Legionella: Understanding the ASHRAE 188 Standard
Acknowledgements

• Alan Wozniak, CEO/President
• Rony Iraq, QAM
• Joiya Mendez, Staff Microbiologist
• Troy Raszka, Marketing Communications Director
• Wayne Barrette, Graphic Designer
Legionella?

- 1976 American Legion Convention
- Environmental bacteria
- Naturally occurring
- Gram-negative
- Rod, coccobacillus to filamentous
- Pathogenic/nosocomial
Understanding the Risk

• **Mild Febrile illness (Pontiac fever)**
  An acute, self-limiting illness with flu-like symptoms that includes fever, chills, headache, myalgia and malaise. The symptoms of Pontiac fever usually last for 2 to 5 days and go away on their own without treatment.

• **Pneumonia (Legionnaires’ disease)**
  It shows symptoms like many other forms of pneumonia including cough, shortness of breath, high fever, muscle aches, headaches, neurologic abnormalities (e.g., confusion, disorientation, lethargy) and gastrointestinal symptoms (e.g., nausea, vomiting, watery diarrhea, etc.). These symptoms usually begin 2 to 14 days after being exposed to the bacteria.

• **Extrapulmonary syndromes**
  Extrapulmonary infections
Who Is At Higher Risk?

- Immunocompromised individuals
- Age group 50 years or above
- Community outbreaks
- Individuals with a smoking habit
- People suffering from lung disease (COPD, emphysema, etc.)
Let’s Do The Numbers

- 8,000 to 18,000 cases/year in USA
- 90% cases are unreported
- 23% hospital acquired
- 77% cases non-hospital acquired
- 20% cases Travel Associated (TALD) in Europe
- 10% to 20% known infected dies
Where Are They?

• Natural Environments
  - Aquatic (Ponds, Lake, Ground Water, Sea Water, etc.)
  - Terrestrial (Soil, Biofilms, etc.)

• Artificial Environments
  - Potable water distribution systems
  - Cooling towers and evaporative condensers
  - Swimming pools, spa and hot tubs
  - HVAC system
  - Health care facilities
  - Hotels and ships
  - Water parks and fountains
  - Other indoor environments
How To Diagnose

- Risk and hazard evaluation
- Identify building water system
- Sample collection
- Laboratory testing
- Control measures
Potential Sites

- Ponds
- Cooling Towers
- Faucets
- Shower Heads
- Humidifiers
- AHU Drain Pans
Favorable Conditions

- Temperature 35° C to 42° C
- Deferred maintenance
  - Plumbing system
  - HVAC
  - Water misters
- Biofilm
- Nutrition
- Others
Influential Factors

- pH level
- Nutrition
- Biofilm
- Chlorine residue
ASHRAE 188 Standard

• May 27, 2015; June 4, 2015; and June 26, 2015

• The American National Standards Institute approved ASHRAE Standard 188-2015 care for managing and reducing the health related risk associated with *Legionella* in building water systems

• Legionellosis: Risk Management for Building Water Systems is not a law regulated in the Code of Federal Regulations (CFR)

• Design, construction, commissioning, operation, maintenance, repair, replacement, expansion of new and existing buildings, and legionellosis risk reduction.
Purpose ASHRAE 188

Establish requirements for building water system that minimize *Legionella* associated risk
ASHRAE 188 Scope

2.1 Minimum legionellosis risk management requirements for the design, construction, commissioning, operation, maintenance, repair, replacement and expansion of new and existing buildings and their associated water system and components.

2.2 This applies to human-occupied commercial, institutional, multiunit residential and industrial buildings. It does not include single-family residential buildings.

2.3 It is intended to be used by owners and managers of human-occupied buildings excluding single family residential buildings. It also applies to those who are involved in design, construction, commissioning, operation, maintenance, and service of centralized building water system and components.
Elements of the Standard

• Compliance (Section 4)
  - Building Designer
  - Building Owner
  - Health Care Facility
• Building Survey (Section 5)
• General Requirements (Section 6)
• Requirements building water system (Section 7)
• Requirements Designing building water system (Section 8)
Compliance

4.0 Compliance

The results of each Section 4 compliance determination and the associated building survey in Section 5 shall be documented and shall be physically or electronically on site for review by the authority having jurisdiction (AHJ). This standard does not use or require compliance, training, or certification in any additional hazard analysis, risk assessment, or risk management methodologies.
Building Designer (Section 4.1)

- Survey of building design and water system component of water system
- Requirements for water system
- Compliance with requirements
Building Owner (Section 4.1)

- Survey of existing, new, renovation, addition or modification to building and its water systems
- Conformance with the compliance requirements
- Designer of any new, modification or addition in existing building follow the approved requirements
- Compliance documentation annually or after each modification
Healthcare Facility (Section 4.3)

• Qualification requirements includes corresponding to building design and owner
• Facility Infection Prevention and Control (IC) activities
• IC certified by the Certification Board of Infection Control and Epidemiology (CBIC) or other regional, national, or international certifying body
• The health care facility has an epidemiologist with a minimum of a master’s degree or equivalent
Building Survey (Section 5)

Type of water system
- Open or close-circuit cooling towers or evaporative condensers
- Whirlpools or spas and their location
- Ornamental fountains, misters, atomizers, air washes, humidifiers, or other non-potable water systems or devices that release water aerosols in the building or on the site

Legionellosis factors
- Multiple housing
- 10 stories or more
- Health care facility with 24-hour patient stay
- Building space utilization
General Requirements (Section 6)

- Water Management Program (WMP)
- Program Development
- Building Water System
- Designing Building Water System
WMP Essentials

WMP Team

Knowledge of the water systems

Ability to identify control locations and control limits

Ability to identify and take corrective actions

Ability to monitor and document program performance

Ability to confirm program performance

Ability to communicate regularly about the program

Ability to oversee the program

**Source:** CDC Developing a Water Management Program to Reduce *Legionella* Growth and Spread in Buildings: Version 1.0, June 6, 2016
Continuous Program Review (CPR)

Building Water System

• Point of entry
• Point of use
• Water distribution
• Source of water
• Water condition
  - Hot
  - Cold
• Pattern of water discharge
Building Water System Water Supply and Utilization

Building Water System Water Quality, Disinfection & Monitoring

Building Water System Water Monitoring Control Measures

The design, maintenance, and operation of building water systems are provided in ASHRAE Guideline 12
- Potable Water Systems (Section 7.1)
- Cooling Towers and Evaporative Condensers (Section 7.2)
- Whirlpool Spas (Section 7.3)
- Ornamental Fountains and Other Water Features (Section 7.4)
- Aerosol-Generating Misters, Atomizers, Air Washers, and Humidifiers (Section 7.5)
Microbiological Testing
8.1 Design Documents

When designing for new construction, renovations, refurbishment, replacement, or repurposing of a facility, the following shall be documented:

a. A system overview and intended mode of system operation
Requirements for Designing Building Water Systems (Section 7)

Documentation and design compliance to address hazardous conditions

1. Schematic diagrams of water systems
2. Monitoring and control diagrams of water systems
3. Local, regional, and national code compliance
4. Locations of the following points: makeup, flush, sampling, temperature monitoring, and drain
5. Locations of outdoor air intakes
6. Building water equipment
7. Commissioning
8. Operating instructions and procedures
9. Maintenance schedules, frequencies, and procedures
10. No-flow and low-flow portions of the piping and building water systems
11. Impact of heat loss from hot water or heat gain by cold water in piping and water system components
12. Cross connections between potable and non-potable water
13. Access to water expansion tanks, water hammer arrestors, water storage tanks, water heaters, and other equipment and components that contain water
Requirements for Designing Building Water Systems (Section 8)

Final Installation Documents

Drawings and documents of the actual installation shall be provided to the building owner or designee and shall include:

a. the location of each piece of equipment associated with the building water systems
b. a drawing of the water distribution piping system, including system materials, pipe sizes, design flow rates, design temperatures, temperature monitoring points necessary to confirm design temperatures throughout the system, fill provisions, blow-down provisions, makeup provisions, sampling points, treatment points, and drain provisions
Requirements for Designing Building Water Systems (Section 8)

Final Installation Documents (Cont.)

c. the location of all outdoor air intakes

d. size and options for each piece of water system equipment

e. applicable control system wiring diagrams, schematics equipment and component locations, calibration information, and operational sequences

f. material specifications for all building water system components

g. material specifications for all water systems insulation

h. safety data sheets (SDS) for applicable materials used for building water system treatment, cleaning, flushing, disinfecting, and sealing

i. installation requirements for all equipment

j. start-up requirements for all equipment

k. operational requirements for all equipment and systems

l. maintenance procedures for all equipment and water systems, including required actions, frequencies, and durations
Requirements for Designing Building Water Systems (Section 8)

• Balancing
  - Balance report on building water system

• Commissioning
  - Procedures for flushing and disinfection
  - Confirmation that building water system performance meets design performance parameters
Bibliography


Questions?

Dr. Rajiv R. Sahay, Laboratory Director
800-422-7873 ext. 301
Email: rsahay@pureaircontrols.com