



Emergency eyewash and showers

Introduction

Several OSHA standards require that an emergency eyewash or eyewash and shower be provided whenever employees are exposed to corrosive materials. 29 CFR 1910.151(c) applies to all general industry situations unless a vertical standard applies to the specific hazard being addressed, e.g. formaldehyde (29 CFR 1910.1048(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.

Identification of hazards

The first step to 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 material safety data sheet 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 hazards. A material may be considered hazardous if it can damage the skin or eyes, or 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, and can range from 0 (very acidic) to 14 (very basic or alkaline). A material with a pH of 0 to less than or equal to 2, or greater than or equal to 11 to 14 will, at the very least, cause significant eye irritation and may cause permanent damage or blindness. For skin, a pH less than or equal to 1 or greater than or equal to 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.

At the end of this section is a list of some commonly encountered materials that are eye and/or skin hazards. Remember the strength or concentration of a solution may be a significant factor when determining if there is a hazard.

Consult the material safety data sheet (MSDS) and/or label of the substance in question for pH and health effects. If the MSDS 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 that an eyewash or eyewash and shower are not needed. If the MSDS states that 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 Internet sites that feature MSDSs.

Another source for information is the *NIOSH Pocket Guide to Chemical Hazards* (DHHS (NIOSH) Publication No. 94-116). Besides listing physical and chemical properties and health hazards for many substances, the guide also makes recommendations for personal protection and sanitation. If the entry for the substance in question states, "Provide: eyewash and/or quick drench," this is an additional indication eye and/or skin damage can occur.

Determination of exposure

The second step in deciding whether an eyewash or eyewash and shower are 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, then 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 should be provided if an eyewash or eyewash and shower are 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. Face shields or safety glasses do not provide adequate protection.

Eyewash and shower requirements

Eyewashes and showers should be in compliance with ANSI Z358.1-1998. Construction, installation and location of the eyewash or eyewash and shower should meet the ANSI requirements. A checklist of the ANSI and MNOSHA requirements for eyewashes and showers is available from any MNOSHA area office. Refer to the complete text of ANSI Z358.1-1998 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. 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 an eyewash and shower be no farther than a 10-second travel time from the hazard. ANSI also recommends that for highly corrosive chemicals, such as strong acids (pH less than or equal to 1) or bases (pH greater than or equal to 12), the eyewash unit be immediately adjacent to the hazard.
3. Flushing-fluid temperature for eyewashes and showers should be tepid or lukewarm (i.e., between 15 and 35 degrees C or between 60 and 95 degrees 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 38 degrees C (100 degrees F) have been shown to be harmful to the eyes and can enhance chemical interaction. Where chemical reactions present special hazards (i.e., material reacts with water or water temperature accelerates reaction), a medical advisor should be consulted.
4. Plumbed eyewashes and showers must be flushed weekly to ensure proper operation. Eyewash flushing for at least three minutes has been suggested to reduce bacterial and amoebic contamination. Acanthamoebae are commonly found in eyewashes and can cause severe eye infections when introduced into traumatized eyes. Units must also be inspected on an annual basis to assure conformance with ANSI Z358.1.
5. 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 industry standard, 29 CFR 1910.124, *General Requirements for Dipping and Coating Operations*, 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. Note that static rinse tanks may have very low or high pH.

Where batteries are charged for powered industrial trucks, automobiles, etc., an eyewash is required if electrolyte or water is added to cells. If there is no maintenance of the batteries other than charging, then an eyewash is not required.

Where there is exposure to formaldehyde solutions with a concentration of greater than or equal to 0.1%, an eyewash is required. A concentration of greater than or equal to 1% also requires a shower.

Common eye/skin hazardous chemicals

Some commonly encountered chemicals that present eye and/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 (Super Glue)
diethylene dioxide (boiler treatment, toxic through skin absorption)

epoxy resins (epichlorohydrin/bisphenol A)
ethylene oxide (gas sterilant)
formaldehyde (gas, or up to 50% solution, Formalin)
glutaraldehyde (cold sterilant)
hydrogen peroxide (> 5%, a bleach)
isocyanates (MDI, TDI)
methyl ethyl ketone peroxide (MEKP, catalyst for styrene resins)
any chemical labeled oxidizer, corrosive, or caustic

Checklist: Eyewash/shower requirements — ANSI Z358.1-1998

Requirements that apply to both eyewash units and shower units:

- _____ Sole purpose must be as an eyewash or emergency shower unit
- _____ If shower is needed, separate eyewash required (combination unit is acceptable)
- _____ Quick-opening valve that remains open (simple to operate in less than or equal to 1 second)
- _____ Operational with both hands free
- _____ Water temperature must be tepid or lukewarm (between 15 and 35 degrees C; 60 and 95 degrees F)
- _____ Travel time less than or equal to 10 seconds; ANSI recommends eyewashes be located immediately adjacent to the hazard for pH less than or equal to 1 or greater than or equal to 12. Unit shall be on the same level as the hazardous substance.
- _____ Location well lit, highly visible, marked with highly visible sign
- _____ Unobstructed passages and access to units
- _____ Operable at all times with provisions to prevent unauthorized shutoff
- _____ Sewer connection or drain not required unless special hazards noted
- _____ Must be in compliance with ANSI Z358.1-1998 and verified annually through inspection
- _____ Units shall be installed in accordance with manufacturer's instructions.

Requirements for eyewashes only

- _____ Installed so nozzles are 83.8 to 114.3 cm (33 to 45 inches) from floor
- _____ Pressure reduced divergent flow of flushing fluid
- _____ Minimum of 1.5 liters per minute (0.4 gallons per minute) potable water or commercial flush for 15 minutes

- _____ Weekly checks to flush lines and verify proper operation; plumbed units to be flushed for three minutes
- _____ Where contamination can occur, nozzles protected from contaminants by covers; removal of covers shall not require any extra step beyond activation of unit
- _____ Self-contained and portable units must provide 1.5 liters per minute (0.4 gallons per minute) for 15 minutes (equals six-gallon capacity).
- _____ Portable units to be used only where fixed installation not feasible
- _____ Squeeze bottles used only in conjunction with eyewashes
- _____ Drench hoses used only in conjunction with eyewashes unless at open surface tanks
- _____ Faucet-mounted eyewashes not acceptable unless *all* requirements for plumbed units are met

Requirements for showers only

- _____ Overhead mounted with head height 208.3 to 243.8 cm (82 to 96 inches) from floor or platform
- _____ Minimum of 75.7 liters per minute (20 gallons per minute) flow of flushing fluid dispersed throughout pattern
- _____ Weekly checks to flush lines and verify proper operation
- _____ Valve actuator location less than or equal to 173.3 cm (69 inches) above the floor or platform

Training

- _____ Employees are to be trained about the location and proper use of eyewashes and emergency showers.
- _____ If squeeze bottles are also provided, training must address proper use in conjunction with eyewashes.
- _____ Training shall address holding eyelids open and rolling eyeballs to flush the entire eye.