Effective Training for Adult Learners

By Christine M. Merli

OSHA's pamphlet on training (OSHA 7) states that an "effective training program allows employees to *participate* in the training process and to *practice* their skills or knowledge. This will help to ensure that they are learning the required knowledge or skills and *permit correction* if necessary" (emphasis added) (OSHA, 1998). Learning occurs when behavior is changed.

Adults learn differently than children. When determining the effectiveness of the training experience (e.g., traditional, accelerated learning, e-learning, blended), ask three questions:

1) Did the learner participate in the training? For example, will you have appropriate types/numbers of respirator cartridges/filters to allow each respirator user an opportunity to conduct an exercise on proper selection and attachment of media?

2) Did the learner practice skills or knowledge? For example, will you have appropriate sizes/numbers of self-contained breathing apparatus (SCBA) face pieces and breathing air cylinders to allow each respirator user sufficient time to practice inspection, donning, seal checks and doffing?

3) Was the trainer available to permit correction? Remember that it is harder to unlearn incorrect information than it is to learn new information. So it is critical that learners take the correct information home with them in their short-term memory before committing it to long-term memory.

Learning objectives describe the behavior change expected from the learner after training. Learning objectives should reflect the knowledge and skills addressed in training materials that are then linked to various instructional methods. Learning objectives provide the basis for evaluating course effectiveness in relation to student learning.

This article covers nine learning objectives designed to improve the effectiveness of training for adult learners.

#1: List the Five Required Elements of Properly Designed Learning Objectives

Learning objectives should be SMART: specific, measurable, action-oriented, relevant and timely. Learning objectives should be designed with observable behavior.

For example, the learning objective, "The learner will understand the welding processes and hazards associated with them" uses the verb *understand*, which cannot be observed or measured. Furthermore, the learning objective lacks specificity. The objective may be revised as follows:

- The learner will list five hazards from TIG welding.
- The learner will list three acute and two chronic health effects from exposure to hexavalent chromium while welding stainless steel.

Examples of appropriate action verbs for learning objectives can be found in Russell (1999, p. 219). Review the learning objectives you created for a recent training program and determine whether they are SMART.

Learning objectives describe the behavior change expected from the learner after training.

#2: Use the Flesch-Kincaid Score to Improve Readability of Training & Testing Materials

Only 4% of people can understand an average safety e-mail, which is typically written at grade level 16 (Larkin & Larkin, 2007, p. 5). For technical communications, it is recommended that materials be written at the sixth grade level, where 60% of learners can understand them.

The Flesch-Kincaid readability tests are used extensively in the field of education and include two tests: Flesch Reading Easiness (a score from 0 to 100) and Flesch-Kincaid Grade Level. The tests use the same core measures: word length (syllables per word) and sentence length (words per sentence). The core measures are inversely proportional, so a text with a comparatively high score on the Reading Ease test will correspond to a lower score on the Grade Level test.

Reader's Digest has a readability index of about 65 and is easily understood by 13- to 15-year-old students (grade level 8 to 10). Use of the Flesch-Kincaid score is so ubiquitous that it is incorporated into many popular software programs such as Microsoft Word. Can you determine the readability (grade level) of this article?

#3: List Five Visuals to Improve Comprehension of Technical Material

Can you draw Heinrich's accident triangle? Studies show that presentation graphics can reduce teaching time by as much as 28% (Pink, 2005, p. 64). Furthermore, visuals dramatically improve comprehension of technical material.

TWA flight attendants who took a safety test used images to improve the pass rate from 70% to 100%. Initially they toured the plane and located safety equipment. Then, from memory, they identified the locations of safety equipment on diagrams (Rose & Nicholl, 1997, p. 101).

Visuals include room peripherals, diagrams, charts, mind maps (Rose, 2000, pp. 28, 97, 110), window panes (Pink, 2005, p. 91) and flash cards. When designing visuals, avoid colors such as red and green, since about 10% of American males (< 1% of American females) are color blind.

Can you design a visual to help learners memorize Ohm's Law [voltage (volts) = I (current in amps) × R (resistance in ohms)]?

Can you design a visual to explain the clearance needed to use a shock-absorbing lanyard?

#4: List Four Ways to Use PowerPoint Presentations More Effectively

PowerPoint may be a great tool when used properly:

- Use a minimum 24-point type.
- Use upper and lower case fonts; avoid using all caps.
- Use bold or underline for emphasis.
- Use visuals more than words.
- Use a 6 x 6 format.
- Avoid transitions and moving text.
- Use good contrast between the text color and background color.
- Number slides.
- Use few fonts and few colors on each slide.

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•Use sans serif fonts.
•Avoid italics.
•Use bright color to attract attention (Russell, 1999, p. 240).

It is common to see slides with distracting transitions and multiple fonts and colors, creating a fruit salad effect. Fortunately, far fewer trainers are reading text directly from their slides. Review slides you designed for a recent training program and determine whether they can be improved using these guidelines.

#5: List Four Information Levels for Training

Do you conduct training needs assessments? Consider at least four distinct information levels: mastery, competence, familiarity and awareness for lockout/tagout (LO/TO) training.

•**Mastery:** The superintendent of facilities/maintenance who is responsible for auditing LO/TO programs for multiple energy sources and conducts the annual review/certification.

•**Competence:** The authorized craftspeople who are responsible for conducting LO/TO in their field of expertise (e.g., electricians, pipefitters).

•**Familiarity:** The affected machine operator whose equipment will be locked and tagged out for maintenance or repairs.

•**Awareness:** The other employees who are in close physical proximity to equipment which is being locked and tagged out.

It is common for an employer to offer just one level of training for LO/TO and put all employees in the same training session. While this may be efficient, it is not effective since each level described requires unique knowledge and skills. When employees who are at the competence or mastery level are mixed with those who need awareness-level training, they soon become bored and may distract other learners. How many levels of training do you offer for confined spaces?

#6: List Five Memory Aids to Improve Retention in Learners

Mnemonic devices are fun tools to help learners memorize information. Mnemonics include acronyms, acrostics, linking, rhymes and jingles.

•**Acronyms:** IDLH, immediately dangerous to life or health (a.k.a., "I don't like it here"); SCBA, self-contained breathing apparatus; and WIIFM, what's in it for me?

•**Acrostics:** My Dear Aunt Sally (multiply and divide before you add and subtract); conduct air monitoring in a confined space OFTEN (oxygen first, flammables second, toxics third);

•**Linking:** He screamed "EEE" as he passed the cemetery (spelled with three Es);

•**Rhymes and jingles:** 30 days hath September, April, June and November; when short February is done, all the rest have 31.

Chunking is a memory technique based on the theory that short-term memory is limited to holding seven (plus or minus two) items. When chunking items, decrease the number of items being held in memory by increasing the size of each item.

For example, when spelling the word *psychiatrist* chunk it into syllables: *psy-chi-a-trist.* Local telephone numbers using seven digits are based on chunking. Furthermore, words have more meaning than numbers so a phone number such as 352-1234 is easier to memorize as FLAnders 2-1234 using the telephone keypad.

We remember only 20% of what we read, but we remember 90% of what we see, say, hear and do (Rose, 2000, p. 34). So, use multiple senses to memorize Flanders 1234 by visualizing it, repeating it out loud (auditory) and writing it (kinesthetic).

One last idea: To maximize recall, take frequent, short breaks (5 minutes per hour) to increase primacy and recency. Do you provide memory aids to supervisors to rehearse/review/repeat with learners after training?

#7: List Negative or Defensive Types of Nonverbal Communication

Albert Mehrabian stated that 55% of communication is nonverbal, 38% is vocal and only 7% is words (Bone, 1994, p. 66). Trainers need to be aware of nonverbal communication. Body language is an amplifier to what you are feeling.

Learners with a tight jaw and mouth will struggle to learn and retain information since an increase in tension reduces retention. Learners nodding off or slumped over send cues to the trainer to take a break or change to a more interactive instructional method. Learners who shake their head negatively and sit turned away from the trainer avoiding eye contact require additional follow-up with the trainer or employee's supervisor. Properly decoded nonverbal communication helps the trainer to discern and diffuse hostility in learners.

Similarly, trainers need to be aware of their own nonverbal communication. Trainers who make frequent eye contact open the flow of communication. Trainers who smile often transmit warmth and friendliness.

Can you recognize defensive nonverbal communication in learners? Have you ever videotaped yourself training to check on the nonverbal communication you deliver?

#8: Identify Ways to Prime Participants for Learning Before Training Begins

According to Maslow's hierarchy of needs, a learner's most basic needs must be met before higher-order needs such as learning can be met. What do you do before training to help learners feel safe, to create a sense of belonging and to help everyone feel valued?

Meier (2000, p. 66) suggests sending learners a precourse prep kit to reduce anxiety, identify goals, clarify benefits, raise curiosity and create positive feelings about the upcoming training. The kit might contain an agenda, testimonials from previous attendees about the value of the training and a learning contract specifying what outcomes learners desire and what they are prepared to do to achieve those outcomes (e.g., participation).

Have you ever considered marketing your product (training program) with posters and bulletins to get people energized and curious before training?

Do you provide brain boosters, such as bananas and water, or brain busters, such as donuts and caffeine, as learners arrive? Do you play Baroque music to serenade the brain as learners arrive?

Events that are accompanied by intense emotions result in long-lasting learning. Do you provide fun games such as crossword puzzles, seek and find, or brain games for learners when they arrive?

#9: Distinguish Four Different Levels of Training Evaluations

New information must be under-

stood correctly before learners leave the training room. New skills must be reinforced on the job soon after training or they will not be retained. Evaluating training programs helps the trainer to justify the training budget, quantify performance improvement and improve the effectiveness of all aspects of the training program.

There are four different levels of training evaluations:

1) Level 1: Reaction of the learner regarding the trainer, agenda, presentation style, audiovisuals, handouts and training environment. Last year, the author conducted an 8-hour training program in a conference room with a temperature of 65 °F despite repeated attempts to heat the room. Several people had goose bumps and shivered. They eventually wore coats/jackets. This poor learning environment, albeit uncontrollable by the trainer, contributed negatively to the training experience.

2) Level 2: Learning—Change in knowledge, skills or attitude at the end of training. For example, were learners able to identify multiple energy sources and demonstrate skills to conduct LO/TO at the end of training? Do you use pre-/posttraining tests or quizzes?

3) Level 3: Behavior change—Transfer of knowledge, skills or attitudes to the workplace. For example, were electricians able to perform LO/TO in the workplace properly 30 or 60 days after training? Did employees don a fall protection harness properly or are the chest/thigh straps loose? Does the organizational culture support change?

Note that existing workplace factors may discourage the proper use of PPE, such as lack of enforcement by the supervisor or lack of availability of proper sizes. Was a difference noted in learners' pre- and posttraining behavior observations?

4) Level 4: Results such as return on investment, increased profits, fewer incidents, reduction in turnover, etc.

You can't manage what you don't measure. Review a recent training program in light of the four different levels of training evaluations. What were the learners' reactions? Were changes in learning and on-the-job behaviors noted? What were the bottom-line results?

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Six Ways to Manage Lab Ergonomics More Efficiently

By Jessica Ellison and Ketil Jensen

Every laboratory safety manager enforces fundamental safety rules such as "use protective gloves" or "always wear safety glasses." Yet, repetitive strain injuries (RSIs) that develop over time are much harder to prevent and can be just as damaging, if not more so. In fact, work-related musculoskeletal disorders are the country's most costly category of workplace injuries and illnesses. In 2004 companies spent an estimated $510 billion to treat musculoskeletal disorders, according to the American Association of Orthopaedic Surgeons.

Preventing RSIs requires more than providing industry standard PPE. It requires evaluating each employee and his/her lab setup, analyzing how that employee uses equipment, determining where injuries may occur, and adjusting either the task or equipment. Managing these tasks and following up with at-risk employees can become overwhelming if the right resources and processes are not in place to address these factors consistently, economically and effectively.

Following are six practices for improving the efficiency and manageability of a laboratory ergonomics programs.

Look to the Data

In ergonomics programs, content is king. The more information that can be collected about the types of injuries that occur and the risk factors which lead to those injuries, the better chance your team will have of identifying potential solutions. However, it can be daunting to imagine having to analyze all the data after collecting it and leveraging those insights to make improvements.

Laboratory environments, with the demands of performing work differing from one department to the next and with the high rate of task variation, can make this step challenging. For example, a lab technician may perform a few hours of pipetting and sampling, writing reports and conducting an analysis. The next day's activities may consist of looking through a microscope for 4 hours. Yet, the way in which the technician uses standard equipment, such as a pipette, as well as how many hours per day s/he uses it, are key factors in determining whether that technician will eventually feel discomfort.

Safety managers can avoid treating costly injuries down the road by proactively assessing the risk of injury for each employee to determine how to most efficiently allocate limited resources. Five types of data are critical to capture during an assessment:

- which equipment the employee uses for each task;
- how often the employee uses the equipment;
- how the employee uses the equipment (as well as the head, neck, arms, hands and back postures engaged to perform each task);
- task duration.

Preventing RSIs requires more than providing industry standard PPE. It requires evaluating each employee and task.

Using these data, safety managers should use a concrete, measureable risk assessment, such as rapid upper limb assessment (RULA) method or the NIOSH lifting equation, rather than subjective data (e.g., "this looks bad") to understand which tasks might lead to discomfort, the first sign of a possible injury. Then, they can better prescribe a safer way to perform each task.

Gathering the data from each assessment can be done in person and added to a spreadsheet. To achieve greater efficiency and accuracy, employees can perform a self-assessment using an online survey or software program that the evaluator can update following the in-person evaluation. Using software to manage assessments enables laboratory safety managers to collect data consistently and quickly, identify potential risk patterns across employees and jobs, and prioritize how they follow up.

Focus on Service Quality

A groundbreaking study published in the *Journal of the American Medical Association* showed there was a positive correlation between the quality of patient service, factors such as improved wait time and communication, and its subsequent impact on health outcomes (Kenagy, Berwick & Shore, 1999). This correlation might sound sensible to patients, but it is contrary to the discipline of medical practitioners, who perceive that health outcomes are driven by the technical accuracy of diagnosis and the effectiveness of available treatments. This insight into general medicine holds true in laboratory ergonomic programs as well.

Consider this example: At a major biotechnology corporation, 98% of employees completed online ergonomic self-assessments. However within a 2-year period, ergonomic injuries increased nearly 42%. The corporation's safety committee discovered that employees weren't implementing the suggested recommendations from their assessments, despite the fact that 16% of the population was at high risk of injury.

In response, the committee created an in-house task force consisting of varying levels of peers and managers, and trained each in basic office ergonomics setup so they could address the problem by bringing a more personal touch to the ergonomics program.

Each month, the safety committee assigned a task force representative to visit each employee identified by the online self-assessment system as having high or moderate risk of injury. The representatives observed an employee's work setup, provided feedback on posture, helped organize workflow and answered questions. The representatives also worked directly with employees to update their online assessment profile and risk score based on changes made to their work setup.

In just 7 months, the safety committee substantially improved employee assessment follow-through and engagement, and reduced the number of high-risk employees to less than 5% of the population. By providing more personalized service to at-risk employees, the group was able to prevent injuries more effectively.

Manage Ergonomics Process Implementation

Some lab managers know their environment can be risky and are familiar with some solutions for reducing risk, but they do not necessarily know how to create accountability or implement efficient

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corrective solutions. In these situations, consider these suggestions for how a team can stay accountable and manage ergonomics process implementation with limited resources:

•Prioritize and tackle the highest risk issues first. Using the assessment data collected, focus resources on employees most likely to develop an RSI; these cases will be more costly to treat once they are claims.

•Assign owners and create deadlines. Once priority issues are identified, keep the team accountable by assigning a deadline for each follow-up task and an individual responsible for its completion. Some companies keep track of tasks, owners and deadlines with a white board or Excel spreadsheet; others use software to automate and track completion of ergonomic evaluations and follow-up tasks.

•Implement a buddy system. If one team member is falling behind, pair that individual with another employee who is always ahead in fulfilling his/her tasks, so one can learn from the other and stay accountable.

Try Peer-Driven Programs

While inspiring employees to engage in their own safety and health can be effective, encouraging them to oversee and teach one another has proven influential in creating a culture of injury prevention and getting results. One 2005 EPA study of laboratory environmental management at university laboratories in New England found that at the University of Vermont, which reported a 40% turnover among laboratory workers each year, peer training proved more effective than training provided by management in reducing risk of injury.

For example, the ergonomics team for a leading biopharmaceutical company realized that many employees were unaware of the ergonomics program when it was overwhelmed with employees' requests for help after these employees felt discomfort. The safety management team implemented an educational campaign explaining where and how employees could receive job and task evaluations.

The team also created a task force that assigned a laboratory employee "peer champion" to interview employees within his/her department and gain further insight into the work, equipment or culture issues driving employee injuries.

These one-on-one peer conversations provided a safe environment for employees to share certain job details that a basic injury assessment might overlook, such as being asked to process 2,000 samples within a tight time frame. In turn, the consultations provided peer champions with valuable information about key issues and potential solutions that they could share with the management group.

This campaign empowered both employees and champions to make positive ergonomic changes to their own work environments, and more employees sought out ergonomic evaluations proactively as a result.

Additionally, the company's safety team was able to reduce injury rates and focus resources on proactive strategic planning instead of reactively responding to ergonomic injuries.

Add Engineering Controls

Engineering controls protect laboratory workers by improving the environments or equipment at the source of the risk, without relying on the skill or vigilance of technicians to perform the tasks safely. These controls also can improve productivity in laboratory environments where employees may feel pressure to complete experiments quickly and, therefore, might not follow safety rules and regulations as consistently.

By providing equipment that makes the tasks easier and removes associated risks, laboratories can avoid the cost associated with treating RSIs after they develop. Consider these examples of simple equipment changes that can make laboratory jobs safer and more efficient:

•Filling bottles. Instead of asking employees to manually pour liquid into bottles and enforcing short breaks, some laboratories have purchased a foot-pedal-operated machine that automatically fills bottles.

•Capping vials. To eliminate the frequent task of capping and uncapping vials, some laboratories have purchased a machine known as the "Capitator," which screws and unscrews caps, thus decreasing the risk of RSIs.

Measure Program Outcomes

Measurable outcomes are critical to ensuring that safety managers understand the effectiveness of their effort and continue to receive program funding and support. Several methods can be used to analyze whether laboratory ergonomic processes and programs are working, how they are reducing risk and how they affect the bottom line.

In addition to performing employee assessments and collecting discomfort data at the beginning of the program, other critical data must be compiled before one can measure the changes that lead to fewer injuries and lower costs. These data include:

•past illness and injury records, and time away from work (absenteeism) data (which can be gathered from the human resources department);

•past incremental expenditures on workplace injuries, including the purchase of optimal equipment;

•costs of the leading indicators of risks, including incidences of discomfort and first-aid cases;

•costs of lagging indicators of risk, including workers' compensation claims, lost workdays, salary to temporary workers covering shifts and increased insurance premiums;

•engineering controls, including whether employees are using what they have been issued.

Once these data are collected, you have a baseline for measuring them, determining how to act on these data and where to direct resources to achieve the greatest benefit.

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Respiratory Protection Simplified

By Mark Shirley

A respiratory protection program (RPP) is intended to protect employees from exposure to hazardous levels of occupational dusts, fumes, mists, gases, vapors, biological agents and infectious pathogens. At first glance, building a compliant RPP can appear to be overwhelming, even for an SH&E professional. However, OSHA respiratory standards are fairly well prescribed, and tools are available to help employers build and maintain an effective program.

Establishing an RPP

Why is establishing an effective RPP important? OSHA reports its respiratory protection standard (29 CFR 1910.134) was the fourth most cited standard during FY2010. These citations represent far too many preventable workplace injuries and illnesses occurring as a result of airborne hazards. According to NIOSH's National Occupational Respiratory Mortality System, during the 10-year period from 1995 to 2004, more than 28,000 occupational-related pneumoconiosis deaths occurred in the U.S.

Additionally, according to Bureau of Labor Statistics (BLS), during the period 1972 to 2004, the estimated cases of occupational respiratory conditions due to toxic agents ranged from 7,900 cases in 1983 to 25,300 cases in 1994. BLS reported 17,600 cases in 2004, which is the most recent year available.

How does an employer know whether a respirator program is required? In most instances, a program is required if a respirator is needed to protect the employee's health, if the employer requires its use or if the employer allows voluntary use of a respirator.

In addition, programs must be written, the employer must have a designated program administrator and worksite-specific procedures must be established. Depending on the workplace, the written program must include the selection, use, storage, maintenance and cleaning of respirators as well as emergency response, medical evaluation, fit testing, training and program evaluation procedures.

An RPP must be written, the employer must have a designated program adminstrator and worksite-specific procedures must be established.

Program Administrator

The designated program administrator must be qualified to implement, evaluate and update the program. *Qualified* does not mean certified; rather, this individual must have the knowledge to recognize, evaluate and control hazards in the workplace. Ultimately, the appropriate qualifications for each employer's program administrator are determined by existing respiratory hazards, or those that are reasonably anticipated, at the employer's workplace. The administrator can rely on others to carry out program components such as fit testing and medical evaluations.

Hazard Assessment

The first step in determining whether a respirator is needed to protect an employee is performing a hazard assessment. Identifying the hazard type (e.g., vapor, mist, dust, vapor, fume) is generally not too difficult; however, determining toxicity and measuring employee exposure can require specialized equipment and expertise.

Several helpful tools are available to determine whether a material is toxic or hazardous. For example, tables found in OSHA's air contaminants standard (29 CFR 1910.1000) list legally binding exposure limits for toxic and hazardous chemicals.

Conducting personnel monitoring is the most accurate and preferred method of measurement, however, estimating employee exposure is an acceptable practice if done correctly. Estimates can be obtained through extrapolation from short exposures, historical experience or industry standards. When estimating, it is critical to minimize variable conditions (e.g.,room size, ventilation, temperature) and to remain conservative by estimating a worst-case scenario.

Hierarchy of Controls

Once it has been determined that contaminants are present, an employer must adhere to the hierarchy of controls. OSHA's respiratory protection standard states, "In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays or vapors, the primary objective shall be to prevent atmospheric contamination."

Not following this requirement is a common source of violations. This requirement is met by emphasizing substitution, administrative and engineering controls prior to issuance of respirators.

Respirator Selection

Assuming controls cannot effectively reduce contaminants to safe levels, respiratory protection will be required. Since all respirators are not designed the same, selection of the most appropriate type is important. Respirators must be NIOSH approved, provided by the employer at no cost to the employee and always be used in compliance with an employee's certification.

NIOSH provides tools to help program administrators make the best choice. NIOSH's Respirator Selection Logic Sequence (**www.cdc.gov/niosh/docs/2005.100**) guides users through a series of questions that help deter-

mine what class of respirator should be selected. NIOSH also publishes a certified equipment list. This list allows one to search by class or define a search by detailed criteria to find a make/model that will best meet the worker's needs.

IDLH Atmospheres

Immediately dangerous to life and health (IDLH) atmospheres have special program requirements. IDLH refers to an atmosphere that poses an immediate threat to life; would cause irreversible adverse health effects; or would impair an individual's ability to escape from a dangerous atmosphere.

IDLH atmospheres include those with less than 19.5% oxygen or unknown contaminants, and those where a respirator would be needed for escape. Employers must provide either of the following for use in IDLH environments:

- full-face-piece pressure-demand self-contained breathing apparatus (SCBA) that is certified for 30 minutes or more;
- combination full-face-piece pressure-demand supplied-air respirators with auxiliary self-contained air supply.

Respirators for escape from IDLH atmospheres must be NIOSH certified for escape from the atmosphere in which they will be used.

Fit testing must be conducted for an employee who is required to wear either a positive or negative pressure tight-fitting face piece respirator.

Emergency Response

When an employee is engaged in emergency response operations for releases of hazardous substances, OSHA's HazWOPER standards apply. Under 29 CFR 1910.120 (q)(3)(D):

> (D) Employees engaged in emergency response and exposed to hazardous substances presenting an inhalation hazard or potential inhalation hazard shall wear positive pressure self-contained breathing apparatus (SCBA) while engaged in emergency response, until such time that the individual in charge of the ICS determines through the use of air monitoring that a decreased level of respiratory protection will not result in hazardous exposures to employees.

Full understanding of this requirement and the applicability of limited exceptions (e.g., incidental spills and hospital staff) is critical. OSHA's HazWOPER frequently asked questions provide additional information (**www.osha.gov/html/faq-hazwoper.html**).

Medical Evaluations

Before an employee is fit tested or required to use the respirator in the workplace, s/he must be cleared medically. This is accomplished by a physician or other appropriately licensed healthcare practitioner. A questionnaire and/or medical exam issued to evaluate the employee. The evaluation must be repeated anytime the condition of the employee or workplace changes.

A medical evaluation is required for an employee who voluntarily uses an elastomeric respirator. OSHA has provided a template questionnaire (Appendix C to Section 1910.134) to guide the medical professional. Workplace conditions to consider include:

- respirator type and weight;
- duration and frequency of respirator use;
- expected physical work effort;
- additional protective clothing to be worn;
- potential temperature and humidity extremes.

Fit Testing

Fit testing must be conducted for an employee who is required to wear either a positive or negative pressure tight-fitting face piece respirator. These tests must be conducted with the same make, model and size that the employee will be expected to use at the worksite. Fit testing for voluntary use is not required.

A tight-fitting face piece respirator is fitted:

- prior to initial use;
- whenever a different respirator (size, style, model or make) is used;
- if the employee's physical condition changes;
- at least annually thereafter.

Cleaning, Disinfecting & Storage

The RPP must include processes for cleaning and disinfecting a respirator. If a respirator is dedicated to a single employee, then it should be cleaned and disinfected as often as necessary. Those used by more than one employee should be cleaned and disinfected before each use. Any respirator used in emergencies, testing or training should be cleaned and disinfected after each use. When storing a respirator, it should be protected against contamination, dust, sunlight, moisture, extreme temperatures and deformation.

Cartridge Change-Out

If a cartridge respirator is used, the RPP must include a process to determine when a cartridge needs to be replaced. Some cartridges are designed with an end of service life indicator (ESLI). ESLI is a mechanism for warning the user that a cartridge is approaching the end of its ability to provide protection. The warning appears on the cartridge itself.

Unfortunately, this feature is not available for all cartridge types. Those with this feature include

mercury vapor, carbon monoxide, ethylene oxide, chlorine and hydrogen sulfide. If the cartridge does not have an ESLI, a change-out schedule must be designed and implemented. When designing the change-out schedule, the administrator should consider:

- the contaminants the respirator is to protect against;
- the concentrations of contaminants in the work area;
- frequency of use (e.g., used continuously or intermittently throughout the shift);
- temperature, humidity and air flow through the cartridge or canister;
- an employee's work rates;
- the presence of other potentially interfering chemicals;
- manufacturer's recommendations.

Inspection

During inspections, the user or inspector should check for respirator function, tightness of connections, and condition of the face piece, head straps, valves, cartridges and elastomeric parts. For an SCBA, check that cylinders are fully charged, and that regulators and warning devices function properly. If a respirator does not pass inspection, it must be removed from service and repaired or adjusted. If repairs or adjustments do not correct the problem, it must be discarded.

An SCBA and any respirator used for emergency situations must be checked at least monthly. Documentation of this inspection should be maintained with the respirator. Nonemergency use equipment must be inspected before each use and during cleaning and disinfection.

Training

Training must be completed prior to use in the workplace. Also, retraining must be provided annually, whenever workplace changes occur and whenever retraining appears necessary to ensure safety. Training must include:

- why the respirator is necessary and the consequences of improper fit, use or maintenance;
- limitations and capabilities of the respirator;
- how to effectively use the respirator in emergency situations;
- how to inspect, put on, remove and use the respirator, and check its seals;
- maintenance and storage procedures;
- general requirements of OSHA's respiratory protection standard.

OSHA's HazWOPER FAQs

OSHA provides a list of frequently asked questions on its website for those who need quick reminders about HazWOPER regulations.

Q: Can refresher training be given in segments?
A: Refresher training may be given in segments so long as the required 8 hours have been completed by the employee's anniversary date.

Q: Is computer-based training acceptable for refresher training?
A: Computer-based training may meet some refresher training requirements, provided that it covers topics relevant to workers' assigned duties. It must be supplemented by the opportunity to ask questions of a qualified trainer and by an assessment of hands-on performance of work tasks.

Q: For emergency response in an unknown or potentially IDLH atmosphere, what is the minimum number of people required?
A: At a minimum, four people are required: two working as a team inside the unknown or potentially IDLH atmosphere, and two working outside this atmosphere for assistance or rescue.

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Evaluations & Recordkeeping

Workplace evaluations must be conducted as necessary to ensure that the written RPP is being implemented effectively. An employee who is required to wear a respirator should regularly be consulted to assess his/her views and to identify problems with respirator fit, selection, use and maintenance. Any problems identified during assessments must be corrected. Records of these evaluations and all applicable corrective actions should be maintained as part of the program documents.

Additionally, the medical record for each employee should be preserved and maintained for at least the duration of employment plus 30 years; however, fit test records are only required to be maintained for 1 year. Access to these records by affected employees is required under 29 CFR 1910.1020.

Conclusion

Although creating an RPP may seem daunting, it is necessary to protect employees from hazardous exposures. Tools such as OSHA standards and NIOSH respirator guides are helpful resources to reference when implementing and maintaining a respirator program. Focusing on proper administration, inspections, fitting and program evaluation procedures will help ensure an effective RPP.

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