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Australian/New Zealand Standard™

Air-handling and water systems of buildings—Microbial control

Part 1: Design, installation and commissioning

Standards Australia

STANDARDS NEW ZEALAND
Paerewa Aotearoa

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The following interests are represented on Committee ME-062:

Air-Conditioning and Refrigeration Equipment Manufacturers Association of Australia
Australasian Fire Authorities Council
Australian Building Codes Board
Australian Chamber of Commerce and Industry
Australian Industry Group
Australian Institute of Building Surveyors
Australian Institute of Refrigeration Air Conditioning and Heating
Chartered Institution of Building Services Engineers
Department of Contract and Management Services, W.A.
FPA Australia
Institute of Refrigeration Heating and Air Conditioning Engineers New Zealand
Institute of Engineers Australia
Plastics and Chemicals Industries Association
Property Council of Australia

Additional interests participating in the preparation of this Standard:

Department of Human Services (Vic)
Department of Human Services (Tas)
Institute of Plant Engineers Australasia
National Health and Medical Research Council
New South Wales Health Department
Queensland Health
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Australian/New Zealand Standard™

Air-handling and water systems of buildings—Microbial control

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 3666.1:1995.

This Standards forms Part 1 of a series of Standards for the microbial control of air-handling and water systems, 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

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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 legionnaire's 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 environment 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 are readily 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 legionnaire's 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 (misters 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 legionnaire's 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 this subject 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 in the monograph produced by the National Environmental Health Forum entitled, Guidance for the control of *Legionella* [found at the website www.health.sa.gov.au/pehs (click Publications then Legionella). The Australian Institute of Refrigeration Air Conditioning and Heating has produced a series of application manuals on cooling towers, water treatment, piping systems and maintenance.

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

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.

NOTE: Refer to regulatory authority for the application of the criteria to buildings.

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, spray irrigation systems, and industrial water-based cutting fluid systems.

2 In the event of an outbreak of legionnaire's 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 HB 61 provides details of the standard specifications in the NATSPEC series.

5 Operation and maintenance requirements are given in AS/NZS 3666.2.

1.2 OBJECTIVE

The objective of this Standard is to assist in the control of microorganisms in building systems, particularly those associated with legionnaire's 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 regulation.

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.