



# UF TREEO 2023

## Cross-Connection Control Survey / Medical Facilities

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South Carolina Department of Health and Environmental Control  
Healthy People. Healthy Communities.

# Facilitator (Backflow Nerd)





# Presentation Agenda

- **Types of Healthcare Facilities**
- **Plumbing Code Considerations**
- **Preparing for Surveying a Healthcare Facility**
- **Containment and Isolation**
- **Types of Processes – Healthcare Facilities and How To Control Cross Connections**

# Types Health Care Facilities

- Large Hospitals
- Long Term Care (LTC) Facilities
- Laboratory Buildings
- Surgi-Centers
- Cancer Centers
- Office/Administration Support



# Backflow Preventer–Selection Criteria

1. Evaluate Hazard Level of substance that could backflow – **High/Health Hazard or Low Hazard?**
2. Could backflow occur due to **Backpressure, Backsiphonage**, or BOTH?
3. Is “**Continuous Pressure**” resulting from a downstream shutoff or control valve possible (Y/N)?

**Critical Concept**



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# *Survey* Preparation



# Survey Preparation/Considerations

1. **Codes and Regulations** – Must know relevant codes. This was under IPC...
2. **Containment vs. Isolation?**
3. **Point of use visual inspection vs. above ceiling tile/level?**
4. Field Forms/Data Entry Process (i.e., how will you document field data?)
5. Ladders, equipment (considerations for inspecting pipe above tile)!



# Survey Preparation/Considerations

6. **Site Water Main and Architectural Drawings** – Showing All Rooms, plumbing drawings, etc.
7. Meet with Personnel **Familiar w/ Water Systems**
8. **PPE** (eye protection, hearing protection, “Bunny Suits”, face masks, etc).
9. Clarify **Accessibility** (master keys, permission, escorts, etc.)
10. **Communication** – e.g., nurses on patient floors



# Containment Case Study

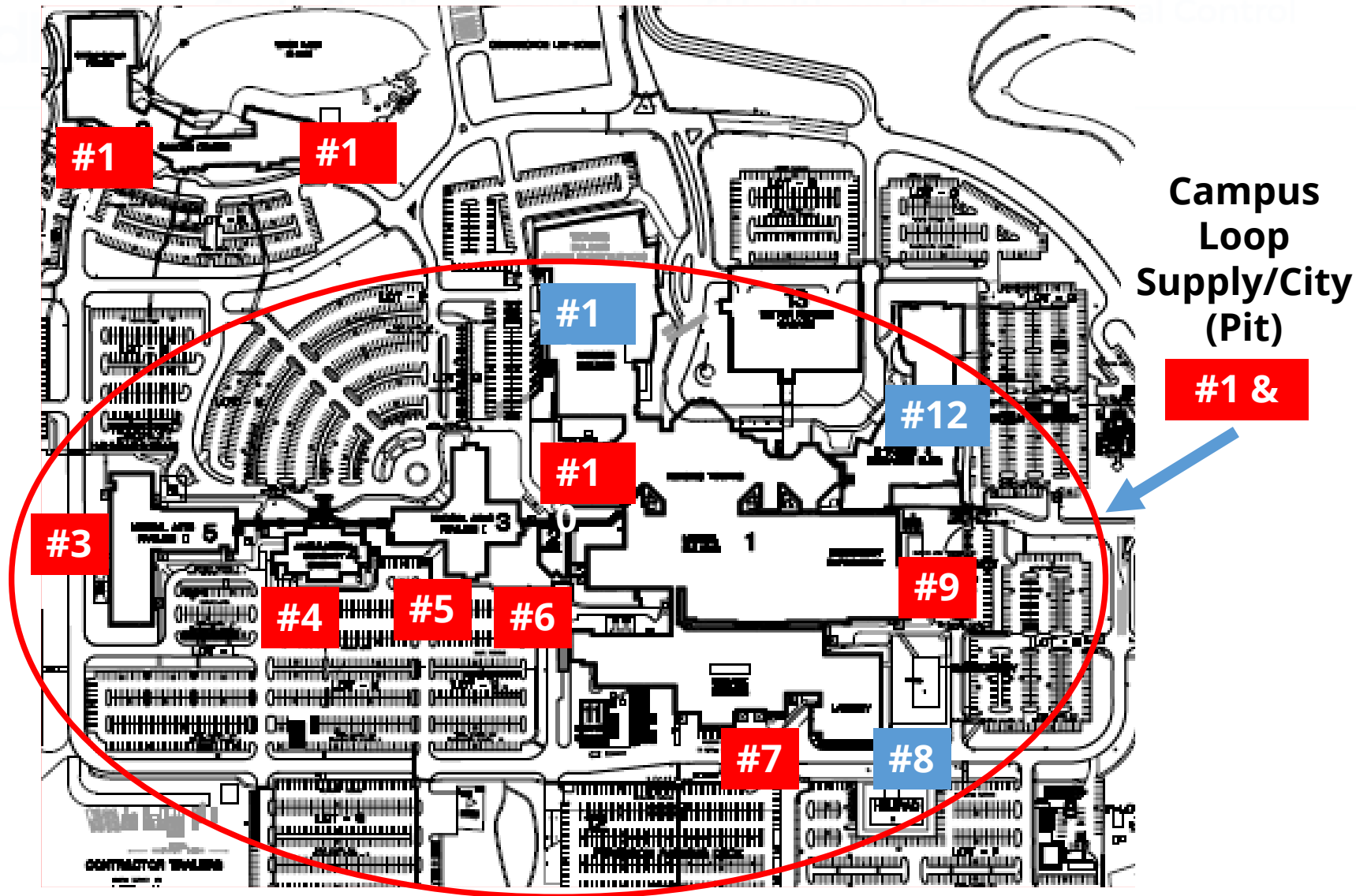
- Large Medical Campus. Multiple Outbuildings plus Main Hospital.
- Two- (2) separate community water supplies.
- Each supply controlled with reduced pressure principle backflow preventer (**Located in Pit!!!**). Each line combines to form a “Campus Loop”.
- Campus Loop supplies multiple campus buildings.



# Containment Case Study - Questions

1. Are all Campus Buildings supplied by Campus Loop? How does affect containment?
2. Is each building supplied by campus loop "contained"?
3. Are all domestic, fire and irrigation service connections accounted for/identified?





## Service Connections

# Containment Case Study - Findings

1. Are all Campus Buildings supplied by Campus Loop? How does affect containment? **Cancer Center supplied directly from community water supplier – no containment.**
2. Is each building supplied by campus loop “contained”? **Not each building was contained – many unprotected bypasses or no containment.**
3. Are all domestic, fire and irrigation service connections accounted for/identified? **Identified irrigation and fountain connections from campus loop – no protection.**



# Internal Water Distribution Processes

## Point of Use/Isolation – Cross Connection Evaluation



# Common Systems-Survey

## Building Systems


- Chilled Water
- Boilers/Steam Generation
- Cooling Towers
- Kitchen/Cafeteria Operations
- Lawn Irrigation
- Decorative Fountains
- Humidification Systems

## Medical Process Systems

- Morgue/Autopsy
- Labs and Equipment
- Equipment Sterilization/Cleaning
- Dialysis Systems
- Treated/Soft Water Systems
- Endoscopy Equipment
- Bed Pan Washers
- Therapy Tubs/Cleaning

# Final CCC Survey Report Information

- **Inventory** of all backflow prevention assemblies, devices and methods
- Itemized list of **recommendations** based upon survey information – **be specific in terms of location, system, etc.**
- Service connection assessment
- Internal Program Compliance, Local/State (Health Dept) or OSHA Compliance



What do we have,  
and what do we  
need to do?

# Domestic Hot Water Production

Use “Condenser Return Water” to Preheat Domestic Cold Water Before Supplying Heat Exchanger





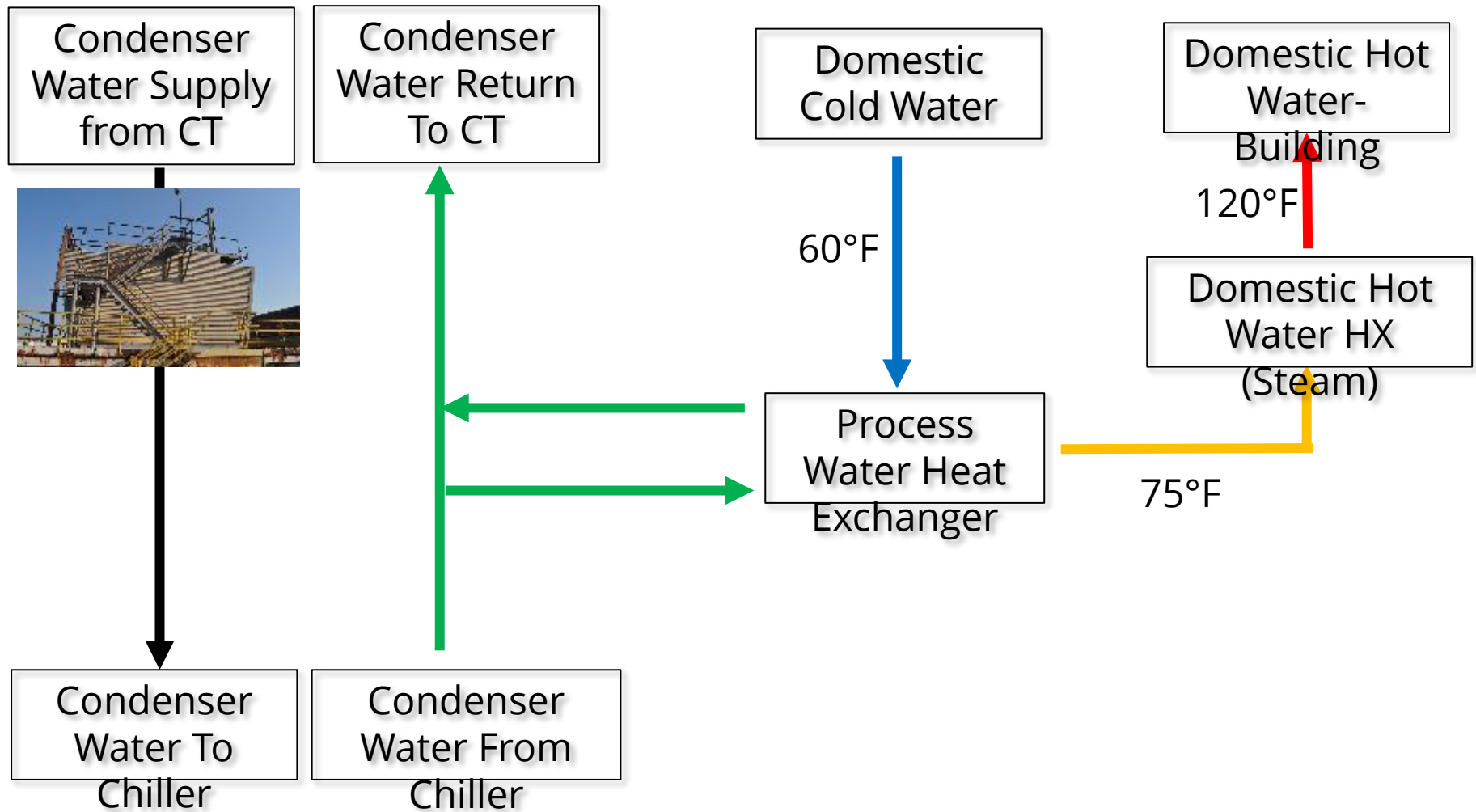
# Heat Exchangers

## Plumbing Code 608.16.3

Toxic Transfer Fluid = Double Wall Required  
Non-Toxic Transfer Fluid = Single Wall Allowed



# Preheat Domestic Cold Water For Domestic Hot Water Loop



# Heat Exchangers

- Must Evaluate Process Water Heat Exchanger
- Must Evaluate Steam/Domestic Hot Water Heat Exchanger
- Determine Toxicity of Transfer Fluid
- Determine HX Type Required  
(Single vs. Double Wall)

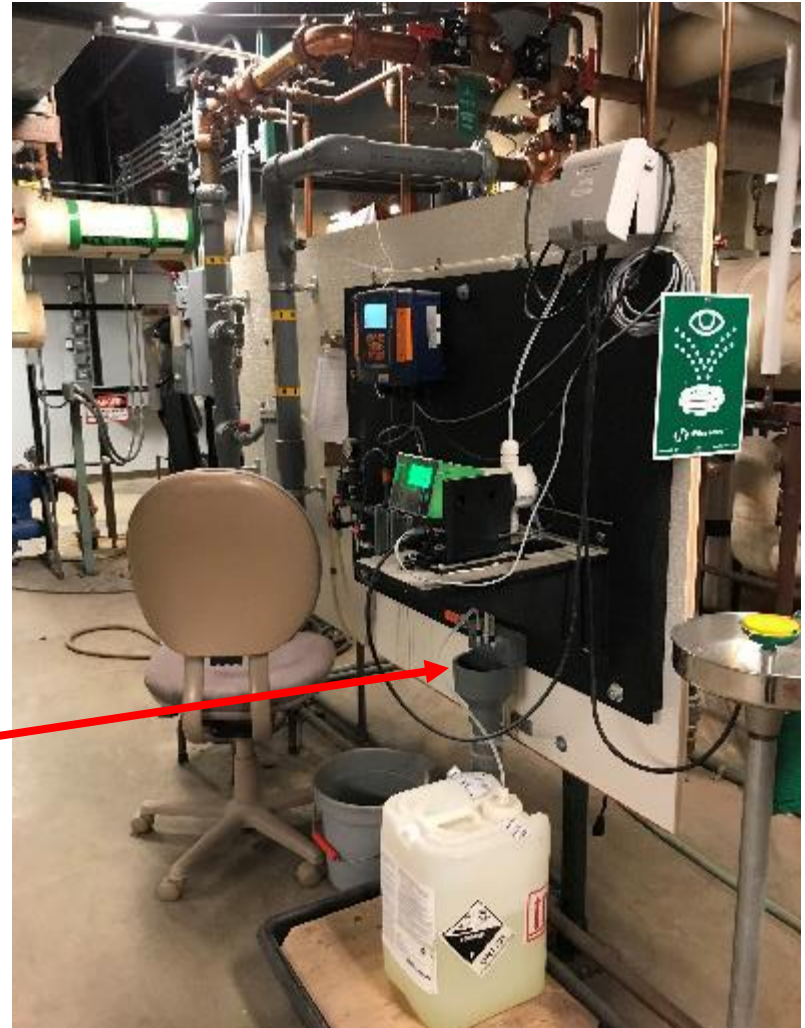
# Domestic OR Process Hot Water?

- Must ensure correct **labeling** – see picture...is this correct?
- Hot water line supplies sterilization equipment AND small restroom – compliant?
- Domestic hot water return lines must be **UPSTREAM** of backflow preventer supplying process water



# Chemical Injection Systems - Air Gaps

- Common to see disinfectant introduction into potable cold and/or domestic hot water systems for bacteria control
- Typical disinfectant introduction (chlorine dioxide, hypochlorite, etc.)
- Air gaps on system drains required ( $AG=2X$  Diameter of Discharge Pipe, or 1" Minimum)



# Chilled Water – RPBP Required Typical Makeup – Chilled Water Return





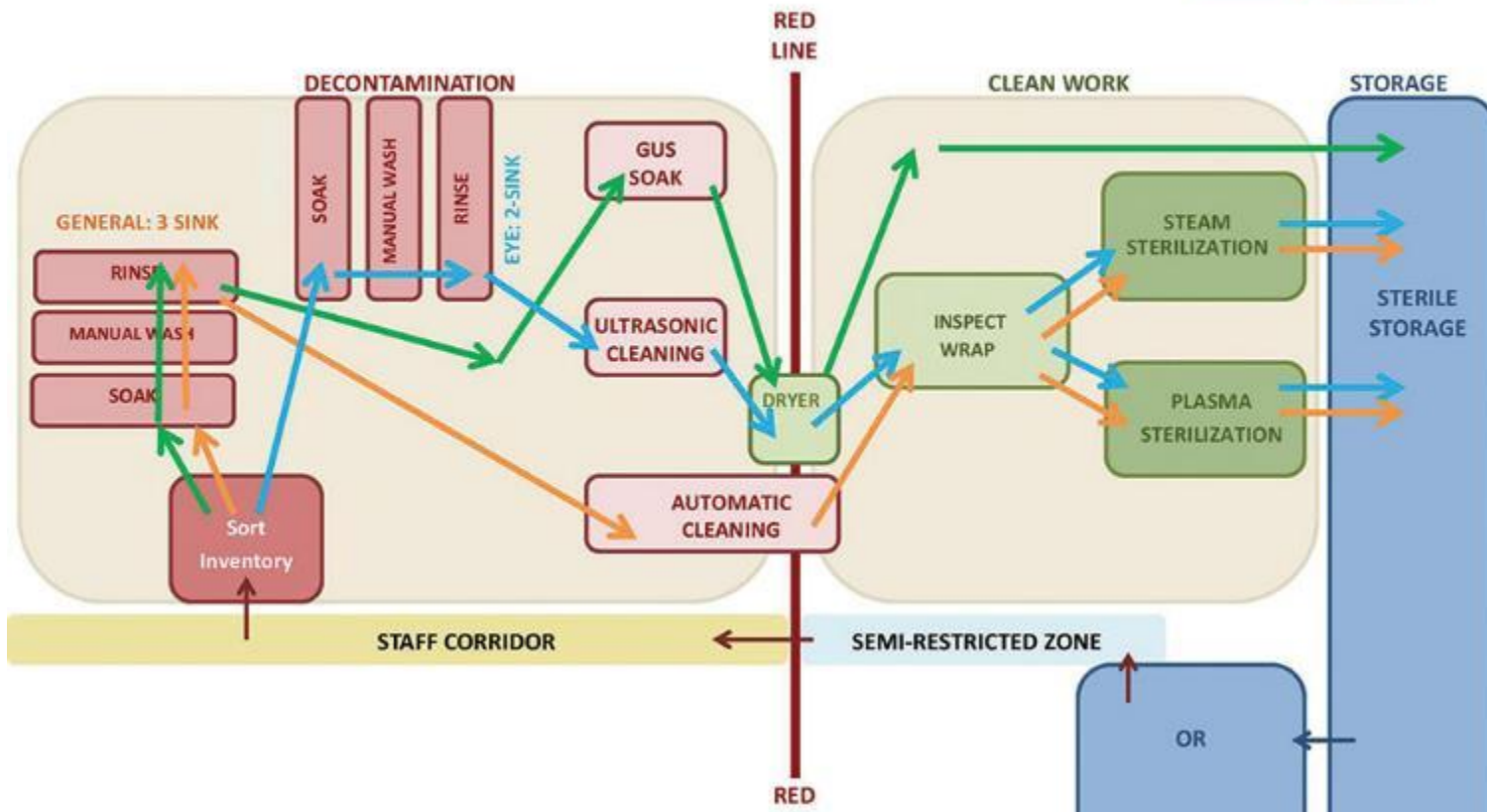
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# Cooling Tower Systems - RPBP or Air Gap Required



# Central Sterile Processing

STERILE PROCESSING DEPARTMENT  
 WORK FLOW DIAGRAM





# Central Sterile Processing

- **Many processes requiring water to process surgical instruments – all high hazard cross connections**
  - Ultrasonic Cleaners
  - Sinks w/ Spray Hoses
  - Chemical Dispensers
  - Sterilization Equipment
  - Autoclaves
  - Deionized/RO Water
- **These areas require special access and PPE.**



# Central Sterile Processing

- **Typically dedicated cold and hot water mains are isolated with reduced pressure principle backflow preventers to "zone isolate" multiple processes**
  - **Practice requires strict/accurate pipe labeling**
  - **Often find other potable uses supplied by dedicated non-potable system!**
  - **Often find processes not protected!**

**MUST WEAR THE BUNNY SUIT WHEN SURVEYING.....**

# Zone Isolation- Central Sterile

- RPBP in supply to cold and hot water
- Piping typically located above ceiling
- Often times find assemblies located above ceiling level/tile



# Central Sterile – Sinks/Spray Stations



# Autoclave - RPBP in Supply



# Central Sterile - Washer (RPBP Required)



# Sterilizers – RPBP in Supply

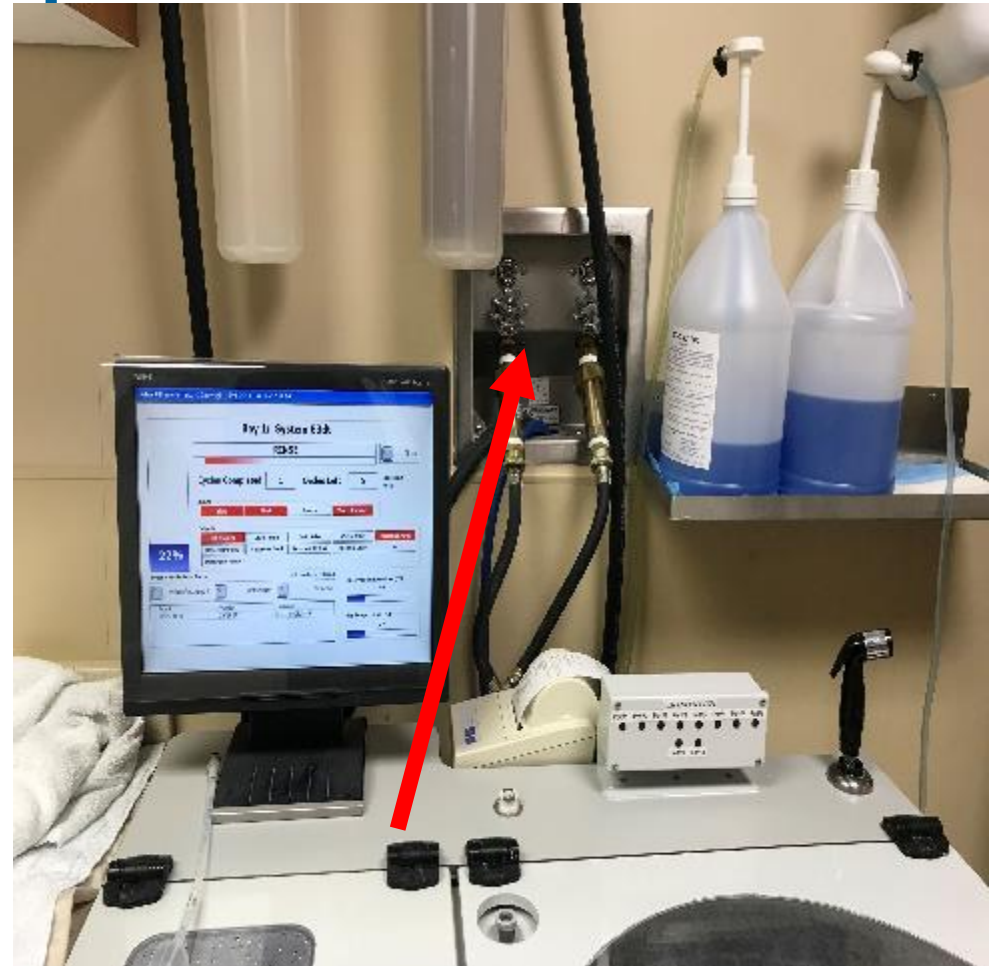


# Endoscope Reprocessors

- ✓ May utilize cold and hot water - mixed to supply equipment
- ✓ Water subsequently filtered
- ✓ Water used to reprocess endoscopes – decontaminate between uses
- ✓ Commonly found - Gastroenterology Units
- ✓ HIGH HAZARD CROSS CONNECTION – RPBP typically required on cold and hot supply!!



# Endoscope Reprocessors



Dual Check??

# RPBP in Supply Multiple Units



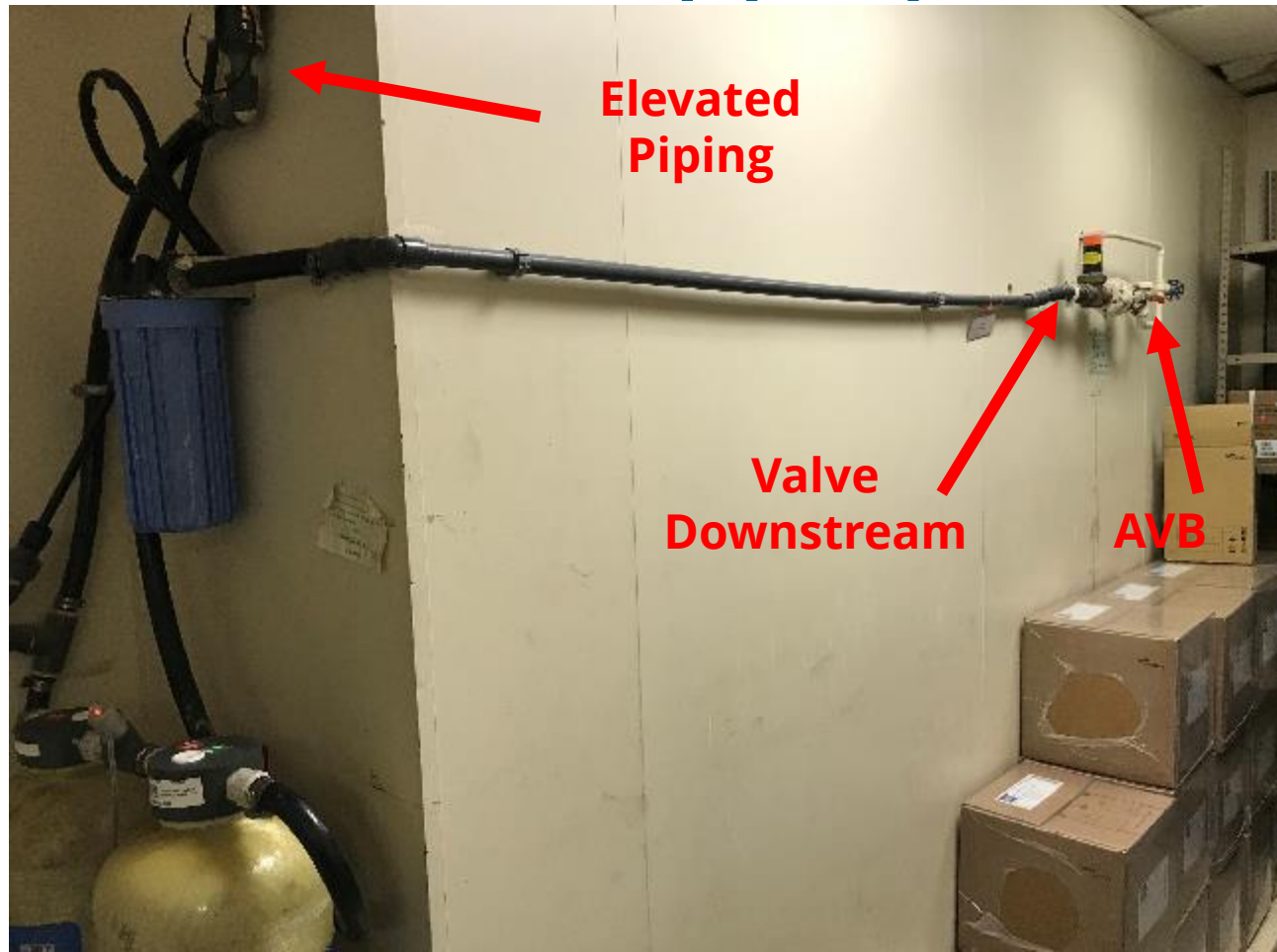
# Astra Tee Transesophageal Reprocessor Found Commonly Ultra Sound Dept.



# Deionized Water Systems

- Need deionized water for lab processing functions
- Water may be heated for glass washing and supplying sterilizers
- Deionized water may be used to supply/makeup to clean steam, specific humidification operations, etc.
- Reduced pressure principle backflow preventer required – High Hazard cross connection!

# DI System Supplied by Atmospheric Vacuum Breaker – Inappropriate Device



# Approved?



# Dialysis Treatment

- Centralized multistep water treatment system to supply product water loop
- Wall hydrants to connect dialysis treatment units to treated loop
- RPBP in potable cold and domestic hot water supply
- High Hazard!



# Dialysis Cart and Wall Connection





# Dental Operations/Lab

- Dental Chairs – water supply vs. bottled water supply
- Grinder systems
- Vacuum systems
- Lab faucets



# Morgue Supply

- RPBP in cold supply and also in supply to dedicated domestic hot water heat exchanger
- Dedicated cold and hot water lines supply morgue operations
- Discharge lines also supply public restroom – is this acceptable????



# Embalming Station Supply

- RPBP in main supply



# “SAF T” Pumps

- Disposal of infectious liquid medical waste
- Potable water flows through venturi – aspirating dangerous fluids to waste stream (High Hazard!)
- Reduced pressure principle backflow prevention assembly
- Commonly found - Operating Room areas
- Must review drainage of RPBP



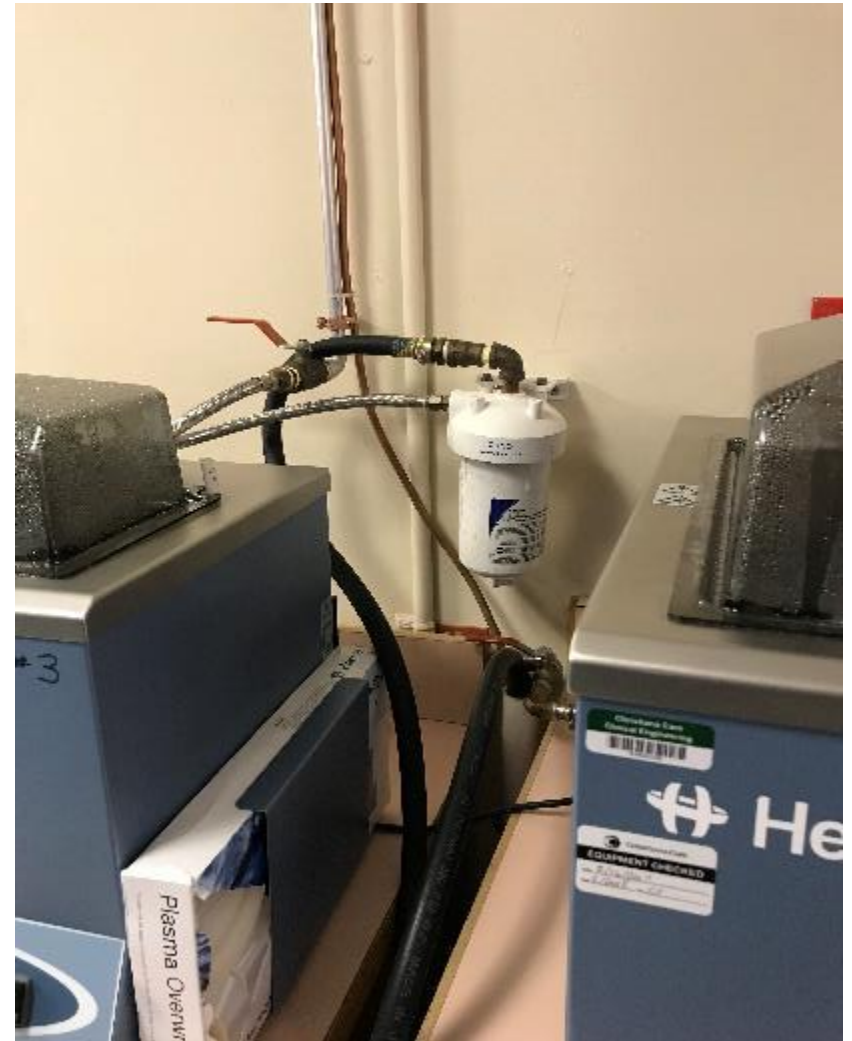
# “Macerator”

- Disposal of bedpan pulp materials and waste
- Machine pulverizes materials with addition of water to facilitate decomposition and drainage
- Water typically flows from top of lid
- RPBP may be recommended – water supply is typically threaded hose connection from behind unit



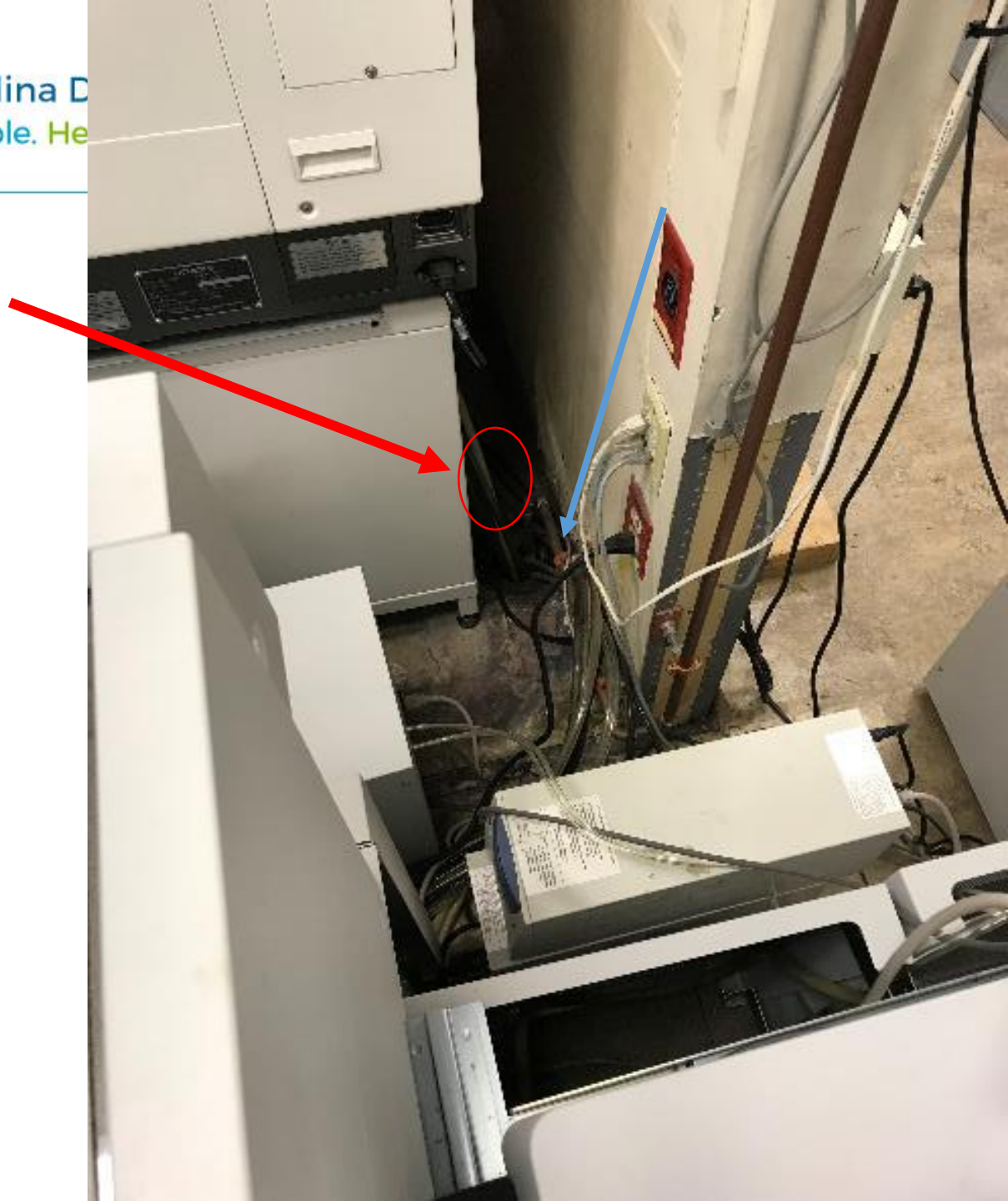
# Dethawer – Blood Bank/Lab

- Bath to warm up frozen blood samples
- Typically supplied water by hose drop
- Approved vacuum breaker required



# Blood Bank – Equipment Drain (Waste Dilution)

- Multiple system drains and drain trap primers may be found in lab areas.
- Approved air gap must be equivalent of 2X diameter of outlet pipe.



# Bed Pan Washer/Slop Hopper

- Approved vacuum breaker for spray hose must be installed per Plumbing Code (IE: 6' above floor)
- Inspect for valves at end of spray hose (implies possible continuous pressure)
- AVB or SVB (continuous pressure-valve) required
- Often installed adjacent to chemical dispenser (inspect for vacuum breaker, wasting tee)





# Shower Heads/Hoses

- Shower hose may be “air gapped”
- Showers may have atmospheric vacuum breaker in supply
- Some showers may have Watts S8C or equivalent in supply
- ASME A112.18.1 or ASME A112.18.3



# Ice Machines

## Inspection Items

- ✓ Found throughout patient floors, kitchens, therapy areas
- ✓ Internal air gap or ASSE 1022 required in water supply to ice maker (IPC 2018 allows ASSE2024)
- ✓ Approved air gap required for water cooled condenser - drain line
- ✓ Water supply filters - commonly have drain line – approved air gap required



# Commercial Laundry Machines RPBP Required Cold and Hot Supplies

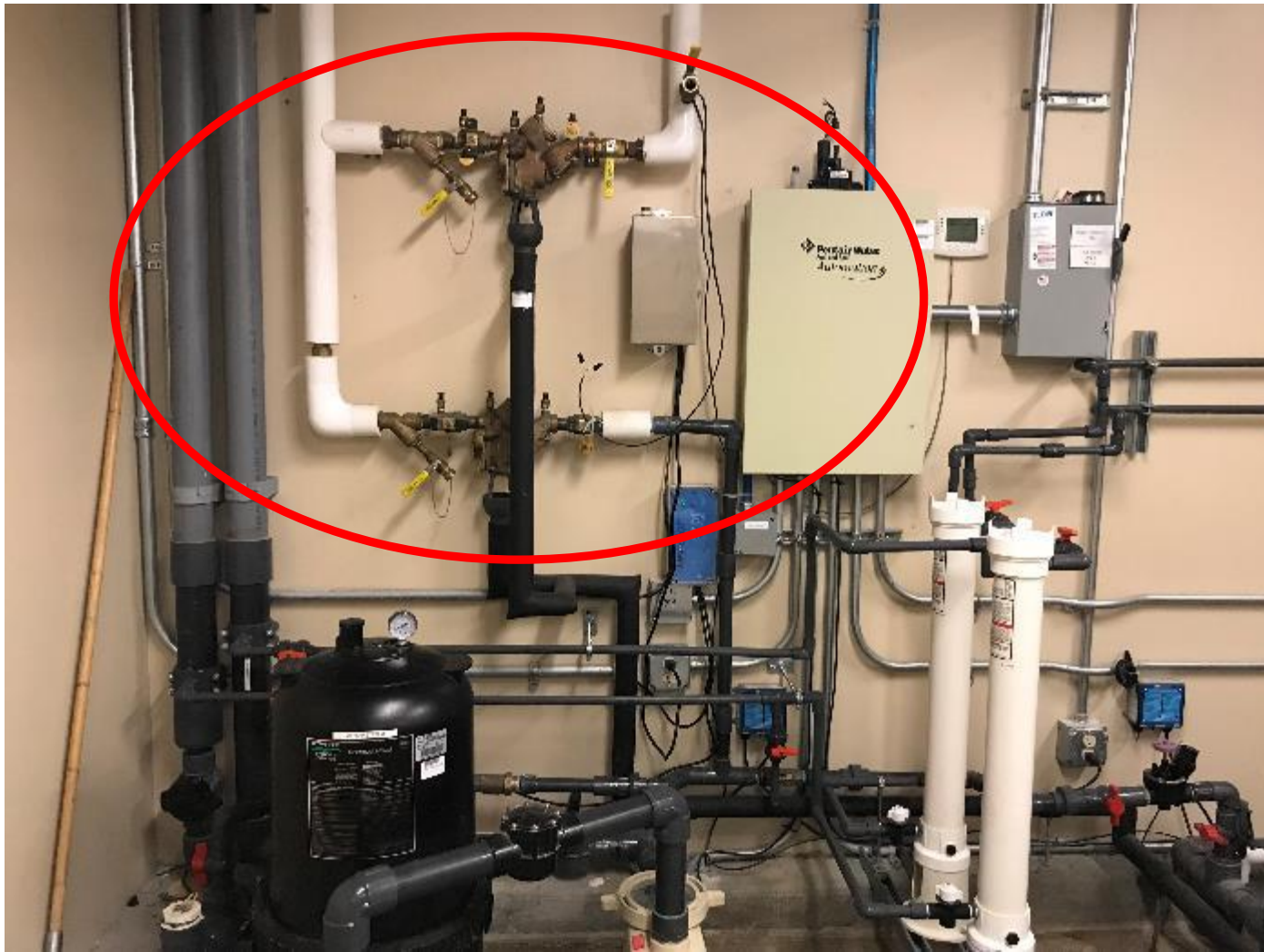


# Decorative Fountains

- High Hazard Cross-Connection!
- Chemical treatment, exposure, bacterial growth, etc.
- Many hospitals are decommissioning due to *Legionella* concerns

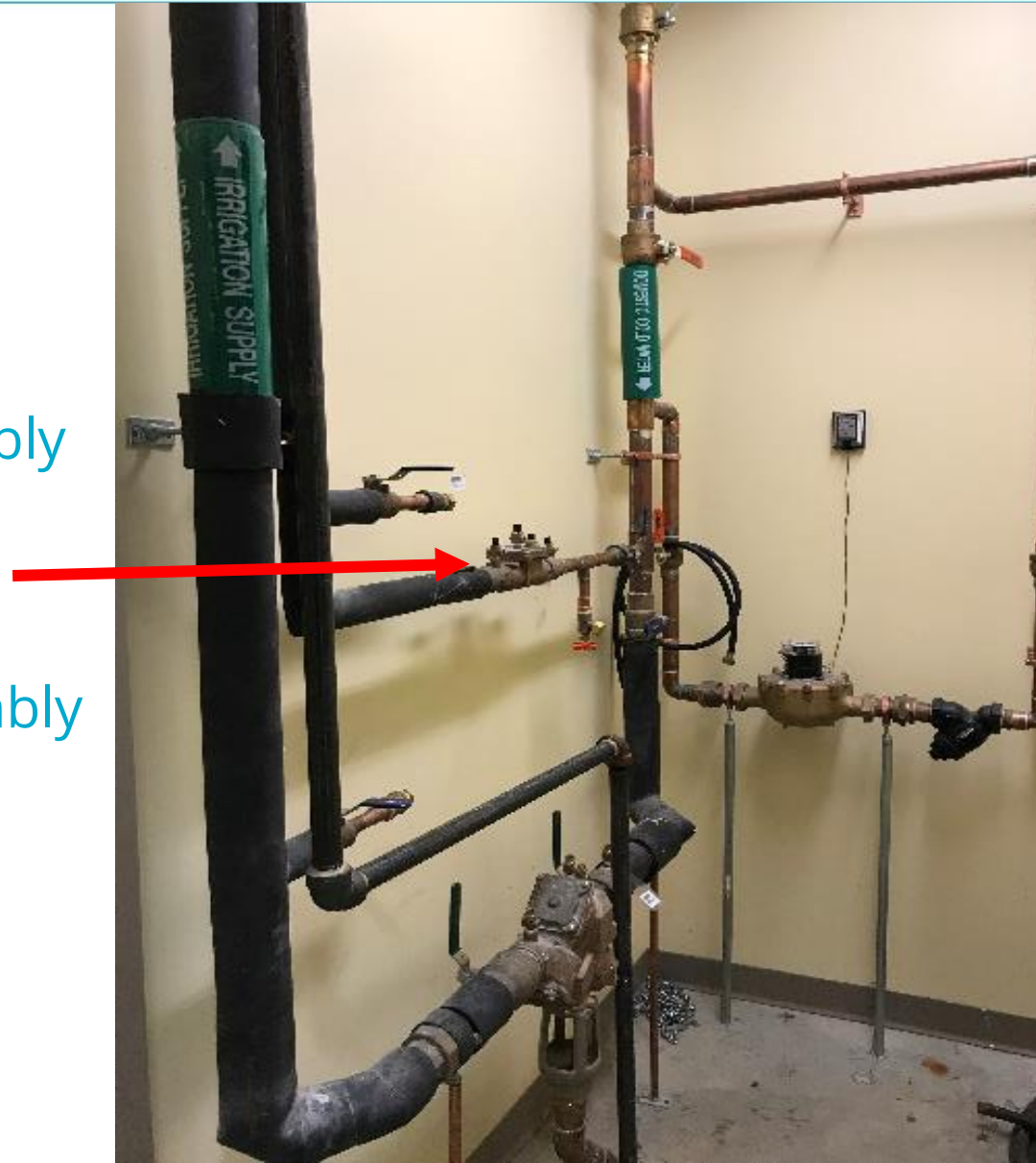


## Decorative Fountains – Typical System Makeup



# Approved?

- Double Check Valve Assembly (Low Hazard Assembly) in Supply to Fountain
- Reduced Pressure Principle Backflow Prevention Assembly Required!



# Water Wall



# Decorative Fountain – Supplied Reclaimed Water



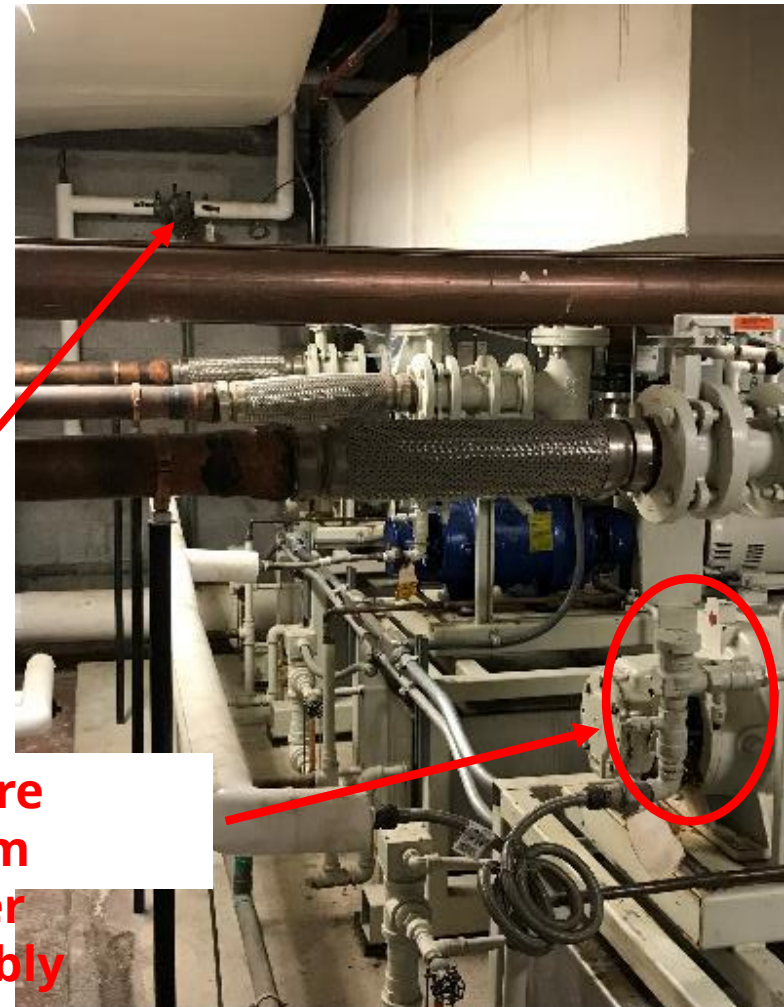


# Indoor Decorative Fountain-Manual Fill



# Medical Vacuum System Pumps

- Medical Vacuum System – pumps require water seal
- Sealing water may be once pass through (high water use), or recirculated/cooled to perform seal via a heat exchanger/chilled water (reduce water makeup)
- Reduced pressure principle backflow preventer typically required



**Pressure  
Vacuum  
Breaker  
Assembly**

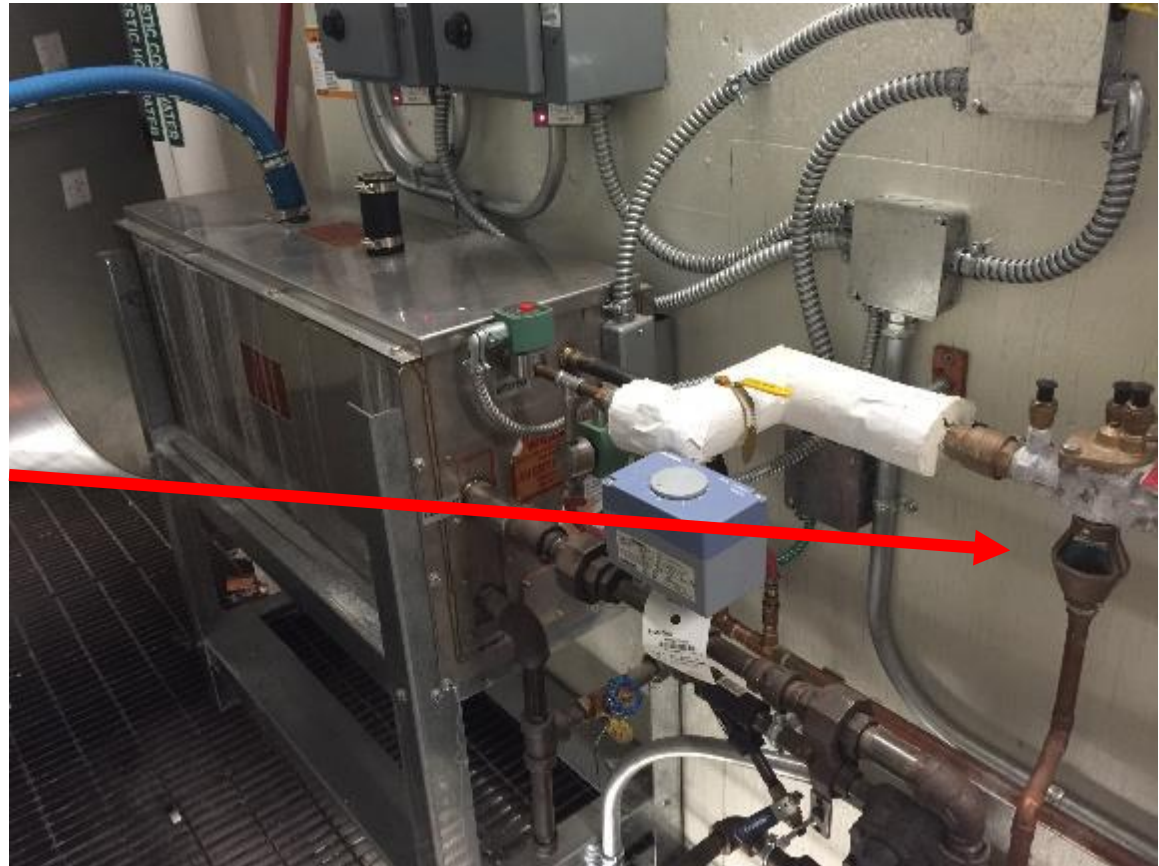
# Humidification- Water Supplied

- Steam-humidification common
- Remote water supplied units commonly found in OR and MRI areas
- Must inspect internal makeup and drain from system for approved air gap
- Multiple systems typically recommend RPBP in supply
- Picture – what's wrong???



# Steam Humification Unit

- Reduced pressure principle backflow preventer in cold water supply



# Emergency Room Decontamination Showers

- Showers for Decontamination
- Typical Hot and Cold Water routed to SVB
- Must review “Critical Level” of Spill Resistant Vacuum Breaker in relation to highest point of hose



# Janitor Sinks – Soap Dispenser

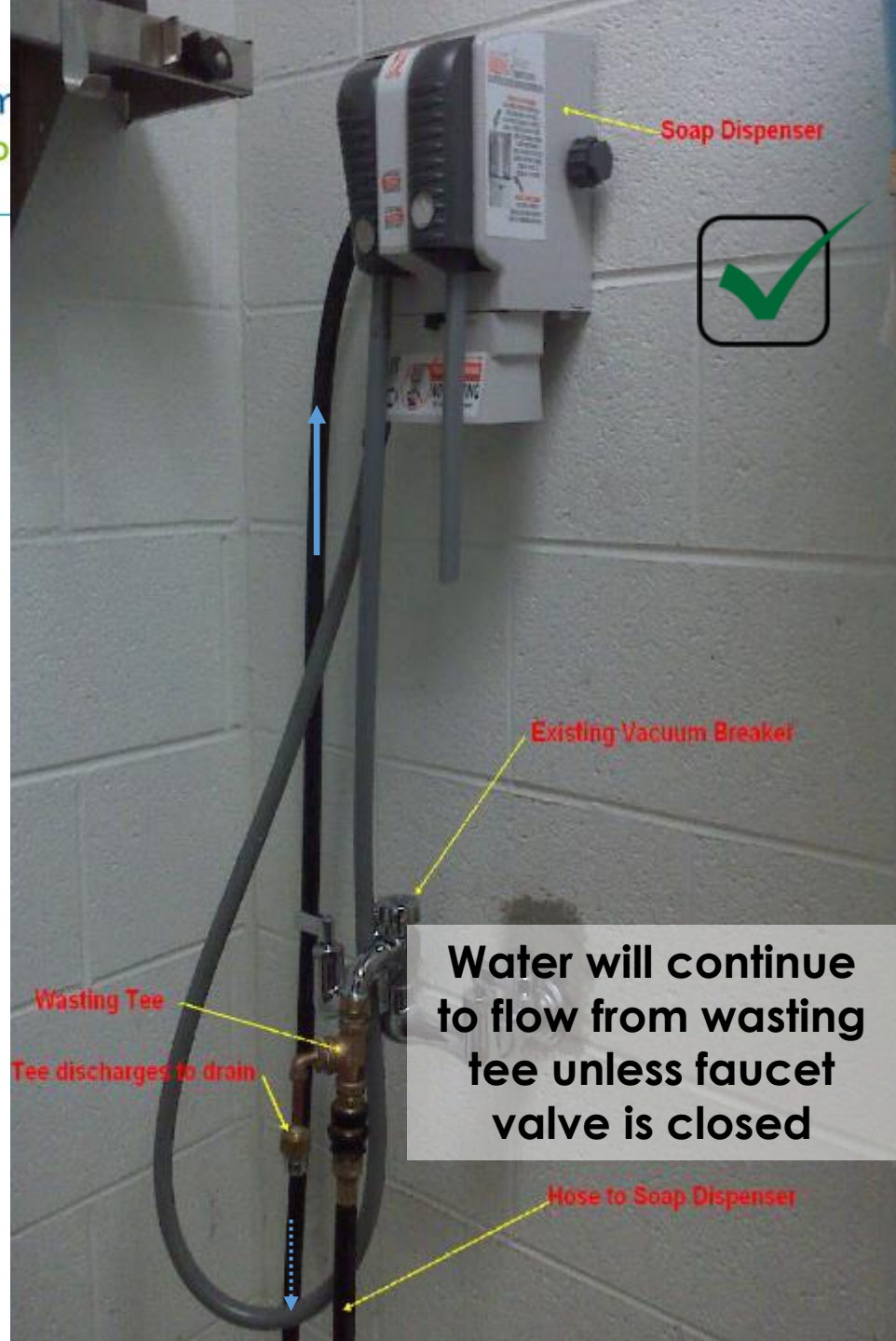
## Why Is This a Non-Compliant Installation?

- Valve is downstream of AVB at splitter and inside unit soap dispenser. AVB cannot have valve downstream.
- Hose is elevated – AVB cannot be subject to backpressure.
- AVB can fail allowing chemical to backflow into potable water supply, or allowing domestic hot water to flow into cold supply.
- **To correct this, see next slide!**



# SOLUTION: Install Water Wasting Tee

1. Forces user to shut off water supply after mixing soap and water, allowing water to drain from hose via “Wasting Tee”.
2. Shutting off water supply and allowing for hose drainage prevents “continuous pressure” and “backpressure” on AVB.
3. Protects AVB and allows it to function properly.





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# FACILITY BEST MANAGEMENT PRACTICES CCC PROGRAM

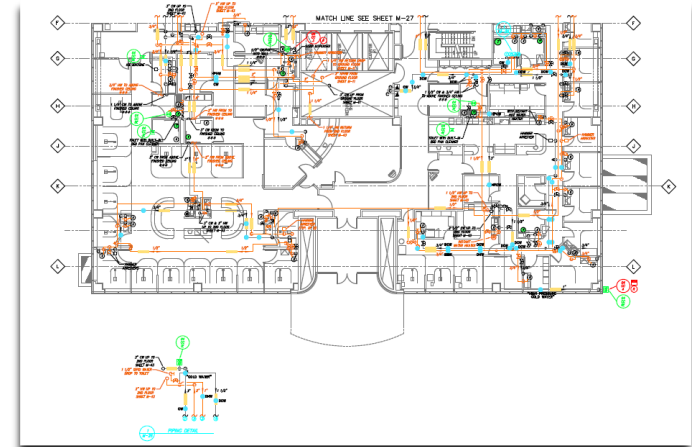


# CCC - Best Management Practices

## Develop Cross Connection Control Plan

1. Containment/Isolation Policy
2. Survey Requirements (i.e., how often)
3. Backflow Prevention Assembly Testing
4. Required and Approved Backflow Preventers
5. Recordkeeping/Data Management

CCC Plan/Program may also support efforts in *Legionella* WMP!





## Contact Us

Enter presenter information



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