Emergency Eyewash

Honeywell

WORLD LEADERS IN EMERGENCY EYE CARE

# The Importance of Eye Flushing Systems

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Experts agree that eyes utilize more than 65 percent of the pathways to the brain, contributing nearly 85 percent of an individual's total knowledge. Yet, because the eye is often minimally protected, it is particularly vulnerable to injury — especially in the workplace.

In fact, more than 2,000 workplace eye injuries occur every day, with nearly 100,000 of these injuries resulting in temporary or permanent vision loss per year, according to the U.S. Bureau of Labor Statistics. The cost of these injuries is staggering. The U.S. Department of Labor estimates that the financial cost of occupational eye injuries is more than $300 million per year and includes lost production time, medical expenses and workers' compensation.

## What Causes Workplace Eye Injuries?

While the causes of workplace eye injuries vary by industry, the overwhelming majority of incidents involve flying particles or falling objects striking the eye at a high rate of speed. Many of these particles are smaller than the head of a pin. A full 20 percent of all eye injuries sustained on the job are caused by chemicals, according to the Bureau of Labor Statistics.

## What is Being Done About Workplace Eye Safety?

The enormous number of incidents and costs related to workplace eye injuries has given rise to a variety of private sector and federal initiatives and regulations to address and mitigate the consequences.

**Prevention is Key.** The first defense against workplace eye injury is prevention. Proper eye and face protection, the proper use of equipment guards, safety-conscious manufacturing processes and education and training initiatives can be effective in reducing the number of injuries incurred.

**Response is Critical.** The second defense against workplace eye injury is the capability to treat accidents quickly and effectively. When an accident happens, timely and proper treatment is critical to minimize the effects of the injury, and perhaps, in whole or in part, save the injured person's eyesight. To that end, the government has developed a number of recommendations and regulations relating to on-the-job eye safety.

Current Occupational Safety and Health Administration (OSHA) guidelines relating to workplace eye safety state, “Where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.” (OSHA regulation 29 CFR 1910.151(c)).

It is important for employers to know that in addition to the aforementioned standard, OSHA frequently refers employers to ANSI standard Z358.1.

## What is ANSI?

ANSI stands for the American National Standards Institute, a private, non-profit organization that administers and coordinates the U.S. voluntary standardization and conformity assessment system. ANSI does not assess or certify products or services. It “serves as a neutral forum for the development of policies on standards and serves as a watchdog for standards development and conformity assessment programs and processes.” As noted above, OSHA refers to ANSI standard Z358.1 to guide employers in establishing and maintaining work practices relating to eye safety.

### What does the ANSI Z358.1 standard require?

Like OSHA, ANSI standard Z358.1 requires that the first step following chemical contact of any kind with the eye(s) — including caustics, acids, solvents and other hazardous materials — is immediate flushing of the eye(s) with water.

**Speed is of the Essence.** ANSI Z358.1 states that eyewash stations must be accessible within 10 seconds or less of an accident.

**Duration is Critical.** ANSI Z358.1 requires that eyewash stations be able to provide flushing fluid uniformly over a period of 15 minutes.

**Temperature is Important.** The ANSI Z358.1 standard was updated in 2009 and requires that eyewash stations deliver tepid flushing solution. Tepid temperature is no less than 60° F and no greater than 100° F. Water that is too cold may prevent the patient from completing the full 15-minute cycle and also is capable of causing hypothermia. Water temperatures over 100° F have been proven harmful to the eyes and can enhance chemical reaction with the eyes and skin.

In addition to the above requirements, ANSI Z358.1 also calls for each eyewash station to be easily identified with the use of a highly visible sign. Eyewash equipment should be certified annually by a third party to ensure compliance with ANSI standards.

## FDA to Enforce Changes

In addition to OSHA and ANSI guidelines, the Food and Drug Administration has weighed in regarding workplace eye safety. The agency is proposing to amend the final monograph for over-the-counter ophthalmic drug products to include OTC emergency first aid eyewash products.

In the document detailing the proposed changes, the FDA concluded after reviewing available medical literature that "the treatment of choice for both acid and alkali burns [to the eye] to be copious and continuous irrigation of the area with water or a pH balanced solution." The FDA's Final Monograph (21 CFR) further states that, "Because an eyewash is intended to be used in the eyes, it should be physiologically compatible with [human] tears." The agency will soon be requiring that all over-the-counter ophthalmic drugs be sterile in order to minimize the likelihood of infection among patients treated on the job for eye injuries.

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Given all of the existing and proposed recommendations and mandates regarding workplace eye safety, it makes sense to review and assess the current state of eyewash stations in the American workplace and also take a look at the future of these products.

## Current Eye Wash Solutions:

### Plumbed Eyewash Devices

Plumbed eyewash devices have been in use for more than 100 years. Their greatest attribute is the ability to deliver plentiful amounts of flushing liquid. But plumbed fixtures have a significant number of drawbacks — mostly due to the fact that plumbed fixtures use tap water as a rinsing agent. Not only does tap water not match the pH of the eye, but it could also contain contaminants and microorganisms — both of which could further irritate and injure the eye, potentially leading to serious complications such as corneal cell damage. While flushing with tap water from plumbed eyewash devices is better than not flushing at all, it is far from the optimal solution.

**Flushing eyes with tap water can be very painful.** People find it virtually impossible to flush their eyes with tap water for the recommended 15 minutes. The water is often too cold or too hot to be tolerated. The presence of chemicals and contaminants in tap water can exacerbate the problem.

**Flushing with tap water can damage the epithelial layer of the eye.** A study conducted by the Louisiana State University Health Sciences Center and the Kentucky Lions Eye Center found that flushing with tap water can further disrupt the eye's protective epithelial cell layer and cause additional corneal cell damage because it is incompatible with the pH of the eye.

**Tap water introduces contaminants into the injured eye.** Plumbed eyewash stations can develop rust and scale in their supply lines. Though tap water is suitable for drinking, it does contain various irritants and contaminants including the free-living amoeba, Acanthamoebae. In fact, a December 2005 survey by the Environmental Working Group (EWG), a nonprofit environmental research and advocacy group based in Washington, DC, found 141 unregulated chemicals and an additional 119 for which the Environmental Protection Agency (EPA) has set health-based limits. Most common among the chemicals found were disinfection by-products, nitrates, chloroform, barium, arsenic and copper. Flushing these harmful elements into an already damaged eye can cause serious secondary injury and possible vision loss.

**Plumbed eyewash stations are expensive to install and impractical to move.** When plant layouts are modified or production facilities expanded, plumbed eyewash stations may need to be added or relocated to maintain adequate coverage for hazardous areas. Such actions represent a significant cost and time factor.

**Plumbed units warrant frequent maintenance.** According to the ANSI standard, plumbed eyewash units should be activated weekly to flush out dangerous contaminants and microorganisms. In large plants, maintenance of multiple eyewash units can represent a substantial labor and cost commitment.

## Self-contained Portable Systems

Developed in the 1970s, self-contained, tank-style eyewash devices were designed for portability and easy access, and represented a significant improvement over plumbed units. Not only were they far less costly than plumbed devices, they were also designed to dispense a buffered saline solution that approximates the pH of the human eye at ambient temperatures (typically 60-100° F).

However, despite the significant improvements self-contained units brought to the workplace, some important operating and maintenance concerns remain.

**Many self-contained units are filled with ordinary tap water.** As previously discussed, tap water presents certain risks for flushing the eyes. Even though self-contained units have fewer contamination problems than plumbed units, and can be filled with a buffered saline solution, many users fill the reservoir with common tap water. Studies have detected Acanthamoebae, Pseudomonas and other harmful bacteria, viruses and fungi in the stagnant water of improperly maintained units. Filling self-contained units with tap water only increases the likelihood of contaminants in the water supply.

**Device components can be a source of contamination.** Filler caps, nozzles, basins and drains can be breeding grounds for bacteria and collection points for other harmful elements. The fluid in the tank can also become contaminated. Even if the unit is cleaned and filled with "fresh water," if the tank is not thoroughly disinfected, the harmful contaminants can be left behind to contaminate the new water source.

**It's difficult to see if the unit needs refilling.** In many cases, the only way to tell if a self-contained unit is full of water is to look inside. Unfortunately, there have been cases when an accident has occurred and the eyewash device was found to be empty.

**Regular maintenance is essential.** ANSI standards recommend that inspection and maintenance be carried out in strict accordance with manufacturer's instructions. That typically involves cleaning, disinfecting and changing the flushing fluid as often as every week with untreated tap water, to every six months with preserved saline solutions. Either way, the maintenance of these units can be costly and time consuming.

## Sealed-Cartridge Devices

The next step in the evolution of eyewash stations was the sealed-cartridge device. The sealed cartridge device features factory-sealed cartridges containing purified, buffered saline eyewash solution that remains free of bacteria or contamination for up to 24 months. Because these units can only be refilled using factory-sealed replacement cartridges (not filled on-site with bacteria-harboring tap water), they are safer than other self-contained devices.

**24-month cartridges minimize maintenance.** Unlike plumbed fixtures or other self-contained portable systems, which require constant and costly maintenance, sealed cartridges last up to two years and take less than five minutes to replace.

## Sterile Solution

Although the introduction of sealed-cartridge devices represented a major step forward in the treatment of workplace eye injuries, the units do not offer a 100 percent sterile solution for injured workers. Recent research has proven that sterile emergency eyewash solutions deliver additional benefits to the patient being treated. The findings were compelling enough to warrant the FDA's plans to soon enforce regulations on the use of sterile solutions in portable emergency eyewash.

***Why is a sterile eyewash solution better?***

- *Sterile solution offers unmatched safety.*
- *When compared to tap water, sterile solution offers the best protection from contaminants and bacteria that could lead to secondary trauma to an injured eye.*
- *Sterile solution reduces the risk of potential liability if eye injury from flushing with contaminated water occurs.*

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## Are Sterile Solutions Available Today?

Yes. The new Fendall 2000™ from Honeywell offers a sterile delivery system designed exclusively for its new sterile Eyesaline® solution.

To minimize the chance of contaminants entering the eye from other sources, the new Fendall 2000 sterile delivery system features hermetically sealed nozzles, hoses and nozzle covers that are protected until used, in order to minimize the possibility of contamination.

In addition to its modular, compact and durable design, the new system uses only one sterile Eyesaline cartridge that is 100 percent safe and lasts for two years. It also features an alarm that sounds upon activation or deactivation, and a nozzle that is easy to install for added assurance that the unit is properly assembled. Drug information, lot numbers and expiration dates are also visible through a clear window for easy inspection and to ensure that the sterile Eyesaline is replaced when required. Company contact information is also clearly marked. For added comfort, proper use and improved compliance, the Fendall 2000 system also includes such ergonomic features as an arm and head rest.

With an integrated waste water containment system, the Fendall 2000 eyewash station captures its own solution during the 15-minute flush, thus preventing dangerous spills and the need for cleanup when installing the new cartridge. In addition to a one-year product warranty, the Fendall 2000 station is SEI certified to meet the ANSI Z358.1 standard and is supported by a dedicated team with the technical expertise necessary to answer user questions.

Sterile Eyesaline offers significant advantages over tap water and even the first generation of sealed cartridges produced with purified water. It is buffered to the same pH as the human eye, which is especially important in the case of chemical splashes, when the eye's pH is disrupted. Because it utilizes a physiologically correct saline solution that is similar to human tears, it can be used for a full 15 minutes without irritation to the eye. Sterile Eyesaline solution maintains its stable pH during all stages of use, including storage and flushing.

With a 24-month shelf life, Honeywell brand sterile Eyesaline® cartridges require significantly less maintenance than plumbed fixtures or self-contained portable fixtures. In fact, cartridge replacement takes less than five minutes. Sterile Eyesaline cartridges are standard on the new Fendall 2000™ station, and are also available for the existing Fendall Pure Flow 1000® eyewash station.

When it comes to workplace eye safety, the Fendall 2000 or Fendall Pure Flow 1000 eyewash stations with new sterile Eyesaline cartridges are the most advanced and effective eyewash devices available today. Sterile Eyesaline solution is available only under the Honeywell brand name and adheres to ANSI eyewash standards as well as FDA requirements for providing the use of sterile eyewash solution in all self-contained eyewash stations.

The Fendall 2000 eyewash station is available for purchase through U.S. and Canada safety equipment distributors.

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Honeywell brand eyewash products are manufactured by Sperian Eye & Face Protection, Inc., a Honeywell company.