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The DEFINITIVE GUIDE

Emergency Safety Showers, Eyebaths and Eye/Facewash Fountains

PREFACE

Tony Hughes, Managing Director of Europe's Largest Emergency Shower and Eye wash manufacturer, recognised that there was no easy source of reference for Safety Officers and Employers relating to Emergency Safety Showers, Eyebaths and Facewash Fountains.

With over 40 years experience, Hughes Safety Showers was ideally placed to compile this information, to be used as a reference, or for future use whenever planning the purchasing and installation of this type of safety equipment. Designed in such a way this document brings together all relevant aspects of health & safety into one 'Definitive Guide'.

Note: The Definitive Guide covers all known National Standards, but only takes into account UK Legislation. Legislation in other countries will vary and where legislation does not exist UK legislation could be used as a guide for the future.

INTRODUCTION/HISTORY

Since the start of manufacturing of chemicals in bulk quantities for use by industry for cleaning and manufacturing purposes, there has been a real requirement for Emergency Safety Showers, Eyebaths and Eye/Facewash Fountains. Legislation in the UK dates back to 1922 with the advent of The Chemical Works Regulations and since then there has been great progress made in the implementation of all types of legislation, recommendations and standards.

Needless to say, some countries have made further advances in the field of Health and Safety at Work than others. In particular, the UK and the USA have produced more standards and legislation than most other countries. The USA has been the leader in implementing standards for the design, performance, installation, maintenance and training for such equipment, and due to this a product awareness has developed in the States since the introduction of the American National Standard in 1981. The UK however, probably due to the strength of the Unions in the 60's and 70's, has been the leader in the field of legislation particularly with the passing of the Health and Safety at Work Act in 1974. Since this date there has been an increase in Health and Safety legislation and recommendations to the extent that no company in the UK can avoid the subject. With £20,000 fines and jail sentences as deterrents, this is not surprising!

Due to this lead taken by America and Britain, other countries are now anxious to catch up with their legislation and awareness of Health and Safety products, adopting new standards or enacting new legislation. The Indian Standard is similar to the internationally accepted American ANSI Standard and Europe wide adoption of the new European Standard will help to raise standards of protection.

A further driving force in the international awareness for Emergency Showers, Eyebaths and Eye/Facewash Fountains is coming from the multinational companies who have their headquarters in the USA and the UK. The Bhopal disaster in India made all large international companies review their world-wide standards when the parent company, Union Carbide, was sued for millions of dollars for having substandard safety equipment compared to their other subsidiaries in the developed countries.

1. LEGISLATION/LEGAL REQUIREMENTS (UK)

The first UK legislation covering first-aid in the workplace, where strong acids and dangerous corrosive liquids are used, was **The Chemical Works Regulations, 1922.**

This stated that ***there shall be provided, for use in case of emergency***:-

(i) **Adequate and readily accessible means of drenching with cold water, persons and the clothing of persons, who have become splashed with such liquid.**

(ii) **A sufficient number of eye wash bottles, filled with distilled water or other suitable liquid, kept in boxes or cupboards conveniently situated and clearly indicated by a distinctive sign which shall be visible at all times.**

This legislation remained in force for 66 years, eventually superseded in 1989 by The Control of Substances Hazardous to Health Regulations, commonly known as the COSHH regulations.
Prior to the introduction of the COSHH regulations, The Health and Safety at Work Act was passed in 1974, placing the liability on the employer for the Health, Safety and Welfare of their employees, thus encompassing The Chemical Works Regulations.

The Health and Safety at Work Act 1974 clearly outlined this by stating:

*(*1) **It shall be the duty of every employer to consult any such representative with a view to the making and maintenance of arrangements which will enable him and his employees to co-operate effectively in promoting and developing measures to ensure the health and safety at work of the employees, and in checking the effectiveness of such measures.**

(2) **In such cases as may be prescribed it shall be the duty of every employer, if requested to do so by the safety representatives, to establish, in accordance with regulations made by the Secretary of State, a safety committee having the function of keeping under review the measures taken to ensure the health and safety at work of his employees and such other functions as may be prescribed.**

In 1981 **The Health and Safety (First-Aid) Regulations** were introduced which not only defined the meaning of the word first-aid but also clarified the duty of employers in its implementation.

First-Aid means:

(a) **in cases where a person will need help from a medical practitioner or nurse, treatment for the purpose of preserving life and minimising the consequences of injury and illness until such help is obtained, and**

(b) **treatment of minor injuries which would otherwise receive no treatment or which do not need treatment by a medical practitioner or nurse.**

To clarify the duty of an employer it states:

Duty of employer to make provision for First-Aid:
An employer shall provide, or ensure that there are provided, such equipment and facilities as are adequate and appropriate in the circumstances for enabling first-aid to be rendered to his employees if they are injured or become ill at work.

Also it states:
Duty of employer to inform his employees of the arrangement made in connection with First-Aid:
An employer shall inform his employees of the arrangements that have been made in connection with the provision of first-aid, including the location of equipment, facilities and personnel.

The Health and Safety (First-Aid) Regulations were subsequently supported by **Guidance Notes published by the Health and Safety Executive (HSE).**

(*a*) *Burns and Scalds*
Small burns and scalds should be treated by flushing the affected area with plenty of clean cool water before applying a sterilised dressing or a clean towel. Where the burn is large or deep, simply apply a dry sterile dressing. (N.B. Do not burst blisters or remove clothing sticking to the burns or scalds).

(b) Chemical burns
Remove contaminated clothing which shows no sign of sticking to the skin and flush all affected parts of the body with plenty of clean, cool water ensuring that all the chemical is so diluted as to be rendered harmless. Apply a sterilised dressing to exposed damaged skin and clean towels to damaged areas where the clothing cannot be removed. (N.B. Take care when treating the casualty to avoid contamination).

(c) Foreign bodies in the eye
If the object cannot be removed readily with a clean piece of moist material, irrigate with clean, cool water. People with eye injuries which are more than minimal must be sent to hospital with the eye covered with an eye pad from the container.

(d) Chemical in the Eyes
Flush the open eye at once with clean, cool water; continue for at least 5 to 10 minutes and, in any case of doubt, even longer. If the contamination is more than minimal, send the casualty to hospital.

In October 1989, **The Control of Substances Hazardous to Health (COSHH) Regulations** were introduced which were probably the most effective regulation to date in bringing an awareness to companies for the safe handling and storage of chemicals. All chemicals, no matter how strong, had to be assessed with procedures written up by all companies that stored or handled anything that was more toxic than water!

A section in the COSHH regulations refers to *'Prevention or control of exposure to substances hazardous to health'*

(1) **Every employer shall ensure that the exposure of his employees to substances hazardous to health is either prevented or, where this is not reasonably practicable, adequately controlled.**

(2) **So far as is reasonably practicable, the prevention, or adequate control of exposure of employees to a substance hazardous to health shall be secured by measures other than the provision of personal protective equipment.**

(3) **Where the measures taken in accordance with paragraph (2) do not prevent, or provide adequate control of, exposure to substances hazardous to the health of employees, then, in addition to taking those measures, the employer shall provide those employees with such suitable personal protective equipment as will adequately control their exposure to substances hazardous to health.**

It also covers *'Use of control measures'*

(1) **Every employer who provides any control measure, personal protective equipment or other thing or facility pursuant to these regulations shall take all reasonable steps to ensure that it is properly used or applied as the case may be.**

(2) **Every employee shall make full and proper use of any control measure, personal protective equipment or other thing or facility provided pursuant to these regulations and, if he discovers any defect therein, he shall report it forthwith to his employer.**

'Maintenance, examination and test of control measures' is also covered:

(1) **Every employer who provides any control measure to meet the requirements of the regulation ('Prevention or control of exposure to substances hazardous to health'), shall ensure that it is maintained in an efficient state, in efficient working order and in good repair.**

(2) **Where engineering controls are provided to meet the requirements of the regulation, the employer shall ensure that thorough examinations and tests of those engineering controls are carried out at suitable intervals.**

(3) **Every employer shall keep a suitable record of the examinations and tests carried out and a record or a suitable summary shall be kept available for at least 5 years from the date on which it was made.**

In the advent of the COSHH regulations the **Health and Safety Commission (HSC) Approved Code of Practice** subsequently superseded the HSE guidance notes in 1990. This not only amended the previous recommendations but it also highlighted the fact that 'different work activities need different provisions'

Different work activities involve different hazards and therefore different first-aid provision is required. Some establishments (e.g. offices or libraries) have relatively low hazards whereas others (e.g. factories and chemical works) often have a greater degree of hazard or specific hazard. Requirements for first-aid provision at work will therefore largely depend on the type of work being carried out.

Regarding Burns and scalds the **HSC Approved Code of Practice** states:

***Burns and Scalds* – Do not remove clothing sticking to the burns or scalds or burst blisters. If burns and scalds are small, flush with plenty of clean, cool water before applying a sterilised dressing. If burns are large or deep, wash your hands, apply a dry sterile dressing and send to hospital.**
***Chemical Burns* – Avoid contaminating yourself with the chemical. Remove any contaminated clothing, which is not stuck to the skin. Flush with plenty of clean, cool water for 10-15 minutes. Apply a sterilised dressing to exposed, damaged skin and send to hospital.**

***Eyes* – Loose foreign bodies in the eye: Wash out eye with clean, cool water.**
***Chemical in the eye:* Wash out the open eye continuously with clean, cool water for 10 – 15 minutes.**
People with eye injuries should be sent to hospital with the eye covered with an eye pad.

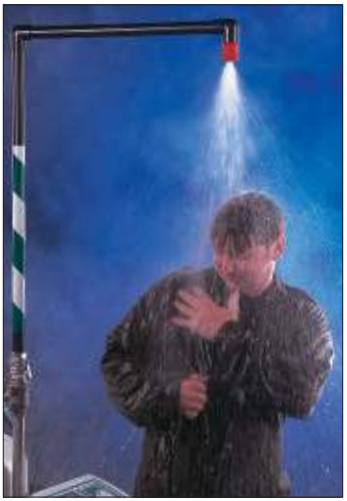
Further to this and in line with its recommendation for flushing the eye with clean, cool water for 10 to 15 minutes it also clarifies the position as regard to the use of eye wash bottles by stating:
Where mains tap water is not readily available for eye irrigation, sterile water or sterile normal saline (0.9%) in sealed disposable containers should be provided. Each container should hold at least 300 ml and should not be re-used once the sterile seal is broken. At least 900 ml should be provided. Eyebaths/eye cups/refillable containers should not be used for eye irrigation.

Since 1988 there have been a number of guidance notes and codes of practice produced.
These include '**The International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk**' which states:
Suitable marked decontamination showers and an eye wash should be available on deck in convenient locations. The showers and eye wash should be operable in all ambient conditions.

Furthermore the HSE have produced **Guidance Notes for 'Sulphuric Acid used in Agriculture'** which states:

(1) **Additional arrangements should include the provision of an adequate supply of clean water and sterile eye wash bottles for irrigating the eyes in the event of contamination. A minimum of two 300 ml containers must be immediately accessible to all persons working with sulphuric acid. In the event of contamination, irrigation of the eyes should continue for at least 15-20 minutes and specialist medical attention should be sought.**

(2) **Where contamination of the skin occurs the affected area should be drenched with large amounts of clean water for at least 10 minutes and any contaminated clothing removed. At permanent storage sites consideration should be given to the provision of a shower for personal decontamination. Care should be taken to avoid further contamination. If blistering or persistent pain occurs, specialist medical attention should be sought. Where ingestion or inhalation occurs, urgent specialist medical attention should be sought.**



Finally the most recent guidance notes relating to substances hazardous to health has also been produced by the HSE and is entitled '**Designing and Operating Safe Chemical Reaction Processes**':
Many dangerous substances are harmful to health if inhaled, ingested or come into contact with eyes or skin. Some obvious precautions to take against skin and eye contact is to provide such items as gloves, protective clothing and eye protection (goggles). Decontamination facilities such as eye wash stations and showers should also be made available. Suitable respiratory protection may need to be worn during operations with toxic gases. Such protection may be needed in emergency situations to deal with spills and leaks, and possibly to enable evacuation.

To back up the above legislation and to ensure that the management of companies take effective measures in its implementation the UK government has introduced the '**Corporate Manslaughter Bill**'. The Bill makes provision for a new offence of corporate manslaughter.

This bill concerns cases where the conduct of a company's management falls far below what can reasonably be expected, and is therefore the cause or one of the causes of a person's death. Secondly, if a company is convicted of corporate killing, the court should not only be able to punish the company severely, but have the power to order the company to put right the failings that were the cause of the death. Thirdly, the Bill would impose on the senior management of a company – its Chairman and Managing Director – an overarching responsibility for the health and safety of its work force, and, equally important, for the health and safety of the general public.

More recently, **The Management of Health and Safety at Work Regulations 1999** were introduced, these once again emphasise the importance of efficient management procedures where dangerous substances are used, stored or handled. These regulations do not include any new legislation with regard to emergency first-aid equipment, but do tighten up on the management aspect of all the previous legislation detailed above.

2. DESIGN STANDARDS

There is one World Standard that is internationally recognised covering the design parameters for Emergency Safety Showers and Eye/Facewash Fountains used in industry, this is the **American National Standard ANSI Z 358.1 2004**. For those used in laboratories, a new **European Standard EN 15154-1&2: 2006** was published in October 2006 to replace the German Standard. An **Indian Standard** for industrial installations is also in use but the key parameters are also covered by the more comprehensive American Standard.
According to the ANSI standard, there are four essential requirements for Emergency Safety Showers and Eye/Facewash Fountains to function satisfactorily.

1. Adequate Water Flow
2. Ease of Operation
3. Instant and Positive Operation
4. Reliability

1. Adequate Water Flow:
Properly designed Emergency Showers with manual valves (not self closing) should deliver a minimum of 75 litres/minute (17 gallons/minute) from a water pressure of 2.1 Bar (30 psi). Shower heads should produce a conical deluge of water with a diameter of 50 cm at 150 cm from the floor surface when spraying from a height of between 208-244 cm and the centre of the spray pattern should be 40 cm from any obstruction.
Eye/Facewash Fountains must provide a continuous effective minimum flow of water in the region of 11.5 litres minute (2.5 gallons/minute) at a height of 84-114 cm. An auxiliary aerated eyebath diffuser on hose should have a flow rate of not less than 1.5 litres/minute (1/3 gallon/minute). Higher flow rates for these can usually be achieved by adjusting the flow regulators.
In addition all Emergency Showers and Eye/Facewash units must provide a continuous effective flow of water at the minimum rated pressure.

2. Ease of Operation:
Activation devices must be simple to use and easily accessible - even if the victim has impaired vision. Stay-open ball valves operated either by hand pull levers, panic bars or a walk-on foot control enable an Emergency Shower to be operated quickly and efficiently delivering a continuous drench for 15 minutes, allowing the casualty to remove any contaminated clothing without having to hold on to a spring return valve.

Quick action valves operated by pull handle, Treadle foot control, lifting a lid or even pushing a button with the forehead will enable an Eyebath or Eye/Facewash unit to be operated quickly and efficiently for 15 minutes and leave the hands free to hold the eyes open throughout the irrigation. It is a requirement that all personnel exposed to hazardous substances are to be fully trained in the use of Emergency Shower and Eye/Facewash Equipment.

3. Instant and Positive Operation:
Instant and positive operation is imperative for all Emergency Shower and Eye/Facewash equipment as every second counts in an emergency. Water supply valves must open quickly and simply as maximum flooding action must be provided within 1 second.

4. Reliability of Equipment:
Probably the single most important factor when choosing this type of equipment is how well made it is. Units must be capable of performing their required service even after long periods of idleness. Top quality valves operated by jam-proof, robust and corrosion resistant actuating devices are essential for total reliability. To ensure reliability of units installed outdoors in cold climates, it is essential that these units be freezeproof. Furthermore when units are installed outdoors in very hot climates, it is equally as important that these units are insulated from the effects of overheating due to solar radiation.

The **European Standard EN 15154-1&2: 2006** for equipment used in Laboratories states that:

1. Emergency Shower Installations *(Laboratory Showers only)*
Potable water or water of similar quality must be used and it is suggested that a suitable flow rate of an Emergency Shower should be a minimum of 60 litres/min and should flow for a minimum duration of 15 minutes. At a distance of 70cm below the shower head 50(±10)% of the water volume delivered should fall within a radius of 20cm. The flow rate within the circle must not deviate more than 30% from the mean. At this level the area reached by 95% of the water shall not exceed a radius of 40cm. The shower head should be 220cm(±10)cm above the level on which the user stands. The space under the shower measured between the centre line of the shower head and the nearest obstruction should have a minimum radius of 40cm but the shower lever/pull rod or eye wash unit may project into this space by a maximum of 20cm. The valves are to have 90° operation or a maximum of 20cm stroke and the direction of operation should be unmistakable. The valve actuator should be large enough to be easily operated by the user (even when wearing gloves) and it shall be

positioned between floor level and a maximum of 175cm above that level. Maximum force for manual operation shall be 100N or a maximum torque of 7Nm and the valve shall be fully open within 1 second. The valve shall not close automatically once it has been opened. It shall only be possible to make adjustments with a tool to the direction of spray or spray pattern of a shower head. Shower heads are to be self-draining to avoid lime scale and the build up of bacteria. A safety sign in accordance with ISO 3864-1 shall be supplied with each emergency shower.

2. Emergency Eye wash Installation

Potable water or water of similar quality must be used at all times. Each nozzle or diffuser should deliver a minimum of 6 litres/min for a minimum of 15 minutes. The spray of water should be between 10cm and 30cm measured from the diffuser centre before tipping over or collapsing. The diffuser height is to be fixed at 100cm (±20)cm above the level on which the user stands and at least 15cm from the nearest wall or obstruction; diffusers should also be protected from airborne contaminants. Valves are to have a maximum 90° operation or 20cm stroke and shall not close automatically. Maximum force for operation shall be 100N or a maximum torque of 7Nm and the valve shall be fully open within 1 second. The operation of the valve actuator shall be clearly visible and unmistakable and shall be large enough to be easily located and operated by the user, even when wearing protective gloves. If the direction of the spray or the water distribution can be adjusted, it shall only be possible to make adjustments with a tool. A safety sign in accordance with ISO 3864-1 shall be supplied with the Eye wash.

From this it can clearly be seen that Industrial Emergency Showers differ widely from Laboratory Showers and in particular with regard to their flow rates. In the case of Industrial Emergency Showers, these are designed to cover many different types of accident involving the spilling, spraying or splashing of dangerous chemicals or hot liquids, so must give the highest flow of water possible without causing injury to the user. Laboratory Showers on the other hand are generally used in a controlled environment where smaller quantities of dangerous chemicals are handled.

It is for this reason that Laboratory Showers should only be used in laboratory type locations.

3. TYPES AND APPLICATIONS

Throughout industry and other areas where dangerous chemicals or corrosive substances are used there are many different conditions that determine the type of unit to be installed. When choosing this type of emergency equipment, not only is it very important that it has been designed and tested in line with the relevant standard, it is equally important that the correct model is chosen to suit the specific application and location. In the UK this is specifically highlighted in The Provision and Use of Work Equipment Regulations 1998 (PUWER) which requires that all equipment covered by the legislation must only be used for its intended purpose and under conditions for which it is suitable. In the context of these regulations, 'suitable' means suitable in any respect which it is reasonably foreseeable will affect the health or safety of any person.

To be sure of this there are a number of points to be considered:

1) ***The type of chemicals or hazardous materials being handled or processed and the respective manufacturers instructions regarding first-aid.***
2) ***Quantity and concentration of chemical/material.***
3) ***Solubility and viscosity of the chemical/material.***
4) ***What type of accidents are possible i.e. spilling, splashing, spraying or ignition of clothing.***
5) ***The atmospheric conditions the Showers and Eye/Facewashes will be exposed to.***
6) ***The prevailing ambient conditions of the proposed location for each unit.***
7) ***The safe positioning of this equipment.***
8) ***The reliability of the water supply.***
9) ***Whether this equipment is also needed to decontaminate protective clothing prior to its removal.***

It is beneficial to obtain expert advice when choosing this equipment, to ensure that what is installed suits both the application it is intended for and the prevailing ambient conditions of the area where it is being located.

THE EQUIPMENT

Eyebaths and Eye/Facewash Fountains:

Eyebaths and Eye/Facewash Fountains are designed to provide a constant flow of clean cool water to wash away chemicals or loose foreign bodies from the eyes and face. In the case of chemicals, it is the approved code of practice that the open eye should be washed continuously for 10 - 15 minutes. Most modern Eye/Facewash Fountains for industrial locations are designed with lids that automatically operate the water flow when pulled open. The lid also ensures that the unit remains clean and free from contamination and therefore usable at all times.

Eye/Facewashes can be wall or pedestal mounted depending whether a suitable wall is available and can be heated or unheated dependent on whether their location is to be indoors or outdoors. Outdoor units in cold climates need to be heated to ensure they don't freeze rendering them inoperable when needed. In many cases where small amounts of chemicals are being used it may be sufficient to have an optional hand operated eye, face and body shower on a flexible hose fitted on or adjacent to the Eye/Facewash unit. This will also enable the treatment of disabled or unconscious personnel.

Emergency Showers:

Emergency Showers are designed to effectively wash off chemicals or hazardous materials from the skin as quickly as possible. This should be done using clean tepid potable water and involves removing any contaminated clothing that is not stuck to the skin. Once the clothing is removed the affected area must be flushed for 10-15 minutes to ensure any chemicals are thoroughly washed away.

Outdoor showers must be capable of operating in all types of weather conditions, from freezing winters to hot summers.
In cold climates there are effectively only two ways in which to ensure that the showers will always work when needed. The most effective, and consequently the most popular method, is to install heated and insulated models. These are effective down to temperatures as low as minus 35°C (minus 31°F). The other method is to have the operating valve for the unit buried underground, below the level of frost. This is not particularly favoured today due to the problems caused by dirt getting into the self-draining valves and their inaccessible nature.

For outdoor use where a regular water supply cannot be relied upon, Tank Showers, with a choice of capacities, can be installed. These can also be heated which is a popular choice where warm water decontamination is essential to wash off certain specific hazardous substances.

In hot climates solar radiation can heat the standing water in the Shower standpipes up to scalding temperatures, it is therefore essential that this water is not showered onto personnel as it could cause serious scalding and shock. Once again, underground valves connected to buried water supplies with self-draining standpipes are an option, but as pointed out previously these are not generally preferred. In preference to these, Showers and Eye/Facewashes with self-draining valves that are located above ground level but adjacent to the incoming water supply are recommended. Insulating the standpipes from the heat is becoming more and more popular, in particular in countries that experience cold winters and hot summers. In very hot climates, it has been found that fitting Tank Showers with special insulation and sun shields is the most effective way of keeping the shower water temperature below 35°C (95°F). It should also be remembered that at night Showers need to be visible so illuminated signs are now a useful option. All Showers can have Eye/Facewashes fitted to them as well, enabling them to cover all eventualities.

Where there is no possibility of the water in the shower pipes freezing or overheating, unheated and uninsulated units are normally installed. In most countries this type of unit can only be installed indoors in a controlled environment.

For laboratories different types of Showers and Eye/Facewashes are required and these generally have a lower water flow rate than units installed in industry, as can be clearly seen in the **European Standard** (EN 15154-1&2: 2006).

There is also the choice between galvanised and stainless steel for the shower pipework. The choice between these materials usually depends upon the material of the supply pipes to the showers, and the prevailing atmospheric conditions.

Also available are mobile showers that can be hitched to a car or van and positioned in remote areas when needed or near a fixed unit that may be being serviced or that is temporarily out of commission.

4. WATER TEMPERATURES

Although guidelines have been included in both the ANSI and the European Standards, the water showering temperature must be considered in line with the specific hazard being washed off and should take into consideration its viscosity and solubility.

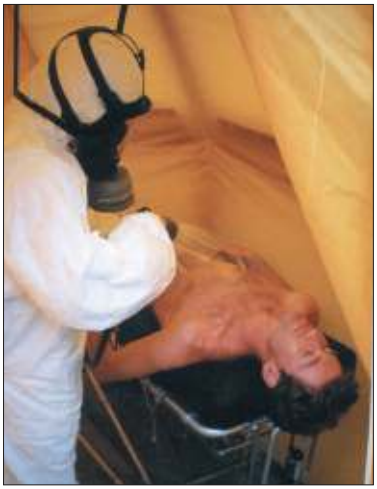
Delivered Flushing Fluid Temperature

Starting irrigation of affected tissue quickly and continuing for the recommended period is essential in providing effective first-aid treatment. It is also important to provide flushing fluid at the appropriate temperature for the duration of the treatment.

Medically, it is recommended that tepid flushing fluid is used on chemically injured tissue. Both the ANSI Standard and the European Standard confirm that temperatures in excess of 38°C (100°F) have proven to be harmful to the eyes and can enhance chemical interaction with the eyes and skin.

Flushing with cold fluid provides immediate cooling after chemical contact but prolonged exposure to cold fluid affects the body's ability to maintain an adequate temperature and can result in a premature cessation of first-aid treatment. Recent tests indicate that the temperature of tepid water should be no lower than 15°C (60°F) to avoid the risk of hypothermia to the user. This recommendation is included within both Standards.

The British Health and Safety Commission have published a booklet detailing guidelines as to when and how flushing should take place; their recommendations are as follows:



Chemical Burns

Remove any contaminated clothing which is not stuck to the skin. Flush with plenty of clean cool water for 10-15 minutes. Apply a sterilised dressing to exposed, damaged skin and send casualty to hospital.

Eyes

Loose foreign bodies in the eye: Wash out eye with clean cool water.

Chemical in the eye: Wash out the open eye continuously with clean, cool water for 10-15 minutes. People with eye injuries should be sent to hospital with the eye covered with an eye pad.

Medical studies have concluded that cool water is better for washing most chemicals off the skin as it soothes the affected area (similar to using cool water on a heat burn) and helps numb the pain. It has also been proved that cool water closes the pores of the skin and therefore reduces the effects of chemical absorption through the skin (Percutaneous Absorption). A further medical fact is that damaged skin, whether by burn or abrasion, can suffer first degree burns from water at temperatures of 40°C (104°F) or above (40°C being normal domestic showering temperature). The American Standard ANSI Z 358.1 2004 recommends a minimum showering temperature of 15°C (60°F) and it is suggested that showering for any length of time (up to the recommended 15 minutes) at temperatures below that would affect the ability to maintain adequate body temperature and can result in the premature cessation of first-aid treatment.

The problem then occurs of how to maintain a steady flow of water (at a minimum flow rate of 75 litres/minute) at a 'Tepid' temperature?

Several solutions to this problem have been developed by the various Emergency Safety Shower manufacturers throughout the world and they include:

- High flow rate thermostatic mixer valves
- Under temperature bleed valves (for cold countries)
- Hot water systems with thermostatic mixer valves (for cold countries)
- Over temperature bleed valves (for hot countries)
- Tank Showers with large water tanks heated and/or insulated (for either hot or cold countries)
- Circulating heated water ring main systems (for cold countries)
- Circulating cooled water ring main systems (for hot countries)

It is important to remember that this type of equipment is very rarely used, and unfortunately is often badly maintained and serviced, therefore a heating, or cooling system must be simple and reliable.

Further details are available on any of these systems but advice would normally be given depending on the individual circumstances, ie. water main feed temperature, ambient air temperature etc.

The above information will answer most question and give a better insight as to the importance of getting things right when installing or maintaining this lifesaving equipment, but it should always be remembered that good advice can always be sought from a reputable supplier.

5. MATERIALS OF MANUFACTURE

Throughout the many different ranges of Emergency Safety Showers & Eye/Facewash Fountains, there is a choice between galvanised and stainless steel for the shower pipework. The choice between these materials usually depends upon the material of the supply pipes to the showers, and the prevailing atmospheric conditions. **The European Standard** states: **Materials used should not affect the water quality or contaminate the water supply.**

Galvanised Units:

Galvanised mild steel is one of the most popular forms of piping when connecting this type of equipment to a water main. Galvanised units are more suitable than stainless steel models where there could be rust particles in the water supply. It also has superior corrosion resistant properties to stainless steel when there is a dead leg of water, as well as being more suited where high concentrations of chlorine are present in the water supply. Galvanised mild steel is also generally cheaper than stainless steel.

Stainless Steel Units:

Stainless steel pipework does not cause any discolouration to the water when left for long periods and is therefore more suitable for units supplied for use in food factories and some chemical environments. It also looks better when highly polished although corrosion can occur when the surface is rubbed as this removes the protective passive oxide layer.

Plastic Units:

Plastics are used extensively in the production of Shower and Eye/Facewash units, but mainly for their corrosion resistant properties. The plastic parts are usually Eye/Facewash bowls, valve levers and outer jackets on heated models, but plastics are also found extensively on Tank Showers for tanks, valves and fittings. Plastics are rarely found as the main pipework for a Shower as plastic pipe is not generally rigid enough.

6. BATTLING CORROSION

It is important to ensure that Emergency Showers and Eye/Facewash Fountains are corrosion resistant, as this adds to their reliability and dramatically increases their life-span. Units made of conventional materials, which are unprotected obviously deteriorate more rapidly in corrosive environments and subsequently require significantly more maintenance. Corrosion resistant outer jackets or other protective coatings are recommended for use in such areas. Plastic coating over stainless steel has been found to be one of the most successful methods of eliminating corrosion on operating handles and linkages, as well as the use of stainless steel nuts, bolts and washers. ABS and Glass Reinforced Plastic (GRP) Eye/Facewash bowls have performed well too, even better than stainless steel, which can be affected by the chemicals present on some sites.

7. LOCATION/INSTALLATION

For Emergency Safety Showers and Eyebath/Facewash Units to work when needed, it is imperative that they are installed correctly and in the right location.

Emergency Safety Showers and Eyebath/Facewash units should be installed within 10 seconds reach if an accident occurs, 15 metres (50 ft) away maximum; for strong acids and caustics they must be immediately adjacent to the hazard. Ideally they should be centrally located in a prominent position and not obstructed by heavy traffic or clutter. Panic-stricken persons easily remember such spots. Emergency Showers and Eye/Facewash units should be on the same level as the hazard and the path of travel shall be free of obstructions that may inhibit the immediate use of the equipment.

All units should be clearly labelled with pictogram signs to International Standard ISO 3864-1 and wherever possible, green/white stripes or green lights should be used to help identify the Shower and Eye/Facewash areas.

Regardless of the type of unit installed, only potable water should be used. The inlet water pressure must meet the manufacturers recommended minimum, and the supply pipe should have at least the same diameter as the inlet pipe on the equipment (even larger if long lengths of pipe are being used to feed this equipment, and especially if only low water pressures are available).

In practice some of the largest companies in the world buy and install the best units money can buy, then either connect them with the wrong size of pipework, or, install them in the wrong place. If the above guidelines are followed this will help to stop this from happening.

The Provision and Use of Work Equipment Regulations 1998 (PUWER) states that it is the employer's responsibility to not only select the most appropriate equipment but ensure that it is installed in the correct place and ready for use. Consequently, it has to be suitable for use and for the purpose and conditions in which it is used. This also means that it must be adequately maintained in a safe condition so that it does not put people's health and safety at risk.

Labourer Falls into Corrosives Vat

A factory worker was badly burned when he fell into a ten gallon vat of corrosive chemicals. Fortunately he managed to scramble out and douse himself with water to dilute the corrosive.

The man was a zinc-line operator and was standing on a vat of sodium hypochloride to reach a valve when the top of the valve gave way and he plunged in upto his knees.

Dousing himself with dipping swill to cut down the burning and relieve the pain was quick thinking action that probably saved his life, said a fireman later. Prompt action from workmates also helped by hosing him down with fresh waterbefore he was taken to hospital for medical treatment.

Caustic soda sprayed in eyes

Following an incident in which caustic soda sprayed into the eyes of a factory worker a chemical company has been fined £1,100.

An employee was sprayed with 47 per cent strength caustic soda when a pipe burst on the machine he was working on. A company trainee who was working with the man jumped off a platform to help but was unable to reach him because caustic soda was spraying from fixed plastic bellows.

The court heard how the area in which the accident occurred had not been made a mandatory eye protection area, despite two previous incidents where chemicals had come into contact with workers eyes in the same department. Although plastic safety spectacles had been issued they did not provide protection from chemical spillage.

The company pleaded guilty to two charges under the Health and Safety at Work Act in failing to ensure the safety of both workers.

'A permit to work would have alerted them to the dangers of ammonia.'

HSE INSPECTOR

9. TEST PROGRAMMES/SERVICING

It is vital that Emergency Safety Showers and Eye/Facewash Fountains be visually inspected every day to make certain that nothing has been placed in or around them which may prevent quick and easy access. Water flow should be checked at least once a week to 'flush the line, and to verify proper operation' and to ensure that the water supply line has not been inadvertently turned off. Eyebaths and Eye/Facewash Fountains should be tested daily and cleaned on a regular basis.

A good maintenance program for Emergency Safety Showers and Eye/Facewash Fountains is also very important as it can increase the life span and guarantee the equipment's reliability. As well as being beneficial from an employee's point of view, the Health and Safety Executive consider them lifesaving equipment, in the same way as they do fire extinguishers; regular servicing can help satisfy the Health and Safety Executive's Inspector that this equipment is being well maintained.

The **COSHH Regulations** require that safety equipment is "**maintained in an efficient state, in efficient working order and in good repair**" also records must be kept of the examinations and tests carried out for a period of at least five years. This is reinforced by The Provision and Use of Work Equipment Regulations 1998 (PUWER) which states that where inspections are carried out they should be undertaken by a competent person and a record kept until the next inspection. The ANSI Standard also specifies annual inspections to ensure conformance with ANSI requirements.

On-site servicing can usually be provided by a reputable manufacturer who would have a team of trained engineers experienced in the repair and maintenance of all types of Emergency Safety Showers and Eye/Facewash Fountains. These engineers visit sites in specially prepared vehicles which are fully stocked with any parts that may be required to carry out this work both quickly and efficiently. In practice, almost without exception it has been proved that when servicing a number of units at one time, this is the most cost effective solution available. Should a company attempt to service or repair their own safety equipment, invariably they don't have the spare parts to be able to complete the work that they have started. This then causes the problem of an important piece of safety equipment being out of commission, thus rendering that area of the plant unsafe. Furthermore, these experienced engineers are also required to clean all units, as well as produce a fully detailed service report detailing all work carried out as well as highlighting any problems that they have found, thus assisting the company to conform with COSHH and PUWER regulations, as detailed above.

A comprehensive service procedure would include all of the following points:

1. Allocate a location reference, to enable easy future identification.
2. Check unit is clearly visible in case of emergency.
3. Ensure immediate area is free from sharp projections and is unobstructed and that the Shower and Eyebath/Facewash equipment is on the same level as the hazard.
4. Activate Shower and Eyebath/Facewash '**for a period long enough to verify operation and ensure that the flushing liquid is available**' as per ANSI standard.
5. Repair wear and tear/accidental damage.
6. Check operating linkages for damage and repair/replace where necessary.
7. Remove and clean/disinfect Eyebath/Facewash 'Y' strainer (where fitted).
8. Remove, check and replace Eyebath/Facewash aerators where necessary.
9. Clean/disinfect shower nozzles/roses.
10. Clean Shower exterior and Eyebath/Facewash unit.
11. Activate Eyebath/Facewash, set volume control screws and adjust flow regulator.
12. Tank showers should also be internally chlorinated to combat any problems associated with legionnella.

Chlorinating is achieved as follows:

a) Isolate water supply.
b) Remove shower rose and place in a container of 50 p.p.m. (parts per million) dissolved free chlorine.
c) Remove Eyebath/Facewash filter, clean it, and place it in the same container.
d) Remove the Tank Shower lid and clean the tank.
e) Refill the tank with clean water and add chlorine release agent to gain 50 p.p.m. of free chlorine.
f) Operate the Eyebath/Facewash to hold chlorinated water in the pipework. Leave for one hour then empty the system and flush with clean water prior to refilling.
g) Replace the shower rose and filter.

Electrical Testing:

a) Check water temperature to verify correct thermostat operation/setting.
b) If no heating investigate reason.
c) Replace light bulbs where necessary.

After each visit, the customer should be provided with a detailed report indicating the condition of each shower, as well as parts fitted and faults found, and where applicable any recommendations for improvements which should be made. This report is classed as a quality document and is required to build a history of service/maintenance as stipulated in the COSHH and PUWER regulations. Copies of all reports must be kept by the company for a minimum period of five years.

10. TRAINING (POSTERS/FILMS)

All employers are responsible for training their employees with regards to Health and Safety at work. The Provision and Use of Work Equipment Regulations 1998 specifies that anyone using the equipment must have received adequate training, instruction and information. This must be accompanied by suitable safety measures such as the fitting of warnings notices and special markings. In the case of an Emergency Safety Shower this could include the use of high visibility signs for easy identification (illuminated if necessary) and advisory notices on correct operation. Employees who may be exposed to hazardous materials must be instructed on the location and proper use of Emergency Safety Showers, Eyebaths, Eye washes and Eye/Facewash Fountains. Furthermore, these instructions must be readily available and accessible to maintenance and inspection personnel, whether or not they are employees of the company.

The most important factors are to ***'know where they are'*** and ***'know how to use them'***.

'Know where they are'

This of course is simple to train people as usually it just involves showing each respective trainee where the units are located in the area that they are working or will possibly be working in the future, and in most cases involves a limited number of units. What is probably more important is to train each person that when working in any area they must firstly make themselves aware of the location of all first-aid equipment and in particular Emergency Safety Showers, Eyebaths and Eye/Facewash Fountains.

'Know how to use them'

This is a bit more involved as it includes full training with each and every type of unit in the company, and these can differ from area to area, especially when a plant or factory has been added to over the years. The most important part of this is that the affected part should be '**flushed with plenty of clean cool water for 10-15 minutes**', as stipulated in the Health and Safety Executive's Guidance Notes. Furthermore, '**any contaminated clothing which is not stuck to the skin should be removed**' and medical advice must always be sought following any incident involving dangerous chemicals or corrosive substances.

When addressing washing of the eyes, training shall stipulate holding the eyelids open and rolling the eyeballs so that flushing fluid will flow on all surfaces of the eyes and under the eyelids. Also, after using a plumbed-in Eyebath or Eye/Facewash Fountain it is always advisable to finish off with an Eye wash Bottle filled with sterile saline solution (this maybe carried out by the Company's qualified First Aider). For any incident that involves chemicals and the eyes it is recommended that the patient should always visit hospital to ensure that the first-aid treatment has been successful.

An easy way for a company to assist in the training of his employees and visitors is either by **Safety Posters** or **Safety Training Films.**

Safety Posters are available and should be displayed in prominent positions to increase awareness in the workplace of the existence of this equipment and to make clear how it is operated in case of an emergency.

Safety Training Films are available from the most reputable of manufacturers and these give clear and concise instructions as to the use of this all important life saving equipment.

HUGHES

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