

## ESSENTIAL WATER SURGERY

for your dental surgery

A new piece of legislation for Primary Care Dentists was issued recently as a Health Technical Memorandum. It highlighted Dental Practice Hygiene and the maintenance of hot and cold water systems and dental unit water lines (DUWL). The memorandum is designed to prevent the proliferation of Legionella bacteria with full compliancy for dentists required by April 2011.

### The Memorandum refers to ACOP L8 and recommends that all practices should:

- Undertake a Legionella risk assessment on their hot and cold water systems, including DUWLs to identify potential risks
- Create schematics of hot and cold water systems to identify future control measures
- Carry out remedial work to ensure that their water systems comply with regulations
- Implement monitoring programmes to ensure control measures minimise future Legionella risks
- Ensure that the work is completed by a qualified and registered Legionella Control Association (LCA) organisation

As standard practice, all water containing systems need to be surveyed as does the monitoring of records such as DUWL daily flushing routines to minimise stagnation. The memorandum recommends the flushing of 'low-use' outlets twice a week.

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EVERYDAY PROBLEMS, UNIQUE SOLUTIONS



# 19 Hot and cold water systems and dental unit water lines

19.1 Registered Managers of dental practices have an overriding general duty of care under the Health and Safety at Work etc Act 1974. Therefore, they should ensure that the water supply, storage and distribution services should comply with the best practice guidance given in:

- the Health & Safety Commission's 'Legionnaires' disease – the control of *legionella* bacteria in water systems. Approved Code of Practice & Guidance' (also known as L8); and
- Health Technical Memorandum 04-01 'The control of *Legionella*, hygiene, "safe" hot water, cold water and drinking water systems'.

The Approved Code of Practice L8 has a special legal status. Health and safety inspectors seek to secure compliance with the law and may refer to L8 as an illustration of good practice.

Compliance with Health Technical Memorandum 04-01 and this guidance document will satisfy L8.

19.2 All premises are required to have a **written scheme** and a *Legionella* **risk assessment** for controlling any identified risks in accordance with L8:

- Competent Persons who are members of the Legionella Control Association are able to produce written schemes to the required standard.
- A **risk assessment** for the water services will be necessary to identify potential problems in the system (for example, excess storage capacity, temperature distribution problems, low water usage, inappropriate materials etc). The risk assessment should be carried out by a Competent Person.
- The Registered Manager should ensure that an operational plan is in place for each site under his/her control. This document should comprise:

up-to-date as-fitted drawings, schematic diagrams and descriptions of all the supply,

storage and distribution systems within those premises;

As-fitted drawings can be obtained from third parties such as architects.

step-by-step instructions to operate, maintain, control and shut down the water supply, storage and distribution systems within those premises;

a schedule of possible emergency incidents causing loss of the water supply from the water undertaker. Each item in the emergency incident schedule should include guidance on operational procedures to re-establish a stable wholesome water supply.

19.3 The Registered Manager should implement a programme of staff training to ensure that those appointed to devise strategies and carry out control measures are appropriately informed, instructed and trained, and should be assessed as to their competency. It is also essential that they have an overall appreciation of the practices affecting water hygiene and safety, and that they can interpret the available guidance and perform their tasks in a safe and technically competent manner.

## Safe hot water temperature

19.4 To reduce the risk of scalding, thermostatic mixing devices should be installed where applicable. A risk assessment will be necessary to establish the need and type of device to be installed.

19.5 Routine checks are essential to ensure continued satisfactory operation.

## Utilisation

19.6 One of the critical factors affecting the quality of water within hot and cold water distribution systems is the extent of utilisation. The Registered Manager needs to ensure that there is good liaison between staff members in the dental practice to ensure that the water services are sufficiently used.

- 19.7 L8 recommends that, for sporadically used taps, flushing is carried out once a week. The procedure for such practice should be fully documented and covered by written instructions.

### Flushing dental unit water lines (DUWLs)

- 19.8 For procedures on flushing DUWLs between treatment sessions and at the beginning/end of each working day, see [paragraphs 6.84](#) [6.86](#).

### Decommissioning of DUWLs

- 19.9 Follow the manufacturer's guidance for the temporary decommissioning of DUWLs.
- 19.10 In the absence of manufacturer's guidance, DUWLs should be flushed, drained and left disconnected during any temporary closure of the treatment room. If this is not practicable, they should be flushed on a weekly basis as per the guidance above.
- 19.11 Self-contained water bottles (bottled water systems) should be removed, flushed with distilled or fresh RO water and left open to the air for drying. They should then be stored inverted to prevent contamination during the temporary closure.

### Recommissioning of DUWLs

- 19.12 In the absence of manufacturer's guidance, flush the DUWL for at least three minutes, disinfect the DUWL with a suitable disinfectant (as recommended by the manufacturer for routine disinfection of the DUWL), then flush for a further three minutes.
- 19.13 Where in-line filters are used, these will require treatment using a cleansing solution that has been recommended by the manufacturer. This step should be performed after first flushing the DUWL.

#### Note

Care should be taken to minimise the occurrence of splashing and aerosol formation.

- 19.14 If DUWLs have disposable filters, they should be replaced.
- 19.15 Self-contained water bottles (bottled water systems) should be flushed with distilled or clean RO water. Where visual contamination is present, flushing with a suitable disinfectant followed by

thorough washing is necessary. The manufacturer's instructions will specify which disinfectant to use. In instances where visual contamination is routinely detected, it will be necessary to decrease the interval between flushing operations. If good practice is followed, practices should not routinely detect evidence of visual contamination.

#### Note

The self-contained water supplies used for dental care systems should be freshly distilled or RO water (see [Chapter 17](#)).

- 19.16 As part of the recommissioning, dental equipment requiring protection against backflow should have the anti-retraction valves (incorporated on handpieces or waterlines) checked by the responsible person. They should ensure they are suitably decontaminated, refitted correctly and are operating in the correct manner. Examples of dental equipment requiring backflow protection are:
- dental spittoons;
  - three-in-one syringes;
  - ultrasonic scalers;
  - wet-line suction apparatus; and
  - self-filling automatic radiographic processors (where still used).
- 19.17 Adherence to the equipment manufacturer's recommended cleaning procedures, including use of the manufacturer's recommended chemicals, is a requirement for medical devices such as those listed above.

### Maintenance policy

- 19.18 The Registered Manager is ultimately responsible for the provision of a wholesome water supply in the premises under his/her authority.

### Contract maintenance

- 19.19 When selecting subcontractors, particularly in relation to the control of *Legionella*, their competence should be established beforehand (for example, companies/individuals who are members of the Legionella Control Association).

### Emergency action

- 19.20 Contingency plans should be available in the event of the following:

a. A power failure:

This may result in a failure to maintain temperature in the hot water system.

If the dental practice produces its own distilled water, this will restrict the amount of distilled water that can be produced in a set time period.

b. A mains-water failure that could last beyond the period for which storage capacity has been designed:

may result in the temporary cessation of the production of RO water;

may require the temporary cessation of sterile supply activities;

may result in hygiene issues for patient and staff WCs/washrooms;

The emergency action to be taken during an outbreak of healthcare-associated legionellosis is covered in Health Technical Memorandum 04-01 Part B Appendix 1.

**Documentation**

19.21 It is essential to have comprehensive operational manuals for all items of plant; they should include requirements for servicing, maintenance tasks and frequencies of inspection.

19.22 This information should be kept together with all commissioning data.

**As-fitted drawings**

19.23 The availability of accurate as-fitted drawings is essential for the safe operation of hot and cold water service systems. The drawings are necessary to perform the temperature control checks on the systems and will assist in identifying any potential problems with poor hot water circulation and cold water dead-legs where flow to sporadically-used outlets can be low. Such information should identify all key components in the installations, for example water meters, storage tanks (filtration equipment, where fitted), calorifiers and the location of isolating valves in the systems. As-fitted drawings can be obtained from third parties such as architects.

19.24 In addition to drawings, there should be comprehensive schedules of outlets, lists of sentinel

taps (outlets), other outlets to be tested annually and other components in the system.

**Note**

The information required above could be compiled by the Competent Person employed to produce the written scheme, since much of the information is an integral part of the written scheme itself.

**Record-keeping**

19.25 The User should ensure that an accurate record of all assets relating to the hot and cold water distribution systems is set up and regularly maintained.

19.26 The User should also ensure that records of all maintenance, inspection and testing activities are kept up-to-date and properly stored. Records should be kept for at least five years. As a minimum, the following items should be recorded:

- the names and positions of those responsible for performing the various tasks under the written scheme;
- a *Legionella* risk assessment and a written scheme of actions and control measures;
- details of precautionary measures that have been carried out, including sufficient detail to identify that the work was completed correctly and when the work was carried out.

19.27 Planned preventive maintenance will help to ensure that systems perform correctly, and an essential element of this process is the maintenance of accurate records.

19.28 Maintenance records should include the following:

- details of remedial work required and work carried out;
- details of cleaning and disinfection procedures;
- results of any chemical or microbiological analyses of water.

19.29 When alterations to equipment or systems are implemented, any drawings kept with the records should be updated to reflect the modifications carried out.

19.30 The asset register should be designed to provide the following information:

- an inventory of equipment;
- a basis for identifying equipment details;

- a basis for recording the maintenance requirements;
- a basis for recording and accessing information associated with disinfection and maintenance.

19.31 When completing records, it is essential that the individual concerned signs and dates the entries, and that there is an audit trail in place.

### Water supply hygiene

19.32 After any installation work, all piping, fittings and associated services used for the conveyance of water for domestic purposes must be disinfected before being brought into use. The method generally used for disinfection is chlorination. Disinfection using chlorine should be carried out in accordance with BS EN 806-2:2005, BS EN 806-3:2006 and BS 6700:2006 (see also Health Technical Memorandum 04-01 Part A Chapter 17) and under the direct supervision of a nominated person.

19.33 Despite disinfection of systems, some outbreaks of disease related to treated water supplies still occur. To reduce the risk of such outbreaks, the design should eliminate:

- direct contact with the internal parts of water pipes and structures by people, animals or birds (for example, ensure covers are in place on storage tanks/cisterns);
- backflow (back-siphonage) of contaminated water into systems conveying potable water (mains and storage structures).

### Water treatment

19.34 In a properly installed and commissioned hot water system, it should be possible to maintain a temperature of at least 55°C at the furthest draw-off point in the circulating system, and 50°C in the circulating system's return connection to the calorifier.

19.35 In older premises, however, this may not be possible, and in the case of cold water systems it is not always possible or practicable to maintain water temperature below 20°C because of utilisation and complexity. In addition, therefore, it may be necessary to apply a residual biocidal water treatment that has been shown to destroy and remove biofilm. Information on these techniques, which include chlorine dioxide and copper and silver ionisation, can be found in Health Technical Memorandum 04-01 Part B.

### Note

In addition to residual biocidal techniques, there are other manufacturer-specified treatments that are developed for use on DUWLs and other associated dental equipment. Refer to the manufacturer's instructions for their correct use.

19.36 Where automatic equipment is used for disinfection, it should indicate any change in the amount or concentration of material injected into the water so that immediate action can be taken.

19.37 Continuous dosing with appropriate biocides that have proven efficacy should be considered during construction to prevent the accumulation of biofilm. A regular flushing programme for all outlets should also be implemented.

19.38 The continuous chlorination of hot and cold water service systems to control the growth of *Legionella* is not generally recommended. Treatment using chlorine dioxide or copper/silver ionisation can be used. Advice should be sought from the PCT's Responsible Person (Water).

19.39 In defining their responsibilities, service providers should be asked to advise on test methods and anticipated concentrations of residual chemicals within the system. (See also Chapter 3 of Health Technical Memorandum 04-01 Part A for more guidance on water treatment regimens.)

### Purging the systems

19.40 Where chemical treatment is introduced, it is essential to ensure that all parts of the system are purged so that adequate concentrations are achieved.

19.41 As temperature monitoring is performed on sentinel and representative outlets on a rolling basis only, additional draw-off will be required at all points on a regular basis.

### Ozone and ultraviolet treatment

19.42 Whereas treatments such as chlorine dioxide and copper and silver ionisation are intended to be dispersive (that is, they result in a residual agent within the system), ozone and ultraviolet are intended to be effective close to the point of application. They are not, therefore, necessarily effective in hot and cold water service systems (see Chapter 15 of Health Technical Memorandum 04-01 Part A).

### Metal contamination

19.43 See Health Technical Memorandum 04-01 Part A Chapter 6.

### Filtration

19.44 It is essential for filter cartridge elements to be changed at appropriate intervals in accordance with the manufacturer's recommendations, taking into account local conditions.

19.45 Filter membranes should also be chemically cleaned or replaced at the recommended periods, and care must be taken to ensure that the "vessel or "housing" containing the filter assembly is also disinfected appropriately during filter or membrane maintenance.

### Water storage

19.46 For general information on water storage, see Health Technical Memorandum 04-01 Part A (paragraphs 7.1–7.2) and Health Technical Memorandum 04-01 Part B (paragraphs 7.54–7.61).

### Cold water distribution system

19.47 The design and installation of the cold water distribution system should comply with the Water Supply (Water Fittings) Regulations 1999 and relevant parts of BS EN 806-2:2005, BS EN 806-3:2006 and BS 6700:2006. (See Chapter 8 of Health Technical Memorandum 04-01 Part A for further information.)

19.48 The control of water temperature in the cold water service will essentially rely on good insulation and water turnover. Cold water services should be sized to provide sufficient flow and should be insulated and kept away from areas where they are prone to thermal gains (this also applies to water supplies for spittoons). Stagnation must be avoided. Special attention should be given to the maintenance and monitoring of these systems.

19.49 Schematic drawings of the system with numbered and labelled valves will reduce confusion and save time in trying to identify appropriate isolating valves and other system components.

19.50 Checks and actions should be carried out to show that:

- the system components show no sign of leakage or corrosion;
- the system insulation is in good condition;

- the system filters have been changed and/or cleaned in accordance with manufacturer's recommendations. Strainers should be checked and cleaned regularly;
- all isolating valves have periodically been worked through their full range of travel;
- every water outlet complies with the backflow protection requirements of the Water Supply (Water Fittings) Regulations 1999.

### Drinking water

19.51 If separate drinking water supplies are provided, reference should be made to Health Technical Memorandum 04-01 Part A (paragraphs 8.13 and 8.14).

### Hot water storage and distribution

19.52 Hot water services should be designed and installed in accordance with the Water Supply (Water Fittings) Regulations 1999 and relevant parts of BS EN 806-2:2005, BS EN 806-3:2006 and BS 6700:2006. The hot water system may be of either the vented or the unvented type. (See Health Technical Memorandum 04-01 Part A Chapter 9 for further information.)

19.53 To control possible colonisation by *Legionella*, it is essential to maintain the temperature within the hot water circulating system. To some extent, if properly maintained, the calorifier/water heater will provide a form of barrier to *Legionella* and other water-borne organisms. The minimum flow temperature of water leaving the calorifier/water heater should be 60°C at all times and 55°C at the supply to the furthest draw-off point in the circulating system.

### Notes

A minimum of 55°C may be required for the operation of suitable mixing devices to provide "safe hot water at the upper limit of the recommended range.

In large non-recirculating systems, the minimum of 55°C should be maintained by electric trace-heating.

19.54 The minimum water temperature at the connection of the return to the calorifier/water heater should be 50°C. To achieve the required circulating temperatures, it will be necessary to maintain the balance of flows to individual pipe branches and draw-off points.

19.55 Calorifiers (where fitted) should be subjected to regular procedures that include the following:

- cleaning and maintenance;
- quarterly draining to minimise the accumulation of sludge. This may be extended to annual draining if, during inspection, it is found that there is little accumulation of debris;
- whenever dismantled for statutory inspection, or every year in the case of indirect calorifiers, calorifiers should be thoroughly cleaned to remove sludge, loose debris and scale;
- whenever a calorifier is taken out of service, it should be refilled, drained, refilled again and the entire contents brought up to, and held at, the nominal operating temperature of 60°C for at least an hour.

See also Health Technical Memorandum 04-01 Part B paragraphs 7.74–7.76 for further advice on calorifiers.

### Instantaneous water heaters for single or multi-point outlets

19.56 The general principles and limitations of instantaneous water heaters are given in the relevant parts of BS EN 806-2:2005, BS EN 806-3:2006 and BS 6700:2006. In essence:

- the flow rate is limited and is dependent upon the heater's hot water power rating;
- where restricted rates of delivery are acceptable, the heater can deliver continuous hot water without requiring time to reheat;
- they are susceptible to scale formation in hard water areas, where they will require frequent maintenance;
- this form of hot water heating should only be considered for smaller premises or where it is not economically viable to run hot water distribution to a remote outlet.

### Safe hot water delivery devices

19.57 Appropriate types of thermostatic mixing device are specified in Health Technical Memorandum 04-01 Part A Table 4.

19.58 It is essential to check the temperature settings and operation of all water mixing devices regularly (preferably every six months, provided that there is no "drift" in excess of 1°C). Other maintenance

should be strictly in accordance with the manufacturer's instructions.

19.59 Local water quality will influence the maintenance frequency for any installation. (A relatively small piece of debris may restrict the operation of the temperature control and fail-safe mechanisms.)

19.60 The recommendations regarding safe water temperature apply to all areas to which patients and visitors have free access.

### Materials of construction

19.61 Systems should comply with the requirements of the Water Supply (Water Fittings) Regulations 1999. Materials used in contact with water that is for drinking etc should comply with BS 6920-1:2000 and be listed in the latest edition of the 'Water Fittings and Materials Directory' published by WRAS.

### Temperature control regimen

19.62 Temperature control regimen is the preferred strategy to maintain systems free from *Legionella* and other water-borne organisms. This will require monitoring on a regular basis. The test frequencies are listed below in Table 1.

### Point-of-use filtration

19.63 Point-of-use filters must be changed in accordance with manufacturers' recommendations, typically at least once a month. When changing filters, it is recommended that water-quality sampling takes place at outlets identified as sentinel points before refitting a replacement filter. Except where taking samples as above, once point-of-use filtration has been introduced, taps or showers must not be used without a filter in place.

19.64 Where point-of-use filters are no longer required, the outlet and associated pipework must be disinfected to remove any accumulated biofilm before the system is returned to service (see also Health Technical Memorandum 04-01 Part A paragraph 5.16).

### Summary checklist

19.65 A summary checklist for hot and cold water services showing recommended frequency of activity is given in Table 2.

The checks/tasks outlined in Tables 1 and 2 could be carried out by trained user or contracted-out to a third party (for example a PCT).

Table 1 Tests for temperature performance

Frequency	Check	Cold water	Hot water	Notes
Monthly	Sentinel outlets	The water temperature should equilibrate below 20°C after draw-off for 2 minutes <sup>1,2</sup>	The water temperature should equilibrate to at least 50°C after draw-off for 1 minute <sup>3</sup>	These measurements are applicable to non-mixed outlets only
Monthly	Inlets to sentinel TMVs	Temperatures as above	Temperatures as above	Measurements can be made by means of surface temperature probes
Monthly	Water leaving and returning to calorifier			Also to be monitored continuously by BMS
6-monthly	In-coming cold water at inlet to building in the winter and in the summer	The water should be below 20°C <sup>2</sup>		Also to be continuously monitored by BMS
Annually	Representative outlets	The water temperature should equilibrate below 20°C after draw-off for 2 minutes <sup>1,2</sup>	The water temperature should equilibrate to at least 50°C after draw-off for 1 minute <sup>3</sup>	

Notes:

Sentinel outlets are normally those that on a hot water service are the first and last outlets on a recirculating system. On cold water systems (or non-recirculating hot water systems), they are the closest and furthest from the storage tank (or water heater). The choice of sentinel taps should also include other outlets that are considered to represent a particular risk, for example those installed in accommodation in which particularly susceptible patients are treated, or others identified in the risk assessment and temperature mapping exercise as having the least satisfactory temperature performance.

‡ Representative outlets include conventional and mixed-temperature taps; 20% of the total number installed throughout the premises would be tested annually on a rotational basis: that is, all taps checked every five years.

1. The Health & Safety Commission's (2000) Approved Code of Practice L8 permits a period of two minutes to achieve an equilibrium temperature below 20°C. Achieving this minimum requirement would be indicative of an exceptionally underutilised water system. (At a typical flow to a wash-hand basin of 4.5 L/m, 2 minutes to achieve temperature would indicate a 50 m dead-leg of 15 mm pipe.)
2. The Water Supply (Water Quality) Regulations 2000 permit water undertakers to supply water to premises at temperatures up to 25°C. In practice, the water temperature is likely to be below this maximum value, typically below 10°C in winter and 20°C in summer. If, during prolonged periods of high environmental temperature, the water temperature starts to exceed 20°C, the water undertaker should be asked to see whether remedial action could be undertaken. Within the curtilage of the premises, the aim should be to ensure that the temperature difference between the in-coming supply and most distal parts of the distribution system is below 2°C.
3. The Health & Safety Commission's (2000) Approved Code of Practice L8 permits a period of 1 minute to achieve an equilibrium temperature of 50°C. A minimum of 55°C may be required for the operation of suitable mixing devices required to provide "safe" hot water at the upper limit of the recommended range. Hot water at 55°C is required in many cases for reasons of food hygiene or decontamination requirements, for example in kitchens and sluice rooms etc. In a properly balanced hot water circulating system, with the circulation taken close to the draw-off point, achieving temperature should be virtually instantaneous. (At a typical flow to a wash-hand basin of 4.5 L/m, 1 minute to achieve temperature would indicate a 25 m dead-leg of 15 mm pipe.)

**Table 2 Summary checklist for hot and cold water services**

Service	Task*	Frequency
Hot water services	Arrange for samples to be taken from hot water calorifiers/ water heaters in order to note condition of drain water	Annually
	Check temperatures in flow and return at calorifiers/water heaters	Monthly <sup>4</sup>
	Check water temperature after draw-off from outlets for 1 minute to ensure that 50°C has been achieved in sentinel outlets <sup>1,2,5</sup>	Monthly <sup>4</sup>
	Visually check internal surfaces of calorifiers/water heaters for scale and sludge. <sup>5</sup> Check representative taps for temperature as above on a rotational basis	Annually
	Manual check to confirm secondary hot water recirculation pumps are operating effectively	Monthly
Cold water services	Check tank water temperature remote from in-coming ball valve and mains temperatures. Note maximum temperatures recorded by fixed max/min thermometers, where fitted	6-monthly <sup>4</sup>
	Check temperature in sentinel outlets after draw-off for 2 minutes to establish that it is below 20°C <sup>2,3</sup>	Monthly
	Visually inspect cold water storage tanks and carry out remedial work where necessary. Check representative taps for temperature, as above, on a rotational basis	Annually
Dental equipment	Drain down and clean	At the end of each working day
Emergency eye wash sprays	Flush through and purge to drain	6-monthly or more frequently if recommended by manufacturers
Mixed-temperature outlets	Check delivery temperature in accordance with D08	6-monthly
Showerheads	Dismantle, clean and descale showerheads and hoses	Quarterly, or as necessary
Sporadically-used outlets	Flush through and purge to drain, or purge to drain immediately before use without release of aerosols	At least twice weekly <sup>6</sup>

Notes:

\* See paragraph 182 in the Health & Safety Commission's Approved Code of Practice L8 for further guidance on tasks that should be undertaken.

1. For effective operation of hot water services, the minimum equilibrium temperature should be 55°C and be achieved within seconds.
2. For thermostatic mixing devices, temperatures should be measured at the inlet.
3. For satisfactory operation of cold water services, temperature equilibrium to below 20°C should be achieved well within one minute.
4. Temperatures should be continuously monitored by the BMS.
5. Additional checks should be made on the hot water circulating system and systems using trace heating at distal points.
6. Risk assessment may indicate the need for more frequent flushing of outlets. It is preferable that this form part of the daily cleaning routine where appropriate. Alternatively, self-purging showers that discharge water to a drain prior to use and without the release of aerosols can be considered.

## Microbiological monitoring

- 19.66 Apart from situations where there are taste or odour problems, microbiological monitoring for total viable counts (TVCs) is not considered to be necessary.
- 19.67 If performed for these purposes, the detection of low TVCs is not necessarily an indication of the

absence of *Legionella*, but is an indication of the overall water quality and signifies a generally unfavourable environment for bacteria.

- 19.68 All microbiological measurements should be by approved methods and/or be carried out by United Kingdom Accreditation Service (UKAS)-accredited laboratories. Dip slides are not acceptable.