There's a New Laser Safety Officer on Campus: (Re)Starting the Laser Safety Program at the University of Minnesota

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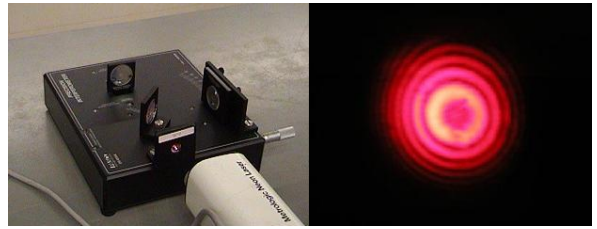
University of Minnesota
DOE LSO Workshop May 19, 2026

The Story Thus Far…

- Prologue – Life before laser safety
- State of the laser program – Inheriting a “Blank Slate”
- (Re)Starting – Policy, pedagogy, and portals
- The discovery phase – Identifying laser users and starting inspections
- The Clinical Pivot! – Learning the language of medicine
- Evaluating program impact
- Lessons learned and future growth

A Recent Timeline

- 2001 - MS in Physics (Superfluid Helium)
- 2001 - Physics demonstration manager
- 2020 - COVID! ☹
- 2021 – Research Safety Professional
- 2022 – Appointed Laser Safety Officer
- 2025 – CLSO



Me? The New LSO?

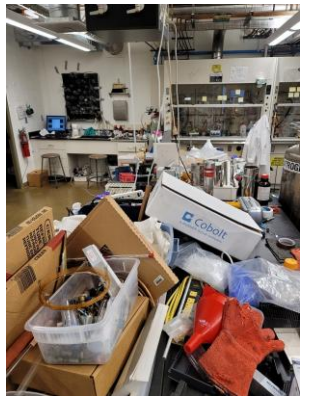
Primary duties: “Safety Partner” for the College of Science and Engineering (CSE).

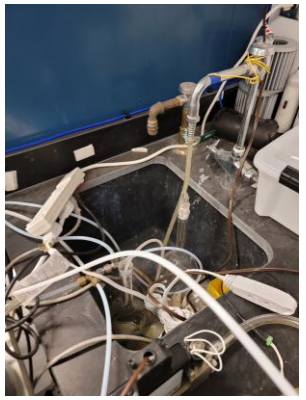
- Consultations and inspections for 200+ research labs.
- Many labs have lasers.

Why formalize the laser safety program?

- The university has several hundred hazardous lasers
- Serious gap in safety and liability
- Goal: Move from passive compliance to active risk management.

But, why *me*? Physicist = “expert” in all things related to lasers, both theory and safe operation.





$$\hbar\omega = E_2 - E_1 \qquad \frac{dI}{dz} = \sigma I(N_2 - N_1)$$

$$\left(\frac{\partial}{\partial z} + \frac{1}{v_g}\frac{\partial}{\partial t}\right)A(z,t) = \frac{N\hbar}{4T_2E_s}\,w(z,t)A(z,t)$$

State of the Laser Safety Program 2021

- The University did have an LSO assigned (member of the Radiation Safety group)
- Primary responsibilities:
  - Answer questions
  - Respond to consultation requests
  - Investigate exposures or other injuries
  - No regular inspections
- ‘Reactive’, not ‘Proactive’

State of the Laser Safety Program 2021

UNIVERSITY OF MINNESOTA
University Health and Safety

UNIVERSITY OF MINNESOTA

Effective Date:

I. PURPOSE

II. SCOPE

III. DEFINITIONS

IV. RESPONSIBILITIES

V. PROCEDURE

VI. APPENDICIES

VII. REFERENCES

The written program document as it was in 2021

State of the Laser Safety Program 2021

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BLANK!

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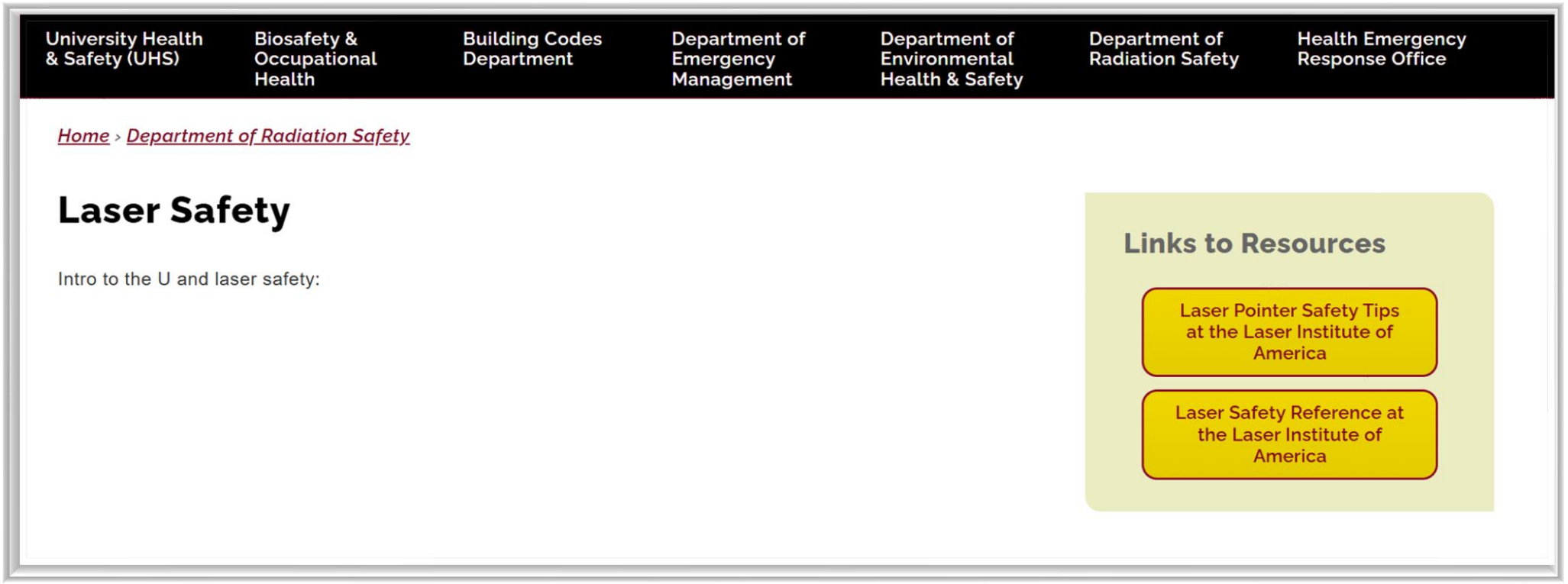
BLANK!

Dept. of Energy Training Module

The “Website” in 2021



Thanks to the Wayback Machine for preserving internet history.

Where to Begin?

Traveled to Disney World and completed the 5-day LSO training (2022)

- Co-workers were jealous ☺
- However, picked up COVID ☹

Disney Springs

What did I learn? A written program is a must! However, would I need to write the program from scratch?

- Answer: Fortunately, no. You gain inspiration (a.k.a “borrow”) from other institutions.
- Z136.1 is your friend

What other content could I tackle? Training!

- Existing training included topics not applicable to UMN
- Task: Develop training that is more digestible for lab researchers and addresses local administrative procedures.

HEALTH, SAFETY,
AND RISK MANAGEMENT
UNIVERSITY OF MINNESOTA

Laser Safety Program

Effective Date: February 2023, Revised April 2026

I. Purpose

The purpose of this program is to provide general laser safety information and to establish rules and procedures to ensure faculty, staff, students, and visitors are not exposed to laser radiation more than the Maximum Permissible Exposure (MPE) limit for the human eye or skin.

II. Scope

The Laser Safety Program applies to all employees, contractors, and students working directly with or around Class 3B or Class 4 lasers within University of Minnesota research laboratories, teaching labs, non-traditional research spaces (e.g. makerspaces), and machine shops.

III. Authority

This program is part of the University's Occupational Health and Safety administrative policy, which charges Health, Safety, and Risk Management (HSRM) with providing leadership, resources, and services to ensure that the University provides a healthy and safe workplace, and that applicable regulations, policies, and procedures are being implemented and compliance is met. As stated in the policy, all health and safety programs must be followed by all University staff if applicable to the type of work being performed.

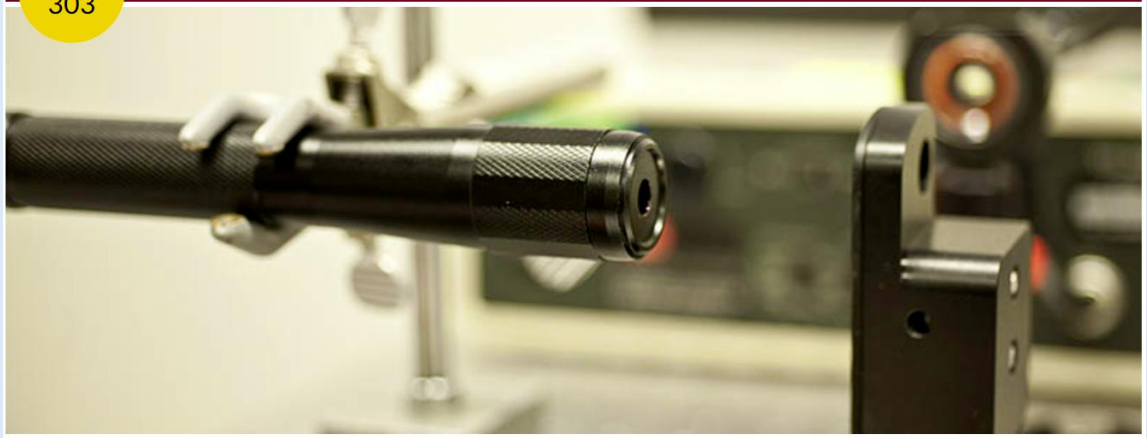
IV. Definitions

Accessible Laser Radiation – Laser radiation emitted that is compared with the Accessible Emission Limit to determine the hazard class of the laser.

ANSI – American National Standards Institute. This program is based on the American National Standard for Safe Use of Lasers (ANSI Z136.1-2022).

UHS 303

Laser Safety Training



Why You Need to Take this Training

The purpose of this training is to provide general laser safety information and to establish rules and procedures to ensure faculty, staff, students, and visitors are not exposed to laser radiation more than the Maximum Permissible Exposure (MPE) limit for the human eye or skin. This training is required for all employees, contractors, and students working directly with Class 3B or Class 4 lasers in University of Minnesota research laboratories, teaching labs, non-traditional research spaces (e.g., makerspaces), and machine shops.

Topics covered in this training include:

- Roles and Responsibilities
- Properties of Lasers
- Laser Classifications
- Bioeffects of Laser Exposure
- Safety Control Measures

✱ Tip for Completing this Training

At the end of the training there is a final quiz that you are required to score 80% or higher to pass. If you do not score high enough to pass, you must retake the training.

DOE module (2018 – 2023): 400 completions
*New module (2023 – present): **800+** completions*

Compliance increasing!

In 2025, the laser safety webpage was expanded to include info specific to research, healthcare, and teaching.

Laser Safety

The Departments of Environmental Health and Safety (DEHS) and Radiation Safety maintain programs which have been developed to provide laser safety information and to establish rules and procedures to ensure University faculty, staff, students, patients, and other visitors are not exposed to harmful laser radiation. These Laser Safety Programs apply to all employees, contractors, and students working directly with or around Class 3B or Class 4 lasers within University of Minnesota research laboratories, clinical spaces, teaching labs, and non-traditional research spaces (e.g. makerspaces). In addition to the written safety programs, several other resources have been made available to assist members of the University to use lasers in a safe manner, regardless of power output or location.

The use of lasers at the University generally fall into one of three categories. Please select from the links below to access information relevant to your specific laser use.

Lasers Used in Research | Lasers Used in Clinical Spaces | Lasers Used in Teaching

If you have any questions regarding the use of lasers at the University of Minnesota, please contact the Laser Safety Officer.

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Resources

- Laser Safety Program
- Online Laser Safety Training
- Laser Registration
- Laser Lab SOP Template
- Laser Acquisition and Disposal
- Laser Lab Self-Inspection
- Laser Safety Fact Sheet

Many resource documents now available

Discovering the Universe of Lasers

There are 3,000+ labs on 5 campuses throughout the state. How do I find the lasers?

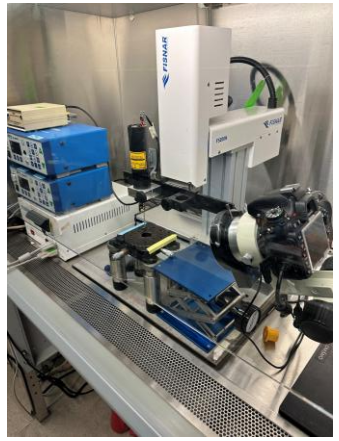
Send out a survey!

To date, ~120 labs have been identified.

- Nearly 400 lasers!

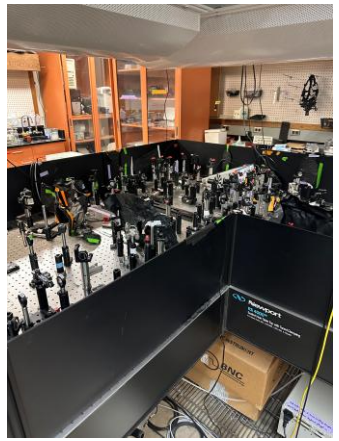
Let the inspections begin.

1 kW laser used in freezer chest!

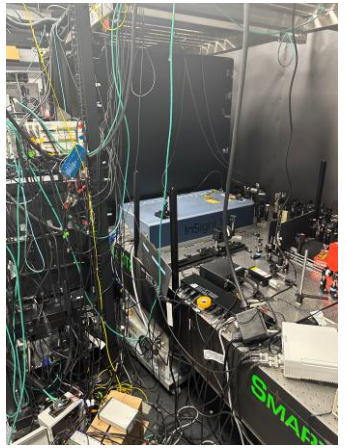


Laser in BSC

Pink insulation?



That's a lot of optics!

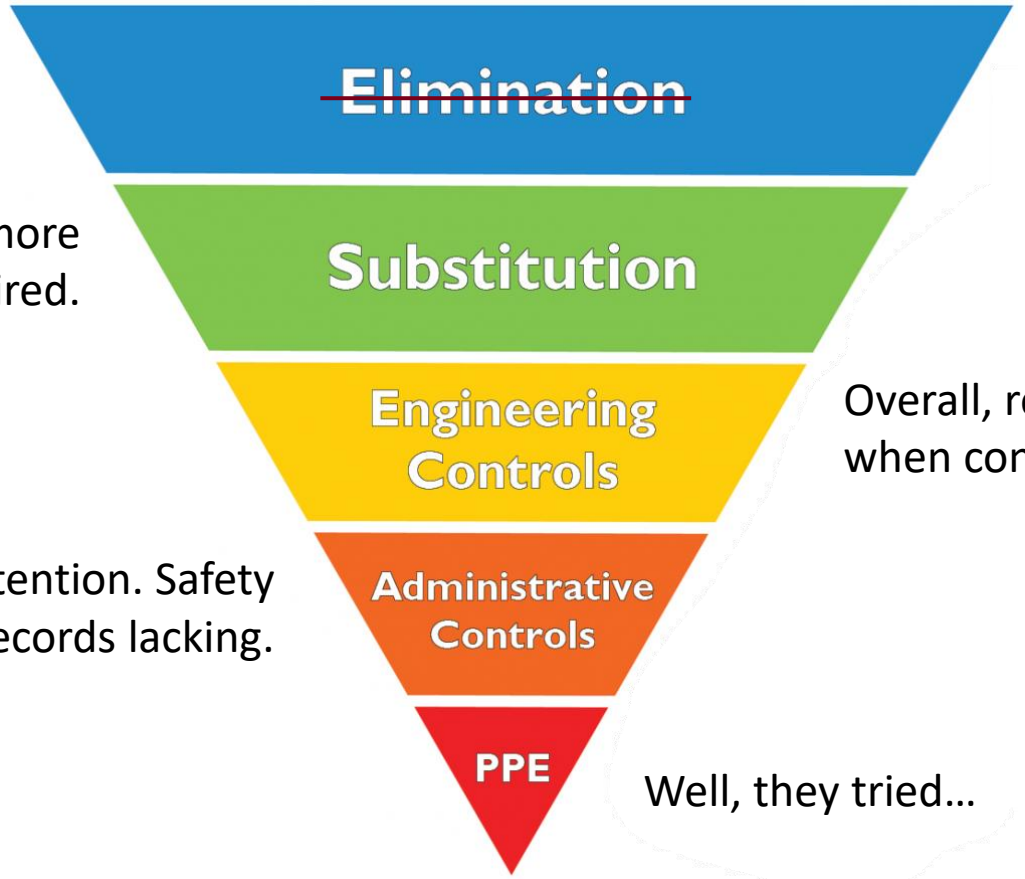


Messy setup

Initial inspections used a similar checklist form. (January 2023)

Signs and Labeling	Yes	No	N/A
Are all lasers, laser systems, and Laser Control Areas (LCA) properly labeled?			
Do signs contain appropriate information (Class, power, wavelength, OD)?			
Are all signs and labels in good condition and legible?			
Do signs conform to standards specified in the written Laser Safety Program?			
Training and Documentation			
Have all laser users completed the HSRM on-line laser safety module?			
Have all personnel completed annual lab-specific laser training? Documented?			
Has your lab-specific training program been reviewed by the Laser Safety Officer?			
Have all laser accidents, incidents, or near misses been documented?			
Communication			
Is the Laser Safety Officer consulted prior to purchasing, transferring, or disposing of lasers or laser systems?			
Is your laser inventory, submitted to the LSO, up to date?			
Hazard Analysis Documentation			
Has a hazard analysis been conducted/documented for each laser or laser system?			
Does this documentation address both beam and non-beam hazards?			
Standard Operating Procedures (SOPs)			
Have SOPs been developed detailing the safe use of lasers or laser systems?			
Have alignment procedures been developed and documented?			
Has the Laser Safety Officer reviewed and approved of all Class 4 SOPs?			
Are all authorized users listed in the SOPs?			
Personal Protective Equipment			
For Class 3B and Class 4 lasers and laser systems, are appropriate laser safety glasses available for all personnel?			
Is laser eyewear the correct OD, wavelength, and visible light transmission?			
For IR or UV lasers or laser systems, is additional protective clothing and other skin protection available?			
Safety Controls			
Are windows and ports covered to prevent a stray beam from entering an uncontrolled area?			
Are barriers/screens rated for the power/energy of the laser?			
Are all protective housings intact and interlocked and/or labeled?			
Housekeeping and Safety Equipment			
Are optical tables free of clutter and cords do not present a trip hazard?			
Is a fire extinguisher available, accessible, and up to date?			
Are extension cords only temporary and power strips not daisy-chained?			

Initial Observations



Cannot do laser research without lasers.

A few labs using a bit more power than required.

Overall, researchers were thoughtful when configuring their laser systems.

Area that required most attention. Safety documentation and training records lacking.

Well, they tried…

Research Diplomacy

How to approach a PI who has operated without oversight for 10+ years? Management of Change can be tricky.

Frequent communication is essential.

- Send out regular updates on program documents and initiatives
- Reminders to complete online and lab-specific training

Researchers sometimes become quite focused around their very specialized work

- To ionize, or not to ionize? That is the question.

Overall, the more proactive program has been well received. On numerous occasions, researchers have expressed their appreciation for the changes to the program.

Just when I thought I had a handle on the program…

Surprise! Lasers in Clinical Spaces

A colleague informed me clinical spaces also use lasers.

- Veterinary Medicine and School of Dentistry

Research labs → DON'T AIM LASERS AT PEOPLE!

Clinical spaces → AIM LASERS AT PEOPLE! (and animals)

With these differences, it was time for more training.

- 2-day MLSO training
- Learned about hazards not considered in research:
  - Laser plume (LGAC)
  - Patient fires!

CO_2 laser for animal use

Enclosure for horses

HEALTH, SAFETY,
AND RISK MANAGEMENT

UNIVERSITY OF MINNESOTA

Laser Safety in Health Care

Effective Date: November 2025, Revised April 2026

I. Purpose

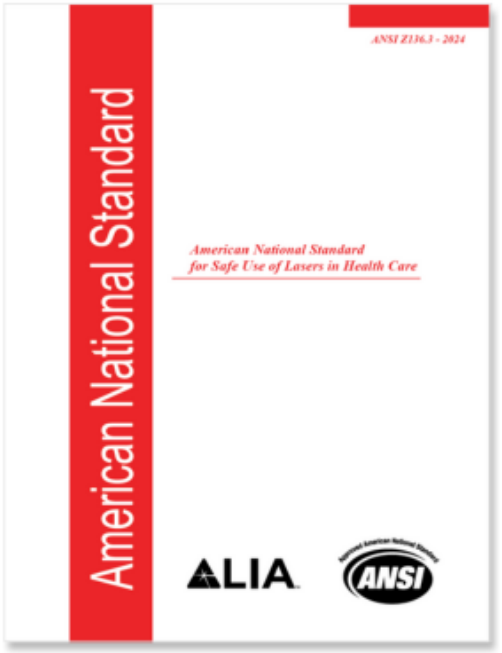
The purpose of this document is to provide general laser safety information and to establish rules and procedures to ensure that faculty, staff, students, patients, and visitors in University of Minnesota clinical health areas are not exposed to laser radiation greater than the Maximum Permissible Exposure (MPE) limit for the eye or skin (human or animal), except for the intended treatment of a disease or condition.

II. Scope

This document applies to all employees, contractors, and students working directly with Class 3B or Class 4 Health Care Laser Systems in University of Minnesota clinical spaces, including, but not limited to, the School of Dentistry and the Veterinary Medical Clinic. The information that follows is meant to compliment the University of Minnesota's Laser Safety Program.

III. Authority

This program is based on the University's Occupational Health and Safety administrative policy, which charges Health, Safety, and Risk Management (HSRM) with providing leadership, resources, and services to ensure that the University provides a healthy and safe workplace, and that applicable regulations, policies, and procedures are being implemented and compliance is met. As stated in the policy, all health and safety programs must be followed by all University staff if applicable to the type of work being performed.

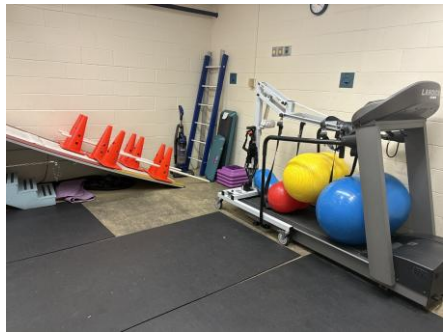


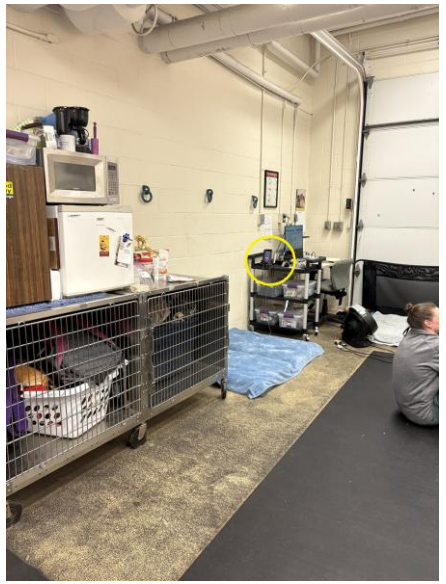
What I Have Learned about Healthcare

I am not fully versed in all the medical jargon

Take care when discussing laser use with a physician or veterinarian. *Never* **“tell”** them how to do their job. Diplomacy is an absolute must!

- Having an intermediary is priceless.



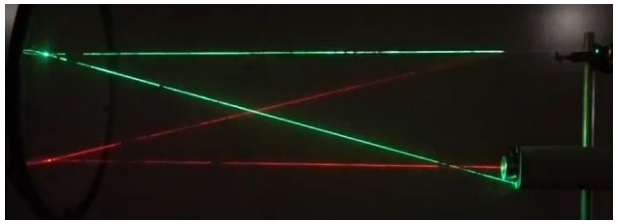


Lasers often travel around the building and are used in rooms not always optimally configured for high power laser use (non-traditional Nominal Hazard Zones).

Lectures and Classrooms

Lasers are often used in university lectures, such as physics and chemistry.

- Physics – Diffraction, reflections, etc..
- Chemistry – Exploding hydrogen/chlorine balloons



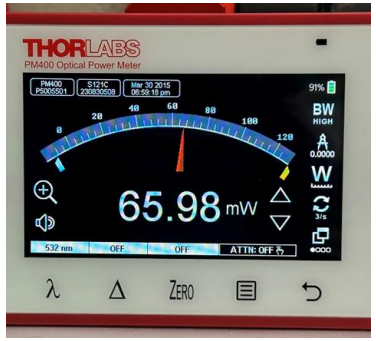
Lectures may have 200+ students in attendance.

- How do you protect so many people?
- Class 4 lasers prohibited. Class 3B allowed with controls.

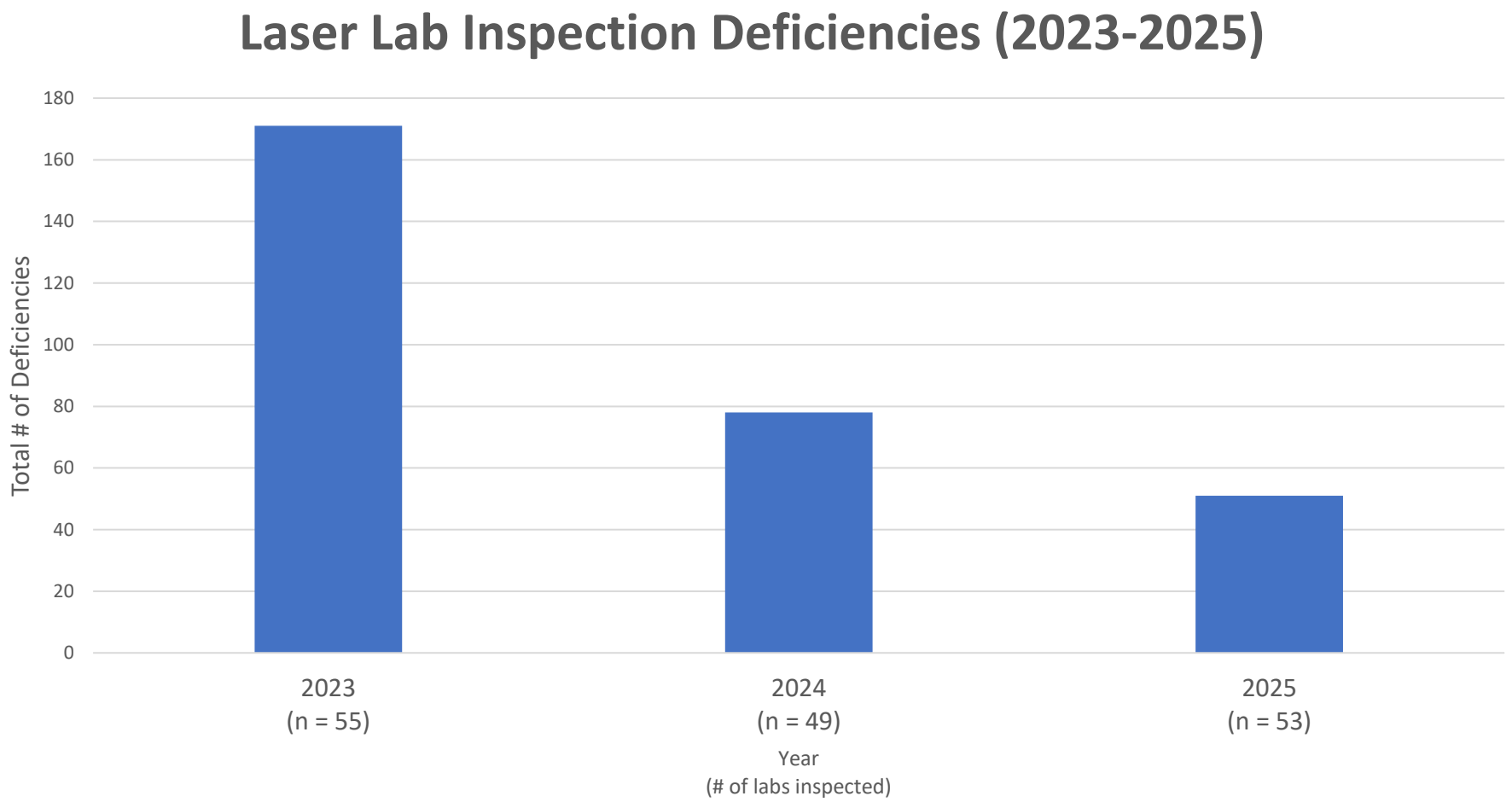
Laser pointers are everywhere!

- And can be purchased from anywhere!
- A batch of 10 pointers measured 25 – 80 mW!
  - Cheap!

"< 5 mW" green laser pointer



Program Impact



Program Impact

Inspection Results (2023 - 2025)

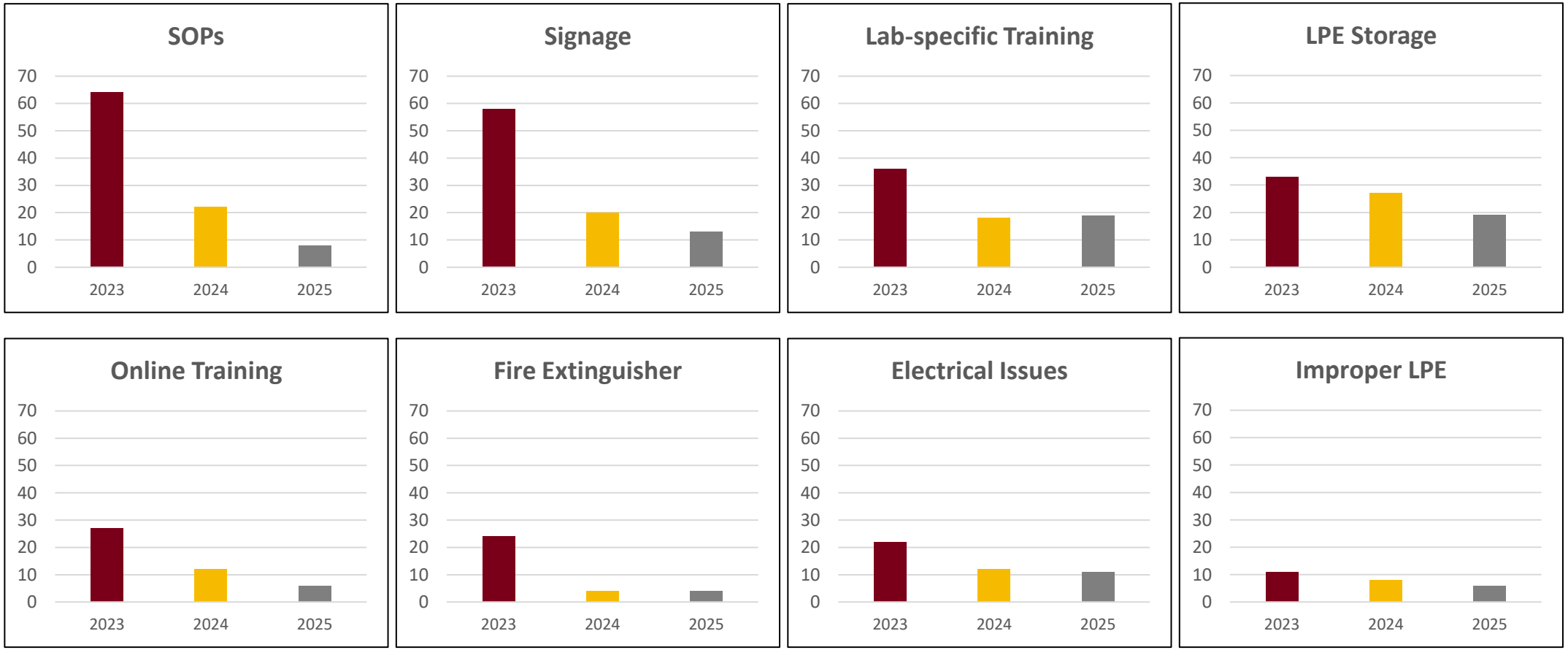
Number (%) of Labs

Deficiency Item	2023	2024	2025
Lack of SOPs	35 (64%)	11 (22%)	4 (8%)
Improper or missing signage	32 (58%)	10 (20%)	7 (13%)
Missing or out of date lab-specific training	20 (36%)	9 (18%)	10 (19%)
Improper LPE storage	18 (33%)	13 (27%)	10 (19%)
Missing on-line training	15 (27%)	6 (12%)	3 (6%)
Fire extinguisher issues	13 (24%)	2 (4%)	2 (4%)
Electrical Issues*	12 (22%)	6 (12%)	6 (11%)
Improper LPE specs for application	6 (11%)	4 (8%)	3 (6%)
Total Number of Inspections	n = 55	n = 49	n = 53

**Exposed wiring, extension cords, and daisy chained power strips*

Notable Deficiencies 2023-2025

(% of Labs)



Injuries, Exposures, and other Incidents

Number of injuries, exposures, or other incidents 2023-2025:

Injuries, Exposures, and other Incidents

Number of injuries, exposures, or other incidents 2023-2025:

0

Lessons Learned as LSO

Listen to your researchers/clinicians. Ask them about their work. Showing interest in their research can bring down barriers.

Help your laser users, don't hinder them. Walking in, quoting OSHA or Z136.1, and walking away is not productive! Find solutions that won't cost the lab .

- Don't come in with a clipboard and red pen ready to scold.

There are a LOT of lasers on a university campus used in countless ways! The challenge in understanding how they are used is always there.

Moving Forward

Keep finding those laser labs

- Colleagues occasionally inform me of newly discovered labs.

Convene a formal laser safety committee

- Who to include?
- How often to meet?
- Common topics of discussion?

Provide in-person training opportunities

- Safety lectures
- Hands-on alignment training

If you would like to see more information about the University of Minnesota's laser safety program, please scan the QR code to the right to visit the website.

Thank You!