



Government of **Western Australia**
Department of **Health**

Air-handling and water systems of commercial buildings review – Part 2

Proposed legislative content for new regulations for air-handling and water systems in WA

In accordance with the *Public Health Act 2016* regulatory framework

May 2020



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Have your say

The Department of Health (DOH) is seeking feedback on this Discussion Paper on the proposed regulatory reforms and options for the management of public health risks associated with air-handling and water distribution systems in Western Australia.

You are invited to read through this discussion paper and provide your feedback by completing the online survey.

Stakeholder input is critical in helping to identify the most appropriate management response or identify new options not considered as part of this proposal, and to ensure the impacts on consumers, business and government have been effectively considered.

Where to send your feedback

Online:	WA Health online consultation hub - https://consultation.health.wa.gov.au/
Email:	publichealthact@health.wa.gov.au
Post:	Review of Air-handling and water systems - Part 2 Science and Policy Unit Environmental Health Directorate Department of Health PO Box 8172 Perth Business Centre, WA 6849

Submissions close

The closing date for submissions is **31 August 2020**

Disclaimer

The views expressed in this document may not, in any circumstances, be interpreted as stating an official position of the Department of Health. This document is intended to serve as the basis for further discussion with interested stakeholders.

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Overview of air-handling and water systems in Western Australia

Public health risks

Potential growth of *Legionella pneumophila* in poorly maintained and operated cooling towers and warm water systems.

This can lead to outbreaks of Legionnaires' Disease and other respiratory illnesses.

Since 2005, on average there are 11 cases of Legionnaires Disease related to *Legionella pneumophila* reported in WA each year.



Who may be impacted by changes to the Health (Air-handling and Water Systems) Regulations 1994?

~3192

WA businesses are estimated to have a cooling tower

~396

WA based health and aged care facilities are estimated to have a warm water system

40
out of
139

WA local governments are estimated to have an enforcement role based on cooling towers or warm water systems located within their jurisdiction



Executive summary

The key focus of this review is to obtain feedback on the most effective option for managing the potential public health risks associated with air-handling and water distribution systems in Western Australia (WA), to prevent the spread of air-borne diseases such as Legionnaires' Disease caused by *Legionella pneumophila*.

With the introduction of the *Public Health Act 2016* in WA, the [Health \(Air-handling and Water Systems\) Regulations 1994](#) (Air-handling Regulations) which are adopted under the *Health (Miscellaneous Provisions) Act 1911*, must be reviewed and either repealed or replaced with new regulations in accordance with the new regulatory framework.

In April 2019, the discussion paper '[Managing the public health risks associated with cooling towers and warm water systems in WA](#)' was released for a fourteen week comment period. The paper discussed four options:

- Option A –Deregulate the industry. That is, repeal the existing *Health (Air-handling and Water Systems) Regulations 1994* without replacement and allow the industry to self-regulate.
- Option B – Retain the status quo by making equivalent regulations under the Public Health Act
- Option C – Develop new regulations to manage this public health risk with building requirements addressed by the Building Code of Australia
- Option D – Manage this public health risk under Occupational Safety and Health legislation

Analysis of the consultation responses received by the DOH determined that there was general agreement from all sectors that any approach should be risk-based and that Option C – development of new regulations was the preferred strategy. New regulations must clearly state inclusion and exclusion factors for air-handling and water systems that legislative requirements are intended to apply to.

This paper provides further detail on the proposed regulation content for new regulations which have been categorised into the following four topics:

1. Revised definitions and exemptions based on the risk of facilities or systems
2. Revised administrative requirements and application of regulations
3. Revised approval requirements and risk management plan requirements
4. Revised monitoring, investigation and decontamination requirements

Further stakeholder consultation is required to ensure the impacts on consumers, business and government have been effectively considered during this reform process.

1 Introduction

In April 2019, the discussion paper '[Managing the public health risks associated with cooling towers and warm water systems in WA](#)' was released for a fourteen week comment period. The paper discussed four options:

- Option A –Deregulate the industry. That is, repeal the existing *Health (Air-handling and Water Systems) Regulations 1994* without replacement and allow the industry to self-regulate. The DOH could provide guidance documents to help minimise the public health risks which would complement the general public health duty provisions of the *Public Health Act 2016*.
- Option B – Retain the status quo by making equivalent regulations under the *Public Health Act 2016*. This will transfer all existing provisions under public health legislation with minimal revision.
- Option C – Develop new regulations to manage the public health risks from air-handling and water systems, while design, installation and building requirements being addressed by provisions of the National Construction Code (NCC).
- Option D – Manage this public health risk under Occupational Safety and Health legislation.

The purpose of this consultation was to inform the review of existing regulations under the *Health (Miscellaneous Provisions) Act 1911* (Health MP Act), in particular the *Health (Air-handling and Water Systems) Regulations 1994* (Air-handling Regulations). The DOH sought to gain a better understanding of the potential impacts on and opinions of industry, local government, other government agencies and members of the public associated with the management of public health risks related to air-handling and water systems.

The paper was circulated to a total of 138 local governments, ~30 state agency contacts and ~600 industry stakeholders (including representative bodies and individuals), as well as >400 subscribers to the DOH Environmental Health list server.

The DOH received a total of 48 responses during the comment period – 37 through the Citizenspace online survey and 11 via email. There was strong support (78%) for the ongoing management of air-handling and water systems by way of regulation under the Public Health Act, with building requirements to be addressed by the NCC.

Analysis of the responses received by the DOH determined that there was general agreement from all sectors that any approach should be risk-based, and new regulations must clearly state inclusion and exclusion factors for air-handling and water systems that legislative requirements are intended to apply to.

This Discussion Paper details proposed legislative content changes and additions for new regulations and to request further consultation responses from stakeholders.

2 Objectives

The overall objectives for managing the public health risks associated with air-handling and warm water systems are to:

- Ensure the correct operation and regular maintenance of air-handling systems installed in WA buildings
- Ensure the correct operation and regular maintenance of water distribution systems in high risk buildings such as hospitals and aged care facilities
- Ensure timely and effective control measures are initiated in the event of a Legionnaires' Disease outbreak in WA to minimise the risks to public health
- Prevent outbreaks of Legionnaires' Disease and other airborne diseases from cooling towers and water distribution systems in WA.

Note: *Public health* is defined in the *Public Health Act 2016* to mean the health of individuals in the context of the wider health and wellbeing of the community.

This review does not consider Legionella risks associated with spas, which have been considered as part of the [Management of public health risks associated with aquatic facilities in WA discussion paper](#).

3 Current WA legislation

Air-handling and water systems in WA are currently managed under the *Health (Air-handling and Water Systems) Regulations 1994* (Air-handling Regulations).

The Air-handling Regulations currently adopt superseded versions of AS/NZS 3666 including

- AS/NZS 3666.1:1995/Amdt 1 — 1996; Air-handling and water systems of buildings – microbial control – design, installation and commissioning; amendment by Australian/New Zealand Standards, 01/01/1996
- AS/NZS 3666.2:1995; Air-handling and water systems of buildings – microbial control – operation and maintenance;
- AS/NZS 3666.3:2000; Air-handling and water systems of buildings – microbial control – Performance-based maintenance of cooling water systems.

These Australian Standards have been superseded by the 2011 versions and this is not reflected in the current Air-handling Regulations.

When the DOH consulted in April 2019, the stakeholder responses indicated strong support for the management of air-handling and water systems by way of regulation under the *Public Health Act 2016*, with design, installation and building requirements to be addressed by the Building Code of Australia (BCA) provisions of the NCC.

Stakeholder responses highlighted that the Victorian air-handling legislation is considered to be the benchmark in managing the public health risks in this area. [Appendix 1 – Table 1: Legislative requirements for air-handling and control of Legionella](#) compares the requirements of WA and VIC air handling legislation. [Appendix 1 – Table 2](#) details the requirements of AS/NZS 3666.

These summaries show that the existing WA regulations contain basic provisions for approvals, maintenance, compliance actions and penalties, whereas the Victorian regulations provide greater detail on the registration requirements, risk management plan and auditing requirements, maintenance and testing requirements, sampling and decontamination for higher risk premises and record keeping requirements. It is considered that more comprehensive and nationally consistent requirements would be beneficial to the WA industry.

3.1 Limitations of the Air-handling Regulations 1994

A review of the existing Air-handling Regulations has identified a number of shortcomings including:

- No requirement for local government to keep an up-to-date list of cooling tower locations;
- No specified details for annual registration requirements;
- No ability to issue infringement notices;
- No requirement for industry to notify an enforcement agency of elevated legionella or heterotrophic plate counts;
- No inspection or auditing requirements and other compliance checks;
- No risk based / management approach;
- Adoption of superseded Australian Standards.

These items were prioritised based on analysis of stakeholder responses and considered in terms of potential impacts on public health. The below proposed regulatory reforms were then developed with the view to rectify many, if not all, of these shortcomings.

4 Proposed regulation content

As indicated by the previous consultation results, new regulations are considered by the majority of respondents to be the most beneficial option for legionella control following the review of public health legislation. Further stakeholder feedback is now requested on the proposed content of new air-handling regulations as detailed below.

The proposed regulatory reforms have been categorised into the following four topics:

1. Revised definitions and exemptions based on the risk of facilities or systems
2. Revised administrative requirements and application of regulations
3. Revised approval requirements and risk management plan requirements
4. Revised monitoring, investigation and decontamination requirements

The key aims of the proposals are to:

- Ensure accountability of owners and/or operators to maintain and operate air-handling and water systems according to the Australian Standards and/or other legislative requirements;
- Establish a robust process for local government and the CHO to respond to emergencies, such as outbreaks, and investigate complaints or poor monitoring results. Any suspected system in the vicinity of an outbreak can, upon the provision of a notice, be:

- sampled for further testing;
 - shut down; and
 - disinfected or decontaminated.
- Provide the enforcement agency with the ability to inspect any system for operation and maintenance; and
 - Provide the enforcement agency with the ability to apply penalties for non-compliance, with the possibility of escalating to prosecution if required.

4.1 Revised definitions and exemptions

4.1.1 Definitions

Current definitions in the Air-handling Regulations are

- **air-handling system** means an air-handling system as defined in AS/NZS 3666.1 but does not include a dry system which does not use water or other liquids to operate, humidify, clean, maintain, heat or cool the air;
- **cooling tower** means a cooling tower as defined in AS/NZS 3666.1 and also means any other liquid cooled heat rejection or liquid cooling equipment;
- **water system** means a piped water system within a building designed to deliver water to outlet points.

It is proposed that the new regulations will retain the above definitions and will include new and redefined terms applicable to air-handling and water systems. A revised definition for ‘water distribution system’ will capture a range of possible risks beyond cooling towers including warm water systems, hydrotherapy pools, spa pools and ice machines.

Note that in this report the term ‘water system’ refers to higher risk water distribution systems rather than any piped water system.

[Appendix 2](#) provides a list of terms that are proposed to be defined in new air-handling and water system regulations.

The proposed regulations would also apply to water systems in “**vulnerable facilities**” or high-risk facilities which include the following in Table 1:

Table 1: Vulnerable facilities

Facility	Extract / comments
Public hospital	public hospital has the meaning given in the <i>Health Services Act 2016</i> section 8;
Private hospital	private hospital defined in the <i>Private Hospitals and Health Services Act 1927</i>
State aged care facility	These are facilities that provide Australian Government-funded residential aged care either on a permanent or short-term (respite) basis to people. The service must meet specified standards in the quality of the built environment, care, and staffing levels in accordance with the <i>Aged Care Act 1997</i> .
Residential aged care facility, other than a	The <i>Private Hospitals and Health Services Act 1927</i> , Part 1 section 2 (1), states: “Nursing Home” means premises in which persons who do not require constant

Facility	Extract / comments
State aged care facility, prescribed by regulation.	<p>medical attention are received as patients and lodged for the purpose of medical supervision and nursing care but does not include any premises declared by the Minister under section 3 not to be a nursing home for the purposes of this Act.</p> <p>Nursing Homes in Western Australia that require to be licensed under the <i>Private Hospitals and Health Services Act 1927</i> are those that are not certified as residential aged care service under Part 2.6 of the <i>Aged Care Act 1997 (Cmwth)</i>. Facilities that require to be licensed are Transitional care and Care Awaiting Placement Nursing Homes, and nursing homes funded by the Disability Services Commission.</p>

4.1.2 Exemptions

Air-handling and water system legislation enforced by most Australian States applies to:

- all cooling towers; and
- all warm water systems or water distribution systems in health and aged care facilities.

In addition to these systems, Victoria also captures water distribution systems in car washes and correctional institutions. See [Appendix 3](#) for a summary of Australian Legislation and [Appendix 4](#) for International legislation.

Exemptions are in place in most Australian States to limit the application of regulatory controls to certain buildings, particularly residential dwellings.

In WA, it is proposed that the regulations would apply to cooling towers or water systems in any building except those classed as 1, 4 or 10 under the Building Code of Australia (BCA). See [Appendix 5](#) for a full explanation of all Building Classes under the BCA.

Note that 'warm water system' is not to be confused with 'heated water system' typically installed in all or most buildings, including circulatory heated water systems that are designed to distribute heated water at higher temperatures.

4.1.3 Risk rating of facilities and systems

It is proposed that enforcement agencies apply a risk matrix to further rate buildings/facilities or systems based on risk factors such as size of air-handling or water system, number of occupants or patrons per day, and likelihood of disease outbreak involving the system.

[Appendix 6](#) details the proposed risk categories and ratings to use when risk assessing air-handling or water systems. Each risk category description includes the following factors for consideration:

- Health factors – an estimate of the adverse health impacts on the human population with consideration of the at-risk population characteristics. This includes:
 - Population size;
 - Vulnerability; and
 - Location in relation to the impact area.
- Environment factors – an estimate of the geographical area size impacted by the risk.
- System – Consideration of the likelihood of the air-handling or water system to promote the growth or transmission of pathogenic *Legionella* and/or other microbes. Factors can include:

- Estimated human population present in building, serviced by system;
- Air turnover volumes;
- Maximum capacity of water handling and storage;
- Complexity of system equipment and components;
- Likelihood of system equipment and components to create aerosols; and
- Number of interfaces for human contact with potentially contaminated water, aerosols or air.

4.1.4 Consultation questions

1. Do you agree that the proposed regulations apply to all cooling towers except those in Class 1, 4 or 10 buildings under the Building Code?
2. Do you agree that a proposed risk rating matrix should be used by enforcement agencies to classify each type of system and/or building?
3. Do you agree that the proposed regulations should apply to commercial car washes or other potentially high-risk businesses/facilities?
4. Do you agree with the term 'vulnerable facility'?
5. Should the proposed regulations apply to any other building or facility not mentioned?
6. Do you have any concerns or comments about this proposal?



4.2 Revised administration requirements and application of regulations

4.2.1 Registration of systems

One of the main issues raised in submissions regarding administrative requirements for air-handling and water systems was whether registration of systems should be done by each local government or whether a centralised register held by the Department of Health was more suitable.

Under the existing WA Air-handling Regulations, there is a requirement for building owners or operators of air-handling and water systems to obtain the approval of their local government before installing or modifying an air-handling or water system or component thereof.

In order for health authorities to be able to respond to an outbreak of Legionnaire's disease it is necessary to know the exact location of air-handling and water systems within the vicinity of an outbreak. If this is not known, significant time delays may be experienced attempting to determine the location of suspect air-handling and water systems for inspection and disinfection, resulting in potentially increased disease incidence.

Authorised officers need the ability to quickly inspect and request treatment of suspect air-handling and water systems within the vicinity of an outbreak, and a mechanism to easily contact owners or responsible persons to implement decontamination procedures.

Numerous health authorities world-wide, including the United Kingdom and New York, as well as Victoria, New South Wales, South Australia and Tasmania, have required the registration of cooling towers to enable more efficient investigation in the event of a legionella outbreak.

SA and NSW require the registration of cooling towers with local government authorities. SA, NSW and Tasmania also require the registration of warm water systems with the relevant local government. Victoria is the only Australian state to centralise registration of cooling towers with the State Department of Health. Although they are not required to register cooling towers or warm water systems, all Queensland healthcare facilities are required to report legionella results to Queensland Health.

Part 8 of the Public Health Act provides a framework for the registration of activities declared by the regulations to be public health risk activities. A regulation must prescribe the appropriate enforcement agency for each registrable activity. This may be the local government, the CHO or both. The appropriate enforcement agency will be required to administer Part 8 of the Public Health Act in conjunction with any regulations related to a prescribed activity.

A certificate of registration must specify (section 68(6)):

- The premises and activity for which the registration is granted; and
- any conditions to which the registration is subject.

A certificate of registration remains in force until such time as it is suspended or cancelled. If local governments retain management of these applications, the DOH will produce templates that may be used and/or adapted by each local government.

4.2.2 Proposal

It is proposed that the new air-handling regulations will require the owner of a building or facility where an air-handling or water system (including a cooling tower) is located, to ensure that each system on that land is registered with the appropriate enforcement agency until decommissioned. Only one registration is required for the building or facility, however, each system or cooling tower in the building or facility must be documented separately within the registration.

Registration periods currently vary from 1 year up to 3 years, with a renewal process to occur at the end of this period. Registration will imply installation approval as system design and installation certification will be a requirement of registration; however, any modification to the system or components will require an amendment to the registration. Approval of systems is discussed in more detail in [section 4.4.1](#) of this document.

It is not intended that authorised officers are to be experts in air-handling or water systems for the purposes of registration or auditing. As a regulator, their role will be to ensure that registration and amendments are approved based on adequate supporting information and certification of the system supplied by the operator or landowner.

The purpose of registration is to facilitate:

- compliance and surveillance checks to ensure maintenance standards are adhered to by landowners and/or operators; and
- an up to date list of the location of high-risk systems is maintained to enable a faster response by identifying potentially suspect systems located within the vicinity of a *Legionella* outbreak. Action required could include requiring emergency decontamination of suspected systems within the vicinity of an outbreak.

Registers should be easily accessible by all enforcement agencies to ensure that outbreaks can be pinpointed in a timely manner and controlled. It will also encourage communication and collaboration between enforcement agencies to support a more coordinated approach to surveillance.

The Public Health Act provides that where the enforcement agency is a local government, a fee may be charged for registration on a cost recovery basis.

4.2.3 Consultation question

7. Do you agree that air-handling and water systems should be registered with the appropriate enforcement agency?

4.3 'Vulnerable' facilities

Also raised during the consultation was the issue of whether a risk-based approach can be applied to air-handling and water systems, possibly based on the NCC building classifications. The concept of 'vulnerable facilities' is presented as a potential new definition to be defined by the risk-based system.

Following outbreaks of Legionnaire's disease in a number of health and aged care facilities throughout Australia, the focus is now on these facilities to produce risk management plans for their entire water distribution systems. These facilities are considered to be higher risk due to the high proportion of immunocompromised patients or residents typically present within these facilities.

This approach was agreed to at a national level by enHealth, who released the [Guidelines for Legionella Control in the operation and maintenance of water distribution systems in health and aged care facilities \(2016\)](#), which has subsequently been adopted by most Australian States. WA has adopted this approach although it has not been formally included under the current Air-handling Regulations.

4.3.1 Proposal

Under the *WA Food Act 2008*, private hospitals and aged care facilities that prepare food for 'vulnerable' populations must register with the local government enforcement agency who may charge registration and surveillance fees. Public hospitals and aged care facilities must register with the CHO, and it is at the discretion of the CHO whether to charge registration or surveillance fees to the public sector. A similar model is proposed for air-handling and water systems, to ensure that all high risk or 'vulnerable facilities' are registered with the Department of Health.

4.3.2 Consultation questions

8. Do you agree that warm water systems in 'vulnerable' facilities including hospitals and aged care facilities should be registered with the appropriate enforcement agency?
9. Do you agree that the Chief Health Officer should be the principle enforcement agency for State hospitals and State aged care facilities?
10. Do you agree that 6 months is an appropriate amount of time for owners to register a warm water system following the enactment of the proposed regulations?
11. Do you have any other ideas or comments to make about any of these proposals?

4.4 Revised approval requirements and risk management plan requirements

4.4.1 Approval requirements

The installation and design of cooling towers and warm water systems is generally captured by the Building Code of Australia (the BCA), which requires compliance with the AS/NZS 3666.1. The BCA:

- requires a mechanical ventilation or air-conditioning system to comply with AS/NZS 3666.1 (and AS 1668.2), where installed in lieu of natural ventilation complying with Clause F4.6. (Clause F4.5 of BCA Volume One)
- also requires hot water, warm water and cooling water systems to be installed in accordance with AS/NZS 3666.1. This does not apply to a system serving only a sole occupancy unit in a Class 2 or 3 building or Class 4 part of a building (Clause F2.7 of BCA Volume One).

The BCA requirements take the onus away from local government authorised officers to assess system plans for compliance, instead relying on information and certification supplied to the approving authority from recognised experts, such as engineers and approved auditors, ensuring that the system and its components comply with relevant standards.

Existing systems will need to be registered; however, it will be assumed that the system was compliant with Australian Standards requirements at the time of installation. Some basic information for the system will need to be provided as part of the registration process, e.g. make, model, numbers of cooling towers, location of components, schematics, etc.

4.4.2 Proposal

The DOH proposes that new health regulations remove direct references to Australian Standards, instead requiring compliance with the NCC for the design, construction and installation of air-handling and water systems. This will remove requirements for local government to assess and approve applications in respect of air-handling or water systems reducing regulatory burden.

Similar to Victorian legislation, new WA health regulations can adopt similar requirements to the Australian Standards, such as the need for developing a risk management plan, investigation and decontamination provisions.

4.4.3 Consultation question

12. Do you agree with requiring compliance with the NCC for design, installation and maintenance of air-handling and water systems?

4.5 Risk management plan requirements

Risk Management Plans (RMP) are now widely used in many industries as part of an effective framework to collate and document risk-based strategies and performance-based outcomes. The use of this framework provides:

- A mechanism for identifying the major hazards, risks and preventative/control measures
- An operational monitoring approach designed to detect system faults
- The use of verification monitoring to ensure that management systems function effectively
- Establishment of incident protocols
- Implementation of supporting requirements including staff/personnel training, record keeping and reporting.

The RMP describes the nature of the air-handling or water system and how it should be operated and maintained in accordance with the NCC and thereby the AS/NZS 3666. Section 2 of AS/NZS 3666.3 details the risk factors that contribute to the growth and disseminations of microbes within cooling water systems. The RMP is necessary for operators and building owners as it provides a 'living document' that can be reviewed and audited, both internally and externally.

According to industry estimates, obtained from providers of this service by the Victorian Department of Health, the cost of developing a RMP lies in the range \$500 - \$2500, while the average cost is estimated to be around \$1000.

Based on the estimated number of cooling towers in WA being >3000 with an estimated average cost of \$1000 to develop a RMP, the upfront maximum cost to industry to develop RMPs for each premises is estimated to be up to \$3,000,000.

If only high-risk systems or 'vulnerable' facilities were required to develop risk management plans, it is estimated to cost around \$400,000 in total. This is based on an estimated 400 premises having a system that would be considered high risk, or the building itself being considered a 'vulnerable facility' and the cost to develop a RMP being \$1000.

While RMPs are not intended to be updated multiple times a year, these are to be reviewed (annually for high risk systems or vulnerable facilities and every 2 years for others) and updated if required. Whenever a system is modified, the RMP is to be amended to reflect any changes. It is intended that the auditor or RMP developer can undertake these reviews and changes, however there are no cost estimates for this work yet. Reviews and minor changes are likely to cost less than the initial development of the RMP.

Collectively, these costs appear to be significant but when considered individually, they represent a modest expense for landowners or operators. In addition, a properly prepared and implemented RMP may reduce long-term costs through better management of infrastructure and maintenance of assets. The costs should also be considered with reference to the public health risks associated with not implementing such a practice such as the adverse health outcomes, financial and reputational impacts associated with a case of Legionnaire's Disease contracted within a premises and consequential remediation.

4.5.1 Proposal

It is intended that as a condition of registration, the landowner/building owner or operator of an air-handling or water system develop a risk management plan (RMP) for the building to detail appropriate risk management strategies for each cooling tower, air-handling or water system installed for that building. Regulations will state that RMPs will be mandatory for high risk and/or vulnerable facilities, while RMPs for lower risk premises will be optional.

The RMP could be developed by a competent person employed by the owner or a third party, i.e. an approved independent auditor or qualified/experienced consultant.

The cost of developing a RMP is predicted to be a one-off cost, although it is proposed that annual audits and reviews are conducted which will incur ongoing costs.

To support a reduction in costs for developing a RMP, it is proposed that the Department of Health would issue guidelines for the development of a RMP and a template RMP that would be based on Table 2.1 of AS/NZS 3666.3. Appropriate [Legionella control guidelines](#) and templates have already been developed by enHealth.

RMPs are to be verified by the appropriate enforcement agency to ensure they contain the necessary information as described in the DOH template. Following verification, the RMP should be regularly audited by an approved third-party auditor at intervals appropriate to the risk

level. If the auditor believes that the requirements of legislation are not being met, they should notify the enforcement agency to investigate.

The RMP will indicate whether a prescriptive monthly maintenance inspection schedule compliant with AS/NZS 3666.2 or the alternative performance-based requirements under AS/NZS 3666.3 will be implemented.

4.5.2 Consultation questions

13. Do you agree that Risk Management Plans should be mandatory as part of the registration process for high risk or vulnerable facilities? And optional for lower risk premises? Please detail any costs or benefits of this proposal.

4.6 Independent auditors

Independent or third-party auditors are required under other public health related legislation, such as the *Food Act.2008*. The use of an independent external auditor ensures that risk assessment processes have been undertaken appropriately and in accordance with legislative requirements. Auditor services are integral to the use of a RMP to perform regular reviews of the implemented management strategies ensuring that these are effectively controlling the risk/s.

It should be noted that an independent auditor is a separate role to that of service technician. A service technician carries out the operational and maintenance work on the system. An auditor will generally review documentation and record-keeping practices during most audits, however should also be familiar with air-handling and water systems to be able to investigate and report poor performance or substandard results.

4.6.1 Proposal

New WA air-handling and water system regulations will include provisions for the approval of air-handling and water system auditors by the DOH. It should be the responsibility of a professional body, preferably a national organisation such as the Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH), to determine the minimum competency standards for both independent auditors and service technicians.

Independent auditors will take on the role of undertaking regular audits of the building or facility RMP and where appropriate, ensuring the regular maintenance or bacterial monitoring processes are being followed and remain compliant. Audit reports will be submitted to the relevant enforcement agency for record keeping and further investigation if required.

This auditing model will follow the regulatory Food Safety Auditor model regarding the approval provisions and requirement for landowners or operators to engage auditor services to ensure that the RMP and implemented risk management strategies are truly effective.

Independent auditing of compliance with risk management planning would be undertaken annually for high risk facilities and be mandatory. Evidence of audit completion would be given to the local enforcement agency.

Based on an estimated 400 premises having a high-risk system, independent auditors having an hourly rate of \$195 and each audit taking approximately 5 hours, the projected annual cost to

the industry would be \$390, 000. The time taken per audit will vary considerably with the complexity of the system.

If a premise that is not high risk has a risk management plan this will need to be audited up to three yearly or according to the risk level which the auditor or author of the risk management plan will determine. Although independent auditors can potentially be qualified and experienced service technicians, they do not need to be one and the same. What is important is that an auditor is not the landowner or operator of the same air-handling and water system that is being audited by that person.

The role of the service technician is a separate one which will conduct the maintenance inspections and required works or undertake the performance-based monitoring testing.

4.6.2 Consultation questions

14. Do you agree with the use of independent auditors to undertake regular inspections of systems and to report to the appropriate enforcement agency?

15. Do you have any other ideas or comments to make about any of these proposals? Please detail any costs or benefits of these proposals.

4.7 Revised monitoring, investigation and decontamination requirements

4.7.1 Equipment maintenance and water sampling

Sampling for legionellae and other heterotrophic bacteria is not required by AS/NZS 3666.2, but is considered to be a relevant monitoring activity in a performance-based approach as detailed in AS/NZS 3666.3 and 3666.4

Where regular maintenance of a cooling tower or water system can be achieved at least monthly, application of and compliance with the requirements contained within AS/NZS 3666.2 is considered sufficient. Monthly bacteriological sampling is therefore not mandatory in this circumstance but is considered an important validation method that auditors, operators and technicians can still carry out to complement regular maintenance inspections.

If monthly maintenance inspections are carried out, it is a requirement of AS/NZS 3666.2 that the air-handling and/or water system equipment being maintained is to be shut down to prevent particulate matter being passed through the system.

Where air-handling or water system equipment (including cooling towers) cannot be shut down for maintenance, compliance with AS/NZS 3666.3 provides an alternative performance-based regime of monthly water sampling and testing for *Legionella* and heterotrophic plate counts instead of the prescriptive requirements for regular maintenance.

If monthly bacteriological testing for *Legionella* is undertaken, it should be supplementary to and not in place of good design, installation, and general maintenance practices as prescribed by AS/NZS 3666. It is poor practice to solely rely upon routine water sampling and testing for *Legionella* species as an indicator of the need to initiate maintenance procedures. Additionally, this practice does not comply with the Australian Standard or the existing legislative requirements.

Victorian regulations detail strong provisions for the development of a risk management plan and require these plans to be audited on a regular basis by approved and suitably experienced independent auditors. Risk management plans are a useful tool that can be customised to suit the air-handling or water system and detail appropriate risk management strategies specific to the system.

4.7.2 Proposal

It is proposed that WA regulations will require the development of a RMP for all air-handling and water systems installed at all higher risk or 'vulnerable facilities', and optional RMPs for lower risk systems/buildings. The DOH will provide a template to be used for these RMPs.

The AS/NZS 3666.2:2011 specifies prescriptive requirements of maintaining a system through regular inspections and cleaning schedules. Alternative performance-based requirements are detailed by AS/NZS 3666.3 and 3666.4, which specify minimum monthly water sampling and microbial testing. New regulations will follow the same model by allowing compliance with either monthly inspections and maintenance schedules or monthly water sampling and microbial testing. Regulations will also detail requirements for record-keeping, results reporting, investigation and decontamination procedures, however, it is intended to require these without direct reference to the Australian Standards.

It is necessary that maintenance and servicing of air-handling and water systems is carried out to ensure these systems and equipment is maintained to prevent the growth and transmission of legionella or other harmful bacteria. This includes ensuring cleanliness of equipment, regular inspections, repair, replacement, preventive services and cleaning. As requirements for service inspections and water sampling are already undertaken by service technicians there are no additional costs anticipated with compliance.

Maintenance record-keeping is important in providing operators, auditors and enforcement agencies with written documentation proving that a regular maintenance program has been followed. Keeping records of maintenance and operational work completed for system components is an important process step in documenting and verifying completed work tasks.

In the event of a legionella detection or outbreak, this information enables operators to review their own systems and also demonstrate to auditors or enforcement officers whether remedial action has been conducted or not.

In most cases, remedial action would be in accordance with the RMP control strategies. However, where there are high levels of Legionella or heterotrophic colony counts (HCC) it is considered appropriate for authorised officers to have the power to direct remedial action as required. Although bacterial testing is not considered a control strategy, testing methods can be used to validate that Legionella control measures and equipment systems are operating properly and/or to ensure RMP efficacy.

4.7.3 Consultation questions

16. Do you agree with the proposal to replicate the Australian Standards requirements for either routine maintenance schedules or regular water sampling and testing?

17. Do you have any other ideas or comments regarding this proposal?

4.8 Testing results reporting

Currently the local government or CHO do not have to be notified when a high level of legionella or other harmful bacteria is detected in a system.

The AS/NZS 3666 states that the detection limit for legionella is 10 colony forming units per millilitre (10 cfu/ml), meaning that less than this is an acceptable result and no further action is required. It is important to note that a positive detection of legionella does not necessarily correlate with a disease outbreak. Therefore, it is likely that detections may occur even if regular maintenance was being conducted and compliance with AS/NZS 3666 was being achieved.

The concentration of legionella detected is an important consideration; a level exceeding 1000 cfu/ml requires immediate investigation and decontamination of the system. Detection between 100-1000 cfu/ml may be significant in some systems and requires further investigation; however immediate remedial action may not be required.

Whereas detection between 10-100 cfu/ml may be commonly found in some systems and although remedial action may be required, it can often be regarded as a minor detection if proper maintenance practices can be demonstrated and therefore reporting is not required.

This may not be the case for spa pools, warm water systems, reticulated domestic supplies or other equipment where aerosols are produced or the interface for human contact is present. In these facilities, even low concentrations of legionella detections can be considered significant and immediate disinfection is required. Following disinfection in any water source or component of a system, follow up microbial testing is required 3-7 days after the action is completed to ensure that the process was effective.

4.8.1 Proposal

It is proposed that legionella counts above a set threshold (as per Table 3.1 of AS/NZS 3666.3) or by other NATA accredited detection method, are reported to the appropriate enforcement agency for further investigation. Reporting high levels of legionella counts to health authorities will assist with correlating any new disease cases and support surveillance programs. It is further proposed that the enforcement agency is notified when legionella is detected in three consecutive water samples from a system which includes post-disinfection follow-up testing.

As detailed by Table 2 below, reporting of legionella test results is proposed to be mandatory for high risk or 'vulnerable facilities' and high-risk components such as spa pools, warm water systems and misters (focusing on aerosol generation and human contact interfaces), when concentration is detected above 10 cfu/ml. For any facility or component, when a legionella count is above 1000 cfu/ml reporting is mandatory.

While concentrations detected between 10-1000 cfu/ml are not mandatory for lower risk premises or systems, it is proposed to be at the auditor's discretion to determine whether reporting the result to the enforcement agency is required.

Example 1: if a single cooling tower servicing a small office building has a legionella count of 800 cfu/ml and the operator or owner has service technicians follow control strategies (2) and (3) in Table 3.1 and follow up testing results show a decrease to 10 cfu/ml over two consecutive samples, reporting of this event may not be required.

Example 2: if a series of cooling towers servicing a large office building have a legionella detection of 75 cfu/ml, but no control strategies are conducted and on the second test the results increase to 820 cfu/ml before control strategies are implemented, this event should be reported to the enforcement agency although investigation may not be necessary unless there is further increase in bacterial count or if control strategies appear to not significantly reduce the bacterial count.

In the event of a Legionnaire’s disease outbreak a local government authorised officer involved in the outbreak investigation requires the power to request emergency disinfection and/or decontamination of the air-handling or water system or components thereof suspected of being the source of infection, or a system located in the vicinity of an outbreak that has been inspected and does not comply with specific requirements of the regulation. The same powers are to be available to the CHO.

It is important to balance public safety with the potential costs to owners and operators to decontaminate/disinfect a water system. Ordering an online disinfection is a preventative, time-sensitive action and a necessary component of protecting public health if a legionella outbreak is occurring or suspected.

Table 2: replication of AS/NZS3666.3 Table 3.1 Control strategies for the presence of Legionellae

Test result, cfu/ml	Required control strategy	Reporting required
Not detected (<10 cfu/ml)	(1) Maintain monthly monitoring. Maintain water treatment program.	No
Detected as between 10-1000 cfu/ml (<1000 cfu/ml)	<p>(2) Investigate problem. Review water treatment program Take necessary remedial action including immediate online disinfection in accordance with Appendix B and undertake control strategy (3)</p> <p>(3) Retest water within 3-7 days of plant operation:</p> <p>a. If not detected, continue to retest water every 3-7 days until two consecutive samples return readings of not detected and repeat control strategy (1).</p> <p>b. If detected at <100 cfu/ml repeat control strategy (2)</p> <p>c. If detected at >100 cfu/ml investigate problem and review water treatment program, immediately carry out on line decontamination in accordance with Paragraph C2 of Appendix C and repeat control strategy (3)</p> <p>d. If detected at >1000 cfu/ml undertake control strategy (4)</p>	Yes – if detected in high risk premises or vulnerable facility
Detected (>1000 cfu/ml)	<p>(4) Investigate problem Review water treatment program. Take necessary remedial action including immediate online decontamination in accordance with Paragraph C2 of Appendix C and undertake control strategy (5)</p> <p>(5) Retest water within 3-7 days of plant operation.</p>	Yes

Test result, cfu/ml	Required control strategy	Reporting required
	<ul style="list-style-type: none"> a. If not detected, continue to retest water every 3-7 days until two consecutive samples return readings of not detected and repeat control strategy (1). b. If detected at <100 cfu/ml repeat control strategy (2) c. If detected at >100 <1000 cfu/ml, investigate problem and review water treatment program, immediately carry out online decontamination in accordance with Paragraph C2 of Appendix C and repeat control strategy (5) d. If detected at >1000 cfu/ml investigate problem and review water treatment program, immediately carry out system decontamination in accordance with Paragraph C3 of Appendix C and repeat control strategy (5). 	

4.8.2 Consultation questions

18. Do you agree with the proposed requirements for reporting of microbial testing and investigation if above a threshold?

19. Do you have any other ideas or comments to make about any of these proposals?

5 Key changes

- Registration will remain a requirement, however it is to be confirmed whether this is maintained at local government or in a centralised register.
- Remove the requirement for local government to assess and approve applications in respect of air-handling or water systems.
- Require a Risk Management Plan as part of the registration process and provide templates and guidance to enable local government to enforce this requirement.
- If facilities choose water sampling and testing, reporting of results over set thresholds will be mandatory for high risk systems and vulnerable facilities.
- Independent auditors will be required to review the RMP every 3 years or sooner, depending on the risk level of the system or facility. Service technicians will undertake monthly inspections or water sampling and complete repairs or equipment replacement.

6 Next Steps

The information gathered from this consultation will be used in the development of recommendations on the best way to manage air-handling and warm water systems under the *Public Health Act 2016*.

After analysis of all submissions, a determination of which proposals to adopt will be made. The results and findings of the consultation will be presented in a consultation summary report and submitted to the WA Better Regulation Unit, to support the preferred options. The consultation summary will be made available on the Department of Health Website.

Please note, that your feedback forms part of a public consultation process and the Government may quote from your comments in future publications. If you prefer your name and organisation to remain confidential, please indicate that in your submission. As submissions made in response to this paper will be subject to the Freedom of Information requests, please do not include any personal or confidential information that you do not wish to become available to the public.

The consultation and feedback process will be open until 31 August 2020. Please direct any feedback to publichealthact@health.wa.gov.au.

7 Glossary

Air-handling Regulations	<i>Health (Air-handling and Warm Water Systems) Regulations 1994</i>
Cooling tower	A cooling tower is a device for lowering the temperature of water by evaporative cooling in which atmospheric air is in contact with falling water, thereby exchanging heat. Many buildings such as hotels, hospitals, shopping centres, office towers and universities may have one or multiple cooling towers installed on each building.
Warm water system	Warm water systems distribute water to outlets used for personal hygiene purposes such as showers, basins and baths, at a reduced temperature (in the vicinity of 40 degrees), to minimise the risk of scalding. They should not be confused with the 'heated water system' typically installed in all, or most, buildings, including circulatory heated water systems that are designed to distribute heated water at higher temperatures, although there are numerous similarities. Many hospitals have warm water systems to minimise scalding to patients
DOH	Department of Health
DOHMH	New York Department of Health and Mental Hygiene (DOHMH)
<i>Legionella pneumophila</i> <i>L. pneumophila</i>	Refers to the bacteria that cause Legionnaires' Disease.
NYSDOH	New York State Department of Health

8 Appendices

Appendix 1 – Table 1: Legislative requirements for air-handling and control of Legionella in WA and Victoria

WA		VIC	
Section	Specific details/requirements	Section	Specific details/requirements
r.4	Requirements apply to all buildings, except Class 1, Class 2 or Class 10 as defined under the <i>Building Regulations 2012</i>	s.80 (offence for non-compliance)	Cooling tower must be registered with Secretary
r.5	Adoption of AS 3666. Regulations are in addition to and prevail in the case of inconsistency	s.81	Applications for registration or renewal
r.6	Chief Health Officer can grant exemption to compliance with AS 3666 – either for design, installation or maintenance of air-handling system, water system or cooling tower	s.82	Powers of Secretary
r.7 (offence for non-compliance)	Approval required from Local Government before installing or modifying an air-handling system, water system or cooling tower	s.83	Processing of applications
r.8	Local government can refuse approval	s.84	Registrations can be for multiple cooling towers
r.9 (offence for non-compliance)	Compliance with AS 3666 required for operation and maintenance	s.85	Registration period can be up to 3 years
r.10 (offence for non-compliance)	Owner or Occupier of a building to ensure adequate control of liquids and dust generated from operation or maintenance of the system/s	s.86	Registration to continue pending renewal
r.11 (offence for non-compliance)	Local Government can direct a person not to use a material in the construction of a system. Non-compliance with the direction is an offence	s.87 (offence for non-compliance)	Secretary to be notified of changes to ownership or contact details within 30 days of the change
r.12 (offence for non-compliance)	Provisions for Local Government to close an air-handling system, water system or cooling tower. Non-compliance with the direction is an offence	s.88 (offence for non-compliance)	Secretary to be notified of changes to cooling tower system or equipment within 30 days of the change
r.13 (offence for non-compliance)	Provisions for Chief Health Officer to close an air-handling system, water system or cooling tower. Non-compliance with the direction is an offence	s.89	Secretary to keep register of cooling towers and make this available to anyone during office hours
r.14	Provisions to re-open a system	s.90	Issuing replacement certificates
r.15	CHO direction or Notice prevails	s.91 (offence for non-compliance)	Cooling tower systems require a risk management plan while in operation

r.16	Offence penalties	s.92 (offence for non-compliance)	Risk management plan to be reviewed at least every 12 months, and updated when required due to legionella detection or other changes to the system
		s.93 (offence for non-compliance)	Risk management plan audit conducted annually and by an approved auditor
		s.94 (offence for non-compliance)	Certification of approved auditors, Secretary can impose approval conditions. Non-compliance with approval conditions is an offence
		s.95 (offence for non-compliance)	Only approved auditor to conduct audits
		s.96 (offence for non-compliance)	Offence to impersonate approved auditors
		s.97 (offence for non-compliance)	Conflict of interest to be avoided when auditing risk management plans
		s.98	Secretary can declare optional variations to risk management requirements
		r.49	Prescribed fees for registration or renewal
		r.50	Secretary can waive fees
		r.51	Prescribed risks to be addressed by a risk management plan by s.92(2)
		r.52	Documents prescribed for risk management plan audit by s.93(4)
		r.53 (offence for non-compliance)	Responsible person to ensure system is maintained and tested as required by legislation
		r.54 (offence for non-compliance)	Requirement for continuous treatment of the cooling tower water
		r.55 (offence for non-compliance)	Requirements for disinfection, cleaning and re-disinfection of cooling tower water, at least every 6 months
		r.56 (offence for non-compliance)	Requirements for routine service and water testing of cooling tower systems, at least monthly
		r.57 (offence for non-compliance)	Treatment requirements following high heterotrophic colony count to be within 24 hours of result. Retesting requirements and closure provisions

	r.58 (offence for non-compliance)	Treatment requirements following high legionella count to be within 24 hours of result. Retesting requirements and closure provisions
	r.59 (offence for non-compliance)	Sampling and decontamination requirements for cooling towers suspected or implicated in legionella case or outbreak
	r.60 (offence for non-compliance)	Record keeping requirements for maintenance and testing
	r.62 (offence for non-compliance)	Responsible person for 'higher risk' premises to ensure system is maintained and tested as required by legislation
	r.63 (offence for non-compliance)	Treatment requirements for 'higher' risk premises following high legionella count to be within 24 hours of result. Retesting requirements and closure provisions
	r.64 (offence for non-compliance)	Sampling and decontamination requirements for 'higher risk' premises cooling towers suspected or implicated in legionella case or outbreak

Appendix 1 – Table 2: Summary of AS/NZS 3666 requirements

Australian Standards 3666 requirements referenced by WA air-handling regulations	
Part	Requirement
1	Minimum standards for the design, installation and commissioning of air-handling and water systems of buildings for the purposes of microbial control
1; section 3.2	Hot water systems to comply with AS 3500.4
1; section 3.3	Warm water systems to comply with AS 3500.4
1; section 4.1.3	Cooling water systems to be provided with automatically controlled water treatment systems, and designed to facilitate the water treatment
1; section 4.1.5	Design, installation and construction of cooling towers
2	Minimum requirements for operation and maintenance of air-handling and water systems of buildings for the purposes of microbial control
2; section 2.3	Maintenance of air-handling systems – monthly inspections
2; section 2.4	Maintenance of heated water systems – monthly inspections. Operated, maintained, inspected, cleaned and disinfected according to AS 3500.4
2; section 2.5	Maintenance of cooling water systems – monthly inspections. Cleaning schedule to be less than every 6 months. Water quality to comply with requirements of

Australian Standards 3666 requirements referenced by WA air-handling regulations

	regulatory authority. Decontamination as required by regulatory authority. Seasonal use requirements.
2; section 2.6	Availability of records and manuals upon request by regulatory authority.
3	Performance based approach to maintenance of cooling water systems for microbial control. Alternative to the prescriptive requirements of Part 2
3; section 2.2	Risk factors in table 2.1 shall be assessed and documented for each site
3; section 2.3	Risk assessment to be conducted to identify, evaluate and report on all factors in Table 2.1. Undertaken and documented by person competent to evaluate cooling water systems, relevant control measures to be implemented. i.e. risk management plan to be part of the operating and maintenance manual
3; section 3.2	Sampling of cooling tower water to be done at least monthly for legionella monitoring according to Appendix A. Testing to be done in accordance with AS 3896. Control strategies to be adopted to be according to Table 3.1
3; section 3.3	Sampling of cooling tower water to be done at least monthly for heterotrophic microbe monitoring according to Appendix A. Testing to be done in accordance with AS 4276. Control strategies to be adopted to be according to Table 3.2
3; section 3.4	Effectiveness of water quality management to be assessed at least monthly
3; section 3.5	Operating system temperature to be measured at least monthly
3; section 3.6	Sampling and testing to be done within 3-7 days of start up if system has been offline for more than 30 days
3; section 3.7	Monthly reporting requirements
4	Performance based approach to maintenance of ducts and components forming air-handling systems for microbial control. Alternative to the prescriptive requirements of Part 2
4; section 2.2	Risk factors in table 2.1 shall be assessed and documented for each site
4; section 2.3	Risk assessment to be conducted to identify, evaluate and report on all factors in Table 2.1. Undertaken and documented by person competent to evaluate cooling water systems, relevant control measures to be implemented. i.e. risk management plan to be part of the operating and maintenance manual

Appendix 2 – Table of proposed defined terms to be included in new regulations

Definitions	
Air-handling system	means an air-handling system as defined in AS 3666 but does not include a dry system which does not use water or other liquids to operate, humidify, clean, maintain, heat or cool the air
Accredited laboratory	<p>Queensland Public Health Regulation 2005</p> <p>accredited laboratory means a laboratory accredited as complying with ISO/IEC 17025 by— (a) the National Association of Testing Authorities Australia ABN 59 004 379 748; or (b) another entity the chief executive is satisfied is appropriately qualified to accredit a laboratory as complying with ISO/IEC 17025.</p>
Cooling tower	means a cooling tower as defined in AS 3666 and also means any other liquid cooled heat rejection or liquid cooling equipment;
Water distribution system	<p>means a piped water system within a building designed to deliver water to outlet points.</p> <p>Queensland Public Health Act 2005</p> <p>water distribution system, of a prescribed facility— (</p> <p>a) means the infrastructure within the prescribed facility from every point where water enters the facility through the infrastructure to every point where the water is used; but</p> <p>(b) does not include a cooling tower.</p> <p>Victoria Public Health and Wellbeing Regulations 2009</p> <p>water delivery system includes any shower plumbing, bath, pipes, water heaters, bathing facilities, water storage tanks or vehicle washing equipment used to store, deliver, transmit, treat or mix water;</p>
Warm water system	<p>South Australian Public Health (Legionella) Regulations 2013</p> <p>warm water means water that is not more than 60°C and not less than 30°C;</p> <p>warm water system means a reticulated water system that distributes or recirculates warm water through the majority of its branches at a nominal temperature of 45°C by means of a temperature controlling device.</p>
Humidifying/ Humidification system	A system that artificially regulates the humidity of an inside environment.
High risk system	A system that services a vulnerable facility or building/premises that houses a susceptible human population; or includes a warm water system or a system set to specific water temperatures that can sustain or promote the growth of legionella and other pathogenic microbes; or includes equipment components that cause aerosols, sprays, mists etc and include cooling towers.
Vulnerable facility	<p>Queensland Public Health Act 2005</p> <p>Queensland introduced a number of mandatory requirements for health related facilities. They define “prescribed facility means—</p> <p>(a) a public sector hospital that provides treatment or care to inpatients; or</p> <p>(b) a private health facility licensed under the Private Health Facilities Act 1999; or (c) a State aged care facility; or</p> <p>(d) a residential aged care facility, other than a State aged care facility, prescribed by regulation. <i>Aged Care Act 1997</i></p>
Health related facility	<p>Queensland Public Health Act 2005</p> <p>Queensland introduced a number of mandatory requirements for health-related facilities. They define “prescribed facility means—</p> <p>(a) a public sector hospital that provides treatment or care to inpatients; or</p>

Definitions

(b) a private health facility licensed under the Private Health Facilities Act 1999; or (c) a State aged care facility; or

(d) a residential aged care facility, other than a State aged care facility, prescribed by regulation.

Other susceptible systems

For other systems that do not meet the definition of high risk, however due to equipment components, system function or other factor, the system must meet certain requirements.

Independent auditor

[South Australian Public Health \(Legionella\) Regulations 2013](#)

People who conduct inspections can be referred to as independent compliance inspectors. Independent compliance inspectors play a crucial role in indirectly providing relevant authorities with clear, timely, thorough, accurate and unbiased information.

They must not be the owner or responsible person

Competent person / responsible person

[South Australian Public Health \(Legionella\) Regulations 2013](#)

In sub regulation (2)(a)(i) a reference to a *competent person* is a reference to a person who—

is knowledgeable in the operation and maintenance of high risk manufactured water systems; and

is sufficiently competent to ensure that high risk manufactured water systems are operated and maintained as required by these regulations; and

has qualifications or training in water treatment of high risk manufactured water systems.

[Victoria - Public Health and Wellbeing Regulations 2009](#)

Regulation 62 requires that the responsible person must take reasonable steps to manage the risks of Legionella in the delivery system located at the premises. The responsible person is any person who owns, manages, or controls the water delivery system.

[NSW Public Health Act](#)

duly qualified, in relation to a person who installs, maintains or operates a regulated system, means a person who might reasonably be expected to be competent to do so.

[NSW Public Health Regulations 2012](#)

In this Part, competent person means a person who is a tertiary qualified chemist, chemical engineer, engineer or microbiologist and who has relevant expertise.

This definition may be reviewed to include:

Competent person should possess tertiary education in engineering or science, practical experience in cooling tower operation and managed, an understanding of risk management and AS/NZS 3666.3.2011, and independence from the person or corporation employed to maintain the water-cooling system, in order to avoid conflict of interest.

[Queensland Public Health Act 2005](#)

responsible person, for a prescribed facility, means—

(a) for a prescribed facility that is a public sector hospital—the health service chief executive for the public sector hospital; or

(b) for a prescribed facility that is a private health facility licensed under the Private Health Facilities Act 1999—the licensee for the private health facility under that Act; or

(c) for a prescribed facility that is a State aged care facility—the health service chief executive for the State aged care facility; or

(d) for a prescribed facility that is a residential aged care facility, other than a State aged care facility—the approved provider that provides residential care at the residential aged care facility.

Definitions

Tasmania -

“water systems professional” means a person who is approved by the Director to perform a risk assessment on a regulated system, or a NP3 tertiary qualified engineer.

AS3666.1.2011 – Design, installation and commissioning

Competent person – a person who has had appropriate training or practical experience (or both) in the subject, sufficient to provide safe and satisfactory performance.

Owner

South Australian Public Health (Legionella) Regulations 2013

(2) In these regulations, a reference to an owner of premises includes a reference to an occupier of the premises.

Risk management plan

Queensland Public Health Act 2005

Water risk management plan, for a prescribed facility, means a written plan to prevent or minimise the risks posed by hazards, hazard sources or hazardous events to individuals at the prescribed facility.

Appendix 3 – Australian legislation summary

Summaries of current legislative management of air-handling and water systems in key Australian jurisdictions.

Legislative requirements	Summary
<p>Victoria</p> <ul style="list-style-type: none"> • Cooling tower systems and warm water systems are governed by the Public Health and Wellbeing Act 2008 and the • Public Health and Wellbeing Regulations 2009. 	<p>Victoria Health centralises the registration of cooling towers and employs 3 FTE positions to inspect these systems each year. There are currently 3,215 cooling tower systems registered on 1,907 sites across Victoria. Victoria Health are funded to undertake 1,000 inspections each year and they focus inspections on sites that are associated with cases of Legionnaires' Disease, that have failed their annual audit, have not had an annual audit or have failed to register / renew their registration.</p> <p>The <i>Public Health and Wellbeing Act 2008</i> and the <i>Public Health and Wellbeing Regulations 2009</i> commenced on 1 January 2010. The following is a summary of the changes introduced by the legislation:</p> <ul style="list-style-type: none"> ▪ Registration of a cooling tower system is done by the Department of Health rather than the Building Commission. ▪ Penalties for failing to register a cooling tower system have been increased significantly. ▪ Registration periods can now be up to 3 years. ▪ Risk management plans must include the steps that are being taken to comply with the maintenance and testing requirements (including remedial action following an adverse test result). ▪ The HCC trigger level for action was increased to 200,000 cfu/mL and there is now an alternative process which can be followed when a high HCC result is obtained. ▪ There is a mandatory requirement for a minimum of a <i>Legionella</i> test every 3 months. The Department still strongly recommends the risk management approach, which in most cases will result in an increased level of testing reflecting the risks associated with particular systems and sites. <p>The owner of the land on which there is a cooling tower system is to ensure that each cooling tower system on that land is registered with the department at all times that the system is in operation.</p> <p>The registration holder must notify the department within 30 days of:</p> <ul style="list-style-type: none"> ▪ a change in the ownership of the land ▪ a change in mailing address or contact details ▪ a change in the numbers of cooling towers in a cooling tower system ▪ the removal or decommissioning of the cooling tower system ▪ the relocation of the cooling tower system on land.
<p>New South Wales</p> <p>Regulation</p> <ul style="list-style-type: none"> • Public Health Act 2010, Legionella Control • Public Health Regulation 2012 - Legionella Control <p>Code / guide</p> <ul style="list-style-type: none"> • Code of Practice for the Control of Legionnaires' Disease 2nd Edition 2004, NSW - currently under review. 	<p>The <i>Public Health Act 2010</i> and the <i>Public Health Regulation 2012</i> control various artificial environments and systems which are conducive to the growth of <i>Legionella</i> organisms and which are capable, under the right conditions, of transmitting Legionnaires' Disease. These regulated systems include:</p> <ul style="list-style-type: none"> ▪ water cooling systems ▪ hot water systems ▪ warm water systems ▪ air handling systems. <p>Exemptions</p>

<ul style="list-style-type: none"> • Water - Requirements for the Provision of Cold and Heated Water - Policy Directive PD2015_008 • Legionnaires' Disease - Control for Building Owners and Occupiers Factsheet • Legionnaires' Disease - Control Guideline for Public Health Units 	<p>Some systems are exempt - including those in a dwelling, warm water systems in any premises other than a hospital, or cooling systems used for making snow.</p> <p>Installation requirements</p> <ul style="list-style-type: none"> ▪ Installed in accordance with AS3666.1:2011 <p>Operating requirements</p> <ul style="list-style-type: none"> ▪ Operation in accordance with AS3666.2:2011 <p>Maintenance precautions</p> <ul style="list-style-type: none"> ▪ Maintenance in accordance with AS3666.2:2011 ▪ Warm water systems must be maintained in accordance with a separate NSW guideline. ▪ Prescribed penalties e.g. for not maintaining appropriately or allowing persons to access area in which maintenance is being carried out. <p>Certification</p> <ul style="list-style-type: none"> ▪ The occupier of a premises must ensure the water-cooling system is certified annually by a competent person and keep a copy to show an authorised officer if requested. <p>Registration</p> <ul style="list-style-type: none"> ▪ The occupier of a premises must notify local government of the installation of water cooling and warm water systems. ▪ Each local government to keep a register of water cooling and warm water systems. <p>Training in Legionella control in cooling water systems</p> <ul style="list-style-type: none"> ▪ NSW Health has developed a training course on Legionella Control in Cooling Water Systems together with TAFE NSW. The course provides an overview of the science relating to Legionnaires' disease outbreaks, cooling water system management, and the roles, responsibilities, and requirements under Regulations. <p>Additional amendments</p> <p>In 2008 NSW Health amended the Regulation to include six key requirements or "safeguards" as part of the risk management approach. This includes:</p> <ol style="list-style-type: none"> 1. assessing risk of <i>Legionella</i> contamination and preparing a Risk Management Plan (RMP) – every 5 years (or more frequently if required) 2. independent auditing of compliance with the RMP and Regulation – every year 3. providing certificates of RMP completion and audit completion to the local government authority 4. sampling and testing for <i>Legionella</i> and heterotrophic colony count – every month 5. notifying reportable laboratory test results (<i>Legionella</i> count $\geq 1,000$ cfu/mL or heterotrophic colony count $\geq 5,000,000$ cfu/mL) to the local government authority 6. displaying unique identification numbers on all cooling towers.
<p>South Australia</p>	<p>Issues addressed by the regulations include:</p> <ul style="list-style-type: none"> ▪ Duty to register high risk manufactured water system ▪ Register of high risk manufactured water systems

- [South Australian Public Health \(Legionella\) Regulations 2013](#)
- [Guidelines for the Control of Legionella in Manufactured Water Systems in South Australia \(PDF 270KB\)](#)

- Cooling water systems to be fitted with automatic biocide dosing devices
- Cooling water systems to be fitted with drift eliminators
- Commissioning of high risk manufactured water systems
- Plans and manuals relating to high risk manufactured water systems to be kept readily accessible etc
- High risk manufactured water systems to be operated and maintained by competent persons
- Maintenance of cooling water systems
- Maintenance of warm water systems
- Maintenance log books
- Annual inspection and microbiological testing
- Power of relevant authority to require microbiological testing in other circumstances
- Responses to detection of Legionella
- Determinations and approvals
- False or misleading statements
- Prescribed guidelines
- Fees.

The Regulations apply to the owner(s) of all warm water system(s) and/or cooling water system(s), except for systems installed in:

- a Class 1A, 4 or 10 building (private single domestic dwelling) under the Building Code, or
- a sole occupancy unit in a class 2 building (unit or flat) under the Building Code, provided that it is not a warm water system that serves more than one dwelling.

Registration

All high risk manufactured water systems installed in premises must be registered with the relevant authority.

'*High risk manufactured water system*' or '*system*' mean a cooling water system or warm water system. Applications are with the local authority and last for a 12 month period.

Fees

The following fees relate to high risk manufactured water systems from 1 July 2016:

- Registration - \$36.25 for the first system, \$24.30 for each subsequent system installed on the same premises
- Renewal - \$18.20 per system
- Inspection - \$145.00 for the first system, \$96.50 for each subsequent system installed on the same premises
- Determination or approval - \$606.00.

Inspections

The Legionella Regulations require system owners to conduct monthly inspections of regulated systems and ensure periodic preventative maintenance is performed as prescribed.

Annual inspection and microbiological testing

Environmental health officers from the relevant authority (for example, the local council) must ensure all regulated systems are inspected at least annually and may inspect systems at any time in relation to disease investigations, reports of non-compliance, Legionella detection or complaints.

	<p>The relevant authority is not required to comply with subregulation (1) (annual inspection and microbiological testing) if the relevant authority, at least once in every 12 months, gives the owner of each of the premises on which a high risk manufactured water system registered with the relevant authority is installed written notice requiring the owner to cause an inspection of the water system to be carried out by a competent person.</p>
<p>Queensland</p> <ul style="list-style-type: none"> • <i>Work Health and Safety Act 2011</i> • Guide to Legionella control in cooling water systems, including cooling towers (PDF 196 KB). 	<ul style="list-style-type: none"> ▪ Service contractors, designers or owners of cooling water systems are required to use the guidelines to manage risks associated with <i>Legionella</i>. ▪ The guidelines state that one of the best ways to protect the public from <i>Legionella</i> is to ensure that all plumbing work complies with relevant plumbing codes and standards.
<p>ACT</p> <ul style="list-style-type: none"> • Public Health Act 1997 • ACT Code of Practice for Public Health (Cooling Towers, Evaporative Condensers and Warm Water Storage Systems Specialised Systems) 2005 	<ul style="list-style-type: none"> ▪ The <i>Public Health Act 1997</i> and the Code of Practice are intended to minimise the potential risks to public health from exposure to Legionella bacteria by: <ul style="list-style-type: none"> • adopting standards for the design, location, commissioning, operation and maintenance of specialised systems at premises; • requiring regular maintenance, inspection and record keeping by trained or competent personnel to ensure that specialised systems at premises meet the standards; and • permitting Public Health Officers to check compliance, take samples for testing and the Chief Health Officer to require the closure of any specialised systems or require the evacuation of a premises where a suspected outbreak of Legionellosis has occurred. ▪ The Code of Practice sets out the minimum requirements for the operation and maintenance of specialised systems at premises in the Australian Capital Territory. The Code of Practice is determined under section 133 of the <i>Public Health Act 1997</i> and is enforceable under section 20 of the Act. ▪ The <i>Public Health Act 1997</i> states that a person may apply to the Minister for a registration to carry on a registrable public health risk activity. The operation of a specialised system is declared to be a location-specific registrable public health risk activity that may result in the transmission of disease to the community. Upon approval by a Public Health Officer, a registration certificate is issued for each specialised system (cooling tower, evaporative condenser or warm water storage system).
<p>enHealth</p> <ul style="list-style-type: none"> • Guidelines for Legionella control in the operation and maintenance of water distribution systems in health and aged care facilities • Risk management plan for Legionella Control in the operation and maintenance of the water systems 	<ul style="list-style-type: none"> ▪ In 2016 enHealth released the Guidelines for Legionella Control (2016), following a number of outbreaks of Legionnaires' Disease in water distribution systems in public hospitals. The design and function of the water distribution system within a health or an aged care facility can affect the potential health risks posed by Legionella within the facility. ▪ The guidelines are designed to assist facility managers to assess and manage the risk from Legionella in health and aged care facilities. They are aimed at facility managers and the facility's risk management team to support the development of a <i>Legionella</i> risk management plan. A plan template is also available. ▪ In March 2016, the "WA Management of Legionella in Warm Water Systems in HealthCare Establishments Working Group" adopted the enHealth Legionella Guidelines and Risk Management Template as best practice. However, this has not yet been officially communicated to the healthcare industry.

Appendix 4 – International legislation summary

Summaries of current legislative management of air-handling and water systems in key International jurisdictions.

Regulation / Code of Practice/ Guidelines	Comments / overview
<p>New Zealand</p> <p>The Prevention of Legionellosis in New Zealand: Guidelines for the Control of Legionella Bacteria available from the Ministry of Health</p>	<p>This document is intended for use by building owners and managers whose buildings incorporate the systems and specific items of equipment mentioned in these guidelines, as well as by health protection staff when advising or following up identified cases.</p> <p>Legionella is a notifiable disease under the <i>Health Act 1956</i>. Health professionals and all medical laboratories (since December 2007) are required to inform their local Medical Officer of Health of the District Health Board (DHB) of any case of legionella either suspected on clinical grounds or established on both clinical grounds and positive laboratory tests.</p> <p>Councils are required to follow the regulations established under the <i>Building Act 2004</i> to ensure buildings are safe and healthy. They administer and enforce the building warrant of fitness regime under the <i>Building Act 2004</i>. This identifies safety systems and features present in a building (such as sprinkler systems, lifts or cooling towers), the performance standards for those systems, and how they will be monitored and maintained to ensure they continue to function safely.</p> <p>Compliance schedules made under section 22 of the <i>Building Act 2004</i> specify inspection, maintenance and reporting procedures for mechanical ventilation and air conditioning systems, to ensure compliance with the New Zealand Building Code. For a building to comply with the Building Code, the territorial authority (or other building consent authority) will issue a 'compliance schedule' itemising all specified systems in the building, as found in the <i>Building (Specified Systems, Change of Use, Earthquake Prone Buildings) Regulations 2005</i>. Mechanical ventilation and air conditioning systems are specified under these regulations [19].</p>

Regulation / Code of Practice/ Guidelines	Comments / overview
<p>United States – New York</p> <p>Part 4 - Protection Against Legionella</p> <p><i>Public Health Law, Section 225(5)(a)</i></p>	<p>Under the regulations, owners of cooling towers must:</p> <ul style="list-style-type: none"> ▪ Register cooling towers in a State-wide electronic system. New towers must be registered prior to initial operation and all tower registrations must be updated in the system whenever ownership changes. ▪ Inspect cooling towers prior to seasonal start-up, following maintenance, and at intervals no greater than 90 days while in use. The purpose of the inspection is to check for deficiencies or problems. ▪ Have an updated maintenance program and plan that includes a schedule for routine bacteriological culture sampling, routine <i>Legionella</i> culture sampling and analysis, and immediate <i>Legionella</i> culture sampling and analysis under specific conditions. ▪ Conduct <i>Legionella</i> culture sampling and analysis within two weeks after start-up for seasonal towers or within two weeks of start-up following maintenance for year-round towers and at intervals not to be greater than 90 days thereafter. <i>Legionella</i> culture sampling and analysis is required where New York State Department of Health (NYSDOH) or a local health department determines that one or more cases of legionellosis is or may be associated with a cooling tower. Bacterial culture sampling and analysis must be conducted at intervals not to exceed 30 days while the cooling tower is in use.

	<ul style="list-style-type: none"> ▪ Use a laboratory approved by NYSDOH to perform <i>Legionella</i> culture analyses. ▪ Respond appropriately to any elevated <i>Legionella</i> culture sampling results. ▪ Notify the local health department within 24 hours of getting a <i>Legionella</i> culture sample result exceeding 1,000 colony-forming units (CFU) per millilitre (mL). ▪ Use only pesticide applicators or technicians certified by the state Department of Environmental Conservation to apply biocides for disinfection. ▪ Certify by November 1st each year that a cooling tower has a maintenance plan, that it has been followed and that all requirements of the regulations have been met. <p>The new regulations also require hospitals and residential health care facilities to:</p> <ul style="list-style-type: none"> ▪ Perform or update an environmental assessment. The purpose of this assessment is to evaluate the building and the potable water systems, and identify sampling locations. ▪ Adopt and implement a sampling and management plan for potable water systems, which includes routine <i>Legionella</i> culture sampling and analysis and immediate <i>Legionella</i> sampling and analysis under specific conditions, including where NYSDOH determines that one or more cases of legionellosis is or may be associated with the facility. ▪ Conduct <i>Legionella</i> culture sampling and analysis at intervals no greater than 90 days for the first year and annually thereafter. Potable water systems that serve stem cell or organ transplant patients must be sampled and analysed at intervals not to exceed 90 days. ▪ Use a laboratory approved by NYSDOH to do <i>Legionella</i> culture analyses [12].
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Regulation / Code of Practice/ Guidelines	Comments / overview
<p>United Kingdom</p> <p><u>Notification of Cooling Towers and Evaporative Condensers Regulations 1992</u></p>	<ul style="list-style-type: none"> ▪ The <i>Notification of Cooling Towers and Evaporative Condensers Regulations 1992</i> require the notification of wet cooling towers and evaporative condensers to local authorities in whose area the equipment is situated, regardless of whether the local authority or Health and Safety (Executive) is the enforcing authority. ▪ The Regulations also require notification to the local authority of the closure of the device.
<p><u>Health and Safety at Work etc Act 1974 (HSWA)</u></p>	<ul style="list-style-type: none"> ▪ The <i>Health and Safety at Work etc Act 1974</i> (also referred to as HSWA, the HSW Act, the 1974 Act or HASAWA) is the primary piece of legislation covering occupational health and safety in Great Britain. The Health and Safety Executive, with local authorities (and other enforcing authorities) is responsible for enforcing the Act and a number of other Acts and Statutory Instruments relevant to the working environment. ▪ Duties under the <i>Health and Safety at Work etc Act 1974</i> extend to risks from legionella bacteria, which may arise from work activities. <i>The Management of Health and Safety at Work Regulations 1999</i> (MHSWR) provide a broad framework for controlling health and safety at work. More specifically, <i>the Control of Substances Hazardous to Health Regulations 2002</i> provide a framework of actions designed to assess, prevent or control the risk from bacteria like Legionella and take suitable precautions. The Approved Code of Practice: <u>Legionnaires' Disease: The control of Legionella bacteria in water systems (L8)</u> contains practical guidance on how to manage and control the risks in a system [20].

Appendix 5 – Class of buildings under the Building Code of Australia

Class	Explanation
Class 1A	A single dwelling being a detached house, or one or more attached dwellings, each being a building, separated by a fire-resisting wall, including a row house, terrace house, town house or villa unit.
Class 1B	A boarding house, guest house, hostel or the like with a total area of all floors not exceeding 300m ² , and where not more than 12 reside, and is not located above or below another dwelling or another class of building other than a private garage.
Class 2	Class 2 buildings are apartment buildings. They are typically multi-unit residential buildings where people live above and below each other. The NCC describes the space which would be considered the apartment as a sole-occupancy unit (SOU). Class 2 buildings may also be single storey attached dwellings where there is a common space below. For example, two dwellings above a common basement or carpark.
Class 3	Class 3 buildings are residential buildings other than a Class 1 or Class 2 building. They are a common place of long term or transient living for a number of unrelated people. Examples include a boarding house, hotel, motel, guest house, hostel or backpackers (that are larger than the limits for a Class 1b building). Class 3 buildings could also include dormitory style accommodation, or workers' quarters for shearers or fruit pickers. Class 3 buildings may also be "care-type" facilities such as accommodation buildings for children, the elderly, or people with a disability, and which are not considered to be Class 9 buildings.
Class 4	A dwelling in a building that is Class 5, 6, 7, 8, or 9 if it is the only dwelling in the building.
Class 5	Class 5 buildings are office buildings that are used for professional or commercial purposes, excluding Class 6, 7, 8 or 9 buildings. Examples of Class 5 buildings are offices for lawyers, accountants, general medical practitioners, government agencies and architects.
Class 6	Class 6 buildings are typically shops, restaurants and cafés. They are a place for the sale of retail goods or the supply of services direct to the public. Some examples are: <ul style="list-style-type: none"> ▪ A dining room, bar, shop or kiosk part of a hotel or motel ▪ A hairdresser or barber shop ▪ A public laundry ▪ A market or showroom ▪ A funeral parlour ▪ A shopping centre.
Class 7	Class 7 buildings include two sub classifications: Class 7a and Class 7b. Class 7a buildings are carparks. Class 7b buildings are typically warehouses, storage buildings or buildings for the display of goods (or produce) that is for wholesale.
Class 8	A factory is the most common way to describe a Class 8 building. It is a building in which a process (or handicraft) is carried out for trade, sale, or gain. The building can be used for production, assembling, altering, repairing, finishing, packing, or cleaning of goods or produce. It includes buildings such as a mechanic's workshop. It may also be a building for food manufacture, such as an abattoir. A laboratory is also a Class 8 building, even though it may be small in size. This is due to their high potential for a fire hazard.
Class 9	Class 9 buildings are buildings of a public nature. Class 9 buildings include three sub classifications: Class 9a, Class 9b and Class 9c. Class 9a buildings are generally hospitals which are referred to in the NCC as health-care buildings. They are buildings in which occupants or patients are undergoing medical treatment and may need physical assistance to evacuate in the case of an emergency. This includes a clinic (or day surgery) where the effects of the treatment administered would involve patients becoming unconscious or unable to move. This in turn requires supervised medical care (on the premises) for some time after treatment has been administered. Class 9b buildings are assembly buildings in which people may gather for social, theatrical, political, religious or civil purposes. They include schools, universities, childcare centres, pre-schools, sporting facilities, night clubs, or public transport buildings. Class 9c buildings are aged care buildings. Aged care buildings are defined as residential accommodation for elderly people who, due to varying degrees of incapacity associated with the ageing process, are provided with personal care services and 24 hour staff assistance to evacuate the building in an emergency
Class 10	A non-habitable building or structure. Class 10A examples include a private garage, carport or shed. Class 10B examples include a structure being a fence, mast, antenna, wall or swimming pool. Class 10C is a private bushfire shelter.

Appendix 6 – Risk Rating matrices and definitions

A number of risk assessment tools need to be used to determine the risk level for each identified public health risk. These tools include a health consequences table (Table 4), risk likelihood table (Table 5) and risk qualitative matrix (Table 6).

These risk assessment tools are from AS/NZS ISO 31000:2009 Risk Management – Principles and guidelines [27] and the Health Risk Assessment (Scoping) Guidelines [28].

The DOH has five Public Health Risk levels (shown Table 3), each requiring a varying degree of DOH involvement in their management.

Table 1 Definition of risk levels

Risk Level	DOH management requirements
Very Low Public Health Risk	No further assessment required
Low Public Health Risk	Some mitigation/management may be required – no detailed assessment of health hazards required but addressed with routine controls
Moderate/Medium Public Health Risk	Substantial mitigation/management required – assessment required of health hazards
High Public Health Risk	Not an acceptable risk. The DOH needs to be involved in the management of high public health risks. Major mitigation/management (including offsets) may be required – assessment required of health hazards
Extreme Public Health Risk	Potentially unacceptable: modification of proposal required

Table 2 Health consequences table adapted from the 2011 Health Risk Assessment (Scoping) Guidelines, DOH WA

Category	Acute Health Consequences (per hazard or outbreak)	Chronic Health Consequences (per project lifecycle)
1 Catastrophic	<ul style="list-style-type: none"> • >1 fatality • OR >5 permanent disabilities • OR Non-permanent injuries requiring hospitalisation for 5 – 10 % of populations at risk • OR Acute health effect requiring hospitalisation for 5 – 10 % of populations at risk 	Chronic health effect requiring medical treatment for 10 – 15 % of population at risk
2 Massive	<ul style="list-style-type: none"> • 1 fatality • OR 2 – 5 permanent disabilities • OR Non-permanent injuries requiring hospitalisation for 2 - 5 % of populations at risk • OR Acute health effect requiring hospitalisation for 2 – 5 % of populations at risk 	Chronic health effect requiring medical treatment for 5 - 10 % of population at risk
3 Major	<ul style="list-style-type: none"> • No fatality • AND 1 permanent disability • OR Non-permanent injuries requiring hospitalisation for 1 – 2 % of populations at risk • OR Acute health effect requiring hospitalisation for 1 - 2 % of populations at risk • OR Evacuation is necessary 	Chronic health effect requiring medical treatment for 2 - 5 % of population at risk

Category	Acute Health Consequences (per hazard or outbreak)	Chronic Health Consequences (per project lifecycle)
4 Moderate/ Significant	<ul style="list-style-type: none"> No fatality AND No permanent disability AND Non-permanent injuries requiring hospitalisation for 1 – 2 % of populations at risk OR Acute health effect requiring hospitalisation for 1 – 2 % of populations at risk AND No evacuation 	Chronic health effect requiring medical treatment for 1 - 2 % of population at risk
5 Minor	<ul style="list-style-type: none"> No fatality AND No permanent disability AND Non-permanent injuries requiring hospitalisation for 1 – 5 persons OR No Acute health effect requiring hospitalisation AND No evacuation 	Chronic health effect requiring medical treatment for 0 - 1 % of population at risk
6 Negligible/ Slight	<ul style="list-style-type: none"> No fatality AND No permanent disability AND No Non-permanent injuries requiring hospitalisation AND No Acute health effect requiring hospitalisation AND No evacuation 	No chronic health effect requiring medical treatment

Table 3 Risk likelihood table adopted from the 2011 Health Risk Assessment (Scoping) Guidelines, DOH WA

Likelihood	Expected or Actual Frequency	% Chance of chronic health effect during life of project
Almost Certain	More than once a year	Over 90%
Likely	Once in 1 to 3 years	61 – 90%
Possible/ Occasionally	Once in 3 – 5 years	31 – 60%
Unlikely	Once in 5 – 10 years	6 – 30%
Rare/Remote	Once in more than 10 years	Up to 5%

Table 4 Risk matrix (qualitative)

Likelihood	Consequences					
	Slight/ Negligible	Minor	Moderate	Major	Massive	Catastrophic
Almost certain	Low	Medium	High	Extreme	Extreme	Extreme
Likely	Low	Low	Medium	High	Extreme	Extreme
Possible	Very Low	Low	Low	Medium	High	Extreme
Unlikely	Very Low	Very Low	Low	Low	Medium	High
Rare/ Remote	Very Low	Very Low	Very Low	Low	Low	Medium

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