Eye and Face Protection in the Laboratory

By

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Introduction

Choosing eye and face protection in the laboratory is often a challenge. Its a challenge for a variety of reasons:

1. Lab workers (including teachers and students) and their management (administrators) may not understand the relevant regulations and standards.

2. They may not be able to correctly identify the various types of eye protection devices. In particular, distinguishing between some types of goggles and between some goggles and spectacles can be difficult.

3. Many employers (including all educational institutions) have not yet accepted and implemented one of the fundamental principles of effective safety programs.

This article discusses each of these areas. In addition, it comments on device selection, face shields, contact lenses, eyewash fountains. It concludes with the recommendation of a simple good sense eye and face protection policy.

Relevant Regulations and Standards

Two documents can help significantly with the challenge: the Occupational Health and Safety Administration (OSHA) 29CRF1910.133 Standard and the American National Standards Institute (ANSI) Z-87.1 Standard. Lets begin with OSHA.

The OSHA eye and face protection standard, 29CFR1910.133, makes two important points:

1. "The employer shall ensure that each affected employee uses

appropriate eye or face protection when exposed to eye or face hazards "

2. "Protective eye and face devices purchased after July 5, 1994 shall comply with ANSI Z87.1 - 1989, or shall be demonstrated by the employer to be equally effective"

Who should decide if a hazard is present, the employee or the employer? OSHA answers this question in 29CFR1910.132. It says it's the employers' responsibility to determine the presence of hazards, select the appropriate device, and train the employees.

These requirements apply to all of the private sector employers in the United States and roughly 75 to 80% of the public sector employers. It's hard to suggest a reasonable argument to justify not doing what's good for about 90% of all employers in the USA just because your employer is not regulated. And, its equally hard to justify not extending this same protection to students whose eyes and faces are every bit as vulnerable as those of employees'.

ANSI creates many consensus standards. They bring together groups from government, industry, academia, and professional organizations. Some of the standards, like Z-87.1 get adopted by OSHA and then have the force of law. The Z-87.1 standard is actually maintained by a Secretariat at the American Society of Safety Engineers (ASSE).

For more information about the ANSI Z-87.1 standard, contact:
Z87 COMMITTEE, PRACTICE FOR EYE AND FACE PROTECTION, AN ANSI ACCREDITED STANDARDS COMMITTEE, 1800 E. Oakton Street, Des Plaines, IL 60018, Phone: 847/699-2929, Fax: 847/296-9221.

Identifying the Types of Devices

There are three major types of eye and face protection devices: spectacles, goggles, and face shields. Within each category there are also several types. The ANSI Z-87.1 standard describes the various types. The following points from the standard help to identify goggles: (italics added)

1. **6.3 Goggles**. Primary protective devices intended to *fit the face immediately surrounding the eyes* in order to shield the eyes from a variety of hazards. Goggles commonly are available in two styles: eyecup, to cover the eye sockets completely; and *cover, which may be worn over spectacles*. Goggles are commonly available *with rigid or flexible frames*, and are usually ventilated to allow passage of air to minimize fogging.

2. **7.4.1 Devices with Adjustable Features**. Adjustments should be made on an individual basis for a comfortable fit that will maintain the protective device in proper position. Extra care should be taken in fitting goggles for protection against dust and chemical splash *to assure that they are sealed to the face*. Where manufacturers instructions are available, they shall be followed."

LSI's understanding of the above passages is that if the device does not fit the face immediately

surrounding the eyes or does not seal to the face, it should not be considered to be a goggle. What do you think?

Selecting the Proper Device

The ANSI Z-87.1 standard has a section devoted to protector selection, section seven. This section contains a selection chart which shows five major hazards, thirteen types of commonly available devices and indicates which ones are appropriate for each type of hazard. Spectacles with side protectors offer the minimum protection. Where there is the possibility of a chemical splash, a chemical splash goggle is required. If the splash hazard is severe, then the face shield should be added.

First, note that the goggle for chemical splash is a chemical splash goggle (indirectly vented) not the impact goggle which is directly vented. This latter type often has lots of small holes on the sides. Second, the face shield is not a replacement for spectacles or goggles. Rather, it is a supplement. It is worn over spectacles or goggles to protect the rest of your face and your throat.

Reminder, according to the OSHA PPE Standard, it is the employer's responsibility (and not the manufacturer's) to determine which type(s) of device are needed for the hazards presence in the workplace. Both ANSI and OSHA make this point.

Certification of Devices

It is not mandatory for a manufacturer to produce products that comply with the ANSI Z-87.1 standard. It is voluntary but clearly in their best interests. It is the employer who must ensure that the devices comply with the Z-87.1 standard.

Who certifies that a manufacturer's eye or fact protection device complies with the standard? There are two allowed routes: Self and independent third party.

Some manufacturers choose to provide their own certification that the device meets the requirements of the Z-87.1 standard. LSI sees some problems with this approach. We would prefer that this certification be done by an impartial third party.

ANSI recognizes a few organizations to do this independent testing. The Safety Equipment Institute (SEI) is one. SEI visits the manufacturer and does a review of the quality control, etc. and more. SEI then sends the devices to independent testing labs for the technical specification tests.

In speaking with one of these testing labs, LSI learned that their testing does not determine into which category a device belongs. We were told that the manufacturer does this. There have been instances where the testing laboratory disagreed with the manufacturer.

Interestingly, the ANSI Z-358.1 (safety showers and eyewashes) standard in its definitions contains the word certify. The definition there is to test by a third-party to verify performance requirements as specified in this standard. The Z-87.1 standard does not have this definition use this word, or require this process.

Bottom line employers should be absolutely sure they know what kind of device they need and are actually purchasing. Use caution because there can be confusion. You might wish to know how a manufacturer obtained the certification of its devices and how the category of proper use was determined.

The Fundamental Principle

The folks that have the best safety programs understand the "working safely is a condition of employment." To say it another way, if you want to play on our team, you play by our rules.

The state of New Hampshire got it about right. Their legislature and governor passed regulations requiring all public and private employers to have a safety program. The safety program must include provisions for verbal warning, written warning, and termination for failure to follow company safety rules and policies.

LSI recommends adding one more step to the process. We encourage including a paid decision-making leave of absence (or suspension from class) after the written warning and before termination. This provides the employee (student) the opportunity to reassess whether he or she is willing to follow the rule without further exception or would prefer to resign (withdraw) at this point.

Three More Important Points

There are three additional issues that should be mentioned briefly in conjunction with this discussion on eye and face protection devices: contact lenses, eyewash fountains, and portable shields.

Contact lenses are now generally accepted in the laboratory. In June of 1998, the American Chemical Society's Council Committee on Chemical Safety published in C&EN its new policy on contact lenses.. They joined other professional organizations Prevent Blindness America and American Optimetric Association) to say the use of contact lenses in labs was acceptable as long as all appropriate eye and face protection devices are worn. Contact lens wearers should wear the same eye and fact protection devices require of everyone else in the lab.

Eyewash fountains are essential emergency equipment for all laboratories where there is risk of chemical splash. The ANSI Z-358.1 (2000) standard discusses both eyewash fountains and safety showers. According to the ANSI standard, the eyewash fountain should be accessible within ten seconds. It should be activated weekly and tested monthly. The water should turn on (and stay on) with the pushing of a lever and protective covers should automatically uncover the eye pieces.

Many people have never tried to use an eyewash fountain. The worst time to learn would be in an emergency. Have you ever had this experience. You were in the shower and got soap or shampoo in your eyes. What did you do? If you are like most people, you clamped your eye shut, rubbed it, did a little dance and perhaps even cursed. The water was on, right there, aerated, and tempered.

How is this going to go in the lab? You're in pain, can't see, rubbing, dancing and perhaps cursing. But now there's furniture everywhere and a device on the other side of the room that you've never used before. This is the recipe for a disaster.

What's the solution? Practice. And, practice the buddy system. When a person says, "My Eyes," the nearest person guides them to the eyewash. The person closest to the eyewash turns it on so that it is ready when the injured person and guide reach the eyewash.

LSI recommends making up a card that says, "You have just splashed chemicals in you eyes." The card is given unannounced to someone in the lab to initiate an eyewash drill.

Portable shields should be used whenever there is risk that a reaction, experiment, or demonstration may cause an injury to an employee (student) or to an audience (class). None of the demonstrations that hospitalized 50 children in 2000 had shields between the demo and the students.

The recent explosion (June 2002) at a college in New England illustrates the need for great use of shields. A graduate student scaled up an experiment involving a reactive material. The experiment was done in a fume hood with the sash down to within one inch of the airfoil. When the explosion occurred, fragments of the glass and shattered metal hotplate bounced under the sash and off the airfoil lacerating the graduate student's chest and face. A portable shield would likely have prevented this injury.

A Good Sense Eye and Face Protection Program

LSI recommends that both academic institutions and other employers adopt the following eye and face protection policy for their laboratories:

Eye protection must be worn at all times in the laboratory. These devices must comply with the ANSI Z-87.1 standard (including being appropriate for the activity). The minimum acceptable protection is spectacles with side protectors. If the hazard is chemical splash or hot liquids (about 60 degrees Celsius), chemical splash goggles should be worn. If the splash or impact hazard is severe, a face shield that covers the face, neck, and throat should be added.

It will be beneficial to have all types of devices present in a variety of sizes and shapes. No two people have the same size or shape face. Providing an element of choice is very helpful and improves acceptance.

Conclusion

Proper eye and face protection requires understanding the hazards that are present or likely to be

present, the relevant OSHA and ANSI standards and the differences between various protective devices. It also requires that management (administrators) make wearing the designated devices a condition of employment (class participation).

If you have questions about eye and face protection, please contact the Laboratory Safety Institute (192 Worcester Road, Natick, MA 01760 Tel: 508-647-1900 Fax: 508-647-0062 Email: labsafe@aol.com Web: www.labsafety.org). Free copies of LSI's *Laboratory Safety Guidelines* are available on request.

References

1. The Code of Federal Regulations, 29 Part 1900 to 1910.999, revised as of July 2000, Government Printing Office, Washington, DC

2. American National Standards Institute, ANSI Z-87.1 1998, (office: 25W. 43rd Street, New York, New York 10036; headquarters: 1819 L Street, N.W., Washington, DC 20036 (www.ansi.org)

3. American National Standards Institute, ANSI Z-358.1 2000

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James A. Kaufman is founder and director of the Laboratory Safety Institute. For over 25 years, he has been writing and lecturing on laboratory safety and effective lab safety programs. More then 50,000 scientists and science educators have attended his training programs. Over two million copies of his *Laboratory Safety Guidelines* have been distributed making it one of the most widely read lab safety publications in the world.