ASHRAE Standard 188P:

Prevention of Legionellosis Associated with Building Water Systems

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Summary of Proposed New Standard 188, *Prevention of Legionellosis Associated with Building Water Systems …*

PERSPECTIVES

EXECUTIVE SUMMARY

EXAMPLES

IMPACT

PERSPECTIVES

Public Review Draft

ASHRAE® Standard

Proposed New Standard 188, Prevention of Legionellosis Associated with Building Water Systems

→ The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) develops three types of voluntary consensus standards accredited by the American National Standards Institute (ANSI):

1) Method of Measurement or Test
2) Standard Design
3) Standard Practice

→ **ASHRAE Standard 188P is a "Standard Practice".**

Timeline

This ASHRAE Standard development project began in Jan 2006

Proposed Standard 188 was unanimously approved for public review publication by the Project Committee in July 2010

First public review was completed in November 2010

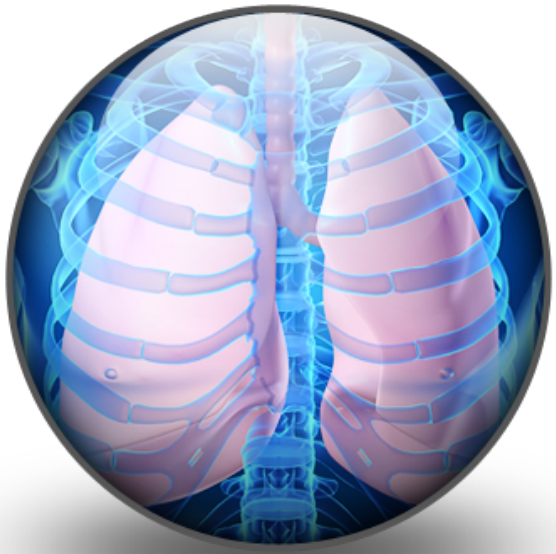
Revisions were made and approved in April 2011

Second public review closed on July 25, 2011

Responses to comments are in preparation

Publication will probably be in 2012

Why is the prevention of legionellosis necessary?



Legionellosis

By The Numbers

Legionellosis

By The Numbers

120,000

The approximate number of people who have died from legionellosis in the US since the cause of the disease and how to prevent it was determined 30 years ago

Legionellosis

By The Numbers

217%

Increase in annually reported U.S. legionellosis cases from 2000-2009. Officially reported incidence rate has tripled in this decade.

Legionellosis

By The Numbers

34,000

The number of direct healthcare dollars
it costs in the US to treat
a single case of legionellosis

Legionellosis

By The Numbers

12

The number of dollars of indirect cost
for every direct healthcare dollar
spent on pneumonia due to
missed time, disability and lost productivity

Legionellosis

By The Numbers

Several Billion

The annual cost in dollars to the US economy due to legionellosis

Every year!

Legionellosis

By The Numbers

193 million

The largest dollar jury award (so far) for gross negligence and other failures in a case of legionellosis that resulted in long-term disability and severe debilitation

The case was not fatal

Dubai World sued in $337.5m Legionn

By Claire Ferris-Lay Thursday, 25 August 2011 10:57 AM

CityCenter Holdings is a joint venture between MGM Resorts and Dubai World

Dubai World and MGM Resorts, joint owners of the Las Vegas CityCentre complex, are being sued for $337.5m by eight former hotel guests who claim they were exposed to legionnaire's disease during their stay.

EXECUTIVE SUMMARY

Summary of Proposed New Standard 188, *Prevention of Legionellosis Associated with Building Water Systems …*

→ Compliance with Standard 188 will require facility managers/owners to **establish a team** with assigned responsibilities and accountabilities

→ The first job for the team is to describe how water is **processed and used** in the facility. This description must be schematically represented in process flow diagrams, with each processing step named and numbered on the diagrams.

Summary of Proposed New Standard 188, *Prevention of Legionellosis Associated with Building Water Systems …*

→ Next, the team is required to perform **systematic hazard analysis** to:

- Identify the potential hazards for each step in the process
- Decide if the risks of those hazards are significant (Yes or No) and if "Yes",
- Determine what hazard control is being applied, or should be applied, at that processing step,
- Designate each processing step at which hazard control is applied a **Critical Control Point (CCP).**

Summary of Proposed New Standard 188, *Prevention of Legionellosis Associated with Building Water Systems …*

→ For each critical control point, the team must address four issues about the hazard control used:

1) The critical control limit(s)

2) The hazard control monitoring method(s),

3) The frequency of hazard control monitoring,

4) The corrective actions to be taken if critical control limits are violated.

Summary of Proposed New Standard 188, *Prevention of Legionellosis Associated with Building Water Systems …*

- Lastly, the team must:

  1) Confirm that the overall plan is being implemented (Verification), &

  2) Provide evidence that the plan is effective (Validation).

Summary of Proposed New Standard 188, *Prevention of Legionellosis Associated with Building Water Systems …*

EXAMPLES

Example: Multiple Campus Hospital Water Management Team

- Executive Director
- Director
- Infection Control/Epidemiology
- Environment Risk Manager/Safety Officer
- Facilities Manager/Supervisor
- Facility Engineer - Campus 1
- Facility Engineer - Campus 2
- Facilitator/Consultant
- Water Treatment Vendor
- Equipment Supplier

Standard 188P Appendix B: Example HACCP Plan

→ Standard 188P Appendix B provides a "sample" HACCP plan developed for a GSA-managed building water system:

1. Process Flow Diagrams
2. Hazard Analysis Summary
3. Verification and Validation Summary
4. HACCP Plan Document

Figure B1:
Process flow diagram for an GSA-managed building Potable Water service

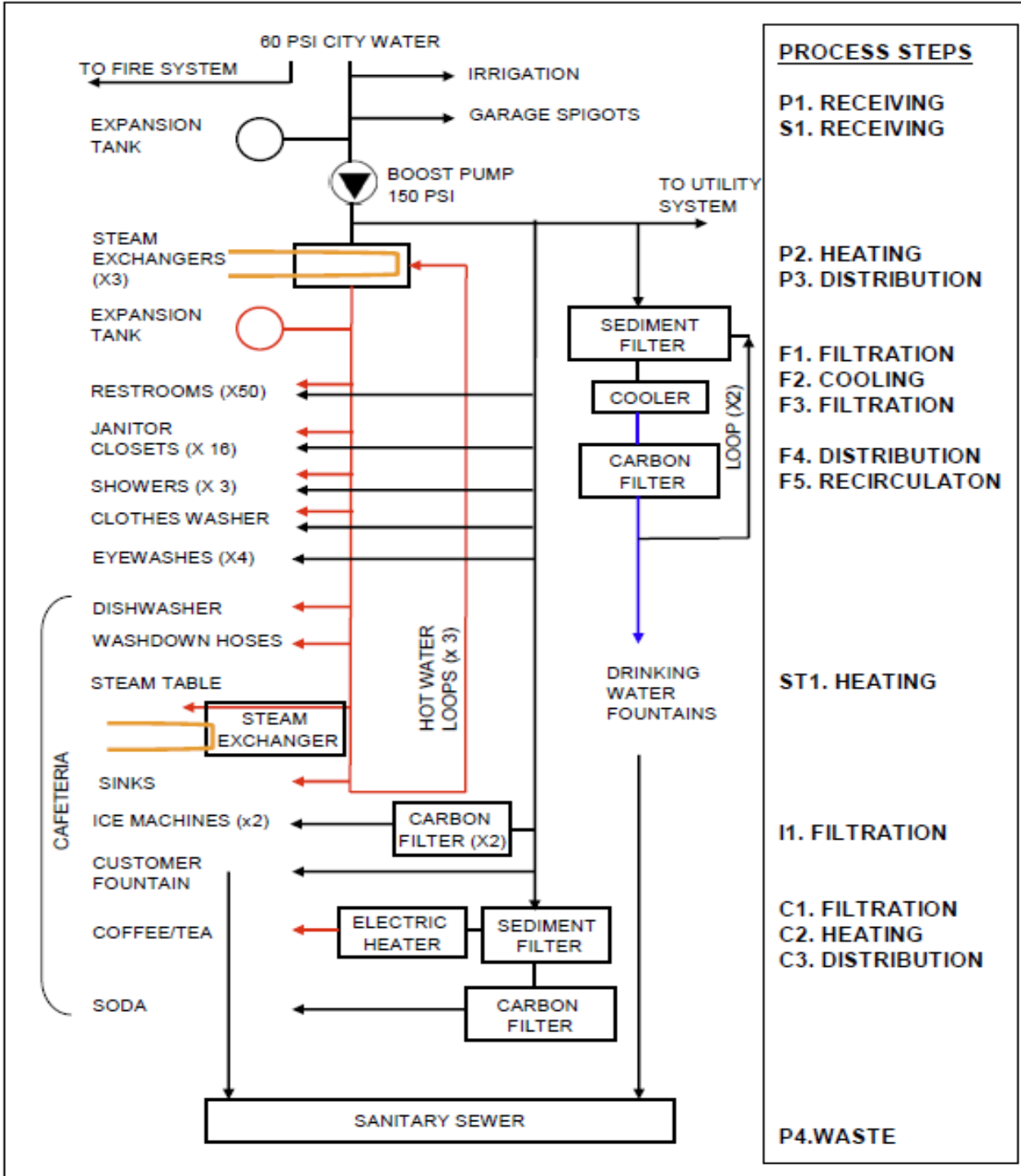
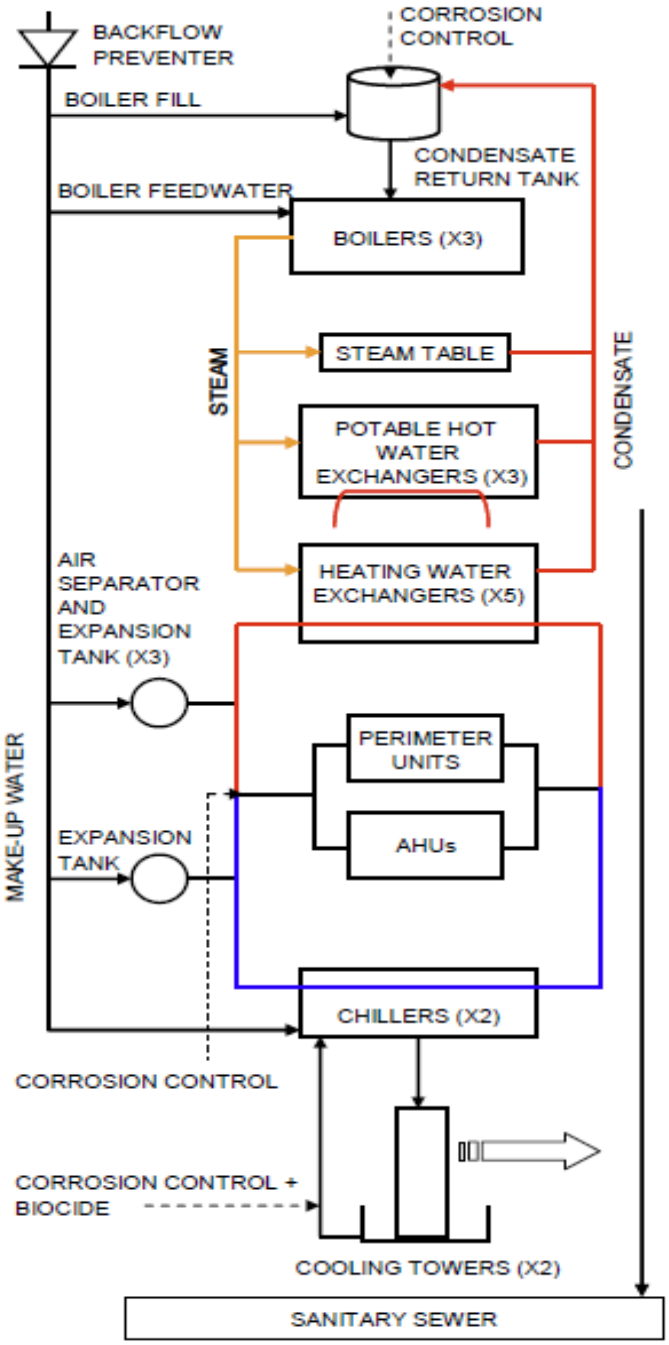


Figure B2:
Process flow diagram for an GSA-managed building Utility Water service



PROCESS STEPS

U1. RECEIVING
B1. CONDITIONING

B2. HEATING
B3. RECIRCULATION

ST1. HEATING (X-REF POT)

P2. HEATING (X-REF POT)

HW1. HEATING

HW2. RECIRCULATION
HW3. CONDITIONING

CW1. CONDITIONING

CW2. COOLING
CW3. RECIRCULATION

CT1. COOLING
CT2. CONDITIONING
CT3. RECIRCULATION

U2. WASTE

Table B1: Hazard analysis summary for the GSA building Potable Water System described in Figure B1

Product: Potable Water **Processing Steps**	**System /subsystem**	**Identify potential hazard introduced, enhanced or controlled at this step**	**Risk and Severity Significant?**	**Basis for the Risk Characterization**	**What controls *could* be applied to eliminate, reduce or prevent the hazard from causing harm?**	**CP**	**CCP**
P1 RECEIVING	General system	**B = Biological Hazards** Coliforms, *Legionella*, viruses, and protozoa **C = Chemical Hazards** Lead, other metals, and disinfection by-products **P = Physical Hazards** Radon	No	Low risk because water is treated to US Standards for drinking water given in the Code of Federal Regulations	Obtain product from sources that are certified to the National Primary Drinking Water Regulations (NPDWR) Obtain water quality test results from the water provider every six months	B C P	No
S1 RECEIVING	Fire suppression	B = microbial growth due to stagnant water in FS system	No	Low risk because limited exposure	Wear PPE during routine maintenance and periodic flushing	B	No
P2 HEATING Steam Tables	General system	B = Growth of microbes in the heating system	No	Medium risk because no storage tanks	Maintain temperature in hot water loop above 140 °F Thermal flush hot water loop >120 °F periodically	B	NO
P3 DISTRIBUTION	General system	B = Microbial growth in the potable water distribution system which could be transmitted by faucets and showerheads C = Toxins could be transmitted by ingestion P = Scaling	Yes	Low or medium risk because municipal water source has a measurable halogen residual in the building water system	Flush system x times per year Chlorinate x times per year	B C	YES B,C
F1 FILTRATION	Drinking fountains	B = Microbial growth in filter media	Yes	Medium risk because improperly maintained filters can cause poor microbiological quality	Maintain filters according to manufacturers instructions Replace filters x times per year	B	NO
F2 COOLING	Drinking fountains	B = Microbial growth in the potable water distribution system	No	Low risk because temperature is maintained below 65 °F		B	NO
F3 2ND	Drinking	B = Microbial growth in filter	Yes	High risk because filtration media	Maintain filters according to	B	YES

Table B2: Hazard Analysis Summary for the GSA building Utility Water System described in Figure B2

Product: Utility Water **Processing Steps**	**System/ subsystem**	**Identify potential hazard introduced, enhanced or controlled at this step**	**Risk and Severity Significant?**	**Basis for the Risk Characterization**	**What controls *could* be applied to eliminate, reduce or prevent the hazard from causing harm?**	**CP**	**CCP**
U1 RECEIVING	General utility system	**B = Biological Hazards** Coliforms, *Legionella*, viruses, and protozoa **C = Chemical Hazards** Lead, other metals, and disinfection by-products **P = Physical Hazards** Radon	No	Low risk because water is treated to US Standards for drinking water given in the Code of Federal Regulations	Obtain product from sources that are certified to the National Primary Drinking Water Regulations (NDWR) Obtain water quality test results from the water provider every six months	B C P	NO
B1 CONDITIONING	Boilers	C = treatment chemicals	No		Maintain boilers to manufactures' specifications	P	NO
B2 HEATING	Boilers	No Biological Hazards	No		Maintenance	P	NO
B3 RECIRCULATION	Boilers	No Biological Hazards	No		Maintenance	P	NO
ST1 HEATING	Steam table (x-ref potable sys)	No Biological Hazards	Yes	Low risk because no exposure	Maintenance		NO
P2 HEATING	Potable hot water (x-ref potable sys)	No Biological Hazards	Yes	Low risk because no exposure	Routine Maintenance	P	
HW1 HEATING	Heating water	No Biological Hazards	No		Routine Maintenance	P	
HW2 RECIRCULATION	Heating water	No Biological Hazards	No		Routine Maintenance	P	
HW3 CONDITIONING	Heating water	No Biological Hazards	No		Routine Maintenance	P	
CW1–CW3 CHILLED WATER	Chilled water	No Biological Hazards	No		Routine Maintenance		
CT1-3 CONDENSER WATER	Cooling towers	B = pathogenic bacteria such as *Legionella* can thrive in improperly maintained cooling water systems	Yes	Medium risk because transmission from cooling water to susceptible people can cause disease	Control makeup water hardness Control pH, scale, corrosion and microbial fouling Perform regular maintenance Maintain drift eliminators	B C	YES B C
U2 WASTE	General utility system	Possible bio hazards from fecal coliforms and viruses. Possible chemical hazard from overfeeding inhibitors	No	Low risk; limited exposure. Sewage can transmit waterborne pathogens	Routine Maintenance	B C	

Standard 188P Appendix B: Example HACCP Plan - CCPs

→ Every step at which hazard control is applied is, by definition, a **Critical Control Point** (CCP).

→ For every CCP, four issues must be decided by the HACCP (Water Management) Team:

1) the **Critical Control Limits**,

2) the hazard control **Monitoring Methods,**

3) the hazard control **Frequency of Monitoring,**

4) the **Corrective Actions** to be undertaken if the critical control limit is violated.

HACCP Plan for the GSA building water system described in Figures B1-2 and Tables B1-3

Product: Potable Water **Processing Step**	**CCP #**	**Critical Control Limit**	**Monitoring Method**	**Frequency**	**Corrective Actions for Deviation from Limits**	**Location of Records**	**Verification Procedure** (Responsible persons)
STEP No. P3 DISTRIBUTION	1B 1C						
STEP No. F3 2nd FILTRATION (Drinking water fountains)	2B						
STEP No. I3 ICE MACHINE FILTRATION	3B						

Product: Utility Water **Processing Step**	**CCP #**	**Critical Control Limit**	**Monitoring Method**	**Frequency**	**Corrective Actions for Deviation from Limits**	**Location of Records**	**Verification Procedure** (Responsible persons)
STEP No. CT1-3 CONDENSER WATER (Cooling Towers)	1B 1C						

Example form of validation and verification for the GSA building water system described in Figures B1-2 & Tables B1-2

Activity	Frequency* ((i.e., Initially, quarterly , annually or other specified trigger point))	Responsibility** (i.e., Engineering Technician, Independent surveillance, Executive Engineer)	Reviewer Accountability** (i.e., Facility Manager Chief Building Operating Engineer, Independent Reviewer)
Initial validation of the HACCP plan			
Verification that CCP monitoring is according to plan			
Subsequent validation of hazard control			
Review of corrective action monitoring to verify that it is according to plan			
Scheduling verification activities			
Comprehensive plan verification and reassessment			

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IMPACT

A Brief History of HACCP Plans

→ People often associate HACCP (and HACCP plans) with food safety; but these principles were not developed for food safety applications

→ Hazard Analysis and Critical Control Point risk management:

- The United States Armed Forces
- NASA
- US Manufacturing
- Adapted by food safety professionals

A Brief History of HACCP Plans …

→ In February 2007, the World Health Organization (WHO) published their 267-page document (book): ***Legionella* and the Prevention of Legionellosis**.

→ This is the definitive monograph on the subject. It is entirely arranged around the principles of hazard analysis and control with each chapter arranged around HACCP principles.

→ The work advocates that water safety for all building water systems should be managed in accordance with these hazard analysis and control principles.

Impact

- Facility managers/owners will be required to formally take responsibility for controlling *Legionella* in their building water systems.
- The potable water system in buildings, not just the cooling tower, is an equal focus of the Standard.
- The Standard Practice will be hard on water treatment providers who are not competent and/or who "cut corners". This is as it should be.

Impact

- Competent water treatment providers are already doing in their own fashion most of what the Standard Practice requires.
- Compliance with a Standard Practice is the best defense against an accusation of negligence in cases caused *Legionella* from unknown sources.
- Compliance with this Standard Practice will prevent legionellosis cases, perhaps thousands of cases every year in the US, and that is what really should motivate us most of all.

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