



Engineering Standard

SAES-B-069

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Emergency Eyewashes and Showers

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1 Scope

This standard covers the minimum mandatory requirements governing the design and installation of emergency eyewash and shower facilities that are designated for the emergency first-aid treatment of personnel exposed to injurious chemicals.

2 Conflicts and Deviations

- 2.1 Any conflicts between this Standard and other applicable Saudi Aramco Engineering Standards (SAESs), Saudi Aramco Materials System Specifications (SAMSSs), Saudi Aramco Standard Drawings (SASDs), or industry standards, codes, and forms shall be resolved in writing by the Company or Buyer Representative through the Manager, Loss Prevention Department of Saudi Aramco, Dhahran.
- 2.2 Direct all requests to deviate from this Standard in writing to the Company or Buyer Representative, who shall follow internal company procedure SAEP-302 and forward such requests to the Manager, Loss Prevention Department of Saudi Aramco, Dhahran.

3 References

The references listed below are a part of this Standard to the extent specified herein and shall be of the latest edition, revision, addendum or issue unless otherwise specified.

3.1 Saudi Aramco References

Saudi Aramco Engineering Procedure

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| <i>SAEP-302</i> | <i>Instructions for Obtaining a Waiver of a Mandatory Saudi Aramco Engineering Requirement</i> |
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Saudi Aramco Engineering Standards

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| <i>SAES-B-067</i> | <i>Safety Identification and Color-Coding</i> |
| <i>SAES-L-032</i> | <i>Materials Selection for Piping Systems</i> |
| <i>SAES-L-041</i> | <i>Utility Piping Connections to Process Equipment</i> |
| <i>SAES-P-123</i> | <i>Lighting</i> |
| <i>SAES-S-040</i> | <i>Saudi Aramco Water Systems</i> |
| <i>SAES-S-060</i> | <i>Saudi Aramco Plumbing Code</i> |
| <i>SAES-S-070</i> | <i>Installation of Utility Piping Systems</i> |

3.2 Industry Codes and Standards

American Society of Mechanical Engineers

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| <i>ANSI Z535.2</i> | <i>American National Standard for Environmental and Facility Safety Signs</i> |
| <i>ANSI Z535.3</i> | <i>American National Standard for Criteria for Safety Symbols</i> |
| <i>ANSI Z358.1</i> | <i>American National Standard for Emergency Eyewash and Shower Equipment</i> |

4 Equipment and Materials

4.1 General Requirements

4.1.1 Emergency eyewash and shower facilities (or hand-held sprays for a temporary hazard as noted below) shall be provided wherever there is a potential for exposure of personnel to:

- Eye or skin irritants that are toxic by absorption,
- Materials handled at elevated temperatures,
- Injurious chemicals that can cause immediate or irreversible damage on contact or that have adverse systemic effects on contact.

This includes gasoline, diesel, heavy fuel oils, lube oils, molten sulfur, hot asphalt, acids, caustic soda, chemical inhibitors, and many other materials commonly handled in Saudi Aramco production, distribution, bulk plant and refinery facilities. Refer to the Material Safety Data Sheets (MSDS) for material properties and appropriate emergency response if it is spilled on the skin or eyes.

4.1.2 Sources of exposure where emergency eyewash and shower facilities are required include, but are not limited to, sample points, tank truck/ tank car loading/unloading connections, open hatch loading positions, mix tanks, chemical storage areas, and battery rooms. (See Section 6.2 for information on the location and exceptions for battery rooms).

4.1.3 An emergency shower installation shall always include an eyewash. However, an eyewash does not always have to include a shower (see 6.1).

4.1.4 All equipment and materials shall meet this Standard and ANSI Z358.1, Eyewash and Shower Equipment, as modified herein.

4.1.5 Emergency eyewashes and showers shall be permanently installed except in the following situations where temporary installations are permitted if approved by the Chief Fire Prevention Engineer or his representative in consultation with the Environmental Compliance Division:

- The hazard is temporary, where the material is not normally handled or where handling is very infrequent.
- The hazard is ruled to be small due to infrequent personnel exposure.
- A permanent water supply is not available.

Hand-held sprays are permitted in temporary installations in place of safety showers.

4.1.6 In permanent installations, hand-held drench hoses may be used only as auxiliary equipment in support of eyewash and shower units, not in place of eyewash and shower units.

4.2 Equipment Specifications

4.2.1 Purchase orders for emergency eyewash and shower equipment shall require conformance to ANSI Z358.1 as modified herein in Section 7.

4.2.2 Since ANSI Z358.1 does not provide complete purchasing specifications, additional specifications shall be added to the purchase order based upon SAES-B-069.

4.3 Materials

4.3.1 Eyewashes and showers shall be constructed of a material resistant to corrosion in their installed environment.

4.3.2 The water supply piping shall be consistent with materials provided for the source water system as specified in SAES-L-032.

5 Basic System Design

5.1 Flushing Fluid

5.1.1 The fluid used in the system for flushing injurious materials from the eyes, face and body of personnel shall be potable water or otherwise water certified for the purpose by Saudi Aramco Environmental Compliance Division/ Environmental Protection Department.

5.1.2 Hard piped systems shall be inspected and flushed for three minutes on a weekly basis to prevent bacterial contamination build-up and to verify

proper operation.

- 5.1.3 The flushing fluid in self-contained units shall use an isotonic saline solution 0.85% to 1.0% NaCl buffered to a Ph from 7.3 to 7.4 and preserved with a suitable anti-bacterial agent or other alternative as approved by Environmental Compliance Division/ Environmental Protection Department. The changing or recharging of flushing fluid in these devices and their overall maintenance shall meet the manufacturer's instructions to avoid dangerous build-up of contaminants. Maintenance records shall be maintained and be readily available.

5.2 Flow Capability and Duration

- 5.2.1 Water supply systems shall be capable of providing flow for a duration of at least 15 minutes to the involved eyewashes and showers at the flowrates and pressures specified herein.
- 5.2.2 A combination eyewash/shower unit shall be capable of flowing through both units simultaneously with the flow rate, pressure, and temperature requirements specified herein.
- 5.2.3 If more than one eyewash, or combination eyewash/shower unit could be used by personnel in a release, the system shall be capable of such usage with the flow rate and pressure requirements specified herein.
- 5.2.4 Water supply systems shall be continuously available for use when release of an injurious chemical is possible.
- 5.2.5 Eyewash nozzles shall be protected with covers, that can be easily removed, to prevent nozzle contamination and clogging.

5.3 Water Temperature, Pressure, and Flowrates

- 5.3.1 The delivered water temperature at showers shall not exceed 38°C at any time; the delivered water temperature at eyewashes shall not exceed 38°C, except for the short duration when warmer water is being flushed out of the piping between an aboveground eyewash operating valve and the eyewash nozzles after opening the operating valve.

Commentary Note:

Over the years, Loss Prevention has recommended to bury piping upstream of the eyewash/showers to control high temperatures, a practice that is simple and often works to bring the water temperature down enough to satisfy this Standard (insulating the piping and leaving it aboveground seldom, if ever, works). Solar radiation on aboveground piping heats the water and therefore buried piping is preferred. In some

situations, even buried piping may exceed the safe limit. In situations where coolers are considered, there has been some question about the need to use such an expensive (and high-maintenance) solution. While coolers are sometimes acceptable (outside of electrically classified areas), before using a cooler, consult with the Environmental Compliance Division and the Chief Fire Prevention Engineer or his representative to see if there may be a better solution.

5.3.2 The delivered water temperature shall not be less than 15°C except during initial activation of the eyewash or eyewash/shower unit, when a lower temperature is permitted during the period necessary to flush the aboveground piping immediately in the vicinity of the eyewash or eyewash/shower unit.

5.3.3 Required pressures and flow rates are covered in ANSI Z358.1, which is part of this Standard.

5.4 Pressure Control

Permanently installed emergency eyewashes shall be provided with pressure controllers or self-regulating orifices to ensure that eyes will not be injured due to excessive water velocity if the water supply pressure exceeds the 207 kPa (30 psig) design flowing pressure in ANSI Z358.1, unless the system is designed such that this pressure could not be exceeded.

5.5 Cross Connections and Backflow Prevention

The water supply system shall be designed as a potable water system. Refer to SAES-L-041, SAES-S-040, SAES-S-060 and SAES-S-070 for design requirements including cross-connection constraints and backflow preventer requirements between potable water and other systems.

6 Installation

6.1 General

All installations shall meet the requirements of this Standard and ANSI Z358.1 as modified herein.

6.2 Location

Emergency eyewashes and showers shall be located as follows:

- In accessible locations that require no more than 10 seconds to reach (no closer than 3 m nor further than 15 m from a hazard except where specifically allowed below). The nature, severity, and environment of the chemical hazard shall be considered in determining the maximum allowable
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unobstructed distance. For severe hazards consult with the Industrial Hygiene Unit and Medical Services to determine the proper distance.

- Outside of the most likely spray paths such as sample and drain points.
- Along or adjacent to the normal path of egress and on the same floor level as the hazard.
- In a location accessible from the hazard without the use of stairs, a ladder or a door.
- Upwind, based on the prevailing wind, of the hazard where practical.
- At a safe distance (at least 3 m) from electrical equipment and power outlets that are not protected by ground-fault circuit-interrupters (GFCIs), except in battery rooms, in which case separation between an eyewash (no shower) and the batteries shall be at least 1.5 m. Only an eyewash is required in the battery room, provided that there is no acid-mixing activity to be done inside the battery room. If a shower is provided with the eyewash, then 3 m separation is required.
- In more than one place in the vicinity of the hazard if more than one person is likely to be splashed at the same time.
- In an area that is well lighted (100 lux minimum; refer to SAES-P-123).

6.3 Piping

- 6.3.1 Block valves in the water supply system shall be car-sealed open.
- 6.3.2 No permanent or temporary connections shall be made to the water supply for other purposes.
- 6.3.3 A strainer shall be provided in the water supply to a permanently installed eyewash to prevent solid particles from entering the eyes.

6.4 Identification

- 6.4.1 If the location so permits, permanently installed safety shower and eyewash units shall have a vertical background area nominally 1 m wide by 2 m high painted with either alternating green and white stripes approximately 152 mm wide or a solid green color per SAES-B-067.
 - 6.4.2 Each unit shall be assigned a unique number for tracking in the maintenance log and for identification of the units in an emergency.
 - 6.4.3 The appropriate sign with words as shown below, in Arabic and English meeting ANSI Z535.2, ANSI Z535.3, and SAES-B-067, shall be
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mounted in a clearly visible location near each permanently installed emergency shower and eyewash:

Emergency Shower

- Get into shower immediately.
- Remove contaminated clothing while showering.
- Shower for at least 15 minutes.
- Summon medical assistance.

Emergency Eyewash

- Flush eyes immediately.
- Hold eyes open rolling them back and forth during flushing.
- Flush for at least 15 minutes.
- Summon medical assistance.

6.5 Alarms

6.5.1 Under special circumstances such as areas where personnel work alone handling hazardous chemicals or where communications may not be readily available, alarms shall be considered for eyewashes and safety showers by Operations in conjunction with the Loss Prevention Department and the Industrial Hygiene Unit of Medical Services. The nature of the hazard and its location shall be evaluated in determining whether an alarm is necessary.

6.5.2 If an alarm is provided, it shall be per the following:

- The alarm shall be activated when either the eyewash or safety shower is activated.
- The alarm shall sound at a location that is attended during all working hours, such as a control room, and also in the vicinity of the eyewash/shower.
- The alarm shall be activated by a flow switch or by microswitches on the operating valves.
- The alarm shall show on a visual display board in the attended location to identify the location of the emergency.

6.6 Drainage

All permanently installed eyewashes and showers shall be provided with drainage for periodic testing, such as surface drainage to a catch basin, to a

gravel filled pit or to a suitable area.

6.7 Disinfection

Water supply systems shall be certified as suitable for the purpose by Saudi Aramco Environmental Compliance Division/Environmental Protection Department.

7 Modifications to ANSI Z358.1

The following paragraph numbers and illustration references refer to ANSI Z358.1, which is part of this Standard. The text in each paragraph below is an addition, modification, exception, or deletion to the requirements of ANSI Z358.1. Paragraphs and illustrations not mentioned below are accepted in their entirety.

4.1 (Revision) Performance of Shower Heads

Change the word "should" in the last sentence to the word "shall". The last sentence shall then read: "Emergency shower heads shall be capable of delivering a minimum of 113.6 liters per minute of water, which shall be substantially dispersed throughout the pattern."

4.6.1 (Deletion) Installation (Emergency Showers)

5.4.4 (Deletion) Installation (Eyewash Units)

7.4.4 (Deletion) Installation (Eye/Face Wash Units)

9.4.1 (Deletion) Installation (Combination Units)

The deleted paragraphs above refer to the location of eyewashes and showers. Refer to paragraph 6.2 in SAES-B-069 for location requirements.

Illustrations

Illustration 1 (Deletion), Emergency Shower.

Commentary Note:

Illustration 1 in ANSI Z358.1 is deleted because an emergency shower must also have an eyewash unit per Illustration 11, Combination Shower and Eyewash. However, note that an eyewash does not always have to include a shower.

Revision Summary

15 March 2006

Revised the "Next Planned Update". Reaffirmed the contents of the document, and reissued with no other changes.
