Australian Standard™

Power station cooling tower water systems—Management of legionnaire's disease health risk

Standards Australia

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PREFACE

This Interim Australian Standard was prepared by the Standards Australia Committee ME-062, Ventilation and Airconditioning.

This Standard is applicable to the cooling tower condensing water systems and major auxiliary plant cooling water systems of power stations connected to the national or regional grids that supply electricity for public consumption. The impetus for the Standard was recognition that the series of Standards under AS/NZS 3666, *Air-handling and water systems of buildings—Microbial control*, were not appropriate to apply to these systems. The application of the Standard in place of the AS/NZS 3666 series requires that comprehensive water treatment programs are maintained and health risks are managed in accordance with this Standard.

Standards Australia invites comment on this Interim Standard from persons and organizations concerned with the subject of the Standard. The date of expiry of comment is 2 years after publication, at which time this Interim Standard will be confirmed, withdrawn or revised in the light of public comment received.

This Standard incorporates a Commentary on some clauses. The Commentary is set directly following the relevant clause and is designated by 'C' preceding the clause number and printed in italics in a panel. The Commentary is for information only and does not need to be followed for compliance with the Standard.

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FOREWORD

Legionnaire's disease is an acute bacterial infection of the lower respiratory tract. Infection is caused by exposure to, and inhalation of, tiny airborne water droplets containing the *Legionella* bacteria. Among the elderly and persons whose body resistance is weakened by other concurrent illnesses, the infection can be fatal. Healthy people are at a much lower risk of infection.

Legionella bacteria is very widespread and can survive and multiply in natural fresh water systems such as rivers, lakes and underground water systems, and readily enters man-made water systems. It proliferates in the presence of sludge, scale, rust, algae and, most importantly, in water of temperature in the range of 20°C to 45°C.

Poorly maintained cooling towers in building airconditioning systems have been identified as a source of outbreaks of infection. They provide an environment in which *Legionella* can proliferate and become airborne in droplets of water that could be inhaled. Procedures and practices that have been established to reduce the risk of infection from these sources require decontamination of the cooling water systems using prescribed chemical treatment and shutdown and cleaning of the cooling towers and associated systems. As described below, such requirements are not appropriate to apply to the major cooling tower water systems used in power stations.

Based on evidence up to date, cooling towers used in power stations have been recognized as being of low disease risk. Cases of legionnaire's disease infection have not been identified as being caused by a cooling tower that is part of the condensing water systems or major auxiliary plant cooling water systems used in power stations, despite frequent unavoidable presence of *Legionella* bacteria in these systems, which is due mainly to the indifferent quality of water that is drawn into the systems from external sources. legionnaire's disease cases that have occurred at power stations have been associated with small auxiliary cooling towers serving compressor plant and the like, which are not covered by this Standard and are required to be maintained in accordance with AS/NZS 3666.

As optimum cooling system performance is critical to the efficient production of electricity and the commercial viability of these power plants, the cleanliness of power station condensing water and major auxiliary plant cooling tower water systems is closely managed and monitored by on-site specialists. This management regime is an essential difference between these power station systems and many of the much smaller systems that have been associated with *Legionella* infection. Maintenance of cooling system cleanliness is achieved through chemical treatment programs that are continually applied, and which are designed and developed to inhibit growth of organisms and minimize corrosion and depositions in the systems, using experience gained from each individual plant. These programs take into account the condition of the water supply the system draws on, plant-operating conditions and the materials of construction of the system, and include monitoring and control of *Legionella* concentrations. Some of these decontamination procedures may be impractical to use in power station cooling tower water systems because of the corrosive damage they are likely to cause to the plant.

Power station cooling towers associated with condensing water systems and major auxiliary plant may be required to run continuously for many years without shutdown. *Legionella* control regimes that require more frequent shutdowns are not practicable, as they would add very significantly to the cost of electricity and could result in shortages in public electricity supply, the consequences of which could be widespread and serious.

Practical control of *Legionella* populations within power plant cooling water systems and appropriate control measures are needed in order to provide a safe community and power

station working environment, whilst maintaining efficient and cost-effective power generation.

This Standard was developed to further minimize the risk of legionnaire's disease and relates to the management of legionnaire's disease health risk associated with power station condensing water and major auxiliary plant cooling tower water systems. It recognizes that the power plant environment is characterized by unique conditions that are not compatible with conventional intervention practices such as shutdown or use of alternating biocides. These conditions include continuous in-service duty requirements; elevated water temperatures; variable quality of source water; presence of microorganisms including low legionellae counts as normal.

This Standard sets out control strategies considered to be suitable for use for the major cooling tower water systems at power stations. The strategies follow risk management principles and may also be suited to other large cooling tower water systems for which shutdown is impractical.

Background information on *Legionella* and guidance on general principles of control may be found in the National Environmental Health Forum monographs found at http://enhealth.nphp.gov.au/council/pubs/ecpub.

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SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out control strategies suitable for the management of legionnaire's disease health risk from the cooling tower water systems of power stations connected to the national or regional grids used to supply electricity for public consumption. It applies to the cooling tower water systems associated with—

(a) condensing systems of steam driven turbines driving electricity generators and

(b) main power station auxiliary plant such as coal pulverizing mills and turbine plant heat exchangers, where—

(i) a chemical dosing regime is applied to maintain the cleanliness of those systems and is demonstrably effective in the control of concentrations of *Legionella* bacteria; and

(ii) shutdown for cleaning of those systems would require total or partial shutdown of electricity generation by the power station, which may not be practicable.

The approach to management of legionnaire's disease health risk set out in this Standard is based on the principles and generic process set out in AS/NZS 4360. This approach involves setting the context, identifying risks, then evaluating treating and monitoring risks, and ensuring that the information is communicated effectively.

This Standard is not applicable to associated power station site services such as air-conditioning systems of buildings, or other relatively smaller cooling tower water systems in power stations, that can be taken out of service without affecting electricity generation. The AS/NZS 3666 series of Standards applies to microbial control in these systems.

NOTE: This Standard does not prohibit the operation of associated site services that use condenser water from a main power generation cooling tower.

1.2 OBJECTIVE

The objective of this Standard is to establish appropriate means for minimizing the possibility of outbreaks of legionnaire's disease, as a result of operation of power station cooling tower water systems.