

# Code of Practice for Water Treatment Service Providers (Cooling Tower Systems)

January 2002

**Department of Human Services  
Public Health Group**



## **Feedback**

The Department welcomes feedback on this document. Comments can be made in writing to the *Legionella* Risk Management Project within the Public Health Group, or via e-mail to [lrm@dhhs.vic.gov.au](mailto:lrm@dhhs.vic.gov.au)

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# Preface

The development of this Code of Practice has been facilitated by the Government of Victoria's Department of Human Services as part of its *Legionella Risk Management Strategy*.

The Code of Practice was developed by the Department in partnership with a consultative committee established for this purpose. The committee consisted of members of the Water Treatment Service Provider (WTSP) industry, the Plastics and Chemicals Industries Association (PACIA) National Water Treatment Group, WorkSafe Victoria, EPA Victoria, Melbourne University Microbiology, Plumbing Industry Commission, Air Conditioning Mechanical Contractors Association, Australian Institute of Refrigeration Air-Conditioning and Heating (AIRAH), Property Council of Australia, Construction, Forestry, Mining and Energy Union (CFMEU), and the Department of Human Services.

Further consultation with stakeholders occurred through a one-day workshop held in late May 2001 and subsequent mail-outs of new resources as they were produced. Over twenty submissions were received from industry members, representative associations, regulators, water authorities, and other interested parties.

Establishing a Special Interest Group (SIG) for WTSPs under the auspices of AIRAH during the consultative phase has provided for the first time a mechanism for the representation of the WTSP industry in Victoria that incorporates the views of large, medium and small companies. It is hoped that this may become a national model for the industry. AIRAH has, during the course of development of the Code, proactively engaged with industry members and consulted frequently with the

Department and their project consultant, Egis Consulting Australia P/L.

The provisions of the Code, and the supporting information and guidance to be provided in an accompanying Guidance Manual (currently under development) are now largely representative of what the industry and the Department believe should be covered in the Code. Notwithstanding some points of contention and disagreement from some sectors, consensus has been reached as far as is possible at present on such a complex and significant issue. It is hoped that in subsequent revisions of the Code over time, these issues can be suitably resolved.

It is the Government's and the industry's wish that the Code of Practice will serve as an accepted 'best practice' standard for the industry and lead to more professional, consistent and accountable service which will ultimately reduce the potential occupational and public health risks associated with the presence of *Legionella* bacteria in cooling tower systems.

**The Department of Human Services and AIRAH will promote the application of the Code of Practice for WTSPs (Cooling Tower Systems) throughout industry as a recognised standard for adoption by WTSPs. Compliance with the Code is voluntary. However, the process of organisational accreditation will establish compliance requirements on organisations that wish to become accredited.**

# Preface

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Industry accreditation arrangements to be established by AIRAH will signify that an organisation complies with the Code, is prepared to be independently audited for compliance, and will comply with the rules of accreditation. It also demonstrates that it meets the required training and competency standards developed by the industry for the provision of such technical services.

This is an important non-regulatory lever for improving the general performance of the industry and providing some assurance to cooling tower system owners that their systems are being maintained appropriately by competent organisations.

The Code will encourage continuous improvement within the industry at all times. It will be amended from time to time to incorporate developments within the industry and its developing organisational structure and training requirements. AIRAH will be responsible for reviewing and amending the Code, in consultation with the Department, PACIA and other stakeholders.

It is expected that the Code will be reviewed within 18 months of its release and endorsement by Government.

# Executive Summary

This Code of Practice is considered an essential element of the Government's *Legionella Risk Management Strategy*.

The major objectives of the Code of Practice are:

- To minimise the potential risks to occupational and public health from exposure to *Legionella* bacteria arising from cooling tower systems.
- To provide guidance to WTSPs and their clients on expectations for maintaining the waters of cooling tower systems in accordance with a system's Risk Management Plan (RMP), and relevant legislation and standards.
- To establish an accepted 'best practice' standard for WTSPs to assist in achieving the above objectives.
- To provide an acceptable self-regulating mechanism for improving the industry's collective performance and accountability.

All WTSPs should comply with the relevant legislative requirements, guidelines and Australian Standards, and endeavour through the management systems they have in place to proactively monitor and validate their compliance with those requirements.

Industry accreditation arrangements to be established by AIRAH will signify that an organisation which complies with the Code is prepared to be independently audited for compliance and will comply with the rules of accreditation. It also demonstrates that it meets the required training and competency standards developed by the industry as being appropriate for the profession.

Compliance with the Code is voluntary. However the process of organisational accreditation will establish compliance requirements on those organisations that wish to become accredited. This is an important non-regulatory lever for improving the general performance of the industry and providing some assurance to cooling tower system owners that their systems are being maintained appropriately by competent organisations.

The Code of Practice requires that WTSPs will:

- Comply with the relevant legal obligations for cooling tower maintenance in Victoria.
- Inform the land, building or facility owner/manager of all service treatments, testing results and any defects observed in the system and develop an agreed communication protocol for each client.
- Where required to seek funds from the facility owner (or their delegated representative) in order to rectify reported system deficiencies, do so as soon as is reasonably practicable and communicate the potential consequences of inaction.
- Maintain a cooling tower system's water quality such that the performance, efficiency and expected lifetime of operation of the system is maintained within acceptable limits.
- Only employ competent, appropriately experience and qualified personnel to manage and/or maintain cooling tower systems on behalf of their clients.

# Executive Summary

- Ensure that samples are taken from designated and identified sampling points in cooling tower systems at appropriate intervals, and delivered to laboratories accredited by NATA, for testing to be conducted within the required timelines;
- Notify the Department of Human Services where three consecutive positive *Legionella* test results are received.
- Notify the Department of Human Services where continued inaction to rectify a deficient cooling tower system by the system owner or their delegated representative results in a potentially significant risk to occupational and/or public health.
- Have contingency plans in place for each cooling tower system serviced, to ensure compliance with legislation on the notification of adverse events and subsequent remedial actions.
- Test and record chemical and physical parameters as required, to ensure that the treatment regime adopted for a cooling tower system is being maintained within acceptable limits.
- Use appropriate chemicals at effective concentrations, as per manufacturer's specifications, for the maintenance of the desired water quality within a cooling tower system.
- Ensure that where non-chemical options are utilised for microbial control within a cooling tower system, they are effective and fit for purpose, and that chemical treatment is available if an adverse event occurs.
- Use auto-dosing equipment (or equivalent) for the maintenance of microbial control and auto-bleed equipment (or equivalent) for the maintenance of water quality.
- Provide and maintain records of maintenance and servicing for the client's records.
- Develop and deploy management systems to address issues of quality control and quality assurance; occupational health and safety; environmental management; and risk management.
- Abide by all relevant occupational health and safety requirements on site, and work in a safe manner as directed by the WTSP's and/or client's health and safety management plan.
- Ensure that all chemical containers left on-site are appropriately labelled and that Material Safety Data Sheets (MSDS) for each chemical or formulation are left with the client on-site, or are clearly located in close proximity to the chemicals used in treating the cooling tower system.
- Ensure that all wastes generated from the water treatment of cooling tower systems are managed and disposed of in accordance with the requirements of EPA Victoria, and the local sewage authority.
- Have public liability and professional indemnity insurance (or equivalent) appropriate for the nature and number of cooling tower systems serviced.
- Have contracts with clients that clearly indicate the respective responsibilities of each party.

To allow time for WTSPs to prepare for the compliance requirements of the Code of Practice and for the industry accreditation arrangements to be established, the implementation timeline for this version of the Code of Practice is 1 July 2002.



# 1 Introduction

The Code of Practice is considered an essential element of the Government's *Legionella Risk Management Strategy*.

Adherence to and compliance with the Code of Practice will be recommended by the Department of Human Services in its written advice to and guidelines for water treatment service providers (WTSP) and other relevant stakeholders.

The Department of Human Services and AIRAH will promote the application of the Code of Practice for WTSPs (Cooling Tower Systems) throughout industry, as a recognised standard for adoption by WTSPs. Compliance with the Code is voluntary. However, the process of organisational accreditation will establish compliance requirements on those organisations that wish to become accredited. As it will take some time and effort for companies to comply with the Code, a six month period of grace will be given in order for companies who have signified their intent to comply to reach the required standards.

This Code of Practice will provide the 'best practice' benchmark for water service treatment providers to achieve.

## 1.1 A Living Document

The Code of Practice is a living document, designed to reflect currently accepted best practice as a minimum operating standard.

As treatment technologies and chemical formulations will change and improve, the document must be careful not to restrict or preclude new or emerging technologies, or chemical products. A performance-based approach is therefore desirable, with the practitioner choosing

the technology and/or chemical system that best suits the client's particular needs, while achieving regulatory expectations.

As these improvements and changes take place, the Code of Practice will be amended to reflect them. It will evolve along with the collective expectations of the industry, the Government and other stakeholders such as building owners, asset management companies, mechanical service contractors and the general public.

It is expected that the Code will be reviewed within 18 months of its adoption by the Department and AIRAH, through a consultative committee consisting of representatives of all relevant stakeholders.

## 1.2 Objectives

The major objectives of the Code of Practice are as follows:

- To minimise the potential risk to occupational and public health from exposure to *Legionella* bacteria arising from cooling tower systems.
- To provide guidance to WTSPs on maintaining the waters of cooling tower systems, in accordance with the Risk Management Plan (RMP) and relevant legislation and standards.
- To establish an accepted 'best practice' standard for WTSPs, to assist in achieving the above objectives.
- To provide an acceptable self-regulating mechanism for improving the industry's collective performance and accountability.

# 2 Legal Obligations

All WTSPs must comply with the requirements relevant to them from the following legislation, guidelines and Australian Standards, and endeavour through their management systems to proactively monitor and validate their compliance with these requirements.<sup>1</sup>

## 2.1 Legislation

In Victoria, the following legal obligations can apply to cooling tower systems and the people or organisations responsible for them:

- *Building (Legionella) Act 2000*
  - Building (*Legionella* Risk Management) Regulations 2001
- Plumbing (Cooling Towers) Regulations 2001
- *Health Act 1958*
  - Health (*Legionella*) Regulations 2001
- *Occupational Health and Safety Act 1985*
  - Occupational Health and Safety (Hazardous Substances) Regulations 1999
  - Occupational Health and Safety (Manual Handling) Regulations 1999
  - Occupational Health and Safety (Confined Spaces) Regulations 1996
  - Occupational Health and Safety (Plant) Regulations 1995
- *Environment Protection Act 1970*
  - Environment Protection (Prescribed Waste) Regulations 1998
- *Dangerous Goods Act 1985*
  - Dangerous Goods (Storage and Handling) Regulations 2000
- *Drugs Poisons and Controlled Substances Act 1981*
- *Water Act 1989*
- *Water Industry Act 1994*
  - Water Industry Regulations 1995

Note that under the Drugs, Poisons and Controlled Substances Act, a **Poisons Licence** must be obtained by companies or individuals who manufacture and sell, or supply by wholesale, Schedule 5 or 6 poisons (such as water treatment biocides). In this context, manufacture can include re-labelling, decanting into smaller containers, and dilution of product.

In addition, the following Australian Standards and guidelines apply to the management, maintenance and servicing of cooling tower systems.

## 2.2 Australian Standards

- AS/NZS 3666: Air-handling and water systems of buildings—Microbial control:
  - AS/NZS 3666.1, Part 1: Design, installation and commissioning
  - AS/NZS 3666.2, Part 2: Operation and maintenance
  - AS/NZS 3666.3, Part 3: Performance-based maintenance of cooling water systems.
- AS/NZS 4276.3.1: Water microbiology—Heterotrophic colony count methods—Pour plate method using plate count agar.
- AS/NZS 3896: Waters—Examination for *Legionellae*, including *Legionella pneumophila*.
- AS/NZS 2031.2, Part 2: Microbiological—Selection of containers and preservation of water samples for chemical and microbiological analysis.

<sup>1</sup> Further discussion of many of these requirements can be found in the Guidance Manual.

- AS 2865: Safe working in a confined space. (Worksafe Australia National Standard)
- AS/NZS 1715: Selection, use and maintenance of respiratory protective devices.
- AS/NZS 1716: Respiratory protective devices.
- AS/NZS 1336: Recommended practices for occupational eye protection.
- AS/NZS 1337: Eye protectors for industrial applications.
- AS/NZS 1269.3: Occupational noise management—Hearing protector program.
- AS 2380: Electrical equipment for explosive atmospheres.
- AS 2430: Classification of hazardous areas.
- AS 3190: Approval and test specifications—Residual current devices (current operated earth leakage detectors)
- AS/NZS 3500, Part 1 and Part 2: National Plumbing and Drainage Code.
- AS/NZS 4801: Occupational Health and Safety Management Systems—Specifications and guidance for use.
- AS/NZS ISO 9001: Quality management systems—Requirements.
- AS/NZS ISO 14000: Environmental Management Systems.
- AS/NZS 4360: Risk Management.

## 2.3 Published Guidelines

- *A Guide to Developing Risk Management Plans for Cooling Tower Systems*, Department of Human Services, Public Health Division, 2001.
- *Supplementary Notes for Hospitals*, Department of Human Services, Public Health Division, 2001.

### Note

*The legislation and documentation referred to above is to be the current document applicable, as amended, at the time of use or referral.*

*Where discrepancies exist between the documents listed above, the Victorian legislation will take precedence over relevant standards and guidelines.*

# 3 Roles and Responsibilities

In examining the roles and responsibilities of WTSPs, it is important to also identify and clarify the relationships with other parties that play a role in the management of cooling tower systems. It is common for WTSPs to be contracted by mechanical services contractors to undertake certain maintenance and servicing tasks with respect to cooling tower systems. Mechanical services contractors are also usually contracted by either land/building/facility owners or contracted asset management companies to maintain mechanical plant and equipment, including cooling towers.

The *Building (Legionella) Act 2000* sets out responsibilities for landowners in relation to the registration of cooling tower systems and the development of Risk Management Plans (RMPs).

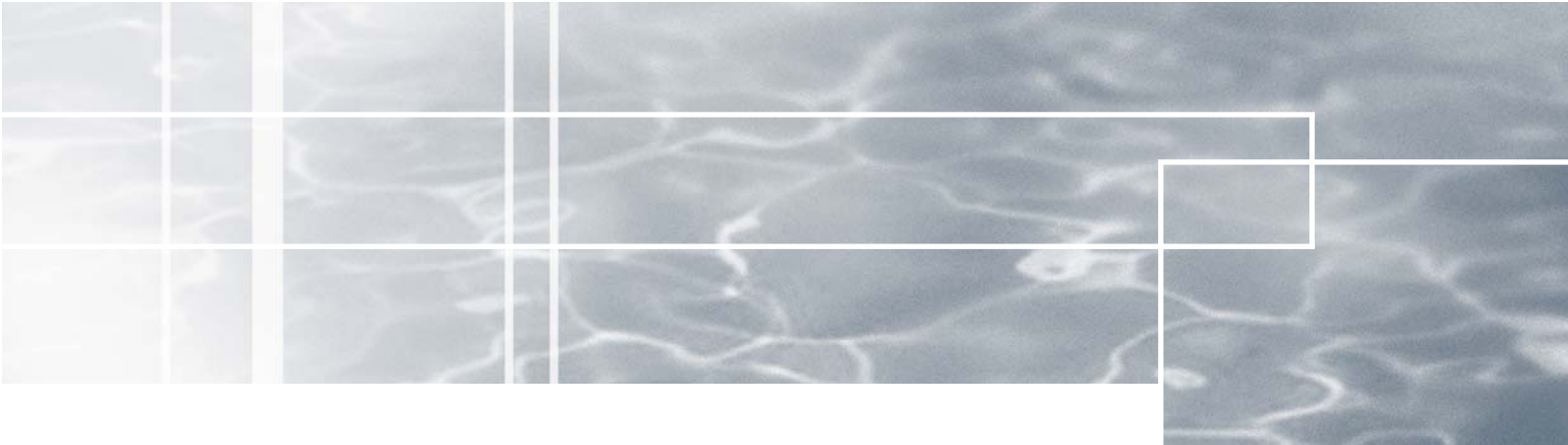
The Health (*Legionella*) Regulations 2001 state that “**the responsible person** must ensure that the water of the cooling tower system is maintained in a clean condition”, and that “**the responsible person** must ensure that the water of the cooling tower system is continuously treated with one or more biocides to effectively control the growth of micro-organisms, including *Legionella*; and chemicals or other agents to minimise scale formation, corrosion and fouling”.

Regulation 5 of the Health (*Legionella*) Regulations 2001 defines a “responsible person” to mean “the person who owns, manages or controls the cooling tower system or warm water system”. The “responsible person” may be the owner of the

system or the person or company who manages it on their behalf.

In addition to responsibilities imposed by legislation, which is outlined above, the law of negligence imposes certain duties on the owner, asset manager, mechanical services contractor and WTSP in respect of the cooling towers. The content of this duty depends on the circumstances, the contractual responsibilities and relationships. There are also legal requirements on service-providers to provide services that are fit for their purpose and of merchantable quality.

To ensure that their responsibilities are met, the owner or asset manager should ensure that it chooses a competent WTSP to maintain its cooling towers.



It is critically important that any deficiencies noted with respect to a cooling tower system are communicated to a “responsible person” for appropriate action. Inter-relationships between the following will need to be examined:

- Cooling tower system design, construction and commissioning.
- Maintenance of mechanical and electrical systems associated with the cooling tower system.
- Treatment of the system’s water to control potential pathogens, corrosion and scale.
- The likelihood of unacceptable levels of *Legionella* and/or high heterotrophic colony counts (HCC).

For the purposes of the Code, the following roles and responsibilities are described and based on the likely responsibilities and contractual arrangements of the various parties generally involved with a cooling tower system.

### **3.1 Land/Building/Facility Owners**

It is the responsibility of the land, building or facility owner to:

- Ensure that RMPs are prepared, implemented, maintained and audited for all cooling tower systems under their control in accordance with the Building Act requirements.
- Take appropriate action to rectify any deficiencies communicated to them by those persons contracted to maintain the cooling tower system in good order, and in accordance with the RMP, on their behalf.
- Take all reasonable steps to ensure that they engage competent and appropriately experienced and qualified personnel to manage and/or maintain a cooling tower system on their behalf.

### **3.2 Asset Management Companies**

Where an asset management company is contracted to maintain a cooling tower system on behalf of the facility’s owner, then the asset management company undertakes the responsibilities, as outlined above, for building/facility owners. However, this contractual arrangement does not absolve the building/facility owner from their responsibilities.

Where the asset management company is required to seek funds from the facility owner in order to rectify reported system deficiencies, it is their responsibility to do so as soon as is reasonably practicable and to communicate the possible consequences of inaction to the facility’s owner.

### **3.3 Mechanical Service Contractors**

Where a mechanical service contractor is contracted to maintain a cooling tower system on behalf of the facility’s owner, this contractual arrangement does not absolve the building/facility owner from their responsibilities.

It is a responsibility of mechanical service contractors to report cooling tower system deficiencies to the appropriate “responsible person” for action as soon as is reasonably practicable, and to communicate the potential consequences of inaction to the “responsible person”.

Where the mechanical service contractor is required to seek funds from the facility owner (or their delegated responsible representative) in order to rectify reported system deficiencies, it is their responsibility to do so as soon as is reasonably practicable and to communicate the potential

# 3 Roles and Responsibilities

consequences of inaction to the facility's owner (or their representative).

The "responsible person" may be the facility owner or an asset management company. Some factors relevant to determining the identity of the "responsible person" are any contractual arrangements, the type of deficiency noted to exist (such as 'dead legs' in pipework, water circulation pump failure, drift eliminator replacement, UV lamp failure, or exhausted treatment chemical supply) and also whether additional funds are required to rectify the reported system deficiency.

## 3.4 Water Treatment Service Providers

The responsibilities of WTSPs will be determined by the contracts entered into by them in relation to the cooling towers. Additional responsibilities will also be determined by the duty of care owed by WTSPs and the requirement to deliver services that are fit for their purpose and of merchantable quality.

The likely range of contractual responsibilities for WTSPs is as follows:

- Maintain the water in a cooling tower system in accordance with the requirements of the Risk Management Plan (RMP), and the relevant regulations and standards, on behalf of the client.
- Maintain water quality such that the cooling tower system's performance or efficiency, and the expected lifetime of operation of the system, stays within acceptable limits.
- Report cooling tower system deficiencies beyond their control to the appropriate "responsible person" for action as soon as is reasonably practicable, and to communicate the possible ramifications of inaction to the "responsible person" (in some cases this may be via contractual arrangements and agreed communication protocols).

- Take all reasonable steps to ensure that they deploy competent and appropriately experienced and qualified personnel to manage and/or maintain cooling tower systems on behalf of their clients.

**Compliance with the Code of Practice for WTSPs (Cooling Tower Systems) is voluntary for WTSPs and is not required by legislation. The Department of Human Services and AIRAH will promote the application of the Code of Practice for WTSPs (Cooling Tower Systems) throughout industry as a recognised standard for adoption by WTSPs.**

Industry accreditation arrangements to be established by AIRAH will signify that an organisation complies with the Code, is prepared to be independently audited for compliance and will comply with the rules of accreditation. It also demonstrates that it meets the required training and competency standards developed by the industry as being appropriate for the provision of such technical services.

Therefore it is strongly recommended that WTSPs put appropriate management systems into place that can maintain and verify compliance with the Code of Practice.

**Note:** *Persons who provide only cooling tower cleaning services, which may be subcontracted by WTSPs, are not considered to be WTSPs for the purposes of this Code, unless they treat the cooling tower water with chemical biocides, as is required when a system goes through the "clean, disinfect, clean" cycle required by regulation. Tower cleaning should be undertaken under the supervision of the responsible WTSP.*

### 3.5 Reporting System Deficiencies

The reporting of system deficiencies and appropriate timely action to rectify such deficiencies is a major issue with respect to the control of *Legionella* bacteria in cooling tower systems.

**Any reported deficiencies should be included as a required improvement, or condition, within the RMP. Until the deficiency is rectified it may be necessary to upgrade the water treatment program.**

**It is recommended that WTSPs inform the Department of Human Services of the potential risk posed by a cooling tower system where:**

- Continued inaction to rectify reported system deficiencies occurs.
- The water treatment regime is incapable of controlling water quality within accepted or regulated limits due to these deficiencies.
- The system is considered by the WTSP to be of significant potential occupational and/or public health risk.

Any reports on cooling towers of concern should be directed to the Manager, Environmental Health Unit, Department of Human Services. They will assess the risk situation and may send an inspector to assess the problem facility and take samples to determine if there have been any breaches of the Building Act or the Health (*Legionella*) Regulations 2001. The Department may take further action as appropriate.

### 3.6 Communication between Responsible Persons

Notwithstanding the roles and responsibilities described above, communication responsibilities should be clearly defined in the contract of engagement between WTSPs and their clients and be in accordance with the provisions of this Code and the Guide to Developing Risk Management Plans for Cooling Tower Systems, published by the Department of Human Services.

The communication protocols for relaying the results of an adverse event and the subsequent remedial actions taken should also be defined in the contract of engagement between the WTSP and the client. Agreed communication protocols should also be described in the RMP.

# 4 Contingency Planning and Management

Contingency planning and management are essential in ensuring an appropriate and timely response to an adverse event, complying with regulatory requirements, and meeting the expectations of clients. Contingency planning is therefore an integral part of an organisation's risk management strategy.

## 4.1 Developing Contingency Plans

WTSPs should develop contingency plans to enable them to comply with the provisions of the Health (*Legionella*) Regulations 2001 when positive *Legionella* or high HCC results occur. This is particularly important for rural areas, where the logistics of staff availability and transport times may make compliance more difficult.

**Samples must be delivered to a laboratory so that tests can commence within 24 hours of the sample being taken. Suitable arrangements must be made to ensure that this takes place.**

To achieve this, samples should arrive at the laboratory within at least 20 hours of collection so that analysis can commence within 24 hours. Country areas can have samples collected late in the day, couriered overnight and still comply.

Contingency planning and management should also address the situation where an incident of legionellosis may be associated with a cooling tower discharge (refer to Guidance Manual for further advice on this matter).

Contingency planning should address:

- Staff availability for adverse events.
- Transport logistics (covering servicing requirements and sample delivery).
- Access to cooling tower systems (out of normal working hours).
- Organising independent sampling (where required under special circumstances).
- Ensuring sufficient "supplies" are available to meet client needs.

There may be circumstances such as natural disasters or other "acts of God" (bushfires, dust storms and so on) which will impact on cooling tower system performance. Timely compliance may be beyond the scope of the industry affected. Such exceptional circumstances should not be construed as a servicing deficiency, and may be beyond the expectations of normal contingency planning.

Contingency plans should be endorsed or ratified by the client and a cost recovery mechanism included in the contract to ensure that contingency plans can be readily implemented.



# 5 Sampling and Testing of Cooling Tower Waters

To achieve the greatest possible consistency in the required monitoring process, it is essential that sampling and microbial testing be undertaken in accordance with the required standards.

## 5.1 Sampling Cooling Tower Waters

Samples shall be taken in containers as described in AS 2031.2 (*Selection of containers and preservation of water samples for chemical and microbiological analysis: Part 2—Microbiological*) and collected as described in AS/NZS3666.3 (*Air-handling and water systems of buildings—Microbial Control: Part 3—Performance-based maintenance of cooling water systems*) and stored and transported as described in AS/NZS 3896 (*Waters—examination for Legionellae, including Legionella pneumophila*) for *Legionella* samples, or as described in AS 2031.2 for HCC samples.

These standards require that the samples be transported to the testing laboratory and for analysis to commence within 24 hours of the sample being taken. This may be difficult to achieve when servicing some rural areas and appropriate contingency plans should be put into place to meet the required timeframe. Note that 24 hours is the upper limit and shorter processing times are desirable.

### 5.1.1 Sampling Point

To minimise variables associated with the sampling and microbial testing of cooling tower waters each cooling tower system should have a **clearly identified sampling point** from where all regular sampling occurs. This may be indicated by a sign or label directing where all routine sampling is to take place.

**Sampling should never occur next to, or immediately downstream of, where make-up water or biocide is introduced into the system.**

It is recommended that sampling occurs at a readily accessible point in the return line, and a tap be fitted for this purpose. When sampling from the return line, water should be allowed to run for a minimum of 30 seconds and/or flushed with a sufficient volume of water prior to the sample being taken. If this is not possible, the sample should be collected from the designated sampling point.

The designated sampling point should be documented in the system's Risk Management Plan.

### 5.1.2 Independent Sampling

Sampling should normally be undertaken by the WTSP as part of the range of professional services offered to the client.

There may be special circumstances whereby regular or random independent sampling is highly desirable, in order to avoid potential allegations of a conflict of interest, and/or to reassure the client, workers and/or the public about a system's performance.

# 5 Sampling and Testing of Cooling Tower Waters

Special circumstances cover:

- Where cooling towers in a given area are to be tested on the request of the Department of Human Services, due to an incident(s) of legionellosis.
- Where a tower is deemed to be of high risk as determined by the facility's Risk Management Plan, such as cooling towers associated with healthcare facilities, or sited in areas of high population density, such as major urban commercial centres and large shopping complexes.

The client and/or the "responsible person" always have the prerogative to conduct independent testing if they wish to independently verify system performance. The opportunity for such independent testing further reinforces the need for each system to have a clearly designated sampling point, so as to reduce the variability inherent in sampling from different locations within the system.

Where independent sampling does take place, it is important that the same NATA registered laboratory be used for microbial testing as is normally used by the WTSP in order to address the potential inherent variability that exists in microbial testing between laboratories.

There may be other reasons for independent sampling in some areas due to the fact that sampling of cooling tower waters should take place at least 72 hours after system operation, following disinfection, decontamination or cleaning procedures, so as to allow the system to stabilise. In rural areas, it is advisable to have a suitably trained independent contractor available to take samples and ship them to the nominated laboratory, to avoid a lengthy return trip just for the purpose of sampling.

The WTSP may contract out sampling to an independent third party such as a NATA accredited laboratory which undertakes microbial testing for cooling tower systems, or another WTSP or organisation with no ties to the contracting organisation. This will be considered to constitute independent sampling.

Where samples are taken for the purposes of investigating the source of an incident(s) of legionellosis, samples shall be split at the laboratory in case a positive result is obtained. The split sample can then be used to further investigate water quality parameters if required.

### 5.1.3 NATA Accredited Sampling<sup>2</sup>

Sampling is considered to be a normal part of the professional services undertaken by WTSPs.

However, where independent sampling is required, it is appropriate that such sampling be undertaken by individuals or organisations who have NATA accreditation for undertaking this activity in compliance with the appropriate standards.

It is recommended that laboratories that have NATA accreditation for microbiological testing for heterophilic bacteria and Legionellae develop a capability in this area, so that the process of NATA accredited sampling and NATA accredited testing can occur under the management of the one organisation wherever possible.

<sup>2</sup> Note that at this time there is no NATA accredited sampling system in place for cooling towers. This is an initiative proposed by the Code. It is hoped that such an accreditation can be established within twelve months of the introduction of this Code of Practice.

## 5.2 Testing Cooling Tower Waters

Testing for prescribed microbiological, chemical and physical parameters is essential in order to monitor the performance of a cooling tower system.

Such testing provides indicative feedback on system performance with respect to:

- Control of *Legionella* bacteria and other microorganisms.
- Effective maintenance of desirable water quality standards, to achieve system efficiencies and longevity in line with the system manufacturer's expectations.

### 5.2.1 Microbiological Testing

The Heterotrophic Colony Count (HCC) is a basic test of the microbiological load in a cooling tower system. Analysis must occur in accordance with AS 4276.3 (*Water microbiology—Heterotrophic colony count methods—Pour plate method using plate count agar*).

Legislation also permits other methods such as spread plate and membrane filtration.

Testing for *Legionella* must occur in accordance with the provisions of AS 3896 (*Waters—examination for Legionellae, including Legionella pneumophila*).

The laboratory undertaking testing in accordance with the above standards must be suitably accredited by NATA.

Microbial testing should be conducted after commissioning of a new cooling tower system and the introduction of the water treatment program, when system start-up occurs, or when there is a change to the water treatment program, to validate its acceptable performance.

### 5.2.2 Testing of Chemical and Physical Parameters

Although the major focus with respect to testing of cooling tower waters is microbial performance, it is also important at times to check chemical and physical parameters to ensure that they are within appropriate limits for the cooling tower system in question, the quality of the make-up water available, and the type of treatment regime adopted for the system.

Corrosion testing/monitoring for example can be important, as the minimisation of corrosion can assist in microbial control as well as enhance the system's life.

Where the testing of other parameters is required, it should be undertaken by laboratories accredited by NATA to undertake such testing.

# 6 Water Treatment

It is the responsibility of the WTSP to maintain the waters of a cooling tower system within accepted parameters, as defined by legislation and the client.

## 6.1 Water Quality

Monitoring of chemical, physical and biological water quality will provide the WTSP with feedback on whether the water treatment system established for the cooling tower system is effective. After successful establishment of the treatment system, routine monitoring and maintenance (as required by the system's Risk Management Plan), is then required.

If results indicate that some of the desired parameters are not being achieved, then modification of the treatment system must take place to achieve the desired parameters and outcomes.

## 6.2 Microbial Control

Microbial control is a mandatory requirement for cooling tower systems (as defined by the Regulations) and the treatment system deployed by the WTSP must be designed to achieve microbial control. The chemical and/or physical agents that may be used for this purpose must be deployed in accordance with the manufacturer's specifications.

Where the use of the selected agent(s) in accordance with the manufacturer's specifications does not result in acceptable microbial control, then other causes for enhanced microbial growth must be investigated, in conjunction with measures designed to increase the established treatment regimes effectiveness (increased dose or an alternative

treatment agent(s) deployed). The Health (*Legionella*) Regulations 2001 require cooling tower systems to be disinfected and cleaned when unacceptable results are obtained.

If cooling tower systems are still problematic in achieving acceptable microbial control after all avenues have been explored, and the relevant requirements of the regulations have been followed, then the system may need to be shut down until the cause of the problem has been rectified.

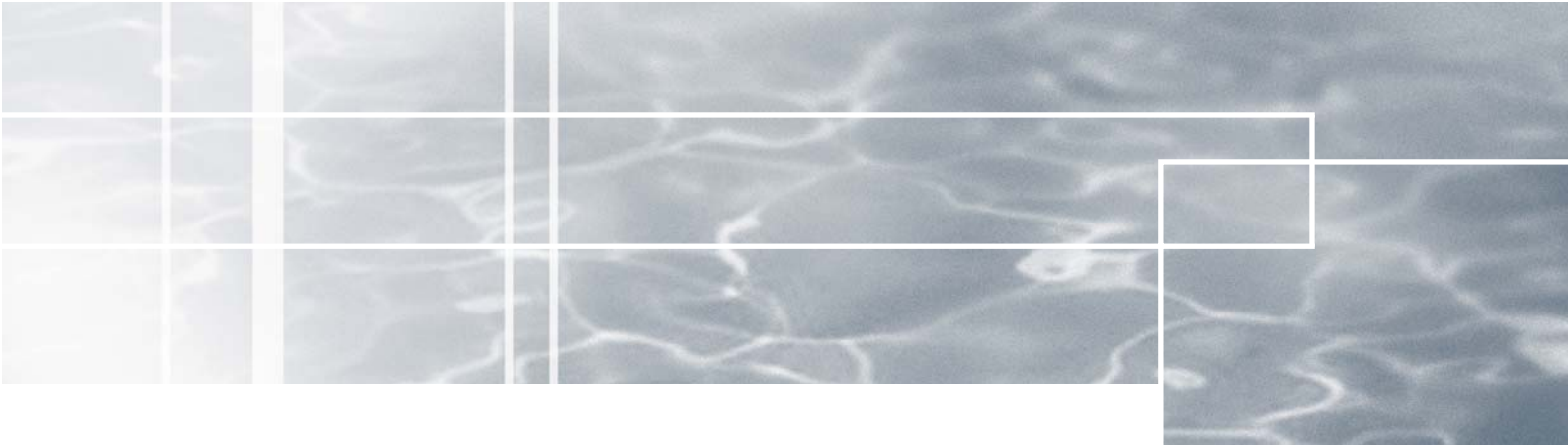
Consultation with the Department of Human Services should occur in such circumstances.

**The Department must be notified if three consecutive positive *Legionella* test results are received.**

### 6.2.1 Biocides

It is the responsibility of the WTSP to provide an effective water treatment service for microbial control, in accordance with the advice and specifications for use of the manufacturer of the technology and/or chemical treatment regime adopted.

The treatment regime adopted must also account for the possibility of eventual microbial resistance against a specific biocide or formulation of biocides. Alternative biocides should be used on a regular basis to reduce the likelihood of resistance developing.



The chemical treatment regime adopted must also ensure that all chemicals used are compatible and that the desirable pH range for their optimal effectiveness is maintained.

The water treatment regime provided by a WTSP must ensure so far as is practicable that an effective concentration of biocide(s) is present in the system under their control, at all times.

Where WTSPs blend chemicals (including biocides) they need to be handled with appropriate care. Chemical biocides are toxic substances that can also exhibit other hazards and therefore need to be handled and used with caution and in accordance with regulatory requirements, such as the *Drugs Poisons and Controlled Substances Act 1981* and the Occupational Health and Safety (Hazardous Substances) Regulations 1999.

### 6.3 Scale Control

Scale formation will reduce the efficiency of heat transfer operations and can contribute to microbial growth.

It is the responsibility of the WTSP to ensure that the rates of make-up water, and system bleed, and water pH, are controlled in such a manner so as to reduce the build-up of scale to levels that do not adversely affect system performance.

### 6.4 Corrosion Control

Corrosion control has many aspects, only some of which fall into the general responsibilities of WTSPs.

Corrosion may occur due to erosion and/or impingement attack, loss of protective surface coatings, or incompatible materials of construction. Corrosion due to such causes is avoided by proper

equipment design and maintenance and cannot always be corrected by water treatment.

The types of corrosion that are within the ambit of the WTSP are electrochemical in nature and are able to be corrected by conventional water treatment.

WTSPs must understand the underlying mechanisms of corrosion within a system and provide advice as to how it may be managed effectively. This may mean indicating that water treatment alone will not solve the problem and other issues outside of the WTSP's control are at the cause of, or are contributing to the problem.

WTSPs must also ensure that the water treatment regime they recommend does not cause excessive corrosion and reduce the capital life of the system, or unduly increase maintenance costs.

Where corrosion issues are beyond the capability of a WTSP, appropriate specialist corrosion consultants should be recommended. It is the responsibility of the organisation contracting such specialised services to ensure that provider is capable and competent of providing such a service.

### 6.5 Non-Chemical Options

This Code of Practice supports the use of any techniques that can provide consistent and acceptable treatment of cooling tower waters, such that the desired control over microorganisms, scale formation and corrosion are achieved, and all regulatory requirements are met.

A range of non-chemical options exist and can be effective in enhancing or replacing traditional chemical controls in certain applications.

# 6 Water Treatment

However, a non-chemical option may not provide a residual biocidal effect throughout a system. In these situations, they may be regarded as a supplementary form of treatment, and care should be taken in placing such an option in the most strategic location within a cooling tower system.

Whichever non-chemical system is adopted, it should have proven efficacy, be fit for its purpose and must be installed and maintained in accordance with the manufacturer's specifications.

In the future, there may be a range of non-chemical treatment methods developed and applied to the treatment of cooling tower waters. When such systems come on-line, this Code of Practice can be amended to address any relevant aspects of applicability, operation and maintenance.

## 6.6 Specific System Controls

A number of specific system controls can be necessary to enhance the efficacy of a water treatment program offered by a WTSP. Such system specific controls can be incorporated into the risk management plan for a facility where appropriate (refer *A Guide to Developing Risk Management Plans for Cooling Tower Systems*).

### 6.6.1 Auto-Dosing Equipment

Auto-dosing equipment has become more common as WTSPs strive to ensure that the desired concentrations of treatment chemicals are circulating within a system.

Auto-dosing can be used to control pH, the concentration of biocide(s), and corrosion inhibitors.

Such equipment is not fail-safe and must be regularly checked and properly maintained to ensure that the expectations of the water treatment program are achieved.

Installing alarms will indicate that the auto-dosing pump or feedback detector (where applicable, such as pH probe) has failed, in systems designated to be of potentially high risk.

The *Guide to Developing Risk Management Plans* recommends standard operational programs based on the risk classification of the system. As a minimum, these frequencies should be recommended to the client for adoption. With regard to inspections of the system, the WTSP should show the designated "responsible person(s)" at the premises how to check auto-dosing equipment and associated detectors (if applicable). Such equipment should be checked during every inspection.

Any problems with the auto-dosing equipment or ancillary detectors should be reported by the responsible person to the WTSP as soon as possible, for immediate rectification.

All inspections should be recorded in an inspection/maintenance log maintained on-site

All such equipment should be installed, maintained and calibrated in accordance with the manufacturer's specifications and in accordance with the terms of agreement between the WTSP and the client.

### 6.6.2 Make-Up Water and Bleed Rate Controls

Make-up water and bleed rates for cooling tower systems must be properly managed to maintain the appropriate concentrations of treatment chemicals, and total dissolved solids limits, within a system.

Where auto-dosing equipment is used, it must be integrated into the make-up water, with bleed rate cycles applicable to the installation.

The WTSP must ensure that the water treatment program designed and implemented for a given

cooling tower system addresses the requirements and relationships between the dosing of water treatment chemicals, or alternative treatment regimes, and the regulation of make-up water and system bleed rates.

As make-up water and bleed rate requirements will vary according to cooling system demands and climatic conditions, the program developed by the WTSP must account for this.

The quality of make-up water can also impact on effective water treatment and must be considered by WTSPs when designing and implementing a treatment program.

### 6.6.3 System Cleanliness

The water treatment program cannot be considered in isolation from the need for physical cleanliness of the total system. Both are essential; one is not an alternative to the other.

Regular comprehensive cleaning of the system should be provided as a necessary adjunct to the water treatment program and/or as defined in the system's Risk Management Plan.

WTSPs may choose to offer system cleaning as part of a total service to the client and should establish cleaning criteria with the client that triggers the need for additional routine cleaning of the system.

Cleaning of the system is also required by regulation under certain circumstances.

Where a WTSP subcontracts the cleaning of the cooling tower system, they must ensure that the cleaning of the system is done safely and in accordance with required specifications.

## 6.7 Record-Keeping

The WTSP shall keep records detailing the design basis for the water treatment program adopted for each cooling tower system they service, including the calculations done to determine appropriate dose rates or treatment levels, make-up water requirements and bleed rates. Analytical results used in these determinations must also be maintained.

Where a cooling tower system has its treatment regime modified or changed as a result of unacceptable monitoring results, the design basis for these changes must be recorded and attached to the file for that system.

All results of microbial analysis associated with a cooling tower system must also be maintained on the system's file on-site.

Over time, a useful record of ineffective and effective water quality maintenance programs, and remedial actions for problematic systems, will be established and available for reference when designing treatment regimes for similar systems.

All maintenance and servicing undertaken by a WTSP must be entered into the maintenance log kept at the cooling tower system site. Note that this is a requirement of Regulation 23 of the Health (*Legionella*) Regulations 2001.

All such records must be maintained on site and at the premises of the WTSP for a minimum of three years. Such records will be the subject of inspection by Department of Human Services inspectors and also be audited annually as part of the system's Risk Management Plan.

# 7 Management Systems

Management systems help manage potential risks to a business.

The most important are:

- Quality control and quality assurance
- Occupational health and safety
- Environmental management
- Risk management.

It should be noted that it is both possible and desirable to have all the above integrated into one management system.

This Code of Practice does not propose that these systems be solely developed for the purposes of independent certification, but that the basic elements required by these recognised standards be adopted, modified accordingly and implemented by each business, where applicable.

This is in recognition of the difficulty smaller firms can have in obtaining such certification and the time and ongoing costs of certification.

The objective is to be able to demonstrate that appropriate management systems are in place, are utilised as a normal component of doing business, can be scrutinised to determine what went wrong, and can be audited either internally, or by a third party, if necessary to demonstrate that correct procedures and best industry practice was achieved.

This can be particularly important where prospective litigation may result from allegations made with respect to the water treatment of a cooling tower system.

Management systems can therefore both help sustain and protect your business.

Note that some WTSPs associated with chemical companies may be able to join the **Responsible Care® program** administered by PACIA (Plastics and Chemicals Industry Association) which provides elements of the above management systems when implemented.

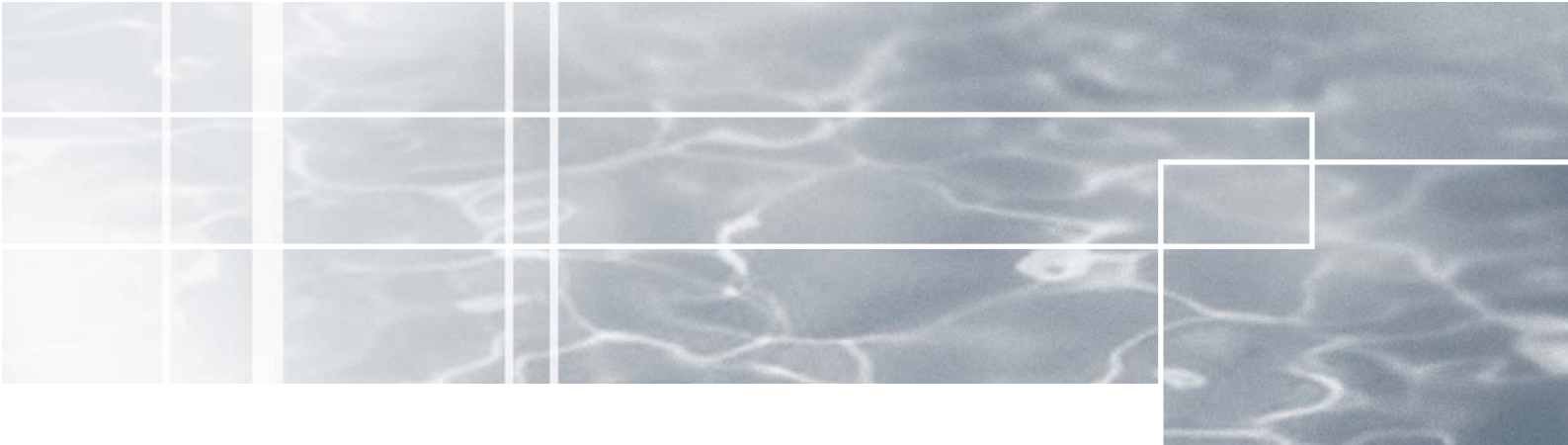
## 7.1 Quality Control and Quality Assurance

WTSPs should establish the basis of a quality management system within their business management structure, to account for and verify the basis upon which service delivery occurs.

Records should be kept in sufficient detail as to demonstrate due diligence to an auditor and/or the regulator, if required.

The adoption, development and implementation of an appropriate Quality Management System (QMS) modelled to the ISO 9000 series of requirements can provide the WTSP with a management framework which, if effectively applied, monitored and recorded, can demonstrate to the client, the





regulator, or other stakeholders, compliance against stated requirements (including requirements for duty of care).

## 7.2 Occupational Health and Safety

Occupational health and safety management systems should also be incorporated into an organisation's quality assurance system, to verify the actions that must take place with respect to the management of health and safety of employees.

This Code of Practice **does not** require organisations to establish occupational health and safety management systems that are certified under AS/NZS 4801, however, the basic elements of the standard must be incorporated in the systems developed.

## 7.3 Environmental Management

Environmental management systems should also be incorporated into an organisation's quality assurance system, to verify the actions that must take place with respect to the management of wastes and the authorised discharge of cooling tower waters to sewer.

This Code of Practice **does not** require organisations to establish environmental management systems that are certified under ISO 14000 series, however, the basic elements of the standards should be incorporated in the systems developed.

## 7.4 Risk Management

The basis of all of the above management systems (quality, **occupational health and safety**, and environmental) is to manage risk—risks to the business, its staff, clients, the general public, and the environment.

Further guidance on risk management can be found in AS/NZS 4360:1999.

To manage risks in the most cohesive and integrated way, all reasonably foreseeable aspects of service design and delivery, accountability, occupational health and safety, environmental management and risk management need to be incorporated into the organisation's quality management system.

# 8 Occupational Health and Safety

The legal obligations of occupational health and safety are clear—it is the employer’s responsibility to provide employees with a healthy and safe work environment. Similarly it is the contractor’s responsibility to provide sub-contractors with a healthy and safe work environment.

The servicing of cooling towers by WTSPs can potentially expose service technicians to a number of potential hazards, for which procedures and practices to manage such risks must be in place within occupational health and safety management plans and/or systems.

All cooling tower systems that are to be serviced by a WTSP should have had an inspection conducted prior to bidding for and/or undertaking such work, to investigate and anticipate any occupational health and safety issues that may be associated with servicing the system(s) in question.

Those occupational health and safety issues that are the responsibility of the WTSP can be then appropriately addressed in the health and safety plan (HASP) developed for the servicing of a particular client’s system(s). The health and safety plan will address generic occupational health and safety issues applicable to all servicing operations (potential exposure to *Legionella*), as well as those issues specifically relating to the facility in question (access/egress, electromagnetic radiation exposure).

Where a cooling tower system presents unacceptable occupational health and safety risks beyond the control of the WTSP, such as access/egress issues, the client should be informed that servicing will be based on acceptable standards being met. Such safety requirements should be

incorporated into the contract between the WTSP and the client.

Further guidance on potential health and safety issues is available from WorkSafe Victoria (formerly the Victorian WorkCover Authority).

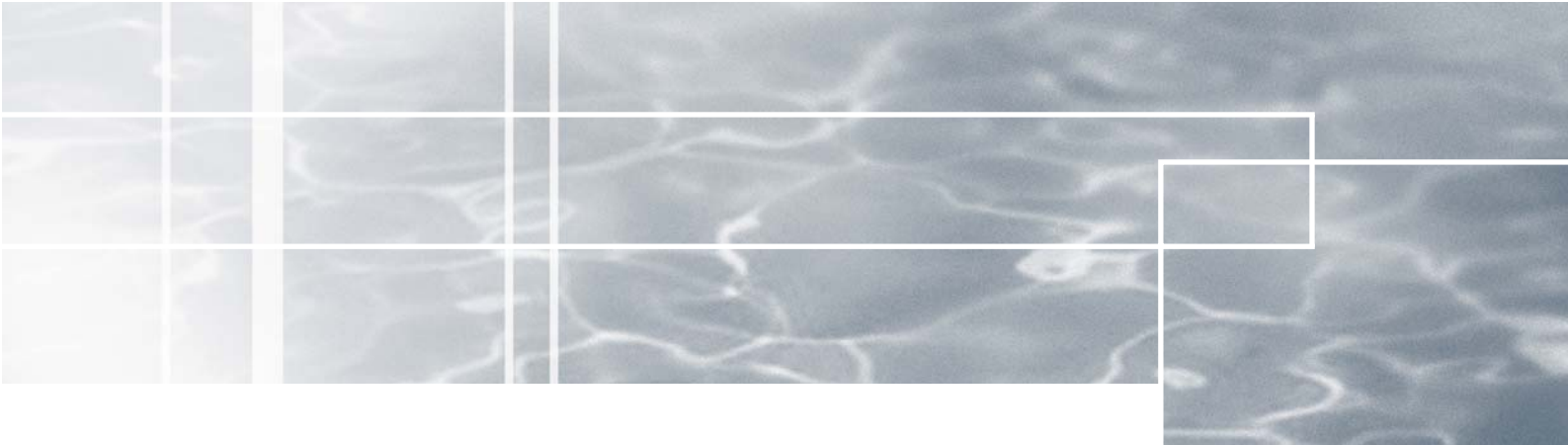
## 8.1 Potential Exposure to *Legionella* Bacteria

WTSPs servicing cooling tower systems do not know at the time of servicing whether *Legionella* bacteria are present or not within the cooling tower’s water, or whether sufficient *Legionella* bacteria are contained within aerosols being generated by the cooling tower system to potentially cause infection, or whether they are being exposed to sufficient aerosol to potentially cause infection. In reality, such information is not possible to obtain in real time.

It is essential therefore that water treatment technicians err on the side of safety and deploy appropriate respiratory protection when working in close proximity to cooling tower systems.

As a minimum, a half-facepiece disposable particulate filter of class P2 shall be used for protection against cooling tower aerosols.

However, the preferred use of reusable rubber half facepiece respirators with a Class P2 rating should



be considered, as these provide a better fit and can incorporate other protective attributes into the filter canister, such as protection against organic vapours, and acid gases.

The choice of respiratory protection by the WTSP will ultimately depend on the environment to be worked in and an assessment of the potential respiratory hazards that may be present.

## **8.2 Chemical Issues**

### **8.2.1 Personnel Protective Equipment**

Where chemicals are used in the treatment of cooling tower systems, the Material Data Safety Sheets (MSDS) provided shall be studied by the WTSP to determine what personnel protective equipment and other precautions are required to protect technicians from inadvertent exposure.

Technicians shall be accordingly instructed and provided with appropriate protective equipment and training.

### **8.2.2 Dangerous Goods and Hazardous Substances Requirements**

WTSPs may handle a variety of dangerous goods and hazardous substances.

The requirements of the Occupational Health and Safety (Hazardous Substances) Regulations 1999 apply to these substances and place requirements on the employer who allows staff to use hazardous substances.

Where dangerous goods are stored at the WTSPs premises in excess of prescribed quantities, the Dangerous Goods (Storage and Handling) Regulations 2000 also apply.

All chemical containers must be labelled in accordance with the relevant dangerous goods or hazardous substances requirements, where applicable.

The WTSP must keep and maintain a register of dangerous goods and hazardous substances used by the organisation, together with an up-to-date MSDS for all such materials. The register and all MSDS must be available to employees, and employers must provide employees with information, instruction and training on hazardous substances and dangerous goods, to enable employees to perform their work in a manner that is safe and without risks to health.

The employer must conduct a risk assessment on all hazardous substances used in the workplace before the substance is used for the first time. If the substance is already in use, then this risk assessment should have been completed prior to the 2 September 2000.

Employers must endeavour to minimise the risks associated with any dangerous goods or hazardous substances used in the workplace.

### **8.2.3 Compatibility**

Where multiple chemicals are used, the chemical compatibility between them and the effect pH can have on this compatibility must be understood.

When developing a health and safety plan for a given client, the chemicals to be used must be critically examined to determine if any potential for incompatibility exists, and any such potential incompatibilities documented in the HASP.

# 8 Occupational Health and Safety

## 8.3 Industrial Sites

Cooling tower systems located at industrial premises may present potential exposures to chemical substances relating to the industrial processes on the site. The location of the cooling tower system may be elevated and near process discharges that could adversely impact on the health of water treatment technicians.

The health and safety induction program required by many industrial sites will typically deal with emergency procedures and basic personnel protective equipment requirements, but may not include the potential for chemical exposures on roof tops by technicians servicing cooling towers. The WTSP should enquire as to the nature of any nearby process emissions or other hazards in proximity to the facility they are servicing and take advice from the site operator as to what precautions or protection may be required.

The occupier or person who has management control of the site has responsibilities with respect to persons they employ to undertake works at their premises; this includes WTSPs.

A work permit may be required before any maintenance or servicing works can take place on a cooling tower system(s). Consideration of the risks associated with any elevated hazards should be incorporated into the permit conditions.

Where a work permit is not required, WTSPs must check in with the appropriate site representative prior to servicing the facility.

## 8.4 Electromagnetic Radiation

While servicing cooling towers, service technicians may be in close proximity to communication transceivers emitting non-ionising electromagnetic radiation.

Although the risks associated with mobile phone transceivers is considered small by the relevant authorities, there are other communications devices found on roof tops and other elevated locations which may present a more significant risk to persons working in their vicinity. This includes microwave dishes and HF (high frequency), VHF (very high frequency) and UHF (ultra-high frequency) emitters.

The designated safe distances applicable to such devices depend on the maximum power the device is capable of emitting and the time that will be spent at that distance. Longer exposure times are acceptable at greater distances and shorter exposure times at closer distances.

Equipment which potentially present such risks to proximate persons should be appropriately labelled and warnings should be located on access doors to the rooftop or service area.

WTSPs must enquire of building owners or the delegated responsible person as to whether such potential hazards exist in the vicinity of the cooling tower system(s) to be serviced as part of the HASP to be developed for that site.

Advice on exposure standards and the types of equipment, which may put WTSPs at risk, can be obtained from the Australian Communications Authority.

## 8.5 Access/Egress and Working at Heights

The WTSP industry needs to take a more proactive stand on the occupational health and safety issues relating to access/egress to cooling tower systems that are to be serviced, and any applicable working at height requirements, and inform and educate clients as to their responsibilities in providing suitable access and egress from cooling tower systems in accordance with the relevant requirements.

The site occupier has a responsibility to provide safe access/egress to WTSPs employed to service systems on their premises.

Safe access/egress to cooling tower systems must be a standard clause in contracts between WTSPs and their clients, and WTSPs should collectively refuse to service facilities which have unsafe access/egress.

## 8.6 Confined Spaces

Entry to and working in confined spaces is regulated by the Victorian Workcover Authority (VWA) via their Occupational Health and Safety (Confined Spaces) Regulations 1996. Guidance on how to meet the requirements of the regulations is found in VWA's *Code of Practice for Confined Spaces* (No.20, March 1997<sup>3</sup>).

In addition, there is an Australian Standard/ Worksafe Australia National Standard AS 2865:1995 "*Safe working in a confined space*" that can provide further guidance on this issue.

**The entry into cooling towers for the purposes of cleaning constitutes an entry into a confined space and all relevant regulatory provisions apply.**

**Any hazards associated with fans, pumps, and so on, must be managed, by ensuring that such equipment is isolated so that it may not be activated whilst someone is working within the confined space. A tagging system for such equipment should be used in conjunction with a confined space entry and works permit.**

The use of chemicals in the cleaning of cooling towers could give rise to unacceptable levels of contaminants within a cooling tower during the cleaning process and this potential hazard must also be addressed in the risk assessment and Health and Safety Plan (HASP) for this activity.

At industrial sites, confined space entry will be governed by the site operator's occupational health and safety requirements and a permit should be required for entry for the purposes of cleaning or other maintenance activities.

WTSPs should not enter a confined space unless they:

- Have had appropriate training.
- Are knowledgeable of the potential hazards associated with the confined space and the activities that they intend to undertake therein.
- Have undertaken all appropriate measures to eliminate or minimise the risks associated those hazards.
- Have evidence that the atmosphere is safe within the confined space.
- Are permitted to enter the confined space and undertake the intended activities.
- Have measures in place to ensure rescue is possible in the event of an incident.

## 8.7 Climatic Considerations

Climatic conditions can potentially impact on the health and safety of water treatment technicians. Examples include:

- Heat Stress.
- Sunburn.
- Hypothermia.
- Slips and falls caused by strong winds and/or heavy rain (causing slippery surfaces).
- Electrical hazards due to outdoor surfaces and electrical equipment being wet after rain, or during electrical storms.

Occupational health and safety plans must address such issues and provide guidance on the procedures to be adopted to minimise such risks.

<sup>3</sup> The provisions of the VWA's Code are not mandatory. That is, a person may choose to comply with the Regulations in some other way, as long as that method also fulfils the requirements of the Regulations. However, in legal proceedings, failure to follow an approved code of practice can be used as evidence that a person or company has not complied with the provisions of the Occupational Health and Safety Act or Regulations.

# 8 Occupational Health and Safety

Common sense must be used when climatic conditions are so extreme that they may impact on the safety of an individual servicing a cooling tower system.

## 8.8 Electrical Safety

Electrical equipment and power supply should be isolated and tagged prior to entry into a cooling tower's confined space.

Every electrical supply to which portable equipment or tools could be connected, or which supplies power to such through flexible cords, should incorporate residual current devices (RCDs) to protect against electric shock.

RCDs and electrical equipment and power supplies associated with cooling towers shall be installed in accordance with AS/NZS 3000: Wiring Rules.

Where electrical equipment and power supply via flexible cord is situated outside and exposed to the elements, all necessary measures must be undertaken to ensure that this equipment is safe to check, calibrate, use or service under all expected and prevailing climatic conditions.

The degree of protection for such equipment shall be in accordance with AS1939: Degree of protection provided by enclosures for electrical equipment.

The requirements for testing and tagging of electrical equipment and leads are set out in AS/NZS 3760: In-service safety inspection and testing of electrical equipment.

If not, then warnings must be issued in the HASP for that client, and the relevant employees informed of such potential hazards.

Note that within industry, special safety requirements exist for designated hazardous areas which may contain flammable liquids, gases or dusts. These provisions apply to the use of

intrinsically safe electrical equipment and the maintenance and servicing of such equipment.

Where WTSPs are servicing or installing equipment at industrial sites, it is essential that enquiries are made as to whether the area where the cooling tower system is located is a designated hazardous area. If it is a designated hazardous area, then the relevant safety requirements must be followed.

Electrical equipment and power supply associated with the cooling tower must be installed and maintained in accordance with the required standards.

## 8.9 Manual Handling

Manual handling is regulated by WorkSafe Victoria via the *Occupational Health and Safety (Manual Handling) Regulations 1999*. Guidance on how to meet the requirements of the regulations is found in VWA's *Code of Practice for Manual Handling* (No.25, April 2000<sup>4</sup>).

A quarter of all workplace injuries involve manual handling. *An employer must undertake a risk assessment of manual handling activities and endeavour to reduce any identified risks so far as is practicable.*

The cartage of containers of chemicals and equipment to the cooling tower system (which may include scaling ladders or flights of stairs) may constitute a potential manual handling hazard which may require risk reduction.

WTSPs must identify any potential manual handling issues associated with servicing cooling tower systems and put the necessary plans in place to reduce such risks to staff.

<sup>4</sup> The provisions of the VWA's Code are not mandatory. That is, a person may choose to comply with the Regulations in some other way, as long as that method also fulfils the requirements of the Regulations. However, in legal proceedings, failure to follow an approved code of practice can be used as evidence that a person or company has not complied with the provisions of the *Occupational Health and Safety Act* or Regulations.

# 9 Environmental Management

The traditional approach to treating cooling tower waters involves the use of a variety of chemical products that can adversely impact on the environment if not managed sensibly and in accordance with the relevant legislation. All chemicals used in the treatment of cooling tower systems must be managed in accordance with relevant environmental, occupational health and safety, dangerous goods and hazardous substances legislation.

Chemical issues must be covered in: the quality management system in terms of purchasing policy and the defined quality of product; the occupational health and safety management system in terms of potential occupational health and safety issues relating to use and the supply, understanding and application of MSDS; and the environmental management system in terms of management and disposal of chemicals, their containers and spills, and the discharge of cooling tower waters.

## 9.1 Waste Management

Proper management of chemicals by WTSPs should not result in any wastes being generated, apart from chemical containers and their residues which are classified as prescribed wastes by EPA Victoria.

**It should be noted that it is illegal to dispose of containers with residues of biocides or other hazardous substances into the general waste stream.**

Chemical containers should be triple rinsed with fresh water (using 10 per cent of the container's volume each time) and the rinsate discharged into the cooling tower basin, before the cleaned container is punctured and legally placed into the general

waste stream. The product labels should also be removed or defaced to indicate that it no longer contains chemical product.

**If containers are not to be cleaned, they must be managed in accordance with EPA requirements for prescribed wastes.**

If possible, chemical containers should be returned to the chemical supplier for refilling, as this is a better environmental option.

### 9.1.1 Spills and Leaks

Spills and leaks of treatment chemicals should be collected and either reused, or disposed of to the sewer with sufficient dilution water to mitigate against any potentially adverse impacts, after permission has been obtained from the local sewage authority. If this is not possible, desirable, or allowed, then the collected material must be managed as a prescribed waste in accordance with EPA requirements.

**Spill kits should be part of the WTSP's 'tool kit' to enable the proper management and cleanup of spills and leaks.**

# 9 Environmental Management

WTSPs should endeavour to place chemical containers that are part of a chemical delivery system, undercover wherever possible, and within a bunded area or tray capable of containing the total volume of a single container and 10 per cent of any other containers within the bunded area. Such practices will enable any spills or leaks from such containers to be more efficiently and effectively managed.

Leaks from cooling tower systems into the immediate area around or below the system due to excess water in the system, or from structural defects, will usually result in an inadvertent discharge to stormwater or land and must be rectified as soon as possible. WTSPs must contact the responsible person to rectify such system leakages, if they are beyond their control.

## 9.2 Authorised Discharge to Sewer

**All discharges of cooling tower waters should be to sewer and be authorised by the relevant sewage authority in accordance with the Water Industry Regulations 1995 or the *Water Act 1989*. WTSPs must advise their clients accordingly.**

**Where access to a sewerage system is available, all cooling tower systems must be registered with the relevant sewage authority and permission sought to discharge to sewer before commissioning. All such discharges of cooling tower waters must be to an approved and authorised sewer connection. This is the responsibility of the building facility owner (or their delegated representative), not the WTSP.**

Cooling tower systems are to be connected to the water supply system and property service drains in accordance with AS/NZS 3500 Part 1 and Part 2 (*National Plumbing and Drainage Code*).

EPA Victoria has indicated that it is illegal to discharge any chemical residues or cooling tower waters to land or storm water drains. It has also indicated that in the event of a cooling tower system causing pollution, it would consider enforcement action against both the owner and contracted parties involved in the discharge.

Therefore, the WTSP must obtain assurances from the client that the cooling tower system(s) to be serviced is compliant with the requirements of the local water/sewage authority. A copy of the trade waste agreement should be obtained, so as to ensure that the water treatment service is conducted in compliance with any relevant provisions of the trade waste agreement.

It should be noted that acceptance of trade waste to sewer is at the discretion of the relevant water/sewage authority.

### 9.2.1 Notification Requirements

Some sewage authorities have a requirement that they must be notified when the cooling tower system is to dump its water to sewer, in the event of the need to disinfect, clean and disinfect (as required by regulation) as a result of a positive *Legionella* result. It is the WTSPs responsibility to be aware of such requirements if they exist and to abide by those requirements.

Trade waste consents are in the process of being updated by some water/sewage authorities to include these requirements and will provide a contact number for notification purposes.

Each of these issues must be incorporated into the WTSP's management system to verify the actions expected to be taken in each instance.



# 10 Training

This Code of Practice supports the development of an industry accredited training program for Water Treatment Service Providers servicing cooling tower systems (as defined in the Regulations).

The approach supported by the Department of Human Services and the representative industry special interest group in association with AIRAH is for a **recognised qualification system** to be developed for water treatment technicians in Victoria.

A technician classification system will be based on relevant courses of study and levels of experience and define a career path for water treatment service technicians.

The details of the training system will be developed by AIRAH in conjunction with the WTSP Special Industry Group (SIG), interested stakeholders, and the Department of Human Services within twelve months of the endorsement and release of the Code of Practice by the aforementioned parties. These training requirements will subsequently be described in detail in the Code.

Transitional provisions for existing experienced practitioners need also to be developed to allow equivalent qualifications to be awarded to these persons subject to meeting some basic criteria and demonstrating existing competencies. These transitional provisions must be able to account for the individual's acquired knowledge, experience, and client base. The basic technical competencies of the individual must be demonstrated to the accrediting body.

Employees who have completed their company's own internal training requirements can obtain the relevant qualifications provided the level of training is equivalent and necessary competencies can be demonstrated.

**The training level status will apply to the individual, not the organisation.**

It is important for all individuals involved in WTSP to keep accurate records of their training, experience, qualifications, and any accreditations. Companies should also keep duplicate records of the above.

# 11 Accreditation

This Code of Practice encourages the accreditation of WTSP businesses and companies with AIRAH by agreeing to abide by the requirements of the Code of Practice for Water Treatment Service (Cooling Tower Systems).

Organisational membership is subject to written notification that the subject organisation will comply with the provisions of the Code of Practice, can verify compliance with existing statutory requirements, and is prepared to be independently audited for its compliance with the provisions of the Code, if required.

Where minor non-conformities are revealed during such audits, the subject organisation will have between one and three months (depending on the nature of the issue) to rectify the situation to the satisfaction of the accredited body (or its delegated representative).

**The rules of accreditation will be developed by AIRAH in conjunction with the WTSP SIG, and the Department of Human Services and be incorporated into an amended Code of Practice within six months of the Code being endorsed by AIRAH and the Department.**

The rules of accreditation will also cover issues such as non-conformities that could or will result in suspension or cessation of accreditation as a WTSP with AIRAH. For example, refusing to be audited if requested to do so should result in a loss of accreditation. However, the rules relating to accreditation are yet to be developed. It is very important that the accreditation process have some disciplinary provisions inherent if it is to be seen as

an enforceable and credible self-regulating benchmark for the industry. Appeal provisions need also to be considered with respect to suspensions or cessation of accreditation.

Accreditation will be used to collectively negotiate suitable insurance requirements for member organisations and individual contractors.

Accreditation will indicate that a WTSP organisation intends to comply with accepted industry 'best practice'.

Accreditation may be used to promote and market a WTSP business.

Alternatively, WTSPs may indicate in writing to clients that they comply with the provisions of the Code of Practice and are prepared to be independently audited for their compliance if necessary. However, the Department of Human Services would prefer that an enforceable accreditation mechanism was in operation.

With respect to accreditation, a period of six months grace will be allowed for companies to upgrade their operations to comply with the Code after they have signified their intention to comply with the Code and seek accreditation.

# 12 Insurance Requirements

WTSPs must be able to demonstrate that they have the following insurance coverage as a minimum (unless the WTSP is able to demonstrate that it is self-insured to an equivalent or greater level):

- Public Liability Insurance (PLI): \$10,000,000
- Professional Indemnity Insurance (PID): \$2,000,000.

Higher levels of insurance may be required to meet client expectations in some instances.

Qualified technicians employed on a permanent full time or part time basis will have their PID covered by their employer.

Qualified sub-contractors must provide their own PID insurance for work sub-contracted to them.

Insurance will be collectively negotiated by AIRAH on behalf of the member WTSPs who are not self-insured and require insurance, and a preferred insurance provider recommended to accredited industry members.

A preferred insurance provider will be appointed as soon as possible after the release of the Code of Practice.

# 13 Contracts

This Code of Practice defines the required standards for WTSPs and may be used as defining 'best practice' for the purposes of contractual arrangements.

**Standard clauses for contracts referring to the various relevant provisions of the Code are to be developed by AIRAH in consultation with its members for use in contracts between accredited WTSPs and clients.**

For example, safe access/egress to cooling tower systems must be a standard clause in contracts between WTSPs and their clients.

Any delegation or acceptance of responsibilities must be contractually based, or in written agreements between parties, where this is possible. The roles and responsibilities defined in this Code may be used as a basis for this clarification of roles and responsibilities.

Contingency planning is based around attempting to plan for the appropriate management of events that may or may not occur, or may scarcely be foreseeable. It is important therefore that a contingency clause be in the contract between the WTSP and the client to allow for cost recovery for services that must be provided in the instance of an adverse event, for example.

**WTSPs should be required by facility owners (or their delegated responsible representative) to sign a statement that indicates their compliance with the Code of Practice and that they have the appropriate management systems in place that can verify this compliance.**

# Glossary

**AIRAH** Australian Institute of Refrigeration, Air-conditioning and Heating.

**Automated dosing device** A device or delivery system that automatically discharges the required amount of biocide to the water inside a cooling tower system, so as to maintain the required concentration of biocides in the cooling tower system.

**BC** Building Commission.

**Biocide** A chemical or physical agent that can cause the death of microorganisms dependent of the dose administered. With respect to this Code, it is also an agent capable of killing *Legionella* bacteria.

**Biodispersant** A chemical compound added to the water inside a cooling tower system, to penetrate and break down any biofilm that may be present on the wetted surfaces of the cooling tower system.

**Biofilm** A surface layer of microorganisms. It is usually combined with particulate matter, scale and products of corrosion.

**CFU/mL** Colony Forming Units per millilitre of sample. Refers to bacterial levels detected in a sample.

**Clean** To render free from visible sludge, foam, slime (including algae and fungi), rust, scale, dirt, and any deposit of impurities or other foreign material.

**Cleaning** Maintenance work including disinfection, draining, dispersion and removal of solids, manual scrubbing and flushing.

**Cooling tower** A device for lowering:

- (a) the temperature of recirculated water by bringing the water into contact with fan forced or fan induced air; or
- (b) the temperature of water, a refrigerant or other fluid in a pipe or other container, by bringing recirculated water and fan forced or fan induced atmospheric air into contact with the pipe or container.

An evaporative air cooler or evaporative air conditioner is not a cooling tower.

**Cooling tower fill** The structure located within a cooling tower designed to create an extensive wetted surface area using the recirculated water through which air passes.

**Cooling tower system** Defined as:

- (a) a cooling tower or number of interconnected cooling towers that use the same recirculating water; and
- (b) any machinery that is used to operate the tower or towers; and
- (c) any associated tanks, pipes, valves, pumps or controls.

**Decontamination** A process used when a cooling tower system is suspected or implicated as a source of infection of Legionnaires' disease. The decontamination process is usually determined in consultation with the Department of Human Services. It involves a series of actions to disinfect, clean and re-disinfect the cooling tower system. The process is described in detail in the *Guide to Developing Risk Management Plans for Cooling Tower Systems*.

**Disinfect** To carry out a process:

- (a) intended to kill or remove pathogenic micro-organisms, including *Legionella*; and
- (b) in the case of a cooling tower system, consists of dosing the water of a system with either:
  - (i) a chlorine-based compound, equivalent to at least 10 mg/L of free chlorine for at least one hour, while maintaining the pH of the water between 7.0 and 7.6; and
  - (ii) a bromine-based compound, equivalent to at least 20 mg/L of free bromine for at least one hour, while maintaining the pH of the water between 7.0 and 8.5.

**EPA** Environment Protection Authority (Victoria)

**Heterotrophic Colony Count (HCC)** An estimate of the number of viable units of bacteria per millilitre of water made using the pour plate, spread plate or membrane filter test. Also known as total bacteria count, total plate count or viable bacteria count test.

**Manual Handling** Any activity requiring the use of force exerted by a person to lift, push, pull, carry or otherwise move, hold or restrain any object.

**Operational program** A documented program detailing the water treatment and physical maintenance of the cooling tower system, including details of service frequency.

**Owner of any land** The owner in relation to the land or Crown land within the meaning of the Building Act 1993.

**PIC** Plumbing Industry Commission.

**Responsible person** The person who owns, manages or controls the cooling tower system.

**Risk Management Plans (RMPs)** The process prescribed by the Department of Human Services for the assessment and management of risk factors associated with a given cooling tower system, the classification of the cooling tower system and the prescription of a maintenance and servicing regime appropriate for the determined risk category. Guidance on the development of RMPs can be found in the Department's publication: *A Guide to Developing Risk Management Plans for Cooling Tower Systems*.

**Service frequency** The frequency with which the cooling tower system is thoroughly checked by a competent person. Includes a check of the water quality and/or physical components.

**Slug dosing** The process of adding in a single dose a much higher amount of chemical biocide than is normally applied, with the intention of rapidly raising the concentration of biocide in the water to a level expected to kill most if not all organisms in the water.

**VWA** Victorian WorkCover Authority

**WTSP** *A person or organisation which provides a service to maintain the waters of a cooling tower system, so as to minimise microbial growth, and/or scale formation, and/or corrosion within a cooling tower system, by the use of chemical and/or physical agents.* The physical cleaning of an empty cooling tower system may be a service offered by WTSP, but is not covered by the Code at this point in time. Similarly equipment and chemical suppliers, and consultants who prepare Risk Management Plans, are also outside the scope of the Code at this time. In subsequent reviews, the industry may revisit the relevance and/or practicality of including such activities within the Code of Practice.