

**Risk management plan for**

*LEGIONELLA*

CONTROL

in the operation and maintenance of the water distribution system of

***Facility name***

|  |  |
| --- | --- |
| Facility name |  |
| Facility address |  |
| Responsible person |  |

Revision history

| Revision | Comment | Date | Initials |
| --- | --- | --- | --- |
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## Advisory note

This template has been provided to assist in the development of a risk management plan for *Legionella* control based on the information and processes described in the enHealth *Guidelines for Legionella control in the operation and maintenance of water distribution systems in health and aged care facilities*.

Advisory information has been included in certain sections to assist with the interpretation and completion of relevant plan details. It is expected that this content will be either deleted or replaced with content specific to your facility in your final document.

In the event of complicated plumbing infrastructure, positive *Legionella* test results that are not easily controlled via the implementation of measures within the plan, an outbreak of Legionnaires’ disease, or lack of confidence in in-house ability to prepare and implement the plan, external expert assistance should be sought.

# 1 Risk management team

Summary of actions:

Nominate *Legionella* risk management team members.

Record why team members have been selected to participate in *Legionella* risk management.

Clearly articulate the responsibilities of each member of the risk management team.

Table 1 Risk management team members

| Name | Organisation | Position | *Legionella* risk management and reporting responsibilities | Skills/knowledge/experience  *(reasons for being in team)* | Contact details |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
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# 2 Risk analysis

Summary of actions:

Gather information on the water distribution system.

Gather information on the water uses and users within the facility.

Describe the system (including treatment).

Discuss the quality of incoming water.

Identify hazards associated the facility’s water supply system.

Identify existing control measures.

Perform risk assessment.

## 2.1 System description

Insert a flow diagram/schematic drawing/plan of your facility’s drinking water system. An example is shown below.



Figure 1 Schematic of *Facility name* water delivery system

### 2.1.1 Uses of water

List uses of water within the facility, for example:

drinking (includes feed into ice machines and water dispensers)

clinical uses (eg dialysis, hydrotherapy, irrigation of wounds, dental chairs)

swimming and spa pools

bathing

toilet flushing

laundry

firefighting and fire suppression (including sprinklers)

food preparation (including ice making)

irrigation of grounds

birthing pools

decorative fountains.

### 2.1.2 Users of water

Provide details of water users in the facility, for example:

facility population/number of beds

clinical functions (eg maternity, intensive care etc.)

specialist functions (eg dental)

approximate percentage and location (if possible) of high and low clinical risk patients.

### 2.1.3 Incoming water

Provide details of incoming water, both drinking water and non-potable. If there are various sources, identify the linked uses (see 2.1.1). For example:

What is the source of the incoming water (eg bore, surface, rainwater)?

What treatment processes does the incoming water undergo before entry into facility?

Where are the entry points for the incoming water to the facility?

How reliable is the incoming water (eg consistency of water chemistry and microbial quality)?

Is the water treated within your facility?

Is there an emergency supply and what is its source and quality?

### 2.1.4 Quality of incoming water

Describe the typical water quality characteristics of the incoming water. Parameters to consider include disinfection residual in the water entering the facility, temperature, pH, turbidity, metals and microbial quality.

### 2.1.5 System details

Provide an overview of the drinking water system, for example:

Incoming water is supplied to a water heater of xxx litres capacity, set at xx degrees C.

Water within the system is treated using xxx (eg copper silver ionisation)

Heated water is supplied to outlets in two ICU rooms and 5 general wards. Outlets consist of showers, baths, wash basins and sinks.

Each outlet has a TMV with the maximum distance between heater and TMV of xxx metres.

Table 2 Inventory of system components (edit, add or delete rows as required)

|  |  |  |
| --- | --- | --- |
| System component | Characteristic | Details |
| Hot water heaters | Number, location, capacity |  |
| Type of heating | eg solar, gas, instant |
| Max. temperature |  |
| Age of heaters |  |
| Capacity |  |
| Cold water storages | Number, location, capacity |  |
| Capacity |  |
| Material | eg concrete, steel, plastic |
| Water age (ie time since disinfection) | If known |
| Water treatment | Type, location | eg chlorine disinfection |
| Dose rate (if chemical treatment) | eg 1 mg/L |
| Target residual at most distal point in water system (if chemical treatment) | eg 0.5 mg/L |
| Pipework | Age |  |
| Material |  |
| Type and extent of insulation |  |
| Number of dead legs and locations |  |
| Areas of low flow |  |
| % of pipework that is accessible |  |
| Outlets | Number, type and location of hot water outlets | eg 5 sinks in kitchen |
| Number, type and location of cold water outlets | eg 8 taps in landscaped garden |
| Number, type and location of warm water outlets | eg 35 showers in maternity unit |

|  |  |  |
| --- | --- | --- |
| TMVs and tempering valves | Type, number, age and location | Include date of last service |
| Distance from outlets |  |
| Accessibility |  |
| Maximum temperature at outlet |  |
| Other components that use water | Hydrotherapy baths, birthing pools |  |
| Humidifiers |  |
| Water dispensing machine |  |
| Ice machines |  |
|  |  |
| Rainwater tanks |  |
| Fire protection system |  |
| RPZ – backflow prevention | Number and location |  |

## 2.2 Hazard identification and risk assessment

### 2.2.1 Hazard identification

Identify the hazards and potential hazardous events that could affect the water quality within the described water distribution system, promoting *Legionella* colonisation and growth, along with their corresponding control measures. The table below lists some examples of potential hazardous events commonly associated with a facility’s water system.

Table 3 Examples of potential hazardous events

| System component | Event |
| --- | --- |
| Incoming water | Incoming water contamination |
| Loss of supply |
| Failure of backflow prevention device |
| Solar preheat systems | Water stored at below 60°C |
| Booster failure |
| Hot water storage | Heater failure or under capacity |
| Build-up of sludge in tank |
| Thermal stratification |
| Storage temperature too low (below 60 °C) |
| Cold water storage | Water stagnation |
| Contamination of storage tank |
| Build-up of sludge in tank |
| Water temperature >20 °C |
| Pipework/plumbing | Dead legs including capped pipes |
| Cross connections between drinking water and non-potable pipes |
| Deterioration of insulation (lagging) around pipes |
| TMV malfunction or inadequate maintenance |
| Long distances between TMVs or tempering valves and outlets |
| Corrosion due to deterioration of materials |
| Pipe leaks due to age |
| Heating of cold water in pipes (>20 °C) |
| Low flow in recirculating loops |
| Lack of accessibility for repairs and maintenance |
| Outlets | Poorly maintained outlets |
| Unused outlets |
| Flow restrictors |
| Aerators |
| Outlets that hold water after use (eg shower heads or hoses) |
| Treatment systems | Dosing failure |
| Insufficient dosing |
| Running out of disinfectant |

### 2.2.2 Risk assessment

This section includes qualitative measures of likelihood and consequence to allow you to calculate the level of risk for different potential adverse outcomes in your facility. Remember that some controls will be insufficient in themselves to get the level of risk down to low, so keep adding controls until the risk is acceptable. Some examples of risk assessment tables are provided in Appendix 1.

Table 4 Hazard identification and risk assessment table, including examples (edit and add rows as required)

| System component | Hazard and hazardous event | Risk score | Possible control measures |
| --- | --- | --- | --- |
| Incoming water | Supply of water with low chlorine residual | Medium | Install onsite chlorination to achieve ≥ 0.5 mg/L free residual chlorine at all cold water outlets and ≥ 0.2 mg/L at all heated water outlets |
| Incoming water | Supply of microbial contaminated water | Medium | Agreement with water supplier to notify facility manager of any bacteriological contamination; increase chlorine dose chlorinator; flush out contaminated water |
| Hot water system | Water temperature too low (to inhibit growth of *Legionella* and other opportunistic pathogens) | Medium | Measure temperature daily and adjust if too low |
| Warm water system | Distance from TMV to outlet > 6 m leading to *Legionella* detections in high risk location | High | Move TMV closer to outlet or install point of use filter on outlet |
| Pipework | Low flow in several areas (allows adherence and proliferation of *Legionella* and other opportunistic pathogens) | High | Weekly flushing of water in areas of low use |

# 3 Risk management

Summary of actions:

Identify and implement control measures for management of risks.

Establish an operational monitoring program.

Develop written procedures for required actions.

Determine and implement corrective actions for exceedance of critical operational limits.

Establish a verification monitoring program.

Determine and implement responses to exceedances of limits in the verification monitoring program.

## 3.1 Control procedures

All control measures and monitoring activities, whether they are regular maintenance, operational practices or corrective actions, require written procedures detailing how to undertake the required tasks. Complete the table below with control measures identified in the hazard identification and risk assessment table and operational procedure.

Table 5 Risk management plan procedures (edit, add or delete rows as required)

| System component | Control measure | Procedure |
| --- | --- | --- |
| eg pipework | Regular (weekly) flushing of low use areas | eg MTS xxxx Flushing of pipes in Ward 2 |
| eg treatment | Changing dose rate of disinfectant | eg OPS xxxx Adjustment of chlorine dose |
| eg mixing valves — TMVs | Regular maintenance of TMVs | eg MTS xxxx Cleaning of TMVs and heat disinfection of all pipework and outlets downstream of TMVs - yearly |
| eg outlets | Collecting water samples for *Legionella* testing | eg SP xxxx Sample collection for *Legionella* **AND**  eg SP xxx – sample storage and transportation to City Laboratory |

## 3.2 Monitoring

### 3.2.1 Operational monitoring

Many control measures that manage risk in the water supply are in fact corrective actions to measured parameters at particular frequencies and locations when such parameters exceed a critical limit.

Populate the table below with all the operational (ie ‘real time’) monitoring undertaken in the facility.

Table 6 Operational monitoring, showing examples (edit, add or delete rows as required)

| System component | Risk | Parameter | Frequency | Location | Critical limit | Record  *(where is the measurement recorded)* | Corrective action  *(all corrective actions listed here should have a procedure listed in  Table 6)* |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Incoming water | Low disinfectant residual | Chlorine free residual | Online or weekly | Point of entry into facility | Less than 0.5 mg/L | Chlorine free residual record sheet CR 1.001 | Increase chlorine dose within facility |
| Hot water storage and recirculation | Low temperature | Temperature | Daily | Hot water Outlet in kitchen (sink tap at far right corner) | Temperature less than 60 °C | Weekly temperature kitchen record sheet  TP 4.333 | Increase temperature of water heater, check pipework for loss of heat |
| Cold water | Water temperature that supports *Legionella* growth | Temperature | Daily | Random cold water outlet | Temperature greater than 20 °C and less than 60 °C | Daily temperature record sheet  TP 1.333 | Check incoming water temperature, check pipework for heat transfer, and insulate exposed cold pipes |

### 3.2.2 Verification monitoring and responses

Verification monitoring involves the taking of samples for analysis of a particular parameter. The results of the samples confirm that control measures are effective and water quality risk is being managed.

All verification monitoring results that are outside quality standards or critical limits, and confirmed cases of Legionellosis, require responses.

Populate the table below with all the verification monitoring undertaken in the facility.

Table 7 Verification monitoring, showing examples (edit, add or delete rows as required)

| Parameter | Frequency | Location | Limit | Reported to | Operational response to exceedance of critical limit *(all responses should have a procedure as per Table 6)* | Clinical response to exceedance of limit  *(all responses should have a procedure listed as per Table 6)* |
| --- | --- | --- | --- | --- | --- | --- |
| Total bacterial count | Monthly | At the point of entry of water to the facility and at several distal outlets throughout the facility | Indicating regrowth within facility – as per risk management plan | Building, engineering and maintenance services (BEMS) supervisor | 1. Check operational measurements (temperature, pH, turbidity, disinfectant residuals and dose), maintenance schedules (including flushing regimes) and structural integrity  2. Flush water through until sufficient free chlorine residual is achieved at sampling point (0.2 mg/L)  3. Resample 3–7 days after responses are completed | None |
| *Legionella* | Quarterly | Distal warm water taps – wash basins in room with low risk patients | Detected by culture method | BEMS manager and CEO | 1. Check operational measurements, maintenance schedules and structural integrity of system  2. Clean TMV and outlet fitting and heat disinfect all pipework and outlets downstream of TMV  3. Resample 3–7 days after responses are completed  4. If resample positive, move to next row | Install point of use microfiltration on affected outlets  Advise clinical staff to consider or raise the possibility of *Legionella* infection should residents of the facility present with pneumonia or respiratory infection |
| *Legionella* | Quarterly | Distal warm water taps — wash basins in room with high risk patients | Detected by culture method | BEMS manager and CEO | 1. Check operational measurements, maintenance schedules and structural integrity of system  2. Clean TMV and outlet fitting  3. Clean pipework  4. Superchlorinate system  5. Resample 3–7 days after responses are completed | Install point of use microfiltration on affected outlets  Advise clinical staff to consider or raise the possibility of *Legionella* infection should residents of the facility present with pneumonia or respiratory infection |

# 4 Responding to detections or cases

Summary of actions:

Identify measures for responding to *Legionella* detections and cases in various scenarios.

Identify key people and their responsibilities and authorities when responding to detections or cases.

Develop written procedures for required actions.

## 4.1 Key incident response people and their responsibilities

In an incident situation, the risk management team will meet to assess the available information and direct the appropriate responses. The following people will be required to direct those responses and ensure they are undertaken in accordance with documented procedures.

Table 8 Incident response key personnel and their responsibilities (edit, add or delete rows as required)

| Response | Responsible person | Contact information |
| --- | --- | --- |
| eg water sampling / system investigation |  |  |
| eg coordinating system decontamination |  |  |
| eg high risk patient identification |  |  |
| eg implementation of high risk patient protection procedures |  |  |
| eg notify the relevant health department or authority as soon as practicable upon suspecting or confirming a diagnosis of Legionnaires’ disease |  |  |
| eg contact the relevant local health authority promptly for advice on an appropriate response to a suspected case of Legionnaires’ disease |  |  |
| eg media liaison |  |  |

## 4.2 Response procedures

Response activities, whether they are investigations, remedial action or stakeholder liaisons, require written procedures detailing how to undertake the required tasks. Complete the table below that matches responses identified in the incident response measure identification process.

Some of these responses will be sequential and will require information obtained following the implementation of other proceeding procedures. It may also be useful to prepare flow charts showing the sequence of actions required in various incident scenarios.

Medical practitioners and laboratories must notify the relevant health department or authority as soon as practical upon suspecting or confirming a diagnosis of Legionnaires’ disease. This requirement should be documented in the relevant response procedure.

Table 9 Incident response procedures (edit, add or delete rows as required)

| Incident | Responses | Procedure name |
| --- | --- | --- |
| eg isolated *Legionella* species detection | Water sampling or system evaluation | eg INV xxxx Undertaking a Legionella colonisation investigation |
| eg isolated *Legionella* species detection | Localised partial system decontamination | eg INC xxxx Assess and undertake appropriate local partial system decontamination |
| eg single confirmed Legionnaires’ disease case linked to facility | Case activity investigation | eg INC xxxx Assess potential case exposures during incubation period |
| eg single confirmed Legionnaires’ disease case linked to facility | High risk patient identification | eg INV xxxx Undertaking a high risk patient identification |
| eg single confirmed Legionnaires’ disease case linked to facility | Implementation of high risk patient protection procedures | eg INC xxxx Protecting identified high risk patients |

# 5 Review of plan

Summary of actions:

Prepare a schedule for review of the plan.

List triggers for reviewing the plan.

A full review of the plan will be conducted on a XXXX basis.

The plan will be reviewed more frequently as a result of:

(eg change in infrastructure, refurbishment, detection of *Legionella*, significant system modifications or change of use, new staff or roles, changes in legislation or standards etc)

# Appendix 1

## Example risk assessment tables

Table 10a Qualitative measures of likelihood

| Level | Descriptor | Example description |
| --- | --- | --- |
| A | Almost certain | Is expected to occur in most circumstances |
| B | Likely | Will probably occur in most circumstances |
| C | Possible | Might occur or should occur at some time |
| D | Unlikely | Could occur at some time |
| E | Rare | May occur only in exceptional circumstances |

Table 10b Qualitative measures of consequence or impact on facility

| Level | Descriptor | Example description |
| --- | --- | --- |
| 1 | Insignificant | Insignificant impact, little disruption to normal operation, low increase in normal operating costs (eg temporary low free residual chlorine concentration that can be resolved via flushing) |
| 2 | Minor | Minor impact for part of facility, some manageable disruption to normal operation, some increase in operating costs (eg several rooms or one wing with infrequent use, requiring more routine flushing to maintain free residual chlorine concentrations) |
| 3 | Moderate | Major impact for part of facility, significant but manageable modification to normal operation, increase in operating costs, increased monitoring (eg localised *Legionella* colonisation, requiring investigation and implementation of controls) |
| 4 | Major | Major impact for most of facility, systems significantly compromised, abnormal (if any) operation, high level of monitoring required (eg extensive *Legionella* colonisation, requiring investigation and implementation of controls) |
| 5 | Catastrophic | Major impact for whole of facility, complete failure of systems (eg extensive *Legionella* colonisation with one or more confirmed cases of health or aged care facility acquired Legionnaires’ disease) |

Table 10c Qualitative risk analysis matrix – level of risk

| Likelihood | Consequences | | | | |
| --- | --- | --- | --- | --- | --- |
| 1  Insignificant | 2  Minor | 3  Moderate | 4  Major | 5  Catastrophic |
| A (almost certain) | Moderate | High | Very high | Very high | Very high |
| B (likely) | Moderate | High | High | Very high | Very high |
| C (possible) | Low | Moderate | High | Very high | Very high |
| D (unlikely) | Low | Low | Moderate | High | Very high |
| E (rare) | Low | Low | Moderate | High | High |

# Appendix 2

## Key contacts

List key contacts for the plan including risk management team members, laboratory testing, equipment suppliers or service agents, local public health units etc.

## Key documents

List key documents for reference, such as national guidelines, state/territory legislation, procedures etc.