AS/NZS 3666.3:2011

Australian/New Zealand Standard™

Air-handling and water systems of buildings—Microbial control

Part 3: Performance-based maintenance of cooling water systems

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee ME-062, Ventilation and Airconditioning. It was approved on behalf of the Council of Standards Australia on 20 July 2011 and on behalf of the Council of Standards New Zealand on 25 July 2011.
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The following are represented on Committee ME-062:

Air Conditioning and Mechanical Contractors Association
Australasian Fire and Emergency Service Authorities Council
Australian Building Codes Board
Australian Institute of Refrigeration Air Conditioning and Heating
Chartered Institution of Building Services Engineers
Climate Control Companies Association
Consumer Electronics Suppliers Association
Department of Health and Human Services, Tas.
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Australian/New Zealand Standard™

Air-handling and water systems of buildings—Microbial control

Part 3: Performance-based maintenance of cooling water systems

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PREFACE

This Standard was prepared by Joint Standards Australia/Standards New Zealand Committee ME-062, Ventilation and Airconditioning, to supersede AS/NZS 3666.3:2000.

This Standard forms Part 3 of a series of Standards for microbial control of air-handling and water systems of buildings, as follows:

AS/NZS	
3666	Air-handling and water systems of buildings — Microbial control
3666.1	Part 1: Design, installation and commissioning
3666.2	Part 2: Operation and maintenance
3666.3	Part 3: Performance-based maintenance of cooling water systems
3666.4	Part 4: Performance-based maintenance of air-handling systems (ducts and components)

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

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FOREWORD

AS/NZS 3666.2, *Air-Handling and water systems of buildings—Microbial control*, Part 2: *Operation and maintenance*, requires shutdown of cooling water systems for periodic cleaning. This is impracticable for many systems, such as the large industrial types serving power stations, co-generation plants, oil refineries and chemical manufacturing plants. However, microbiological control at these plants is usually effective and no reported outbreaks of Legionnaires' disease have been attributed to such sources. The continuous engineering attention they receive means they are generally well maintained. However, it became apparent that the AS/NZS 3666 series should provide for a performance-based alternative to the prescriptive maintenance requirements set out in Clause 2.5 of AS/NZS 3666.2. This performance-based alternative can be applied to any cooling water system for which the specific requirements of this Standard can be met.

This Standard provides such an alternative option. It follows risk management principles including—

(a) context;

(b) risk identification;

(c) assessment;

(d) control; and

(e) monitoring and corrective actions.

These principles are applied to the key causal factors, understood to lead to a risk of multiplication of legionellae within a system, as set out in the Foreword to AS/NZS 3666.1.

A central issue in the management of health risk arising from microorganisms is the degree of scientific certainty about the underlying causes of growth, dissemination and infection. Control strategies adopted may need to change as new knowledge becomes available.

Sampling for legionellae is not required by AS/NZS 3666.2 but is considered to be a relevant monitoring activity in a performance-based approach. Although the sample taken may not accurately represent the microbial distribution and variety within the system, it is presently the most direct means of assessing the effectiveness of maintenance regimes on the multiplication of legionellae. Such specific tests need to be complemented with other assessments such as total bacterial count (also called heterotrophic colony count) and system water quality characteristics to provide reassurance that the system is well maintained and operating in a hygienic condition.

The concentration level of legionellae required to cause infection has not been established at this time. The risk of disease depends substantially on the susceptibility of the person exposed. However, it is reasonable to assume that increased risk is associated with exposure to increased concentrations of microorganisms. Available data suggest that most outbreaks are associated with a concentration of 1000 cfu/mL or greater, although lower levels may well be associated with sporadic cases of disease. It is the intention of this Standard that cooling water systems operate with non-detectable concentrations of legionellae. This Standard requires corrective actions to be carried out whenever a 'detectable' concentration of legionellae is found (10 cfu/mL or greater) in order to provide confidence that the system is hostile to these microorganisms. More demanding and prompt actions are required when a higher concentration is detected.

The primary aim is to avoid conditions that may allow microorganisms, including legionellae to multiply in the cooling water system thus creating a health risk.

An important strategy in minimizing health risks associated with cooling water systems involves the management of system water quality. Water treatment is designed to preserve the cooling tower and the cooling water system of which it is a part, maintain heat transfer efficiency and help ensure an acceptable standard of occupational and public health. These factors interact so that properly implemented microbial control, for reasons of disease prevention, should also assist in system longevity and efficiency. The water treatment program for microbial control needs to be well managed, and be more comprehensive than a program for those systems that are routinely cleaned in accordance with AS/NZS 3666.2. Water treatment program management approaches may differ in detail from site to site and, therefore, need to be documented in a specific plan for each site.

This Standard addresses only the maintenance of cooling water systems and is to be read in conjunction with Part 1 and the relevant clauses of Part 2. Aspects such as maintenance manuals, records, log books, safety procedures and the like, are as important for the application of this Standard, as they are for a prescriptive approach to maintaining a clean system.

Further explanatory information regarding the subject of microbial control of cooling water systems can be found in the Standards Australia/Standards New Zealand Handbook HB 32:1995, *Control of microbial growth in air-handling and water systems of buildings*, and the National Environmental Health Forum Monograph, *Guidance for the control of Legionella*, published by the South Australian Health Commission (1996) on behalf of the Commonwealth Department of Health and Aged Care, and the *Application Manual No. DA18, Water Treatment*, which is published by the Australian Institute of Refrigeration Air-conditioning and Heating (AIRAH).

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Australian/New Zealand Standard

Air-handling and water systems of buildings—Microbial control

Part 3: Performance-based maintenance of cooling water systems

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard outlines a performance-based approach to the maintenance of cooling water systems with respect to the control of microorganisms, including legionellae, within such systems. This approach combines automatically regulated water treatment with monitoring, assessment and control strategies to help create a low risk environment within the cooling water system.

The provisions of this Standard are an alternative to the prescriptive requirements of AS/NZS 3666.2 for the maintenance of cooling water systems.

NOTE: This Standard addresses only the performance of maintenance programs for cooling water systems and is to be read in conjunction with AS/NZS 3666.1 and the relevant clauses of AS/NZS 3666.2. Aspects such as maintenance manuals, records, log books, safety procedures, and the like, are as important for the application of this Standard as they are for a prescriptive approach to maintaining a clean system.

1.2 OBJECTIVE

The objective of this Standard is to provide a performance-based approach to cooling water system maintenance to assist users in the control of microorganisms, including legionellae, within such systems.

1.3 NORMATIVE REFERENCES

The following are the normative documents referenced in this Standard:

NOTE: Documents referenced for informative purposes are listed in the Bibliography.

AS/NZS

2031 Selection of containers and preservation of water samples for microbiological analysis

3666 Air-handling and water systems of buildings—Microbial control
3666.1 Part 1: Design, installation and commissioning
3666.2 Part 2: Operation and maintenance

3896 Waters—Examination for Legionella *spp.* including *Legionella pneumophila*

4276 Water microbiology
4276.3.1 Method 3.1: Heterotrophic colony count methods—Pour plate method using yeast extract agar
4276.3.2 Method 3.2: Heterotrophic colony count methods—Plate count of water containing biocides