanical hazards associated with robotics
  - Noise
  - Glass particle hazards
- Fiber optic use
  - Sharps
  - Connectors
  - Conduits
- Chemical Agents
  - LGAC – Laser Generated Air Contaminates
  - Compressed gases
  - Laser dyes
  - Other toxic chemicals
  - Hazardous gases
- Collateral and Plasma Radiation
  - Ionizing
  - RF
  - ELF
  - UV – Ozone production
  - Static Magnetic Fields
  - X- and Gamma Rays
  - Particle Beams
  - Radio-activation
- Biological Agents
  - LGAC's
  - Infectious materials
- Human Factors

## APPENDIX B

### SOP Outline for Homewood Laser Management System (HLMS)

#### **SECTION 1 - LASER REGISTRATION (To be completed the day the laser arrives, can be partially completed)**

- Description of each laser [Part of the input supplied when registering a laser]
  1. Classification
  2. Lasing medium
  3. Beam characteristics
    - Divergence
    - Aperture diameter
    - Pulse length
    - Repetition rate or CW
    - Maximum output
      - J/pulse
      - mW
- Location of laser (site, building, room)
- Application of the beam or purpose of experiment
- Is this part of a multi-laser system – Yes / No

#### **SECTION 2- ASSIGN SOP NUMBER**

- System assigns number
- SOP can have multiple lasers of the same or difference ratings

#### **SECTION 3 – Identify Hazards / Controls (To be completed before laser is energized)**

- Identify beam and non-beam hazards (from Appendix A)
- Establish control requirements (Reviewed and approved by LSO)
  - Access Controls (door interlocks, signs, etc.)
  - Beam Controls (key locks, enclosures, beam blocks, shutters, etc.)
  - Electrical Controls on High Voltage
  - Medical surveillance requirements established for Class 4 lasers systems
  - Other controls as needed
    - Cooling
    - Gas controls
    - Chemical
    - Etc.
- Establish PPE requirements (Reviewed and approved by LSO)
  - Eye protection
  - Ear protection
  - Other protection.
- Diagram of room layout [Inserted as a PDF diagram] shall include:
  - NHZ
  - Engineering control locations
  - Warning sign locations

#### **SECTION 4 - OPERATING PROCEDURES (Brief description for each of these items to be used as a checklist during operation)**

- Initial preparation of laboratory

- Identification of all personnel present
- Personnel protection requirements acknowledged by persons present
- Target area set-up
- Key position
- Warning lights on
- Interlocks activated / engaged
- Countdown procedure
- Shutdown procedure
- Special procedures
  - Emergency procedures
  - Alignment procedures
- Visitor Regulations / Policies for Facility

**SECTION 4 -LEDGER OF PERSONNEL [as database items]**

- Training / Monitoring
  - Laser Awareness Training
  - Specific training for laser use / operation
  - Maintenance and repair training if applicable
- **Responsibilities**
  - Supervisor for normal operations
  - Emergency coordinator
  - Operators and other personnel

## APPENDIX C

### LASER EMERGENCY RESPONSE PLAN

In the event of a laser emergency /accident it is important to respond promptly and appropriately.

Incidents with continuing hazard (fire, explosion, gas leak, high voltage, etc.)

1. Shut down the laser and associate equipment using appropriate emergency procedures as established in the SOP.
2. Notify others in the immediate area of the hazard.
3. Evacuate the immediate hazard area.
4. In case of fire or explosion sound the nearest fire / emergency alarm as you exit the building
5. Continue your evacuation to a safe area outside the building
6. From a safe location Contact Security (410-516-7777) using your cell phone or emergency station. When talking to security provide the following details concisely and explicitly:
  - a. Location of incident / accident
  - b. What is happening or happened.
  - c. If there were others in the area of the incident inform security who the people are and their situation, especially if you suspect that they may be injured.
  - d. Provide campus security with the name of the responsible Lab Manager and / or Principal investigator
  - e. Agree upon a location to meet security
7. Wait for the security and the emergency responders to arrive. DO NOT leave the general scene. Be prepared to provide details as to what was happening when you left the location of the incident.
8. Once the situation is stabilized
  - a. Contact both your PI and Lab Manager
  - b. Be prepared to prepare a detailed report on the incident

Injury incidents that present **NO** continuing hazard to you

1. Shut down the laser and associate equipment using appropriate emergency procedures as established in the SOP
2. Stabilize the injured person using appropriate emergency first aid procedures.
3. Contact Security (410-516-7777) using, the lab phone, a cell phone or emergency station. When talking to security provide the following details concisely and explicitly
  - a. Location of incident / accident
  - b. What is happening or happened
  - c. Who was injured and the nature of their injury. Be sure to let the person you are talking to know if it an eye injury or other type of injury (gas inhalation, burn not to the eyes, electrocution, etc.)
    - i. Eye injuries will be taken directly to the Wilmer Institute Emergency Room
    - ii. Other injuries will be directed to Occupational Health Services, Student Health Services, or the nearest available emergency room (Union Memorial)
  - d. Provide campus security with the name of the responsible Lab Manager and / or Principal investigator
  - e. Agree upon a location to meet security, preferably in the lab where the incident occurred.
4. Maintain contact with the injured person who is injured. Keep them quiet and comfortable as possible.
5. Wait for the security and the emergency responders to arrive. DO NOT leave the general scene. Be prepared to provide details as to what happened to cause the injury. This includes the frequency and power of the laser in question or the gas involved.
6. Once the situation is stabilized
  - a. Contact both your PI and Lab Manager
  - b. Be prepared to prepare a detailed report on the incident