THE WATER MANAGEMENT SOCIETY

Managing the Risk of Legionnaires' Disease in Emergency Safety Showers, Eyebaths and Facewash Fountains

Guidance produced by
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Introduction

1. Management and control of Legionnaires' disease is described in the HSE Approved Code of Practice (ACoP) and Guidance Document 'Legionnaires' disease. The control of Legionella in water systems' (L8) 2013[1]. The ACoP is supported by three guidance documents [2]:

- HSG274 Part 1 The control of legionella bacteria in evaporative cooling systems
- HSG274 Part 2 The control of legionella bacteria in hot and cold water systems, and
- HSG274 Part 3 The control of legionella bacteria in other risk systems.

2. L8 recognises that other types of water system can potentially harbour legionella that give rise to Legionnaires' disease and require legionella risk assessment. Some of these systems are listed in HSG274 Part 3: *The control of legionella bacteria in other risk systems*. This checklist gives brief guidance on controlling legionella in the systems listed, but this guidance does not contain the same level of detail as given in other guidance documents on controlling legionella in cooling systems and in hot and cold-water services.

3. The document presented here is one of a series published by The Water Management Society.

4. Each document in the series highlights a specific type of system where there is a recognised risk of Legionnaires' disease from the proliferation of legionella. The purpose of each document in the series is to discuss the issues that give rise to the risk and to offer guidance on controlling this risk. It should be noted that, although this guidance is given in some detail, each system is unique and the approach adopted in controlling the risk must therefore be based on the risk assessment of each specific system.

5. It should be emphasised that the guidance offered here is the considered opinion of The Water Management Society. No guidance document can offer complete protection from risk, but it is the Society's belief that, if this guidance is followed, then the risk of contracting Legionnaires' disease will be reduced. Legionella will grow in any water system where:

- The temperature of the water is between 20 and 45°C in any part of that system,
- There is sediment, sludge or nutrients which will support microbial growth,
- There are biofilms (or slimes) which may support the potential for legionella survival and growth,
- There is scale and/or corrosion (iron is a growth factor for legionellae),
- There are areas of no or low flow (stagnant areas) which increase the risk of microbial growth,
- Once established, legionellae pose a threat to human health wherever the system can produce a spray or aerosol at any time during normal operation or when being maintained, and there is a risk of susceptible persons breathing that aerosol.

6. In line with general principles, the processes for the safe management of emergency showers, eyebaths and facewash fountains should form part of a Water Safety Plan (WSP) [3]. WSPs are the overarching documents which should take account of all potential risks to human health, not just legionella, through consultation with the Water Safety Group (WSG) or responsible person as appropriate. It may be appropriate in certain circumstances to consider BS 8580-2:2022 Water quality - Risk assessments for *Pseudomonas aeruginosa* and other waterborne pathogens. Code of practice[4]. Skin and eye problems may arise from exposure to protozoa such as *Acanthamoeba* spp. (which can cause keratitis) and *Pseudomonas aeruginosa*, but such organisms are not within the scope of this document.

Specific Issues Related to Emergency Safety Showers, Eyebaths, and Facewash Fountains

7. It is important to keep the risk of contracting Legionnaires' disease from an emergency safety shower, eyebath, and facewash fountain in perspective. The purpose of such a unit is clearly to provide a measure of protection to the victim of accidental exposure to hazardous chemicals, etc. The risk of contracting Legionnaires' disease is therefore a secondary consideration and must not be allowed to diminish the function of the primary objective of the unit.

8. Emergency safety showers, eyebaths, and facewash fountains are found wherever there is a risk of individuals coming into skin or eye contact with hazardous substances e.g., chemicals such as strong acids and alkalis, radioactive materials, and microbial hazards. They might also be installed where there is a risk of burns or scalds or of foreign bodies entering the eyes. They are found throughout industrial sites, in laboratories, and in some public buildings (e.g., hospitals) where hazardous substances are used. Their purpose is to be available for use in emergency situations to provide a plentiful supply of water to wash the affected area. By their very nature, they remain unused for long periods of time.

9. Large industrial sites with emergency safety showers, eyebaths, and facewash fountains often have more than one source of water supply. BS EN 15154 1-6[5] guidance have information on both plumbed and non-plumbed systems (the German standard DIN 12899 has now been superseded by these EN documents). The American National Standard for Emergency Eyewash and Shower Equipment (ANSI/ ISEA Z358.1 - 2014)[6] suggests that whenever possible, labs should only use plumbed showers (connected to a continuous source of drinking water) instead of self-contained showers (which contain their own flushing fluid). The main reason for this is that a lab accident would require a continuous flow of water for at least 15 minutes.

10. Where prolonged full-body irrigation is not required, i.e., when it is unlikely that whole body contamination will occur, the use of a sterile water bottle is favoured; the bottle needs to be changed at regular intervals in line with the 'use-by-date', as the bottles ultimately become brittle. Unless the water is sterile, the quality of water stored for long periods of time in plastic bottles may also deteriorate due to microbial growth and cause eye and skin infections especially if there are chemical burns or other breaches in skin integrity.

Equipment Design
11. There are four essential requirements for the design of emergency safety showers, eyebaths, and facewash fountain systems:

1. an adequate water flow
2. ease of operation
3. instant and positive operation
4. reliability

12. Units are designed to be readily accessible, easily activated, and quick acting, with valves that can be activated within 1 second or less and that stay open so that the hands remain free to remove contaminated clothing.

13. Equipment must be capable of performing to their required design parameters even after long periods of idleness. It must therefore be made to a very high-quality standard with robust corrosion resistant components.

14. Commonly used materials of construction are galvanised steel, stainless steel, and plastics. Plastics are used extensively in emergency safety showers, eyebaths, and facewash fountains because they do not corrode. They are used in the construction of eyebath bowls, valve levers, outer jackets on heated models, and water storage tanks. Plastic coating over stainless steel is effective at minimising corrosion on operating handles and linkages, and stainless steel nuts, bolts and washers are commonly used. Acrylonitrile butadiene styrene (ABS) and Glass Reinforced Plastic (GRP) components are also commonly used.

Equipment Operation
15. Safety shower and eye wash nozzles/heads must be secure and should require the use of a tool to adjust or remove them. The control valve must be simple to operate, open fully within 1 second and remain open until intentionally closed. A safety shower should be at full flow within 3 seconds.

16. Eye wash nozzles must be protected from airborne contaminants. The removal of the nozzle protection should not require an additional step when activating.

Equipment Location/ Installation
17. BS EN 15154 advises the following for safety showers: *"Emergency safety shower installation should adhere to the following recommendations: - distance from chemical hazard to shower of less than 20 m without stairs or ramps or any obstacles between, or time of less than 10 s to get to the shower; - shower located in a clearly visible and easily identifiable place, and as far as possible on a regularly-taken path, inside the area exposed to the risk, withouth en-route hindrance by potential obstacles (partitions, doors, steps, corridors, etc.); - shower sheltered from contamination sources and well away from electricity sources; - marking of the way to the shower according to national regulations (see ISO 3864-1). The integration of the emergency safety body shower in the overall plumbing installation requires a specific study in terms of water flow and the capacity to provide a correct flow for each equipment."*

Temperature
18. Units located outdoors must not freeze in cold climates; neither should they overheat in hot climates. They must be always easily accessible and not used as storage areas (either temporary or permanent). Equipment that is located outdoors often has supply lines to the unit that are insulated and fitted with trace heating to prevent freezing in cold climates. Insulation also protects against high water temperatures in hot climates. BS EN 15154 advises that

special attention should be given to avoid overheating or freezing due to ambient conditions.

19. Storage tanks are often installed where warm water decontamination is essential to wash off certain specific hazardous substances. The tanks are fitted with thermostatically controlled immersion heaters to heat the stored water.

20. Temperatures in excess of 38°C have proven to be harmful to the eyes and can enhance chemical interaction with eyes and skin. Temperatures of 40°C and above can result in first degree burns on skin that has already been damaged by burns or abrasion. Medical evidence suggests that cool water is better for washing chemicals off the skin as it soothes the affected area and also closes the pores, which reduces absorption of the chemical through the skin. BS EN 15154 recommends that water delivered by the emergency safety equipment should be tepid, between 15-37°C (ideally between 20-25°C). Special attention should be given to avoid overheating or freezing due to ambient conditions.

Water Flow

21. BS EN 15154 advises that safety showers must comply with the following flow rates:

- Class I: 30-60 L/min
- Class II: > 60-100 L/min
- Class III: > 100 L/min

22. The safety shower or eye wash should deliver a continuous flow of water for at least 15 min with a velocity low enough to prevent further injury to the user.

23. Eye washes should deliver a constant flow of at least 6 L/min of flushing fluid for a minimum of 15 min.

Maintenance and Testing

24. BS EN 15154 advises that testing of safety showers and eye wash units should be performed at least **monthly** and the results documented. The test should include visual inspection of the spray pattern and water quality, and measurement of the flow rate. It is recommended by some manufacturers that units should be visually inspected and activated **weekly** along with an **annual** service to ensure reliable and effective operation.

25. ANSI/ ISEA Z358.1 – 2014 requires plumbed emergency showers to be **flushed weekly** to make sure they operate correctly and has three minimum requirements for weekly inspections:

a. "Emergency equipment shall be activated weekly" - this requires each piece of equipment to be activated.

b. "Activation shall ensure flow of water to the head(s) of the device" - this includes both the eyewash or eye/face wash head, as well as the showerhead.

c. "Duration of the activation shall be sufficient to ensure all stagnant water is flushed from the unit itself and all sections of piping that do not form part of a constant circulation system, also known as 'dead leg' portions" - the duration is determined by the length of piping where stagnant water could be sitting before it reaches the head(s) of the unit.

26. HSG274 part 3 **(table 1)** recommends the following for control of legionella but this is less stringent than the more recent standards described above.

Emergency showers, eyebaths and face-wash fountains	Flush through and purge to drain ensuring three to five times the volume of water in the stagnant zone is drawn off	As indicated by risk assessment, but at least every six months
	Inspect water storage tanks (where fitted)	Monthly
	Clean and disinfect shower heads, nozzles, roses, 'Y' strainers, and water storage tanks (where fitted)	Quarterly, or more frequently, as indicated by the risk assessment

Table 1

Assessing Legionella Risk

27. The following factors need to be considered when assessing the risk of contracting Legionnaires' disease from emergency safety showers, eyebaths, and facewash fountains, refer to BS 8580-1:2019 Water Quality. Risk assessments for Legionella control[7] for more information.

28. **Water Quality** – BS EN 15154 advises that *"materials used in the construction of the shower shall not affect the water quality or contaminate the water supply. Potable water or water of a similar quality complying with European or national standards is required for body showers."* It is important to note that water supplied to the unit may come directly from the mains. However, on industrial sites it may be supplied from a process water source. Industrial process waters should be pre-treated/filtered to make them suitable for this application. Water qualities vary depending on pre-treatment. Ideally, only mains should be used for emergency showers because of the increased risk of infection on physically or chemically damaged skin. In the event of an incident, first aiders should be aware of the additional risks if the water is from a source other than the mains so they can inform medical staff. If the user is a contact lens wearer, there may be a slightly increased risk from other waterborne organisms, such as amoebae.

29. **Supply Pipelines** – Emergency safety showers, eyebaths, and facewash fountains remain idle for long periods. The water in the supply line to the unit is also idle from the point of common supply. The risk assessment must consider the condition of the supply line, materials of construction, and the volume (i.e., length and internal diameter) of water held in the stagnant zone from the common supply to the unit compared with the volume replaced during routine flushing.

30. **Flushing Regimes** – When assessing the flushing frequency and length of time for a flushing regime, the aim should be to flush thoroughly, e.g., drawing off a volume at least 3-5 times the volume of water held in the stagnant zone. This can be calculated from pipe size and length from the point of common supply to the unit, plus knowledge of the design flow rate of the unit at the pressure of the water supply system.

31. When assessing the frequency and length of time for each flush for a tank-fed system, the calculation should take into account the volume of water stored in the tank and the design flow rate at the pressure of the unit. It is also important to calculate the volume of water in the supply pipe from the common supply to the storage tank make up valve and to compare this

with the volume of stored water.
The following table gives a guide to pipe sizes and water volumes.

SUPPLY PIPE SIZE	APPROX. VOLUME PER METRE	3 x VOLUME PER METRE	5 x VOLUME PER METRE
22 mm	380 mL	1.2 L	1.9 L
28 mm	615 mL	1.9 L	3.1 L
35 mm	960 mL	2.9 L	4.8 L
42 mm	1.4 L	4.2 L	7.0 L
54 mm	2.3 L	6.9 L	11.4 L

32. **Tank Storage** – Where stored water must be used for emergency showers the quality of the water must be maintained to potable quality standards because of the increased infection risk. In units with stored water, the condition and design of the water storage tank must be considered when assessing the risk. The tank should be kept clean and free from corrosion and should be designed to minimize the risk of ingress of foreign bodies, e.g., dust, insects, etc. The risk assessment should also consider the volume of stored water compared with the volume replaced during routine flushing. HSG274 part 3 recommends that the storage tank should be inspected monthly.

33. **Cleaning and Disinfection** – HSG274 part 3 recommends that certain components are cleaned and disinfected at least quarterly or more frequently as recommended by the risk assessment **(see table 1)**. The cleaning and disinfection procedure should take into account manufacturers guidance, materials of construction and the likelihood of damage to the components by the biocide. The consequences of failure of the unit compared to that of a domestic shower failure might be catastrophic so proof of competence of persons carrying out the task is essential.

34. Ensure that there is always cover, for example an operational emergency shower, in the event of an emergency when carrying out this work, in the immediate area. The timing of the cleaning and disinfection operation should be subject to risk assessment and done when the risk of exposure to hazardous chemicals is nil or at its lowest. Collaboration with Site Safety Officers is imperative in the planning and implementation of any clean and disinfection. Factors that might be considered are:

- can the job be done when hazardous chemicals are not present, e.g., during a shutdown?
- if some risk of exposure to hazardous chemicals is inevitable, can temporary alternative emergency shower arrangements be made, e.g., use of a mobile unit or an adjacent emergency shower?

35. **Equipment Condition** – The equipment should be in good, clean condition, free from nutrients, corrosion and deposits so that legionella are denied the environment in which they could proliferate.

36. **Temperature** – BS EN 15154 advises that *"Water temperature should be regulated to minimize the risk of hypothermia and at the same time curb the proliferation of bacteria like Legionella."* Legionella proliferate in the temperature range 20 – 45°C. When assessing the risk it is therefore important to record the temperature of the water supplying the equipment and to consider seasonal variations. In units with tank storage, the thermostatically set water temperature must be considered (if used) and the thermostat operation and settings should be checked.

37. In warm weather, particularly in the summer, account should be taken of the potential for growth if mains water input exceeds 20°C. Wherever possible, water temperatures should be kept below 20°C. If there are reasons why this cannot be maintained, then other, more stringent, precautionary measures should be taken to control the risk, e.g., a more regular flushing regime and / or more frequent cleaning and disinfection. Ideally temperatures should be recorded at the time of flushing.

38. **Sampling and Testing for Legionella** – In view of the potential for stagnation in emergency safety shower, eyebath, and facewash fountain systems, it is recommended that legionella sampling and testing is done if the risk assessment indicates the presence of a particularly high risk. Circumstances that might be considered to constitute such a high risk are, for example, tank water storage temperatures or supply line temperatures between 20 - 45°C, corrosion problems in the system or the supply to it, deposits in the system or the supply to it, unavoidably long periods of water stagnation, etc. The chosen frequency of sampling should be advised by the risk assessment. It may also be considered appropriate to sample the water after a genuine use of the equipment.

39. Section 7.3.1 of BS 7592 - Sampling for Legionella bacteria in water systems. Code of practice[8] advises the following when sampling from potable water cisterns:

"Potable water cisterns should not be opened for sampling as this can introduce contamination, especially when removing the lid. Instead, the sample should be taken from either a dedicated sample valve or the nearest outlet to the cistern. NOTE: In exceptional circumstances, e.g. outbreak investigations, it might be necessary to sample a drinking water storage tank. Any conditions in or around the tank which could result in contamination should be recorded, e.g. bird droppings, liners not intact or with tubercles, sediment or corrosion present, lids not fitting securely, evidence of debris, rubbish, human or animal access."

40. **Management and Procedures** – Management structure, definition of responsibilities, lines of communication, training, written procedures, record keeping etc., should also be reviewed when assessing legionella risk. These issues are all covered in detail within ACOP L8, HSG274 Guidance and WMSoc Guide to Risk Assessmen[t9].

References and Further Resources

1 L8 (Fourth edition) 2013 Legionnaires' disease. The control of legionella bacteria in water systems - *www.hse.gov.uk/pubns/books/l8.htm*

2 HSE HSG274 – Parts 1-3 - *www.hse.gov.uk/pubns/books/hsg274.htm*

3 BS 8680:2020 Water quality. Water safety plans. Code of practice. https://knowledge.bsigroup.com/products/water-quality-water-safety-plans-code-ofpractice?version=standard

4 BS 8580-2:2020 Water quality - Risk assessments for Pseudomonas aeruginosa and other waterborne pathogens. Code of practice.
BS 8580-2:2022 | 31 Jan 2022 | BSI Knowledge (bsigroup.com)

5 BS EN15154 Emergency Safety Showers.
https://knowledge.bsigroup.com/search?query=bs+en+15154&type=products

6 ANSI Z358.1-2014 Eyewash Standard
*https://webstore.ansi.org/standards/isea/ansiiseaz3582014r2020?source=blog&_gl=1*1jjgd3p*_gcl_au*MTgyMTg1NzE0LjE2OTUzODM4Mjc*.

7 BS 8580-1:2019 Water quality – Risk assessments for Legionella control – Code of practice - *shop.bsigroup.com/ProductDetail/?pid=000000000030367524*

8 BS 7592 - Sampling for Legionella bacteria in water systems. Code of practice. BS 7592:2022 - TC | 28 Feb 2022 | BSI Knowledge (*bsigroup.com*)

9 WMSoc: Guide to Legionella Risk Assessment
https://www.wmsoc.org.uk/knowledge/publication/23

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Disclaimer: the Water Management Society has published this document as part of a series of guidance papers designed to give support in the control of Legionella. Guidance in this document does not replace any legislative requirements and should be used in conjunction with any manufacturers' recommendations.

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