

Eye safety is everyone's business

Bob Pieper

“Eye Safety is Everyone’s Business” is the theme designated by the National Eye Institute (NEI) for the observance of this year’s Healthy Eyes Month (see Figure 1). Each day, about 2,000 U.S. workers sustain job-related eye injuries that require medical treatment, according to the U.S. Centers for Disease Control and Prevention’s (CDC) National Institute for Occupational Safety and Health (NIOSH). About one-third of those injuries are

May is Healthy Vision Month. “Eye Safety is Everyone’s Business” is this year’s theme. Optometrists should be the preferred source for both prescription and plano safety eyewear. Here is how optometrists can help the nation reach objectives for workplace eye safety and why it makes practice management sense to do so.



treated in hospital emergency departments, and more than 100 of those injury cases result in 1 or more days of lost work (see www.cdc.gov/niosh/topics/eye/).

Occupational Safety and Health Administration (OSHA) standards require employers to ensure workers have suitable eye protection. Yet, the Bureau of Labor Statistics (BLS) reports that nearly 3 of every 5 workers injured were not wearing eye protection at the time of the injury or were wearing the wrong kind of eye protection for the job. It is estimated that 90% of eye injuries could be prevented through the use of proper protective eyewear on the job, according to NEI.

Safety eyewear industry representatives attribute those injuries to a variety of factors. Whereas most large employers have eye safety programs in place, workers and employers may not be diligent in seeing that safety eyewear is used consistently and properly. Many workers may rely on inadequate safety eyewear or even “street wear” to provide eye protection in the workplace. Many on-the-job eye injuries

result when debris strikes the eye from the side. Yet, much of the safety eyewear used in the workplace does not have side shields. Most small and medium-sized employers have no formal eye safety programs at all.

The U.S. Department of Health and Human Services (HHS) has established improved workplace eye safety as a goal under Healthy People 2010, the nation’s official public health agenda (see Table 1). The American Optometric Association (AOA) Board of Trustees has approved a new eye safety policy statement encouraging optometrists to help meet that objective.

Under the Healthy People 2010 program, HHS hopes to cut workplace eye injuries by almost a third over the course of this decade. The agency hopes to reduce the annual incidence of eye injuries resulting in lost work days by 30%, from the current 4.8 per 10,000 full-time workers in private industry (Annual Survey of Occupational Injuries and Illnesses [ASOII], U.S. Department of Labor, Bureau of Labor Statistics) to 3.4 per 10,000 full-time workers. HHS is also targeting a 30% decrease in the incidence of occupational eye injuries treated in emergency departments, from 21.0 per 10,000 full-time workers (National Electronic Injury Surveillance System [NEISS], Consumer Product Safety

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Figure 1 This National Institute for Occupational Safety and Health logo will be the symbol for Healthy Vision Month 2006. Healthy Vision Month is co-sponsored this year by the National Eye Institute, the National Institute for Occupational Safety and Health, and the National Safety Council in collaboration with the American Association of Occupational Health Nurses.

Commission and National Institute for Occupational Safety and Health, CDC) to 14.7 per 10,000 full-time workers.

Businesses, government officials, workers, and optometrists all have good reason to begin working together this Healthy Vision Month to achieve these ambitious targeted reductions in workplace eye injuries. Health care and disability costs have become major concerns for American business as well as federal and state governments. Businesses stand to reduce health insurance and worker's compensation costs, as well as boost productivity by launching eye safety programs. Such programs can save workers from potentially devastating eye injuries as well as considerable out-of-pocket expenses.

Optometrists, as noted in this month's *Optometry* guest editorial, should be the nation's preferred source for safety eyewear and related services. Optometrists are uniquely qualified to educate employers and workers on the threats posed by workplace eye injury. They can:

- Explain the value of proper eye protection, the types of eye protection available, and how to select the eye protection required.

- Determine if a given type of safety eyewear can accommodate a worker's refractive prescription.
- Counsel workers on the use of contact lenses in the workplace and explain the range of new and improved safety eyewear styles and materials that have been introduced over recent years.

As members of the American National Standard Institute (ANSI) Z87.1 Committee, Bernard Morewitz, O.D., and the late Lowell Glatt, O.D., helped develop the current American National Standard for Occupation and Educational Eye and Face Protection Devices (ANSI Z87.1-2003), which provides performance-based criteria for the manufacturing and testing of common industrial forms of safety eye protection such as safety glasses (prescription and nonprescription), goggles, face shields, welding helmets, and full-face respirators. Optometrists can counsel employers and workers on what to do should eye injuries occur in the workplace (and can often provide emergency eye care, faster and more cost effectively than a hospital emergency room, when such injuries occur). In fact, safety eyewear manufacturers who spoke with Practice Strategies are actively encouraging practicing optometrists to become providers of safety eyewear to business and workers.

Safety eyewear manufacturers acknowledge that, currently, relatively few optometrists are actively seeking to provide safety eyewear for local employers. In some cases, optometrists may feel it is too much trouble to contact businesses and solicit contracts to provide safety eyewear. Some optometrists may not wish to provide on-site eye screenings for employees. Safety eyewear manufacturers acknowledge that optometrists may feel safety eyewear will not provide the return on investment necessary in today's competitive eye and vision care market.

However, safety eyewear dispensing can hold a number of benefits for a practice. Most notably, it can be an effective way to draw a substantial number of new patients to a practice. Industry marketing data suggest "a huge, huge unmet demand" for safety eyewear, noted Rod Tahrán, vice-president, professional relations/clinical affairs, Essilor of America, Inc. Safety eyewear manufacturers who spoke with Practice Strategies informally estimate that around two-thirds of workers in manufacturing industries require safety eyewear, and up to a third require prescription safety eyewear. Most of those workers represent new patients for the practices from which they obtain their safety eyewear. Portsmouth, Virginia, practitioner James Cornetta, O.D., said safety eyewear has brought around 400 new patients to his practice.

Those new safety eyewear patients can have a substantial "ripple effect" on a practice, notes Scott Gosky of pioneer-

Table 1 Healthy People 2010

Objective 28-8: Occupational Eye Injury
Objective 28-8a: Reduce occupational eye injuries resulting in lost work days.
Objective 28-8b: Reduce occupational eye injuries treated in emergency departments.

Box 1

Safety eyewear practice portrait

Portsmouth, Virginia practitioner James V. Cornetta, O.D., began providing safety eyewear for the Merchant Marines. “I have not actively solicited contracts. Most of them have fallen into my lap,” Dr. Cornetta said. Initially asked to provide safety eyewear for a locally based ship line, Dr. Cornetta was approached by AOSafety to help service other employers in the area after workers mentioned that he was already providing workplace eyewear. Currently, Dr. Cornetta provides safety eyewear for employees of a half-dozen major companies, including Northrop Grumman, Verizon, and the Norfolk Southern Railroad, plus a handful of smaller businesses, under contracts arranged by AOSafety and U.S. Safety. In all, those contracts bring Dr. Cornetta up to 400 patients annually.

Terms are typical of the safety eyewear industry. The safety eyewear manufacturers approach employers and negotiate contracts. Employees are provided lists of eye care practitioners from whom they can obtain prescription safety eyewear—Dr. Cornetta among them. Safety eyewear manufacturers provide practitioners displays of eyewear covered under their programs. Dr. Cornetta provides necessary examinations, which are normally covered under the employers’ vision plans. The safety eyewear manufacturers bill the employers for eyewear. Most of the employers provide new safety eyewear every year for employees.

Virtually all of the 400 safety eyewear patients represent “new patients” to the practice, Dr. Cornetta said. Moreover, virtually all become “patients of the practice,” not just one-time recipients of safety eyewear, he adds. That is because most employees come to look at the annual appointment to get safety eyewear as their annual eye examination. Many get additional eyewear for everyday use, often at their own expense.

The partnership between safety eyewear manufacturers and the eye care practitioners is ideal, Dr. Cornetta said. “They need us to fit the eyewear. They know how to approach employers. We (optometrists often) don’t have that expertise.” Safety eyewear is no more difficult to fit than any other eyewear, Dr. Cornetta adds. “It involves the same skills we use everyday.” However, the optometrist’s role in ensuring proper safety eyewear should not be underestimated. “Not every prescription will work with every frame,” he notes.

Margins on safety eyewear are not substantial, Dr. Cornetta acknowledges. However, as a way of attracting substantial numbers of new patients to a practice, safety eyewear is hard to beat. “Anything that brings new patients through the door of my practice” is good, Dr. Cornetta said.

In addition to dispensing safety eyewear, Dr. Cornetta currently serves as the American Academy of Optometry’s representative to the ANSI Z-87.1 Committee.

ing safety eyewear maker AOSafety. Although only a relatively small percentage of safety eyewear patients purchase everyday eyewear in addition to their safety eyewear, many visit the practice for routine eye care, and, often, many safety eyewear patients bring their family members to the practice, he said. These patients also may return for medical eye care in the case of a work-related eye emergency. Additionally, co-workers who do not require safety eyewear, may hear about the practice through word-of-mouth from fellow employees, or the practice may benefit by promoting itself to the employer.

In the case of most large employers, safety eyewear is provided under eye safety programs through contracts with eyewear fabricators. Those eyewear suppliers not only refer patients to the panels of eye care practitioners who provide eyewear fitting, but handle all of the billing and processing. That means minimal paperwork for the practice. Manufacturers maintain that, in many cases, because safety eyewear will not generally be covered under an employer’s managed care plan, the profit margin for safety eyewear or related examinations may actually be greater than for some eyewear covered under vision policies.

In fact, optometrists may already be dispensing more safety eyewear than many people realize. The 2005 AOA

Optical Dispensing Survey found AOA member optometrists prescribe industrial safety glasses about 10 times a month, personal safety eyewear about 4.5 times a month, and sports safety eyewear about 6.2 times a month. A number of practitioners are dispensing considerably more, demonstrating that safety eyewear can be developed as a niche practice (*see* Box 1). At least some safety eyewear manufacturers now offer assistance to help optometrists develop safety eyewear practices. Many are actively seeking eye care providers for their dispenser networks. OSHA, ANSI, and other entities offer a wealth of guidance to help optometrists and employers understand safety regulations, assess eye injury threats, and select proper personal protective equipment (PPE) for the face and eye (*see* Box 2).

Optometrists may wish to take time during Healthy Vision Month to review workplace eye safety regulations, safety eyewear standards, procedures to assess workplace eye safety, current safety eyewear options, the process for selecting proper safety eyewear, and the latest developments regarding the use of contact lenses in the workplace and eye disease prevention on the job site. Moreover, they should begin to help businesses and workers in their areas become more knowledgeable on those topics.

Workplace eye hazards

The majority of workplace eye injuries each year result from small particles or objects striking or abrading the eye, according to NEI. Examples include metal slivers, wood chips, dust, and cement chips that are ejected by tools, wind-blown, or fall from above a worker. Some of these objects, such as nails, staples, or slivers of wood or metal, penetrate the eyeball and can result in a permanent loss of vision. Large objects may also strike the eye or face, or a worker may run into an object causing blunt force trauma to the eyeball or eye socket. Chemical burns to one or both eyes from splashes of industrial chemicals or cleaning products are common. Thermal burns to the eye occur as well. Among welders, their assistants, and nearby workers, ultraviolet radiation burns (welder's flash) routinely damage workers' eyes and surrounding tissue, according to NIOSH.

In addition to common eye injuries, health care workers, laboratory staff, janitorial workers, animal handlers, and other workers may be at risk of acquiring infectious diseases via ocular exposure, NIOSH notes. Infectious diseases can be transmitted through the mucous membrane of the eye as a result of direct exposure (e.g., blood splashes, respiratory droplets generated during coughing or suctioning) or from touching the eyes with contaminated fingers or other objects. The infections may result in relatively minor conjunctivitis but in some cases could conceivably result in a life-threatening disease such as human immunodeficiency virus, B virus, or possibly even avian influenza.

While the Healthy Vision Month effort is devoted to preventing workplace injuries, it should be noted that students and trainees in settings from college chemistry laboratories to trade school machine shops may face many of the same eye injury hazards as workers on the job.

Regulations and standards

The Occupational Health and Safety Administration (OSHA) eye and face protection standard (29CFR1910.133) requires employers to "ensure that each affected employee uses appropriate eye or face protection when exposed to eye or face hazards." Eye and face protection must be used whenever necessary to protect against chemical, environmental, and radiologic hazards or mechanical irritants, the Eye and Face Protection eTool on OSHA's Web site notes. The OSHA Web site goes on to emphasize that employers must ensure that each "affected employee" uses appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation. Under the OSHA regulation, it is the employer's responsibility to determine if hazards are present in the workplace, to select the appropriate device, and to train employees. However, it should be noted that "ensure" under the OSHA regulations means "require," not necessarily "provide" or "pay for." Employers under federal law must inform employees if there is a potential eye safety hazard in their work environment and, in such cases, require

employees to use appropriate eye protection. Many large employers provide safety eyewear and related eye examinations under formal eye protection programs as a type of employee benefit. However, employers can simply require employees to provide safety eyewear themselves.

Under OSHA, employers must ensure that any protective devices used by their employees (whether provided by the employer or the employee) meet the ANSI Z87.1-2003 National Standard for Occupation and Educational Eye and Face Protection Devices, or be demonstrated by the employer to be equally effective. (Protective eye and face devices, purchased after July 5, 1994, must comply with ANSI Z87.1 – 1989 standard or shall be demonstrated by the employer to be equally effective. Protective devices, purchased before July 5, 1994, are still technically acceptable if they meet the older ANSI Z87.1-65 standard.) It should be noted that ANSI develops voluntary consensus standards. That means manufacturers are not technically required to produce eye safety devices meeting the ANSI Z87.1 standards, although employers are required under OSHA to see that their employees have eye protection meeting that standard. Fortunately, compliance is in a manufacturer's interest, and most manufacturers produce safety eyewear meeting the ANSI Z87.1 standard. Most commercially available safety eyewear will be certified as ANSI Z87.1 compliant by either the manufacturer, through an internal "self-certification" program, or an independent third-party testing organization, recognized by ANSI, such as the Safety Equipment Institute (SEI). (Although ANSI adopted its new, more stringent ANSI Z87.1 – 2003 safety eyewear standard 3 years ago, federal administrators have not yet formally made compliance with the 2003 ANSI standard mandatory under OSHA. Nevertheless, major safety eyewear manufacturers are already ensuring their products meet the 2003 ANSI standard, and employers who are knowledgeable about eye safety will probably demand it.)

In addition to simply seeing that employees use appropriate safety eyewear on the job, employers, under OSHA regulations, are required to formally assess workplace eye hazards, select the appropriate type of eyewear to use, train and certify employees in eye protection, and plan for eye emergencies. State law may impose additional requirements. A detailed discussion of the steps involved in an OSHA compliance eye safety program, based on the OSHA Eye and Face Protection eTool, is provided in Box 3.

Both ANSI and OSHA emphasize that it is the employer's responsibility, not the device manufacturer's, to determine which type of device is appropriate for the hazards present in the workplace. OSHA requires that employers conduct a workplace hazard assessment to select the proper type of eye protection required. "The eye protection chosen for specific work situations depends on the nature and extent of the hazard, the circumstances of exposure, other protective equipment used, and personal vision needs," NIOSH notes on its Eye Safety Web page (see www.cdc.gov/niosh/topics/eye/). "Selection of protective eyewear appropriate for a

given task should be made based on a hazard assessment of each activity, including regulatory requirements when applicable.” In addition to OSHA’s general industry standards for eye protection (OSHA 1910.133), safety eyewear, in some cases, must meet specific requirements for use in the maritime (OSHA 1915.153) or construction (OSHA 1926.102) industries.

To assist in determining the appropriate eye protection, OSHA, ANSI, and other entities offer considerable guidance (*see* Box 2). The OSHA eTool Web site’s Hazard Assessment module lists various workplace eye hazards with links to appropriate categories of eye protection and guidance on the various safety eyewear options within those categories. ANSI Z87.1 Section Seven is devoted to protector selection. It includes a selection chart listing 5 major hazards and 13 types of commonly available devices and indicates which devices are appropriate for each type of hazard. The NIOSH Eye Safety Web page (www.cdc.gov/niosh/topics/eye/) offers specific guidance on eye safety requirements for working in emergency response and disaster recovery operations, eye protection for infection control, eye safety in the construction industry, and safe contact lens use in chemical environments. Given such step-by-step guidance, virtually any employer or worker should be able to find eye protection suitable for their workplace.

Under the 2003 revisions, the ANSI Z87.1 standard, for the first time, recognizes 2 levels of safety eyewear:

- Regular, generally meeting the “drop ball” standard for impact resistance that has been required of eye safety protection for many years
- “Z87 Plus” eyewear, meeting a somewhat higher standard for impact resistance, designed to take advantage of new, stronger materials and provide greater protection from projectiles. (For a detailed explanation, *see* Box 4).

ANSI emphasizes the importance of selecting the level of safety eyewear that will provide adequate protection for workers. Safety eyewear is available with various tints and coatings that may be important in protecting against glare in many work situations. Some styles or types of eyewear will provide better fit, which may be critical to proper protection against dust or chemical contaminants. More detailed discussion on the requirements for eye protection and the selection of proper eye protection is provided in Box 3. In general, both safety eyewear makers and practitioners experienced in safety eyewear dispensing emphasize the safety eyewear purchased just a few years ago, or safety eyewear intended primarily for sports or recreational use, may not offer adequate protection in the workplace.

Protective eyewear

Industrial safety eyewear is generally broken down into 2 broad categories: plano eye and face protection (including plano spectacles, goggles, face shields, welder’s masks, and full face respirators, all described in the ANSI Z87.1 standard), and prescription industrial eyewear. (A growing variety of

nonindustrial eye safety products is targeted to do-it-yourselfers, hobbyists, hunters, and marksmen, as well as home and garden use. While that eye protection is technically outside the scope of this year’s Healthy Vision Month focused on “Preventing Workplace Eye Injury,” NEI will devote its 2009 Save Your Vision Month to the broader topic of “Eye Protection.”) Plano or prescription safety eyewear used in the workplace should meet the ANSI Z87.1 – 2003 National Standard for Occupation and Educational Eye and Face Protection Devices. Plano safety eyewear is generally marketed through industrial supply stores or by manufacturers who provide it directly to employers. However, there is no reason why eye care practitioners should not dispense goggles or other forms of plano safety eyewear, suggests AOSafety’s Scott Gosky. Manufacturers acknowledge plano safety eyewear provides a limited return on investment. However, eye care practices now routinely handle many items—from clip-ons to eyeglass neck chains—as a matter of patient convenience, even though such items provide only a limited profit margin, Gosky notes.

The field of safety eyewear—plano and prescription—has undergone a major transition over the past 5 to 7 years. Polycarbonate—thinner (generally 2.0 mm) and lighter, yet more impact resistant than traditional materials—has basically replaced glass and Plastic CR-39 as the most common lens material used in safety eyewear. Polycarbonate has been widely shown in laboratory tests to meet the ANSI standard as a high impact protector. The only other material to have met the high impact protector standard in any laboratory tests is Trivex™ (PPG Industries, Pittsburgh, Pennsylvania). Seventy percent of AOSafety’s prescription safety eyewear and virtually 100% of plano safety eyewear is now polycarbonate, according to Gosky.

Moreover, like eyewear as a whole, prescription (and to some degree even plano) safety eyewear has undergone something of a fashion revolution. Back in the 1970s, safety eyewear came in one basic lens shape. “It was the S-7, a 7-mm difference lens shape that was deep and unbecoming,” recalls Marty Gullen, executive vice president of safety frame maker ArtCraft Optical. An early aviator style “was not that pretty either,” adds AOSafety’s Gosky. Today, safety eyewear is available in a wide array of styles and materials that are not only more attractive but, in many cases, provide improved protection. Attractive safety eyewear fashion frames, available in stainless steel, nickel-silver, and monel now often rival conventional eyewear in appearance, manufacturers proudly note. The AOSafety line even offers a safety eyewear line targeted specifically to women. “People today say, ‘if I am going to have to wear safety glasses, I want to wear something that looks good,’” Gullen notes. Some workers now use their workplace safety eyewear for everyday use, manufacturers note. However, in many cases, the use of permanent side shields, necessary in many work environments to provide adequate protection, limits the use of the safety eyewear as attractive day-to-day eyewear.

Box 2

Resources

American Optometric Association—Materials for use in presentations on safety eyewear are available on the AOA Web site (www.aoa.org). The AOA Clinical Care Group's *Occupational Vision Manual*, providing a detailed look at workplace eye protection, is available free of charge on the AOA Web site (www.aoa.org/documents/vision-manual.pdf). *Your Vision ... Your Job Depends On It*, an AOA brochure explaining the basics of workplace eye safety, is available through the AOA Order Department. Call (800) 262-2210 (see Figure 2).

American National Standard for Occupational and Educational Eye and Face Protection Devices (ANSI Z87.1-2003)—The standard provides performance-based criteria for manufacturing and testing of common industrial forms of safety eye protection such as safety glasses (prescription and nonprescription), goggles, face shields, welding helmets, and full-face respirators. Additionally, the standard includes a safety eye protection selection guide and an eye injury incident reporting form. Available at www.safetysafetyequipment.org/eyeface.htm or directly from ANSI at <http://webstore.ansi.org/ansidocstore/product.asp?sku=ANSI+Z87%2E1%2D2003>.

Healthy Vision Month 2006—The National Eye Institute and cosponsoring organizations offer a variety of materials with the “Eye Safety At Work Is Everyone’s Business” theme through the Healthy Vision Month Web site (www.healthylvision2010.org/hvm/).

National Institute for Occupational Safety and Health (NIOSH)—Part of the U.S. Centers for Disease Control and Preventions, NIOSH offers educational materials, information on eye safety in special workplace environments, occupational eye injury statistics, sample health hazards evaluations, and a search engine for academic research on eye safety through the Eye Safety Web page (www.cdc.gov/niosh/topics/eye).

NIOSH Health Hazard Evaluation—NIOSH conducts Health Hazard Evaluations (HHEs) to find out whether there are health hazards to employees caused by exposures or conditions in the workplace. The NIOSH HHE Web page explains the program, offers a searchable data base of past NIOSH HHE reports, and provides forms to request a workplace evaluation (www.cdc.gov/niosh/hhe).

National Safety Council—The council offers information on workplace safety for human resource professionals on its Web site (www.nsc.org).

OSHA Eye and Face Protection eTool—Step-by-step guide to OSHA requirements, hazard assessment and safety eyewear selection. (www.osha.gov/SLTC/etools/eyeandface/index.html).

OSHA Safety & Health Topic: Eye and Face Protection—Information on OSHA and ANSI standards for eye protection, hazard recognition, possible solutions, and more (www.osha.gov/SLTC/eyefaceprotection/index.html).

Occupational Eye Injury Statistics

Work-RISQS—The NIOSH Work-Related Injury Statistics Query System (Work-RISQS) provides national estimates and rates of occupational injuries and illnesses treated in US hospital emergency departments. To obtain annual occupational eye injury statistics, do queries based on “Part of Body = eyeball” (www2a.cdc.gov/risqs/).

Survey of Occupational Injuries and Illnesses—The Bureau of Labor Statistics (BLS) conducts an annual survey of employers to assess nonfatal occupational injuries and illnesses in U.S. private industry. Eye injury statistics are provided for OSHA recordable incidents that involve days away from work (see Non-fatal injuries and illnesses case and demographic characteristics sections for Part of Body = eye). BLS has provided a summary for 2002 (www.bls.gov/iif/).

NIOSHTIC-2—The NIOSHTIC-2 searchable bibliographic database offers access to thousands of occupational safety and health publications, documents, grant reports, and journal articles supported in whole or in part by NIOSH (www.cdc.niosh/topics/eye/).

Special Interest

Agriculture

National Ag Safety Database (NASD): Eye Protection—Provides basic information on preventing eye injuries in agricultural settings (www.cdc.gov/nasd/docs/d001601-d001700/d001628/d001628.html).

National Ag Safety Database (NASD): Eye Protection for Farmers—Provides information on causes for farm-related eye injuries, types of eye protection, basic first aid (www.cdc.gov/nasd/docs/d000901-d001000/d000929/d000929.html).

Box 2 (continued)

Resources

Avian Influenza—Protecting Poultry Workers at Risk—This OSHA Safety and Health Information Bulletin is a product of the OSHA-NIOSH Issues Exchange Group. It describes measures for protecting poultry workers when an avian influenza outbreak occurs. This document complements avian population disease control and eradication strategies of state governments, industry, and the U.S. Department of Agriculture and will aid in the development of biosecurity guidelines and standard operating procedures for the various sectors of the poultry industry (www.osha.gov/dts/shib/shib121304.html).

Emergency Services

Emergency Response and Disaster Recovery—NIOSH offers an overview of eye hazards and injuries, plus information on types of eye protection, safety for prescription lens wearers, and first aid (www.cdc.gov/niosh/eyesafe.html).

Contact Lens Use in a Chemical Environment—NIOSH's Current Intelligence Bulletin 59 (Publication 2005-139, June 2005) provides safety guidelines for contact lens wearers working in chemical environments (www.cdc.gov/niosh/docs/2005-139/).

Hazard Alert—Eye Injuries in Construction—From the Center to Protect Workers' Rights, this document provides general information on eye protection with an emphasis on welding (www.cdc.gov/elcosh/docs/d0100/d000018/d000018.html).

How Much Eye Protection is Enough?—This 2002 *Occupational Hazards* magazine article, made available through the Electronic Library of Construction Safety and Health (eCLOSH), covers hazard assessment, types of eye protection, and information about proper fitting (www.cdc.gov/elcosh/docs/d0100/d000018/d000018.html).

Tool Box Talks—"Tool Box Talk" presentations on eye protection for construction workers are available from NIOSH (www.cdc.gov/niosh/topics/eye/toolbox-eye.html) as well as from the Electronic Library of Construction Safety and Health (www.cdc.gov/elcosh/docs/d0500/d000511/d000511.html).

Infection Control

Eye Protection for Infection Control—NIOSH offers background information and specific details on eye protection used to supplement eye protection recommendations provided in current Centers for Disease Control infection control guidance documents. It is intended to familiarize workers with the various types of eye protection available, their characteristics, and their applicable use (www.cdc.gov/niosh/topics/eye/eye-infectious.html).

Safety Eyewear Manufacturer Resources

Safety eyewear manufacturers may need optometrists to help provide safety eyewear for large employers. They can refer optometrists to nearby affiliated optical laboratories that can provide safety eyewear for small or medium-size businesses, and, in some cases, may offer general guidance for businesses needing safety eyewear. Some manufacturers offer support for optometrists who wish to pursue safety eyewear practice.

ArtCraft Optical—(800) 828-8288 or www.artcrafoptical.com.

AOSafety—(800) 982-2828 or www.aosafety.com/aosafety.com.

Essilor Laboratories—(800) 346-1338 (east of the Mississippi River), (800) 328-4912 (west of the Mississippi River) or www.eloa-safety.com (Company offers in-practice training by field representatives for practices seriously interested in providing safety eyewear programs for local business.)

Kenmark—(800) 627-2898 or www.kenmark.com.

Titmus—(877) 848-6873 or www.titmus.com.

Although safety frames have come to appear much more like "street eyewear" in recent years, there are important differences, Gullen notes. In addition to being tested against

and meeting the current ANSI standards for strength and impact resistance, safety frames should have a full rim and deeper eyewire grooves to better accommodate a safety lens

Box 3

OSHA Eye Safety Requirements Overview

(Adapted from the OSHA Eye and Face Protection eTool)

OSHA requires employers to ensure the safety of all employees in the work environment. Eye and face protection must be provided whenever necessary to protect against chemical, environmental, and radiologic hazards or mechanical irritants. Ensuring worker safety includes conducting a workplace hazard assessment and providing adequate training for all workers who require eye and face protection. When employees are trained to work safely, through the following requirements, they should be able to anticipate and avoid injury from job-related hazards.

OSHA standards

The following OSHA standards provide mandatory requirements and compliance assistance for employers when selecting proper eye and face protection:

- 1910.132 -General requirements
- 1910.133 -General Industry
- 1915.153 -Maritime
- 1926.102 -Construction

The employer shall ensure that each affected employee uses appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation. To select personal protective equipment (PPE) for the workplace, see the Hazard Assessment module accompanying the OSHA Eye and Face Protection eTool (www.osha.gov/SLTC/etools/eyeandface).

Training and qualification of employees

Employers must provide training for each employee who is required to use PPE in the workplace. [1910.132(f)]

- Each employee shall be trained to know at least the following:
 - When PPE is necessary
 - What PPE is necessary
 - How to properly don, doff, adjust, and wear PPE
 - Limitations of the PPE
 - Proper care, maintenance, useful life, and disposal of the PPE
- All training should be conducted by a knowledgeable designated person.
- All required training should be presented in a manner that the employee can understand.
- Each affected employee shall demonstrate an understanding of the training specified and the ability to use PPE properly before being allowed to perform work requiring the use of PPE.
- Employers who allow their employees to wear eye and face protection on a voluntary basis, when not required by OSHA or the employer, must implement limited provisions of a PPE program. For all other voluntary users, an additional written eye and face protection program that covers proper maintenance procedures must be implemented.

Retraining

- When the employer has reason to believe that any affected employee who has already been trained does not have the understanding and skill required, the employer shall retrain that employee. Circumstances under which retraining is required include, but are not limited to:
 - Changes in the workplace render previous training obsolete
 - Changes in the types of PPE to be used render previous training obsolete
 - Inadequacies in an affected employee's knowledge or use of assigned PPE indicate that the employee has not retained the requisite understanding or skill

Written certification

- The employer shall verify that each affected employee has received and understands the required training through a written certification that contains the name of each employee trained, the date(s) of training, and the subject of the certification.

Handling emergencies

- If an eye injury occurs, quick action can prevent a permanent disability. For this reason:
 - Emergency eyewashes should be placed in all hazardous areas.
 - First-aid instructions should be posted close to potential danger spots.
 - Employees must know where the closest eyewash station is and how to get there with restricted vision

Box 3 (continued)

OSHA Eye Safety Requirements Overview

Criteria for personal protective eyewear

Eye and face protection must comply with the American National Standards Institute, ANSI Z87.1-1989 standard if purchased after July 5, 1994, or ANSI Z87.1-1968 if purchased before July 5, 1994 [1910.133(b)(1), 1915.153(b), 1926.102(a)(2)].

- Eye and face PPE shall be distinctly marked to facilitate identification of the manufacturer [1910.133(a)(4)].
- The following minimum requirements must be met by all protective devices:
 - Provide adequate protection against the particular hazards for which they are designed
 - Be of safe design and construction for the work to be performed
 - Be reasonably comfortable when worn under the designated conditions
 - Fit snugly and not unduly interfere with the movements of the wearer
 - Be durable
 - Be capable of being disinfected
 - Be easily cleanable
 - Be distinctly marked to facilitate identification only of the manufacturer

Fitting personal protective eyewear

Consideration should be given to comfort and fit. Poorly fitting eye and face protection will not offer the necessary protection [1926.102(a)(6)(iii)].

- Fitting of goggles and safety spectacles should be done by someone skilled in the procedure.
 - Prescription safety spectacles should be fitted only by qualified optical personnel.
- Devices with adjustable features should be fitted on an individual basis to provide a comfortable fit that maintains the device in the proper position.
- Eye protection from dust and chemical splash should form a protective seal when fitted properly.
- Welding helmets and face shields must be fitted properly to ensure that they will not fall off during work operations.

Maintenance and care of personal protective eyewear

Employees must be trained in the proper care, maintenance, useful life, and disposal of PPE [1910.132(f)(1)(v)].

Maintenance

- PPE must be used and maintained in a sanitary and reliable condition.
- The use of equipment with structural or optical defects is prohibited [1926.102(a)(4)].
- Pitted lenses, like dirty lenses, can be a source of reduced vision. They should be replaced. Deeply scratched or excessively potted lenses are apt to break.
- Slack, worn-out, sweat-soaked, or twisted headbands do not hold the eye protector in proper position. Visual inspection can determine when the headband elasticity is reduced to a point below proper function.

Cleaning

- Atmospheric conditions and the restricted ventilation of the protector can cause lenses to fog. Frequent cleansing may be necessary.
- Eye and face protection equipment that has been previously used should be disinfected before being issued to another employee.
- When employees are assigned protective equipment for extended periods, the equipment should be cleaned and disinfected regularly.
- Several methods for disinfecting eye-protective equipment are acceptable. The most effective method is to disassemble the goggles or spectacles and thoroughly clean all parts with soap and warm water.
 - Carefully rinse all traces of soap and replace defective parts with new ones.
 - Swab thoroughly and immerse all parts for 10 minutes in a solution of germicidal deodorant fungicide.
 - Remove parts from solution and suspend in a clean place for air drying at room temperature or with heated air.
 - Do not rinse after removing parts from the solution because this will remove the germicidal residue that retains its effectiveness after drying.

Storage

- Goggles should be kept in a case when not in use. Spectacles, in particular, should be given the same care as one's own glasses, as the frame, nose pads, and temples can be damaged by rough usage.
- Items should be placed in a clean, dust-proof container, such as a box, bag, or plastic envelope, to protect them until reissue.

Box 3 (cont'd)

OSHA Eye Safety Requirements Overview

Contact lenses and prescription lenses in the workplace

Employers must ensure that employees who wear prescription (Rx) lenses or contacts use PPE that incorporates the prescription, or use eye protection that can be worn over prescription lenses [1910.133(a)(3), 1915.153(a)(3), 1926.102(a)(3)].

- Workers who wear prescription glasses must also wear required eye protection.
 - Eye and face protection that fits comfortably over glasses is available.
 - Safety goggles and spectacles may incorporate prescription lenses.
- Dust and chemicals present additional hazards to contact lens wearers. OSHA recommends that workers have an extra pair of contacts or eyeglasses in case of contact failure or loss.

The employer shall ensure that each affected employee uses appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation. A summary of the basic types of workplace eye hazards, to be considered when selecting safety eyewear, is provided in the Hazard Assessment module below.

Hazard type	Examples of hazard	Common related tasks
Impact	Flying objects such as large chips, fragments, particles, sand, and dirt	Chipping, grinding, machining, masonry work, wood working, sawing, drilling, chiseling, powered fastening, riveting, and sanding
Heat	Anything emitting extreme heat	Furnace operations, pouring, casting, hot dipping, and welding
Chemicals	Splash, fumes, vapors, and irritating mists	Acid and chemical handling, degreasing, plating, and working with blood
Dust	Harmful dust	Woodworking, buffing, and general dusty conditions
Optical Radiation	Radiant energy, glare, and intense light	Welding, torch-cutting, brazing, soldering, and laser work

bevel for proper lens retention. “It is a characteristic that the eye care provider can articulate easily to discern the difference between safety and dress eyewear,” notes Gullen. Gosky says he often encounters workers who attempt to use street eyewear as safety eyewear, even in companies with strict safety eyewear requirements. The importance of using both ANSI-compliant safety frames and safety lenses in workplace safety eyewear cannot be overemphasized, according to Jeff Anderson, vice president, industrial sales, Essilor Laboratories of America. “Some providers will still mount a safety lens in a conventional eyeglass frame and call that safetywear. We have seen some will mount a polycarbonate lens (designed for everyday use) in a safety frame and call that safetywear,” Anderson said. Both frames and lenses must have the required strength and impact resistance to provide protection in the workplace, he said.

The safety eyewear industry—once dominated by 2 brands: AOSafety and Bausch and Lomb—has also diversified over the years. Ninety-eight-year-old AOSafety (originally a division of American Optical, now a division of the international protection technology firm, Aearo Technologies) still claims overall leadership in the field (processing in excess of 2,000 pairs of eyewear a day at its 3 plants for clients like 3M, Burlington Northern Santa Fe, and United Technologies). However, Essilor (which claims to now be at least among the top 2 or 3 safetywear suppliers);

U.S. Safety; Louisville, KY–based Dispensers Optical; Walman Optical; and perhaps hundreds of other optical laboratories across the nation now also offer safety eyewear. Safety frames, meeting the ANSI Z87.1 – 2003 standards, are available from ArtCraft, Hudson, Kenmark, On-Guard, Titmus, and other frame makers. In the field of safety eyewear, the specialized optical laboratories that both produce the safety eyewear and market it directly to industry are the central players. Although many optical laboratories offer safety eyewear, not all may be meeting the current, more stringent ANSI Z87.1 standard, warns Essilor’s Anderson. Eyewear meeting the ANSI safety standard must be marked, indicating the name of the manufacturer, on the lens.

How workers obtain safety eyewear

The majority of American workers obtain prescription safety eyewear through eye safety programs established by large employers to ensure compliance with OSHA eye safety standards. Specialized safety eyewear laboratories such as AOSafety, Dispensers Optical, and Essilor provide eyewear to employers on a contract basis. The laboratories counsel employers on how to set up eye safety programs under OSHA, maintain networks of eye care providers to provide necessary eye examinations, and handle all the processing and paperwork. Eye safety assessment required

Box 4

The ANSI Z87.1 Eye and Face Protection Standard

The ANSI Z87.1 standard recognized 2 classes of eye and face protection: *basic impact* and *high impact*.

Basic impact industrial safety lenses must pass a drop ball test, being capable of resisting impact from a 25.4 mm (1 inch) diameter steel ball dropped from 127 cm (50.0 inches) without fracturing. Basic plastic lenses also must pass a penetration test, withstanding the impact of a pointed projectile weighing 44.2 g (1.56 oz) dropped from a height of 127 cm (50.0 inches). Basic impact lenses must be a minimum of 3.0 mm thick. Lenses with +3.00 diopter power or greater can have a thickness of not less than 2.5 mm.

High impact industrial safety lenses (sometimes known as “Z87 plus” lenses because they are marked with a “plus” sign) can only be made of polycarbonate or Trivex™ material. Prescription lenses must be a minimum of 2 mm thick and must pass a ballistic test with a ¼-inch steel ball fired at the lens at a velocity of 150 feet per second. The velocity must be measured at a point near the lens itself. The test consists of testing 3 lenses, and each test lens must be a beveled round plano clamped in a steel mount. The steel mount is required to allow minimal flexing in the mount and a more demanding test of the lens itself. High-impact plastic plano lenses must meet the same penetration test as basic plastic lenses. High-impact plano plastic lenses used in a frame marked Z87-2 cannot be less than 2.0 mm thick.

under OSHA will generally be performed by plant safety officers who will also determine the types of eyewear appropriate for employees. Employers then provide safety eyewear as an employee benefit. Most plans cover 1 or 2 pairs of basic safety eyewear per worker, per year (in some cases every other year). Some plans come with deductibles. Employees can generally opt for additional features such as coatings, covering costs out-of-pocket. Employees in need of prescription safety eyewear are generally provided a list of participating eye care practitioners. The employee selects a practitioner and undergoes an eye examination or screening to determine the refractive prescription to be used in the safety eyewear. (While “screening” is commonly used to describe the patient’s visit to the optometrist for safety eyewear, some practitioners provide complete eye examinations, paid for through the worker’s vision care plan. Screenings may be performed in the practitioner’s office or on the job site, particularly when a new eye safety program is being established.) The practitioner writes a prescription for the safety eyewear and forwards it to the specialized laboratory for processing. When the order is processed, the

practitioner fits the eyewear for the employee. The laboratory bills the employers for the eyewear. The examination is generally covered by the employer’s vision plan or paid for out-of-pocket by the employee.

In many cases, safety optical laboratories are activity seeking provider panel practitioners to help serve major employers—particularly in certain areas of the country. Essilor is actively recruiting optometrists for its provider network, according to company vice president Anderson. AOSafety’s Gosky said demand for practitioners in his company’s provider network varies with locality. “It depends on how much industry there is. In New Mexico, we can always use practitioners. In a small town, the market may be saturated and one practitioner may be enough. In others, like Cincinnati, where there is a lot of industry, you may need more,” he said. Laboratories may be particularly interested in working with eye care practitioners who are willing to provide on-site screenings for employers. Practitioners who wish to investigate opportunities on the provider panels for safety may wish to consult the contact information in Box 2.

However, the real hope in the safety eyewear industry is that practicing optometrists will now bring eye safety programs, already prevalent among large employers, to small and medium-sized businesses.

The opportunity in safety eyewear

Industry marketing data indicate a huge unmet demand for safety eyewear among small and medium-sized businesses. By now, most employers with 500 or more employees have already been approached by optical laboratories regarding eye safety programs. However, most medium-size businesses with perhaps 200 to 500 employees probably have not been contacted. Neither have most small employers with 200 or fewer employees, adds ArtCraft’s Gullen.

“This is where the dispensing optometrist can make a meaningful contribution,” Gullen said. Businesses with an unmet need for protective eyewear may range from mid-size manufacturers such as auto parts makers and food processing plants, with perhaps hundreds of employees, to auto body shops or lawn care services with as few as 1 or 2 employees. In a manufacturing plant with 100 employees, perhaps about two thirds of the plant’s employees—about 66 to 68 workers—will require safety eyewear, and perhaps, half of those—about 33 to 35 workers—will require prescription safety eyewear, Gullen suggests. That means safety eyewear can bring a lot of new patients to an eye care practice, manufacturers note.

“There is just a golden opportunity here for the optometrist,” said Essilor’s Anderson.

Demand for formal eye safety programs will often come from business owners who have been prompted by their plant safety officers or human resources offices to ensure compliance with OSHA regulations. “This is generally a business owner who will say, ‘My human resources person says I really ought to have an eye safety program,’” Gullen said. When approached by such a business person, the optometrist should be prepared to work with an optical laboratory partner to help

Your Vision...Your Job Depends On It!



American Optometric Association

Figure 2 AOA's *Your Vision ... Your Job Depends On It!* brochure includes a section on workplace eye safety including a brief explanation of safety lenses, goggles, face shields, and welding helmets.

the business owner establish an eye safety program complete with plant review. The optometrist may also wish to provide NIOSH, OSHA, or ANSI materials on assessing workplace eye threats and selecting proper eye protection. The optometrists can then also note that his or her practice can provide the required safety eyewear.

Gullen emphasizes that, "first and foremost," the optometrist who wishes to begin providing safety eyewear for the

employees of small to medium-sized businesses must identify a laboratory "partner" that specializes in prescription safety eyewear programs. The laboratory will have the expertise to facilitate plant inspections to determine proper eyewear selections for the various workplace functions. The optometrist can then provide the necessary eye examinations for workers.

Even the potential for "walk-ins" must be discussed with the laboratory partner to properly match job function with proper eyewear selection, lens designs, and side shield requirements. "Walk-ins might typically come in and say: 'My boss told me I need to have safety eyewear,'" Gullen said. ArtCraft recommends dispensing optometrists maintain a 6-to 15-place kit of safety eyewear frames. Practitioners may wish to inform nearby employers that their practices provide safety eyewear and can accommodate walk-in patients. Practitioners who serve walk-in safety eyewear patients will, of course, charge patients or their vision plans, rather than employers, for eyewear and examinations.

The optometrist's role

The optometrist's primary role in providing workplace eye safety is to provide prescription safety eyewear for those who need it. Under OSHA regulations, employers must ensure that workers who require vision correction have the same level of eye protection as workers who do not—meaning prescription safety eyewear or devices, such as goggles, that will fit over prescriptive eyewear. "Prescription safety spectacles should be fitted only by qualified optical personnel," OSHA's eTool Web site specifies. However, optometrists can play an important role in providing plano safety eyewear as well. "Consideration should be given to comfort and fit. Poorly fitting eye and face protection will not offer the necessary protection," the OSHA regulations specifically state [OSHA 1926.102(a)(6)(iii)]. "Fitting of goggles and safety spectacles should be done by someone skilled in the procedure," the OSHA Web site notes. "Devices with adjustable features should be fitted on an individual basis to provide a comfortable fit that maintains the device in the proper position. Eye protection from dust and chemical splash should form a protective seal when fitted properly."

Many employers send workers with and without corrected vision to an optometrist for safety eyewear to see that both are properly fitted with the same level of high-quality eye protection, notes Gregory W. Good, O.D., Ph.D., chair of the AOA Eye Safety Project Team and AOA's representative on the ANSI Z87.1 Committee. "The right safety eyewear, in many cases, will be the safety eyewear that workers will be most certain to use and keep on. The importance of good fit and comfort should not be underestimated," Dr. Good said.

The potential for legal liability may limit how much an optometrist should do to ensure workers have proper safety eyewear.

Optometrists should not perform the hazard assessment required under OSHA regulations or select the eyewear necessary for employees, safety eyewear manufacturers emphasized.

In large companies, hazard assessment and safety eyewear selection will generally be conducted by an OSHA official or environmental health and safety (EHS) officer—a position that in many large companies now requires a specialized degree, Essilor's Anderson noted. Manufacturers who spoke with Practice Strategies noted that optometrists who perform hazard assessment or specify safety eyewear for a business could open themselves to "huge" liabilities, should a worker sustain an eye injury on the job.

An optometrist may be very helpful in providing an employer a basic understanding of the potential for eye injury in the workplace. An optometrist could play an important role in improving worker eye safety by generally outlining factors such as:

- Potential hazards in a workplace—including potential damage owing to UV radiation
- The benefits of new ANSI "plus" grade safety eyewear or other developments
- The benefits of side shields
- The basic do's and don'ts of contact lens wear in the workplace.

Optometrists may wish to refer business owners wanting more specific information to the ANSI, OSHA, or NIOSH materials developed to assist in the assessment of workplace eye hazards and safety eyewear selection (*see* Box 2).

In many cases, it may be surprisingly easy for an optometrist to effectively advise a business owner on the need for workplace eye protection in broad terms, notes Essilor's Anderson. Take, for example, a typical auto body shop in which virtually anyone in the shop area will be exposed to particulates in the air, Anderson said. "You can simply tell the owner, 'Anyone who steps outside of your office (area) should have on eye protection,'" Anderson said. Similarly, contractors might be advised that anyone on a job site should have eye protection. Many workplaces now have signs, proclaiming "Everyone must wear hardhats." Similar provision for safety eyewear may be appropriate.

OSHA requires worker training on eye protection. Under federal regulation, that training can be provided by a foreman, supervisor, human resource professional, safety officer, or just about anyone else, as long as the worker understands the information. Optometrists can play a part in helping an employer understand what that training should include. An optometrist could certainly provide a credible explanation of eye hazards, the benefits of safety eyewear options, the proper way to flush the eye after a chemical accident, or how to address eye health issues such as the removal of foreign bodies. However, once again, optometrists should understand the possibility of exposure to certain legal liabilities in the course of providing such training. Certainly, for legal reasons, the employer, not the optome-

trist, should be the party that certifies workers have undergone OSHA-required eye safety training.

Establishing a safety eyewear practice

At least some safety eyewear makers offer assistance to optometrists who are interested in helping local employers establish safety eyewear programs. For practices "seriously interested in providing safety eyewear," Essilor can make available field representatives who will outline step-by-step practice methodologies, including advice on approaching local businesses and the structuring of safety eyewear programs. In-office presentations can be scheduled for "a few hours, a half-day, a full day, whatever it takes," Essilor's Anderson said. Essilor field representatives can provide "talking points" on workplace eye safety, as well as other materials, he said. Interested practitioners should call the contact telephone numbers accompanying this article. Practitioners requiring assistance on specific workplace eye safety issues are also welcome to call the Essilor contact numbers, Anderson said.

With its "Prevent Workplace Eye Injuries" theme, this year's Health Vision Month provides a rare opportunity to increase awareness of the need for eye safety among employers and workers. Moreover, it offers practitioners an opportunity to enter or build a safety eyewear practice while minimizing the need to call on businesses and propose eye safety programs—the aspect of safety practices that most optometrists seem to find least appealing.

Practitioners may wish to consider:

- Providing presentations on eye safety at meetings of the local chambers of commerce, labor unions, Lions Clubs, Rotary Clubs, and other appropriate business or community groups
- Submitting press releases to local newspapers, business publications, and broadcast media regarding workplace eye safety
- Guest lecturing on eye safety issues at local business colleges or trade schools

Such presentations could be effective in motivating local businesses to approach the optometrist/speaker regarding safety eyewear.

However, optometrists who have time in their practice schedules should consider directly approaching the owners, human resource personnel, safety managers, or on-site nurses, at both large and small businesses in their areas regarding the benefits of today's safety eyewear and formal eye safety programs.

The AOA Communications Group offers materials that can be used in lectures on eye safety, media outreach, or presentations to businesses (*see* Box 2).

At a minimum, this month, practitioners may also wish to contact safety eyewear laboratories to see if panel providers are needed in their areas.