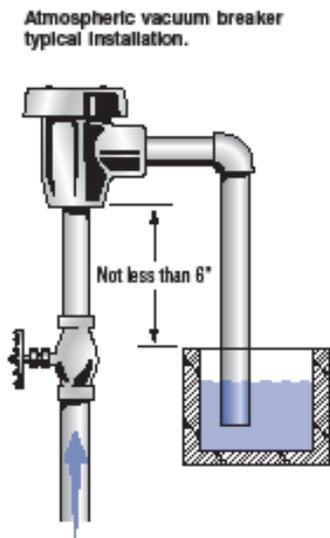


MDEQ Noncommunity Water System Workshop

Cross Connection Control Training – Commercial and Industrial Facilities



Presented by :
Glenn Adamus
Hydro Designs, Inc.



NOT MY HOUSE.....I PROMISE



There I Fixed It

HOORAY, I HAVE AN AIR GAP!....OOPS



HOMEMADE GARDEN SPRAYER.....REALLY?!?!?!?!?



Presentation Objectives

1

Quick Hints-Selecting the Right Backflow Preventer!

2

Type II Systems – Evaluating Water Supply and Internal Points of Use - Cross Connections

3

Help you Evaluate Cross Connections and Control Them



Hydro Designs, Inc.

30 Years In Business

25,000 Annual CCC On-Site Surveys

250,000 Assemblies & Devices-Database Tracking

170 Municipal Clients



- Experience
- Solutions
- Clients



Georgia-Pacific



TOYOTA

Johnson & Johnson



Pentair

NewPage



COOPER Power Systems

Honeywell

Kennedy Space Center

Auto Alliance
Ford Mazda



Protecting the Drinking Water

How Do You Select the Proper Backflow Preventer to Protect Cross Connections?

1. Evaluate the substance that could backflow – High/Health or Low Hazard?
2. Could backflow occur due to Backpressure or Backsiphonage?
3. Is “Continuous Pressure” possible (Y/N)?

CRITICAL CONCEPT!

Helpful Hints – Choosing Backflow Preventers

- Any device or assembly termed “vacuum breaker” may protect against high hazard
- Any device or assembly termed “check valve” may protect against low hazard only
- Vacuum breakers DO NOT protect against backpressure

CRITICAL CONCEPT!

HIGH VS. LOW HAZARD

Common Backflow Preventers

HIGH HAZARD

- Reduced Pressure Backflow Prevention Assembly (RPBP)
- Pressure and Spill Resistant Vacuum Breaker Assembly (PVB and SVB)
- All vacuum breaker devices
- Air Gap

LOW HAZARD

- Double Check Valve Assembly
- Vented Dual Check Valve
- Dual Check

Typical Cross Connections – Commercial/Industrial Facilities

- Chemically Treated Boilers
- Treated Water Systems
- Irrigation Systems
- Fire Protection Systems
- Heating/Cooling Systems
- Cleaning/Pressure Washer Operations
- Chemical Mixing Tanks

Industry

- Water typically used for process water, boiler/heating, cooling and potable use
 - Many opportunities to create cross connections
- Identify common hazards and how to protect them



Containment

- High Hazard type facilities may require RPBP or AG as containment for protection of PWS
 - Type II system properties may require “Containment” if multiple buildings supplied by same well
 - Containment protects PWS - ONLY!

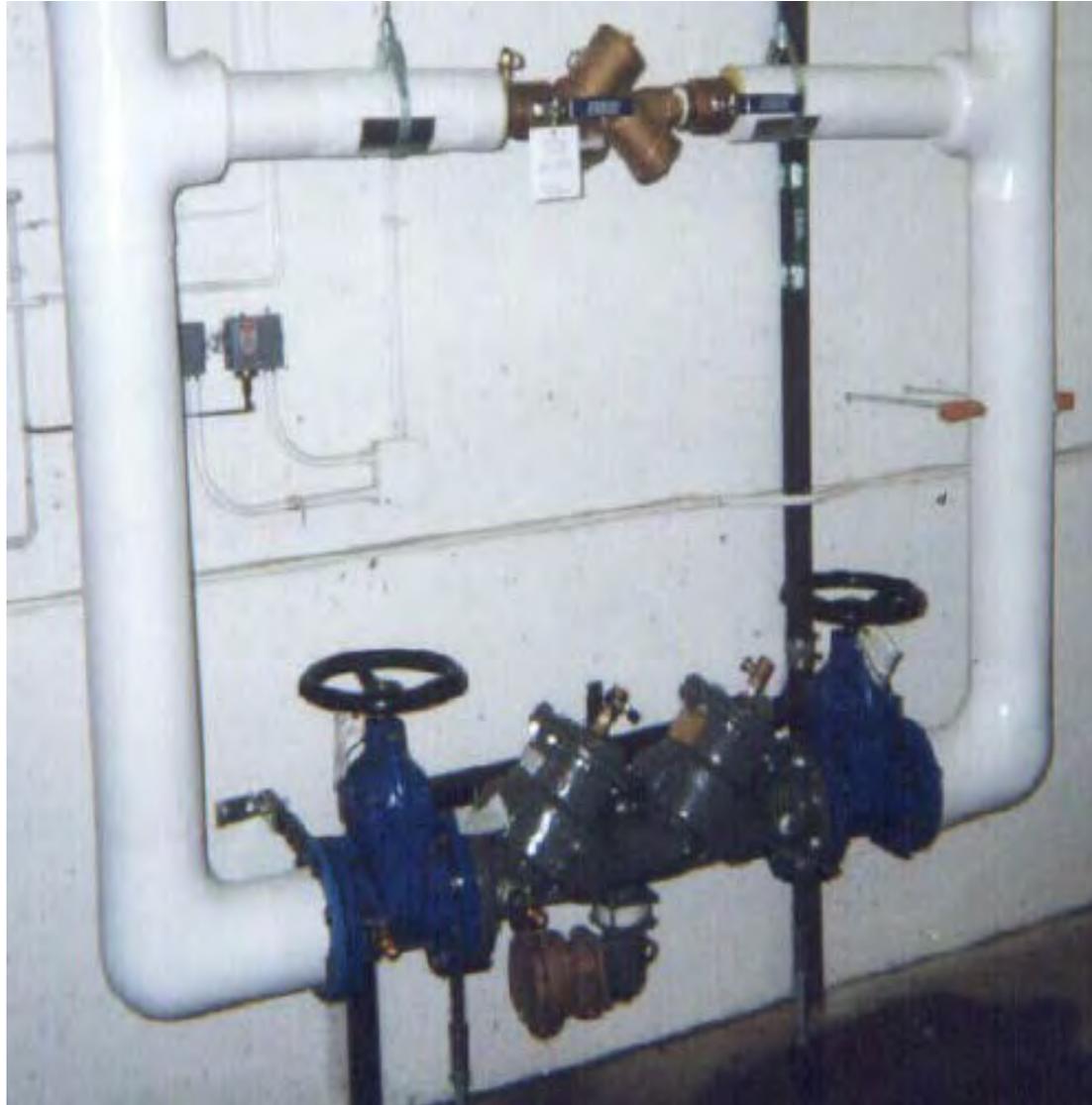
Containment



Containment - Parallel Installations

- Service line containment – may have bypass with equal protection
- Allows maintenance on one assembly while maintaining water to facility
- Bypass must have equal or greater protection

Containment Bypass



Cross Connection!

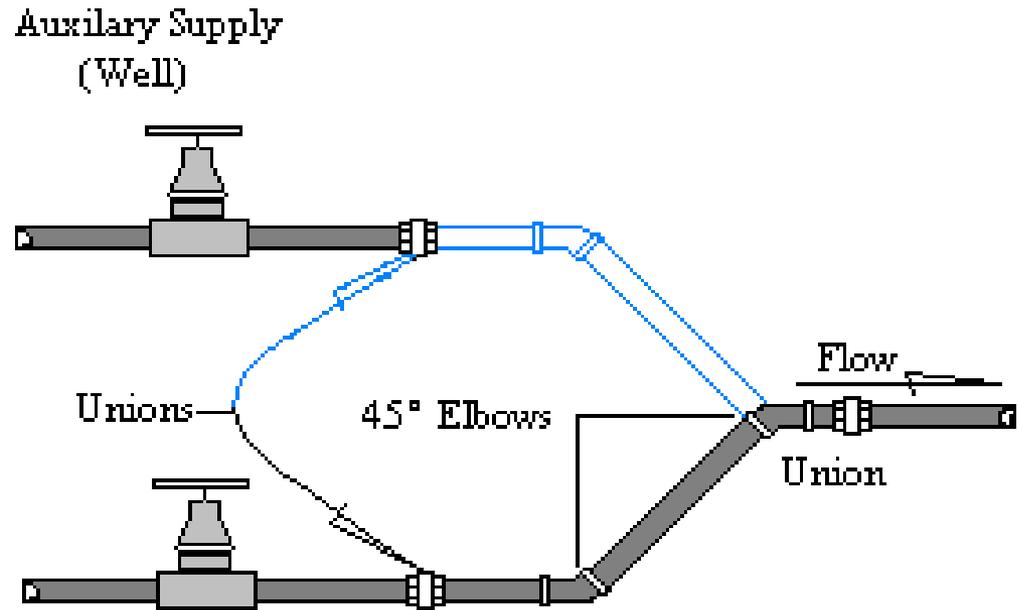
Spool Piece Flange – Private Well/City Water



Spool/Swing Connections

- Spool connections are not backflow preventers!
- Swing connections are not backflow preventers!
- A RPBP may be required on community water supply!

Swing Connection

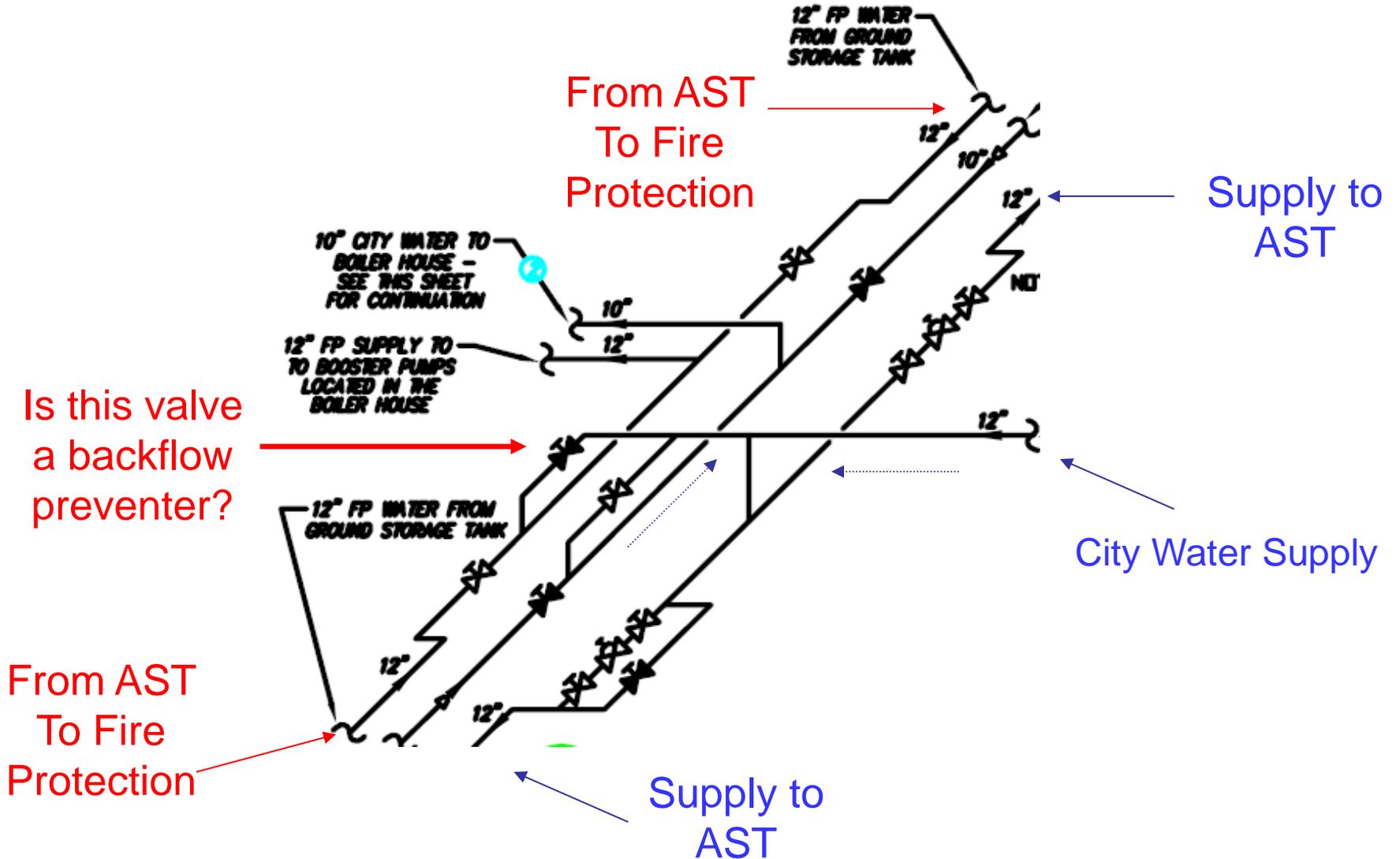


Water Storage Tank Considerations

- Some facilities have above ground storage tanks (AST's) - need to evaluate in relation to water supply arrangement/configuration



Contained?



Above Ground Water Storage Tank- Considerations

- Verify air gap in water supply
 - Ensure air gap not bypassed
- Verify what water in tank is used for?
- Is water treated or heated (steam coils?)
 - Verify condition of tank

Fire Protection Systems

- Often supplied directly by PWS and upstream of other building containment
- Fire Protection (FP) system may represent High Hazard or Low Hazard

Fire Protection Systems

- Evaluation of system may involve consultation with PWS, fire marshal, facility, insurance companies, etc.
- FP systems have specific flow and pressure requirements

Fire Protection System Types

- Types of Systems
 - **Wet Pipe** - system employing sprinklers attached to piping system-connected to water supply – backflow concern
 - **Dry Pipe** - sprinklers attached to piping system containing air-release of air allows water to enter system through dry pipe valve
 - **Preaction** - similar to Dry Pipe, supplemental detection system in same area as sprinklers

Fire Protection System – International Plumbing Code (IPC)

- IPC 608.16.4
 - Dry pipe and Preaction systems do not require isolation
 - Wet systems shall have the potable water supply protected by either RPBP or DCV
- IPC 608.16.4.1
 - Chemical addition to FP system or connection to non-potable secondary water supply requires RPBP protection
 - Chemical addition – RPBP may be used to isolate portion of FP system vs. entire FP system

Pumps

- **Booster Pumps**
 - Used to supply high volumes of water – electric, diesel, or combination
 - May be water cooled/glycol mix via single wall heat exchanger
- **Jockey Pumps**
 - Low volume, high pressure pump to maintain elevated pressure in system
 - Supplied water from city/domestic or FP system







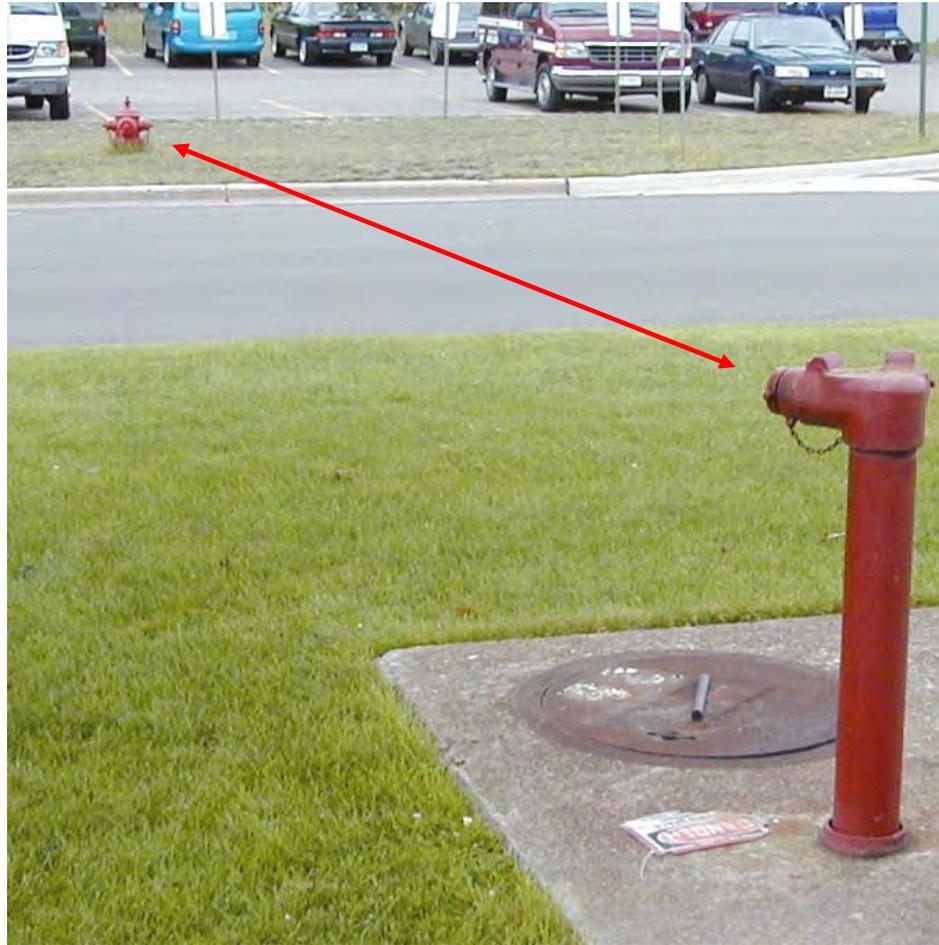
Fire Protection Systems

- What factors may increase hazard level with Fire Protection Systems?
 1. Chemical treatment to FP system
 2. Presence/condition of above ground storage tanks
 3. Siamese/pumper and hydrant connection locations
 4. Fire Department – water source?
 5. Evaluate Jockey and Booster Pumps

Pumper Connection



Hydrant/Pumper



Double Check Valve Assembly - FP









Industry

- Internal/Isolation Hazards

Hose Connections

- Most common cross connection!
- **IPC 608.15.4.2 Hose connections** = “Sillcocks, hose bibbs, wall hydrants ...with a hose connection shall be protected by an AVB or PVB or a permanently attached HBVB”
 - *2 Exceptions – Hot water tank drains and residential clothes wash machines*
- High hazard cross connection
- Continuous pressure and physical location will dictate type of protection

Example – Antifrost Hose Bibb Vacuum Breaker (AFHBVB)



Exterior Wall Hydrants/Hose Connection

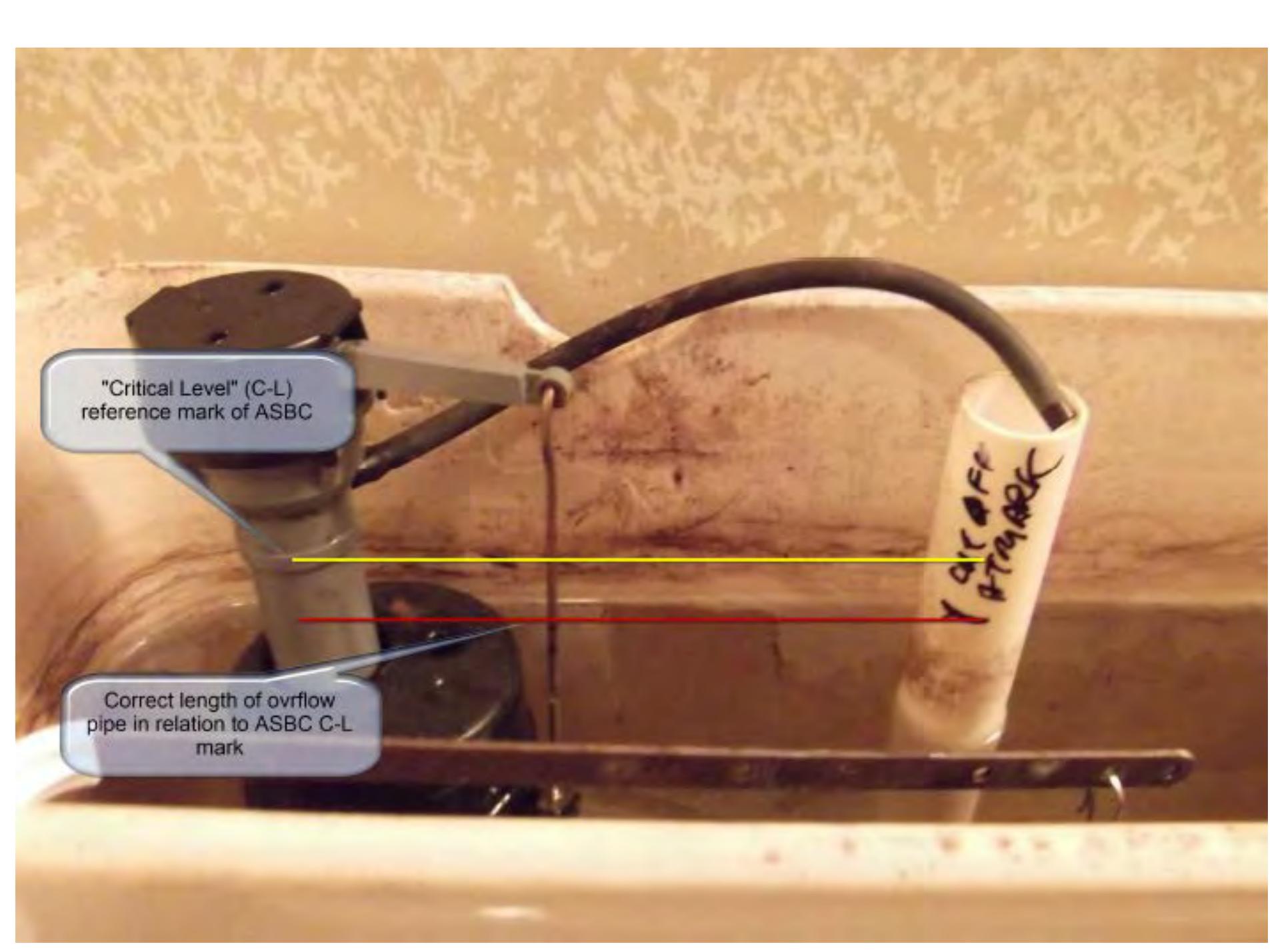
- May not be approved to protect against backflow
- May need to install AFHBVB onto existing wall hydrant
- Hydrants may be ASSE 1019, 1052 or 1053



Toilets

- Approved Antisiphon Ballcock Assembly required (ASSE 1002)
- Critical level of device must be 1" above top of overflow tube
- High Hazard cross connection

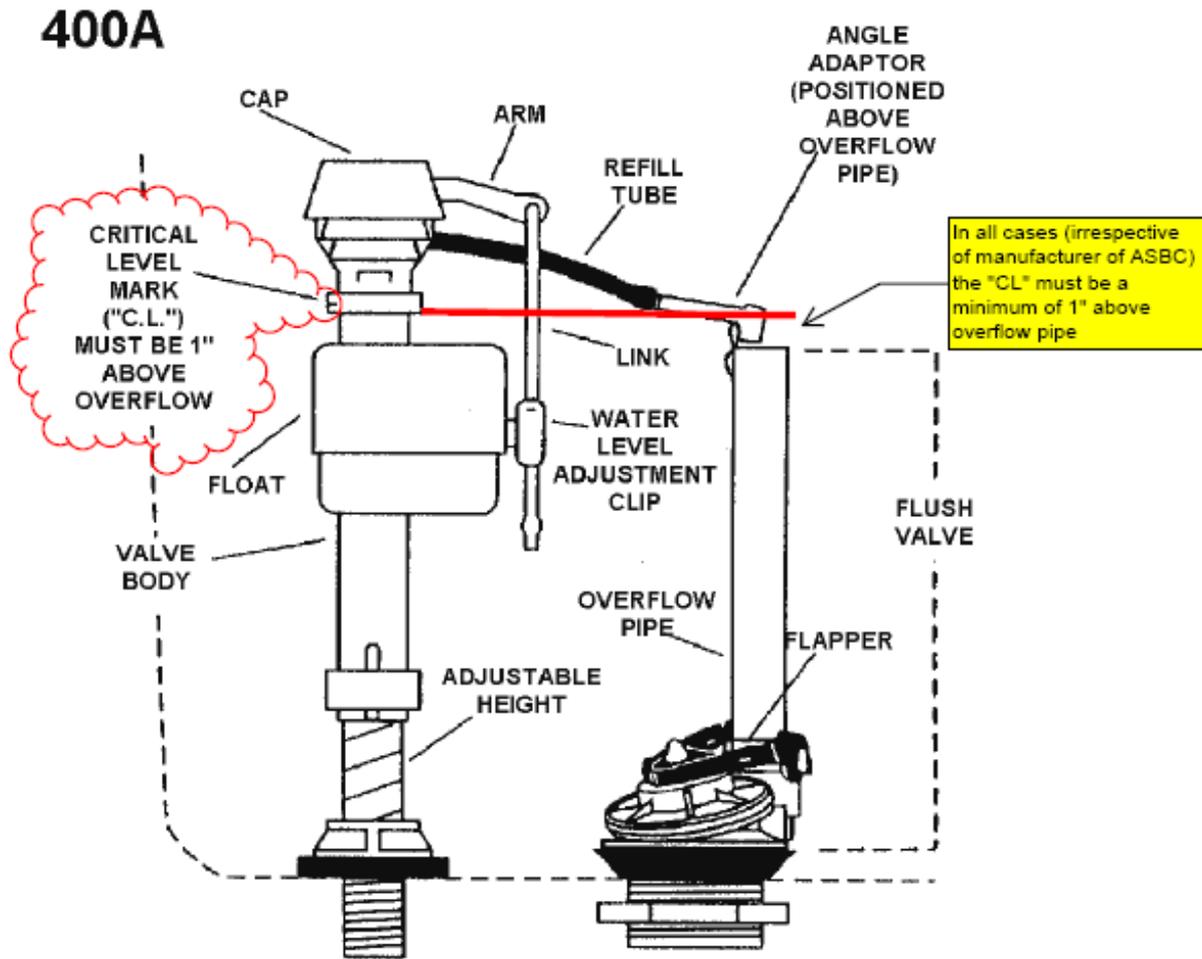




"Critical Level" (C-L)
reference mark of ASBC

Correct length of overflow
pipe in relation to ASBC C-L
mark

Anti-Siphon Ballcock Installation Requirements



Urinals

- Vacuum breaker critical level must be 6" above top of urinal
- Sanitizer connection point must be 6" below critical level of vacuum breaker



Sloan Flush Valve – Fixture Vacuum Breaker

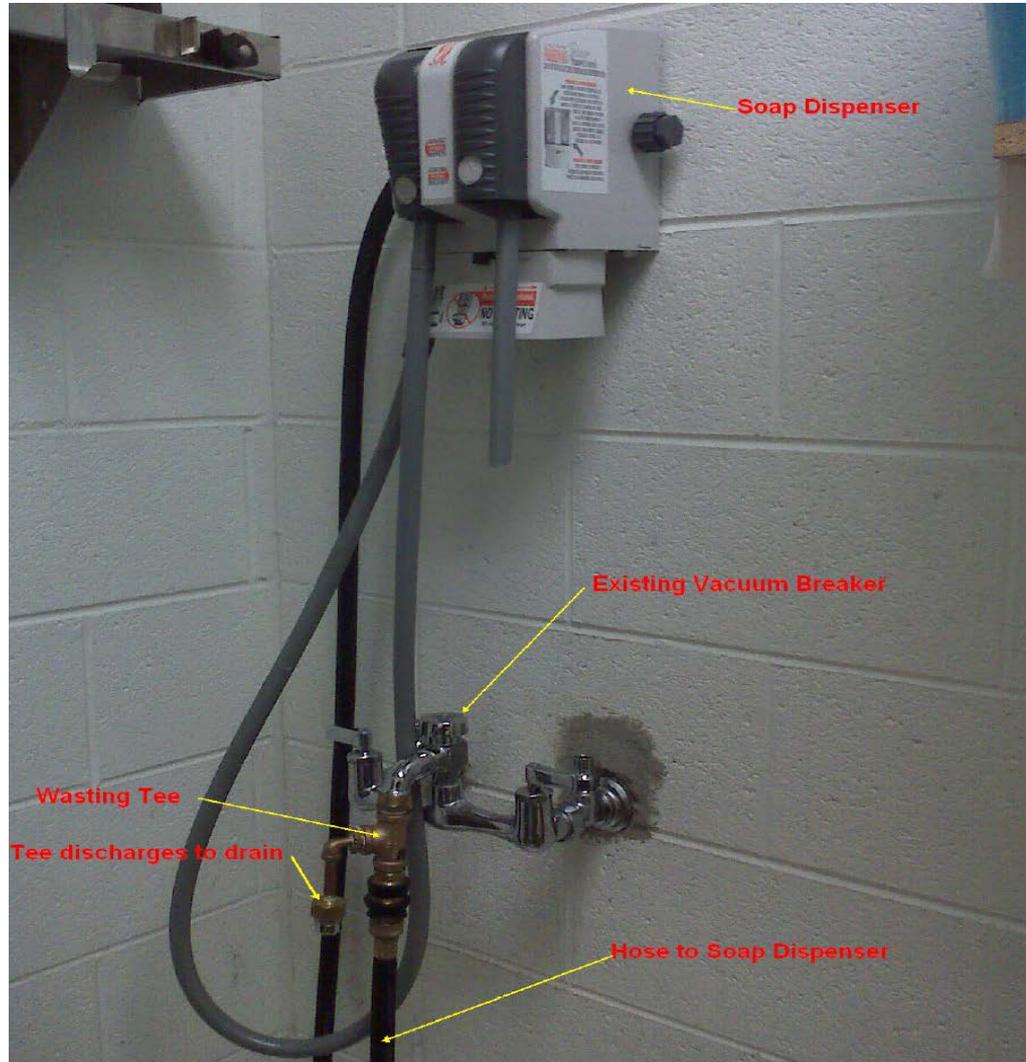


Janitor Sinks

- AVB required for threaded outlet to protect against submerged inlet
- No valves/valved splitters downstream of AVB
- High Hazard cross connection



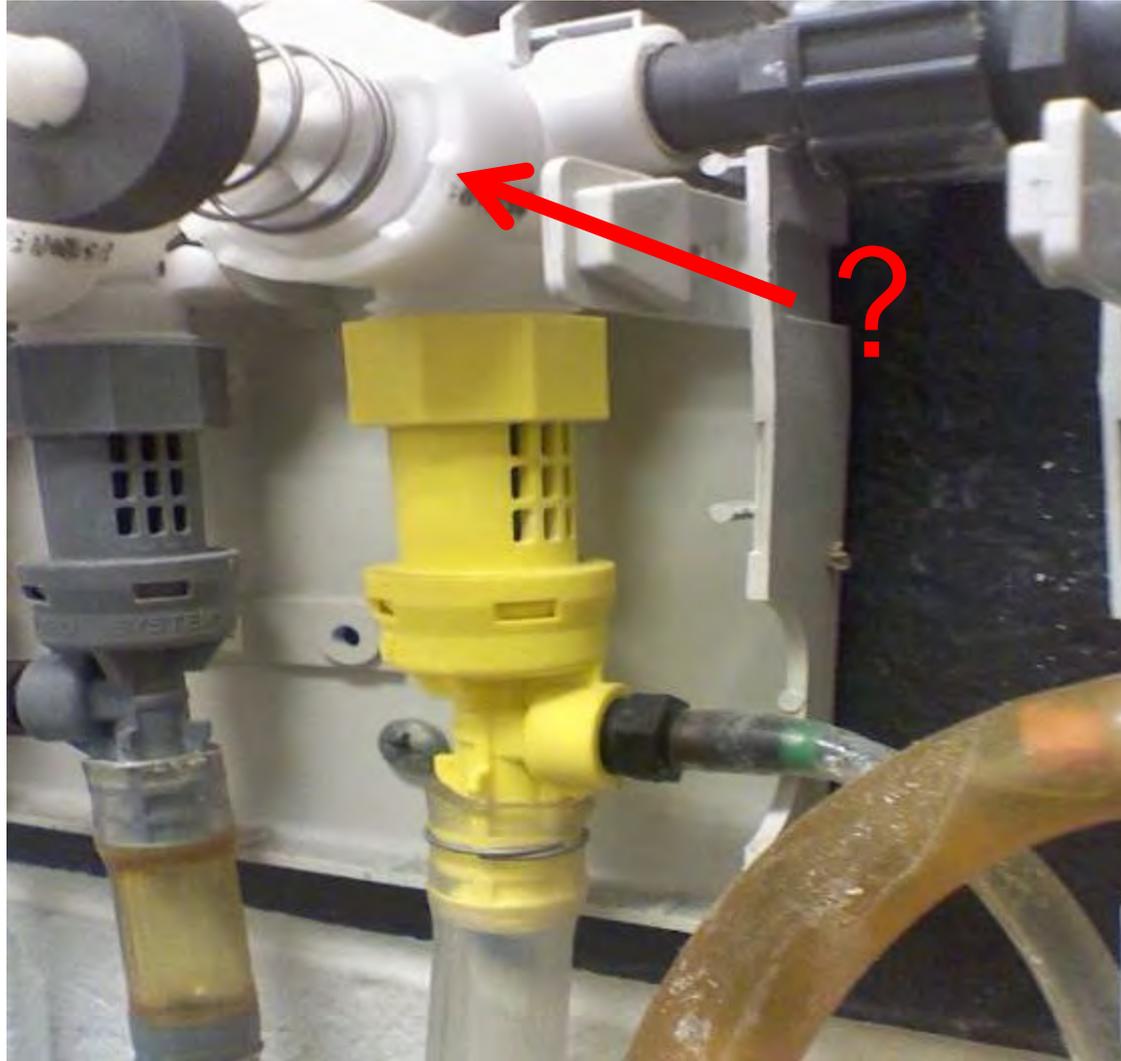
Chemical Dispensing Systems



Chemical / Soap Dispensers

- Only ASSE 1055 devices should be accepted
- May be equipped with internal Air Gap
- May be equipped with external Atmospheric Vacuum Breakers or internal Hose Bibb Vacuum Breakers

Inside ASSE 1055 Dispenser With Air Gap



Dispenser With HBVB (ASSE 1011)



Chemical / Soap Dispensers

1. May be supplied from a dedicated water supply:
 - If this is the case and the dispenser is an approved ASSE 1055A device, **no further action will be required**
2. May be supplied from a mop sink faucet having an approved vacuum breaker:
 - If this is the case and the dispenser is an approved ASSE 1055B device, the **installation of a water wasting tee / side kick device will be required**

Back-Flow Prevention: All Soap Dispensing Stations

AFTER CONTAINERS HAVE BEEN
FILLED WITH SOAP/WATER MIXTURE –

**HOSE MUST BE DISCONNECTED
FROM THE SINK WATER LINE.**

Water Treatment

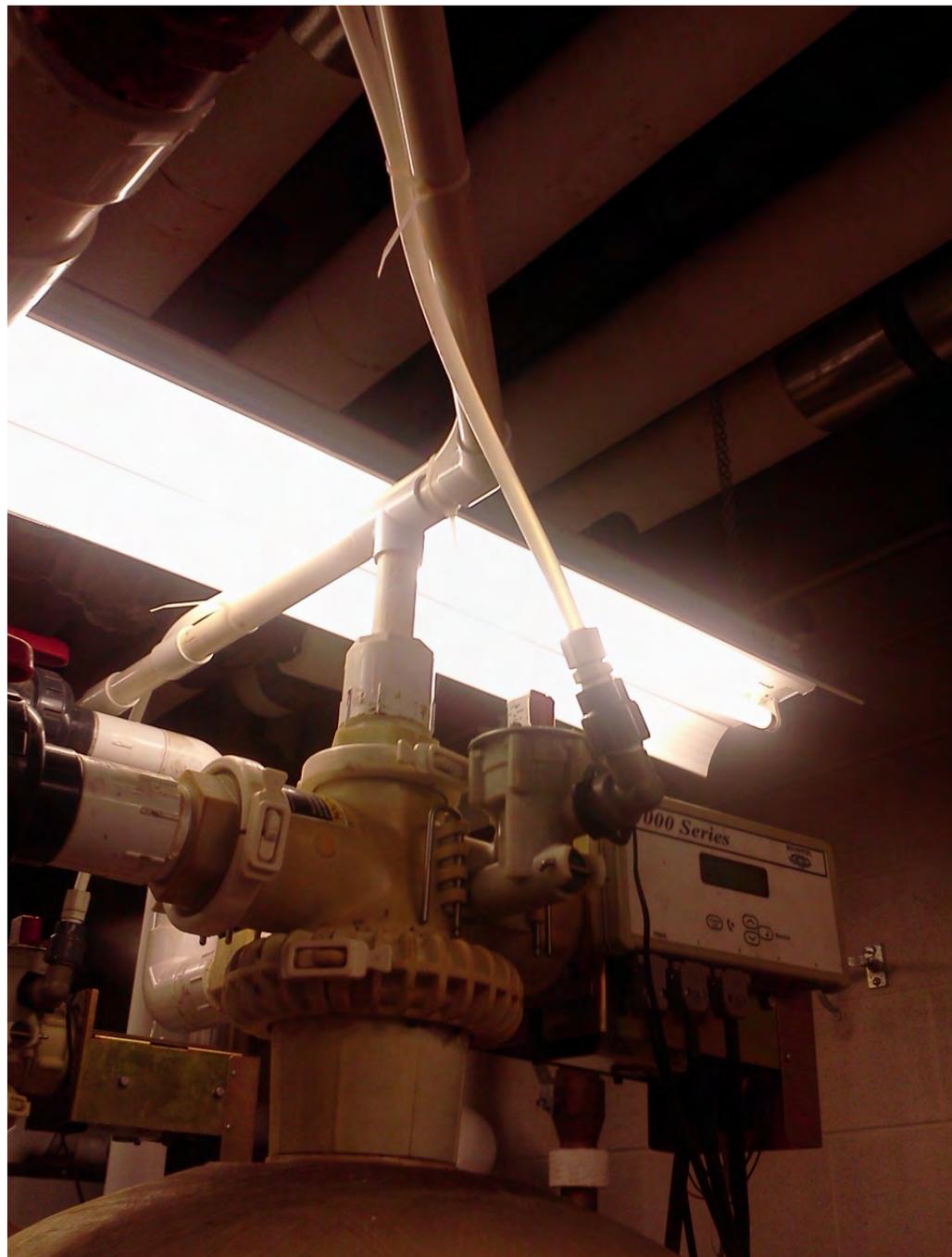
- Water Softeners
- Reverse Osmosis
- Deionized Water
- Protection with RPBP on potable water makeup required if used for Non-Potable/Process Water

Water Softeners

- Water softeners need to be regenerated using brine solution to continue to function
- Drain line from regenerating or backwashing of cycles from softener may pose a high hazard cross connection hazard!
- Submerged inlet may be created due to drain line connection to sanitary drain

Water Softener Drain - Air Gap Required









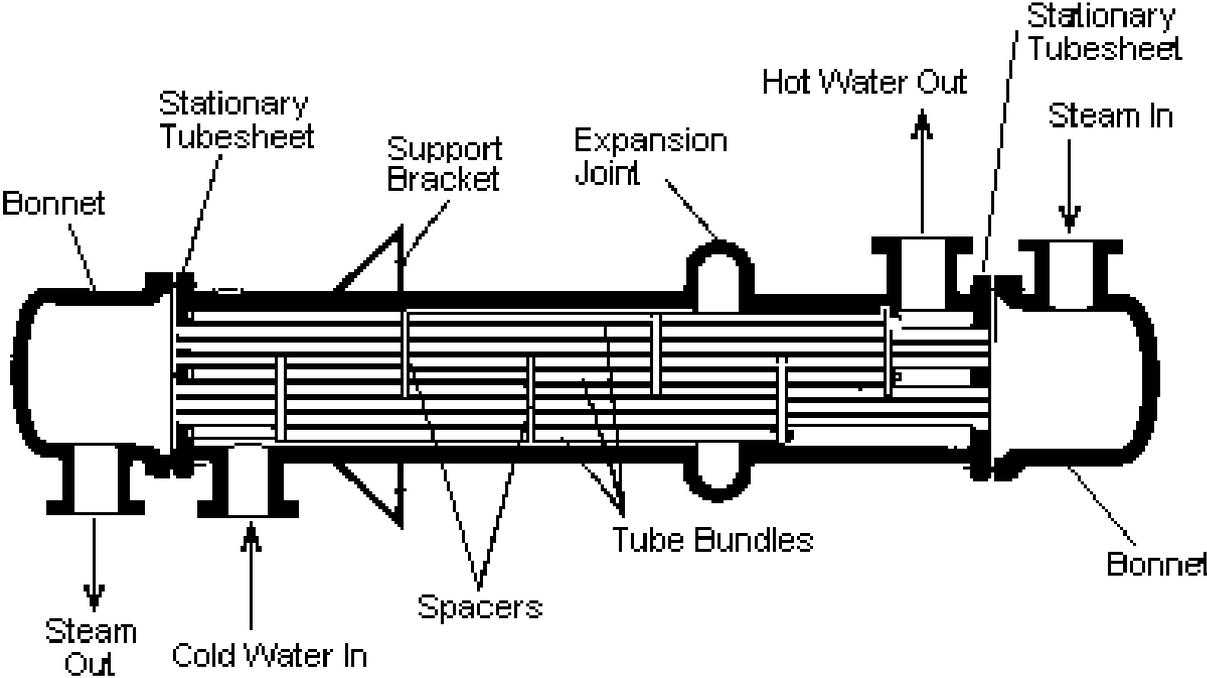
Heat Exchangers

- Steam heat exchangers used to produce domestic and process hot water
- “Double wall” and “single wall” tube versions separate water from steam/transfer fluid
- Steam flows through tubes/surrounded by water

Heat Exchangers

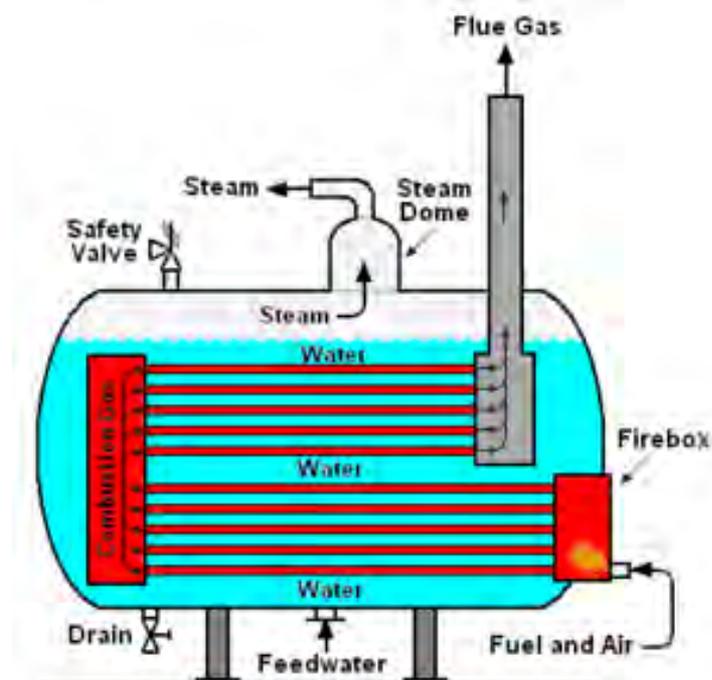
- Steam may be source of contamination (additives)
- IPC 608.16.3 requires use of **double wall** type for domestic use if TOXIC additives used
- **Single wall** shall be permitted for domestic use with addition of only NON-TOXIC additives

Heat Exchanger



Boilers

- Boiler is a closed system in which water is heater under pressure
- Hot water used for multiple purposes
- Water may require treatment prior to boiler



Boilers

- IPC 608.16.2 requires VDCV (ASSE 1012) in supply to non-treated boiler = low hazard
- Chemical treatment/conditioning chemicals added = high hazard cross connection – RPBP (ASSE 1013) required in water supply

Untreated Boiler



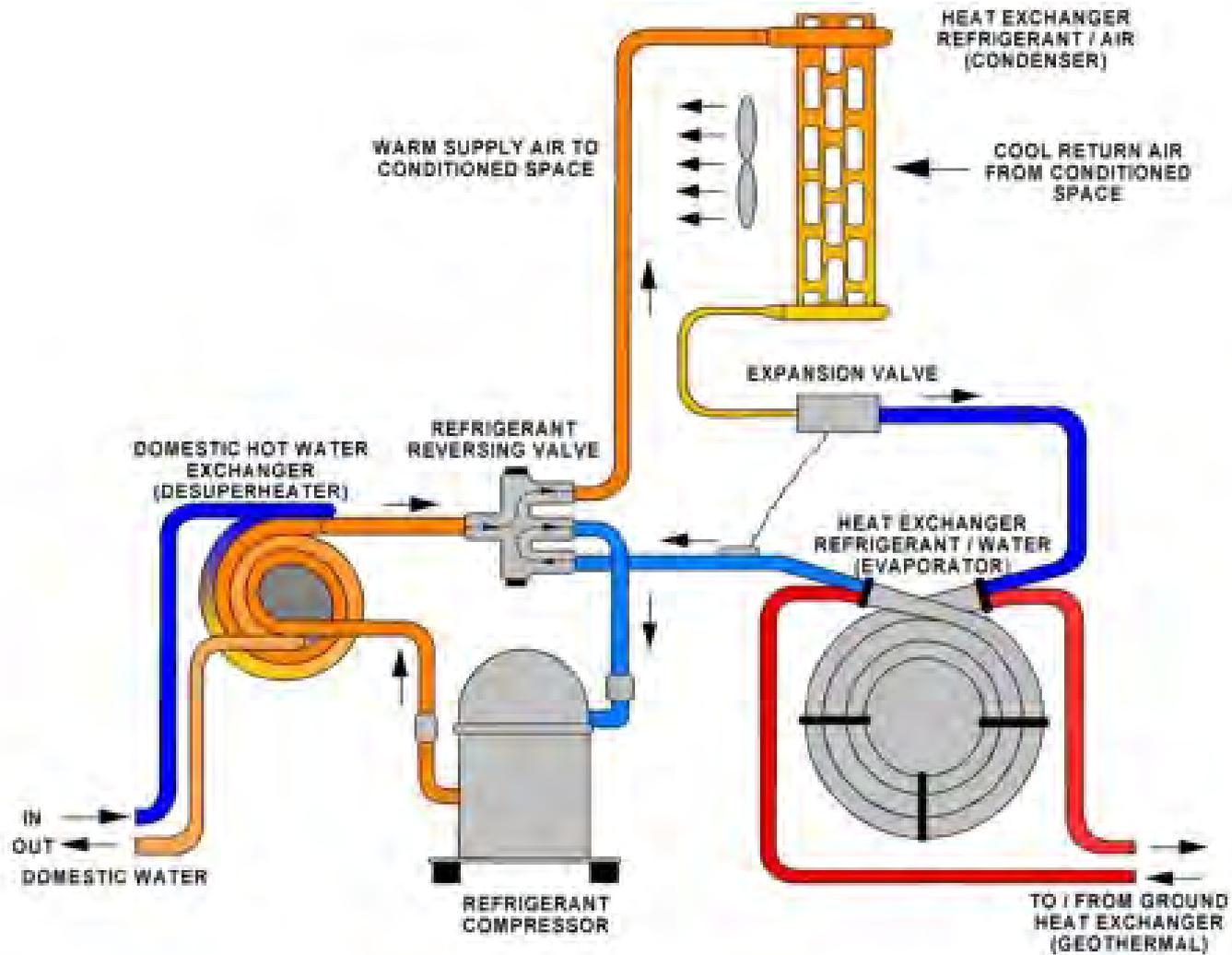
Untreated Boiler Supply

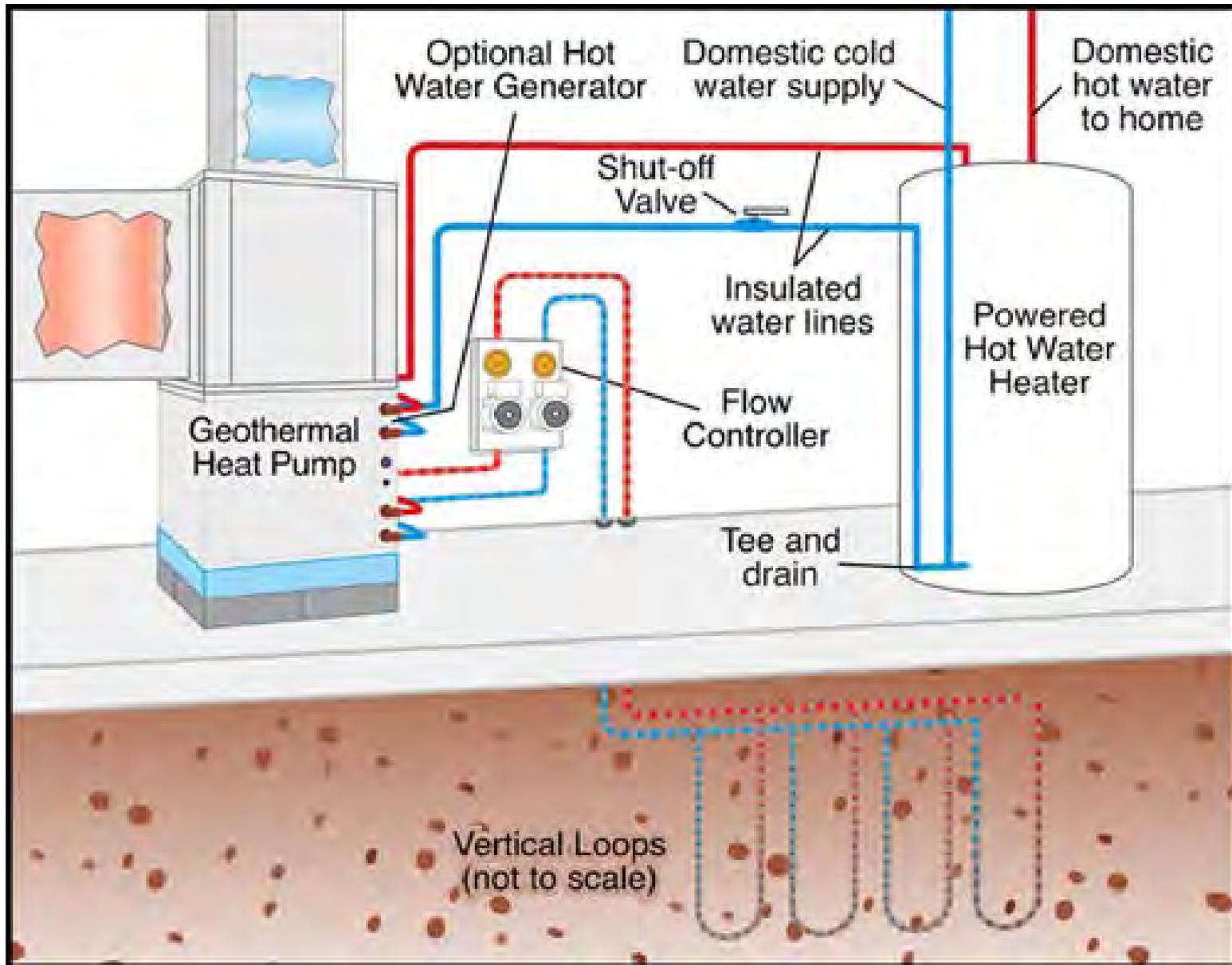


Solar Hot Water System



Geothermal Systems





Cooling Towers

- Cooling towers cool condenser water–cooling systems
 - Water recirculated, chemicals may be added (corrosion inhibitors, biocide)
- Potable water makeup is required as system water levels decrease
- High Hazard protection required on potable water supply due to chemicals, bacteria, vermin, etc.

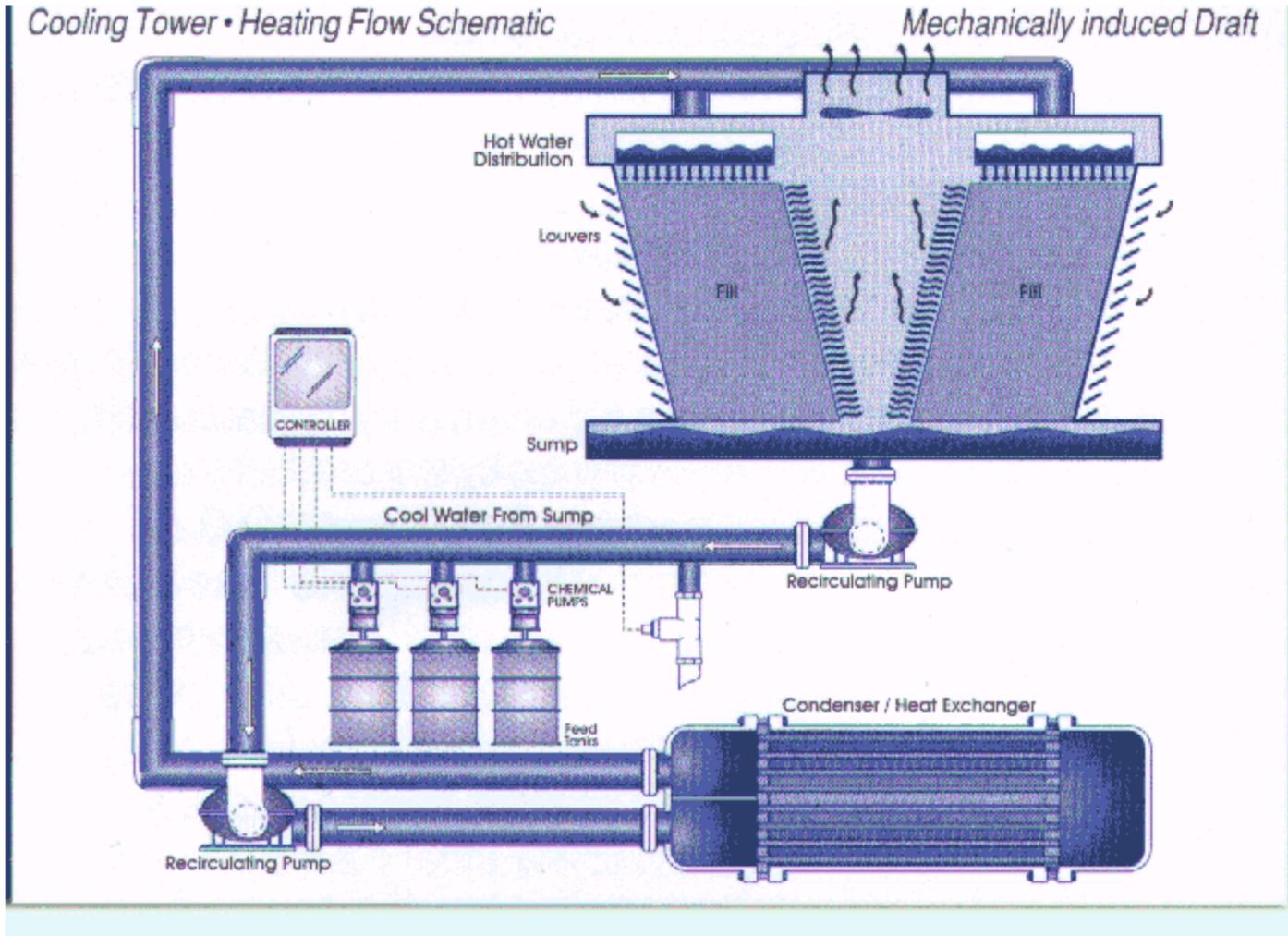
Cooling Tower



Cooling Towers

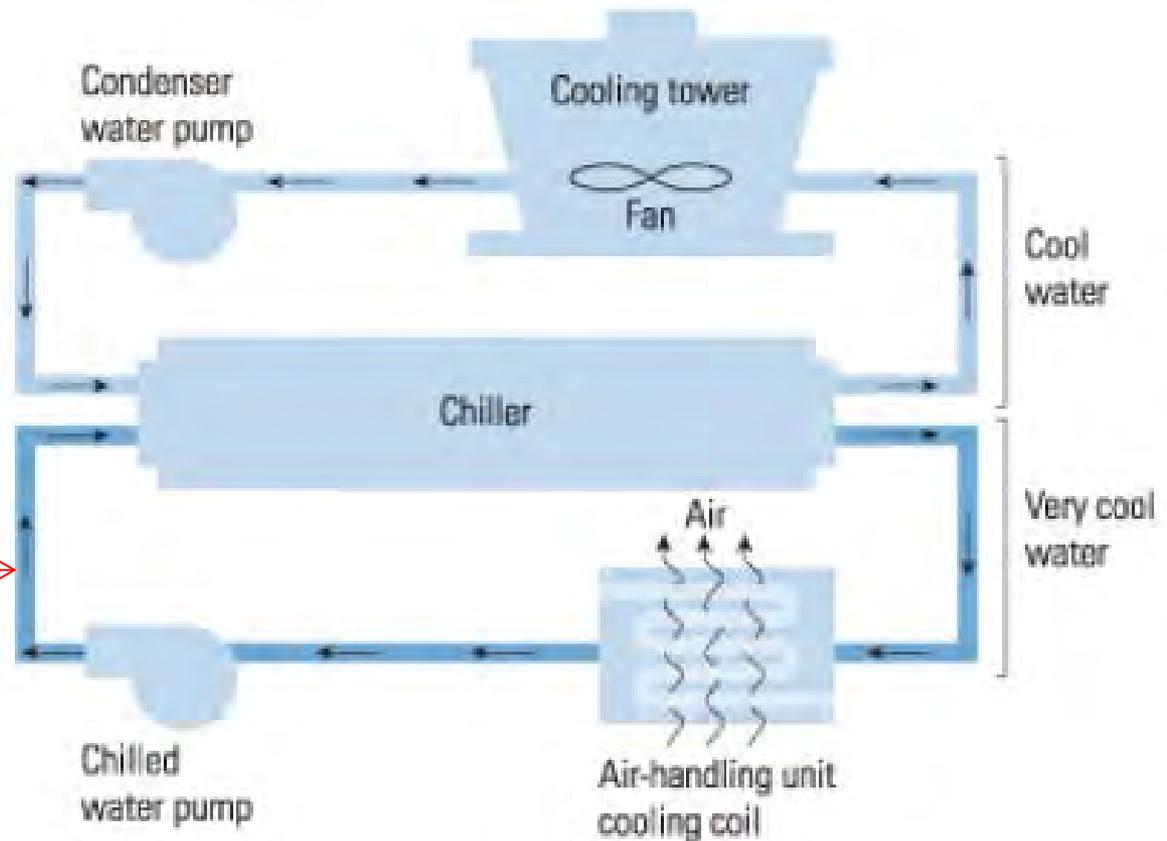
- Air gap – effective cross connection control method
- Air gap **must** be outside of enclosure (contaminated water vapor)
- RPBP - correct application under backpressure conditions or if water makeup is inside cooling tower

Cooling Towers



Chilled Water Loop Makeup

Return Line-Water
Makeup-protection
required?





CHILLED WATER
RETURN

65
228 B

RW



Lawn Irrigation Systems

- Water used to irrigate premises
- Sprinkler heads may be exposed to chemicals, environment
- Potable water supply represents High Hazard cross connection (chemicals, bacteria)

Lawn Irrigation Systems

- IPC 608.16.5 - RPBP, PVB, AVB may be appropriate water supply protection
- PVB most commonly seen
- Code requires that ANY chemical addition requires RPBP in water supply
- Pumps, injectors, pressurized tanks used for introducing chemicals

Lawn Irrigation System – Approved PVB Installation



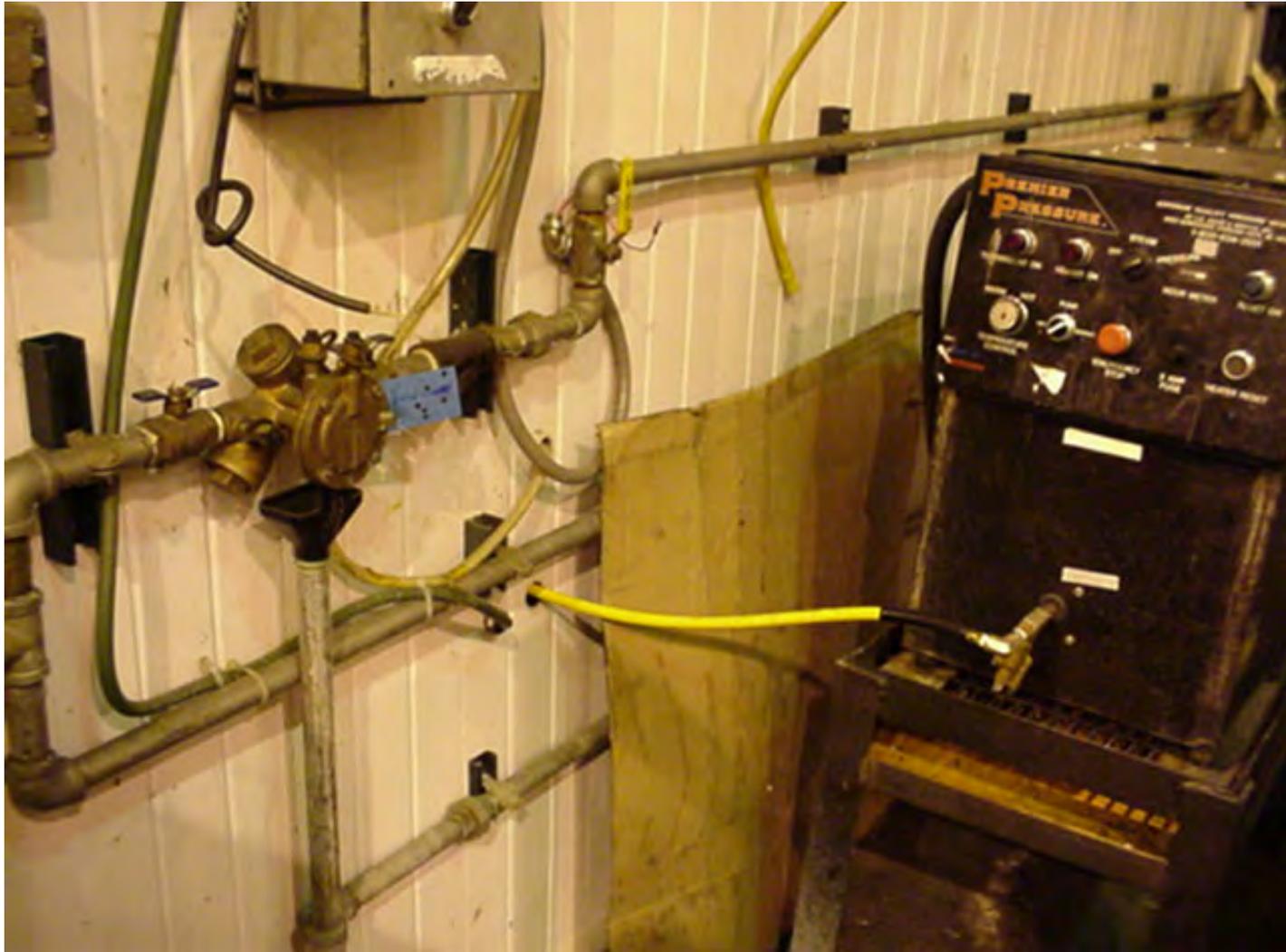
Power Washers

- Require water supply, a pump to pressurize the incoming water, a chemical aspirator to draw a cleaning chemical (soap) into the water stream and a wand to direct the water/chemical solution
- Water may be direct feed to pump, or supplied to holding tank – feeds pump
- Represents **High Hazard** cross connection

Power Washers

- Direct feed to pump = Backpressure condition
– RPBP required on supply!
- Direct feed to holding tank = Backsiphonage condition – inspect internal Air Gap/supply - install PVB in supply

RPBP Supplying Power Washer





Power/Steam Cleaner Holding Tank



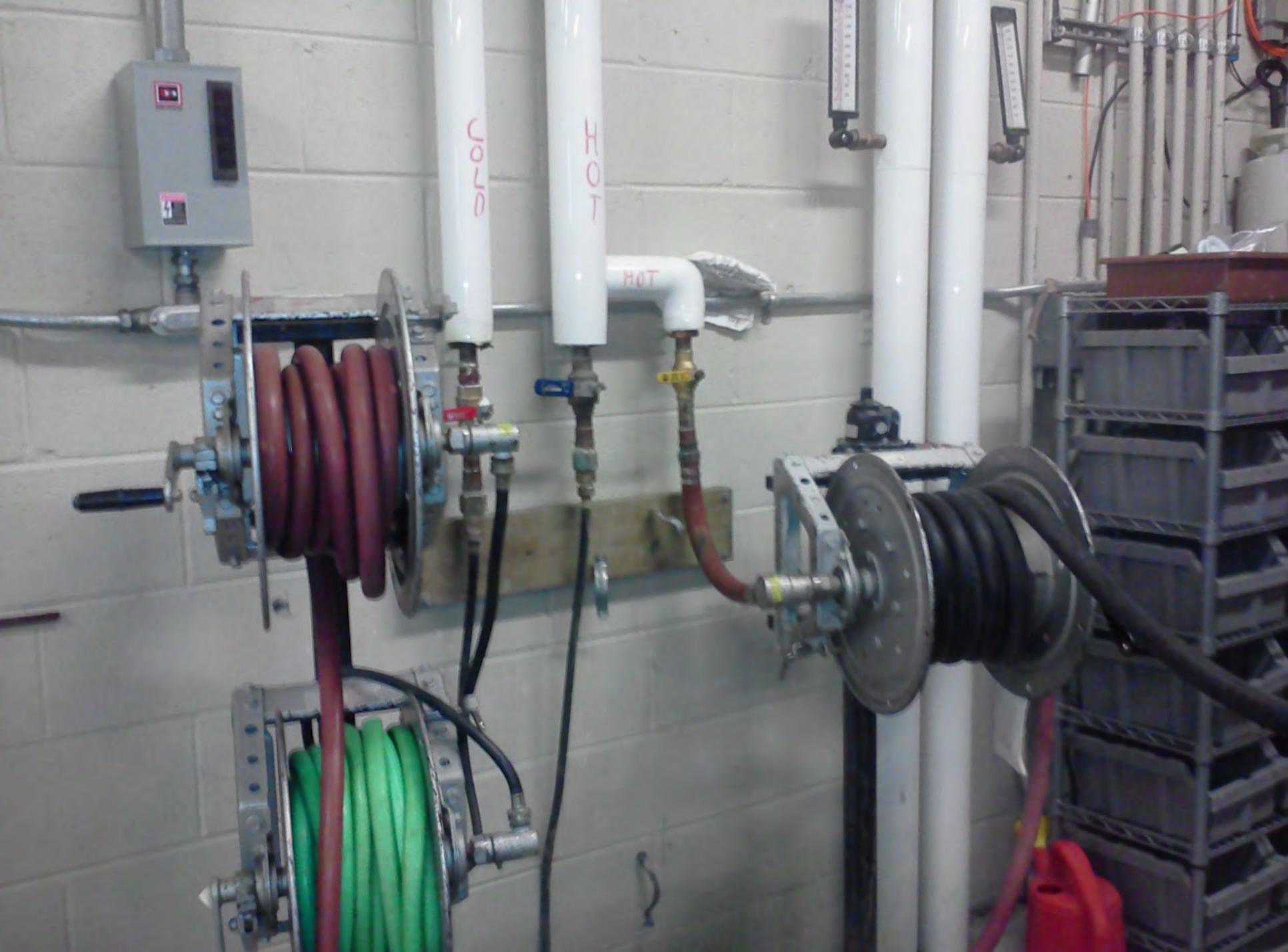
Valved Hoses/Reels

- Very common for cleaning purposes
- Garage areas, food processing areas, plant floor cleaning
- Represents a High Hazard cross connection – Backsiphonage
- RPBP, SVB or PVB appropriate



Valved Hoses/Reels





Food Establishment Hazards

- Water used extensively for food preparation and cleaning purposes
- Water used for beverage dispensers
- Similar cross connections may be found as in Industrial Facilities (Fire Protection, Boilers, Water Softeners, Lawn Irrigation, etc.).

Typical Food Establishment Equipment Requiring An Air Gap

- Steam Kettles / Pot Fillers
- Ice Machine Condenser Drains (Water Cooled)
- Walk-In-Cooler Condenser Drains (Water Cooled)
- Chemical / Soap Dispensers
- Sinks/Dip Sinks
- Dish Hand Sprayers
- Water Softener and Filter Drain Lines
- Coffee Machines

Dish Hand Sprayer – Air Gap



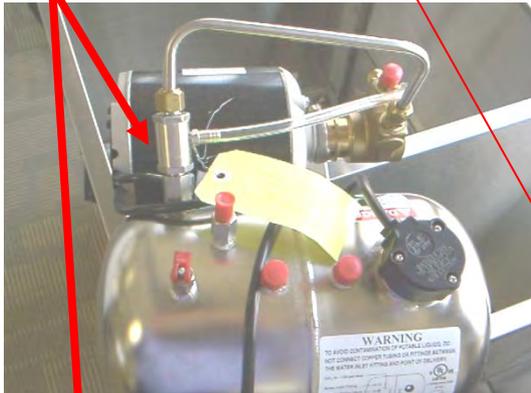
IPC Section 608.16.1

“The water supply connection to coffee machines and non-carbonated beverage dispensers shall be protected against backflow by a backflow preventer conforming to ASSE Standard 1022 or by air gap.”

A.S.S.E. 1022 Typical Applications

- Espresso Machines
- Coffee Pots/Coffee Vending Machines
- Ice Makers (with no internal air gap)
- Juice Machine
- Slushy/Slurpee Machine
- Soda Fountain Carbonators

ASSE 1022 Device
(mfg by Watts)

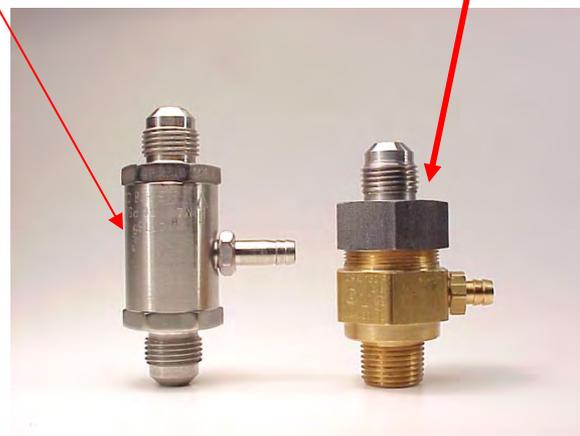


ASSE 1022 Tag

New Style ASSE 1022
(mfg by Abco)



McCann's E200397 Carbonator with New ASSE 1022 Device



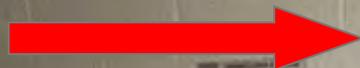
Soda Fountain Carbonator



Equipment Typically Requiring An Atmospheric Vacuum Breaker or Pressure Vacuum Breaker

- Garbage Disposals
- Dishwashers
- Chemical/Soap Dispensers
- Garbage Can Washers
- Mop Sinks
- Hose Connections
- Trough Urinals
- Water Closets/Urinals With Sloan Type Flush Valves
- Pasta Cookers and Rethermalizers

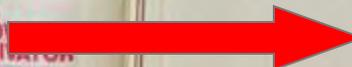
Dishwasher AVB



Soap Dispenser AVB



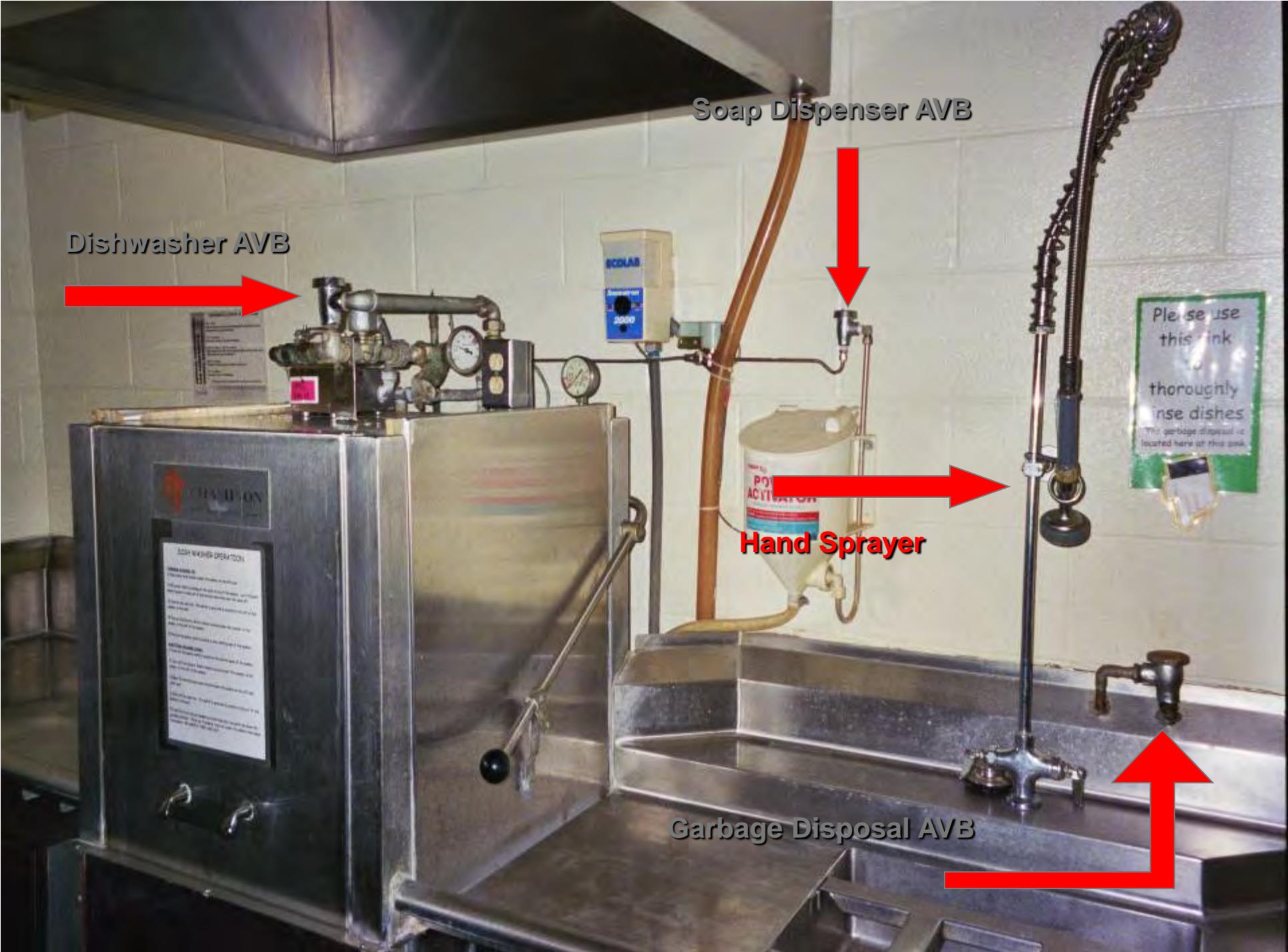
Hand Sprayer



Garbage Disposal AVB



Please use
this sink
thoroughly
use dishes
The garbage disposal is
located here at this sink



Lab Faucets

Lab faucets require AVB protection, or LFVB protection



General Office/Commercial Typical Cross Connections

- Toilets
- Urinals
- Janitor Sinks
- Hose bibbs
- Cafeteria Equipment

General Office/Commercial Typical Cross Connections

- Chemical Dispensers
- Boilers
- Cooling Towers
- Irrigation
- Fire Protection Systems

School/College

Typical Cross Connections

- Toilets
- Urinals
- Janitor Sinks
- Hose bibbs
- Cafeteria Equipment
- Chemical Dispensers
- Boilers
- Labs
- Pools

School/College

Typical Cross Connections

- Sterilizers and Autoclaves
- Film Processing
- Cooling Equipment
- Irrigation
- Fire Protection Systems

You Make The Call!







Return

CW fill

VDCV that replaced DC

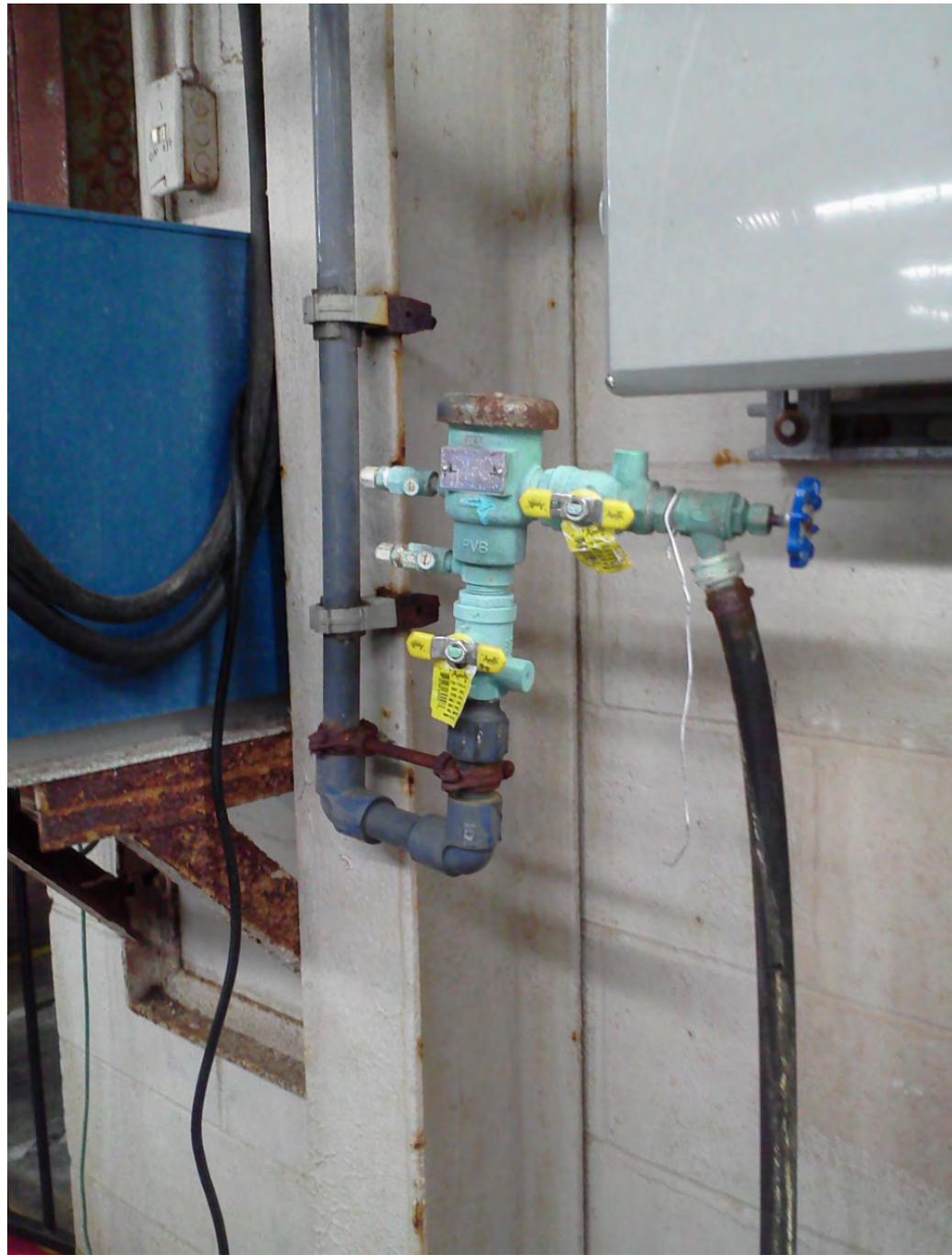
Feed

Heater

SHELITE I
NATURAL CORK











1842

TEST VALVE
IN SERVICE
IN SERVICE
IN SERVICE

TEST OF BACKFLOW
PREVENTOR



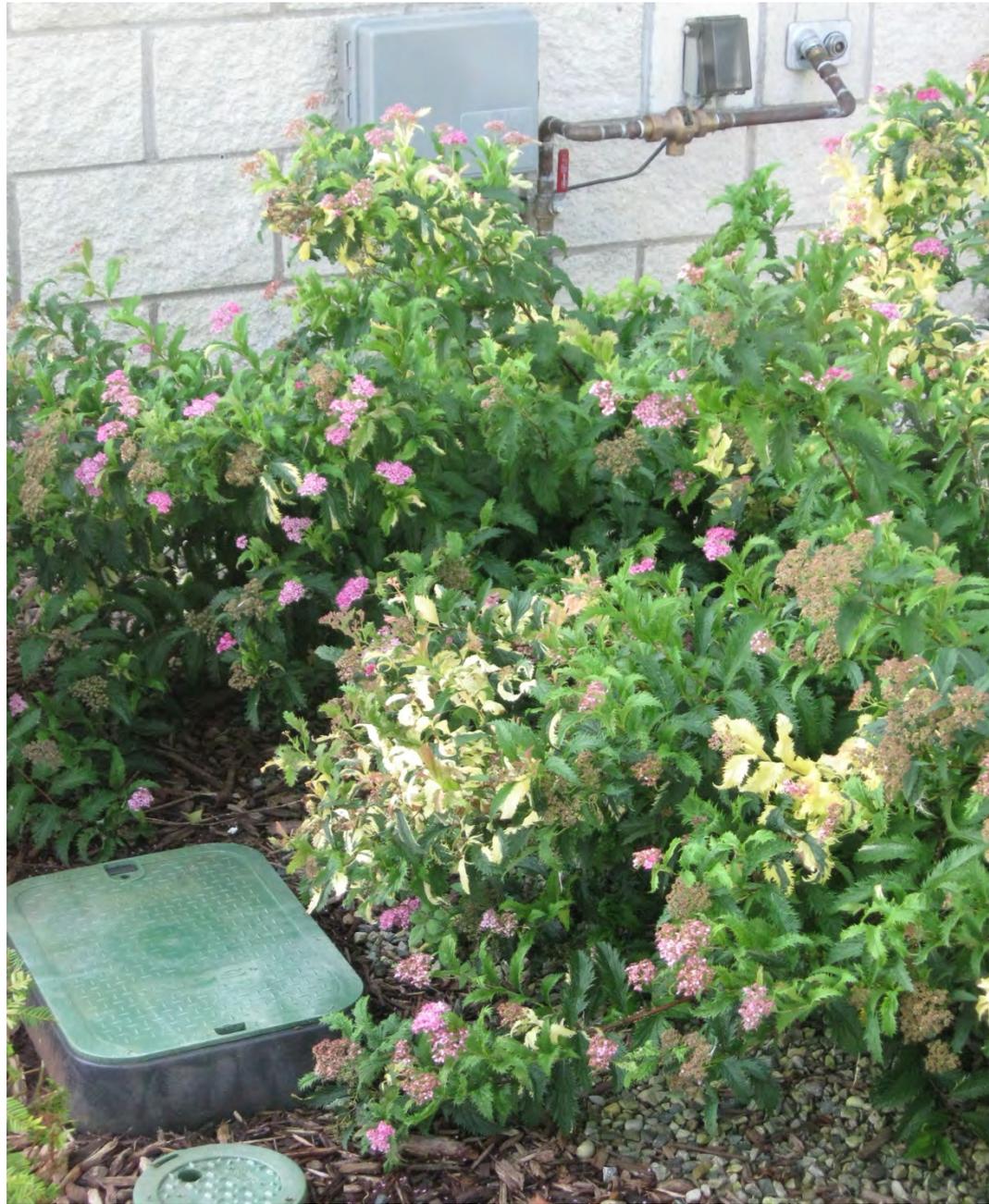
Tundra
ISGLATION TUYAUX

POUR CONDUITE D'EAU
CHAUDE-FROIDE

Mur **1**

CUIVRE, CTS-CPVC
EN FER 3/4 po











7. 1. 2003





Double Detector Check Valve?



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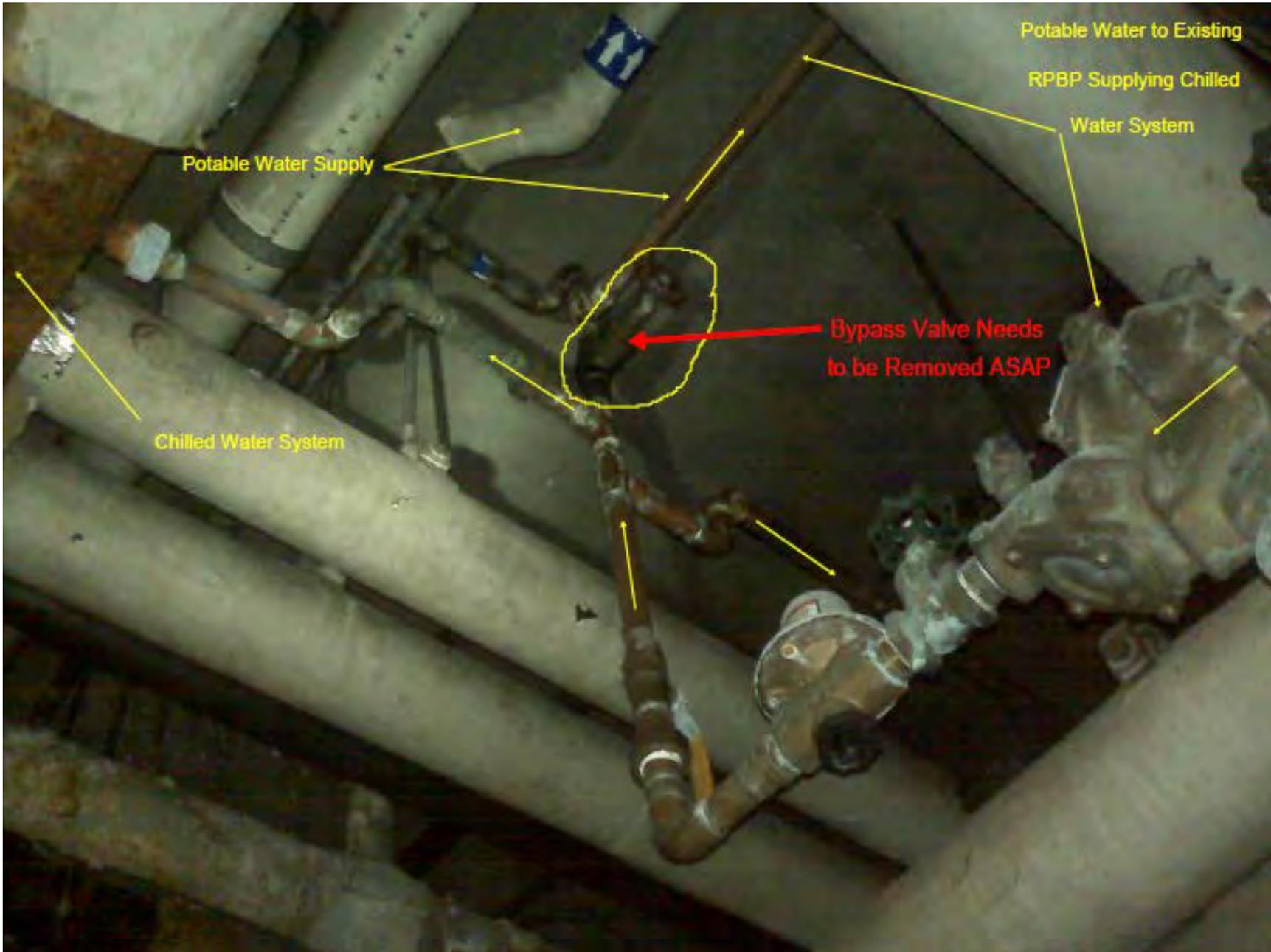




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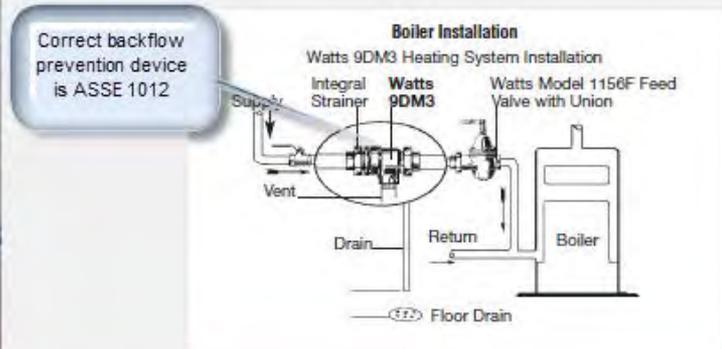
Potable Water Supply

Potable Water to Existing
RPBP Supplying Chilled
Water System

Chilled Water System

Bypass Valve Needs
to be Removed ASAP

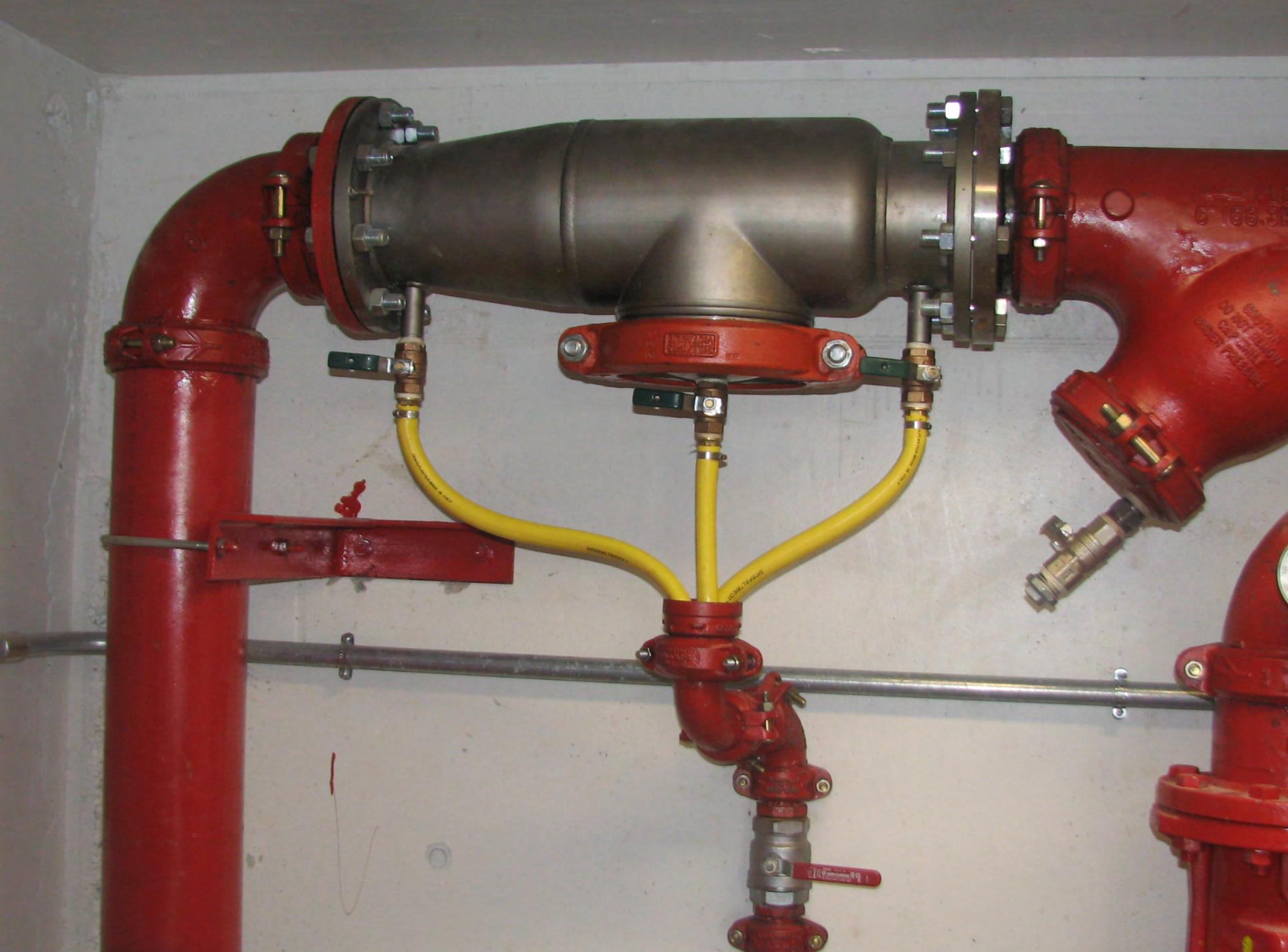




The following reference is from the 2009 Plumbing Code

608.16.2 Connections to boilers. The potable supply to the boiler shall be equipped with a backflow preventer with an intermediate atmospheric vent complying with ASSE 1012 or CAN/CSA B64.3. Where conditioning chemicals are introduced into the system, the potable water connection shall be protected by an air gap or a reduced pressure principle backflow preventer, complying with ASSE 1013, CAN/CSA B64.4 or AWWA C511.











Glenn Adamus

Vice President - Operations

Hydro Designs, Inc.

5700 Crooks Road, Ste. 100

Troy, MI 48098

800.690.6651 toll free

Office: 248.250.5015

gadamus@hydrodesignsinc.com