

## The 10-Second Race: Better Eyewash Stations Reduce Injury

By Imants Stiebris, BS, MBA and Steven H. Miller, CDT

Chemical eye burns don't stop burning. Unlike an impact or abrasion, where damage is done in an instant, chemical burns keep on doing harm until the hazardous substance is removed from the eye. Minimizing injury is, therefore, a race against time. That's why the standard for eyewash stations<sup>1</sup> dictates that they must be accessible within 10 seconds of places where accidental exposure may be expected.

In the real world, it means that an eyewash station must be easy to get to at a time when the accident victim may be unable to see well and may be panicked. It must be easy to operate quickly under those difficult conditions. And it must work reliably when needed.

One logical solution is to place the eyewash station at a sink, a place where anyone familiar with the room will naturally turn in such an emergency. Several "faucet-mount" products that add eyewash heads onto existing faucets have been offered. However, they could present safety hazards involving delays in activation and the danger of scalding water being delivered to the eyes. Newer, specially designed combination products feature both eyewash and faucet functions that work independently. These integrated units solve the safety problems posed by faucet-mounts.



Image courtesy of Speakman Company

**A combination eyewash and faucet unit places the eyewash station where workers are most likely to turn in the emergency: the sink. The eyewash functions without having to turn on the faucet, so there is never a danger of scalding water on the eyes.**

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<sup>1</sup> ANSI Z358.1-2009 American National Standard for Emergency Eyewashes and Shower Equipment

## **Background:**

There were 27,450 workplace non-fatal eye injuries that resulted in days out of work reported in the US in 2008, according to the U.S. Department of Labor Bureau of Labor Statistics. Of those, about 10 % were from chemical burns. There were undoubtedly many more exposure injuries that did not result in days of lost work, probably because they were treated quickly in eyewash stations.

Chemical burns get worse the longer they go untreated. Acid burns typically only damage the surface of the eye, but serious damage to the cornea can cause blindness. Alkali burns are often more damaging because they can penetrate and harm internal eye structures, as well. As long as the harmful substance is in contact with the eye, the chemical reaction can continue. Worse, the damage may be increased by the natural, instinctive response of closing the eye, which traps the burning agent against the eye surface.

Emergency treatment for chemical exposure is to flush eyes immediately and extensively with either water or a prepared eye-flushing solution. The ANSI standard requires that eyewashes be able to deliver 15 minutes of continual flushing to both eyes simultaneously at minimum 0.4 gpm. (Eye/Face washes must deliver minimum 3.0 gpm.) It specifies tepid water for eye-flushing, defined as being between 60°F and 100°F. It requires eyewash stations to be located within ten seconds' travel time from any location where exposure may occur. The equipment must be able to be activated within one second or less, and stay on without requiring use of the operator's hands.

To ensure that an eyewash is in working order when needed, it must be tested once per week. An eyewash station must be equipped with covers that prevent dust or debris from entering the spray heads (which point straight up), and the covers must remove automatically when the device is activated. (This is usually accomplished with plastic dust-caps that are popped off by the pressure of the activated wash.)

These performance standards, with their emphasis on time and ease of operation, strongly suggest other considerations for the designer. The eyewash station should be placed where a person in mid-emergency will find it quickly and easily. It must be operable without mistakes or confusion in a moment of crisis. The flushing action should be effective but comfortable (such as is achieved by aerated spray heads) to encourage using it for the extended flushing period that's recommended. It should be easy to test, simplifying compliance with the testing requirements.

Examples of locations where exposure may be expected to occur include any lab handling fluids or powders of an alkaline or acidic nature, areas where medically contaminated substances are handled, and maintenance areas or closets where cleaning products are mixed or dumped.

## **The Real World**

The unfortunate truth is that real-world eyewash installations often fall short of these safety goals. In many labs, the eye wash station is not well located, not well marked, and difficult to find. Moreover, a free-standing station requires a bucket (and probably additional cleanup) for weekly testing, which may deter testing from actually being performed as often as required.



**Can you find the eyewash? In the real world, eyewash stations are often badly marked, difficult to find, and difficult to operate fast in a panicked state, falling short of the real safety goal of treating eye burns quickly.**

An attempt to improve this situation was made with the introduction of faucet-mount devices that attach to existing faucets. This places eyewash stations in locations where people will reflexively turn in an emergency: the sink. It saves money, because the unit does not have to be individually plumbed in. It saves space along the walls where a freestanding station would mount, and on the floor where space must be left for the eye injury victim to stand. It also makes it quick and easy to test, because the sink catches the water.

However, add-on devices pose safety challenges in actual installations. Because they are dependent on the operation of the faucet's hot and cold valves, there is always the potential that an injured person could activate the hot instead of the cold, presenting a scalding danger. To remedy this, users are often advised to make the eyewash the primary function of the device and disable the hot supply. This configuration limits the utility of the faucet because hot water for washing has been eliminated and faucet operation has become secondary.

## **Dedicated Combination Units**

A newer improvement over add-on devices are dedicated dual-function faucet/eyewash units, such as the Speakman SEF 1850 Eyesaver series. These are standard laboratory faucets with built in, independently operating eyewash stations. They use a standard plumbing supply, but eyewash function is controlled without use of the faucet valves. Eye wash function is activated by a single pull on a dedicated, well-marked

lever. They comply fully with the ANSI standard. They are made in a variety of configurations for different sink types, etc.



Image courtesy of Speakman Company

**A safe dual-function unit has an independent plumbing supply to the eyewash function (green), which operates from its own activator handle without use of the faucet valves. The faucet valves get normal hot (red) and cold (blue) supply, which they mix in the faucet neck (purple). There is never a danger of scalding water being delivered to the eyes.**

A key benefit of the dual-function approach is the independent water supply to the eyewash function, so there is never a danger of hot water being delivered for eye-flushing. This independent supply can be either from a specially controlled tepid water source, or from the cold water inlet if it meets the temperature requirements. In circumstances where the chemical reaction of the expected exposure is accelerated by flushing fluid temperature, a medical advisor or industrial hygienist should be consulted about optimum temperature for the application.

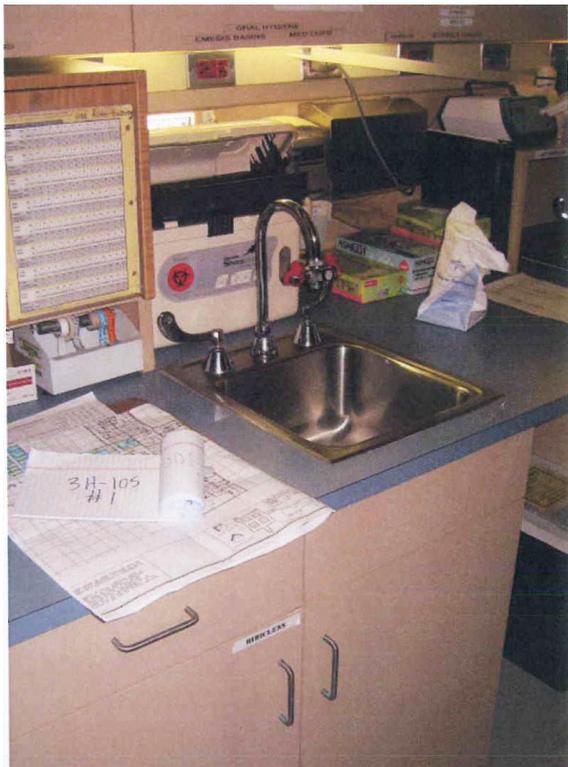
From a design perspective, combination units have all the virtues of faucet-mount additions: they take no additional space, require no additional location to be plumbed, and have the benefit of a sink to catch water in testing and in use.

From a safety perspective, they resolve the negative issues of faucet mounts, because they are functionally equivalent to a dedicated eyewash station. They may actually improve overall safety versus a free-standing station by avoiding the creation of slippery floors around the station when the eyewash is in use. The newest dual-function units also offer aesthetic improvements over more traditional lab-style faucets, providing a look that may be more compatible with contemporary design.

CASE STUDY: Veteran's Administration Hospital, Minneapolis

In 2009, the Veteran's Administration (VA) Hospital in Minneapolis, MN ordered an upgrade of all their eyewashes and drench showers. The four-story, 1.5 million square foot facility, completed in the late 1980's, includes numerous laboratory facilities.

The upgrade was needed to meet the newer requirements for tepid water flushing. The existing eyewashes were not plumbed for tepid water. Many were faucet-mounted adaptations using the hospital's cold-water supply



**This faucet-mount eyewash was one of dozens in the Minneapolis VA Hospital that needed to be upgraded to comply with the ANSI Z358.1-2009 requirement of tepid water supply for eye washing. This faucet-mount eyewash still had the hot water valves active, creating a risk of scalding water being delivered to the eyes in a moment of panic. It was replaced with a Speakman SEF-1800 EyeSaver dual-function faucet/eyewash unit. The new units are considerably safer to use than faucet-mounts.**

Dual-function eyewash/faucets were selected to replace existing faucets in a variety of configurations. Counter-mounted units included both 5" and 8" high goosenecks, some with dual handles and some with single-lever controls for the faucet functions. Wall-mounted units, where both valves and faucet neck protrude horizontally from the wall above the sink, were also required in some locations. Some even had foot-pedal

operation for the faucet function. In some instances, where the existing faucet was made by the same manufacturer as the new dual-function unit, they were able to replace only the faucet neck with a dual-function neck, reducing materials and plumbing costs.

In addition to 128 faucet/eyewash dual-function units, emergency swing-out and swing-down eyewashes were installed in some locations. Free-standing emergency shower/eyewash combination units were also installed. In areas where the building's hot water supply could not reliably deliver tepid water as required, heaters were added. Temperature for the tepid water supplies is controlled by thermostatic mixing valves.

Curt Wentz of Wentz Associates, the engineer who designed the upgrade, noted that a significant factor in the selection of the dual-function units was "the flexibility to use the fixture for normal washing and for emergencies."



Image courtesy of The Speakman Company

**On this dual-function eyewash/faucet installed in the Minneapolis VA Hospital upgrade, the faucet function is pedal-operated, one of the many configurations available. The eyewash operates independently using the activation lever marked "PULL."**

Pamela Russell Demaster, Occupational Safety Manager for the hospital, notes that, "People should be wearing their personal protective equipment (PPE), specifically proper eye protection, if they're following the applicable OSHA safety standards, but it would be terrible if someone were exposed and there was no functioning eyewash."

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