



## Laser Safety

Dangers and hazards associated with the use of surgical laser systems require appropriate safety precautions and policies. The success of any Office Laser Program depends heavily on the responsibility taken by the users to ensure that while offering their patient state-of-the-art treatment and care, the safety of the patient, staff, and physician is maintained during the use of that laser system. Training appears to be single most important factor for any medical/surgical laser program.

This document will provide basic laser guidelines to understand basic laser safety concepts that should be utilized every time your laser device(s) are powered up.

Every physician's office utilizing laser devices of levels Class 3b and Class 4 devices should develop and follow an office wide laser safety policy.

Physician office laser practices should also utilize a "Laser Safety Checklist" as well as a "Patient Documentation Form" for each and every procedure to ensure reproducible safety and clinical outcomes.

There are many facts of laser safety used in the office treatment area. This document will attempt to cover general areas of safety associated with overall laser safety as well as those concerns directed specifically to certain wavelengths that you will be working with in the medical/surgical laser devices family.

### Federal Guidelines (Last Revision Noted: 1996)

With your Physician's Practice Laser Safety Kit, you will find copies of the National Standards Guidelines for the "Safe Use of Lasers" and the "Safe Use of Lasers in the Healthcare Facilities". These documents are the American National Standards or "**ANSI Z136.1 and ANSI Z136.3**". The Basic Laser Safety Policy for the Physician's Office is based on these guidelines. All safety content in **this** program is specifically designed for laser treatments that deal with patients that are awake and ambulatory, **without the use of anesthesia or anesthesia gases**. Because the laser procedures you will be providing in your office are all minor, superficial, and require no anesthesia, some of the indicators and guidelines in the ANSI Laser Standards will not apply. It is, however, important to implement other guidelines in the standards that apply to all Class 4 laser systems. This will help ensure a safe and compliant program. New National Guidelines are expected in 2005. Both ".1 and .3" standards should be a part of your office laser safety library. The ANSI Z136.1 standard discusses many of the mathematical basis for industry lasers; the ANSI Z136.3 standard utilizes the industry standards and applies these basic principles to all healthcare facilities using lasers in the nation.



## Medical/ Surgical Laser Systems

Most all medical and surgical laser systems are considered Class 4 laser systems. Class 4 means that the laser poses potential dangers to all individuals exposed, and that appropriate control measures should be implemented. These control measures involve eye safety, environmental safety, fire safety, and protection from inadvertent burns. All personnel working with the laser systems should be familiar with the basic function of laser systems and strictly adhere to the Office Laser Policy approved by your office. Today, medical/surgical lasers provide special design and engineering safety measures in their equipment that meets the Code of Federal Regulations Performance Standards for Light-Emitting Products. Again, the Laser Safety Policy adopted by your office should follow appropriate guidelines in the ANSI Z136.1 & ANSI Z136.3, and/or your state regulations.

### Laser Safety Issues

The ANSI Laser Safety Standards provide many tools to assist the Laser Safety Officer evaluate risks from laser systems and applications. Once these analyses have determined, the standards can basically be organized in six areas:

#### Laser Room Safety

- ◆ Room
- ◆ Eye
- ◆ Tissue
- ◆ Airway
- ◆ Environmental Air
- ◆ Administrative



As previously discussed, most probably, the laser systems that you are working with are Class 4 systems. Choosing a laser treatment area should be taken seriously. Ample floor space should be available for the treatment bed/chair, the laser equipment,



delivery systems, accessories, smoke evacuator (if applicable), laser operator, as well as space to easily maneuver in case of an emergency. The room should be well ventilated. Access to the room should be able to be controlled by means of doors with appropriate laser signs posted on the outside of each doorway. Windows should be minimal. If windows are present in the laser treatment room, they should be able to be covered from the inside of the room by means of shades or other method. Any mirrors or highly reflective areas should be removed or covered with towels or drapes during laser surgery. Access to the laser treatment area should be limited to necessary personnel that are properly trained and protected with the appropriate laser safety eyewear.

Laser Danger signs should be posted or readily visible only when the laser is in operation. When laser caution signs are posted continuously, this defeats the purpose of room posting and encourages personnel to ignore the continuously posted **Laser Danger Sign**. Each laser danger sign should provide specific information associated with the characteristics of each laser system utilized. The ANSI Guidelines state specific laser danger sign size, information, and colors to make up each sign. Your laser manufacturer should provide the proper sign or signage information for each specific laser unit. Please be sure you post the proper signage for the laser in use. Eyewear should also be made available outside of the laser treatment room in anticipation of necessary entry of the area by facility personnel.



Example Laser Safety Sign



Depending on the laser system, injury to the eye due to equipment and/or operator error can affect either the retina or cornea and skin. Those lasers lasing in the mid infra-red (MIR) through visible part of the Spectrum can potentially cause damage to the retina of the human eye. Those lasers lasing in the ultra-violet (UV) and far-infrared can potentially pose hazards to the cornea and skin.

Eyewear should be available and readily recognizable for each laser system. If multiple laser systems are present in the physician's office, the Laser Safety Officer for the office laser program should make sure that the appropriate laser safety glasses and/or goggles are with each specific laser system. Proper laser safety eyewear is determined by the laser wavelength, delivery system, pulsing characteristics, and maximum output. Calculations are performed to provide information that will ensure the correct eyewear for each system. All eyewear must be labeled for the appropriate wavelength protection and the amount of designated laser light that is absorbed or filtered into the lens rather than allowing the light energy to pass through to the eye.

The eyewear should be in excellent working order, fit properly and securely, clean, labeled, and free of damage to the lens. The eyewear should be inspected routinely to ensure the eyewear meets these strict standards. Discuss with your laser distributor the availability of appropriate eyewear with each laser system.

All personnel in the laser treatment area should have the proper eyewear covering their eyes. This includes patient, physician, laser operator, assistant or observer. The laser operator should ensure that everyone in the treatment room has the proper laser eyewear before the laser is allowed to convert from the standby safety mode to the ready or operational mode.

An additional set of specific laser eyewear should be made available outside of the entry door for any staff member that must enter the laser treatment room during the time that the laser is in the ready or operational mode.

## Tissue Safety

In addition to protecting accidental exposure of the eyes, unintended skin exposure should be prevented as well. A major preventive measure to any unintended exposure is to keep the laser system in the **“Standby”** at all times until the laser and delivery system is in total control of the laser operator and all safety control measures have been met. The **“Standby”** mode should be on at all times when controlled treatment is not underway.

The laser foot pedal should be under the control of the trained laser operator that is delivering the operative laser delivery system.



Any drape or towel used to cover areas of the patient during laser treatment should be non paper products that are non flammable. Dampening these drapes is also recommended.

If the physician or laser operator functions in the laser suite with the laser operational for long periods of time most days of the week, laser safety specialists should be consulted to ensure that the extreme laser exposure to possible scattered laser light is within acceptable levels. These levels can be calculated using formulas and information provided by your laser manufacturer and the ANSI Z136.1.

### Airway Safety/ Fire Safety

This informational program is designed for functional use in dermatologic office applications of benign skin lesions. This guide is not intended to provide the necessary training for use of lasers in the O.R. suite utilizing multiple specialties and applications. Use of lasers in or near the airway require special safety policies and in depth knowledge of preventing and dealing with these dangers. Special training includes, but is not limited to ENT Laser Safety Policy Development, LSO training, Physician ENT laser training & preceptorship, anesthesia team ENT Laser Safety training, Laser Operator ENT Laser Safety Training, Laser Nurse ENT Laser Safety Training, and training of all patient care providers as a team in the ENT Laser Surgical Suite. Patients requiring general anesthesia with utilizing lasers in or near the airway should be performed in a surgical setting with specially trained personnel.

The use of surgical lasers in or near the airway of a patient under anesthesia is a potentially dangerous scenario. Special individual and team training involving all participants on the patient's O.R. healthcare team are required to protect the patient's welfare and ensure a safe working environment.

All flammable materials and solutions should be removed from potential or near potential laser beam paths. All drapes should be non flammable. Paper products should be avoided at or near the target tissue. Extreme care should be used to ensure that no flammable products, solutions, or cleaning agents are used on or near the patient.

In case of fire, a fire extinguisher should be near the laser treatment area. Laser Operators should be well trained on the use of all types of extinguishers, the types of fires possible, and the proper procedures of responding to a fire situation.

### Environmental Air

The interaction of different laser energy on biological can result in the production of LGAC or "laser generated airborne contaminates" also known as "smoke plume".



Such particulate matter can carry dangerous gases or remnants of potentially dangerous biological material.

The laser treatment room in the office should provide adequate air exchange to compensate for the heat generated by the cooling fans of the laser device. Lack of adequate circulation can not only affect the comfort of the patient and staff, but the efficiency of the laser device as well.

Special consideration should be taken to determine if a smoke evacuator should be available to pull smoke plume from the surgical application area. When in doubt, such a device should be used. Smoke evacuators for laser surgical applications should filter to 0.1 microns. For information about smoke evacuators, feel free to contact your laser representative. When purchasing a smoke evacuator, consider the cost of disposable smoke tubing and filter assembly replacement.

### Administrative

In order to help ensure the long-term success of your office laser program, the designation of certain duties and responsibilities is imperative. This individual should have routine involvement with the laser operation and should be afforded the time required to make sure that the quality and organization of the laser program grows along with the laser utilization and revenue generated.

#### Medical Laser Safety Officer

Knowing that the most common lasers used in physician's offices today are Class 4 systems, the federal government recommends that each facility assign a responsible member of the staff as the Medical Laser Safety Officer. Many states mandate this position, other states have such regulations under consideration. The MLSO may have a variety of job responsibilities and duties depending on the scope of the laser program, the other required tasks within the office, and the educational/ experience of the individual assigned the MLSO task.

If a single site is involved, the MLSO should be readily available to that site any time the laser is in use. In the absence of the MLSO, an additional individual should be assigned and provided appropriate training to ensure a continuous quality of patient care. If multiple or mobile sites are involved, one individual should be responsible for title of MLSO of the multiple locations, with assisting or deputy MLSO's available at each site under the direction of the primary MLSO.

The MLSO is responsible for the safe use of medical/ surgical lasers by those credentialed to perform laser surgery or therapy. The MLSO shall have the authority to suspend, restrict, or terminate the operation of the laser system in use should it be determined necessary by the MLSO due to potential malfunction, hazard control, or misuse of the laser.



A job description should be developed by each office in a format required for each office. The duties of the MLSO should meet the unique needs of each physician's office.

*Medical Laser Safety Officer Basic Responsibility Suggestions:*

The assignment of the role and duties of the Medical Laser Safety Officer for the office laser practice is dependent upon the needs of each individual office and program. The MLSO should have training in laser physics, biophysics, and all aspects of laser safety.

The MLSO shall have a working knowledge of laser physics and characteristics applicative to the individual clinical setting and application of each clinical setting.

The MLSO shall be available to observe or function as the laser technician as needed during laser procedures.

The MLSO has the responsibility to terminate operation of a laser unit during therapy should a situation arise that places the patient, staff, or physician in danger. It is the responsibility of the MLSO to insure that all laser safety policies and procedures are followed.

The MLSO will not initiate a turn-on procedure of the laser system unless a credentialed physician is physically on site.

The MLSO for the physician's office shall be responsible for ensuring all appropriate documentation is completed for each laser treatment, the laser devices are kept in proper working order and properly maintained, and communication is provided to all staff members involved in the laser program.

The MLSO may be a physician, nurse, technician, MA, aesthetician, or other.

The MLSO may be responsible for:

- a. Development of the office Laser Safety Policies
- b. Ensuring strict adherence to the laser safety policy
- c. Documentation of proper training level (laser operator, laser physician, office staff)
- d. Patient Education Materials
- e. Laser Preventive Maintenance, Repair Procedure & Documentation
- f. Development of the Patient Documentation and/or Laser Log
- g. Ensuring Program Meets National & State Standards
- h. Obtaining, inspection, and maintenance of all laser safety accessories
- i. Performance & documentation of annual office laser safety audit



### Laser Safety Committee

The function of the LSC, or laser safety committee, is to provide a variety of knowledgeable individuals to assist in the development and ensure the continued safety and effectiveness of the laser program. In the physician office environment, the function of the LSC would be to assist in the development and approval of all policies, procedures, job descriptions, documentation, and provide direction and continuous feedback for all laser program issues.

It is advisable that the LSC meet regularly (monthly). The issues discussed should be documented and filed.

In addition to ensuring the proper and safe development of the program, other issues involved with general growth opportunities should be addressed by this knowledgeable group.

A laser safety committee for the physician's office may consist only of the program medical director and/or supervising delegate and the primary cosmetic laser operator. Documentation of a formal or informal communication of the group may be documented, issues discussed, resolutions documented, and filed for verification of the laser program LSC activity. The items for discussion should include any safety issues, patient treatment parameters, and routine protocols for the cosmetic laser program. Frequency of the meetings should be determined by each individual office.



## Federal Laser Safety Guideline Focus

### Beam Hazards:

Medical/ Surgical Lasers are divided into 4 Basic Classes associated with Exposure Hazards.

### Laser Classes

- ◆ **Class 1**
  - No more risk than ordinary light
- ◆ **Class 2**
  - Risk over duration or a day
- ◆ **Class 3**
  - Risk of permanent injury if directly viewed
- ◆ **Class 4**
  - Risk of permanent injury if viewed at all

**0.25 watts**

**ALL OF YOUR LASERS are Class 4!**

**Most medical/ surgical/ cosmetic lasers are Class 4 laser devices.  
Eyewear is required with each laser system.**

### Room Protection (Nominal Hazard Zone):

Although each laser system has specific danger areas determined by the possible peripheral exposure dependent on many variables unique to that laser system, it is widely accepted that this zone of danger (Nominal Hazard Zone or NHZ) be accepted as the confines of the enclosed treatment area.



Appropriate laser Danger signs are posted on each entry door, on the outside of the door. The laser signs are specific for each laser system, with the required information on the sign specific to the system in use. The size, information, and color are very specific to the type of laser in use. All doors should remain closed during the duration of the treatment. Be aware of anyone entering the laser treatment area. A pair of laser eyewear should be available outside the treatment area if access to the area is necessary during laser operation. Any windows to the laser treatment area are to be covered from the inside of the treatment area to prevent the rare possibility of inadvertent exposure through the window area.

Laser Eyewear (glasses, goggles, patient treatment eye covers-metal) specific to the operating laser wavelength and potential output are to be worn by everyone in the laser suite. Laser eyewear is specific as to wavelength of the laser in use, and by OD or Optical Density. OD is predetermined to ensure that the correct amount of expected laser energy is filtered out by the lenses provided.

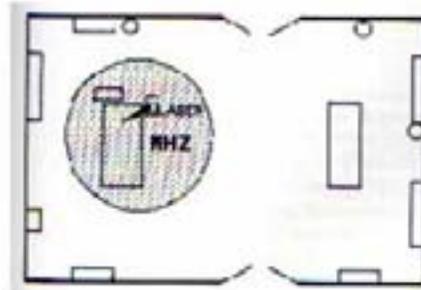
## Treatment Room & NHZ

◆ Post Signs

◆ Close doors

◆ Cover windows for all but CO<sub>2</sub>

◆ Glasses or eye cover for everyone





## Eye Safety

- ◆ Glasses or goggles labeled with wavelength and Optical Density
- ◆ Only metal eye shields
- ◆ Concerns: Fiber Delivery Unpredictability
- ◆ Understand the Nominal Hazard Zone Analysis
- ◆ Knowledgeable MLSO, Evaluate each Situation  
*Safety & Compliance*



If your office is utilizing multiple laser systems, be sure that you are utilizing and providing the PROPER eyewear for that specific laser system.

If laser eye shields are used to protect the patient, make sure the eye shields are a metal rather than plastic.

Although the fiber optic delivery systems from some medical/ surgical laser systems are heavily reinforced, special care should be taken to prevent damage to these inherently delicate and expensive delivery arms and hand pieces. Misuse of these delivery systems can allow for unintended laser exposure and high replacement costs. Avoid bending, crimping, hard bends, or other unusual pressure on fiber optic and articulated arm delivery systems.



**Innovative Solutions**

*Wavelength determines eye affect*

**UV** – chemical, 1st 20 microns of eye surface

**Visible and IR Near** – damage to internal components of eye (retina)

*Nd:YAG, Holmium YAG, Erbium YAG, Erbium Glass*

**IR Far** – ablative, damage to surface of eye or cornea

*CO2 Laser*

Depending on the wavelength of the laser system in operation, an exposure to the eye can result in potential damage to specific eye anatomy.

