Emergency Eyewashes & Showers—Proper Testing and Maintenance

Introduction

When a facility has corrosives onsite, it is required that drenching facilities be readily available. These drenching facilities could include an eyewash, eye/face wash, shower or combination eye/face wash shower depending on the amount of possible exposure to the chemical by the employee. For example, if there is a possibility the employee has a chance that more than their eyes or face could be exposed to the chemical the facility would have a drench shower available to drench the entire body. This requirement is found in the OSHA Code of Federal Regulations (CFR) 1910.151(c).

OSHA defers to the American National Standards Institute (ANSI) Z358.1 standard for the requirements of all portable and plumbed emergency eye, eye/face wash and emergency shower equipment. This includes construction, testing, water pressure, flow requirements, location, operation and maintenance, among others. There will be an ANSI approval marked on the equipment to show that the manufacturer’s product meets the ANSI specifications.

Emergency eyewashes and showers often go unused on a regular basis. So when an emergency occurs, these devices must function properly. Studies show that the seconds immediately following an eye injury or chemical splash are often critical to minimizing damage. That’s why it’s extremely important that eyewash stations and showers are kept in proper working order—if not, the consequences could be serious.
The American National Standards Institute (ANSI) developed a standard specifically for eyewashes and showers. Standard, Z358.1-2004, states that “emergency eyewash and shower equipment shall be located on the same level as the hazard, have un-obstructed access (a door is considered an obstruction), and require not more than 10 seconds to reach.” Z358.1-2004 also outlines specific locations and flow rates for these devices—a section of the standard that is often overlooked is the testing and maintenance of these devices and the training of employees in their proper use.

Common Problems

The Fendall Company (manufacturer of emergency eye-care products) conducted a survey study of approximately 200 U.S. manufacturing facilities to determine the quality of their eyewashes. Not surprisingly, many of the facilities lacked an adequate number of units. More troubling however, was the finding that many of the units already installed were in a serious state of disrepair. More than a third of the stations inspected were inoperable or would not function properly; nearly all were a direct result of insufficient maintenance operations. The following are some of the more common problems noted in the survey:

- Nozzles clogged, broken or missing
- Activating valve inoperable
- Improper water pressure—too high or low
- Low fluid levels in self-contained eyewashes
- Foreign particles in bowl or basin
- Nozzle dust covers not installed

In addition, the survey indicated that the flushing fluid of plumbed and gravity-fed eyewashes was of poor quality in more than 50% of the samples. Of these samples:

- 60% had visible debris or discoloration
- Nearly two-thirds had total plate counts exceeding 500 colony forming units per milliliter (cfu/ml)
- 58% of units tested for microbial contamination contained the pseudomonas bacteria
- 10% had a too high or too low pH level

1 The study tested only for this bacterium.

Flushing Fluids
The quality of flushing fluid is often an overlooked item and is important for a number of reasons. Most important, the presence of foreign particles or unacceptable levels of microorganisms can result in further injury to the eye. Moreover, debris can either reduce or restrict the flow of the flushing fluid by obstructing nozzles, pressure-regulating devices and pipes that feed plumbed units and filters.

Flushing fluid should be clear and visibly free from foreign particles. The presence of off colors or contaminants is an indication of poor fluid quality in the supply line or in the water source. Contaminants can enter a self-contained eyewash via a biofilm on the inside of the station or through openings in the unit.

Total plate count is a measure of the biological activity of a fluid. Water with counts of less than 100 cfu/ml is considered potable, while values of 100 cfu/ml to 500 cfu/ml are considered questionable. Readings above 500 cfu/ml are considered poor quality. If a sample is above 500 cfu/ml, steps should be taken immediately to clean and disinfect gravity-fed eyewashes. For plumbed units, the fluid source must be cleaned. The presence of microorganisms such as bacteria, fungi and amoebae in flushing fluid can pose an added health risk to an injured eye. An eye that is injured is compromised by having less resistance to infection.

There are also requirements for the flow of fluids to eyewashes and showers in the ANSI standard. These are minimum flow rates that should be met to make the equipment work as it was designed, pass possible OSHA inspections and provide relief in case of an accidental splash. Each piece of equipment has a different flow requirement. Plumbed and Self-Contained eyewashes require a minimum flow of 0.4 gallons per minute (GPM) for 15 minutes of flush. Plumbed Eye/Face washes require a minimum flow of 3.0 GPM and combination showers and drench showers a minimum flow of 20 GPM for 15 minutes. All eye and eye/face wash units should be aligned so that the fluid provided flushes the eye and/or face simultaneously. If shut off valves are installed in the supply line, provisions should be made to prevent unauthorized shut off. According to the ANSI standard, these units should be inspected annually to make sure they continue to meet the flow requirements.

**pH Levels**

Tears generally have a pH of 7.4 and possess some buffer capacity. Ideally, the flushing fluid in an emergency eyewash
device should have a pH close to 7.4 as well as a saline content similar to the fluid in the eye. If the pH is too low or too high the water may not be suitable for use as a flushing fluid. Click here for pH meter options.

ANSI Standards

To ensure that your eyewash stations and showers are always ready when you need them, it is important that the requirements for test procedures and maintenance set forth in Z358.1-2004 are followed. The American National Standard for eyewashes and showers provides minimum requirements for these units to function properly.

The requirements for testing and maintaining any of the eye, eye/face washes and showers is based on the manufacturer’s instructions and ANSI requirements. Generally, the manufacturer’s instructions state that the units “should be inspected, tested and recorded weekly”. Individual owner manuals should be looked at for the specific manufacturer’s guidelines. The ANSI standard Z358.1 5.5.2 states that “plumbed eyewashes, eye/face washes and showers “….should be activated weekly for a period long enough to verify operation and ensure that the flushing fluid is available”. While activating plumbed eyewashes, eye/face washes and showers, you should also verify that they are providing luke warm tepid water (between 60°-100°F). Self-contained eye washes obviously cannot be activated weekly without using up valuable solution, so ANSI recommends visually inspecting the unit to see if the fluid needs changing or supplementing. Click here for eyewash inspection tags.

Plumbed and self-contained units shall also be inspected and maintained in accordance with the manufacturer’s instructions. For eyewashes, this includes protecting the nozzles and flushing fluid against airborne contaminants. Although not specifically stated, it’s prudent to check the fluid levels and activation device of self-contained eyewash units every week. The flushing fluid of self-contained units must also be changed periodically. Table 1 provides replacement schedules for eyewash flushing fluids.

Table 1

<table>
<thead>
<tr>
<th>Flushing Fluid Type</th>
<th>Recommended Replacement Schedule</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Tap water only</th>
<th>Weekly.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tap water mixed with a manufacturer’s preservative</td>
<td>Test mixture to identify bacterial loads and determine a maintenance cycle. Manufacturer’s recommend fluid changes of three to six months.</td>
</tr>
<tr>
<td>Tap water mixed with a factory-prepared liquid concentrate plus an additive</td>
<td>Same as above.</td>
</tr>
<tr>
<td>Factory-sealed cartridges</td>
<td>Expiration date of cartridge.</td>
</tr>
</tbody>
</table>

Other important things to look at during the weekly inspection are the lighting and **signage** around the eyewash, eye/face wash or shower station. The ANSI standard states that the eyewash station shall be well-lit and have a highly visible sign positioned so it is identifiable in the area it serves.

**Preservatives**

Most manufacturers provide suggested fluid replacement schedules, however, these are only guidelines. Preservatives are designed to control bacteria levels in flushing fluids but they are not effective against all bacteria. A preservative’s performance also depends upon several factors including the initial bacterial load of the water and a potential biofilm in the station. Self-contained eyewash stations should be drained completely, disinfected and rinsed prior to refilling.

For the annual inspection, flow meters or other measuring devices can be used to make sure the facilities units are in proper working order with the correct amount of flow.

Lab Safety Supply has an **Eye/facewash tester** which will help determine whether the alignment is correct and also that the flow is sufficient. The tester is part #2940. The **Shower tester** is part #14034 and will help with annual testing as well as weekly testing by keeping the fluid contained in a bucket while determining water flow.

Contact LSS at 800-356-0783 or [www.lss.com](http://www.lss.com) for eye wash, eye/face wash and shower testing equipment. For technical assistance contact Technical Services at 800-356-2501 or techsvc@labsafety.com.
To get the complete ANSI Z358.1 Emergency Eyewash and Shower Equipment Standard, you can contact ANSI at 11 W.42nd St. New York, NY. 10036, or by calling 212-642-4900.

Summary

Always inspect and test the unit if you have any doubt about its dependability. Identify problems or concerns and establish a regular maintenance program. Consult the manufacturer’s operating manual and ANSI Z358.1-2004 for assistance in performing test procedures, maintenance operations and training.

Commonly Asked Questions

Q. **Who should be trained on the proper use of emergency eyewashes and showers?**
   A. ANSI states that all employees who may be exposed to hazardous materials should be trained on the use of eyewash and shower devices. Specific areas that should be addressed include the location of the units, how to properly activate the systems and how to correctly maintain the devices.

Q. **Are there any recommended procedures on how to effectively flush eyes that have been contaminated?**
   A. Individuals should be instructed to hold the eyelids open and roll the eyeballs so fluid will flow on all surfaces of the eye and under the eyelid.

Q. **Are there any alternatives to the frequent changing of gravity-fed eyewash solutions?**
   A. Yes. Factory-sealed cartridges containing eyewash solutions are available. These products have shelf lives well in excess of preservative solutions and are significantly easier to maintain.

Sources for More Information

29 CFR 1910.151(c)

ANSI Z358.1-2004

American National Standards Institute
11 W. 42nd Street
New York, NY 10036
212.642.4900
www.ansi.org
FREE Technical Support
When you have a question, you can rely on our team of technical experts. They'll answer your questions about product specifications, chemical compatibility, regulatory issues, and general worker safety and health.
Call our Safety TECHline™ Technical Support toll-free: 800-356-2501 (6 a.m. to 9 p.m. CT, Monday - Friday). Or e-mail our Technical Support Staff at techsvc@labsafety.com anytime!

FREE Catalog
For products to meet all your workplace safety and industrial needs, turn to Lab Safety Supply. In it you'll find thousands of safety and industrial products, plus a complete service package and our 100% guarantee to stand behind them.
Click here to select a catalog and fill out a request form on-line, or call today to reserve your free copy: 800-356-0783 (7 a.m. to 9 p.m. CT, Monday - Friday).

Please Note: The information contained in this publication is intended for general information purposes only. This publication is not a substitute for review of the applicable government regulations and standards, and should not be construed as legal advice or opinion. Readers with specific questions should refer to the cited regulation or consult with an attorney.