Emergency Shower and Eye Wash Stations

Safety Survey/Audit Guide

and

ANSI Z358.1–2014 Compliance Requirements and Checklist

This document is meant to summarize the key points within the standard, but not act as a substitute. It is recommended that the complete ANSI Z358.1 2014 be consulted directly for further details and, before purchasing and installing emergency equipment.

Violating OSHA regulations is against the law. It is critical that employers take the time to determine the need for emergency shower and eye wash systems in their facilities and take the steps to evaluate and install systems that best meet their needs. There is no price tag on the loss of vision or pain and suffering associated with eye and other corrosive splash injuries. In addition, where the law is concerned, legal and financial headaches could plague a company for years.

www.EmergencyShowerSystems.com-
Ken MacKenzie Communications

Forward:

We ask a lot from employees when we ask them to work with hazardous chemicals and products. They know one accident could cost them their sight or leave scars that never disappear. These workers deserve to know that help is always within reach.

This Guide is intended to be consistent with all existing OSHA standards. If an area is considered by the reader to be inconsistent with a standard, then the appropriate state or federal standard should be followed.

This Guide to Eyewash and Safety Showers looks at the kinds of safety equipment workers need to have in their workplaces. It explains what employers are required by OSHA to provide in eyewash and safety shower stations.

Disclaimer:

The materials contained in this guide have been compiled from sources believed to be reliable and to represent the best guidelines and procedures for conducting a thorough safety audit and inspection in the workplace and to assist in the compliance of ANSI 358.1 2014.

This guide is intended to serve only as a starting point for managers and employees in their task of establishing good safety practices in relation to eyewash and emergency shower stations. The guide does not purport to specify any minimal legal standards. No warranty, guarantee, or representation is made by Ken MacKenzie Communications as to the accuracy or sufficiency of the information contained herein, and Ken MacKenzie Communications assumes no responsibility in connection therewith. This guide is intended to provide workplace managers with basic guidelines for conducting safety inspections and the installation of eyewash and emergency showers.

Therefore, it cannot be assumed that all necessary checklists, guidelines, and precautionary measures are contained in this document and that other or additional information or safety measures may not be required or implemented.

Whilst we believe the information and advice herein set forth to be true and correct, same are given on the basis that we shall be under no liability, whether at law or in equity, and whether for negligence, breach of contract or otherwise, with respect to any loss or damage suffered or incurred by anyone whomsoever and caused by any error mistake omission or other defect in such information advice which shall be used and relied and acted upon by every person at his own risk.

Users of this guide should consult pertinent local, state, and federal laws and legal counsel before initiating any safety audit or inspection program and be especially well informed about any compliance issues with respect to the handling of any hazardous materials.

IN YOUR PLANT, LABORATORY OR SITE DO YOU HAVE

ANY OF THESE SUBSTANCES!

IF SO, YOU AND YOUR STAFF MAY BE AT RISK !

TABLE OF CONTENTS: **Page No**

Introduction:

In today's industries, many safety precautions and types of emergency equipment must be used to protect and ensure the health of employees. Although regulations and standards, personal protective equipment, and safety training are used, accidents still happen. Accidents involving hazardous chemicals can be especially severe. Employees who manufacture hazardous chemical products are at risk, of course. Hazardous chemicals can also affect people who work in food industries, or with cleaning solutions, and in manufacturing industries and service establishments.

Eye washes and safety showers were developed in response to the increased use of hazardous materials. Eye washes and safety showers are emergency systems used in both public and private industry to protect an employee from injury in case of contact with hazardous chemicals, chemical compounds, toxic substances, corrosives, flammable liquids and radioactive materials, etc. The four basic ways these safety systems are used include:

1. Dilution—diluting the chemicals and other materials that are on the skin or in the eyes to a non harmful level.
2. Warming/cooling—warming or cooling the body or eyes because of a change in temperature due to hazardous material exposure.
3. Irrigation—flushing the hazardous chemicals or other out of the eyes or off the skin.
4. Extinguishment—putting out fires of clothing on the body.

Workplace accidents can be devastating. Someone can be injured... or even killed. Property, equipment or materials can be damaged or destroyed and your workplace could come to a complete standstill. All of these things can happen if efforts are not made to protect employees. One way to accomplish this is to conduct a safety audit. This is an examination of the work area to make sure it is as safe as possible and all potential hazards are corrected or removed.

What is a safety audit? What is a safety inspection? Although the words *audit* and *inspection* are frequently used interchangeably, they are *not* the same. *Audits* are not inspections. Audits evaluate all aspects of the program with special emphasis on the quality as well as the quantity of safety and health activities at every level. The basic goal of an audit is to verify that health and safety activities comply with institutional policies and federal, state, and local regulations.

Inspection, on the other hand, is defined as that monitoring function conducted in an organization to locate and report existing and potential hazards that could cause accidents in the workplace. Legally, the Occupational Safety and Health Administration (OSHA) or the Environmental Protection Agency (EPA) conducts inspections.

Throughout this guide, the concept of *environment*, *health*, *and safety* is intended, but for the sake of simplicity, *safety* is used. Examples of alternative terms include safety survey, safety consultation, safety assessment, field observation, field assessment, or operational survey. No matter what term(s) you use, you should assign significant importance to the assessment of safety practices in the workplace.

Safety Audits/Surveys:

Safety surveys frequently reveal potential causes of accidents and, provide an opportunity to take corrective action before an injury occurs. Surveys are conducted at the line or operating levels. Audits, on the other hand, are a managerial or corporate activity. Safety surveys are effective ways of preventing accidents.

The most important facet of surveying premises is to be aware that whilst you are fully conversant with the necessary precautions to be followed, your staff, especially new arrivals may not be. Therefore, view the situation through "their eyes".

You should take corrective action as soon as possible to abate all hazards found during an inspection. If the hazard presents an imminent danger to employees, **you must take corrective action immediately**. If you must delay corrective action for non-imminent hazards, you should document the reason for the delay and the estimated date of correction. When the corrective action has been completed, you should document the action date.

Administrative Concepts:

In its broadest terms, an audit includes all or some of the administrative concepts described in this section. Some of these concepts are provided to establish a "Framework for Evaluating Safety." The following information provides a framework for developing evaluation criteria. It should not be used as a checklist, which can be limiting.

Assigning Responsibility:

- Are department heads, supervisors, and staff assigned safety responsibilities as a policy or procedure, and is the policy communicated to all levels?
- Is there a clear line of responsibility?
- Who is responsible for coordinating the compliance program?
- What steps has the organization taken to comply with OSHA and other regulations?
- Is the safety staff competent and qualified?
- Is safety responsibility monitored?

Emergency Preparedness:

- Do you have an emergency action plan? Is it tested by drills?
- Do personnel receive training on the proper way to report emergencies and summon help?
- Does your organization have an emergency response procedure, including backup systems for controlling spills and releases and evacuating personnel?
- Are procedures in place for reentry and cleanup?

Employee Awareness, Acceptance of Responsibility, and Participation:

- Is there active participation in a safety and health committee?
- Are the engineering and administrative controls effective?

Is there an effective personal protective equipment program?:

- What type of equipment is used?
- What is the rationale for use?
- What are the maintenance procedures?
- Is equipment available to and used by all employees?
- Is mandated training performed?
- Is there safety publicity (newsletters, bulletins, etc.)?

Discipline:

- Are violators of safety rules disciplined?
- Are supervisors setting a good example?
- Is the safety and health performance effective?

Identification, Control, and Monitoring of Potential Hazards:

- Is top management aware of all health and physical safety risks in the workplace?

Hazardous substance control program:

- Is one in use?
- Are all substances identified?
- Are employees aware of the risks?
- Are procedures in place to inform and educate employees about all health and physical safety risks? Does this procedure include informing employees about the potential hazards of non-routine tasks and educating contract employees about potential hazards on-site? Do employees receive testing to ensure that they understand what they learned?
- Does the employer provide written information and training procedures?
- Does the employer document information and training session outcomes? Do employees sign attendance sheets and state in writing that they understood the material presented? Does it document who was trained, when they were trained, and whether they successfully completed the training? What procedure is in place to coordinate documentation of training materials? Are the training logs entered into a database? How are the original sign-in sheets stored? Are they easy to retrieve?
- Is a knowledgeable person assigned responsibility to determine the presence and use of hazardous materials?
- Is a list of all hazardous substances available?
- Have suppliers provided material safety data sheets (MSDSs) covering hazards and precautions for all chemicals?
- Are these MSDSs available to all employees on request?
- Is every nonexempt container of hazardous chemicals in the workplace appropriately labeled?

- The hazard communication standard generally applies only to those chemicals (including elements, compounds, and mixtures) to which employees are exposed in the workplace under normal conditions or in a foreseeable emergency.
- Hazardous wastes regulated by the U.S. Environmental Protection Agency (EPA), chemicals produced and used only in a laboratory, and items for personal consumption are exempt.

- How does the safety coordinator find out when a new chemical is introduced into the workplace? How does the safety coordinator ensure that unused chemicals are disposed? For every known health hazard, does a definite control plan exist that covers periodic monitoring of the hazard? Continued maintenance and monitoring of employee exposure records? Periodic physical examinations for employees in exposure areas? Is strict enforcement of rules governing provision, care, and use of personal protective equipment followed in all cases?
- Is a list of symptoms and antidotes for toxic substances circulated and posted where necessary?
- Are known health exposures studied to eliminate or reduce exposures through process or design changes or engineering controls? How are such studies conducted? How are the results communicated?
- Do employees understand and comply with OSHA standards or safe practices recommended by manufacturers or other agencies?
- Have certified industrial hygienists evaluated the operations?
- What actions are taken regarding recommendations made by industrial hygienists? What actions still remain to be taken?
- Are safety rules and approved signs relating to health hazards posted in areas where hazards are present?
- What is the procedure to confirm that supervisors and employees exposed to potential health and safety hazards understand the nature of the risks, the preventive measures, and related safety rules?
- What evidence is there in the workplace that the hazards are known and adequate controls are in place and working?
- Are appropriate safety devices available? Is personal protective equipment (PPE) provided and used properly?
- Is PPE in conformance with appropriate standards such as NIOSH (National Institute for Occupational Safety and Health) or ANSI (American National Standards Institute)?

Management Leadership:

Fundamentally, all safety work must proceed from the proper motivation of management. The effectiveness of any program increases or diminishes according to the degree of support and encouragement that management displays.

- Is there a written safety policy/program? Is employee participation solicited?
- Is management setting a good safety example?
- Is off-the-job safety a management concern?
- Is there a systematic review of safety performance?
- Do safety issues flow down from management or up to management?
- To whom in top management does the chief safety coordinator report?

- Are adequate funds made available to:- support the safety program? - correct unsafe conditions? - support training and other educational activities?
- Are new employees indoctrinated with safety and health training by management's edict? Are they then tested to ascertain that the safety and health training is inculcated?

Maintenance of Safe Working Conditions:

- Is there proper maintenance of good housekeeping conditions in the workplace? Are equipment and materials organized and adequate? Are work areas and the exterior of the plant clean?

Workplace inspection program:

- What is the frequency of inspections?
- Who performs them?
- Is a record maintained?
- Is there a preventive maintenance program?
- Are the inspection team personnel trained?
- Are the engineering and/or administrative control programs routinely evaluated?

Important Questions Answered:

Are emergency showers and/or eye wash stations important?

The first 10 to 15 seconds after exposure to a hazardous substance, especially a corrosive substance, are critical. Delaying treatment, even for a few seconds, may cause serious injury.

Emergency showers and eyewash stations provide on-the-spot decontamination. They allow workers to flush away hazardous substances that can cause injury. Accidental chemical exposures can still occur even with good engineering controls and safety precautions. As a result, it is essential to look beyond the use of goggles, face shields, and procedures for using personal protective equipment. Emergency showers and eyewash stations are a necessary backup to minimize the effects of accident exposure to chemicals.

Emergency showers can also be used effectively in extinguishing clothing fires or for flushing contaminants off clothing.

What is considered to be a 'flushing fluid'?

The ANSI standard defines "flushing fluid" as any of potable (drinking) water, preserved water, preserved buffered saline solution or other medically acceptable solutions. Local laws may apply in some cases. This document will use the term "water" to mean any of these acceptable flushing fluids unless otherwise specified.

How long should the contact area be rinsed/flushed?

For emergency showers and eyewash stations to be effective, the American National Standards Institute (ANSI) Standard for Emergency Eyewash and Shower Equipment recommends that the affected body part must be flushed immediately and thoroughly **for at least 15 minutes** using a large supply of clean fluid under low pressure. Water does not neutralize contaminants -- it only dilutes and washes them away. This fact is why large amounts of water are needed.

However, other references recommend a minimum 20-minute flushing period if the nature of the contaminant is not known. The flushing or rinsing time can be modified if the identity and properties of the chemical are known. For example: a minimum 5-minute flushing time is recommended for mildly irritating chemicals, at least 20 minutes for moderate-to-severe irritants, 20 minutes for non-penetrating corrosives, and at least 60 minutes for penetrating corrosives.

Non-penetrating corrosives are chemicals, which react with human tissue to form a protective layer, which limits the extent of damage. Most acids are non-penetrating corrosives. Penetrating corrosives, such as most alkalies, hydrofluoric acid and phenol, enter the skin or eyes deeply. Penetrating corrosives require longer water flushing (a minimum of 60 minutes) than non-penetrating corrosives (a minimum of 20 minutes).

In all cases, if irritation persists, repeat the flushing procedure. It is important to get medical attention as soon as possible after first aid has been given. A physician familiar with procedures for treating chemical contamination of the eyes and body should be consulted.

Note: The total amount of water in self-contained systems should exceed the volume required to deliver water at the recommended flow rates and flushing times.

What type of equipment should I install?

Emergency showers, also known as drench or deluge showers, are designed to flush the user's head and body. They should **not** be used to flush the user's eyes because the high rate or pressure of water flow could damage the eyes in some instances. Eyewash stations are designed to flush the eye and face area only. There are combination units available that contain both features: a shower and an eye wash.

The need for emergency showers or eyewash stations is based on the properties of the chemicals that workers use and the tasks that they do in the workplace. A job hazard analysis can provide an evaluation of the potential hazards of the job and the work areas. The selection of protection -- emergency shower, eyewash or both -- should match the hazard.

In some jobs or work areas, the effect of a hazard may be limited to the worker's face and eyes. Therefore, an eyewash station may be the appropriate device for worker protection. In other situations the worker may risk part or full body contact with dangerous substances. In these areas, an emergency shower may be more appropriate.

A combination unit has the ability to flush any part of the body or all of the body. It is the most protective device and should be used wherever possible. This unit is also appropriate in work areas where detailed information about the hazards is lacking, or where complex, hazardous operations involve many chemicals with different properties. A combination unit is useful in situations where there are difficulties handling a worker who may not be able to follow directions because of intense pain or shock from an injury.

What specification should the equipment meet?

Please Note: All dimensions and measurements are taken from the American National Standards Institute (ANSI) standard Z358.1-2014 "Emergency Eyewash and Shower Equipment". Although portable models are available, it is always a good practice to select a plumbed model whenever possible. Portable models should be able to deliver the same volumes of water, as well as meet the dimensions for plumbed models, as specified in the standard. However, portable stations are necessary for mobile crews, temporary locations, or when the plumbed model is under repair. In order to prevent any secondary eye infections, the water in self-contained models should be treated to prevent bacterial growth in the water itself. Changing the water supply weekly is another good preventative measure.

Emergency Showers:

The emergency shower should deliver a pattern of water with a diameter of at least 50.8 cm (20 inches) at 152 cm (60 inches). This diameter ensures that the water will come into contact with the entire body - not just the top of the person's head. ANSI also recommends the shower head be between 208.3cm and 243.8 cm (82-96 inches) from the floor. The minimum volume of spray should be 75.7 litres/minute (20 gallons/minute) **for a minimum time of 15 minutes**.

The shower should also be designed so that it can be activated in less than 1 second, and it remains operational without the operator's hand on the valve (or lever, handle, etc.). This valve (or lever, handle) should easily located and not be more than 173.3 cm (69 inches) in height. If enclosures are used, ensure that there is an unobstructed area of 86.4 cm (34 inches) in diameter.

Eyewash and Eye/Face Wash Stations

Eyewash stations should be designed to deliver fluid to both eyes simultaneously at a volume of not less than 1.5 litres/minute (0.4 gallons/minute) for full 15 minutes. However, the volume should not be at a velocity, which may injure the eyes. With eye/face washes the flow must deliver a minimum of 11.4 litres/minute (3 gallons/minute)

The unit should be between 83.8 and 114.3 cm (33 to 45 inches) from the floor, and a minimum of 15.3 cm (6 inches) from the wall or nearest obstruction.

The user should be able to open their eyelids with their hands and still have their eyes in the liquid. As with the shower, the unit should also be designed so that it can be activated in less than 1 second, and it remains operational without the operator's hand on the valve (or lever, handle, etc.) with the valve being located in an easily located place. Since the nozzles to eyewash stations typically need to be protected from airborne contaminants, the units are to be designed such that the removal of these covers should not require a separate motion by the user when the unit is activated.

Personal Wash Stations

Designed to deliver flushing fluid immediately, personal wash stations can be used while transporting the victim to the permanent eyewash station or medical facility. These stations do not replace the requirement to have a 15 minute-supply eyewash station. The expiry date of the fluid should be printed permanently on the unit.

Drench Hoses

This type of equipment is usually considered to be secondary to proper emergency showers and eyewash stations (e.g., having a drench hose does not replace the need for showers/stations). Drench hoses may be used to "spot" rinse an area when a full shower is not required, to assist a victim when the victim is unable to stand or is unconscious, or to wash under a piece of clothing before the clothing is removed.

Combination Units

This name refers to equipment that shares a common plumbing fixture. Any of the fixtures such as shower, eyewash, and eye/face wash or drench hose may be in this combination, but most commonly it refers to a shower and an eye wash station. It is important that pressure and volume requirements for each piece of the unit (as described above) are in compliance with the code. They must provide sufficient pressure and volume to either the eye wash or eye/face wash **simultaneously** the shower flow. You have to ensure that when they are operating independently or simultaneously they still comply. **Many existing safety showers combined with an eye/face wash or eye wash do not comply** !

Important Update to 2009/2014 editions regarding Simultaneous Use

If you're familiar with the 2004 version why is the standard speaking about simultaneous use in the 2009 and 2014 versions? It is correct to say that simultaneous use was written into the 2004 version. It was, however, not written into the testing requirement for the 2004 version. This meant a manufacturer could build a shower and eye wash combination unit, which didn't allow for the strict operation of the flow quantities specified in the standard and, it would have passed the testing requirements because it was not written in the testing part of the standard.

This has now been moved into the testing requirements in the 2014 standard.

Now, what simultaneous use means is when you have a combination shower and eyewash the shower must flow at 20gpm and the eye wash at a minimum 0.4gpm plus they must work together simultaneously when both are on. It is assumed that when you have a combination shower/eyewash that both pieces of equipment will be used at the same time. Therefore, they have strengthened the standard to ensure that both units can run simultaneously and are tested and certified accordingly.

This is a very important feature that most showers in the marketplace today don't truly comply with; meaning that when the shower turns on the eye wash or eye face wash goes to nothing. I.e. no flow, and not enough to get up to your eyes.

It is important to ensure that this is a feature included on your equipment so that when both the shower and eyewash are operated together these minimum standards must be maintained.

Where should the emergency equipment be located?

To be effective, the equipment has to be accessible. ANSI states that a person be able to reach the equipment in no more than 10 seconds. In practical terms, consider that the person who needs the equipment will be injured, and may not have use of their vision. Recommendations for this distance in linear terms range from 16.76 metres (55 feet).

However, the "10 second" rule may be modified depending on the potential effect of the chemical. Where a highly corrosive chemical is used, an emergency shower and eyewash station may be required within 3-6 metres (10-20 ft) from the hazard. These units should be installed in such a way that they do not become contaminated from corrosive chemicals used nearby.

The location of each emergency shower or eyewash station **should be identified with a highly visible signage.** The sign should be in the form of a symbol that does not require workers to have language skills to understand it. The location should be well lit.

Other requirements include that the emergency shower or eyewash station should:

- Be located as close to the hazard as possible
- Not be separated by a partition from the hazardous work area.
- Be on an unobstructed path between the workstation and the hazard. (Workers should not have to pass through doorways or weave through machinery or other obstacles to reach them.)
- Be located where workers can easily see them - preferably in a normal traffic pattern.
- Be on the same floor as the hazard (no stairs to travel between the workstation and the emergency equipment)
- Be located near an emergency exit where possible so that any responding emergency response personnel can reach the victim easily.
- Be located in an area where further contamination will not occur
- Provide a drainage system for the excess water (remember that the water may be considered a hazardous waste and special regulations may apply).
- Not come into contact with any electrical equipment that may become a hazard when wet, and
- Be protected from freezing when installing emergency equipment outdoors.

Important Update to 2014 editions:

What temperature should the water be?

In the 2004 version the Standard was vague about the temperature requirements and said that the water must be tepid. I.e. moderately warm to luke warm. In the Appendix to the 2004 edition there was a temperature range of 60°F to 100°F.

It should be noted that the information in the Appendix was not part of the Standard so that in the 2004 version all that was required was to provide moderately warm to luke warm water.

The temperature range is based on two different studies – one on the lower end where at 60°F it was found that this lower parameter didn't cause hypothermia and at the upper range of 100°F, which is based on data that shows that temperatures above 100°F will be harmful to the eye tissue.

So, in the 2009 and 2014 editions, the standard took that temperature range out of the Appendix and moved it into the definition of what tepid water is.

Now the 2014 edition states that the flushing water temperature must be conducive to promoting a minimum 15-minute irrigation period and have a suitable range of above 60°F (16°C) and below 100°F (38°C)

It is critical that persons in need of emergency flushing be provided with equipment that can adequately remove the hazardous contaminant from the skin or eye tissue without creating further discomfort. By defining a suitable delivery temperature of 60°F to 100°F, the standard seeks to ensure that the victim continues flushing the affected area to minimize any damage.

Why do you have to have a supply of tepid water ?

Having a comfortable range of 80°F encourages the victim to use the emergency equipment for the full 15 minutes. In addition, **it's important that the clothing gets removed** as the clothes act as a sponge meaning that the contaminants get sucked into the cloth of your clothes and stay in there. The required temperature range encourages victims to remove their clothing.

There are a couple of ways to get tepid water to your emergency equipment and the first one is a blending system. These are mixing valves specifically designed for safety shower and eye wash equipment. These are **NOT** typical mixing valves that you purchase from your typical plumbing warehouse. These are designed so that the water flows at all possible scenarios even flowing if the hot water should fail.
I.e. there remains a full flow of water to the shower and eyewash.

If there is a failure of the mixing valve the standard want to ensure there is a full flow of even cold water going to the shower and the eyewash. It is essential that it fails to safety and the hot water shuts off.

So, these valves have external controls to ensure that we have water bypasses. These are designed for when you have hot water available in your facility.

Next we have turnkey temperature solutions. These products ensure that you have a full supply of hot water dedicated for the emergency shower and eyewash.
I.e. that there is enough heated water there to mix with the mixing valves for the full 15 minutes drench requirement. These units are designed to the plumbing and electrical codes and are fully assembled and tested prior to shipment.
What is required is a cold water supply and an electrical supply and then they're up and running.

ANSI now requires that the water temperature should be under 38°C (100°F) and above 15.5°C (60°F). Temperatures higher than 38°C (100°F) are harmful to the eyes and can enhance chemical interaction with the skin and eyes. Long flushing times with cold water (less than 15.5°C (60°F) can cause hypothermia and may result in not rinsing or showering for the fully recommended time. With thermal burns (injuries to the skin), the American Heart Association noted that optimal healing and lowest mortality rates are with water temperatures of 20-25°C (68-77°F).

Remember that any chemical splash should be rinsed for a minimum of 15 minutes but rinsing time can be up to 60 minutes. The temperature of the water should be

one that can be tolerated for the required length of time. Water that is too cold or too hot will inhibit workers from rinsing or showering as long as they should. Install anti-scalding devices (temperature control valve or thermostatic tempering valve), constant flow meters, and other devices that will help maintain a constant temperature and flow rate. For cold or outdoor locations, emergency showers with heated plumbing are available. In hot climates, outdoor emergency showers should also have a tempering valve so that workers are not exposed to water that is too hot.

What are examples of areas that may require this equipment?

Work areas and operations that may require these devices include:

- Battery charging areas,
- Laboratories,
- Spraying operations,
- High dust areas,
- Dipping operations, and
- Hazardous substances dispensing areas.

What other factors should I consider when selecting and using this type of emergency equipment?

The following factors should also be considered as part of a hazard analysis when decisions are being made about the selection and use of emergency showers, eyewash stations or combination units:

Potentially hazardous substances in the immediate work area

All hazardous substances need to be properly identified. A review of MSDSs and labels can help to evaluate the hazard. To select the appropriate eyewash and shower equipment, you must know about the chemicals you use and their potential risks!

Number of workers in an area with a hazardous substance

More than one emergency shower or eyewash station may be required in an area where many workers use hazardous substances. Evaluate how many workers are using the hazardous chemicals, and provide more equipment where necessary to ensure each worker's protection.

Isolated workers

The installation of an audible or visual alarm can alert other workers when the emergency shower or eyewash station is being used. An alarm is especially important if only one worker happens to be working in that area. A victim may need help in getting to the eyewash if temporarily blinded. Some companies connect valves electrically to warning lights or buzzers in central areas.

Comfort and warmth

Extra overalls and foot covers should be stored near emergency showers. Clothes contaminated with corrosive or toxic chemicals need to be removed from the injured person. Consider installing a privacy curtain (but remember to maintain the 'obstacle free' diameter dimension as stated in the ANSI standard.)

Quality of the Flushing Fluid

Changing the fluid in self-contained systems frequently and cleaning the units regularly can prevent inadvertent use of contaminated fluid. Refer to the manufacturer's instructions for further details. Even in plumbed eyewash stations, the water may contain contaminants such as rust, scale and chemicals. Systems should be flushed and cleaned regularly.

Neutralized Solutions

Eyewash bottles and some portable units cannot supply enough fluid to adequately dilute and wash away contaminants. The use of buffered solutions can improve the efficiency of the portable eyewash because these solutions can increase the first aid potential of the small amount of fluid, and can partially neutralize the contaminant.

Are there any limitations I should be aware of? Plumbed Emergency Showers and Eyewash Stations

Studies have shown that despite the 15-minute flushing requirement, users usually flush exposed body parts five minutes or less. The reasons were always related to the extreme discomfort users experienced using cold water. In cold climates the water temperature in indoor plumbed systems can be in the 2-7°C (35-45°F) range. Also, drinkable tap water may not provide the best flushing solution. Tap water may contain many contaminants and could aggravate the injured body part. Some municipal water supplies also contain chlorine, which can irritate and leach salt from the eye tissue. As well, tap water may contain rust, scale and chemicals. Running the water continually keeps the water line fresh. Plumbed emergency eyewash stations should use water that is periodically tested and treated to remove chemical contaminants.

Portable, Self-Contained Eyewash Stations

Portable, self-contained eyewash stations have a limited amount of fluid. As a result, maintenance is critical to ensure that units are fully charged at all times.
These eyewash stations also require ongoing maintenance of the buffered saline solution. The agents used to control bacterial growth are effective for certain limited periods of time. Also, small amoebae capable of causing serious eye infections have been found in portable and stationary eyewash stations. Consequently it is important to monitor the shelf life of the solution and replace the solution when it has expired.

Eyewash Bottles

Eyewash bottles or personal eyewash units supplement plumbed and self-contained stations, but in no way can replace them. They are portable and permit immediate flushing of contaminants or small particles. However, eyewash bottles are very difficult for the user to handle, especially when alone and when both eyes have been exposed. (e.g., holding the eyelids open while handling the unit is awkward). Also, one bottle cannot flush both eyes simultaneously. Since the fluid supply lasts for only a short period of time, the bottle may not able to wash the eyes sufficiently.
The main purpose of such a unit is to supply immediate flushing.

Once accomplished, the user should proceed to a self-contained or plumbed eyewash and flush for the required flushing/ rinsing period.

When should equipment be inspected and maintained?

One worker in the work area should be designated responsible for inspecting and operating (activating) the emergency shower, eyewash station, combination units, and drench hoses weekly. A weekly check will make sure that there is flushing fluid available as well as clear the supply line of sediments and minimize microbial contamination caused by 'still' or sitting water. This worker should keep a signed, dated record. The ANSI standard also recommends a complete inspection on an annual (yearly) basis.

Preventive maintenance inspections should be done every six months to check for such problems as valve leakage, clogged openings and lines, and adequacy of the fluid volume. A work record of these inspections should be kept. Replacement parts should be kept on hand to prevent the system from becoming non-functional. If the system breaks down for any reason, the workers in the area should be properly warned and protected.

Personal eyewash equipment should be inspected and maintained according to the manufacturer's instructions and at least annually for overall operation.

How does the Law apply ?

United States:

The Occupational Safety and Health Act of 1970 was enacted to assure that workers are provided with "safe and healthful working conditions." Under this law, the Occupational Safety and Heath Administration (OSHA) was created and authorized to adopt safety standards and regulations to fulfil the mandate of improving worker safety.

OSHA has adopted several regulations that refer to the use of emergency eye wash and shower equipment. The primary regulation is contained in 29 CFR 1910.151, which requires that...

"...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

ANSI Z358.1 2014

This standard—ANSI Z358.1—is intended to serve as a guideline for the proper design, performance, installation, use and maintenance of emergency equipment.

When specifying emergency shower and eye wash equipment the reference point is the American National Standard ***ANSI Z358.1 2014***" Emergency Eye Wash and Shower Equipment ".

For the proper selection, installation and maintenance of *emergency shower and eye wash stations* this is the only Standard.

ANSI Z358.1-2014 contains provisions regarding the design, performance, installation, use and maintenance of various types of emergency equipment (showers, eye washes, drench hoses, etc.).

You should review the entire ANSI Z358.1 2014 Standard in detail.

This publication includes minimum performance, testing, installation, maintenance and training specifications for equipment and systems used for emergency treatment of the eyes or body of a person who has been exposed to injurious materials.

It covers plumbed and self-contained emergency showers and emergency eyewash equipment, eye/face wash equipment, combination units, personal wash units and hand-held drench hoses. These systems are found in manufacturing facilities, construction sites, laboratories, medical offices and other workplaces.

The standard was prepared by the members of ISEA's Emergency Eyewash and Shower Group as a revision to the 2009 version. Significant changes reflected in the 2014 version include emphasizing that drench hoses and personal wash units are supplemental equipment and an explanation for the reason for weekly operation verification for plumbed equipment.

Copies of ANSI Z358.1-2014 are available from ISA headquarters at 1901 N. Moore Street, Suite 808, Arlington, VA 22209.

You can also buy it from Techstreet:

http://www.techstreet.com/cgi-bin/detail?product_id=1141825

We understand that this Standard is also available in Spanish.

It's Important to Plan Ahead

It's very important to plan ahead, because in an emergency every second counts! The standard includes minimum performance, testing, installation, maintenance and training specifications for equipment and systems used for the ***emergency treatment*** of the eyes or body of a person who has been exposed to injurious materials.

Each section of the Standard addresses how the equipment should perform, as well as the testing procedures to ensure proper operation, installation, maintenance and training.

American National Standards Institute

http://www.ansi.org/

Occupational Safety and Health Administration

https://www.osha.gov/

Canada:

Consult your local occupational health and safety agency in your jurisdiction and check relevant legislation for any requirements to install this equipment. Currently, we understand that there is no Canadian standard for the design or placement of eyewash stations or emergency showers.

As a result, the American National Standards Institute (ANSI) Standard Z358.1-2014 "Emergency Eyewash and Shower Equipment" is generally used as a guide.

There are fourteen jurisdictions in Canada - one federal, ten provincial and three territorial each having its own occupational health and safety legislation. For most people in Canada, the agency that you would contact is the provincial or territorial agency in the area where you work. There are some exceptions to this. Federal legislation covers employees of the federal government and Crown agencies and corporations across Canada. The Canada Labour Code also applies to employees of companies or sectors that operate across provincial or international borders.

We suggest you visit the Canadian Center for Occupational Health and Safety:

http://www.ccoh.ca

The CCOHS also has an Emergency Response Planning Guide for sale, which may be helpful in developing your emergency response plan.

Australia:

The AS 4775 Australian standard for emergency eye wash and Australian standard for emergency shower equipment is now available and may be purchased from SAI Global under licence from Standards Australia:

http://www.saiglobal.com/shop

Alternatively, you can phone Safetyman Pty Ltd, Australia's leading manufacturer of emergency shower and emergency eye wash units, on 1300 781 288.

The objective of Australian Standard AS4775 is to provide uniform minimum requirements for equipment performance, installation, use maintenance and training of users, along with relevant test procedures.

This AS4775 specifies minimum performance for eye wash and shower equipment for the emergency treatment of the eyes or body of a person who has been exposed to materials which may cause injuries. It covers the following types of equipment:
Emergency shower equipment
Eyewash equipment
Eye/Face wash equipment
Combination shower and eyewash equipment
Facilities for disabled persons
It also includes performance and use requirements for the following supplemental equipment:
Drench hoses
Self-contained (portable) equipment

There are some 3000 dangerous goods scheduled in the Australian Code. Whether they are acids, alkalis, solvents, waxes, peroxides, poisons or hot materials, they represent a risk, not only in fire situations, but also in everyday handling, packing, transporting and using. Emergency showers are an essential adjunct to any handling or storing situation and they are called up in a number of Australian Standards. Showers are needed for decontamination, corrosive splash and burn victims. The examples are many.

United Kingdom:

The Control of Substance Hazardous to Health (COSHH) regulations stipulate that safety equipment must be "maintained in an efficient state, in working order and in good repair". Additionally a full service history must be kept for a period of at least five years, recording all examinations and tests that have been conducted.

ANSI Z358.1-2014 Compliance Checklist:

General Considerations:

ANSI Z358.1-2014 contains provisions regarding the design, performance, installation, use and maintenance of various types of emergency equipment (showers, eye washes, drench hoses, etc.). In addition to these provisions, there are some general considerations that apply to all emergency equipment. These considerations may not necessarily be part of the standard, but they should be addressed when considering emergency equipment. These include the following:

First aid devices

Emergency eye wash and shower units are designed to deliver water to rinse contaminants from a user's eyes, face or body. As such, they are a form of first aid equipment to be used in the event of an accident. However, they are not a substitute for primary protective devices (including eye and face protection and protective clothing) or for safe procedures for handling hazardous materials.

Emergency response

Simply installing emergency equipment is not a sufficient means of assuring worker safety. Employees must be trained in the location of emergency equipment and in its proper use. Emergency equipment must be regularly maintained (including weekly activation of the equipment) to assure that it is in working order and inspected at least annually for compliance with the standard. Most importantly, employers should develop a response plan to be used in the event that an accident does occur. The focus of the response plan should be to provide assistance to the injured worker as quickly as possible.

There are a variety of alarm systems, which may be installed in conjunction with emergency equipment. They serve to alert personnel and summon assistance if an eye wash or shower is activated.

It is recommended that you install an alarm unit with any emergency eye wash or shower unit.

Location of Equipment:

In general, the ANSI standard provides that emergency equipment be installed within 10 seconds walking time (approximately 55ft) from the location of a hazard. The equipment must be installed on the same level as the hazard (i.e. accessing the equipment should not require going up or down stairs or ramps). The path of travel from the hazard to the equipment should be free of obstructions and as straight as possible.

However, there are certain circumstances where these guidelines may not be adequate. For example, where workers are handling particularly strong acids, caustics or other materials where the consequences of a spill would be very serious, emergency equipment should be installed immediately adjacent to the hazard.

Laboratory environments may also require special consideration.

It is common in many laboratory buildings to install emergency equipment in a corridor or hallway outside of the lab room. This may satisfy the provisions of the standard but still not provide workers with immediate access to emergency equipment. In these cases, we recommend installing combination eye wash/drench hose units at lab sinks. These units are highly accessible and versatile. They provide immediate protection for the eyes, face or body when a spill involves a relatively small amount of hazardous material.

Water Temperature:

The 2014 version of the standard states that the water temperature delivered by emergency equipment should be "tepid" (i.e. moderately warm or lukewarm). The flushing water temperature shall be tepid ; promoting a minimum 15-minute irrigation period at a range of 60°F to 100°F.

The delivery of tepid water to emergency equipment may raise complicated engineering issues. At a minimum, it generally involves providing both hot and cold water to the unit, and then installing a blending valve to mix the water to the desired temperature. There are a variety of mixing valves to blend and temper water.

Disposal of Water:

The standard does not include any provisions regarding the disposal of waste water. However, designers must give consideration to where waste water will go. In particular, care must be taken that waste water not create a hazard (i.e. by creating a pool in which someone might slip) or freeze.

Generally, eye wash, eye/face wash and safety shower station units are designed with waste connections for connection to drain piping.

It is recommended that emergency eye wash and shower units be connected to drain piping. For emergency showers and for other units without waste connections, floor drains should be provided.

After an emergency eye wash or shower has been used, the waste water may contain hazardous materials that cannot or should not be introduced into a sanitary sewer. It may be necessary to connect the drain piping from the emergency equipment or floor drain to the building's acid waste disposal system or to a neutralizing tank.

Emergency Showers Checklist:

This checklist is a summary of the provisions of ANSI Z358.1-2014 relating to emergency showers. Please refer to the standard for a complete listing of these provisions.

Location	**Install shower within 10 seconds of hazard, on the same level as hazard and with unobstructed travel path.** (S
Water temperature	**Water delivered by shower shall be tepid (lukewarm). Must be 60°F to 100°F**
Training	**Instruct all employees in the location and proper use of emergency showers.**
Maintenance/inspection	**Activate shower at least weekly. Inspect annually for compliance with standard.**
Identification	**Identify shower location with highly visible sign. Area around shower shall be well lighted.**

Eye/Face Washes:

This checklist is a summary of the provisions of ANSI Z358.1-2014 relating to emergency eye/face washes. Please refer to the standard for a complete listing of these provisions.

Location	**Install eye/face wash unit within 10 seconds of hazard, on the same level as hazard and with unobstructed travel path.**
Water temperature	**Water delivered by eye/face wash shall be tepid (lukewarm). Must be 60°F to 100°F**
Training	**Instruct all employees in the location and proper use of eye/face washes.**
Maintenance/inspection	**Activate eye/face wash at least weekly. Inspect annually for compliance with standard.**
Identification	**Identify eye/face wash with highly visible sign. Area around eye/face wash shall be well lighted.**

Eye Washes:

This checklist is a summary of the provisions of ANSI Z358.1-2014 relating to emergency eye washes. Please refer to the standard for a complete listing of these provisions.

Location	**Install eye/face wash unit within 10 seconds of hazard, on the same level as hazard and with unobstructed travel path.**
Water temperature	**Water delivered by eye/face wash shall be tepid (lukewarm). Must be 60°F to 100°F**
Training	**Instruct all employees in the location and proper use of eye/face washes.**
Maintenance/inspection	**Activate eye/face wash at least weekly. Inspect annually for compliance with standard.**
Identification	**Identify eye/face wash with highly visible sign. Area around eye/face wash shall be well lighted.**

Eyewash/Drench Hose Units:

The ANSI Standard states that drench hose units may supplement, but may not be used in place of, dedicated eye wash units. There are a series of units that meet the provisions for both an eyewash and a drench hose. These dual purpose units can be used to combine an eye wash and a drench hose into a single versatile, economic unit.

To use the unit as a fixed eye wash, simply leave the unit in the holder. The dual spray heads will deliver water to both eyes simultaneously. To function as a drench hose, remove the unit from the holder and rinse any part of the eyes, face or body.

These units are particularly useful in areas such as laboratories where workers are handling relatively small quantities of injurious materials. However, should a spill occur, it might affect any part of the worker's eyes, face or body. Eye wash/drench hose units offer a degree of versatility not found with other types of emergency equipment.

This checklist summarizes the provisions of ANSI Z358.1-2014 for both eye washes and drench hoses. Please refer to the standard for a complete listing of these provisions.

Location	**Install eye wash/drench hose unit within 10 seconds of hazard, on same level as hazard and with unobstructed travel path.**
Water temperature	**Water delivered by eye wash/drench hose units shall be tepid (lukewarm). Must be 60℉ to 100℉**
Training	**Instruct all employees in the location and proper use of eye wash/drench hose units.**
Maintenance/inspection	**Activate eye wash/drench hose units at least weekly. Inspect annually for compliance with standard.**
Identification	**Identify eye wash/drench hose unit with highly visible sign. Area around unit shall be well lighted.**

Drench Hose Units:

Under the standard, drench hose units support plumbed and self-contained emergency eye wash and shower stations, but cannot replace them. In other words, drench hoses are intended solely as supplemental units providing additional protection to personnel.

Drench hoses are useful in cases where the user is in a prone position or where it is necessary to reach areas of the face and body inaccessible to the fixed stream of a shower or eye wash unit. They are also advantageous in areas (such as laboratories) where they can be installed close to where accidents might occur.

The checklist above summarizes the provisions of the standard relating to drench hoses. Please refer to the standard for a complete listing of these provisions

Safety Stations:

This checklist is a summary of the provisions of the standard relating to eye or eye/face wash and shower combination stations. Please refer to the standard for a complete listing of these provisions.

Location	**Install safety station within 10 seconds of hazard, on the same level as hazard and with unobstructed travel path.**
Water temperature	**Water delivered by safety station shall be tepid (lukewarm). Must be 60°F to 100°F**
Training	**Instruct all employees in the location and proper use of safety station.**
Maintenance/inspection	**Activate safety station at least weekly.) Inspect annually for compliance with standard.**
Identification	**Identify safety station with highly visible sign. Area around safety station shall be well lighted.**

Barrier Free Equipment:

The Americans with Disabilities Act (ADA) requires that employers provide accessible workplaces for all employees. These workplaces may therefore require emergency eye wash and shower equipment that is specially constructed to provide access to handicapped persons.

Barrier-free emergency equipment must comply with the provisions of ANSI 117.1-1992 ("Accessible and Usable Buildings and Facilities"). These provisions include dimensions for minimum knee clearance, maximum height and reach, and minimum distance from obstructions.

Selecting the Appropriate Unit: The standard includes information regarding six different types of emergency eyewash and shower equipment. Below is a summary of the key points in the standard.

Summary of ANSI Z358.1-2014

Equipment Type	Physical Features	Location	Maintenance	Training
Emergency Shower	Water column between 82" and 96"with 20" minimum diameter of column at 60" above surface floor of user. Should deliver 20 gpm. Enclosures, if used, require minimum 34" unobstructed diameter	Accessible within 10 seconds. Path free from obstructions	Plumbed units activated weekly to flush lines and verify operation. Self-contained units—visually inspect fluid for change and to supplement.	Required for all employees who might be exposed to a chemical splash
Eyewash	Flow rate of 0.4 gpm for 15 minutes required. Fluid flow pattern should be 33 to 53 inches from surface floor of user and 6" from wall or obstruction	Accessible within 10 seconds. Path free from obstructions	Plumbed units activated weekly to flush lines and verify operation. Self-contained units—visually inspect fluid for change and to supplement.	Required for all employees who might be exposed to a chemical splash.
Personal Eyewash	Not addressed	Accessible within 10 seconds. Path free from obstructions.	Inspected and maintained in accordance with manufacturer's instructions	Required for all employees who might be exposed to a chemical splash
Eye/Face Wash	Flow rate of 3.0 gpm for 15 minutes required. Fluid flow pattern should be 33 to 53 inches from surface floor of user and 6" from wall or obstruction	Accessible within 10 seconds. Path free from obstructions.	Plumbed units activated weekly to flush lines and verify operation. Self-contained units—visually inspect fluid for change and to supplement	Required for all employees who might be exposed to a chemical splash
Hand-held Drench Hose	May be considered an eyewash or eye/face wash if meets the requirements of either	Accessible within 10seconds. Path free from obstructions.	Plumbed units activated weekly to flush lines and verify operation. Self-contained units—visually inspect fluid for change and to supplement.	Required for all employees who might be exposed to a chemical splash.
Combination Units	Must meet physical requirement of component parts	Accessible within 10 seconds. Path free from obstructions	Plumbed units activated weekly to flush lines and verify operation. Self-contained units—visually inspect fluid for change and to supplement	Required for all employees who might be exposed to a chemical splash

Because some chemicals can irritate or damage skin upon contact, affected areas should be flushed with water as soon as possible. Even when only a small amount of a harmful substance is splashed on the skin, the substance must be washed from the area immediately. In most cases an emergency shower should be used. When the body is to be flushed following chemical contact, equipment and clothing must be removed once the shower has been activated.

Modesty has no place in emergency situations. If necessary, fellow employees must help remove contaminated clothing. If a helper becomes contaminated, he or she may have to use the facility along with the initial individual, to flush the affected area. Appropriate medical help must be contacted immediately. The affected person should always remain in the shower or continue flushing the eyes for no less than 15 minutes.

Training to Use Eyewash and Safety Shower Facilities

What type of training should the workers receive?

All workers require instruction in the proper use and location of emergency showers or eyewash stations before any emergencies occur. It should never be assumed that workers are already aware of the proper procedures. Written instructions should be made available to all workers and posted beside the emergency shower and eyewash station. Part of the instructional process should include a "hands-on" drill on how to find equipment.

The wearing of contact lenses can be dangerous because chemicals can become trapped under a contact lens. Any delays caused by removing contact lenses in order to rinse eyes could result in injury. Training should include instruction in contact lens removal.

Employees must be properly instructed and trained in the use of eyewash and safety showers regardless of how well they have worked around the chemicals in the past. Directions for use of safety equipment should be written, available and frequently reviewed. Training should be simplified so that there is only one emergency procedure throughout the facility that must be followed whenever eyewashes and safety showers are needed. Since timing is so important to avoid long-term injuries from toxic or corrosive substances, training should ensure that each person is familiar with controls and operating devices of the unit. Because the muscles of the eyes react quickly and strongly to chemicals, it is almost impossible to keep the eyes open for irrigation purposes. For this reason, the ANSI standard requires that valves be located so that they can be turned on easily and will remain on until effort is made to turn them off. Training should emphasize that an injured employee may need assistance in reaching the shower or eyewash and in getting medical attention. Therefore, fellow employees should know how to assist and contact medical help, whether they work directly with chemicals or not. If a fellow employee becomes contaminated while assisting an injured worker, he or she may use the shower with the victim to flush the affected area.

The following checklist offers additional information for training employees in the proper use of eyewash and safety shower facilities:

- In case of chemical exposure, flush skin or eyes with tepid water for at least 15 minutes. **DO NOT RUB!**
- Get medical assistance immediately following flushing.
- If possible, continue flushing while on way to medical help.
- Know the effects of chemicals with which you are working. Read, ask questions about, and understand material safety data sheets for each chemical with which you work.
- Always wear personal protective equipment.
- Learn the location and use of all emergency equipment, even if you are working in a new area for only a brief time.
- Know how to help others reach showers or eyewashes and how to help them get medical assistance.

- Hold your eyes open with your hands while using an eyewash to be sure water reaches the eyes.
- Remove contaminated clothing after the shower has been activated.
- Immediately wash off even small amounts of chemicals.

Locating Eyewash and Safety Shower Facilities:

Because the first few seconds after exposure to a chemical are critical, eyewash and safety shower facilities must be within 10 or fewer seconds of an employee's reach.

If the chemical is left in the eye or on the body for even seconds too long, permanent scarring may result. Therefore, the most important step in treatment is getting to the eyewash or shower as quickly as possible and getting the affected area washed thoroughly before the chemical can cause further damage.

Minor exposures generally are reversible, and healing is normal with immediate treatment. Severe or extended exposure, however, may cause permanent and irreversible damage. The first 15 seconds after injury is generally accepted as the most critical time, so none of this period should be spent looking for an eyewash or safety shower. Shower and eyewash stations should be located close to potential hazard sites. Eyewash and safety shower facilities should not be separated from the hazard site by a wall or partition that would cause an employee to go through a doorway. If the shower or eyewash is located in a usual traffic pattern or conspicuous place, it will be easier to reach when needed. Care should be taken to locate the shower and eyewash and their controls where they will not be blocked or contaminated by other materials.

ANSI Z358.1-2014: Use the following tables as guides to locate eyewash and safety shower facilities so that they may be reached within ten seconds.

ANSI Z358.1-2014
Emergency Eyewash and Shower Equipment

LOCATION			DESCRIPTION
Unit	**Block**	**Tag No**	**Type of Equipment**
HAZARD			

SHOWER

Description	Performance Requirements	Complies	Doesn't Comply
Shower Height	Not less than 82" not more than 96" from standing level		
Water Spray Pattern	20" minimum diameter—60" from standing level		
Center of Water Spray	16" from any obstruction		
Water Delivery—Potable	Minimum of 20 gpm/meeting water spray pattern		
Control Valve and Actuator	Stay ON type—Off to ON one second—easily located		
Location to Hazard	Maximum 10 seconds from hazard		
Identification	Well lighted, sign, highly visible		

EYE WASH

Description	Performance Requirements	Complies	Doesn't Comply
Water Delivery—Potable	Minimum of 3 gpm—dual stream flushing		
Velocity	Soft spent stream		
Location to Hazard	Maximum 10 seconds from hazard		
Nozzles	Covers to protect from airborne contaminants		
Control Valve and Actuator	Stay ON type—Off to ON one second—easily located		
Identification	Well lighted, sign, highly visible		

DRENCH HOSE

Description	Performance Requirements	Complies	Doesn't Comply
Water Delivery—Potable	Minimum of 3 gpm—low velocity		
Location to Hazard	Maximum 10 seconds or from hazard		
Control Valve	OFF to ON one second—easy to locate and operate		

Maintaining Eyewash and Safety Shower Facilities:

Regardless of how well a safety shower or eyewash is installed, if it is not properly maintained and tested, it is of little or no use. Maintenance records should show the date of inspections and the name of the inspector. The following table is an example maintenance record.

Table 3
ANSI Z358.1-2014 Specifications
Emergency Eyewash and Shower Equipment

Description	Performance Requirements	Complies	Doesn't Comply
Inspection	Monthly record SHOULD be maintained		
Maintenance	Each unit activated weekly to flush line		
Training	Instruct all employees on proper use of equipment		

OBSERVATIONS AND CORRECTIVE ACTION

OTHER CONSIDERATIONS

Description	Performance Requirements	Complies	Doesn't Comply
Delivered water temperature	Above 60°F and below 100°F		
Freeze protection required	Mechanical vs. Electrical		
Protection from hostile environments	Enclosure—Heated/Nonheated		
Alarms required	Mechanical vs. Electrical		
Modesty requirements	Not to discourage use of equipment		
Medical assistance	In plant vs. Outside		
Emergency vehicle	Internal vs. External		

EVALUATION PERFORMED BY _____ DATE _____

Regular Testing and Maintenance Program:

All emergency showers, eye and face wash units should be operationally tested on a weekly basis. This serves to refresh and replenish the water in the system and at the same time, allows the tester to check for variations in supply conditions. Without weekly activation, bacteria, sediment and mould can accumulate in the plumbing.

This involves operating the controls and observing the water flows. Any blockages or lack of flow will be immediately apparent. The tester should confirm that the water projectors are still correctly adjusted in accordance with the requirements of ANSI Z358.1 2014. The tester should also be looking for bent operating handles, damaged aerators on the eye/face wash projectors, bent pipe work and a satisfactorily oriented shower rose.

Any mechanical damage should be noted, including damage to aerators resulting in uneven flows. This sometimes results from the use of the eye wash as a drinking fountain, with a thumb inserted in the opposite aerator. **This practise, of course, should be prohibited.**

The presence and satisfactory operation of the dust covers must also be observed. Any deficiencies should be remedied as quickly as possible. These weekly tests should be recorded in a log book to facilitate supervision and to ensure that testing is, in fact, performed.

Deluge showers should show an even spread of water over an area of approximately 700 mm diameter at floor level. Eye and face wash units should show good aeration with crossing or meeting water streams.

According to the standard, plumbed equipment must be activated weekly to flush the line and to verify proper operation. Installing an eye wash or safety shower in poor drainage area facilities may deter scheduled flushing. But if such location is unavoidable, a bucket or drum mounted on a dolly or roller may be used to collect water during routine flushing. The person testing the showers and eyewashes should turn them to full flow to allow residues and other substances accumulated in the lines to be pushed out and washed away. If the showers and eyewashes are not tested at full flow, they may become so clogged that they are not useful when needed.

Annually: On an annual basis, a more thorough testing procedure is required. That is, pressures and flows are measured and any variation from the previous testing is noted and investigated.

At this time replace all aerators and any other components that have been damaged. Usually, aerator dust caps will also be replaced. All units should be cleaned and pressures and flows checked to ensure that the system remains in accordance with the Standard. These readings are recorded and a report supplied to those responsible. These figures indicate if plumbing works undertaken, down or up the line, in the previous 12 months, have adversely affected the operation of the system.

Cleaning Program:

At three monthly intervals, it is recommended that the exposed parts of your shower should be washed down using soap, detergent or a 1% ammonia solution in warm chloride water. Use a cloth or soft brush and avoid scratching the surface. Preferably, dry the shower with a soft cloth after washing.

If "tea staining" has occurred, early action is strongly recommended. After mechanically cleaning off the "tea staining", it is suggested that the surface be passivated using nitric acid gel.

Rust may be removed by the use of a 10% phosphoric or oxalic acid followed by a 1% ammonia solution neutralization and then a water rinse. Alternatively, a mild acid based cleaner such as sulphonic acid (used in some saucepan cleaners) can be used, with care, to avoid local appearance changes. In other words, try the cleaner in some inconspicuous position prior to full scale cleaning. **NEVER** use Hydrochloric acid or Sulphuric acid.

Important Update to 2014 edition:

Eye Wash Testing Requirements:

There were requirements in the 2004 standard that have now been changed to ensure that there is effective and efficient use for the user. In the 2004 version what they were saying is that when you turn the eye wash or face wash on you place the gauge and you could drop the gauge no more than 1½ inches from the peak of the stream to see that the eye wash flows between the line into the area where the eyes would be.

The problem the standard had with that is that there is equipment out there that the flow is 3 feet above the eyewash bowl. In theory you would place the gauge at the peak of that; drop it 1½ inches and, if it conformed to the gauge parameters, you were certified.

The problem is that most people aren't tall enough to utilize that flow. You had to place your head down further into the flow, which may not meet the gauge, or the pressure would be too great on the eyes.

What they have done is to update that in the 2014 standard.

The flushing liquid of an eye wash should cover the areas between the interior and exterior lines of a gauge at some point less than 8 inches (20.3cm)

The flushing liquid flow pattern (not the head) should be not less than 33 inches (83.8cm) and no greater than 53 inches (134.6cm) ie. To the peak of the flow. – (Previously it was 45 inches (114.3cm))

To recap some of the major considerations:

- Tepid water must be 60°F to 100°F and the valve operation must go off and on in one second or less.

- The delivery of the flushing fluid must be 15 minutes minimum.

- Minimum flow for showers is 20gpm.

- 20gpm for 15 minutes is 300 gallons of water. Look at municipal codes to see what requirements there are for drainage.

- You have to be able to operate simultaneously the combination units, which have a shower and eyewash or an eye face wash.

- The showers must be accessible within 10 seconds of the hazard and within that the system must be on the same level as the hazard. There also must not be doors that the victim has to manipulate outwards. They must be pushed in. There must be no obstructions in the way.

Note: Illustrations have been updated in the 2014 Standard to reflect design configurations that are known to meet the criteria of the standard.

Eye Injuries:

Why is eye safety at work important?

Eye injuries in the workplace are very common. More than 2,000 people injure their eyes at work each day. About 1 in 10 injuries require one or more missed workdays to recover from. Of the total amount of work-related injuries, 10-20 % will cause temporary or permanent vision loss.

Experts believe that the right eye protection could have lessened the severity or even prevented 90% of eye injuries in accidents.

What are the common causes of eye injuries? Common causes for eye injuries are:

- Flying objects (bits of metal, glass)
- Tools
- Particles
- Chemicals
- Harmful radiation
- Any combination of these or other hazards

What is my best defense against an eye injury?
There are three things you can do to help prevent an eye injury

- Know the eye safety dangers at work-complete an eye hazard assessment

- Eliminate hazards before starting work. Use machine guarding, work screens, or other engineering controls)

- Use proper eye protection.

When should I protect my eyes at work?

You should wear safety eyewear whenever there is a chance of eye injury. Anyone working in or passing through areas that pose eye hazards should wear protective eyewear.

What type of safety eyewear is available to me? Safety eyewear protection includes:

- Non-prescription and prescription safety glasses
- Goggles
- Face shields
- Welding helmets
- Full-face respirators

What type of safety eye protection should I wear?

The type of safety eye protection you should wear depends on the hazards in your workplace. If you are working in an area that has particles, flying objects, or dust, you must at least wear safety glasses with side protection (side shields). If you are working with chemicals, you should wear goggles. If you are working near hazardous radiation (welding, lasers, or fiber optics) you must use special-purpose safety glasses, goggles, face shields, or helmets designed for that task.

What is the difference between glass, plastic, and polycarbonate safety lenses? All three types of safety lenses meet or exceed the requirements for protecting your eyes.

Glass lenses:
Are not easily scratched
Can be used around harsh chemicals
Can be made in your corrective prescription
Are sometimes heavy and uncomfortable

Plastic lenses:
Are lighter weight
Protect against welding splatter
Are not likely to fog
Are not as scratch-resistant as glass

Polycarbonate lenses:

Are lightweight
Protect against welding splatter
Are not likely to fog
Are stronger than glass and plastic
Are more impact resistant than glass or plastic
Are not as scratch resistant as glass

Does safety eye protection work?

Yes, eye protection does work. The Wise Owl Program, sponsored by Prevent Blindness America, has recognized more than 86,000 people who avoided losing their sight in a workplace accident because they were wearing proper eye protection.

Inform Workers on the use of eyewash stations and their locations within the work area

In 2003, an estimated 94,500 people were treated at U.S. hospital emergency rooms for eye injuries related to workplace or industrial products. Included in the totals are injuries that may have occurred at home or in home workshops, as location of injuries is not reported in statistics. All age groups are included. The following are the top 15 categories contributing to the most eye injuries.

Product Category:

1. Welding Equipment (not specified)
2. Tools (not specified)
3. Adhesives
5. Power Tools (combined, including portable)
4. Bleaches (non-cosmetic)
6. House Structures, Repair or Construction
7. Manual Tools (hammers, screwdrivers, sanders, etc.)
8. Lawn Mowers, Not Specified
9. Paints, Varnishes, Shellacs and Removers
10. Chemicals (misc. and otherwise not classified)
11. Lawn Trimmers or Edgers
12. Saws, Not Specified
13. Flooring, Wood Paneling and Particleboard
14. Nails, Screws, Tacks or Bolts
15. Gasoline and Gasoline Cans

Ways to Prevent Eye Injuries at Work

Nearly one million Americans have lost some degree of their sight due to an eye injury. More than 700, 000 Americans injure their eyes at work each year. Luckily, 90% of all workplace eye injuries can be avoided by using proper safety eyewear.

Here are 10 ways that you can help prevent an eye injury in your workplace:

Assess!

Look carefully at plant operations. Inspect all work areas, access routes, and equipment for hazards to eyes. Study eye accident and injury reports. Identify operations and areas the present eye hazards.

Test!

Uncorrected vision problems can cause accidents. Provide vision testing during routine employee physical exams.

Protect

Select protective eyewear that is designed for the specific duty or hazard. Protective eyewear must meet the current standards from the Occupational Safety and Health Act of 1970 and later revisions.

Participate!

Create a 100% mandatory program for eye protection in all operation areas of your plant. A broad program prevents more injuries and is easier to enforce than one that limits eye protection to certain departments, areas, or jobs.

Fit!
Workers need protective eyewear that fits well and is comfortable. Have eyewear fitted by an eye care professional or someone trained to do this. Provide repairs for eyewear and require each worker to be in charge of his or her own gear.

Plan for an Emergency!

Set up first-aid procedures for eye injuries. Have eyewash stations that are easy to get to, especially where chemicals are used. Train workers in basic first-aid and identify those with more advanced training.

Educate!

Conduct ongoing educational programs to create, keep up, and highlight the need for protective eyewear. Add eye safety to your regular employee training programs and to new employee orientation.

Support!

Management support is key to having a successful eye safety program. Management can show their support for the program by wearing protective eyewear whenever and wherever needed.

Review!
Regularly review and update your accident prevention policies. Your goal should be NO eye injuries or accidents!

Put it in Writing!
Once your safety program is created, put it in writing. Display a copy of the policy in work and employee gathering areas. Include a review of the policy in new employee orientation.

Eyewash Stations must be clearly labelled so that employees know exactly where to go and what to do when they get there in case an emergency arises.

Include training sessions for employees in the proper use of an eyewash station. Once an accident happens, it is too late to learn the proper use of safety equipment. Be sure that eyewash stations are clearly marked and visible to employees. There should be safety signs clearly labelling the eyewash stations in the work area. Make sure that workers know that if they have been splashed by a chemical in the eye that they do NOT squeeze their eyes shut. They need to flood their eyes for a full fifteen minutes in order to minimize damage.

Appropriate personal protective equipment:

Appropriate personal protective equipment should be used to protect against hazardous chemicals. Personal protective equipment should be used if a person is handling chemicals, even though such equipment may not totally guarantee that hazardous chemicals will not pass through to the worker. One federal Bureau of Labor Statistics survey of 1,052 industrial eye injuries revealed that most workers were injured while performing their normal job activities at their worksites.

Sixty percent of these persons surveyed said that they were not wearing eye protection at the time of their injury. When asked why, the majority responded that eye protection was not normally used, or they felt it was not needed.

Personal protective equipment should fit the task. In 1989, the U.S. Department of Labor released the results of a separate survey of people injured by chemicals in the workplace. The results showed that 66 percent were wearing protective equipment when injured. These employees said that the chemicals passed under or around the safety gear (usually glasses, goggles or face shields). Many workers were accustomed to using the material that injured them.

Employees should be informed about hazardous chemicals to which they are exposed, and they should be trained to work with such chemicals. In the U.S. Department of Labor survey mentioned above, nearly three-fifths of the injured employees said they worked with or near the chemicals daily or almost daily; and one-tenth worked with or near the agents weekly. Three-fifths of the injured employees said that they had not been made aware of the dangers of chemicals on their job. During the period between collecting the data and release of the final report for the survey, the federal Occupational Safety and Health Administration issued its Hazard Communication Standard. That standard requires employers to inform employees about the hazards of chemicals through labeling containers, material safety data sheets and special training.

Because safety equipment may not be totally protective and because there may be employees who fail to wear protective clothing, safety showers and eyewash systems should be within easy reach and every employee should know how to use them. Since the eye is one of the most vulnerable and important organs, special care should be taken to counteract chemical eye injuries. Chemical eye injuries can be divided into acid or basic types. Both types are burn injuries that have the same appearance—small, abundant cuts to the eye and eyelids, redness, and swelling. These injuries also produce corneal changes, and the eyelids are usually swollen shut. Whether the chemical is splashed in the eye or on the body, decontamination with water from an eyewash or safety shower should be the first aid.

Treatment strategies for injuries from hazardous chemicals vary from water to neutralizing agents. But, when an accident occurs, time should not be spent looking for agents when water is usually readily available. If a special agent is needed, it can be used after irrigation with water. Chemical burns should be attended by a doctor or emergency medical personnel who can locate and administer the needed solutions.

Because some chemicals, such as concentrated ammonia, can penetrate the cornea and enter the anterior chamber of the eye within six to eight seconds, it is extremely important to flush the chemical out immediately, before it causes severe damage or blindness.

Since it may take 15 minutes or longer before an injured person can be treated by a physician, the affected area must be flushed with water as soon as possible. Neutralizing solutions neutralize an acid or other chemical while water irrigation helps remove the chemical. Chemical burns caused by vapors should be treated in the same manner as those caused by splashes.

According to the Humana Burn Center, the affected area should be irrigated with water for 15 minutes or longer, "no other option should take priority," and by no means should an ointment, salve, grease or other remedy be applied. Early irrigation of the affected area is the most important treatment for a chemical burn.

The types of equipment addressed by the ANSI standard include:

_ *Emergency shower.* The emergency shower is "a unit that enables a user to have water cascading over the entire
body." This unit is used for general irrigation of the body and although it can be used to rinse the face, the unit is not
meant for flushing of the eyes.
_ *Eyewash.* The eyewash is a unit that supplies fluid to irrigate and flush the eyes.
_ *Personal eyewash.* The personal eyewash is "a supplementary eyewash that supports plumbed units, self-contained
units, or both by delivering immediate flushing for less than 15 minutes." The major difference between self-contained
or plumbed and personal eyewash equipment is that the self-contained or plumbed one must have at least a 15-minute
supply of water while the personal units have less than a 15-minute supply. Because of this, the personal eyewash is
used on the site for immediate flushing and while the victim is moved to another unit. Irrigation should continue once
the victim reaches the other unit.
_ *Eye/face wash.* This device is "used to irrigate and flush both the face and the eyes."
_ *Hand-held drench hose.* This arrangement is "a flexible hose connected to a water supply and used to irrigate and
flush eyes, face, and body areas." With this unit it may be necessary for another person to hold the hose to allow the
victim to hold his or her eyes open.
_ *Combination unit.* The combination unit combines a shower with an eyewash or eye/face wash, or with a drench
hose, or with both into one assembly. (See Figure 2.)
_ *Plumbed unit.* A plumbed unit is permanently connected to a potable water source.
_ *Self-contained unit.* A self-contained unit is not permanently installed and must be refilled or replaced after use.

In general, the type of hazard and the number and availability of personnel help to determine what type of emergency equipment to install. The most commonly used emergency wash equipment is the overhead deluge shower, the combination deluge shower with multiple-spray units, and the complete multiple-spray decontamination unit.

Radioactive or highly toxic materials may require a total decontamination shower. These are booth-type showers with numerous spray nozzles that may be combined with central overhead sprayers. A complete safety station combines the eye/face wash fountain with a drench shower. A very useful addition to an eyewash fountain is a face spray ring that sprays the face gently to remove contaminants.
A laboratory safety shower does not always give the same drenching effect of the standard overhead shower. Because of the type of shower head and the angle the water falls, the person using a laboratory safety shower must turn and strain to make sure all chemicals are washed away. This type of shower is suitable where the upper front portion of the body is exposed to chemicals (such as bench work in a laboratory). Even then, the overhead shower should be considered as a backup precaution. The drench shower is not suitable for washing out the eyes because too much water is flowing downward making it difficult to position the face under the shower.

Eye and Face Protection:

Personal protective equipment (PPE) for the eyes and face is designed to prevent or lessen the severity of injuries to workers. The employer must assess the workplace and determine if hazards that necessitate the use of eye and face protection are present or are likely to be present before assigning PPE to workers.

A hazard assessment should determine the risk of exposure to eye and face hazards, including those which may be encountered in an emergency. Employers should be aware of the possibility of multiple and simultaneous hazard exposures and be prepared to protect against the highest level of each hazard.

Impact Hazards:

The majority of impact injuries result from flying or falling objects, or sparks striking the eye. Most of these objects are smaller than a pin head and can cause serious injury such as punctures, abrasions, and contusions.

While working in a hazardous area where the worker is exposed to flying objects, fragments, and particles, primary protective devices such as safety spectacles with side shields or goggles must be worn. Secondary protective devices such as face shields are required in conjunction with primary protective devices during severe exposure to impact hazards.

Heat injuries:

These may occur to the eye and face when workers are exposed to high temperatures, splashes of molten metal, or hot sparks. Protect your eyes from heat when workplace operations involve pouring, casting, hot dipping, furnace operations, and other similar activities. Burns to eye and face tissue are the main concern when working with heat hazards.

Working with heat hazards requires eye protection such as goggles or safety spectacles with special-purpose lenses and side shields. However, many heat hazard exposures require the use of a face shield in addition to safety spectacles or goggles. When selecting PPE, consider the source and intensity of the heat and the type of splashes that may occur in the workplace.

Chemicals:

A large percentage of eye injuries are caused by direct contact with chemicals. These injuries often result from an inappropriate choice of PPE, that allows a chemical substance to enter from around or under protective eye equipment. Serious and irreversible damage can occur when chemical substances contact the eyes in the form of splash, mists, vapors, or fumes. When working with or around chemicals, it is important to know the location emergency eye wash stations and how to access them with restricted vision.

When fitted and worn correctly, goggles protect your eyes from hazardous substances. A face shield may be required in areas where workers are exposed to severe chemical hazards.

Dust:

Dust is present in the workplace during operations such as woodworking and buffing. Working in a dusty environment can causes eye injuries and presents additional hazards to contact lens wearers.

Either eyecup or cover-type safety goggles should be worn when dust is present. Safety goggles are the only effective type of eye protection from nuisance dust because they create a protective seal around the eyes.

Optical Radiation:

Laser work and similar operations create intense concentrations of heat, ultraviolet, infrared, and reflected light radiation. A laser beam, of sufficient power, can produce intensities greater than those experienced when looking directly at the sun.

Unprotected laser exposure may result in eye injuries including retinal burns, cataracts, and permanent blindness. When lasers produce invisible ultraviolet, or other radiation, both employees and visitors should use appropriate eye protection at all times.

Determine the maximum power density, or intensity, lasers produce when workers are exposed to laser beams. Based on this knowledge, select lenses that protect against the maximum intensity. The selection of laser protection should depend upon the lasers in use and the operating conditions. Workers with exposure to laser beams must be furnished suitable laser protection.

Hazard Assessment		
Hazard type	**Examples of Hazard**	**Common Related Tasks**
Impact	Flying objects such as large chips, fragments, particles, sand, and dirt.	Chipping, grinding, machining, masonry work, wood working, sawing, drilling, chiseling, powered fastening, riveting, and sanding.
Heat	Anything emitting extreme heat.	Furnace operations, pouring, casting, hot dipping, and welding.
Chemicals	Splash, fumes, vapors, and irritating mists.	Acid and chemical handling, degreasing, plating, and working with blood.
Dust	Harmful Dust.	Woodworking, buffing, and general dusty conditions.
Optical Radiation	Radiant energy, glare, and intense light	Welding, torch-cutting, brazing, soldering, and laser work.

Signs and Tags:

DANGER signs should be used only where immediate hazards exist.
DANGER signs must be red, black, and white and meet ANSI Z53.1.

CAUTION signs should be used to warn of potential hazards or unsafe practices.

CAUTION signs should have a yellow background and the panel must have black and yellow letters.

Radiation warning signs must have a background that is yellow; the panel must be magenta with yellow letters; the symbol must be magenta; and background letters must be black.

SAFETY INSTRUCTION signs should be used where there is a need for general information and suggestions relative to safety measures. Wording on signs must meet OSHA regulations. Signs must be compliant.

Safety instruction signs and warning notices must be white; the panel must be green with white letters; and background lettering must be black.

Please refer to Hazard Color Coding Standard – ansi Z535.1

Safety Signs
Suggestions for conducting your own audit:

The most important facet of surveying premises is to be aware that whilst you are fully conversant with the necessary precautions to be followed, your staff, especially new arrivals may not be. Therefore, view the situation through "their eyes".

ANSWERS:	YES	NO
The most important - How can you safely exit from the building?		
Are the exits clearly marked and free from obstruction?		
If no exit is in the immediate vicinity, are there signs and arrows indicating in which direction the exists lay?		
Where is emergency equipment stored?		
Is the first-aid box clearly identified?		
Is the emergency shower and eye-wash properly sign-posted?		
Fire fighting equipment needs to be correctly identified.		
Does each fire extinguisher have a location triangle (with correct colour "dot") mounted high above it?		
Is there a disc immediately above each extinguisher denoting type of fires extinguisher can safely be used on?		
What hazardous situations exist that require the wearing of protective equipment?		
As an example, do all bench grinders carry correct mandatory eye protection sign?		
Which areas are restricted either to certain personnel or specific actions?		
Is smoking prohibited in any areas especially around fuel, gas or solvents?		
Are there any potentially hazardous areas that warnings are appropriate?		

Glossary:

Acids. Any compound that reacts with a base to form a salt, 0–7 pH.

ANSI. American National Standards Institute.

Caustics. Corrosive substances usually in reference to strong alkaline chemicals such as sodium and potassium hydroxide; terms base, caustic, alkali and hydroxide are interchangeable.

Chemicals. Of, made by or used in chemistry.

Compounds. A substance containing two or more elements chemically combined in fixed proportions.

Corrosives. Substances that can eat or wear away.

Cryogenics. The science that deals with the effects of very low temperatures on the properties of matter.

Decontamination. Removal of a polluting or harmful substance from air, water, earth surface, etc.

Deluge. Heavy downpour of water.

Dilution. Usually with water—to weaken another substance.

Ergonomics. The study of interaction between people and their total working environment.

Irrigation. To wash out.

Nonpotable. Nondrinkable water.

Noxious Substances. Substances with toxic effects on animals or humans.

OSHA. Occupational Safety and Health Administration.

Personal Protective Equipment. Any material or device worn to protect.

Potable Water. Drinkable water.

Radioactive. Giving off radiant energy in particles or rays by the disintegration of atomic nuclei.

Toxins. Poisonous product of microorganisms.

For the latest information, check the appropriate Web sites, for example:
Occupational Safety & Health Administration, www.osha.gov
U.S. Environmental Protection Agency, www.epa.gov

Conclusion:

Regardless of industry or location, your primary requirement is to maintain compliance with the ANSI Z358.1-2014 standard. Help is available to you whether through ANSI, OSHA, your local distributor or the manufacturer of the product that you select. Some manufacturers even offer hazard assessments in joint cooperation with your local distributor to help you tailor a program specifically to your needs at no cost. The goal is to make sure you are in compliance and that your employees are safe from potential harm.

Notes: