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What we will cover today

- Legionella the history, what is it and where does it come from
- How we deal with Legionella in our plumbing systems
- Codes and Standards driving design changes
- ASSE Mixing Valve codes that we deal with on TMV's and EMV's

Legionella: Design Change

Names we hear in the News

- Bacterium Legionella Pneumophila
- Legionellsis
- Legionnaires Disease
- Pontiac Fever

When was it discovered

1976

American Legion Convention

Philidelphia, PA

Mystery Disease

224 Veterans became sick

34 Veterans lost their lives

1977

CDC on January 18th

Officially termed the issue

Legionella or Legionnaires Disease

What is the actually disease?

- Bacteria that lives naturally in our environment: Bacterium Legionella Pneumophila. A flu like symptom
- Lives outside in rivers, streams and soils throughout all environments
- Also lives in plumbing systems with in buildings-mostly larger commercial plumbing systems

Petrie Dish of Bacteria

How does it spread to the human body

- Must be breathed in
- Aeration must occur to get bacteria airborne
- Microscopic water droplets inhaled
- Can drink the water and never will be affected

What are the sources of spreading the bacteria?

- Hot Tubs
- Cooling towers
- Decorative Fountains
- Swimming Pools
- Sprinkler Systems
- Water Misters
- Shower Systems
- Dental Equipment

Where does it come from?

Legionella is naturally found in in water, especially in warm water.

Who is at Risk?

Elderly People

Smokers

People with weakened Immune Systems

Cancer patients

How is it tested

Testing based on a level of Heterotrophic plate count bacteria measuring with water samples taken. Each facility can conduct testing differently,

So how do we kill or control it???

There are several ways to control and or kill Legionella. It is a continual process as it is naturally occurring as we just discussed. There is no completion of the eradication, just a continuation!.

Ways to Kill/Contain legionella

UV Systems

- Not Ideal
- Require treatment at the main
- Additional treatment on recirc loops
- Has no residual value in the water
- No effect on Bio Slime already in place

Chlroinators

- Chemical Injection into the water using Chlorine Dioxide
- Very good at getting to the Bio Slime in the water
- Has Good residual effects
- Hard to dial in and control
- Can be hard on Piping systems

Ozone

- Requires an Ozone generator
- Related monitoring equipment throughout building
- Can Not be using with Copper and or Steel Piping
- Very quick and powerful oxidizer
- Not much residual valvue

Treatments Continued

Copper Silver Ion Ex

- Electronic System that releases copper and silver Ions in the water prior to the water heater
- Copper Kills Algae
- Silver Kills Bacteria
- Difficult to control
- Hard on Plumbing products like mixing vales, shower valves etc
- Risk of Plating the piping in not controlled

High Temp

- Raise water heater Temps
- Master mixers with Point of use
- Recirc over 128 minimum higher better
- Most cost effective
- Easy to control
- 180 Purge one in a while to elevate kill ratios

Most Common

No treatment

UV System

Ozone System

Chlorine Dioxide

Copper Silver Ion Exchange

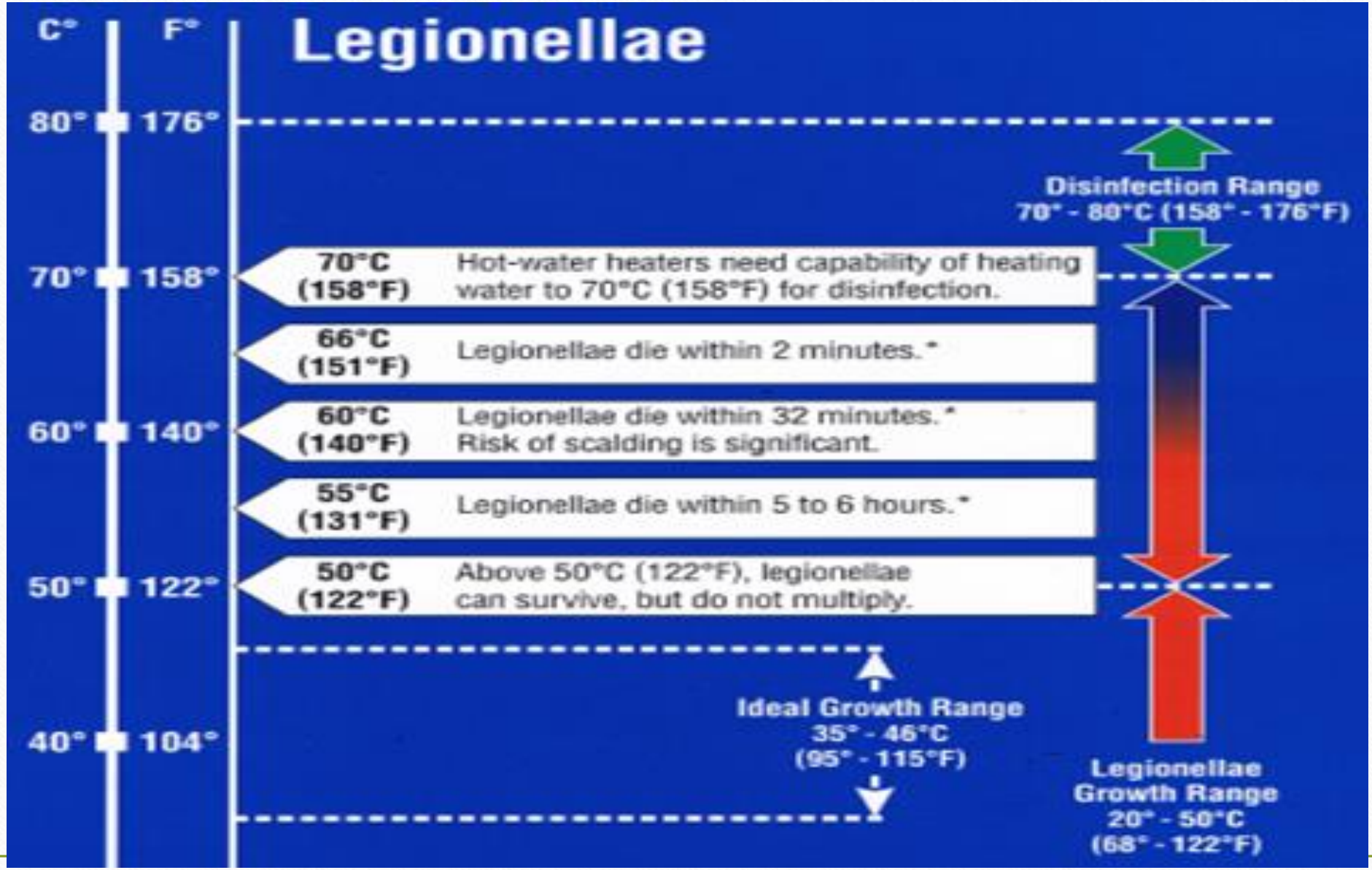
Designing a Hot Water System

Heat as we mentioned is the most effective way to control Legionella. So we must look at new designs to bring our hot waters systems up to a new standard to kill and control. --

Hot water:
What is the right temp to create, store, deliver and recirculate??

Remember Ideal growth rate for Legionella 95-115 dergees

158 degrees and above kills on contact.


C°
F°
Legionellae
80° 176°
70° 158°
60° 140°
50° 122°
40° 104°
70°C (158°F)
Hot-water heaters need capability of heating water to 70°C (158°F) for disinfection.
66°C (151°F)
Legionellae die within 2 minutes.*
60°C (140°F)
Legionellae die within 32 minutes.* Risk of scalding is significant.
55°C (131°F)
Legionellae die within 5 to 6 hours.*
50°C (122°F)
Above 50°C (122°F), legionellae can survive, but do not multiply.
Disinfection Range
70° - 80°C (158° - 176°F)
Ideal Growth Range
35° - 46°C
(95° - 115°F)
Legionellae Growth Range
20° - 50°C
(68° - 122°F)

TEMPS!!

- Water Heater Temp 160 degrees
- Master Mixer at 140 Degree
- Point of use Valves at 110 Degrees
- Thermostatic Shower Valves at 110 Degrees
- Continual Recirculation at 140 Degrees
- Minimized Deadlegs
- Recirc as close to each fixture as possible

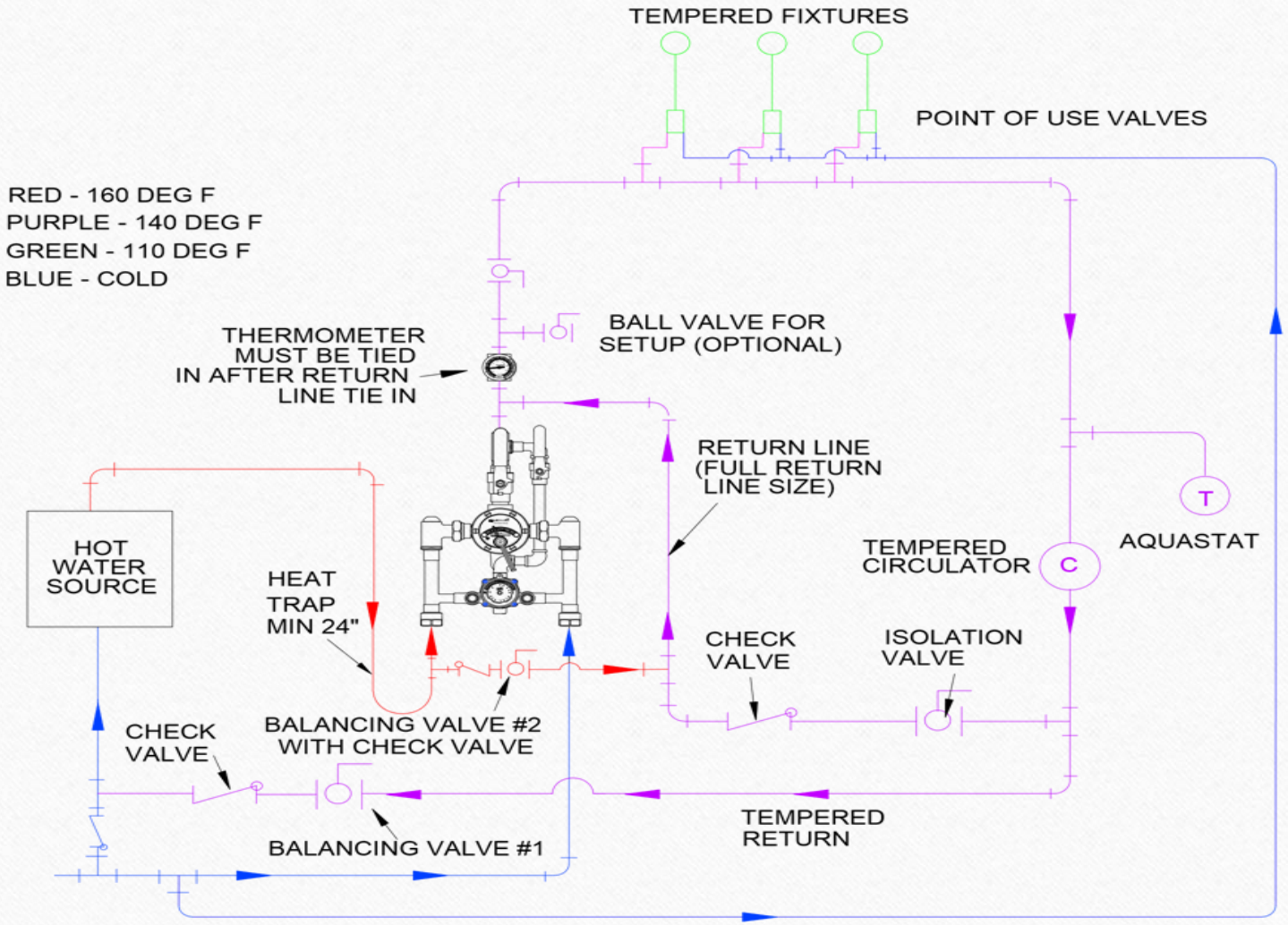
Proper and Complete

Piping Diagram

TWO VALVE HIGH

NOTE: FOR BI-METAL VALVES ONLY INCLUDING TYPE TM SERIES

LEONARD
WATER TEMPERATURE CONTROLS



Key to new design is recirculation

- Does not have to be fast and furious, just keep moving
- Circ pumps require little or minimal electrical draw so thermal circulation benefits extremely out weight Green Energy savings
- Use of aquastats and or pump timers will add to issues of grow due to temps falling into the growth range of Legionella.

Mixing Valve Codes and Standards??

Mixing Valve Std 1016

ASSE STANDARD #1016-2011 (CSA B125.16)

Valves can be listed as Type T, Type P or Type T/P

Key Performance Requirements:

Flow => Designed to function at a flow of 2.5 GPM

Working Pressure Test => Designed to function at maximum pressure of 125 psi

Pressure & Temperature Variation Test:

Type P => With pressure variation of 50% to inlets, must maintain +/- 3.6°F of set output temperature within 5 seconds

Type T => With pressure variation of 20% to inlets, must maintain +/- 3.6°F of set output temperature within 5 seconds. With hot water temperature increase of 25°F, cannot exceed upward spike of 5.4°F within the first 1.5 seconds

Type T/P => Must meet both Type P & Type T test conditions

Cold Water Failure => Must reduce discharge to 0.5 GPM or less w/in 5 seconds to ensure output temperature does not exceed 120°F

Mixing Valve Std 1017

ASSE STANDARD #1017-2009

Key Performance Requirements:

Conditioning Testing => Must perform when subjected to 200°F at a flowing pressure of 125 psi

Hydrostatic Pressure Test => No leaks allowed when valve body subjected to 500 psi

Temperature Control Test => Permissible temperature variation is based on flow at 10 psi:

3.0 – 5.0 GPM => allowed +/- 3°F

Over 5.0 – 40.0 GPM => Allowed +/- 5°F

Over 40.0 GPM => Allowed +/- 7°F

Hot/Cold Water Failure Test => NO specific REQUIREMENT EXISTS….there is no shut-off requirement for a loss of cold/hot water!!!

Mixing Valve Std 1069

ASSE STANDARD #1069-2005

Key Performance Requirements: The most rigorous for a thermostatic valve!

High Temperature Conditioning Test => Must function at 180°F (tested for 5 min)

Working Pressure Test => Designed to function at maximum pressure of 125 psi

Pressure & Temperature Variation Test => With pressure variation of 20% to inlets, must maintain +/- 3.6°F of set output temperature within 5 seconds. With hot water temperature increase of 25°F, cannot exceed upward spike of 5.4°F within first 1.5 seconds.

Sound familiar??....it's the same requirement as ASSE 1016 Type T

Cold Water Failure => Must reduce discharge to 0.5 GPM or less within 5 seconds to ensure output temperature does not exceed 120°F for devices ¾" and smaller, or 1.0 GPM for devices larger than ¾"

Mixing valve Std 1070

ASSE STANDARD #1070-2004

Key Performance Requirements:

High Temperature Conditioning Test => Must function at 180°F (tested for 5 min)

Working Pressure Test => Designed to function at maximum pressure of 125 psi

Hydrostatic Pressure Test => No leaks allowed when valve body subjected to 500 psi

Regulation and Temperature Variation Test => Increase and decrease supply pressures 20% and increase inlet hot + 25°F, the valve outlet shall remain < 120°F at all times and shall maintain w/in +/-7°F

Cold Water Failure => Must reduce discharge to 0.2 GPM or 20% of manufacturer's suggested minimum flow, within 1 second to ensure output temperature does not exceed 120°F

Mixing Valve Std 1071

ASSE STANDARD #1071-2012

Key Performance Requirements:

Conditioning Test => Must function at 200°F at flowing pressure of 125 psi (tested for 6 hrs)

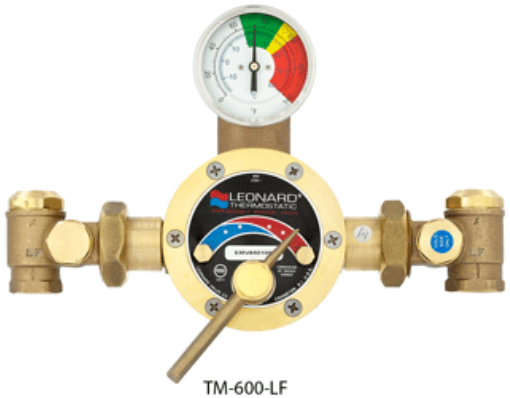
Temperature Control Test => Permissible temperature variation is based on flow at 30 psi

< 7.0 GPM => Allowed +3°F / -5°F

7.0 < 20.0 GPM => Allowed + 5°F / -8.0°F

20.0 < 40.0 GPM => Allowed +/7°F / -12°F

40.0 GPM and over => Allowed +7°F / -15°F



TM-600-LF

Maximum Outlet Temperature Test => Verification that device cannot be inadvertently adjusted to an outlet in excess of 100°F

Hot Water Shut-off Test => Must achieve manufacturer's stated by-pass flow rate at 30 psi

Raised questions about 1071 Systems

- Should they be recirculated? We prefer to not as can cause issues with temps from domestic loops.
- Do they need a separate form of protection is so?? Prefer to feed 140 degrees to all EMV Fixtures. Better control and less growth in the water

- Are they being tested weekly? They need to be it is code. More testing the better flushing action in the lines
- Are these products even installed? Do you have EMV's It is code!!!

- Temperatures are key here with Mixing valves. Hotter the better
- Illinois code requirements

ASHRAE Guideline 12-2000

ASHRAE® STANDARD

Minimizing the Risk of Legionellosis Associated with Building Water Systems

Approved by the ASHRAE Standards Committee February 5, 2000; by the ASHRAE Board of Directors February 10, 2000.

ASHRAE Guidelines are updated on a five-year cycle; the date following the standard number is the year of ASHRAE Board of Directors approval. The latest copies may be purchased from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 404-321-5478. Telephone: 404-636-8400 (worldwide) or toll free 1-800-527-4723 (for orders in U.S. and Canada).

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ASHRAE Std

- **Standard to Minimize Risk of Legionella (Feb 2000)**
- **Recommended Treatment:**
- **"cold water should be stored and distributed below 20°C (68°F), while hot water should be stored above 60°C (140°F) and circulated with a minimum return temperature of 51°C (124°F). However, great care should be taken to avoid scalding problems. One method is to install preset thermostatic mixing valves."**
- **"Where decontamination of hot water systems is necessary…the hot water temperature should be raised to 71-77°C (160-170°F) and maintained while progressively flushing each outlet….minimum flush time of five minutes recommended by the CDC…"**

IPC and UPC Standards and Deadlegs

- Section 607.2=> Hot or tempered water supply to fixtures

- "The developed length of hot or tempered water piping, from the source of hot water to the fixtures that required hot or tempered water, shall not exceed 50 feet (15 240mm). Recirculating system piping and heat-traced piping shall be considered to be sources of hot or tempered water.
- NOTE: Illinois State Plumbing code will be addressing Currently anything over 2ft is being deemed deadleg by their new standards

Allegheny PA Health Dept Code

- **Allegheny County Health Department**
- **First released Guideline on Legionella Prevention (Jan 1997)**
- **Provided direction on sampling and awareness that colonization occurs for the bacteria at temperatures < 122°F**
- **Provided disinfection measures:**
- **Copper-Silver Ionization**
- **Thermal Eradication ("heat and flush method" - flush system for 20-30 minutes at > 158°F; also directed to store hot water at 140°F)**
- **Chlorination**
- **For instantaneous steam heating system - flash heat water to > 190°F**
- **Ultraviolet Irradiation**

VA Administration Codes

- **Veterans Health Administration Directive 1061**

- **"Prevention of Healthcare-associated Legionella Disease…" (Aug 14)**
- **Hot Water Distribution Systems – "must maintain a minimum of 140°F (60°C) to prevent Legionella growth. The minimum discharge temperature…must be 130°F (54.4°C)…..Water in potable hot water distribution system piping must be no lower than 124°F (51.1°C)..."**
- **Water Temperature Monitoring – "…temperature in the hot and cold potable water distribution systems needs to be monitored continuously…" (states 6 points to monitor water temperatures)**
- **Thermal Eradication – "160-170°F…..at least 30 minutes"**

New 2015 ASHRE 188-2015

ASHRAE Standard 188-2015

New standard aimed to Minimize Risk of Legionella (June 2015)

Building Designer/Owner Requirements:

Complete Survey building to identify devices related to Legionella (ie whirlpools)etc.. Review of Hot Water System

ASHRE Continued

- If any devices are identified as a possibility, a Program Team must be created to:
- Identify all the potable and nonpotable water systems (equipment, etc)
- Graphically describe s process flow diagram of the systems (as built, not plans)
- Establish a system for monitoring that the control measures are within limits
- Establish corrective actions when monitoring shows measures are outside limits (Note: this will likely include flushing, disinfection, etc), and also contingency plans
- Bottom line……Documentation, Documentation, Documentation
- Opportunity…….Continuous monitoring of various water temperatures

QUESTIONS???