Laser Pointers

Introduction

Often laser pointer devices are low cost, operated with AAA batteries, produce a beam that can be seen easily hundreds of meters away yet are small enough to be carried in the pocket or on a key chain. One design is available where the laser pointer is co-housed with a functional writing pen. Pointers are now being manufactured that can project patterns of a star, circle, square, as well as the conventional circular dot pattern. Although most of these devices contain warning labels, as required by Food and Drug Administration regulations, many have been erroneously advertised as "safe." At present there are no limitations on purchases and anyone can now buy a laser pointer that could be potentially hazardous if handled carelessly. The number in use today easily totals in the millions.

The use of laser diode pointers that operate in the visible radiation region (400 to 760 nanometers [nm]) is becoming widespread. These pointers are intended for use by educators while presenting talks in the classroom or at conventions and meetings. They are also useful in any situation where one needs to point out special items during any instructive situation. The pointers can be purchased in novelty stores, mail-order magazines, office supply stores, common electronics stores and over the Internet. The power emitted by these laser pointers ranges from one to five milliwatts (mW).

Given the health consequences associated with unintentional exposure to laser pointer light and the difficulty associated with management of laser pointers in the school, it is recommended that free-standing laser pointers not be permitted on school property.

Safety

The major potential hazard from pointers is limited to the unprotected eyes of individuals who look at the direct beam emitted from the laser because no skin hazard usually exists. The natural aversion response or blink reflex (~0.25 sec.) of the eye from the bright laser light normally limits exposure to a safe level for those devices.

Often laser pointers can be used in situations where effects such as temporary flash-blindness, afterimages or glare can occur that cause the person to be distracted from an immediate work task. For example, there have been recent reports of laser light exposures of pilots at airports in regions where there were no known outdoor laser light show activities. Suspicion of exposures to pilots from persons using such laser pointers has been reported in both the United States and the United Kingdom. Similar concerns have been voiced for exposures to persons driving cars and buses. Bus driver and fire engine driver exposures have been reported in the U.K.

There is also the concern for glare when the beam strikes a highly reflecting surface. Such distraction could lead to other primary or secondary effects of more serious nature. An example could be a lathe operator being "flashed" while concentrating on the work and losing concentration. This could cause the person to become temporarily distracted or startled and cause fingers or the whole hand to make contact with the lathe chuck and pose the potential for serious physical harm.

Laser Exposure Effects

Afterimage: The perception of light, dark or colored spots after exposure to a bright light that may be distracting or disruptive. Afterimages may persist for several minutes.

Flash-blindness: A temporary vision impairment that interferes with the ability to detect or resolve a visual target following exposure to a bright light. This is similar to the effect produced by flashbulbs, and can occur at exposure levels below those that cause eye damage. This impairment is transitory, lasting seconds to minutes depending upon the laser's light exposure level and time, the visual task, the ambient lighting and the brightness of the visual target.

Glare: A reduction or total loss of visibility, such as that produced by an intense light source, such as oncoming headlights, in the central field of vision. The visual effect lasts only as long as the light is actually present, effecting the individuals field of vision. Visible laser light can produce glare and can interfere with vision even at low energies well below those that produce eye damage.

In addition to the above light-induced factors that could certainly effect perception during vision-critical activities, the authors also believe there to be yet another factor. This is the case of an individual exposed and having the perception for a significant potential harm. In some cases, this can lead to reactions based on factors other that retinal damage or flashblindness. This would be considered as the Concerns of a Perceived Hazard (CPH). This is often referred to as "outrage." There is growing evidence that adverse physical effects can be deemed by some who are exposed by what is usually considered as a nonharmful beam exposure. In this case, the exposed person feels victimized. In this case, the person becomes "outraged" at the perception of being harmed and is convinced that harm has been done. This individual may be prone to respond violently.

The following safety suggestions are a few common sense rules recommended for laser pointers:

1. NEVER point a laser pointer of any power at anybody. Pointers should be used to point out or emphasize inanimate objects such as slide images, pipes, asbestos, laboratory apparatus or be used in nonhuman scientific experiments, etc.

2. Avoid mirror-like (specular) targets and NEVER stare into a pointer. Also, NEVER view a laser beam using an optical instrument (such as binoculars, microscope, etc.) unless the procedure has been technically approved by appropriate safety personnel.

3. These laser pointers are not toys and should not be used by juveniles. As an aid for this suggestion, it is recommended that the batteries be taken out of the pointer when not in use.

4. Some places may wish to require ***facility registration*** of these devices in order to impress on users the need for safety awareness. The appropriate safety personnel should require all laser pointers to be correctly and conspicuously labeled with the correct warning sign. Facilities may wish to develop their own one-page advisory note for all registered laser pointer users.

CONCLUSION

Given the serious health consequences associated with unintentional exposure to laser pointer light and the difficulty associated with compliance with the above recommendations, laser pointers should not be permitted on school property.

1. Laser Pointer Safety, Laser Institute of America. 2006