



Health

**Proposed changes to the regulation of water-cooling systems to
prevent Legionnaires' disease in NSW:**

Consultation Discussion Paper

December 2016

1. Introduction

The *Public Health Act 2010* (the Act) and *Public Health Regulation 2012* (the Regulation) sets out the regulatory framework for “regulated systems”, which are certain systems that are at risk of spreading *Legionella* bacteria, the cause of Legionnaires’ disease. The Act and Regulation set out the installation, operation and maintenance requirements that apply to occupiers of premises containing regulated systems. These requirements are aimed at minimising the growth and spread of *Legionella* bacteria.

Under the Act, regulated systems include¹:

- air-handling systems
- hot water systems
- humidifying system
- warm water systems and
- water-cooling systems. A water-cooling system includes a water-cooling tower.

Legionnaires’ disease is an uncommon infection of the lungs (pneumonia) caused by *Legionella* bacteria. The bacteria are commonly found in the environment, particularly water and soil. There are many different species of *Legionella* bacteria but the two that most commonly cause disease in NSW are *Legionella pneumophila* (found in water) and *Legionella longbeachae* (found in soil or potting mix). *Legionella pneumophila* bacteria can contaminate cooling towers in water-cooling systems, and water in other settings such as whirlpool spas, plumbing and shower heads. Patients with Legionnaires’ disease can present with pneumonia and while most people recover, approximately 10% of patients die.

Cooling towers are at high risk of contamination by *Legionella* bacteria. Cooling towers usually sit on top of large buildings as part of the water-cooling system. They include a pool of water that is sprayed over pipes to cool the air inside the building. The water is then recirculated into the pool of the cooling towers. This pool of warm water provides ideal conditions for the growth of *Legionella pneumophila* as well other bacteria. Depending on the weather conditions, the water droplets from cooling towers can drift over the roof of the building and down into the street beside the building, or may be blown some distance away. People can be infected with *Legionella* bacteria if they breathe in contaminated water droplets.

Due to the risk of contamination, water-cooling systems must be regularly and carefully inspected, disinfected and, where necessary, cleaned and decontaminated. While regular testing is not necessary to keep the cooling towers clean, it can assist the maintenance process by providing a scientific basis and understanding of microbial loading in the system. It is the responsibility of the occupier of the premises that contains a water-cooling system to comply with the appropriate installation, operation and maintenance requirements of a cooling tower so as to minimise the growth and spread of *Legionella* bacteria.

¹ Section 26 Public Health Act 2010. However, a regulated system does not include a regulated system (other than a water-cooling system) located in a private dwelling, a warm water system that is installed in premises other than a hospital or nursing home and a water-cooling system that is used solely for making snow: clause 5 Public Health Regulation

Although previous sampling has estimated that 10% or more of cooling towers may be contaminated with various species of *Legionella* bacteria at any one time, most are never found to cause outbreaks of disease. The reason why some cooling towers are associated with outbreaks is unclear, but may include the level of contamination, weather conditions that promote *Legionella* growth and survival in droplets (such as the level of humidity, sunlight, temperature and wind direction), and the proximity of susceptible people.

2. The current regulatory framework for water-cooling systems

The NSW Public Health Act and Regulation sets out certain requirements for water-cooling systems, with the aim to protect public health by minimising the likelihood that cooling towers become contaminated with *Legionella* bacteria.

Under section 28-30 of the Act, an occupier of premises containing a water-cooling system must ensure that the prescribed installation, operation and maintenance requirements are complied with. A failure to comply with the prescribed requirements is an offence and can result in an improvement notice being issued or in serious cases a prohibition order being issued. A prohibition order can prevent the regulated system from being operated. Under section 31 of the Act, the occupier of the premises must notify the local government within a month of a water-cooling system being installed. The local government must maintain a register of water-cooling systems installed on premises in its area. The register must contain the following particulars relating to each regulated system:

- the address and telephone number of the premises on which the system is installed
- the name and contact details of the occupier of the premises (including residential address, e-mail address and home, business and mobile telephone numbers)
- the Australian Business Number (ABN) or Australian Company Number (ACN) (if any) of the occupier of the premises
- the type of regulated system
- details of any inspections carried out by the local government authority for the purposes of the Act.

Occupiers of premises containing a water-cooling system must inform the local government within 7 days if any of the above details change.

Under section 33 of the Act, in an outbreak of Legionnaires' disease, the Secretary of the Ministry of Health can direct an investigation and an authorised officer may order the occupier of the premises to take actions to maintain a water-cooling system.

The prescribed installation, operation and maintenance requirements are set out in the Regulation. A summary of these prescribed requirements for water-cooling systems are set out below.

An occupier of premises containing a water-cooling system must ensure that:

- the system is installed in accordance with *AS/NZS 3666.1:2011 Air-handling and water systems of buildings—Microbial control—Design, installation and commissioning*, as applicable to the specific system;
- the system is operated as required by *AS/NZS 3666.2:2011 Air-handling and water systems of buildings—Microbial control—Operation and maintenance*;
- there must be safe and easy access to a regulated system for the purpose of the cleaning, inspection and maintenance of the system;
- the water-cooling system must be equipped with a disinfection procedure that is in operation at all times and that is designed to control microbial growth so that:
 - the level of *Legionella* in the system is not more than 10 colony-forming units per millilitre, and

- the heterotrophic plate count in the system is not more than 100,000 colony-forming units per millilitre.

If a level set out above is exceeded, remedial action must be taken as soon as practicable by a “competent person” or a person acting under the supervision of a competent person;

- a water-cooling system must be maintained in accordance with:
 - AS/NZS 3666.2:2011 *Air-handling and water systems of buildings—Microbial control—Operation and maintenance*, or
 - AS/NZS 3666.3:2011 *Air-handling and water systems of buildings—Microbial control—Performance-based maintenance of cooling water systems* but only if the occupier of the premises on which the water-cooling system is installed has notified the local government authority for the area²;
- all tests carried out in the course of complying with the prescribed maintenance requirements for a regulated system must be carried out in a laboratory accredited by the National Association of Testing Authorities for that purpose; and
- the system must be certified annually by a competent person as being equipped with a disinfection procedure that is effective under the range of operating conditions that could ordinarily be expected for the system concerned. A copy of the most recent certificate at the premises must be kept and made available for inspection on request by an authorised officer.

A competent person is defined in the Regulation as a person who is a tertiary qualified chemist, chemical engineer, engineer or microbiologist and who has relevant expertise³.

Notably, among other aspects required under the Regulation, the Australian Standards referred to in the Regulation require that water-cooling systems be:

- inspected at least monthly and cleaned at least 6-monthly (AS/NZS 3666.2:2011), or
- inspected and tested monthly and controls applied according to monthly testing results and other assessments (AS/NZS 3666.3:2011).

² Water-cooling systems at thermal power stations are not affected by the changes in this paper and are not required to be maintained in accordance with sections 3.2 and 3.3 of AS/NZS 3666.3:2011 *Air-handling and water systems of buildings—Microbial control—Performance-based maintenance of cooling water systems* but must instead be maintained in accordance with the protocols entitled *Thermal Power Station Main Water-cooling Systems—Trigger Action Response Protocols*, published by the Ministry of Health.

³ Clause 4, Public Health Regulation 2012

3. The Chief Health Officer's Expert Panel

Following an outbreak of Legionnaires' disease in the Sydney central business district in 2016, an Expert Advisory Panel (the Panel) was established to review the current regulatory framework and determine if any new measures were required to strengthen the prevention and control of *Legionella* contamination in water-cooling systems.

The Panel included public health physicians, environmental health officers, an infectious disease physician, a legal expert, industry experts, a mechanical engineer and local government. NSW Health also carried out initial consultation with the Office of Local Government and Local Government NSW and the Victorian Department of Health and Human Services (DHHS) to investigate regulatory models.

The Panel noted that while the current regulatory framework in NSW was robust, it allows for varying levels of testing and inspection to be carried out by, or on behalf of, occupiers regardless of the particular design of the water-cooling system and its particular risks of contamination. The physical design of the cooling tower is not usually considered where occupiers follow the maintenance requirements of AS 3666.2, as many do, rather than AS 3666.3.

The Panel considered that a risk management approach would strengthen the current regulatory framework for water-cooling systems in NSW. The Panel reviewed a range of models in Australia and internationally and particular attention was given to the model used in Victoria, which includes risk management plans (RMPs) for individual water-cooling systems and independent auditing. The Panel noted that the Victorian model is already used by national organisations that operate in Victoria and NSW.

The Panel recommended that:

1. **NSW Health** should:
 - develop a regulatory framework that requires minimum standards and a risk management framework for the operation of cooling towers
 - build capacity in the relevant workforces
2. **Minimum standards** include that all cooling towers are tested every month for *Legionella* and Heterotrophic Plate Count and inspected at least monthly with the requirements to be determined by the Risk Management Plan.(see 4.4)
3. **Building occupiers should:**
 - ensure that cooling towers are labelled with a unique identification number (see 4.6)
 - maintain risk management plans for each cooling tower system (see 4.1)
 - demonstrate that compliance with each cooling tower's risk management plan has been audited annually by an independent auditor (see 4.2)
 - provide evidence of compliance with the risk management plan annually to the local government (see 4.3)
 - perform an online disinfection when required by an authorised officer (see 4.7)
4. **Testing laboratories should notify cooling tower test results of:**
 - CFU *Legionella* >1000 and
 - HPC >5,000,000 to the local government (see 4.5)
5. **Local government should:**
 - require additional testing of cooling towers and notification of results if required (4.8)

- include evidence of compliance with risk management plans in the register of cooling towers (see 4.3)

The Ministry of Health (the Ministry) in principle supports these recommendations to help minimise the risk of outbreaks of Legionnaires' disease in the community and is proposing changes to the Regulation to implement the recommendations. These changes largely require compliance with AS/NZS 3666.3:2011, rather than giving occupiers the choice of compliance with AS/NZS 3666.3:2011 or AS/NZS 3666.2:2011, with a requirement that the risk assessment as part of AS/NZS 3666.3:2011 be formally documented in a risk management plan, that accords with a form approved by the Health Secretary.

The proposed changes to the Regulation are set out below and the Ministry seeks submissions from relevant stakeholders to assess the suitability of the proposed changes to the Regulation to implement the recommendations of the Panel.

4. Proposed changes to the Public Health Regulation following the recommendations of the Expert Advisory Panel

4.1. Requirement for occupiers to maintain risk management plans for each cooling tower system

The Ministry agrees that a risk management framework, underpinned by strong minimum requirements, for water-cooling systems is appropriate.

There is a high degree of variability in the risk presented by a water-cooling system. For example, the presence of stagnant water varies with seasonal usage, and the size of the system determines the surface area available for biofilms to form relative to the volume of water it contains. While minimum standards are an important tool to help ensure that water-cooling systems are installed, maintained and operated in such a way as to minimise the risk to public health, a risk based approach ensures that occupiers determine and respond to the differing risks of their system and tailor the operation and maintenance of each individual water-cooling system according to the risks of each system and the environment in which it operates. Tailoring the response to the risks presented by the system allows for additional activities, above a minimal level, to be designed for systems that have higher levels of risk.

Currently under the Regulation, the adoption of a risk based approach to the maintenance and operation of water-cooling systems is not mandated. The Regulation requires occupiers to ensure that:

- the water-cooling system is maintained in accordance with:
 - AS/NZS 3666.2:2011 *Air-handling and water systems of buildings—Microbial control—Operation and maintenance*, or
 - AS/NZS 3666.3:2011 *Air-handling and water systems of buildings—Microbial control—Performance-based maintenance of cooling water systems* but only if the occupier of the premises on which the water-cooling system is installed has notified the local government authority for the area⁴.

This results in an occupier having the choice of prescriptive (AS/NZS 3666.2:2011) or performance based (AS/NZS 3666.3:2011) approaches for maintenance of water-cooling systems.

The performance based standard (AS/NZS 3666.3:2011) requires a risk based approach. It requires a risk assessment to be undertaken, by a competent person (defined as in the Regulation), to identify, evaluate and report on a range of areas (e.g., stagnant water, nutrient growth, poor water quality, deficiencies in the water-cooling system, as well as location and access) that pose a potential risk in order to minimise the risk of the growth of *Legionella* bacteria and Heterotrophic Plate Count (HPC).

⁴ Water-cooling systems at thermal power stations are not affected by the changes in this paper and are not required to be maintained in accordance with sections 3.2 and 3.3 of AS/NZS 3666.3:2011 *Air-handling and water systems of buildings—Microbial control—Performance-based maintenance of cooling water systems* but must instead be maintained in accordance with the protocols entitled *Thermal Power Station Main Water-cooling Systems—Trigger Action Response Protocols*, published by the Ministry of Health.

However, the performance based standard is not mandatory. Rather, occupiers can chose between this performance (risk based) approach and a prescriptive approach (AS/NZS 3666.2:2011). Further, based on information and industry advice, the Ministry understands that a large proportion of occupiers (or those who manage the system on their behalf) opt for the prescriptive approach.

The specific risks associated with the design or performance of an individual system may not be adequately considered in its ongoing operation and maintenance through a prescriptive approach. The Regulation does require that a water-cooling system be certified annually by a competent person as being equipped with a disinfection procedure that is effective under the range of operating conditions that could ordinarily be expected for the system concerned. However, this requirement is not considered sufficient for a risk management approach which requires ongoing monitoring, assessment and control strategies appropriate to the risks each cooling tower system presents.

It is noted that Victoria requires a risk management approach to water-cooling systems⁵ and some water service providers who operate in both Victoria and NSW will adopt a risk management approach for those systems they maintain in NSW.

As such, and in line with the Panel's recommendation, it is proposed to amend the Regulation to remove the discretion occupiers have to comply with either AS/NZS 3666.2:2011, or AS/NZS 3666.3:2011. Rather, the Regulation would require compliance with AS/NZS 3666.3:2011.

AS/NZS 3666.3:2011 requires a risk assessment to be carried out which identifies, evaluates and reports on a range of factors, set out in Table 2.1 of AS/NZS 3666.3:2011 (such as stagnant water, poor water quality and deficiencies in the cooling tower system), and measures to address the risks. In addition, AS/NZS 3666.3:2011 sets out, in Tables 3.1 and 3.2, additional control strategies that must be complied with when the presence of *Legionella* or a raised level of HPC is detected.

While AS/NZS 3666.3:2011 requires a risk assessment to be carried out and sets out additional control strategies, the Ministry is also proposing that this risk assessment is formally set out in a risk management plan (RMP), which would be in a form approved by the Health Secretary. It is expected that the form would be in a template similar to that already in use in Victoria⁶. Occupiers will be required to comply with the RMP (with compliance assessed annual by an independent auditor (see below).

Questions for consideration:

4.1.1 What barriers might there be to occupiers complying with AS/NZS 3666.3:2011 and implementing a risk management plan?

4.1.2 Does the Victorian guide provide a useful template?

⁵ See Part 7 of the Victorian Public Health and Wellbeing Act 2008

⁶ State of Victoria 2015, A guide to developing risk management plans for cooling tower systems, Department of Health and Human Services, State Government of Victoria, Melbourne, viewed 25 October 2016, www.health.vic.gov.au/legionella/index

4.2 Requirement to demonstrate that compliance with each water-cooling system's risk management plan has been audited annually by an independent auditor

The Ministry supports the recommendation of the Expert Advisory Panel relating to an annual independent audit. It is considered that a third party audit of RMPs by a skilled and competent person would improve compliance with implementation of those plans. The role of the auditor would be to:

- evaluate the adequacy of the RMP in meeting the requirements of AS/NZS 3666.3:2011
- assess whether the RMP is properly implemented
- recommend changes to the RMP where necessary with reasonable justification.

An audit will involve a review of all relevant documents including:

- the RMP
- all maintenance activities undertaken in relation to the system; this includes records of any services, cleans, inspections and repairs to the system
- all microbiological test results of samples taken from the system
- all notices/orders/warning letters or other correspondence issued to the occupier

As the audit would involve a review of the records, it is expected that in most cases, the audit could be done off-site.

It is proposed that the auditor should be independent of the occupier and the person employed to maintain the water-cooling system on their behalf. The auditor would need to be a suitably qualified person, being someone who has training, qualifications and experience in the operation and maintenance of regulated systems. This could be determined either by a person holding certain qualifications and/or be approved as an auditor by NSW Health. An auditor could be an authorised officer of a local government authority or NSW Health or a commercial operator.

The auditor must be satisfied that the risk factors outlined in AS/NZS 3666.3:2011 (including stagnant water, nutrient growth, poor water quality, deficiencies in the cooling tower system, location and access to cooling towers) have been considered and addressed as required, based on the risk assessment, and that the RMP is being implemented through review of maintenance logbooks and other documents referred to in the RMP.

If the auditor believes that the RMP has not been implemented or complied with, they must notify the relevant local government who can assess whether regulatory action is required

It is also proposed that occupiers would need to provide documentation that the audit has been performed to the relevant local government authority, with a penalty for non-compliance.

A penalty for failure to provide evidence of a RMP and annual audit would encourage occupiers of premises with water-cooling systems to monitor and comply with risk assessments and RMPs, assisting in the optimal functioning of a water-cooling system.

Questions for consideration:

- 4.2.1 What challenges might arise from the requirement for third party auditors, and how might these be overcome?
- 4.2.2 What competencies are required for auditors?

4.3. Requirement to include evidence of compliance with risk management plans in the register of water-cooling systems to local government

It is proposed that the occupier will be required to provide evidence to the local government authority that a RMP has been developed, and that it has been satisfactorily audited, with a penalty provided for non-compliance. It is not proposed that the actual RMP or audit reports are provided to the local government, rather that certification that they have been done would be provided to the local government. It is proposed that the RMP and audit report would be made available immediately to authorised officers as part of an outbreak investigation, or for the purpose of quality assurance surveys, and to allow regulatory enforcement activities.

It is proposed that the local government would be able to charge a fee to receive certifications, and investigate and carry out any regulatory action. The local government would include the information that the RMP and audit reports had been received in the register of water-cooling towers.

Questions for consideration:

- 4.3.1 Are there any barriers to providing evidence of compliance to local government?
- 4.3.2 What evidence of compliance should be required?

4.4. Requirement that all water-cooling systems are tested every month for *Legionella* and heterotrophic plate count (HPC) and inspected at least monthly, with additional testing and inspection requirements to be determined by the risk management plan

The Ministry agrees that minimum standards are important, even when a risk based approach is implemented. Minimum standards provide a failsafe mechanism to help identify when systems are not functioning appropriately and remedial action is required before bacteria rise to levels that may pose a significant risk to public health.

This minimum standard is consistent with the monitoring and control strategies set out in AS/NZ 3666.3:2011 in which the control strategy details graded responses to levels of *Legionella* bacteria and HPC detected in the system, facilitating investigation of exceeded thresholds, review of the water treatment program and steps to take necessary remedial action including immediate on-line disinfection.

Questions for consideration:

4.4.1 Should monthly testing of cooling towers for *Legionella* and HPC be a minimum requirement?

4.5 Requirement to notify water-cooling systems test results of CFU *Legionella* >1000 and HPC >5,000,000 to the local government

The Ministry supports notification of elevated levels of bacteria identified in water cooling systems as an additional failsafe mechanism to identify failing cooling tower systems so that local government can take regulatory actions if required. The Ministry is proposing that the following test results be required to be notified to local government as follows:

- In respect of *Legionella* bacteria, a level of 1000 cfu/mL or above; and
- In respect of HPC, a level 5,000,000 cfu/mL or above.

Under the current Regulation there is no requirement that elevated levels of bacteria identified in water cooling systems are notified to government. The proposed notification level is deliberately set high in recognition that detections of lower levels will require the occupier to take action based on the AS/NZS 3666.3:2011 and the RMP. AS/NZS 3666.3:2011 requires that escalated control actions be immediately initiated at various levels of *Legionella* and of heterotrophic microorganisms.

NSW Health will carefully monitor the impact of this requirement over time, and if necessary the notification thresholds for contamination can be varied if necessary to protect public health.

Questions for consideration:

4.5.1 Are the levels for notification of *Legionella* and HPC appropriate?

4.6 Requirement to ensure that water-cooling systems are labelled with a unique identification number

The Ministry supports this recommendation. During the recent investigations of *Legionella* cases, authorised officers (Environmental Health Officers) reported challenges in linking laboratory results to specific water-cooling systems, particularly where several samples were being taken from one address. The introduction of clear labeling of water-cooling systems and their locations will allow authorised officers and contractors to easily identify water-cooling systems for inspections and emergency response, especially during outbreak investigations.

Questions for consideration:

- 4.6.1** Should occupiers be required to provide clear and unique labelling of water-cooling systems?

4.7 Requirement to performing an online disinfection when required by an authorised officer

The Ministry supports this recommendation. During outbreak investigations, priority is given to assessing and testing water-cooling systems in the vicinity of areas that have been epidemiologically linked to multiple cases of Legionnaires' disease.

Should a cooling tower test positive, disinfection would be required. However, *Legionella* bacteria are slow to grow and results of testing will take a few days to be finalised. Therefore, it is often prudent for public health purposes to undertaken an online disinfection prior to result being returned.

Online disinfection is the process of chemically disinfecting the water-cooling system while it is operating and the process for carrying out the online disinfection is set out in the AS/NZS 3666.3:2011 (Appendices B and C respectively).

However, under the AS/NZS 3666.3:2011 online disinfection is only required when there is a positive result, not when there has been an outbreak in the vicinity of the cooling tower and before the results of the tests have been returned.

Allowing precautionary online disinfection after the sample has been taken but before the results are available in cooling towers located in an area suspected to be causing an outbreak would reduce the time the contaminated water-cooling systems poses a risk to the public. This approach would likely lead to uncontaminated cooling towers being unnecessarily disinfected, however, this cost is balanced by the likelihood of reducing the outbreak exposure period, and further cases of legionnaires disease.

Accordingly, it is proposed to require an occupier to ensure online disinfection takes place when directed to do by an authorised officer.

Questions for consideration:

- 4.7.1 Should authorised officers have the power to direct an occupier to perform a precautionary online disinfection of water-cooling systems in response to a notified case or cases of *Legionella* even before there is laboratory evidence of contamination?

4.8 Requirement for additional testing of water-cooling system and notification of results if required by local government

When an authorised officer is concerned that a water-cooling system may present a risk of contamination because of evidence of poor compliance with the RMP, notification of high levels of bacteria, or similar concerns that raise a public health risk, then immediate assessment of that risk through inspection and testing is considered to be justified. This will assist local government assessing and addressing the potential risk with minimal delay.

The Ministry supports this recommendation.

Questions for consideration:

- 4.8.1 Should local government be able to require additional testing and notification of the results if required to assess the risk of contamination?

5. Timeframe for Implementation of Proposed Changes

The Ministry recognises that in implementing the recommendations of the Panel, there may need to be a transition period before the proposed amendments commence so as to allow occupiers and operators of regulated systems to familiarise themselves with the changes and make any necessary adjustments to their operations. The Ministry would expect occupiers to move to the new system as soon as possible, but recognises that a 3 to 6 month transition period may be necessary.

6. Summary

The above recommendations together are considered to provide a comprehensive strategy to help control *Legionella* in water-cooling systems. The proposed changes will provide a strengthened regulatory framework to maintain standards for water-cooling systems and help protect public health.

7. Submissions

Comment is invited on issues raised in this Discussion Paper or on any other aspect of the Public Health Act. There is no special form for submissions. Submissions should be in writing and directed to:

Legionnaires' Disease Discussion Paper Response
Health Protection NSW
Locked Bag No. 961
North Sydney NSW 2059
Email: publichealth@doh.health.nsw.gov.au

This Paper can be found at <http://www.health.nsw.gov.au/Infectious/Pages/legionella-panel-recommendations.aspx>. The closing date for comment is 9 February 2017.

Individuals and organisations should be aware that generally submissions made on the Review may be made publically available under the Government Information (Public Access) Act 2009. The Ministry of Health, in considering the submissions received, may also circulate submissions for further comment to other interested parties or to publish parts of submissions. If you wish your submission (or any part of it) to remain confidential (subject to the Government Information (Public Access) Act), this should be stated clearly and marked.

8. References

Australia/New Zealand Standard Committee, *AS/NZS 3666.1-4:2011, Air-handling and water systems of buildings – Microbial control*, Parts 1 to 4, November 2011. 3.