Water Management Program

2019 RMA / WCUPPA Annual Conference

September 18th , 2019

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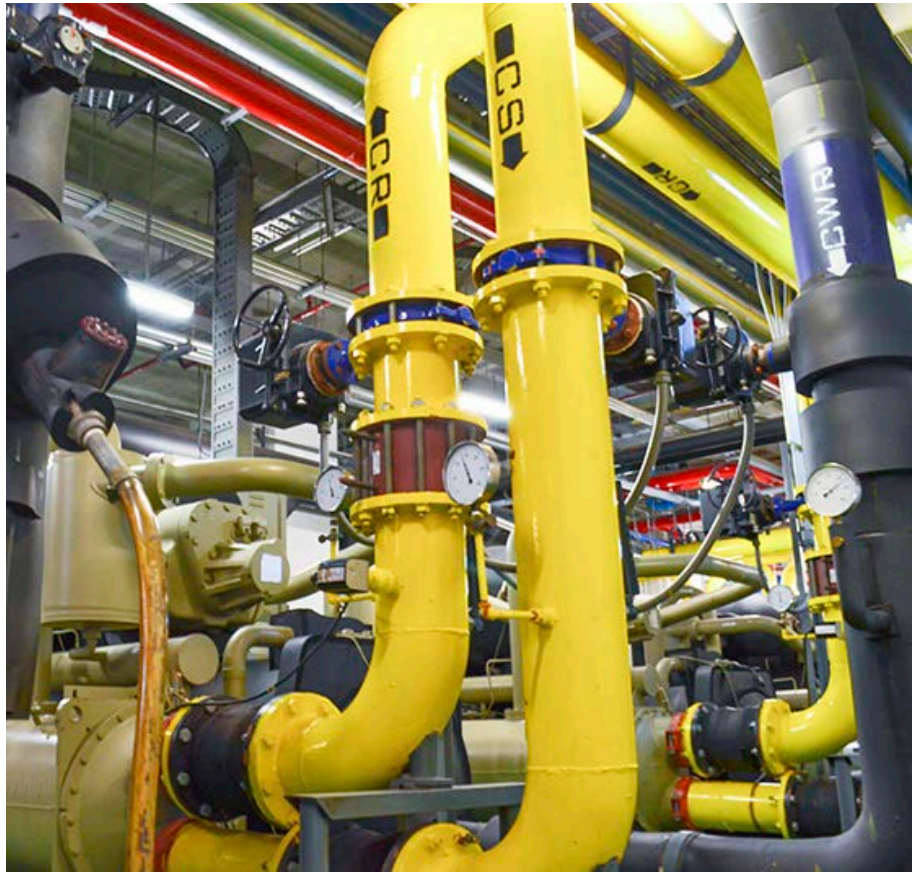
Agenda

- Introductions
- Why are we here ?
- What is a Comprehensive Water Management Program ?
- Legionella 101
- Implementation of a Comprehensive Water Management Program
- How do we get started ?
  - Program Goals / Mission
  - Identifying buildings at risk
  - Describe building water systems / water processing steps

The Problems

- Water quality degradation in building water systems
- Environmental -source pathogens and respiratory disease
- Chemical hazards associated with disinfection and corrosion
- Potential for physical harm from scalding hot water
- Water conservation efforts may cause hazardous conditions
- Maintenance of water processing equipment
- Managing water safety during construction



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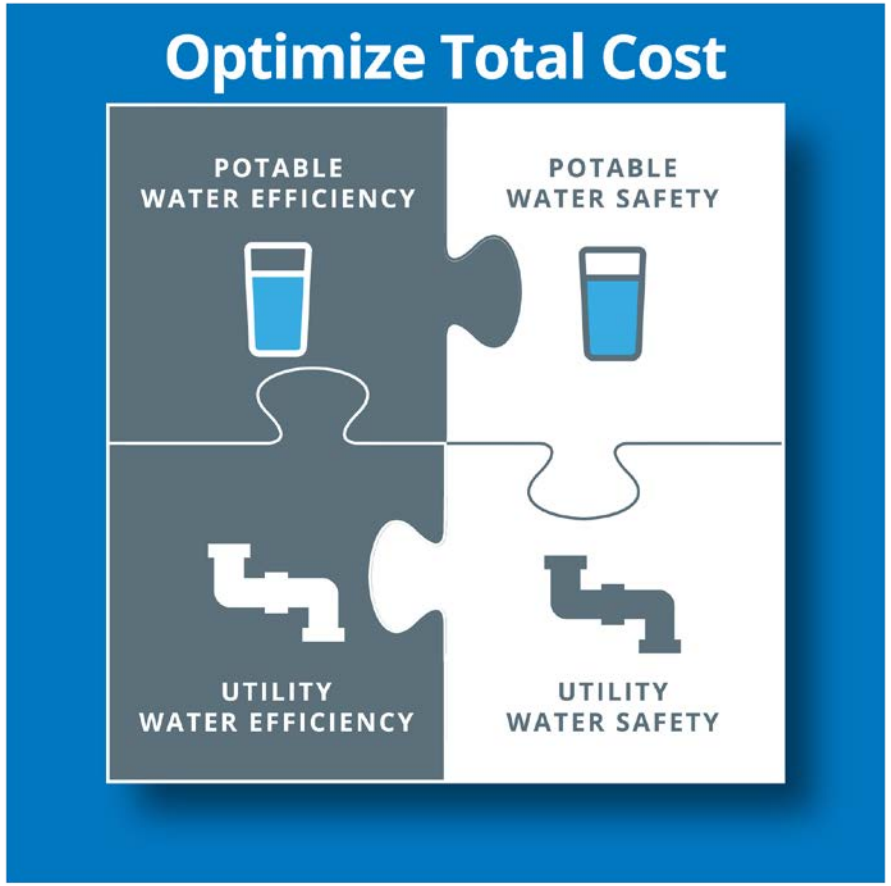
The Solution:

The Sustainable Comprehensive Water Management Program



A Sustainable Comprehensive Water Management Program is a documented, ongoing plan that, when implemented properly, optimizes the total cost of building water systems operation by improving safety and efficiency.

Ultimately, it provides the best means of preventing illness and injury to students, employees and guests by utilizing a data driven process that now represents best practice and defensibility.

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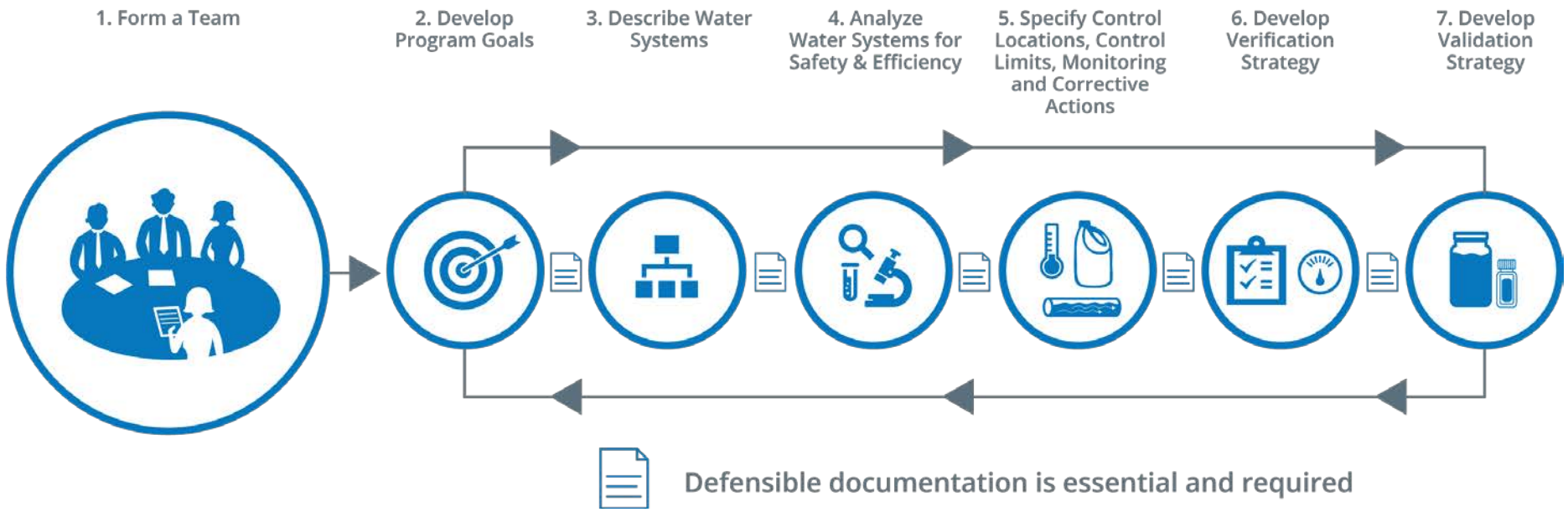
The Solution:

The Sustainable Comprehensive Water Management Program



Sustainable comprehensive water management program development and implementation are based on scientific principles as set forth in Failure Mode Effects Analysis (FMEA) and its derivative Hazard Analysis and Critical Control Point (HACCP) risk management

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Legionella 101

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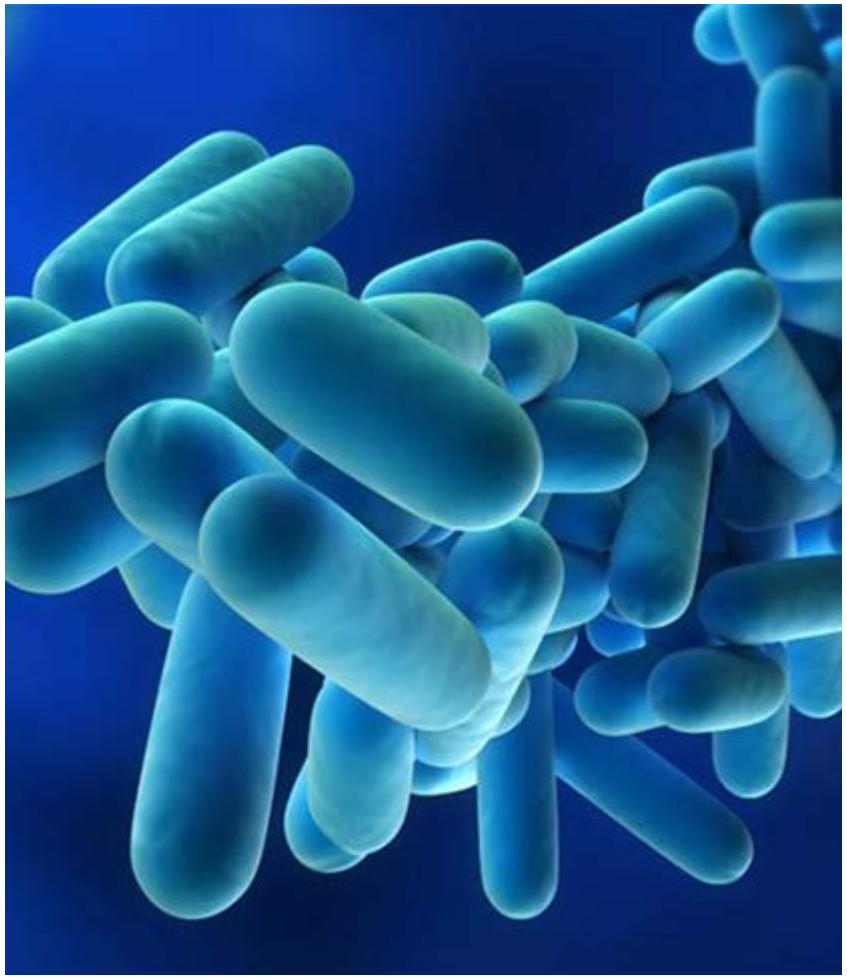
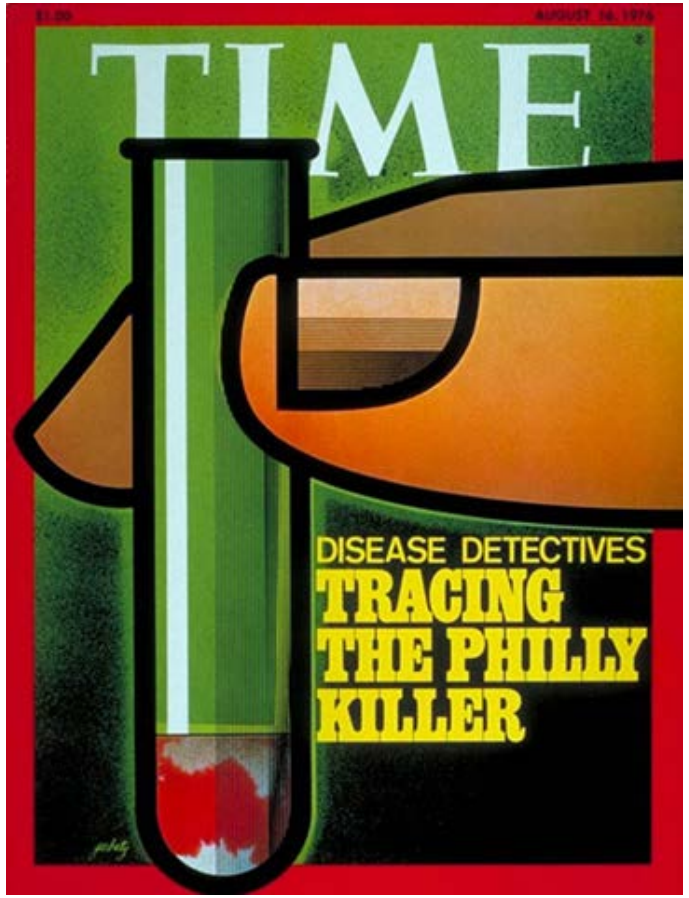
Legionella Overview



- **Atypical gram -negative aerobic bacteria**
  - Intracellular parasite of free -living protozoa primarily found in freshwater environments
- **There are 52 species and 70 serogroups of *Legionella***
  - 22 species associated with human disease
  - *Legionella pneumophila* accounts for 80-90% of all cases
- **Bacterial infection results in Legionnaires' Disease (LD) or Pontiac Fever**
  - Collectively referred to as Legionellosis

Discovery

- First described after the 1976 American Legion Conference in Philadelphia.
- Pneumonia infection – coined Legionnaires' Disease
- 221 people were diagnosed with Legionnaires' Disease and 34 people died
- The facilities cooling system at Bellevue -Stratford was suspected to be the source of the outbreak
  - It was actually the cooling tower from the Holiday Inn down the street



Source of *Legionella*

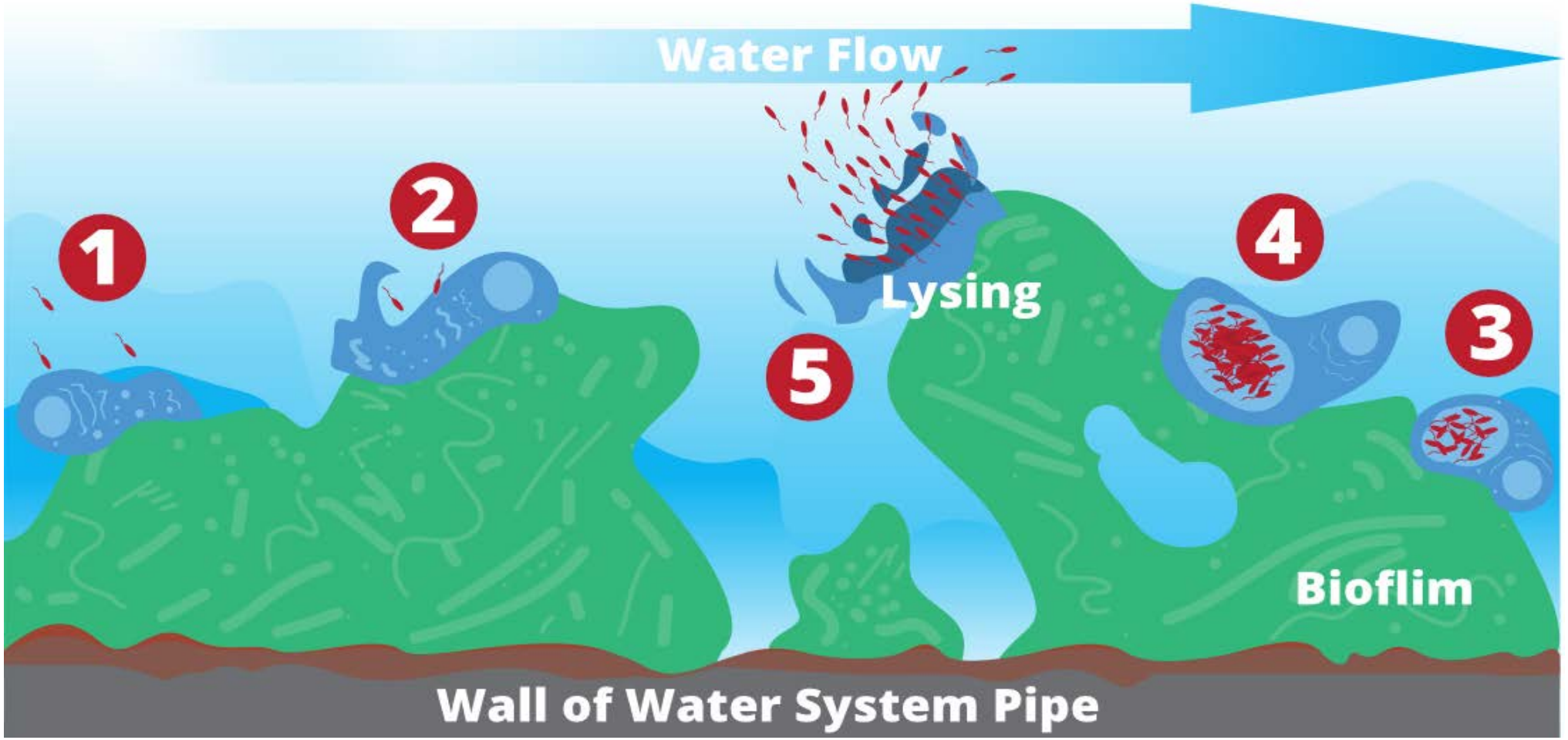
Legionella **is found in the natural environment.**

- Found in sources of freshwater (lakes, streams) and soils.
- Not in sufficient quantities to cause transmission.

Legionella **becomes a hazard when it enters (intrusion) buildings water systems and amplifies – leads to transmission to hosts (humans).**

- Growth conditions for *Legionella* and opportunities for aerosolization must exist for there to be risk of disease.

Legionella Life Cycle



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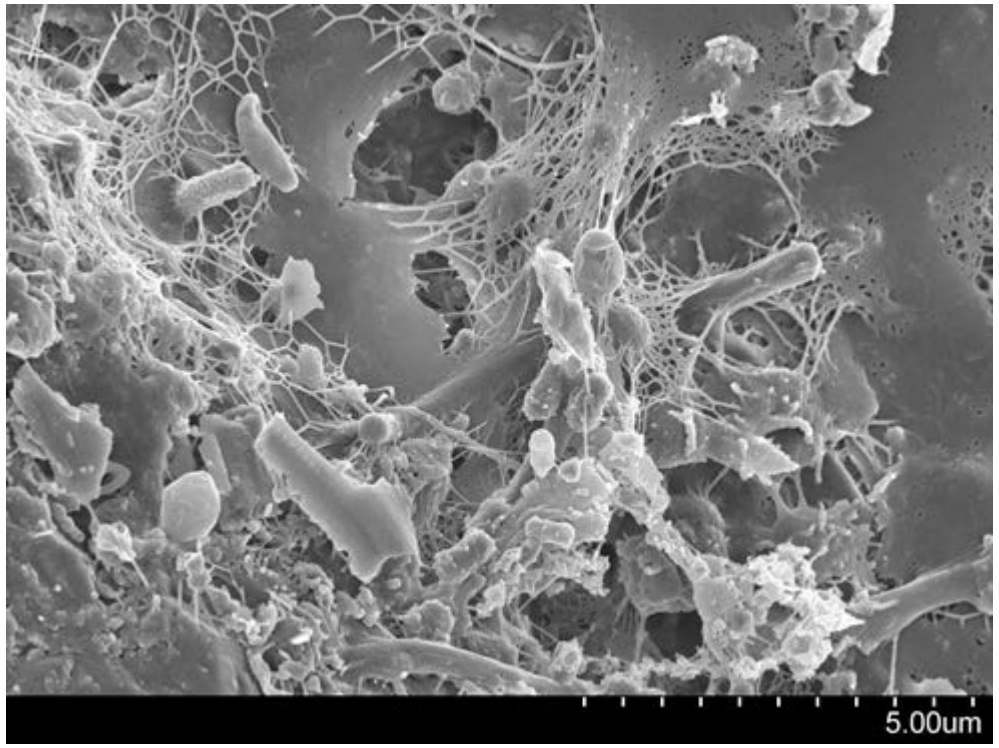
Causes of Amplification

- **Temperature**
- **Water Age (stagnation)**
  - Disinfectants breakdown
- **Scale Deposits**
- **Biofilm**
  - Protects *Legionella* bacteria
  - Presence of higher life forms such as Amoebas
- **pH and Water Pressure Changes**



Biofilm

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Common Sources of Exposure




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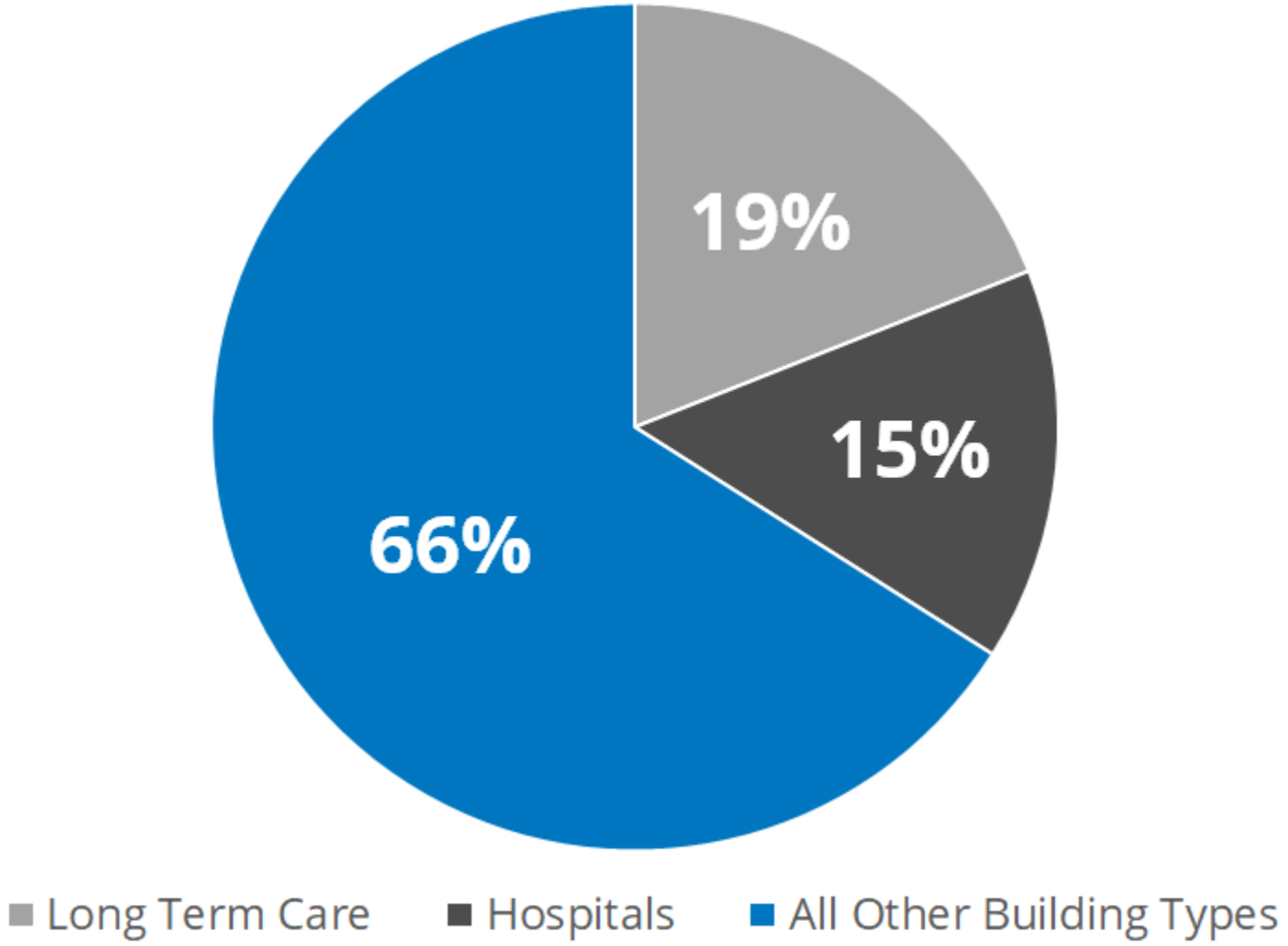
Legionella Outbreaks Associated with Buildings



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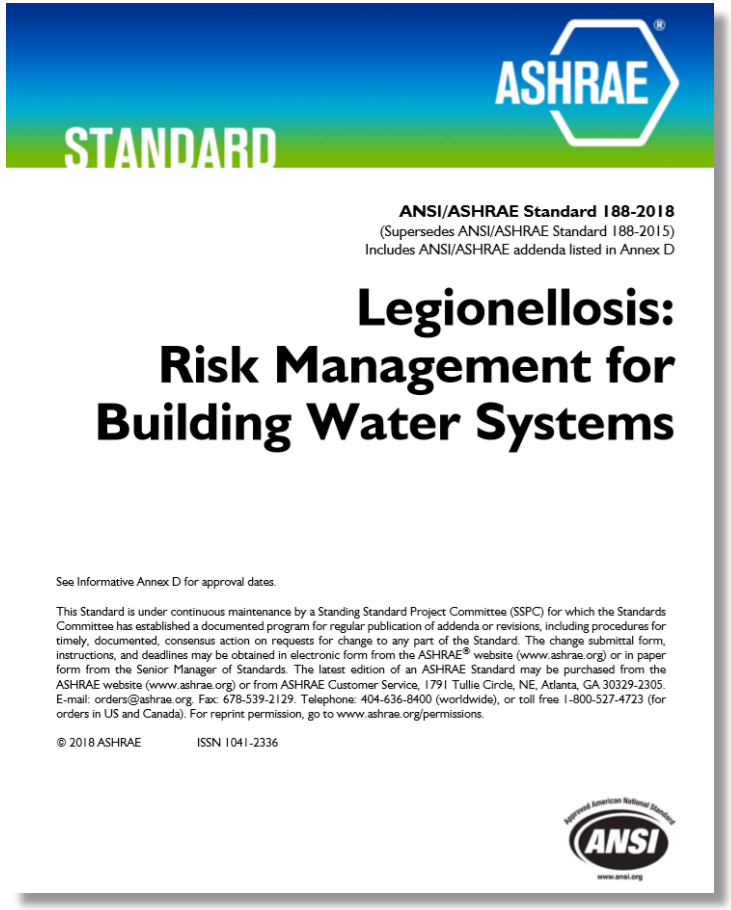
Legionella Prevention Guidance

Almost ALL Legionellosis cases are PREVENTABLE

How? Proper Management of Building Water Systems, using guidelines published by NSF International, VA, CDC, CMS and ASHRAE.

- ASHRAE 188– 2018
- CDC videos and ToolKit
- NSF International Standard 453
- ASHRAE Guideline 12-2000
- State Specific Guidance (ex. NY – cooling towers)

ANSI-ASHRAE Standard 188 -2018


STANDARD

ANSI/ASHRAE Standard 188-2018
(Supersedes ANSI/ASHRAE Standard 188-2015)
Includes ANSI/ASHRAE addenda listed in Annex D

Legionellosis: Risk Management for Building Water Systems

See Informative Annex D for approval dates.

This Standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the Standard. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE® website (www.ashrae.org) or in paper form from the Senior Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

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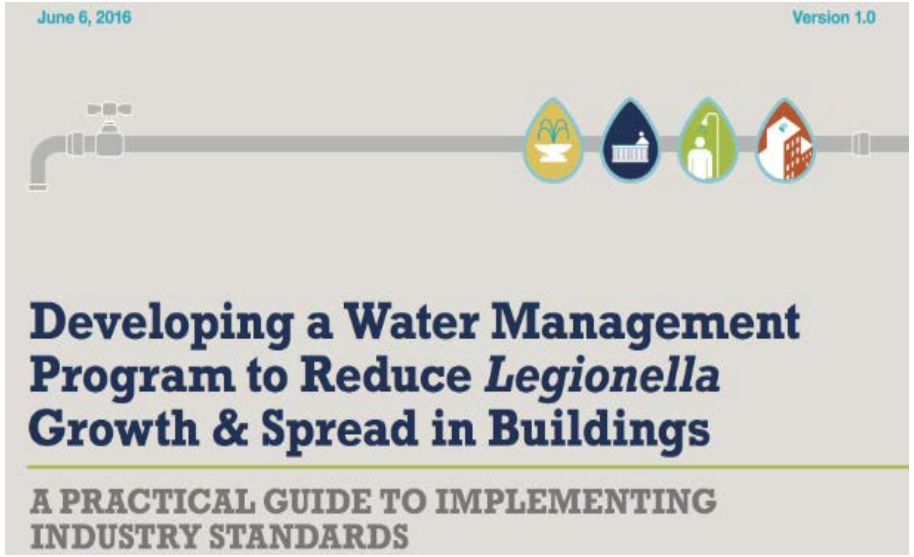
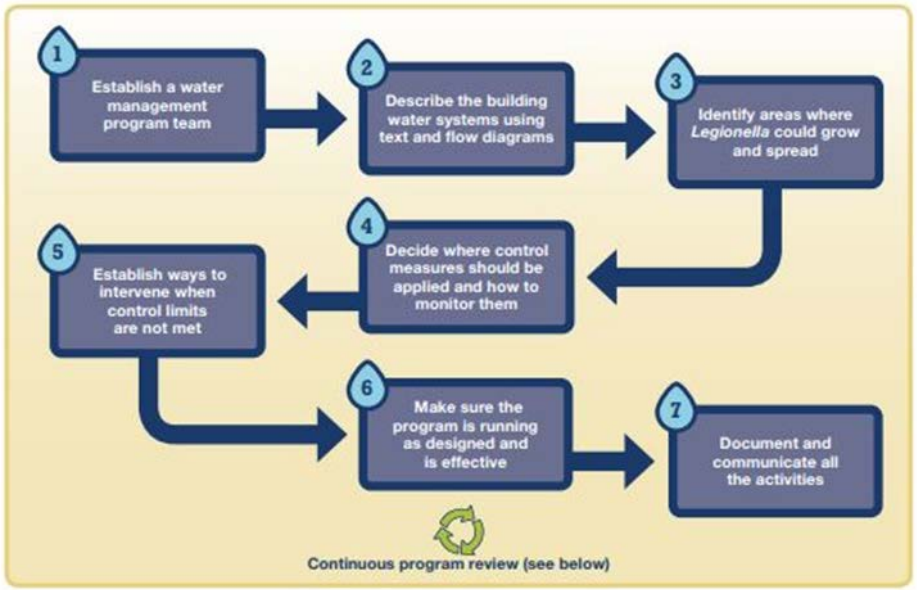
- **No substantial changes**
- **Language was updated to be more “code -ready”**
- All definitions and concepts are the same
- Sec. 6 & Figure 1 have not been changed
- Next publication in 3 years
- Identifies types of buildings and devices that need a WMP
- Defines how to structure a water management team and outlines program considerations



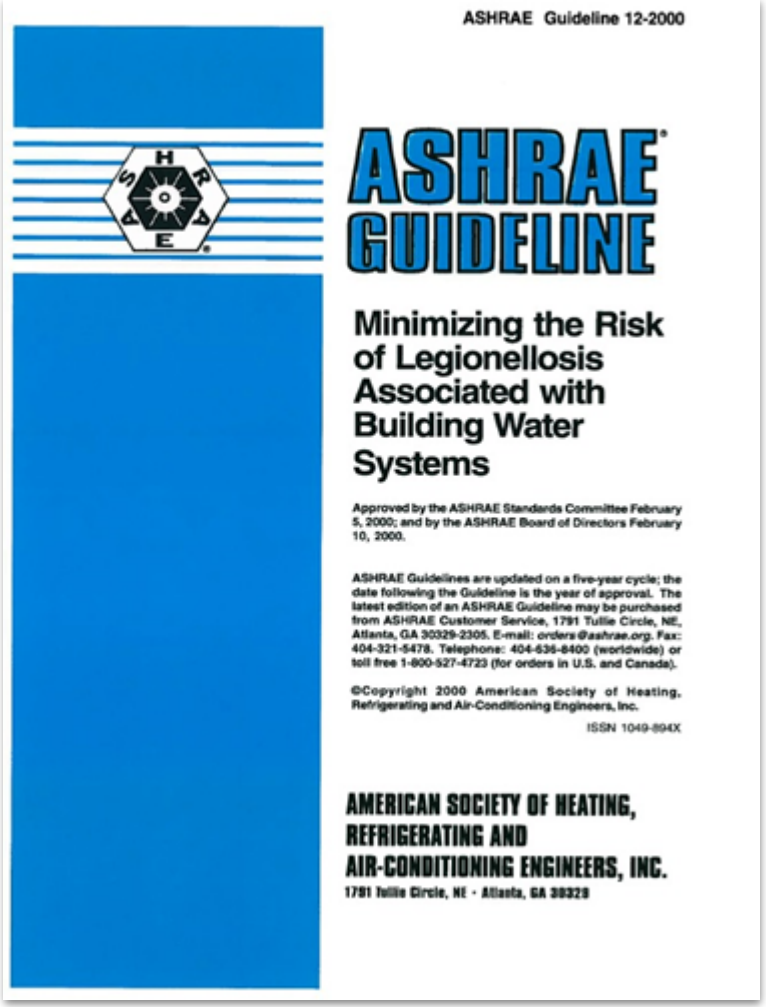


CDC Guidance

CDC Toolkit

- A basic walkthrough of the elements of a *Legionella* water management program
- Scenarios describing common water quality problems and examples of how to respond to them to reduce the risk for *Legionella*
- Special sections and considerations for those who work in healthcare facilities

ASHRAE Guideline 12 -2000



Provides information and guidance on the design, maintenance, and operation of building water systems

- Evaporative coolers
- Cooling towers
- Potable and emergency water systems
- Heated Spas/whirlpools
- Fountains and water features

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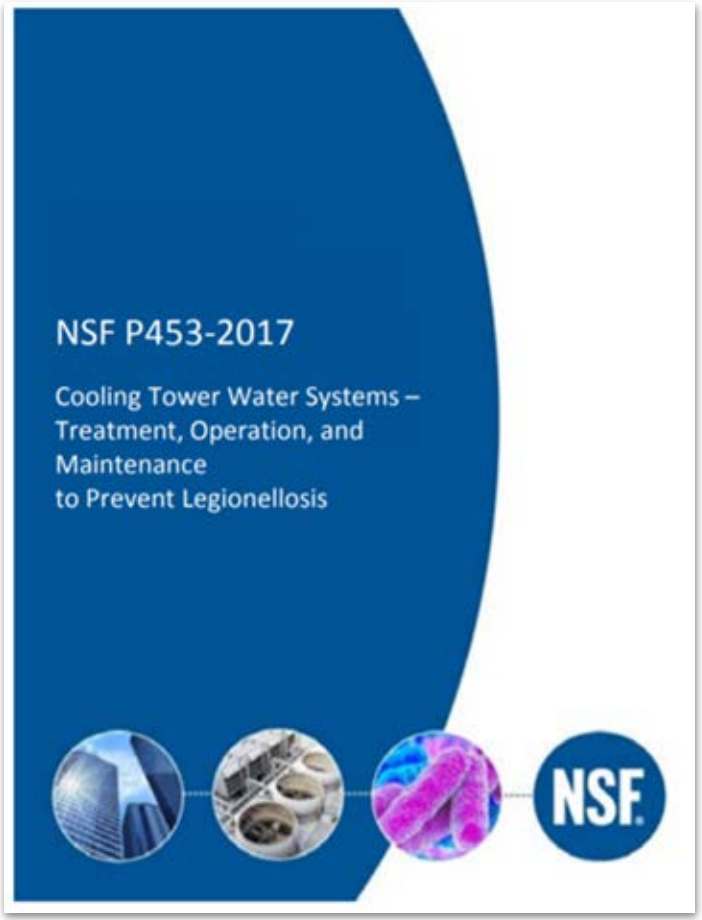
NSF International Standard 453 -2017

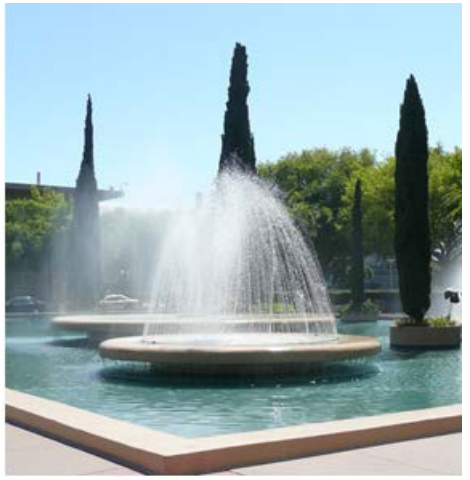


- Cooling Towers – Treatment, Operation and Maintenance to Prevent Legionnaires' Disease
- Outlines benchmark practices of the means, method, and frequency of treating cooling towers using various disinfectants (oxidizing biocides are required)
- More prescriptive than ASHRAE 188
- Incorporate sections 6 and 7 of ASHRAE standard by reference
- Validation testing is required
  - Total bacteria – weekly | *Legionella* culture - quarterly

What can be Monitored?

All steps in which water is processed

- Cooling Towers
- Temperature
- Disinfectant Levels
- Water Age
- Bottle Water Dispensers
- Drinking Fountains
- Ice Machines
- Plumbing Fixtures
- Pools and Spas
- Misting Systems
- Water Features/Decorative Fountains
- Cold/Hot Water Loops
- Etc.



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ANSI/ASHRAE Standard 188 -2018 Legionellosis : Risk Management for Building Water Systems

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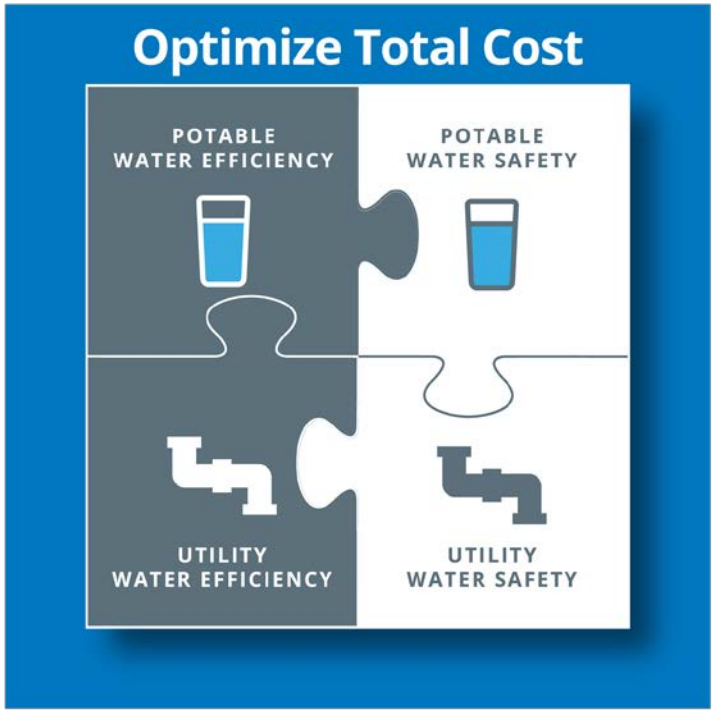
Water Management Programs Overview



A sustainable comprehensive water management program is a documented, ongoing plan that, when implemented properly, optimizes the total cost of building water systems by improving **safety** and **efficiency** .

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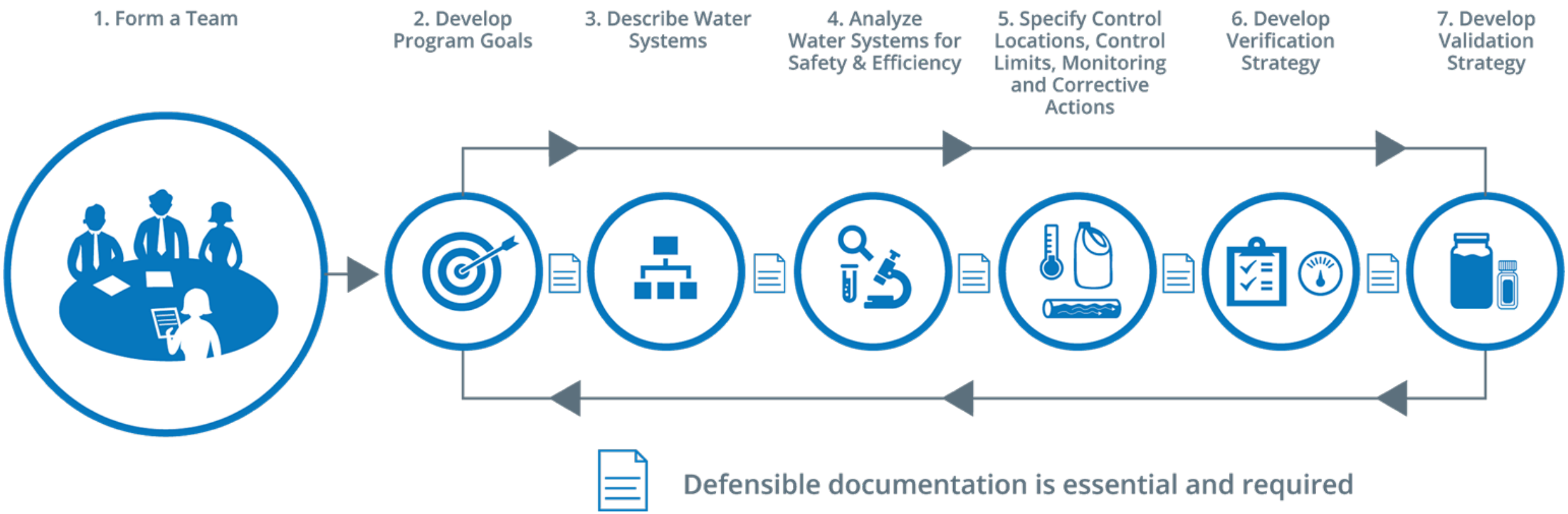
7 STEPS OF THE SUSTAINABLE COMPREHENSIVE WATER MANAGEMENT PROGRAM



Adapted from Figure 1 of ANSI/ASHRAE Standard 188

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Water Management Programs Overview

Water Safety Management Programs

Program Components →	Interdisciplinary Team	Water System Description	Hazard Analysis & Risk Characterization	Control Locations Selected	Control Limits Specficied & Monitored	Confirmation of Plan Implementation	Confirmation Controls are Effective
World Health Organization Water Safety Plan (2005)	✓	✓	✓ Variously called hazard analysis or risk assessment	✓	✓ Controls = Control Measures	✓	✓ Validation is variously called "monitoring" or "testing"
Veterans Health Administration Water Safety Plan (2005)	✓	✓	✓ Risk characterization = assessment of critical & environmental factors	✓ Controls = "Engineering Controls." Values are prescribed for temp. & oxidant residual levels	✓	✓	✓ Requires validation: environmental & clinical testing; prescribed responses
American Society of Heating, Refrigerating, & Air Conditioning Engineers ANSI-ASHRAE 188 (2018)	✓	✓	✓	✓ Critical Control Points are called "Control Locations"	✓	✓	✓

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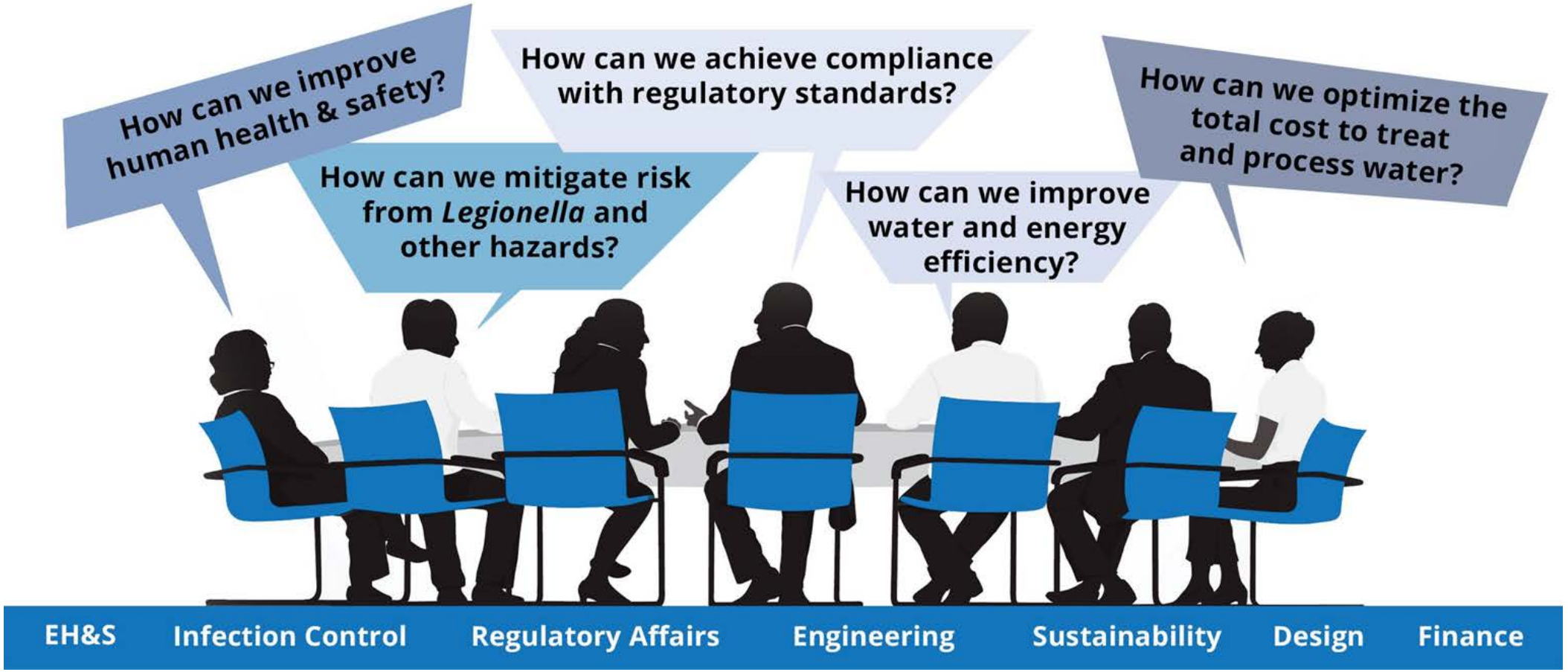
The Water Management Team



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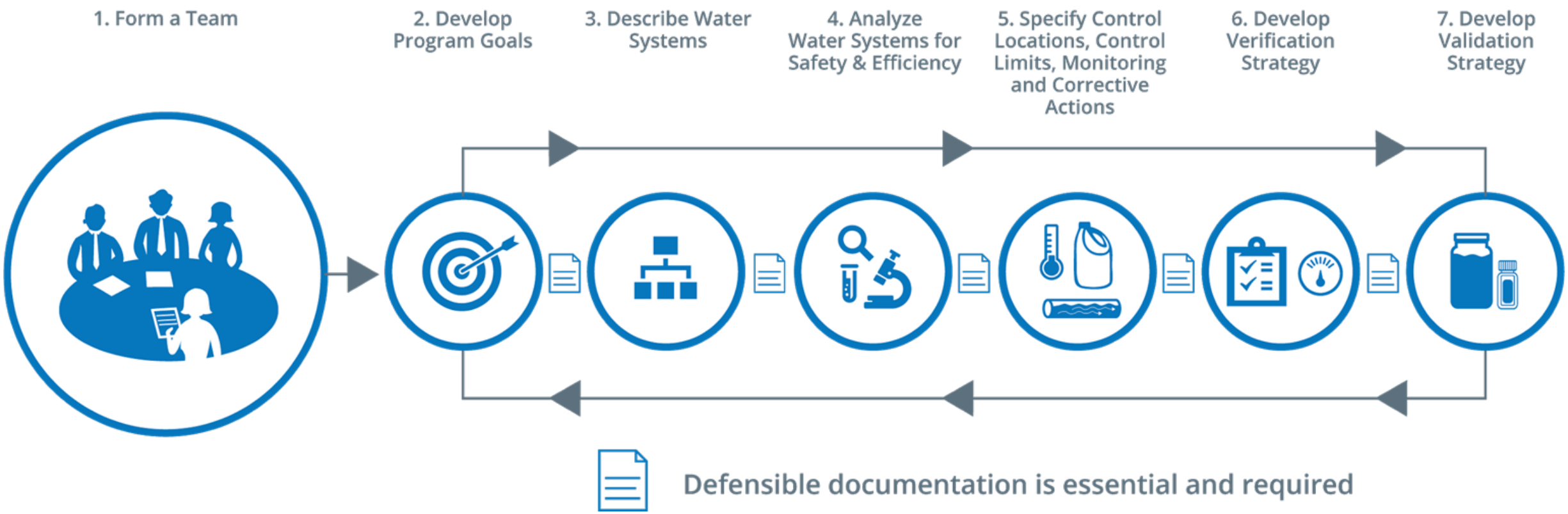

Adapted from Figure 1 of ANSI/ASHRAE Standard 188

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Process Flow Diagram

Working Document
Last Updated: 8-22-2018

1. Receiving
A – Municipal Supply

2. Conditioning
A - Filtration/Cold Water Distribution (Ice Machines and Drinking Fountains)
B - Softening

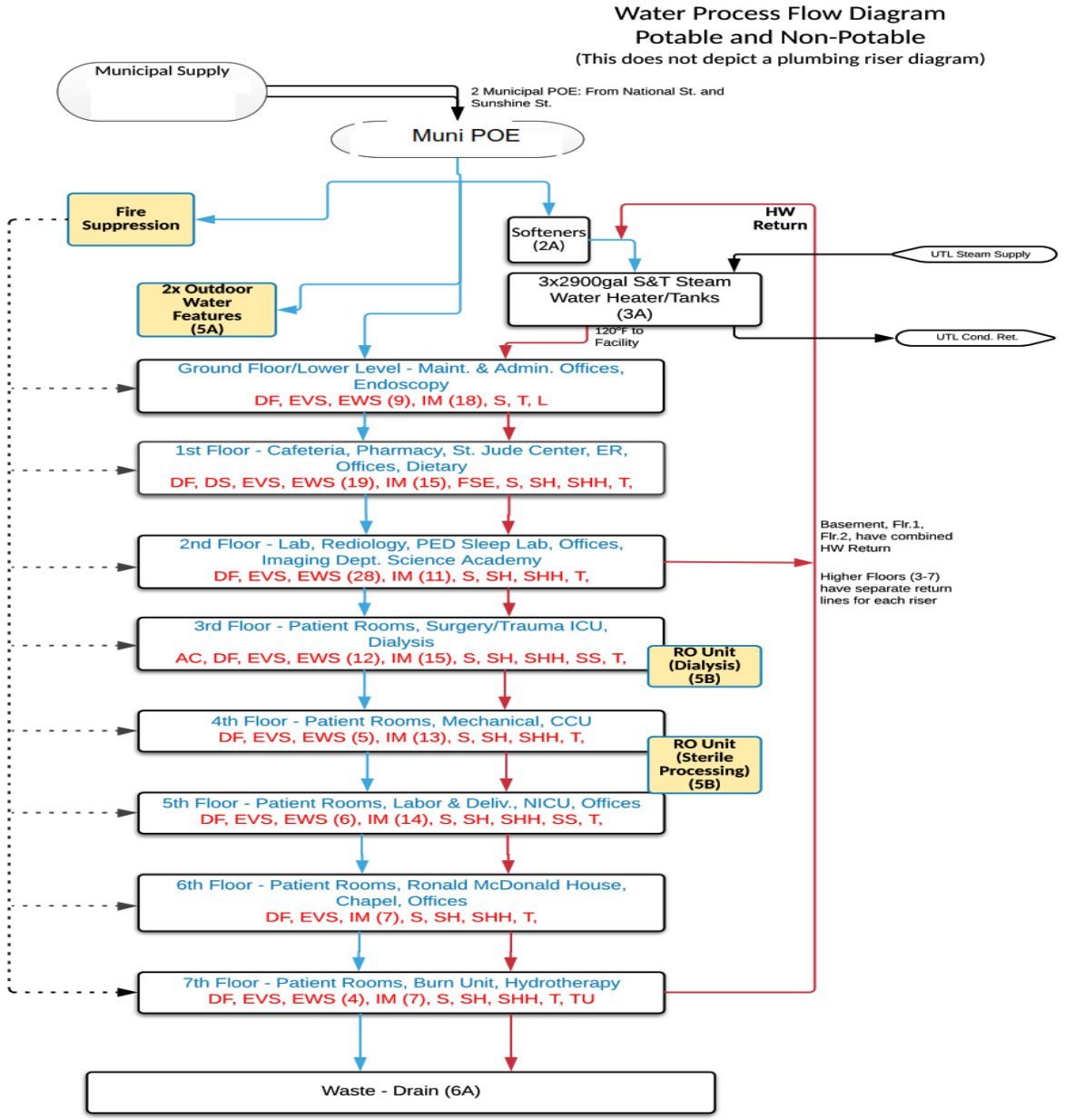
3. Heating & Storage
A - Hot Water Heaters, 120°F

4. Distribution (potable)
A - Cold Water
B - Hot Water
C - Emergency Eye Wash and Showers

5. Distribution (non-potable)
A - Decorative Fountains
B - RO Units in Dialysis and Sterile Processing
C - Medical Devices (incl. Hydrotherapy)

6. Waste
A - Waste

KEY:
AC = Autoclaves
DF = Drinking Fountain
DS = Drink Station
EVS = EVS Closet
EWS = Eye Wash/Shower
FSE = Food Serv. Equip
IM = Ice Machine
L = Laundry
S = Sink
SH = Shower
SHH = Shower with Hose
SS = Scrub Sinks
T = Toilet/ Urinal
TU = Tubs



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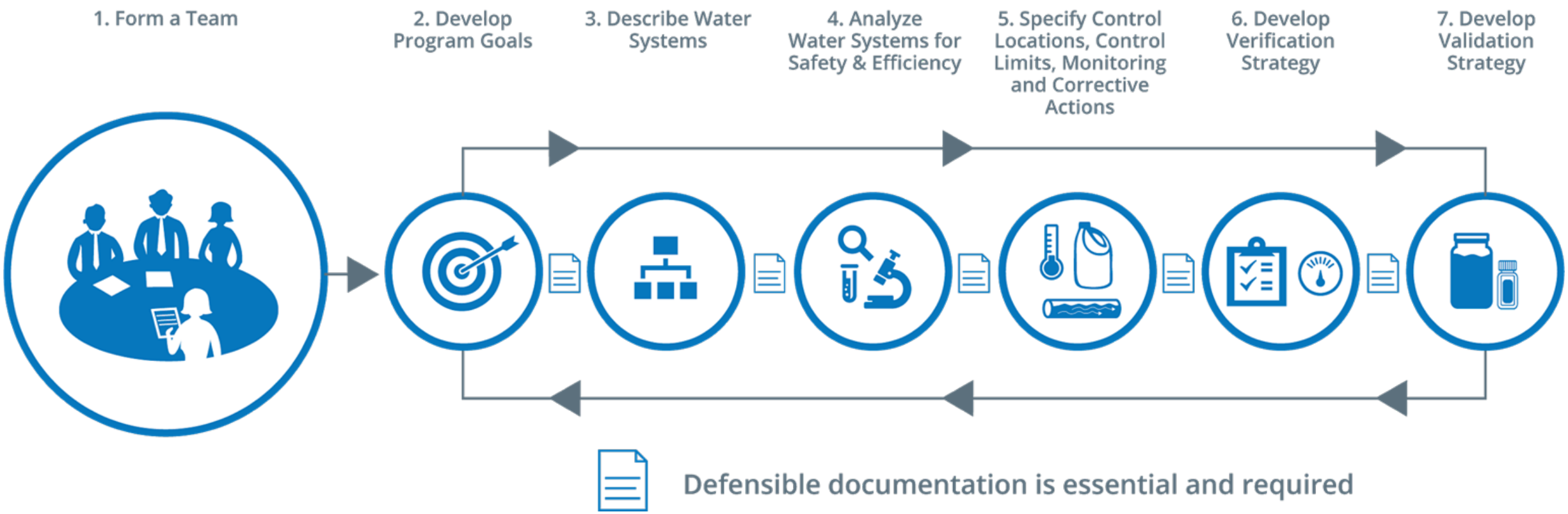

Adapted from Figure 1 of ANSI/ASHRAE Standard 188

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Hazard Analysis

- A *HAZARD* is a physical, chemical, or microbial agent with the potential to harm.
- What are the hazards or potential hazards at each processing step
- Is the risk of harm from identified hazards significant?
- What controls are being applied or could be applied at the processing step to control the hazards?

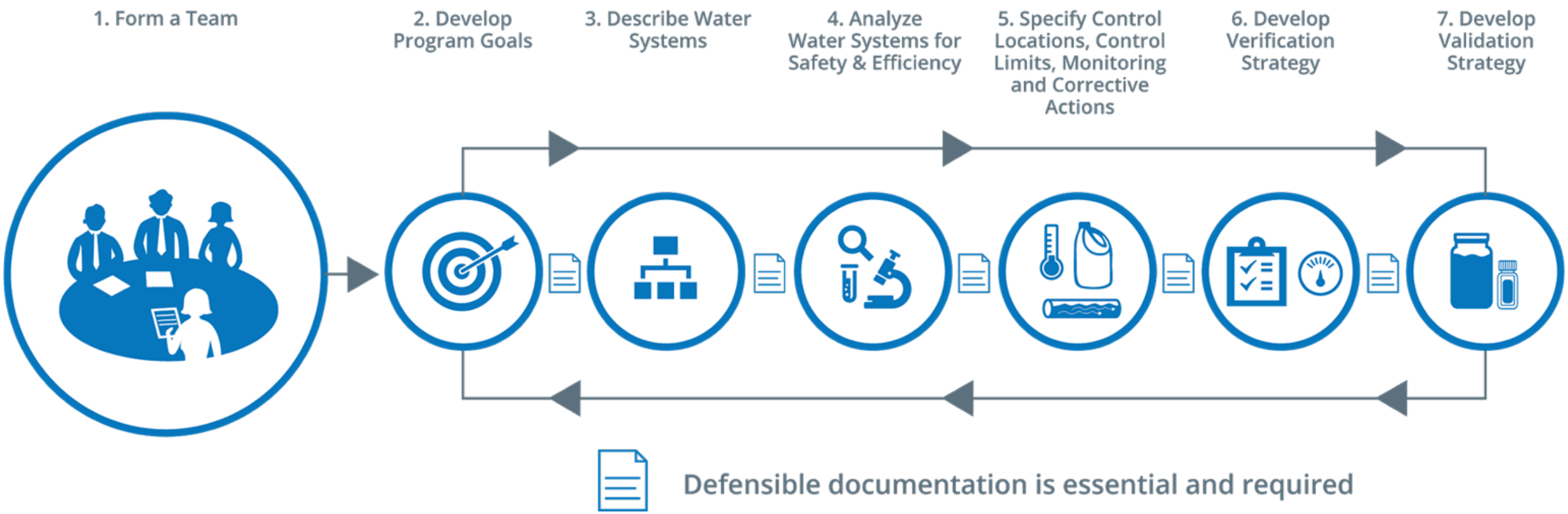
Hazard Analysis

For hazards at each processing step, the Water Management Team must:

- Decide if risk of injury is significant
- State the basis for deciding the significance of the risk.

For each hazard that is above a low risk assessment, a control point should be identified. If control can be is applied it is considered a Critical Control Point.

7 STEPS OF THE SUSTAINABLE COMPREHENSIVE WATER MANAGEMENT PROGRAM



Adapted from Figure 1 of ANSI/ASHRAE Standard 188

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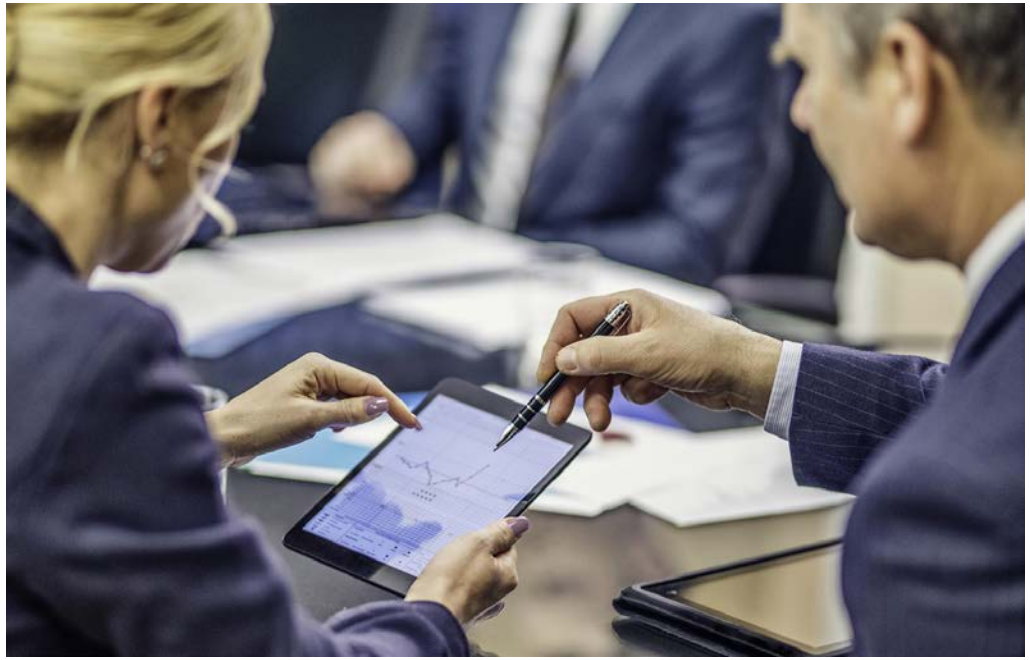
Develop the Plan

For each critical control point:

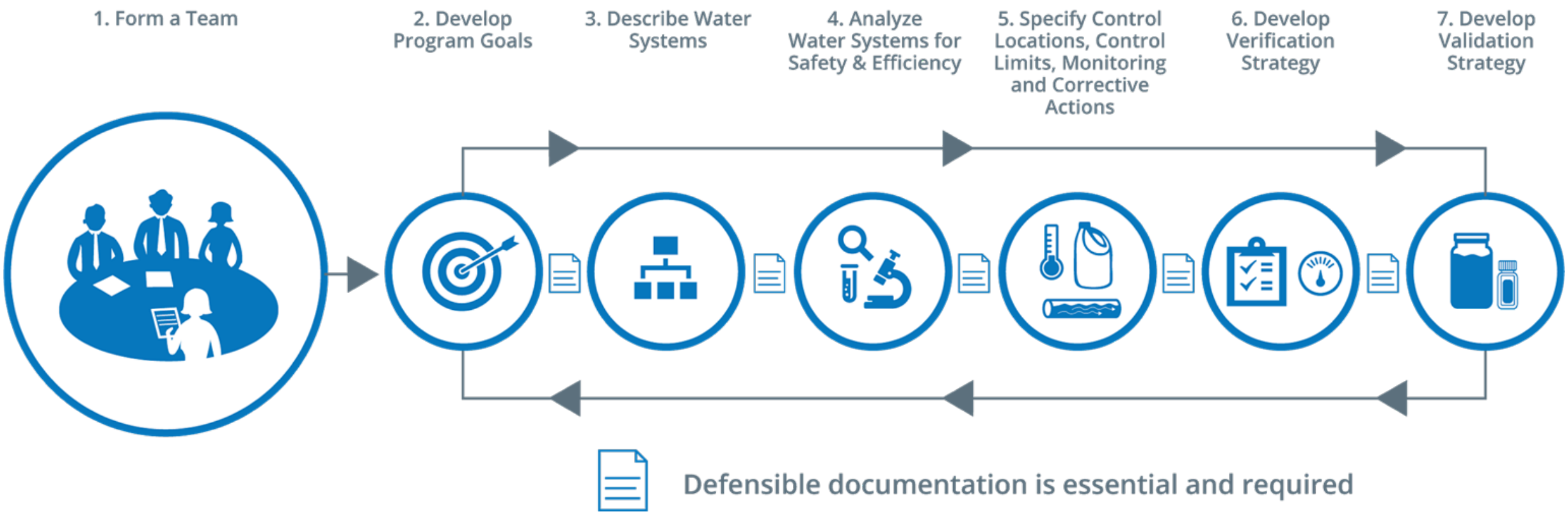
- Limits should be set
- Monitoring methods should be identified
- Frequencies should be stated
- Corrective actions for limit deviations identified
- Recording methods should be identified
- Verification strategy should be developed



Develop the Plan

Processing Step	Safety Hazard or Efficiency Opportunity	Control Location	Control Limits	Monitoring	Frequency	Corrective Action	Verification Procedure
4. Cold water distribution (potable)	Safety	Supplemental disinfection at discharge of South Entrance back flow	0.5 - 1.0 ppm as Cl_2 free residual oxidant (FRO)	Perform free chlorine test on colorimeter instrument; perform disinfection by-products via certified lab	Daily during startup, monthly after start -up	Check product feed; call vendor if not operating properly; consider increased product feed after consultation with WMT	Quarterly review of data log sheets

7 STEPS OF THE SUSTAINABLE COMPREHENSIVE WATER MANAGEMENT PROGRAM



Adapted from Figure 1 of ANSI/ASHRAE Standard 188

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Control Limits

A control limit is the range of the applied control measure.

It must be:

- Quantitative
- Measurable
- Physical or chemical parameter

Example: 0.5 – 1.0 ppm free residual oxidant applied continuously is a control limit used to control microbial hazards in a potable water system

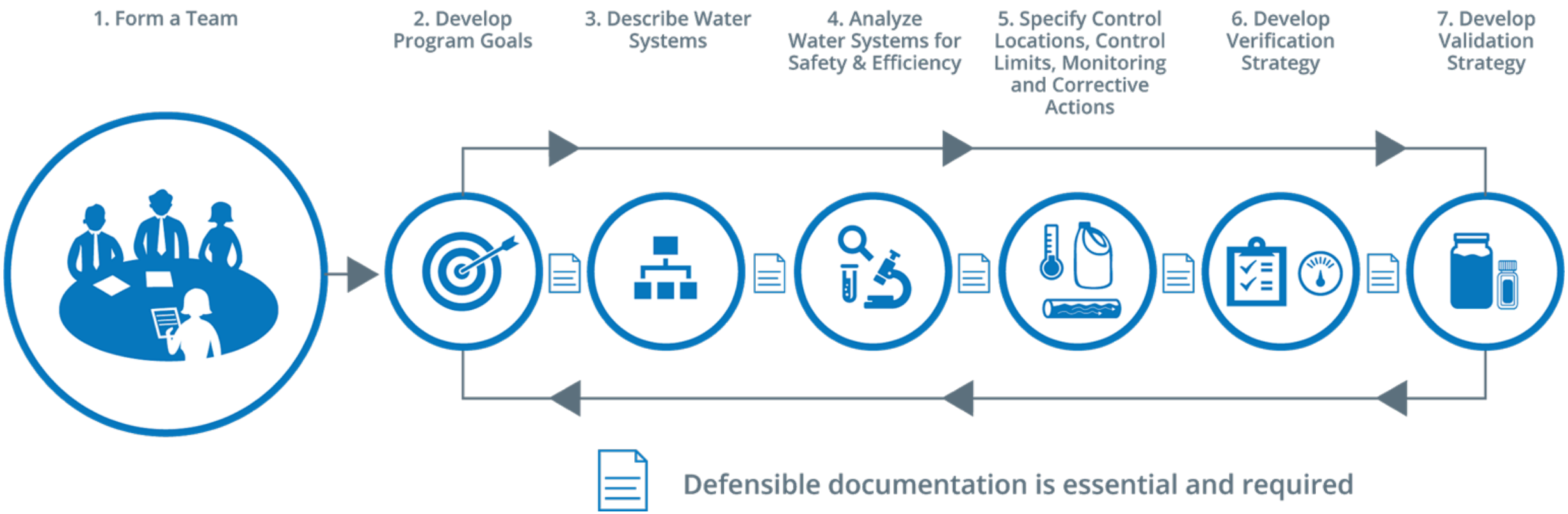
Corrective Action

Predetermined procedure to be followed if there is a deviation from the critical control limit

- Every CCP (control location) must have a specified critical control limit and a monitoring plan for the critical control limit

- Every critical control limit must have a predetermined corrective action specified

7 STEPS OF THE SUSTAINABLE COMPREHENSIVE WATER MANAGEMENT PROGRAM



Adapted from Figure 1 of ANSI/ASHRAE Standard 188

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Verification

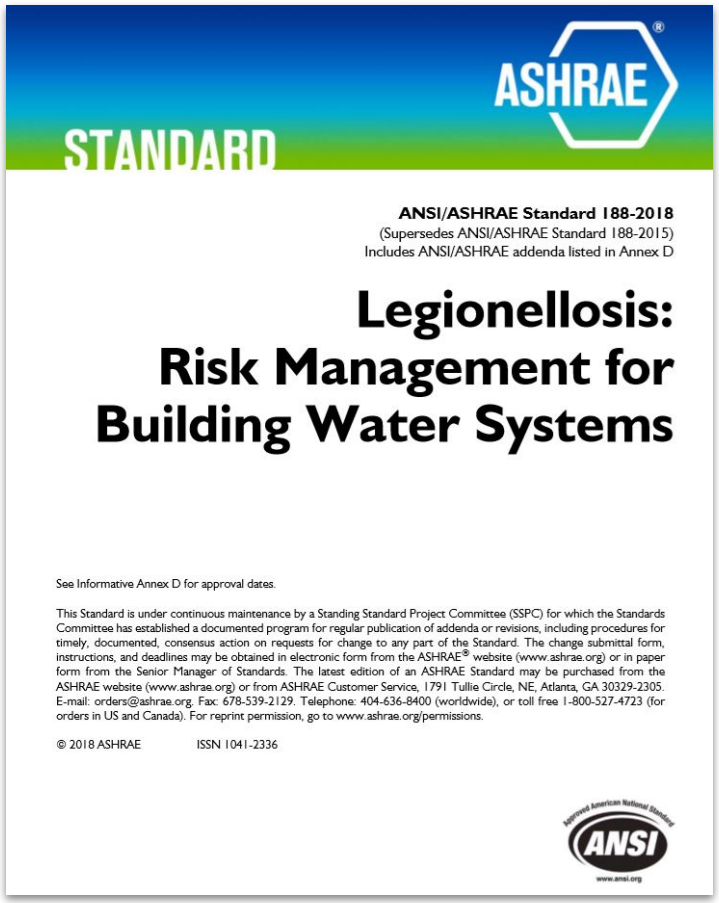
Verification is a Quality Assurance (QA) function.

Verification is confirmation that the Water Management Program (WMP) has been implemented as designed.

Prove with EVIDENCE that Program Controls are being implemented as designed, provides defensibility.

Prove that corrective actions are carried out when control limits are not met or are exceeded.

Verification and Validation


STANDARD

ASHRAE

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ANSI

As defined in ANSI/ASHRAE 188 -2018:

Verification: initial and ongoing confirmation that the program is being implemented as designed.

Validation: initial and ongoing confirmation that the program, when implemented as designed, effectively controls the hazardous conditions throughout the building water systems.

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Validation

Validation is a Quality Control (QC) function.

Validation is confirmation that the Water Management Program is effective when implemented as designed.

To confirm that the HACCP plan, when implemented as designed, controls the hazards/hazardous conditions throughout the system

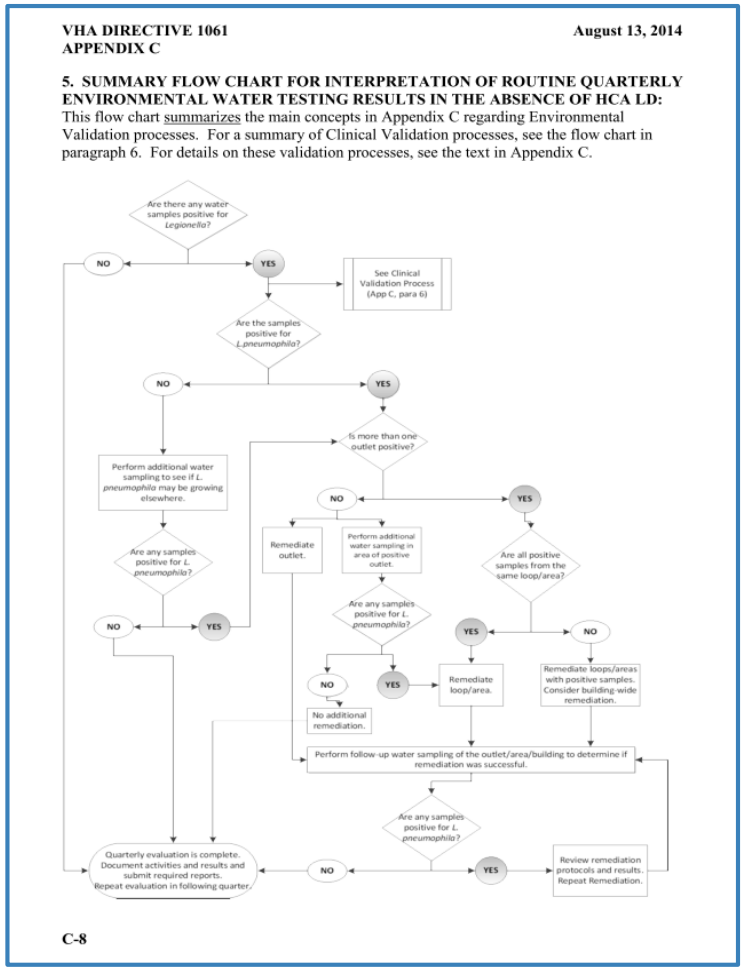
Validation Response

Validation response is the action taken when test results show that the program (when implemented as designed) is:

- NOT effectively controlling the hazard or hazardous conditions throughout the building water system
- NOT effectively generating the efficiency gains throughout the building water system

The VHA Directive 1061 specifies a Graded Response:

- The Facility Water Safety Committee [Water Management Team] determines remedial actions based on positive test result s



VHA DIRECTIVE 1061 August 13, 2014
APPENDIX C

5. SUMMARY FLOW CHART FOR INTERPRETATION OF ROUTINE QUARTERLY ENVIRONMENTAL WATER TESTING RESULTS IN THE ABSENCE OF HCA LD:
This flow chart summarizes the main concepts in Appendix C regarding Environmental Validation processes. For a summary of Clinical Validation processes, see the flow chart in paragraph 6. For details on these validation processes, see the text in Appendix C.

C-8

Documentation

Establish documentation and communication procedures for all activities of the program.

Documented defensible records of independent, third -party verification and validation are essential.

In the absence of clear, defensible records documenting that something was done, it is as if that something was not done.

Program Goals / Mission

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Elements for Consideration

- How will we define safe water ?
- How will we incorporate the Safe Drinking Water Act into our Goals ?
- Are there industry standards to be considered for water processing ?
- Regulations that must be considered ?

Prioritizing Building Risk

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Building Risk Profile

- What factors increase risk of illness related to building water systems ?
  - Centralized / recirculated hot water systems
  - Large / multiple story buildings
  - Overnight stay / use of showers
  - Residents with acute medical problems or weakened immune systems
  - Census changes
  - Construction / renovation activities
- What water processing activities create increased risk ?
  - Evaporative cooling towers
  - Decorative water features
  - Reclaim water systems