

Australian/New Zealand Standard™

**Air-handling and water systems of
buildings—Microbial control**

**Part 1: Design, installation and
commissioning**



AS/NZS 3666.1:2011

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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™

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Part 1: Design, installation and commissioning

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee ME-062, Ventilation and Airconditioning, to supersede AS/NZS 3666.1:2002.

This Standard forms Part 1 of a series of Standards for the 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 term ‘informative’ has been used in this Standard to define the application of the appendix to which it applies. An ‘informative’ appendix is only for information and guidance.

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FOREWORD

Microbes abound in the natural environment and are normally present in low concentration level throughout buildings. Building systems are not sterile and will always contain some microbes. Generally, health hazards, which can lead to infections such as Legionnaires' disease or pontiac fever, or allergic reactions such as humidifier fever, are created only when these microbes multiply to high concentrations.

The three main categories of microbes that can be found in building environments are viruses, fungi and bacteria. Viruses are the simplest form of microorganism (microbe) but they can only reproduce within other living cells. The sources for viral transmission are the occupants rather than the building services. On the other hand, fungi and bacteria can colonize in building services if moisture and organic nutrients are present. Fungi (e.g. mould) attach to hard surfaces and are readily able to grow in conditions of high humidity as they extract their moisture from the air. Fortunately, they can be controlled by the normal principles of hygiene, such as keeping surfaces dry, and by regular cleaning and disinfection with a mild bleaching agent. While fungi are difficult to eliminate, they will germinate only when moisture returns.

Examples of systems that are only intermittently moist, but which are able to support fungal growths, are cooling coils, condensate trays, drain lines, ducting near cooling coils, and humidifier surfaces.

Bacteria also prefer wet surfaces for growth but are generally to be found where the surfaces are submerged or at the interface between wet and dry areas.

Colonization and growth of *Legionella* bacteria (the causative agent for Legionnaires' disease), can take place in any water-based system if the water is warm and supplied with nutrients. Examples of such systems relevant to building services are showers and baths, and cooling towers (and the like) used for heat rejection, for which control measures are described in this Standard.

Other sources include spa pools, decorative fountains, nebulizers (for hospital patients), ultrasonic humidifiers (mistifiers at supermarket vegetable cabinets), cutting fluid (in industrial machine shops), dental equipment and, more recently, the potting mixtures and other composted material used by home gardeners.

As *Legionella* bacteria are widespread in natural water sources, such as rivers, lakes, mud and soil, it is not surprising that they are often present in building water systems. Absolute exclusion of these particular bacteria from water systems, although a worthy objective, may not be possible nor necessary, and finding the bacteria does not by itself indicate that a source presents a risk. AS/NZS 3666.3 provides requirements for system decontamination should elevated *Legionella* counts be found.

One type of application of particular concern is the provision of warm water for bathing or showering at some hospitals and institutions for the elderly, children and the mentally ill. This water is usually supplied at a temperature of 45°C maximum, to prevent scalding. Therefore, *Legionella* control by elevated temperature at the point of use is not possible. Often, a storage-type warm water system is provided rather than a hot-cold mixing system. Cases of Legionnaires' disease amongst susceptible people have been associated with the aerosol sprayed from showerheads or bath taps supplied by such systems. Adverse conditions can be created by the build-up of sludge in storage vessels and possible dead legs in the piping system. Regular cleaning, maintenance and disinfection of the system are required.

The problem can be largely overcome by the provision of anti-scald, thermal shut-off devices that mix hot and cold water supplied to the shower outlets instead of using warm water storage tanks or calorifiers. Such outlets can be readily dismantled and disinfected periodically with chlorine. Alternatively, cold water, which is directly heated to produce warm water, can be used.

In the case of cooling water systems that make use of cooling towers to evaporatively cool recirculating water, the risk of disease can be minimized by the following:

- (a) Careful attention to system design and construction features.
- (b) Use of drift eliminators.
- (c) Siting of towers away from building air intakes, populated areas and discharges from kitchen exhaust systems.
- (d) Maintaining the system in a clean and sound condition.
- (e) Controlling water quality from when water is introduced into the system.
- (f) Monitoring towers and water condition.

Similarly, the control of all microbes able to colonize water and air-handling systems of buildings can be effected by the avoidance of growth needs, by ensuring the systems are clean, properly designed, commissioned, operated and well maintained, and by the use of appropriate water treatment techniques.

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, *Control of microbial growth in air-handling and water systems of buildings*, and the National Environment 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 1: Design, installation and commissioning

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies minimum requirements for the design, installation and commissioning of air-handling and water systems of buildings for the purposes of microbial control. It does not include requirements for refrigerated room airconditioners and non-ducted split systems.

Requirements specified in this Standard are not intended for the control of the wide range of discomfort symptoms that may afflict the occupants of some buildings.

NOTES:

- 1 The Standard covers the most common known sources of the diseases associated with air-handling and water systems of buildings. Other sources, both known and potential, include cooling water systems for refrigeration equipment and air compressors, industrial heat exchangers when opened for cleaning, decorative fountains, spa pools, spray irrigation systems, and industrial water-based cutting fluid systems.
- 2 In the event of an outbreak of Legionnaires' disease, special action is necessary, which will be advised by the health authorities.
- 3 Further information on the control of microbial growth in air-handling and water systems of buildings is given in HB 32.
- 4 Operation and maintenance requirements are given in AS/NZS 3666.2, AS/NZS 3666.3 and AS/NZS 3666.4.

1.2 OBJECTIVE

The objective of this Standard is to assist in the control of microorganisms in building systems, particularly those associated with Legionnaires' disease, Pontiac fever, hypersensitivity pneumonitis and humidifier fever.

1.3 APPLICATION

This Standard is intended for use by regulatory authorities, building services designers, architects, equipment manufacturers and suppliers, installers, maintenance personnel, managers, owners, and operating staff responsible for designing, installing, commissioning, operating, and maintaining the air-handling and water systems of a building. It gives minimum requirements and shall be read in conjunction with any additional recommendations given by suppliers of the equipment and with the requirements of any relevant specification or applicable legislation.

NOTE: This Standard has been developed for commercial building services systems. The technical content may be applied by the regulatory authority to other commercial or industrial systems and to domestic systems incorporating a cooling water system.