Emi-8 Legionella

Points available 1

AIM OF CREDIT

To encourage and recognise building systems designed to eliminate the risk of Legionnaire's disease (*Legionellosis*) as far as is reasonably practicable.

CREDIT CRITERIA

One point is awarded where:

- There are no water-based heat rejection system(s) serving the building;

OR

- Water-based heat rejection system(s) meet all of the following:
  - Do not contain water that is kept at a temperature between 20°C and 50°C;
  - Do not release an aerosol spray during operation;
  - Are designed and built to maintain constant movement of the water in the system, when in operation, to prevent stagnation;
  - Are designed and built for routine and periodic flushing to remove bio-film buildup and stagnant water from the system(s) whenever it is not in operation; and
  - Are designed, located and built in accordance with AS/NZS 3666.1:2002;

  AND

- A *Legionella* Risk Management plan has been prepared in accordance with AS/NZS 3666.2:2002 or AS/NZS 3666.3:2000 and has been included in the O&M manual provided to the building owner.

This credit is applicable to all projects registered after December 16th, 2008. All projects registered prior to this date can choose to use this new credit in its entirety or use the credit issued within the Technical Manual.

COMPLIANCE REQUIREMENTS

Ensure that the submission adheres to all provisions of the Submission Requirements document found on the GBCA website.

Water that is kept at a temperature between 20°C and 50°C has a direct impact on the growth of *Legionella*. The Certified Assessors will look for evidence that the design of the system, and the ongoing maintenance ensure that the temperature of the water is not within this range.

Legionella Risk Management Plan

The *Legionella* Risk Management plan must, as a minimum, contain provisions for:

- Regular and periodic inspections (at least monthly) and maintenance of the system(s) (at least every three months) as per AS/NZS 3666.2:2002 or AS/NZS 3666.3:2000;
- Flushing of the system(s) where the system(s) are not in operation for more than three days; and
- Inspection, cleaning and flushing of the system(s) prior to reactivation.

While the steps outlined in the Credit Criteria and Compliance Requirements have been developed to ensure that the risk of *Legionella* is eliminated as far as reasonably practicable, achieving this point does not guarantee that the risk of *Legionella* has been entirely eliminated from the water-based heat rejection system. By awarding this point, the Certified Assessors are only confirming that the system meets the Credit Criteria outlined above.

Nominated Area

For the purposes of this credit 'nominated area' is UFA.

DOCUMENTATION: DESIGN RATING

Submit all the evidence and ensure it readily confirms compliance.

For naturally ventilated and mechanically assisted naturally ventilated spaces:

Short report

Schedule of ventilation openings

-OR-

Empirical calculation(s)

-OR-

Computer modelling report

Tender drawing(s)

Where the building is air-conditioned without water-based heat rejection systems:

Short report

Extract(s) from the mechanical specification(s)

Tender drawing(s) of the HVAC system

Where the building is air-conditioned with water-based heat rejection systems:

Short Report

Extract(s) from the mechanical specification(s)

Manufacturer's data sheets

Legionella Risk Management Plan (draft)

Short report prepared by a mechanical engineer that describes how the Credit Criteria have been met by:

- For naturally ventilated and mechanically assisted naturally ventilated buildings, referencing either the schedule of openings, the empirical calculations or the computer modelling report to demonstrate why mechanical air-conditioning is not required; or
- For mechanically air-conditioned buildings, indicating the type of the HVAC system(s) and if they require refrigerants, their type(s) and volume; or
- For water-based heat rejection system(s), indicating the type of water-based heat rejection system(s); summarising the operating temperature range or how the system(s) avoids creating an aerosol spray; how the system prevents water stagnation; and a description of the maintenance process for the system.

Schedule of ventilation openings that identifies all spaces within the building; provides their sizes in nominated area; identifies which are naturally ventilated and which are mechanically assisted naturally ventilated; lists the sizes of the ventilation openings; and confirms that the deemed-to-comply requirements of AS1668.2-2002 are met for at least 95% of the nominated area.

Empirical calculation(s) demonstrating that the natural ventilation system or MANV system complies with the relevant provisions of AS1668.2-2002.

Computer modelling report demonstrating that the natural ventilation system or MANV system complies with the relevant provisions of AS1668.2-2002.

Tender drawing(s) for each naturally ventilated and mechanically assisted naturally ventilated space, showing openings, with dimensions clearly indicated, and ventilation inlets and outlets.

Extract(s) from the mechanical specification(s) where the HVAC system is described and its requirements (e.g. capacity and type of refrigerant(s)) are nominated.

- For water-based heat rejection systems, this must include a requirement for the development of a

Legionella Risk Management Plan.

Tender drawing(s) of the HVAC system, with components clearly nominated.

Manufacturer's Data Sheets, where the water-based heat rejection system(s) is described and shown to either meet the required operating temperature range and how the system avoids creating an aerosol spray; how the system prevents water stagnation; and a description of the maintenance process for the system(s).

Legionella **Risk Management Plan (draft),** demonstrating compliance with AS/NZS 3666.2:2002 or AS/NZ 3666.3:2000; showing the inspection and maintenance periods; and outlining the requirements for flushing and cleaning when the system(s) are not in operation.

DOCUMENTATION: AS BUILT RATING

Submit all the evidence and ensure it readily confirms compliance.

For naturally ventilated and mechanically assisted naturally ventilated spaces:

Short report

As-built drawing(s)

Extract(s) from the Commissioning Report

Where the building is air-conditioned without water-based heat rejection systems:

Short report

As-built mechanical drawing(s)

Extract(s) from the Commissioning Report

Where water-based heat rejection systems are used:

Short Report

Extract(s) from the Commissioning Report

Manufacturer's data sheets

Legionella Risk Management Plan

Short report prepared by qualified project team member that describes how the Credit Criteria have been met by:

- Referencing as-built drawings and the Commissioning Report;
- For naturally ventilated and mechanically assisted naturally ventilated spaces, referencing the commissioning report and demonstrating that the natural ventilation system or MANV system complies with the relevant provisions of AS1668.2-2002;
- For mechanically air-conditioned, indicating the type of the HVAC system and if it requires refrigerants, their type(s) and volume;
- For water-based heat rejection system(s), indicating the type of water-based heat rejection system(s); summarising the operating temperature range or how the system(s) avoids creating an aerosol spray; how the system prevents water stagnation; and a description of the maintenance process for the system.

As-built drawing(s) for each naturally ventilated and mechanically assisted naturally ventilated space, showing openings, with dimensions clearly indicated, and ventilation inlets and outlets.

Extract(s) from the Commissioning Report demonstrating that the HVAC system(s) have been commissioned and found to operate as intended by the design.

- For naturally ventilated and mechanically assisted ventilated spaces, demonstrating that the natural ventilation system or MANV system complies with the relevant provisions of AS1668.2-2002.
- For water-based heat rejection system(s), showing that the system(s) as installed maintains the movement of water through the entire system and that the system(s) can be flushed entirely.

As-built mechanical drawing(s) of the HVAC system, with components clearly nominated.

Manufacturer's Data Sheets, where the water-based heat rejection system is described and shown to either meet the required operating temperature range and how the system avoids creating an aerosol spray; how the system prevents water stagnation; and a description of the maintenance process for the system.

***Legionella* Risk Management Plan,** demonstrating compliance with AS/NZS 3666.2:2002 or AS/NZ 3666.3:2000; showing the inspection and maintenance periods; and outlining the requirements for flushing and cleaning when the system(s) are not in operation.

ADDITIONAL GUIDANCE

Water-based systems that do not meet the Credit Criteria are not eligible for points within this credit. Disinfection systems, such as ultraviolet light, chlorination, heat or any other method, are not an equivalent method for meeting the Credit Criteria. Drift eliminators are not an acceptable solution to claim the elimination of aerosol spray during operation or maintenance.

An aerosol spray is defined as droplets which are suspended in the air. Typically, these droplets are less than five micrometers.

There are a number of alternatives to water-based heat rejection systems for buildings with heat rejection requirements. Alternatives which have already been applied on projects in Australia include:

- Natural ventilation;
- Mechanically assisted natural ventilation;
- Air-cooled heat rejection;
- Harbour heat rejection;
- River heat rejection; and
- Ground heat rejection.

BACKGROUND

Colonisation and growth of the bacteria '*Legionella*' (the causative agent for legionnaire's disease) can take place in any water-based system if the water is warm and supplied with nutrients. Such organisms can be transported outside the water-based heat rejection systems within drift aerosol. There is evidence that the inhalation of such drift containing *Legionella* is a means of infection.

In Philadelphia in 1976, the American Legion held a bi-centennial conference to celebrate 200 years since the signing of the declaration of independence from Britain. The Legion is an organisation of ex-servicemen, similar to the Australian RSL. More than 180 delegates, all staying at the same hotel, developed an acute, severe illness and 29 died. The final toll was 34 deaths; some simply passers-by in the street. Initially the cause of their illness was unknown, with food poisoning a major suspect. It is now known that what they had was 'Legionnaires' disease', a form of pneumonia, or infection of the lung.

The cause of Legionnaires' disease is a family of bacteria and as such, it is a micro-organism, not a virus. This distinction is important when it comes to treatment because few viral diseases respond to antibiotics, whereas most bacterial diseases do. *Legionella* pneumophila is the name scientists gave to the bacteria but there are at least 50 other species, all closely related. Incubation in the lung is slow and may not be detected until a few days after infection. Growth in water-based heat rejection systems can also be relatively slow.

Legionella multiplies in temperatures between 20ºC and 45ºC and dies within 6 hours at 55ºC (Department of Human Services, Public Health Division, Victoria, 2001:3) While the spread of *Legionella* can be prevented by the biocide effect of appropriate disinfectants in water-based heat rejection systems, this requires significant maintenance regimes. Legislation, guidelines and responsible authorities varies from state to state. However, while risks can be reduced by adequate maintenance they cannot be eliminated altogether.

Maintenance regimes such as disinfection systems are not a guarantee that a badly designed system will reduce the risk of *Legionella* as far as reasonably practical from the system. There are several reasons for this: chemical injections may not circulate throughout the entire system, or not in the concentration required; ultraviolet light systems only kill the bacteria that is passing through it; and heat may be reliable, but not as well tested. (General Electric Water & Process Technologies, 2006). Furthermore, drift eliminators (devices fitted to cooling towers which remove water droplets from the air within the unit) are

not totally reliable either, as "the effectiveness of these eliminators varies substantially depending on design and condition, some water droplets in the size range of <5 µm will likely leave the unit, and some larger droplets leaving the unit may be reduced to <5 µm by evaporation" (Centers for Disease Control and Prevention).

REFERENCES & FURTHER INFORMATION

- Australian Institute of Refrigeration Air Conditioning and Heating, www.airah.org.au, accessed November, 2007.
- Centers for Disease Control and Prevention, http://www.cdc.gov/ncidod/dhqp/pdf/guidelines/Enviro_guide_03.pdf p58, accessed November 2007.
- National Environmental Health Forum (1996), Guidance for the control of *Legionella*, http://enhealth.nphp.gov.au/council/pubs/pdf/legionel.pdf, accessed November 2007.
- Standards Australia (2002), AS/NZS 3666.1-2002: Air-handling and water systems of buildings – Microbial control – Design, installation and commissioning, www.standards.com.au/, accessed November 2007.
- Standards Australia (2002), AS/NZS 3666.2-2002: Air-handling and water systems of buildings – Microbial control – Operation and maintenance, www.standards.com.au/, accessed November 2007.
- Standards Australia (2002), AS/NZS 3666.2-2000: Air-handling and water systems of buildings – Microbial control – Performance-based maintenance of cooling water systems, www.standards.com.au/, accessed November 2007.

For HVAC Management plans, see

- Department of Human Services, Public Health Division, Victoria (2001), Managing the Risk of Legionnaires Disease, http://www.health.vic.gov.au/environment/downloads/suppnoteshospitals.pdf, accessed November 2007.
- Department of Human Services, Public Health Division, Victoria (2001), A Guide to Developing Risk Management Plans for Cooling Tower Systems, http://www.health.vic.gov.au/environment/downloads/fullrmp.pdf, accessed November 2007.
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), ASHRAE Guideline 12: Minimising the Risk of *Legionellosis* Associated with Building Water Systems, www.ashrae.org, accessed November 2007.
- Australian Institute of Refrigeration Air Conditioning and Heating (AIRAH), AS/NZ 3666 Air-handling and water systems of buildings - Microbial control - Operation and maintenance, http://www.airah.org.au/downloads/2002-03-F01.pdf, accessed November 2007.
- General Electric Water & Process Technologies (2006), Chemical Water Treatment Recommendations for Reduction of Risks Associated with *Legionella* in Open Recirculating Cooling Water Systems, http://www.gewater.com/pdf/tech73.pdf, accessed November 2007.

For state legislation regarding HVAC maintenance and cleaning management programs, see

- Australian Institute of Refrigeration Air Conditioning and Heating (AIRAH), http://www.airah.org.au/downloads/2002-03-F01.pdf.

For temperature ranges see

- Department of Human Services, Public Health Division, Victoria (2001), A Guide to Developing Risk Management Plans for Cooling Tower Systems, http://www.health.vic.gov.au/environment/downloads/fullrmp.pdf.
- The California Energy Commissions, CALIFORNIA ENERGY COMMISSION STAFF COOLING WATER MANAGEMENT PROGRAM GUIDELINES For Wet and Hybrid Cooling Towers at Power Plants, http://www.energy.ca.gov/2005publications/CEC-700-2005-025/CEC-700-2005-025.PDF.
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), ASHRAE Guideline 12: Minimising the Risk of *Legionellosis* Associated with Building Water Systems, www.ashrae.org.
- Chartered Institute of Plumbing and Heating Engineering, Safe Hot Water Temperature, http://www.iphe.org.uk/databyte/legionella.pdf.