

Flushing Conventional Showers Lessons Learned

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Conventional showers of the mixer valve type are widely believed to be the single largest source of Legionnaires' disease and those that are not in regular weekly use present a reasonably foreseeable risk to health and as such precautions should be taken. The UK's Health and Safety Executive / Commission describe two alternative and very different control procedures within the Approved Code of Practice and Guidance: Legionnaires' disease (L8); described in the following paragraphs:

165: Conventional showers - Regular flushing and monitoring

166: Self-purging showers - Purges to drain immediately before use, via additional pipe work and without the production of aerosols.

L8: Paragraph 165

Describes how the risk from Legionella multiplying in peripheral parts of the domestic water system such as deadlegs may be minimised by regular use of these outlets. When outlets are not in regular use, weekly flushing of these devices for several minutes can significantly reduce the number of Legionella discharged from the outlet. Once started, this procedure has to be sustained and logged, as lapses can result in a critical increase in Legionella at the outlet. Risk assessments may indicate the need for more frequent flushing where there is a more susceptible population present, eg in hospitals, nursing homes etc.

Domestic Water Systems

Controlling Legionella in typical large domestic water systems is often considered as controlling two systems which should work together; one cannot provide whole system control without the other:

1. The central system - heating devices and distribution pipe work etc
2. Peripheral systems – dead legs and outlets (showers / taps) etc.

All parts of the system should be designed, installed and maintained in accordance with L8 and it would be prudent to assume that Legionella is always present in domestic water systems, even when none are detected; small numbers of Legionella can enter a buildings water services on any day of the operating year.

Central water systems should always minimize the number of Legionella that pass to peripheral systems; the majority of Legionella are normally killed / controlled by raised water temperatures and biocides, however, always expect small numbers of Legionella to evade the effects of these control regimes. Legionella often find passage, in low numbers, to dead legs and those serving showers are of particular concern.

Guidance Note on Flushing

Reasons why showers are often associated with outbreaks:

Most showers fall out of weekly use at sometime during their working lifetime: during holidays; refurbishments; seasonal uses; unoccupied hotel rooms etc.

Showers out of use for just a matter of days have been shown to provide conditions suitable for the multiplication of Legionella and to potentially hazardous levels, conditions include: Stagnant water at room / service void temperatures;

- A plentiful supply of nutrients in biofilms that line the internal aspects of pipes and fittings;
- Combined with a very efficient means of disseminating Legionella directly to the
- person showering.

As regular flushing continues to be associated with LD outbreaks we should consider possible reasons why.

What Happens During Flushing?

A competent person, with adequate training and resources behind them, should first turn the shower mixer valve onto a hot setting (lower risk cold water is normally drawn at all times by mixer valves, even on the hottest setting, however, always check this); a series of events now follows:

Contaminated stagnant water from the peripheral system (shower and associated dead legs) is displaced by water from the central system; this is the cooler unwanted water found at the beginning of a shower. Flushed water carries away waterborne Legionella and shears unstable biofilm lining the internal aspects of pipe work and fittings, which harbour Legionella. Contaminated water and biofilm now passes from the shower, however, passage is often interrupted by complicated internal devices which restrict the flow; conventional spray plates are often associated with the highest levels of contamination in domestic water systems.

Further consideration:

Showers are often constructed to meet interior design requirements; spray plate apertures are often too fine and become easily blocked by debris and lime scale – offering further obstruction. Complicated by spray plate mechanisms offering multiple spray patterns cause further obstruction to Legionella. Successful flushing requires Legionella and contaminated biofilm to pass these obstacles; when flushing it would be prudent to flush through all the different spray patterns.

Flexible tap tails and shower hoses have become of increased concern, mainly due to poor material choice. However, it should be remembered that some materials which resist microbial growth when new have been shown to lose this resistance with age.

Flexible shower hoses conceal another area for concern; flushing is normally carried out with the shower clipped up or placed on the shower floor. Hydraulic shocks can dislodge biofilms, however, the physical movement of pipes and hoses can also dislodge biofilm into the shower spray water flow. After flushing, the next user can move the hose and heavily contaminated

Guidance Note on Flushing

biofilms may become dislodged and potentially infect the user. Flexible showerhead hoses can allow shower heads to enter bath on this.

L8 describes how showerheads should be dismantled, descaled and cleaned, quarterly or as necessary; it would be prudent to clean at least quarterly. If the showerhead can enter bath water further consideration should be given to more frequent cleaning – a grossly underestimated area for concern.

The hydraulic characteristics of water systems have a big effect on flushing; flushing at 1 Bar is completely different to flushing a system at 0.3 Bar. Debris, biofilm and Legionella must be carried from the system, the slower the water velocity the less effective this process will be.

Some specialist shower manufacturers recommend flushing above 0.5 Bar. Low flow rate showers should be designed with flushing considerations in mind – unfortunately water conservation is not very helpful for flushing of showers. The designated flusher should flush for several minutes, the time should be detailed in the risk assessment, however, this should cover local variations, which include:

- Different water pressures;
- Different sizes of spray plate apertures and other obstructions;
- Mixer valves, mixing water in different quantities;
- Different dead leg lengths;
- Different constructions: fixed showers / hoses;
- Different materials; ages; contamination levels;
- Different people flushing in different ways;
- Different shower head cleaning regimes;
- Seasonal variations – internal / external system factors (article to follow on this point).

It is impossible to calculate an exact time to flush showers, however, several minutes seems to cover most eventualities; many choose five minutes. Always check to see how long hot water arrives at the outlet; L8 describes it should take no longer than one minute to reach 50°C. When you consider dead leg constructions, one minute is a very long time for this to take place.

Monitoring

Monitoring the contamination found in showers will help assess if regular flushing is effective, however, it may indicate that flushing should be carried out at more regular intervals. Independent scientific studies about daily flushing have been published, and describe this as an effective means of controlling Legionella at the shower. Those showers which are not controlled successfully by weekly flushing should be flushed more frequently. L8 does however recommend that flushing is carried out more frequently where highly susceptible occupants are present.

Monitoring is useful to check the efficacy of control regimes; however, it is not an alternative to maintaining regular shower flushing records, which should be checked very regularly, if not daily, to detect underused outlets. Where multiple showers are fitted, e.g. hotels, it is difficult to detect if a shower has been used; a very common mistake is to simply assume

Guidance Note on Flushing

room occupancy means the shower has been used. The personal health risks of those designated to flush showers should also be considered – see below

Hospital Shower Fatality - Independent Inquiry, Ireland

After a hospital related showering fatality, a full independent inquiry was held and the findings published in 2003, this was made available for all to inspect and learn from; clearly a transparent process which helps build public confidence. The inquiry highlighted those staff that should not be considered for flushing, which included those who are, or suffer from the following:

- Smokers
- Diabetes
- Chronic lung or kidney disease
- Immunosuppressant - especially that caused by steroid therapy
- Staff who have had an organ transplant
- Alcoholics

(Age guidelines should also have been considered)

The inquiry also highlighted a protocol for flushing, and the following was highlighted:

- All outlets to be flushed daily whether in use or not;
- Flushing requires that water flows through the outlet for a period of at least 5 minutes;
- Flushing should take place after the facility has been cleaned;
- Showers should be flushed at the maximum hot setting;
- Doors to en-suite facilities should remain closed during the flushing period and should display a
- notice indicating that cleaning is in progress and the facility is out of use;
- Daily flushing to be recorded accordingly.

(Flushing through different shower head spray patterns should be mentioned - when fitted)

Why is Regular Flushing Often Associated with Legionella Infections?

We often read about cases of LD attributed to a rare and unusual set of circumstances, however, in reality these circumstances are very common in showers. L8 describes how the logging of regular flushing is important, as lapses have been shown to cause a CRITICAL increase in Legionella at the outlet; this is not an overstatement, scientific studies have previously used logarithmic scale graph paper to plot this increase. When flushing lapses occur there is a reasonably foreseeable potential risk to health and this is likely to be one of the main reasons why flushing showers, or rather flushing lapses, is often associated with LD outbreaks.

There is often much confusion surrounding showers during outbreaks, and it should be remembered that a conventional shower providing a lethal dose of Legionella one day may be perfectly safe to use the next day. It would be prudent to always maintain regular flushing records in compliance with L8.

Guidance Note on Flushing

Alternative to Flushing

L8 describes that regular flushing may be difficult to achieve, and in these instances it describes an alternative solution: self-purging showers, technology described in paragraph 166 of L8.

A Cautionary Note

As the media reports the ever-increasing number of fatalities associated with conventional showering, which in turn improves the general public's awareness, it is no surprise to hear of an increase in the number of legal claims against implicated organisations. A Legionella infection of increasing concern is Pontiac fever, which is a self-limiting flu-like illness; it is believed that a number of opportunistic claims have been made against those offering showering services and without adequate control regimes in place there will always be an increased risk to both health and business.