Emergency eyewashes and showers

OSHA
DEPARTMENT OF LABOR & INDUSTRY

February 2017
Minnesota Department of Labor and Industry
Occupational Safety and Health Division

This material can be provided to you different formats (audio, Braille or large print) by calling the MNOSHA Training/Outreach Office at (651) 284-5050 or 1-877-470-6742.

For more information, contact:

Minnesota Department of Labor and Industry
Occupational Safety and Health Division
443 Lafayette Road N., St. Paul, MN 55155
Phone: (651) 284-5050 or 1-877-470-6742
Email: osha.compliance@state.mn.us
Website: www.dli.mn.gov

Introduction

Several OSHA standards require an emergency eyewash or eyewash and shower unit be provided whenever employees are exposed to corrosive materials. The medical services and first aid standard, 29 CFR 1910.151(c), applies to all general industry situations unless a vertical standard applies to the specific hazard being addressed, for example formaldehyde (29 CFR 1910.1048(i)) or methylene chloride (29 CFR 1910.1052(i)). Construction activity other than battery handling is covered by 29 CFR 1926.50(g). Battery handling in construction is addressed in 29 CFR 1926.441(a).

Identification of hazards

The first step a person should take when deciding whether an eyewash or eyewash and shower is needed is to determine if a material is hazardous to the eyes or skin. Usually, pH will be used to determine if a material is hazardous. However, other information, such as a safety data sheet (SDS) and various references, may need to be used to determine whether a material is hazardous.

Liquids present the most common hazards, but solids, gases, vapors and mists also may present. A material may be considered hazardous if it can damage the skin or eyes or if it is readily absorbed through the skin.

The strength of an acidic or basic solution is commonly reported as pH, which can be measured with pH paper or a pH meter. The pH can range from 0 (very acidic) to 14 (very basic or alkaline). A material with a pH of 0 to ≤ 2, or ≥ 11 to 14 will, at the very least, cause significant eye irritation and may cause permanent damage or blindness. For skin, a pH ≤ 1 or ≥ 12 is considered hazardous. However, a pH between 2 and 11 (or between 1 and 12 for skin) does not necessarily mean a material will *not* cause injury (certain materials with pH between 2 and 11 may be extremely damaging to the eyes and skin). Alkaline solutions tend to be more damaging to the eyes and skin than acidic solutions.

Page 4 features a list of some commonly encountered materials that are eye or skin hazards. Remember that the strength or concentration of a solution may be a significant factor in determining if there is a hazard.

Consult the safety data sheet and label of the substance in question for pH and health effects. If the SDS indicates irritation only, an eyewash or eyewash and shower may not be required. The employer is encouraged to check further with other references and with the product manufacturer to confirm an eyewash or eyewash and shower is not needed. If the SDS states burns, corneal damage, blindness or eye damage may occur, the material would be considered hazardous and an eyewash or eyewash and shower must be provided. Further information may be available through websites that feature SDSs.

Another source of information is the *NIOSH Pocket Guide to Chemical Hazards* (www.cdc.gov/niosh/npg). Besides listing physical and chemical properties and health hazards for many different substances, the guide also makes recommendations for personal protection and sanitation. If the "Personal protection/sanitation" entry for the substance in question lists "Eyewash," "Quick drench" or "Frostbite wash," this is an additional indication that eye or skin damage can occur.

Determination of exposure

The second step in deciding whether an eyewash or eyewash and shower is required is to determine whether the hazardous material can contact the eyes or skin. To determine exposure, a person should look at the potential for the material to be splashed or

get into the eyes or on the skin. If there is skin exposure, it should be determined how much could splash on the skin. If the material is hazardous and capable of contacting the eyes, quantity is not a consideration.

All determinations of exposure should be made without regard to the use of personal protective equipment, such as goggles, faceshields, gloves or aprons.

In general, adequate eye and face protection and protective clothing must be provided if an eyewash or eyewash and shower is required. The use of personal protective equipment does not change the requirement for an eyewash or shower. Note that, in general, tight-fitting goggles should be worn if eye protection is required against liquid splashes, sprays, mists or vapors. Shields or safety glasses do not provide adequate splash protection unless the face shield meets the requirements under ANSI Z87.1-2015 and is marked "D3."

Eyewash and shower requirements

Eyewashes and showers should be in compliance with ANSI Z358.1-2014. Construction, installation and location of the eyewash or eyewash and shower should meet the ANSI requirements. A checklist of the requirements for eyewashes and showers can be found on pages 5 and 6. Refer to the complete text of ANSI Z358.1-2014 if more information is needed for a particular situation. Also consider the following.

1. Most faucet-mounted (gooseneck) "eyewashes" do not meet the requirements, principally because they lack quick-opening valves and have the potential for high water-temperatures. The one-second activation requirement must be met for these units to be used. Special attention must be paid to temperature control, because a faucet can deliver water greater than 100° F, further injuring the eye. Faucet-mounted eyewashes are not addressed specifically by ANSI.

2. Eyewashes and showers should be located as close as possible to the hazard and on the same level. The more hazardous the material, the closer in time and distance the unit should be. ANSI requires that an eyewash and shower be no farther than a 10-second travel time from the hazard. Appendix B of ANSI 358.1-2014 states that an average person covers a distance of approximately 55 feet in 10 seconds when walking at a normal pace. ANSI also recommends that, for highly corrosive chemicals such as strong acids ($pH \leq 1$) or bases ($pH \geq 12$), the eyewash and shower unit be immediately adjacent to the hazard.

3. Flushing-fluid temperature for eyewashes and showers must be tepid or lukewarm (between 60° and 100°F). Temperatures outside this range are likely to discourage use of the equipment. For showers, there is the additional concern that shock may occur. Temperatures greater than 100º F have been shown to be harmful to the eyes and can enhance chemical interaction. Where chemical reactions present special hazards (the material reacts with water or the water temperature accelerates the reaction), a medical advisor should be consulted.

4. Plumbed eyewashes and showers should be flushed weekly to ensure proper operation, remove any sedimentation and minimize microbial contamination. Eyewash flushing for at least three minutes has been suggested to reduce amoebic and bacterial growth. Ideally, the units should be flushed for the length of time it takes to replace the water in the

unit and the piping from the unit to continuously running water.

Acanthamoebae are commonly found in eyewashes and can cause severe eye infections when introduced into traumatized eyes. Pseudomonas (which can cause septicemia or "blood poisoning") and Legionella (which can cause Legionnaires' disease, a severe form of pneumonia) bacteria may also be present. (For more information, see the federal OSHA information sheet *Health effects from contaminated water in eyewash stations*, OSHA 3818.)

5. Units should also be inspected on an annual basis to assure conformance with ANSI Z358.1.

6. There should be regular maintenance of self-contained eyewash units to ensure the units are full and operational, the flushing solution is changed according to manufacturer's instructions and access to the units is not blocked. Only commercially available solutions intended for eye flushing should be used.

Special considerations

The General requirements for dipping and coating operations standard, 29 CFR 1910.124, allows the use of hoses at open-surface tanks in lieu of an eyewash and shower. Near each open-surface tank containing hazardous liquids, there must be a supply of clean, cold water provided by a 3/4" diameter, 48" or longer hose, with a quick-opening valve. Pressure should not exceed 25 psi. Hoses should be used in conjunction with an eyewash or shower unit unless the hoses meet all the requirements of an emergency eyewash or shower. A backflow preventer should be installed to avoid cross contamination. Note that static rinse tanks may have very low or high pH.

The anhydrous ammonia standard, 29 CFR 1910.111, requires that an easily accessible shower or a 50-gallon drum of water be kept in the stationary storage installation where the respirators for emergency response to leaks are stored.

Where batteries are charged for powered industrial trucks, automobiles, etc., an eyewash is required if electrolyte or water is added to cells and there is a possibility of splashing. If there is no maintenance of the batteries other than charging, then an eyewash is not required. In construction, the batteries and battery charging standard, 29 CFR 1926.441, requires the emergency eyewash and shower be located within 25 feet of the charging area.

Where there is exposure to formaldehyde solutions with a concentration of ≥ 0.1 percent, an eyewash is required. A concentration of ≥ 1 percent also requires a shower. While only requiring conveniently located washing facilities for skin contact, the methylene chloride standard requires an eyewash wherever it is reasonably foreseeable that an employee's eyes may contact a ≥ 0.1 percent methylene chloride solution.

Common eye and skin hazardous chemicals

Some commonly encountered chemicals that present eye or skin hazards are listed below. This list does not include all hazardous chemicals that may be encountered. The hazardous materials may be liquids, gases or solids.

Very acidic (low pH)

acetic acid
chromic acid (crystals or solution)
hydrochloric acid (muriatic acid)
hydrofluoric acid (glass etching, dry cleaners/laundry)
nitric acid (aqua fortis)
phosphoric acid (solid or liquid)
sulfuric acid (battery acid)

Highly alkaline (high pH)

ammonia
ammonium hydroxide (aqueous ammonia)
boiler additives
calcium hydroxide (hydrated lime, slaked lime)
calcium oxide (lime, quick lime, unslaked lime)
diethylaminoethanol (boiler treatment)
ethanolamine (corrosion inhibitor, detergents)
ethylenediamine (solvent, photoresist stripper, corrosion inhibitor in antifreeze)
hypochlorites (disinfectants, household bleach)
potassium hydroxide (lye, caustic potash)
sodium hydroxide (lye, caustic soda)
sodium metasilicate (water glass, detergents)
trisodium phosphate (TSP, detergents)

Other

chlorine
chlorine dioxide
cyanoacrylate adhesives (“superglue”)
diethylene dioxide (boiler treatment, toxic through skin absorption)
epoxy resins (epichlorohydrin/bisphenol A)
ethylene oxide (gas sterilant)
formaldehyde (gas, or up to 50 percent solution, Formalin)
glutaraldehyde (cold sterilant)
hydrogen peroxide (> 5 percent, a bleach)
isocyanates (HMDI, MDI, TDI)
methyl ethyl ketone peroxide (MEKP, catalyst for styrene resins)
any chemical labeled oxidizer, corrosive or caustic

Checklist: Eyewash and shower requirements – ANSI Z358.1-2014

Requirements that apply to both eyewash units and shower units

___ The sole purpose must be as an eyewash or emergency shower unit.

___ If a shower is needed, a separate eyewash is required. (A combination unit is acceptable.)

___ The shower and eyewash must be able to provide a controlled flow of flushing fluid at a rate that will not cause further injury.

___ The shower and eyewash must have a quick-opening valve that remains open and is simple to operate in ≤ 1 second.

___ The unit must be operational with both hands free.

___ The water temperature must be tepid or lukewarm (between 60º and 100º F).

___ The travel time must be ≤ 10 seconds. For highly corrosive materials, ANSI recommends eyewashes be located immediately adjacent to the hazard. (An average person covers a distance of approximately 55 feet in 10 seconds at normal walking pace.)

___ The unit should be on the same floor level as the hazardous substance.

___ The location of the unit should be well lit, highly visible and marked with a highly visible sign.

___ There must be unobstructed passages and access to the unit.

___ The shower and eyewash must be operable at all times with provisions to prevent unauthorized shutoff.

___ A sewer connection or drain for the unit is not required unless special hazards are noted.

___ Plumbed units must be activated weekly for a period long enough to verify operation and ensure fluid is available.

___ Drench hoses are used only in conjunction with eyewashes or showers unless they meet *all* the requirements for eyewashes and showers or are used close to open surface tanks containing liquids that may burn, irritate or otherwise harm skin.

___ All units shall be installed in accordance with manufacturer's instructions.

Requirements for eyewashes only

___ The eyewash must be installed so that the fluid flow pattern is 33” to 53” above the floor.

___ The eyewash muyst allow for both eyes to be washed simultaneously with a flow rate that is low enough not to cause further injury.

___ The unit must provide a minimum of 0.4 gallons a minute flushing fluid flow rate for at least 15 minutes. (This increases to 3.0 gallons a minute with a combination eye/face wash.)

___ Where contamination can occur, nozzles must be protected from contaminants by covers. Removal of covers shall not require an extra step beyond activation of the unit.

___ Squeeze bottles (personal eyewashes) are used only in conjunction with eyewashes.

___ Faucet-mounted eyewashes are not acceptable unless *all* requirements for plumbed units are met. Temperature control must be in place to keep hot water from further damaging the eyes.

Requirements for showers only

___ The top of the water column must measure 82” to 96” from the floor or platform.

___ The shower must provide a minimum of 20 gallons a minute flow of flushing fluid dispersed throughout the pattern.

___ The valve actuator location must be ≤ 69” above the floor or platform.

Training

___ Employees must be trained about the location and proper use of eyewashes and emergency showers.

___ If squeeze bottles (personal wash units) are also provided, training must address proper use in conjunction with eyewashes.

___ Training must address holding eyelids open and rolling eyeballs to flush the entire eye.