

5 Stories on Why Your Potable Water System Needs To Be Surveyed

How to Know—and What to Do About It



LIVE REPORT • WATER SYSTEM DISRUPTION

TUBA CITY, ARIZONA

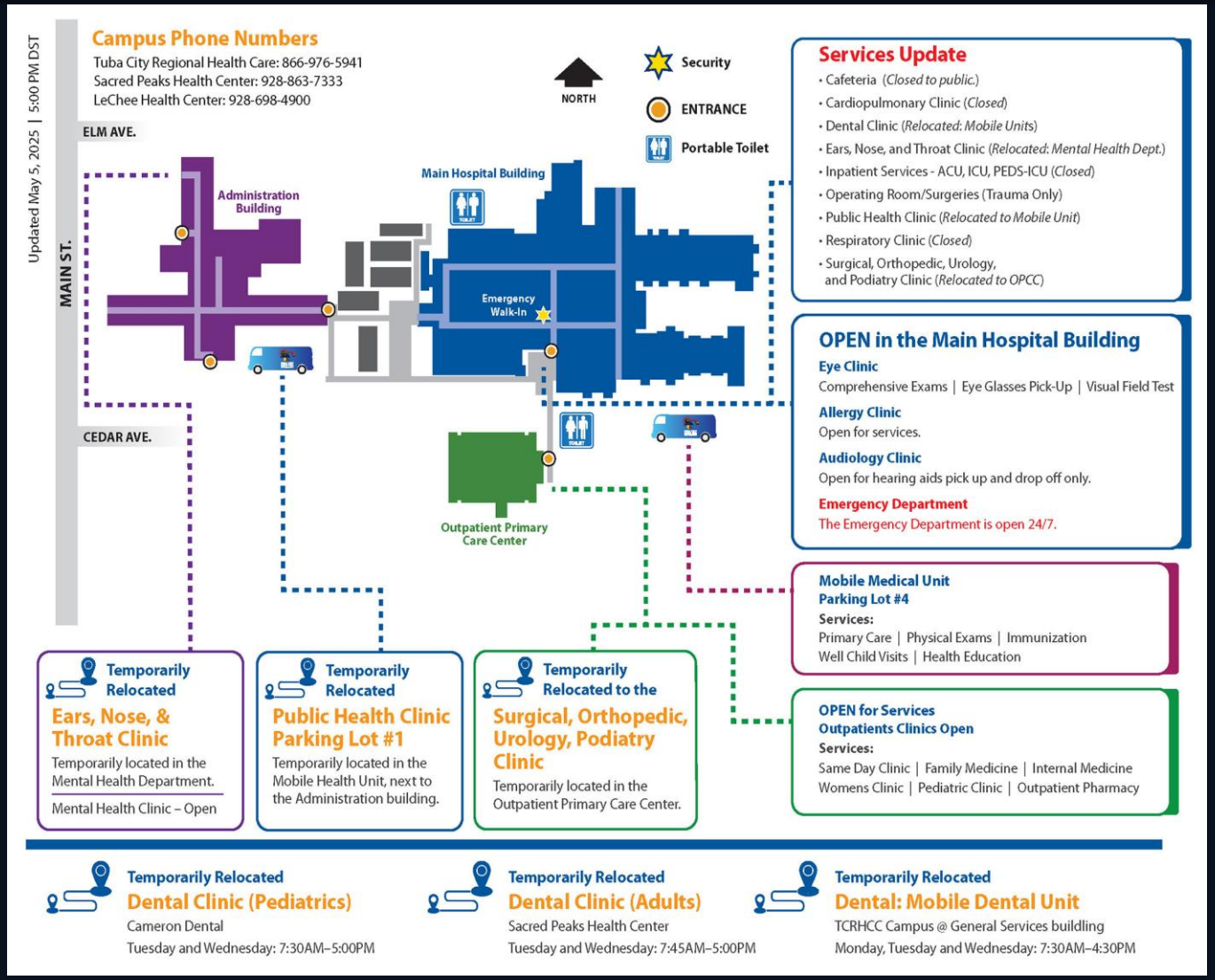
APRIL–MAY 2025

CHEMICAL FOUND IN HOSPITAL WATER

Propylene glycol was detected in the main hospital potable-water system, a result from backflow. Normal water use was suspended while the hospital investigated, remediated, and retested.

OPERATIONAL IMPACT

Water restrictions and phased resumption of operations.



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Services CLOSED in the Main Building:

Inpatient Services (ACU, ICU, PEDS-ICU)

Cafeteria (Closed to public)

Operating Room/Surgeries (Trauma Only)

Cardiopulmonary Clinic (Closed)

Respiratory Clinic (Closed)

Water restrictions and phased resumption of operations.

Facility Water Systems

- Potable Cold Water
- Domestic Hot Water
- "Product" Water
- Chilled Water
- Fire Suppression Water
- Process Cooling Water
- Process Hot Water

Type of Connections to Drinking Water Plumbing

- Facilities can also be categorized “Low or High Hazard”
- Non-Carbonated Beverage Machines
- Non-Chemical Fire Suppression
- Non-Treated Boilers



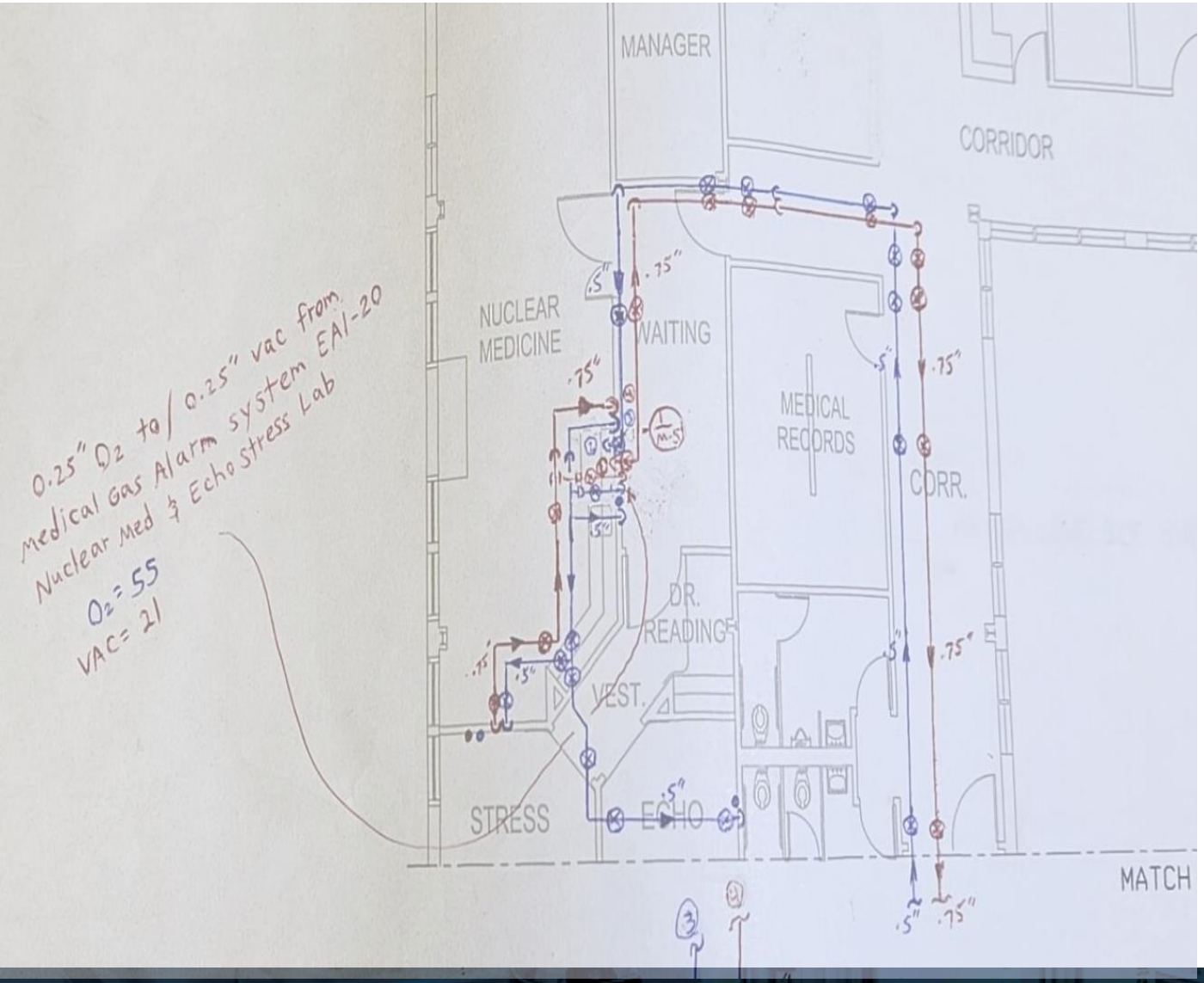
Type of Connections to Drinking Water Plumbing

- Chemical Mixing Stations
- Lawn Irrigation Systems
- Facilities can also be categorized “High or Low Hazard”

High Hazard



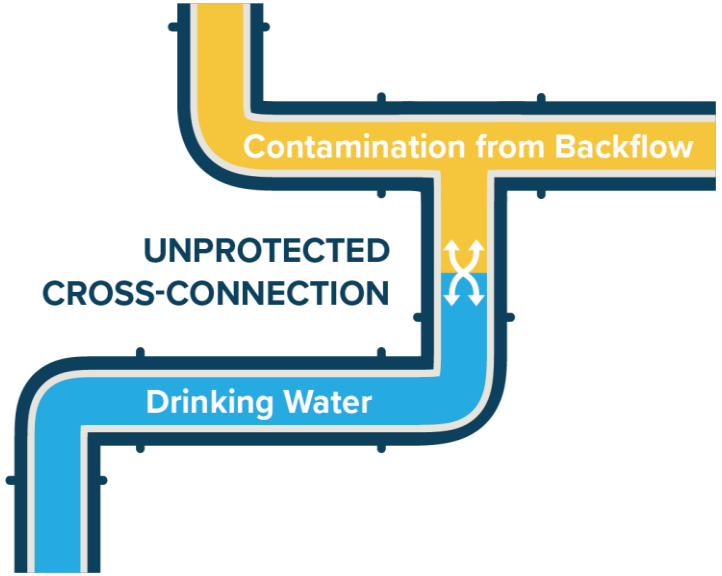
Existing Water System Piping Intel

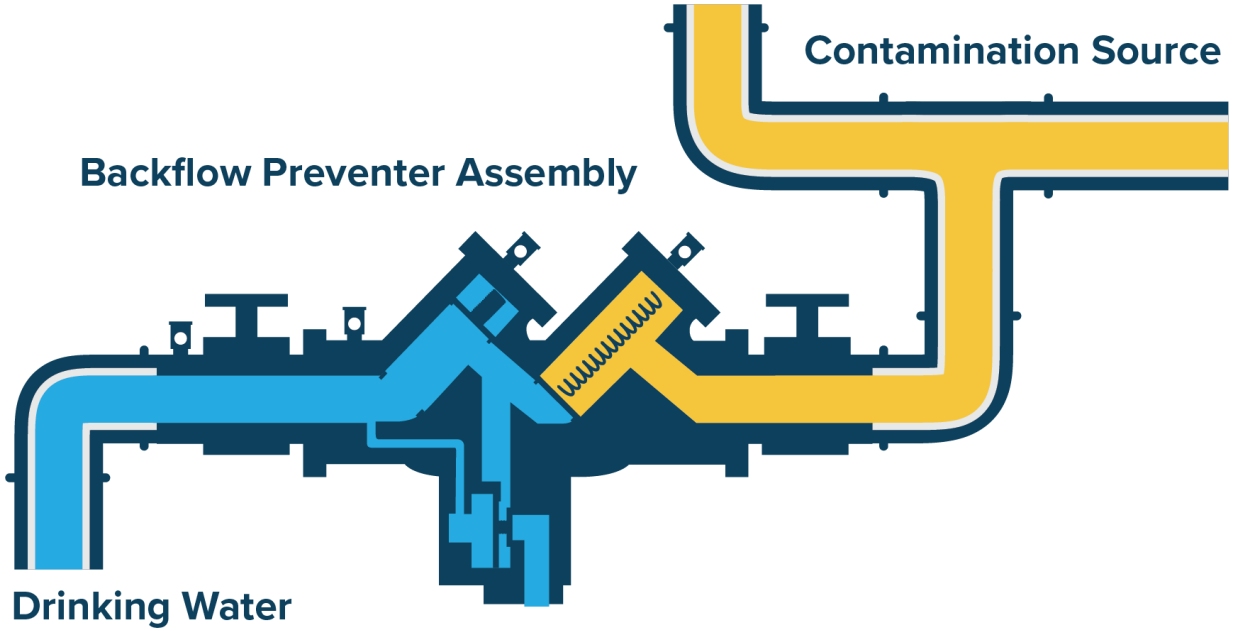


- Last updated 2007
- Average schematic lifecycle is 18 months

Are Cross-Connections Threats Isolated?

And what does it matter for facilities?





Undetected Cross-Connection Scenario



- High Hazard Scenario
- No Premise Containment
- 20 ft downstream of meter
- Incorrect Backflow Preventer
- Owner unaware until Inspected
- Drinking Fountain within 17 feet
- Corrected within 34 days

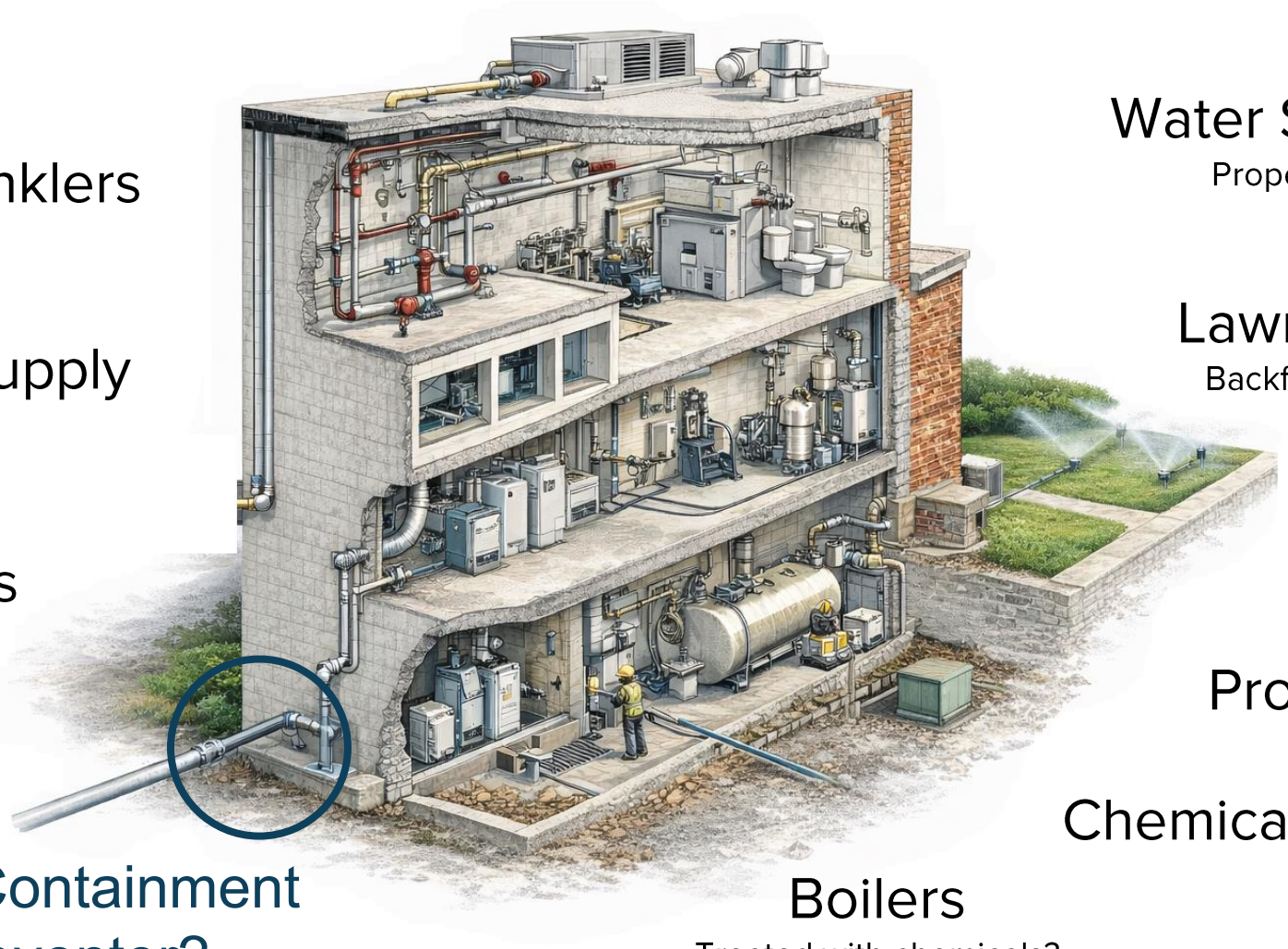


Isolation vs Containment

Fire Sprinklers

Secondary Supply

Hose Bibbs



Water Softener Drains
Proper Air Gap at Drain?

Lawn Irrigation
Backflow Prevention?

Toilets

Process Water

Chemical Mixers

Boilers
Treated with chemicals?

Water Service Containment
Backflow Preventer?

What Backflow Testing Misses

"Over 75% of hospital backflow preventers are the non-testable type."



ASSE 1022/1032
Beverage Machine
Backflow Preventers



ASSE 1012
Dual Check Valve
with Intermediate
Atmospheric Vent

ASSE 1001
Toilet Tank Fill
Valve





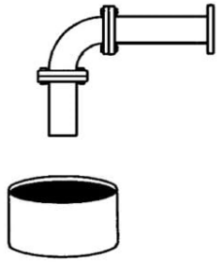
ASSE 1001 Pipe
Applied Vacuum
Breaker



ASSE 1035 type
Laboratory Fixture
Vacuum Breaker



ASSE 1019 Hose
Bibb Vacuum Breaker



ASME A112.1.2
1 Inch Air Gap Minimum



ASSE 1011 Hose
Bibb Vacuum
Breaker

The Gap Between Testing & Reality

Survey Identifies Risk

Cross-Connection Survey

Visual review and documentation of the facility service connection or entire plumbing system



Visual Assessment and Documentation of Every Interconnection to Water

Testing Verifies Devices

Backflow Assembly Testing

Periodical physical performance test and record of one or more backflow assembly installation(s)

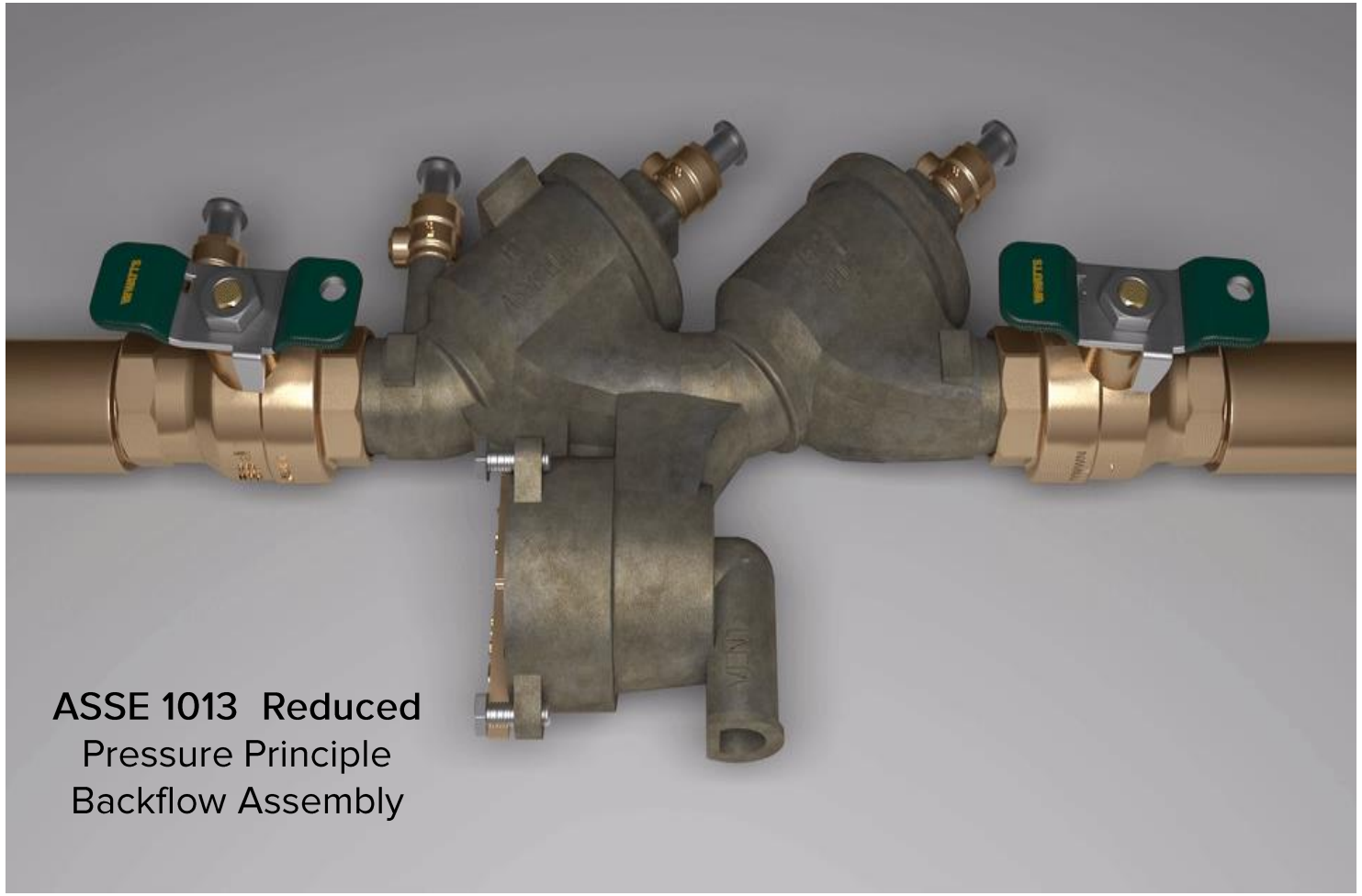


Backflow Preventer Assembly



Differential Test Gauge

What Does Backflow Testing Actually Do?



ASSE 1013 Reduced
Pressure Principle
Backflow Assembly

Wisconsin Department of Safety and Professional Services
Division of Industry Services
4822 Madison Yards Way
PO Box 7302
Madison WI 53707-7302

Phone: 608-266-2112
Web: http://dsps.wi.gov
Email: dsps@wisconsin.gov

Cross Connection Control Performance Test

NOTE: Registrations for all assemblies (except those located in health care facilities) along with all test reports can be done online for reduced fees at http://esla.wi.gov

Regulated Object Number: ____ ____ ____ ____ ____ ____ ____ ____ ____ ____

Personal information you provide may be used for secondary purposes [Privacy Law, s.1504 (1)(m)].

Owner Information

Owner Name		Street Address	
City	State Zip Code	Owner's Contact Person	Telephone Number

Facility Information

Facility Name		Street Address	
City	Zip Code	County	
Assembly Location		Assembly is Serving	
Manufacturer		Model	Serial Number

Size ____ Assembly Type ☐ RP ☐ RP Detector ☐ PVB ☐ SRVB

Water Supply Source: Check One ☐ Municipal Water System ☐ Other than municipal, non-community or private water system. See NR 811 and 812 for definitions.

Initial Test

RP relief valve	1ST check	2nd check
Opened at ____ PSID	☐ Closed tight	☐ Closed tight
☐ Did not open	☐ Leaked	☐ Leaked
	Static ____ PSID	Static ____ PSID

FINAL TEST

Opened at ____ PSID	☐ Closed tight	☐ Closed tight
	Static ____ PSID	Static ____ PSID

DETECTOR BYPASS ASSEMBLY INITIAL TEST

RP relief valve	1ST check	2nd check
Opened at ____ PSID	☐ Closed tight	☐ Closed tight
☐ Did not open	☐ Leaked	☐ Leaked
	Static ____ PSID	Static ____ PSID

DETECTOR BYPASS ASSEMBLY FINAL TEST

Opened at ____ PSID	☐ Closed tight	☐ Closed tight
	Static ____ PSID	Static ____ PSID

PVB/SRVB INITIAL TEST		PVB/SRVB FINAL TEST	
Air inlet valve	Check valve	Air inlet valve	Check Valve
Opened at ____ PSID	☐ Closed tight	Opened at ____ PSID	☐ Closed tight
☐ Did not open	☐ Leaked		Static ____ PSID
	Static ____ PSID		

Assemblies in Fire Protection Systems Note: Include hose stream demand where applicable

Forward Flow Test
Designed flow rate ____ GPM Actual flow rate ____ GPM

Indicating Control Valves
☐ No. one control valve open ☐ No. two control valves open Valve supervision: ☐ Tamper switch ☐ Locked

Part (s) Replaced/Comments

Make Checks Payable to DSPS **Attach Check Here**
Total Amount Due $30 Per Assembly Renewal or $60 Per New Application

I Hereby Certify the Test Results Are True and the Test Was Conducted by Me Personally.

Tester Name (print) _____ Registration No. _____ Time of Day _____
Tester Signature _____ Phone No. _____ Date _____

SBD-9927 (R03/20) Copies: Department, Testers, Owner, Water Purveyor Revenue Code 7657

Regulatory Foundations

- State cross-connection control regulations may define cross-connection control activity requirements on private water systems supplied water by public water systems:
  - Community Water Systems (i.e., municipality supplied)
  - Non-Transient Non-Community Water Systems (i.e., on-site well water supplied)
- OSHA Sanitation Standard 1910.141
- Food Code
- Local Plumbing Code (potable water for drinking, food production)
- Corporate Water Quality Standards/Initiatives

Reliable Piping Schematic Anatomy

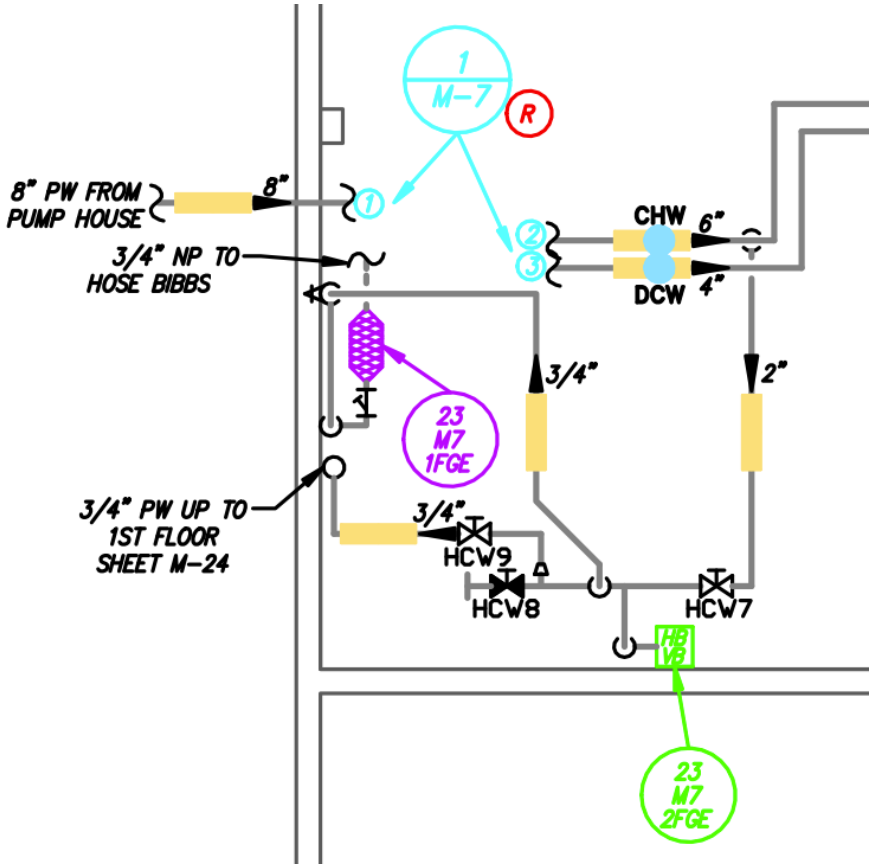
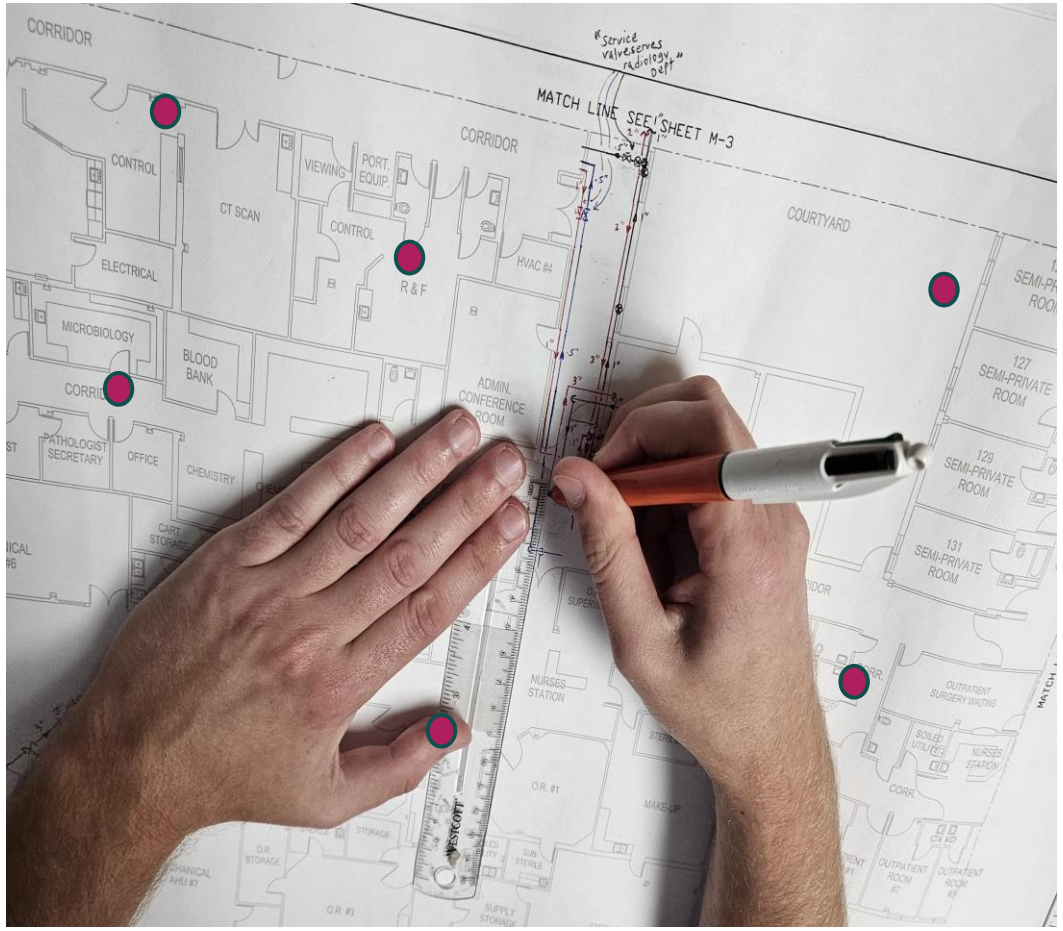




Fig 1. Building Containment - protects upstream public water supply from building domestic water and fire protection water (Not Organization Facility).

When Visibility Breaks Down

- Entire wings shut down due to unknown isolation points
- Patient relocations and procedure delays
- Increased exposure to Legionella and contamination risk
- Failed audits and corrective action plans
- Reactive decisions instead of controlled response



System Safety/Access Limited

“Frank Retired and only he knew where every shut off valve was located” = $18,900 in facility downtime





CASE STUDY

Small Industrial Process Facility

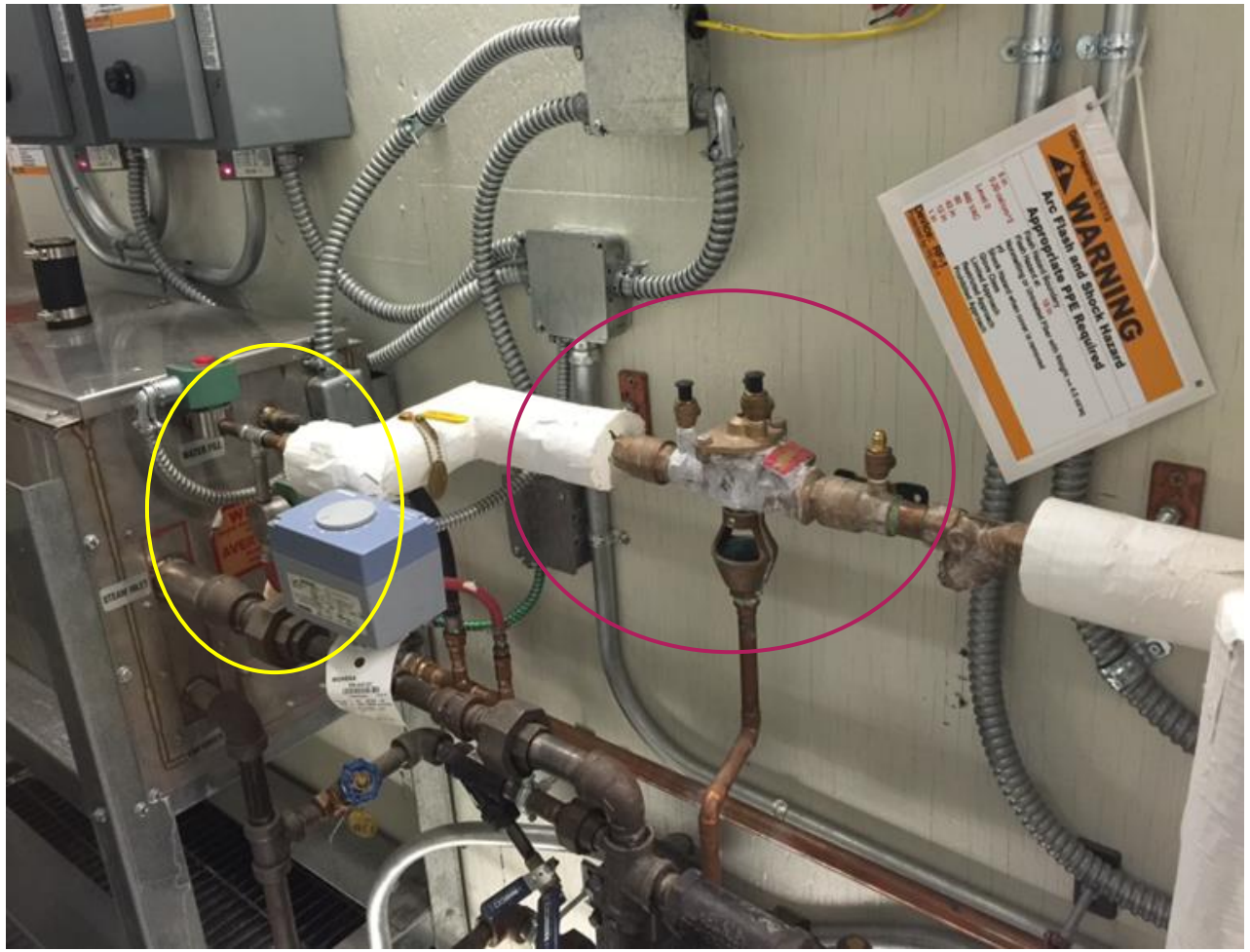
HYDROCORP®

Potable Water Connection: Scenario #1

RISK:
Wastewater contamination exposure

REALITY:
Not fully documented

IMPACT:
Audit failure or patient safety event

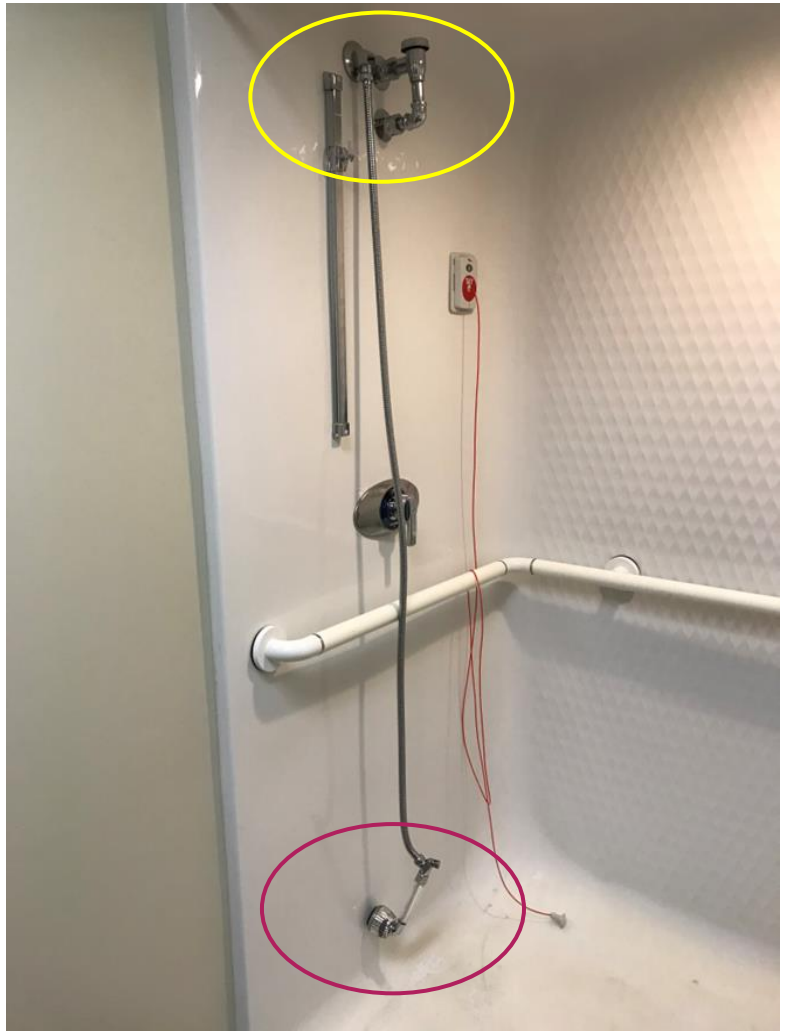


Potable Water Connection: Scenario #2

RISK:
High-hazard cross-connection from submerged hoses

REALITY:
Non-testable devices not tracked in backflow records (88 locations)

IMPACT:
Unmonitored contamination risk and exposure during audits



Potable Water Connection: Scenario #3

RISK:
Direct connection to drain/waste systems (high contamination risk)

REALITY:
Only partial documentation (24 locations, only 10 recorded)

IMPACT:
Undetected exposure and inability to demonstrate compliance

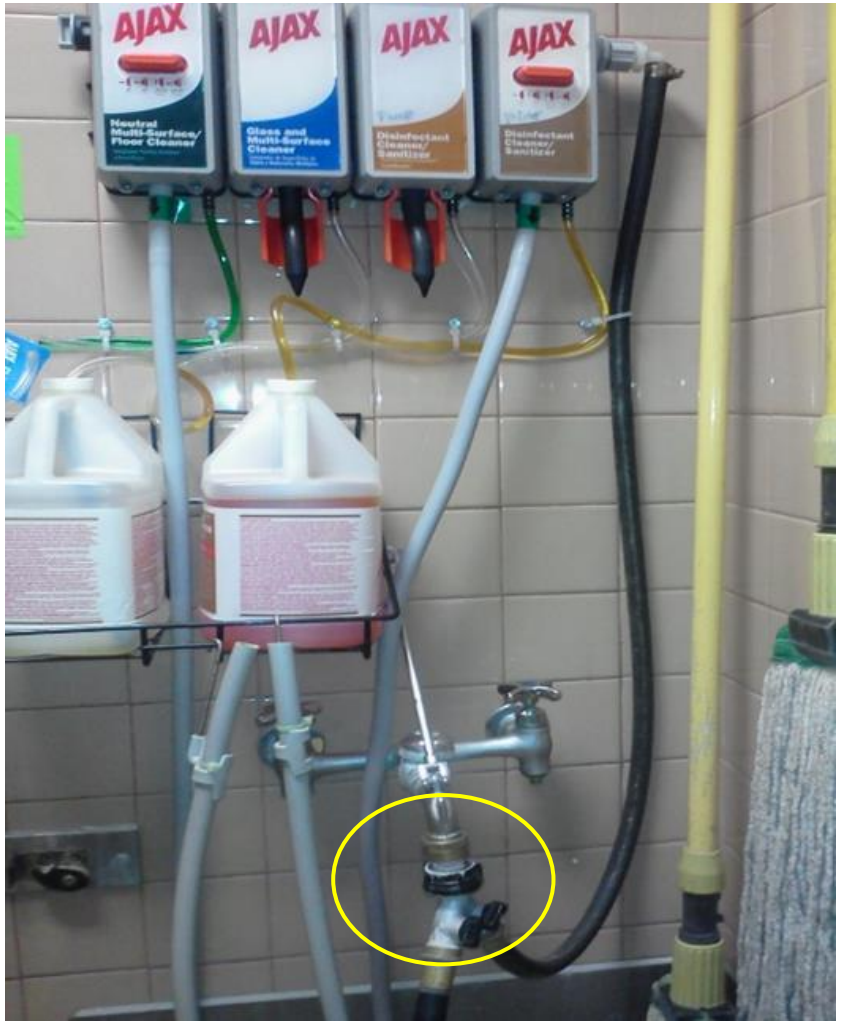


Potable Water Connection: Scenario #4

RISK:
Chemical backflow into potable water system

REALITY:
Installed by third parties, not documented or verified
(45 locations)

IMPACT:
Unknown protection status and increased liability risk

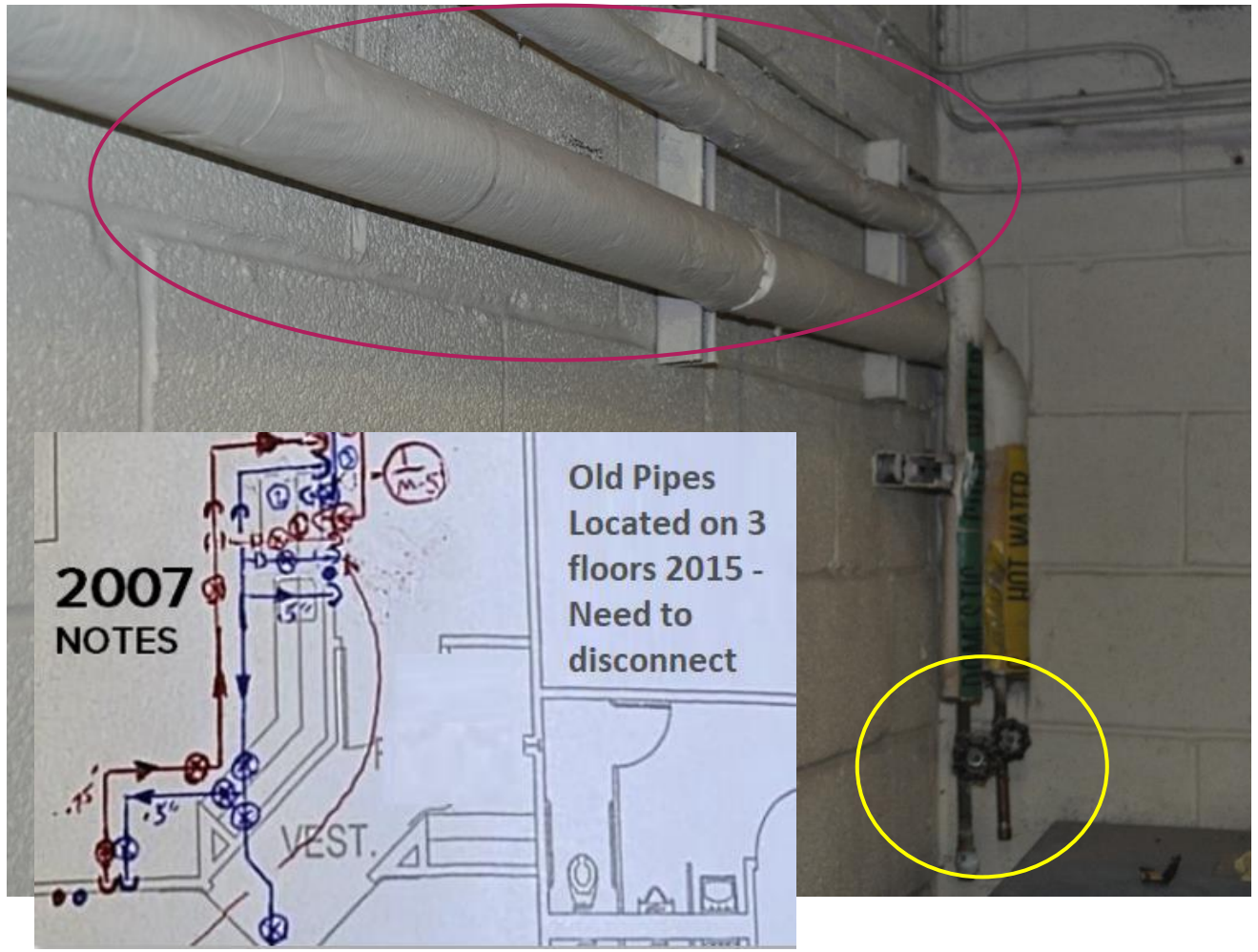


Potable Water Connection: Scenario #5

RISK:
Stagnant water leading to Legionella growth

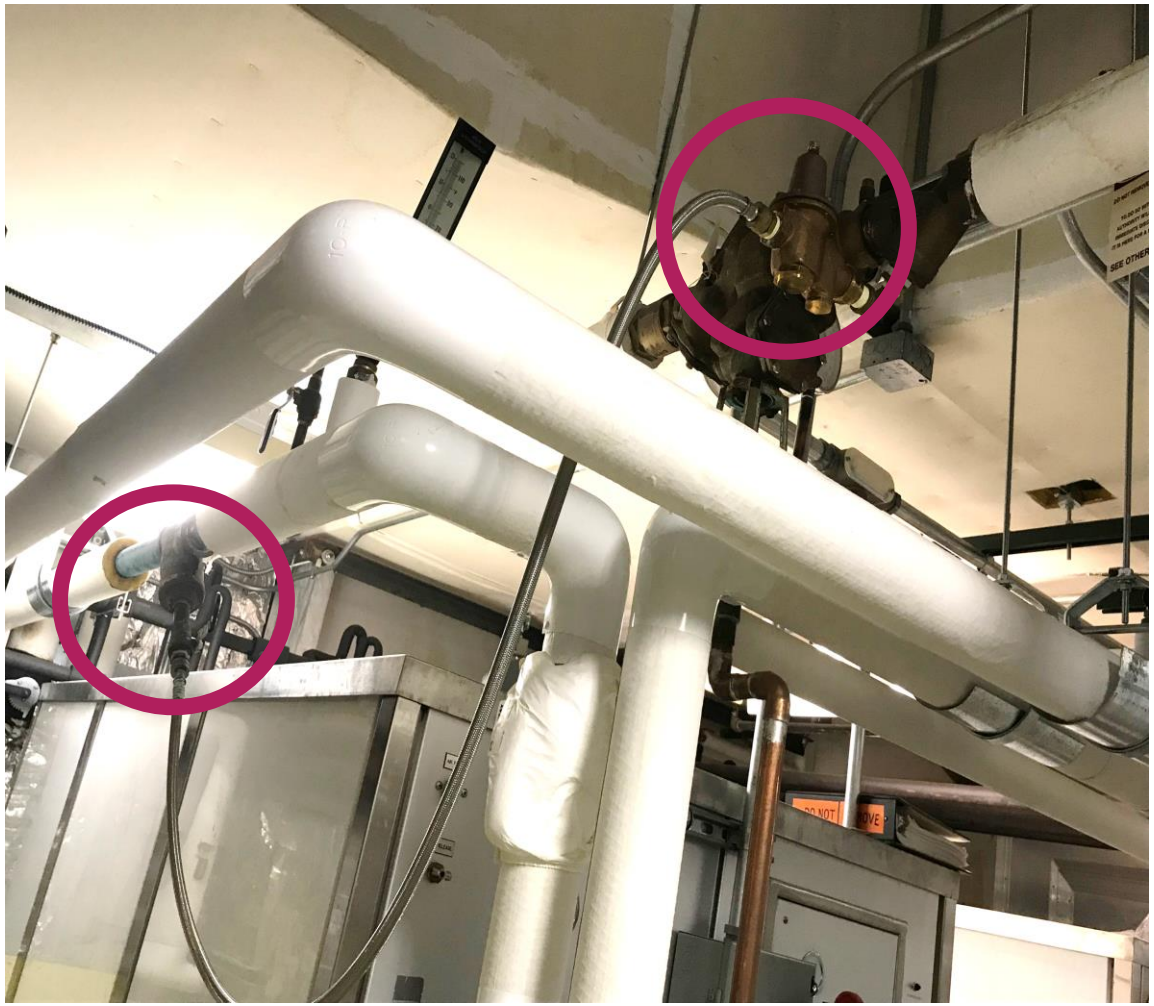
REALITY:
outdated drawings show isolated piping not verified in field

IMPACT:
elevated infection risk and compliance exposure



Why Documentation Gaps Become Audit Findings

- Lack of system-wide visibility
- Fragmented information
- Staff changeover – loss of intel
- No chain of custody in plumbing
- Outdated mapping or schematics
- No defensible record during inspection
- Delayed response during emergency

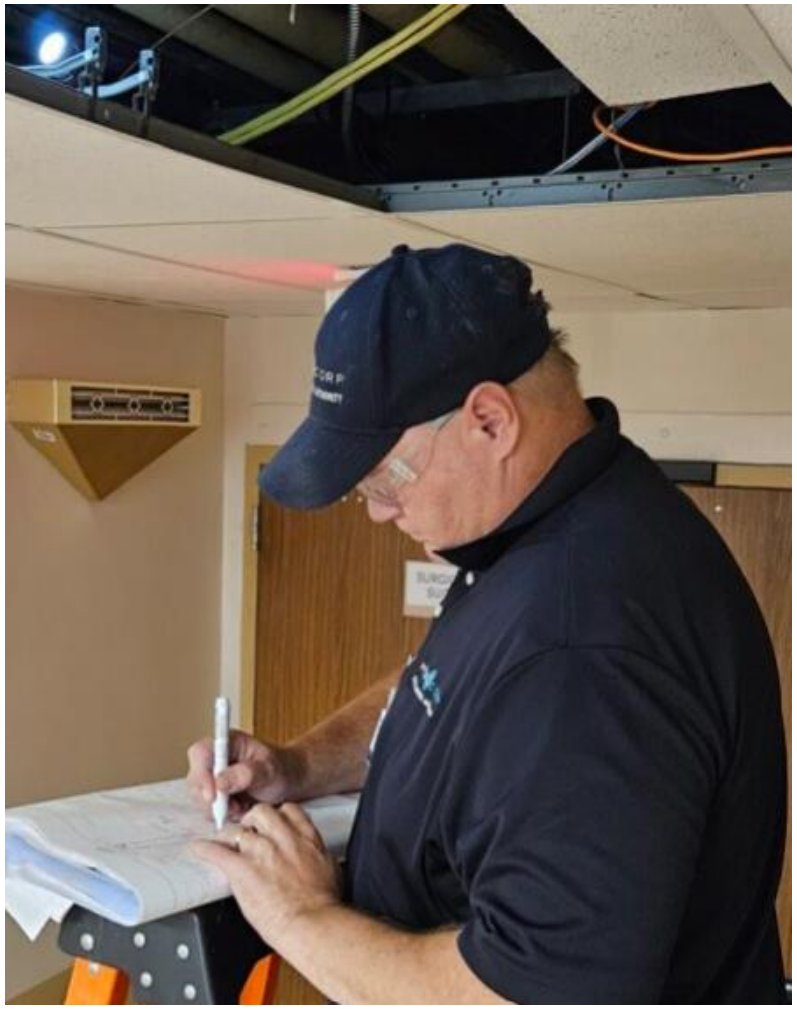


How to Achieve Full System Visibility

1. Validate existing records
2. Conduct full system survey
3. Maintain chain of custody + updates

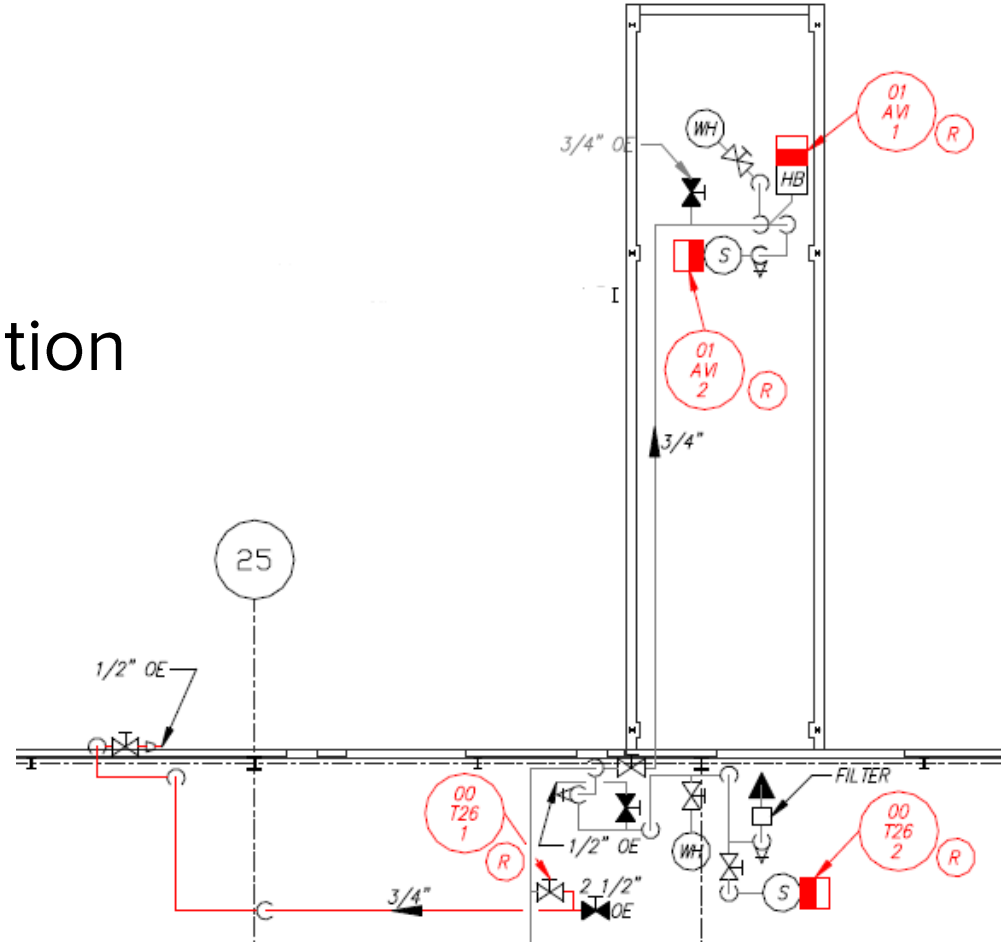
What this enables:

- Faster shutdown response
- Audit readiness
- Reduced risk exposure



What Full System Visibility Includes

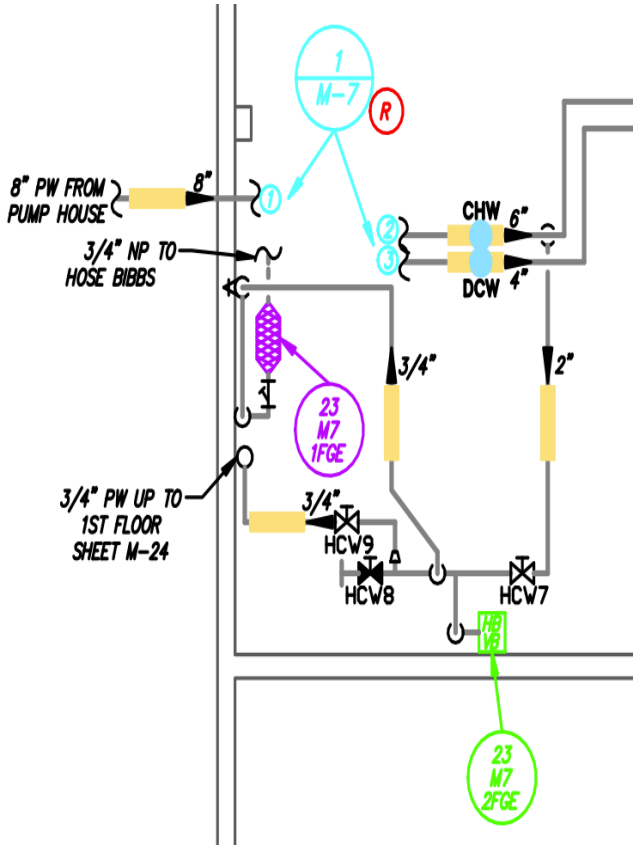
- Reliable schematics / digital twin
- Valve locations
- Full system inventory of backflow prevention
- Dead legs and temporary connections
- Pipe labeling deficiencies



Defining "System Visibility"

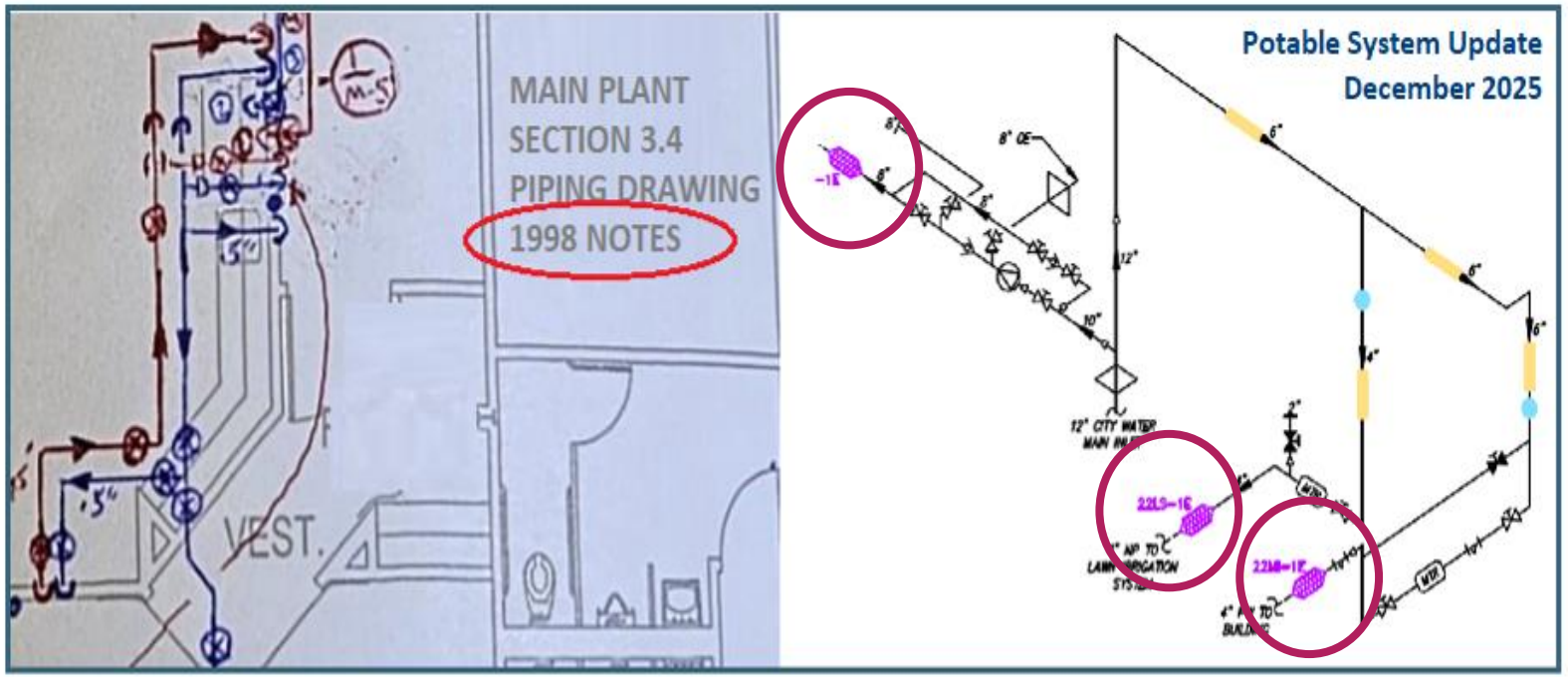
- Complete system understanding
- Verified mapping
- Audit-ready documentation

Drw. #	I.D.#	Dev.Type	Size	Manufacturer	Model	Serial Number	Str.	Val.	Tmp	Location Description and Remarks
M-13	25M13-27F2E	RPBP	1.5	Watts	009M2QT	132798	N	Q	C	Process water make-up - cold water supply - see AIR GAP recommendation I.D. #25M13-23F2 - EVS Closet
M-13	25M13-28F2E	AVB	0.5	Chicago Faucet	892	N/A	-	-	-	Janitor's sink - see INSTALL recommendation I.D. #25M13-24F2 - EVS Closet
M-13	25M13-29F2E	AG	1	N/A	N/A	N/A	-	-	-	Soap dispenser - EVS Closet
M-14	25M14-1FPE	RPBP	1	Watts	LF009M2Q	320998	N	Q	C	Process heating make-up - 2nd Floor Penthouse #GP-1
M-14	25M14-1FRE	RPBP	0.75	Apollo	RP4A	470856	N	Q	C	Condenser cooler - 2nd Floor Roof



Reduce Contractor Costs

- Validated system eliminates exploratory work and repeat visit



3 locations where backflow preventer maintenance costs were obsolete

How to Make the Case Internally

To move forward, teams need to align on risk, cost, and operational impact

Can we isolate precisely?

→

Do drawings match reality?

→

Are we ready at 4:23 AM?

Verified intelligence reduces isolation time and prevents cascading shutdowns

Emergency Response

- Faster system isolation
- Accurate decision-making
- Coordinated efforts
- Incident materials and/or resources

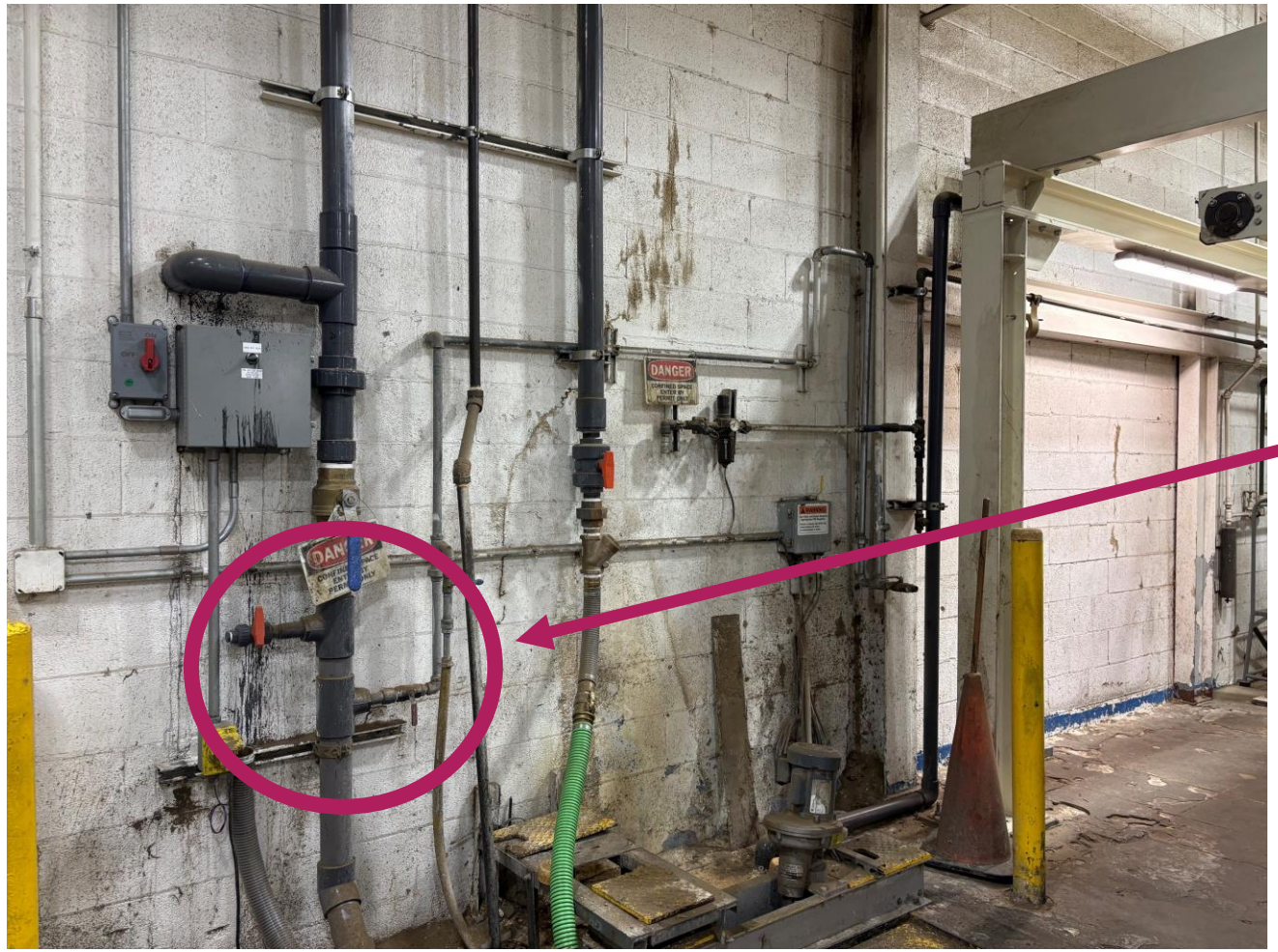


Finding #1: Potable-to-Process Interconnection



- No city water "containment" to protect city from plant water supply
- Separate internal water branches, inconsistent usage
- Inconsistent and incorrect labeling of multiple systems

Finding #2: Potable Water Supply to Process Water Flush System



- Interconnection between potable water line and process water line flush
- Requires backflow prevention assembly to be installed or minimum 1” air gap



Finding #3: Improper Supply Connection - Eyewash



- Eyewash/emergency shower on non-potable water supply to starch kitchen operation
- Requires replumb to potable water supply

Finding #4: Missing Air Gap Protection



- Reverse osmosis system - reject water drain
- Requires air gap on drain line

Finding# 5: Cross-Connection Hazards



- Potable water supply to process tank in waste-water operation – NO AIR GAP
- Requires approved air gap in supply

Turning Findings Into Action

42 RECOMMENDATIONS

- Evaluate containment requirements for domestic service
- Establish zone isolation
  - Create and label dedicated non-potable water piping system to reduce testable assemblies and facilitate system planning and future connections
  - Create and label dedicated potable water piping system
- Ensure any potable water fixtures are removed from dedicated non-potable water system and plumbed to potable water system



Cross-Connection Surveyor Pro-Tip

- Use the 4-digit ASSE number method
- Quick reference high/low hazard
- Aligns with state plumbing code

ASSE Standards Quick Guide

HYDROCORP

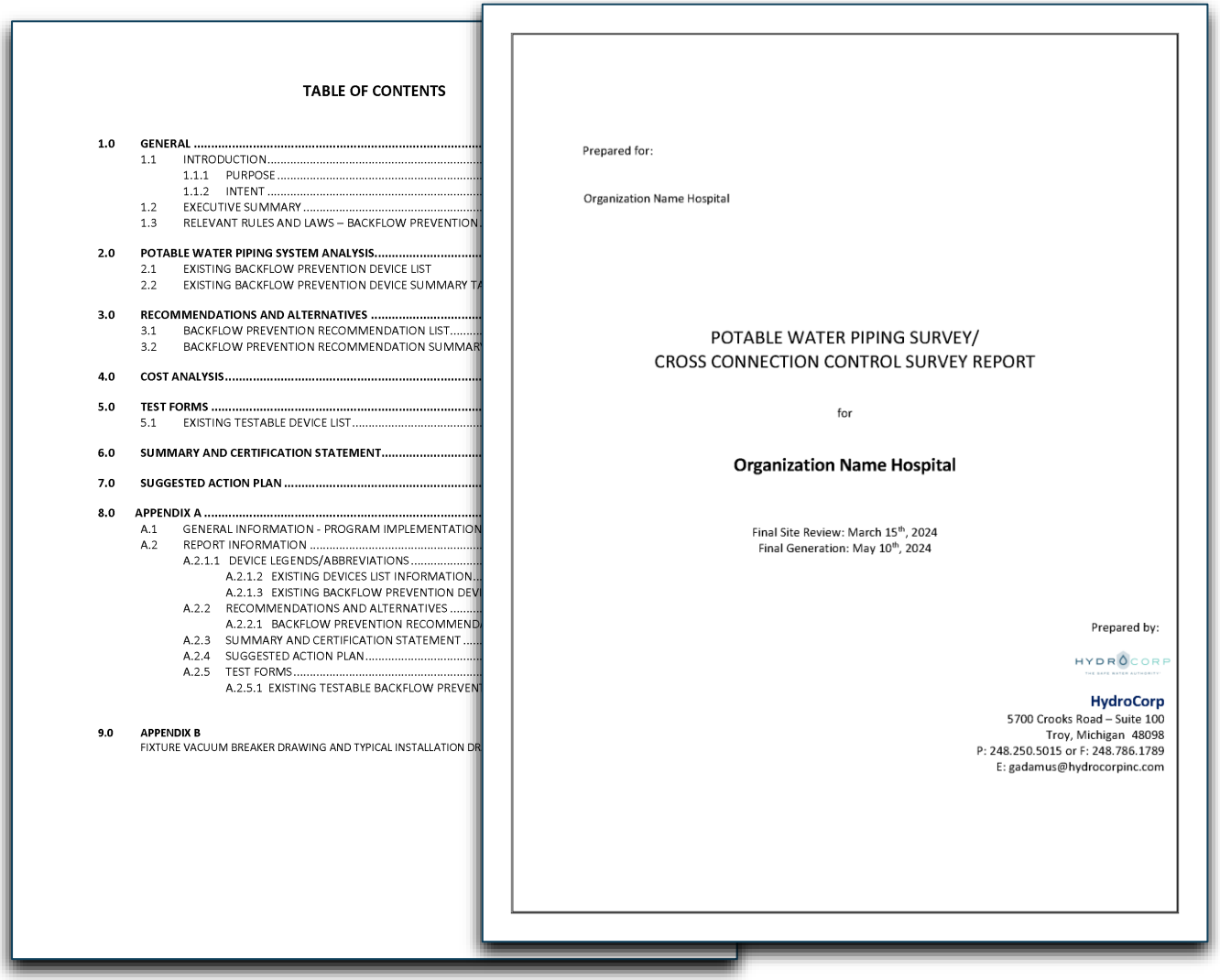
The cross-connection control surveyor's cheat sheet for backflow preventers and their corresponding ASSE standard name and numbers referenced in most state plumbing codes. The four-digit standard number can often be found imprinted on the backflow preventer.

		USES				
ASSE Standard #	ASSE Standard	TESTABLE	HIGH HAZARD	BACK SIPHONAGE	BACK PRESSURE	CONTINUOUS PRESSURE
1001	Atmospheric Type Vacuum Breakers	✗	✓	✓	✗	✗
1002	Anti-Siphon Fill Valves for Water Closet Tanks	✗	✓	✓	✗	✓
1011	Hose Connection Vacuum Breakers	✗	✓	✓	✗	✗
1012	Backflow Preventers with an Intermediate Atmospheric Vent	✗	✗	✓	✓	✓
1013	Reduced Pressure Principle Backflow Prevention Assemblies	✓	✓	✓	✓	✓
1015	Double Check Backflow Prevention Assemblies	✓	✗	✓	✓	✓
1018	Trap Seal Primer Valves – Potable Water Supplied	✗	✓	✓	✗	✓
1019	Wall Hydrant with Backflow Protection and Freeze Resistance	✗	✓	✓	✗	✗
1020	Pressure Vacuum Breaker Assemblies	✓	✓	✓	✗	✓



Find it in our post-webinar email

Piping Schematics + Detailed Connection Intel



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Prepared for:

Organization Name Hospital

POTABLE WATER PIPING SURVEY/
CROSS CONNECTION CONTROL SURVEY REPORT

for

Organization Name Hospital

Final Site Review: March 15th, 2024
Final Generation: May 10th, 2024

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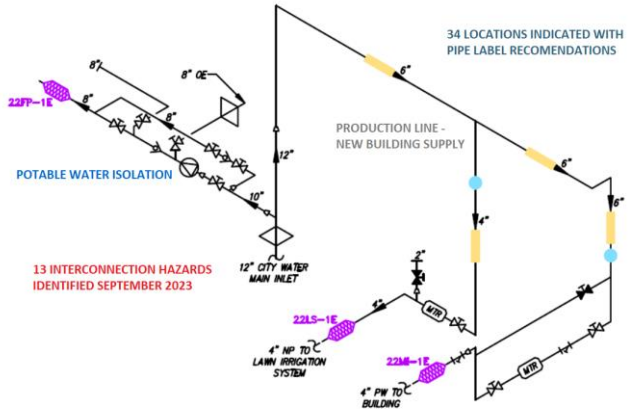


Sorted by Drawing and I.D. Number — **REQUIREMENTS LIST**

Drw. #	Dev.Type	Size	PT	I.D.#	Location Description and Remarks
M-27	RPBP	1.5	I	23M27-2	R.O. water make-up for boiler and storage tanks
M-27	RPBP	2	I	23M27-3	Back-up "SERVICE WATER" feed to MOB2 and walk-in coolers in kitchen - install RPBP or disconnect and cap
M-27	LABEL	2	I	23M27-4	Non-potable water piping mislabeled as "COLD WATER" in multiple locations - relabel as "NON-POTABLE WATER"
M-27A	LABEL	4	I	23M27A-4	Piping mislabled as "DOMESTIC HOT WATER" in multiple locations - relabel as "POTABLE WATER" or "DOMESTIC COLD WATER"
M-27A	REMOVE	0.75	I	23M27A-5	Remove hose bibb on test cock #1 of existing RPBP I.D. #23M27-1E
M-27A	REMOVE	0.375	I	23M27A-6	Piping not in use - disconnect and cap

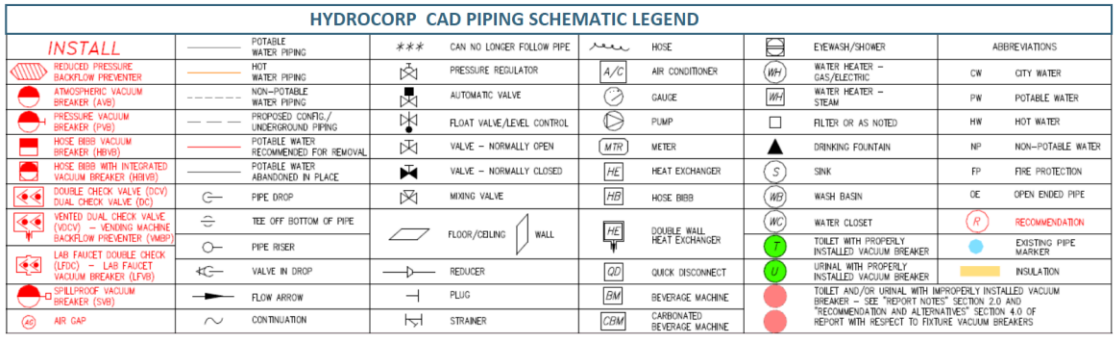
Complete Piping System Documentation

- Detailed List
- Digital/Hardcopy
- Limited Location Description
- No Drawings/Schematics
- Low Cost

Plant ID#	Device	Size	Manufacturer	Model	Serial #	Str	Val	Temp	Remarks
A-1E	RPBP	1.25	Wilkins	975XL	315429	Y	Q	C	Domestic containment assembly in boiler room
A-2E	RPBP	2	Wilkins	975XL	3129196	Y	Q	C	Domestic containment assembly in pump room #1 - Note: meter is by-passed and is in the process of being modified
A-3E	DCV	6	Ames	2000SS	2L10421	N	G	C	Fire protection containment assembly in storage closet
A-4E	RPBP	0.5	Watts	009	255142	N	Q	C	Boiler make-up in basement
A-5E	AG	1	N/A	N/A	N/A	-	-	-	Janitors closet soap dispenser - see HBVB recommendation I.D. #117-1R and INSTALL recommendation I.D. #117-2R
A-6R	PFD	0.5	N/A	N/A	N/A	-	-	-	(2) Restrooms (2) standard flush valve fixture
A-7E	AVB	0.5	Sloan	V-370	N/A	-	-	-	Janitors closet slop sink
A-8E	AG	1	N/A	N/A	N/A	-	-	-	Janitors closet soap dispenser
A-9E	PFD	0.5	N/A	N/A	N/A	-	-	-	(4) restrooms (11) standard flush valve fixtures
A-10E	AFHBVB	0.75	Woodford	17	N/A	-	-	-	Outside hose bibb 203A northwest corner
A-11E	RPBP	2	Watts	909	89215	Y	G	C	Domestic containment assembly in crawl space 207A southwest corner

Potable Water System Documentation

- System Flow Directions + Labeling
- Valve Tag Reference, Labeling
- Color Coded w Legend
- Backflow Prevention
- Pressure Reducers/Regulators
- Emergency Shut-Offs
- Points-of-Use/connection documentation





CASE STUDY

Automotive Manufacturing Facility

HYDROCORP®

Case Study: The Facility

MAIN MANUFACTURING BUILDING

1,000,000 SQ. FEET

WATER SYSTEMS:		
Potable water	Process water	Wastewater

What Prompted the Survey?



Unknown risk points (cross-connections)

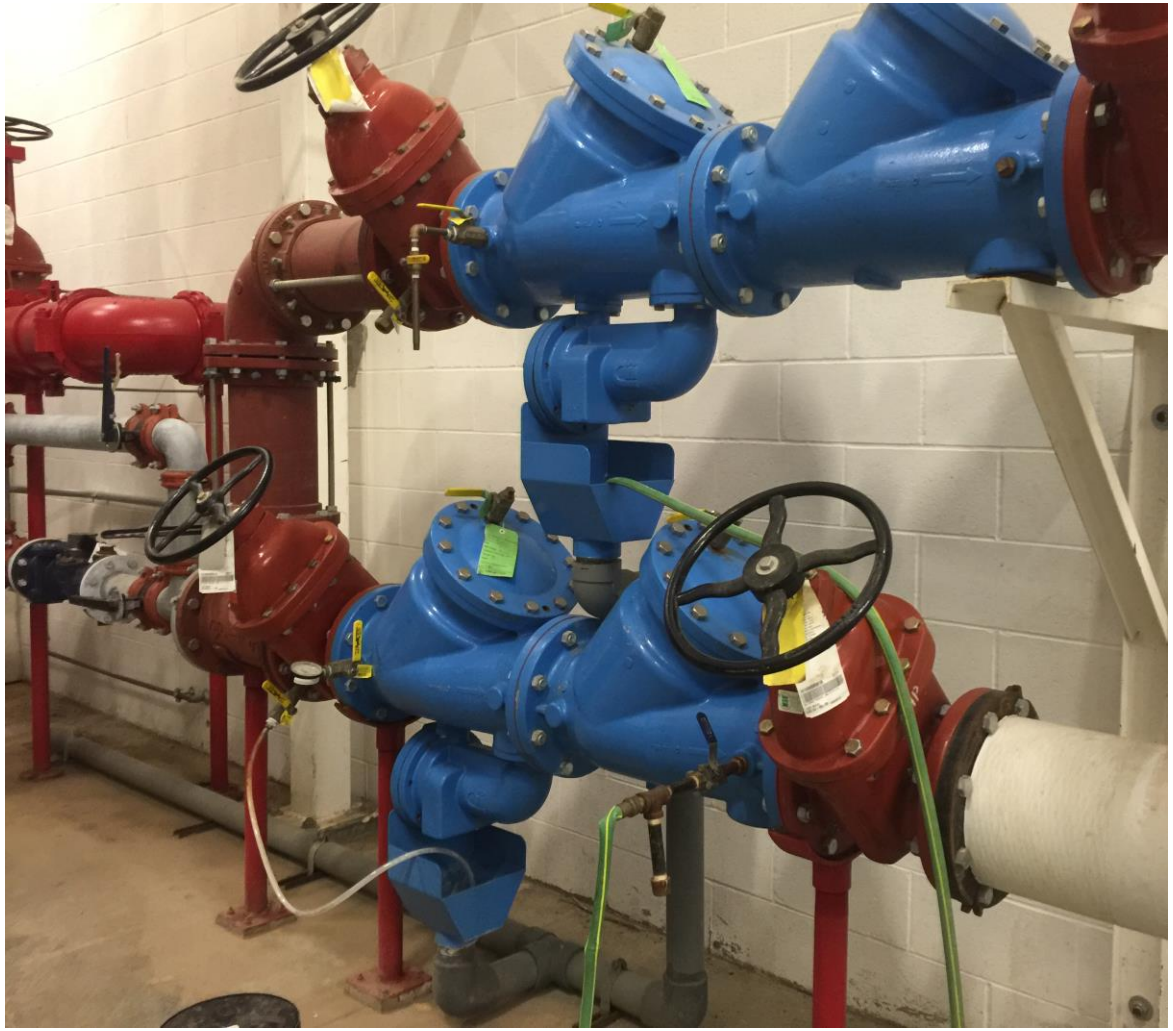


Incomplete inventory of testable backflow prevention assemblies



Internal policy driving cross-connection control surveys

Finding #1: Hoses-Attached to Assemblies



- City water "**containment assemblies**“- hoses attached to test ports – submerged in drain
- Remove hoses and black pipe connections

Finding #2: Hose Connection to Chemical Pump





- Hose – connected to emergency shower riser – supplies chemical pump
- RPBP required – replumb to alternate location!



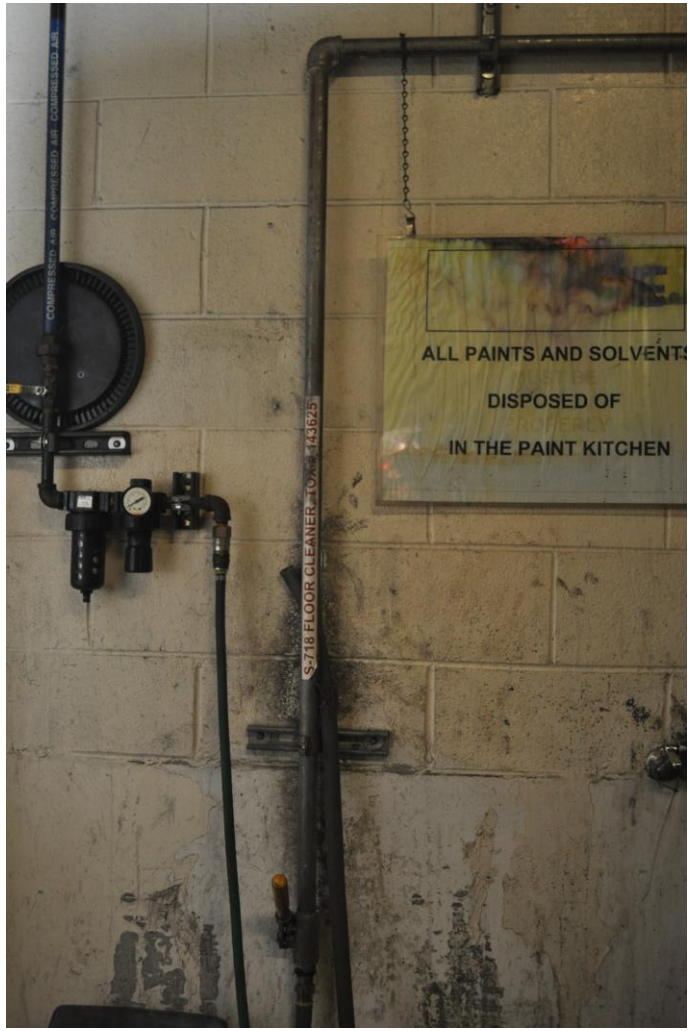
Finding #3: Ice machine



- Ice Machine – backflow preventer installed incorrectly – drain line submerged in condensate pump!
- Reinstall new device correctly!



Finding #4: Pipe Labeling



- Line is labeled “Potable Water”- multiple labels
- Actually a chemical supply line for cleaners to fill mobile cleaning carts
- Potential to install potable water outlet to this line!



Turning Findings Into Action

60 RECOMMENDATIONS

- Address multiple cross connections within potable water piping system – install multiple backflow preventers
- Ensure any potable water fixtures are removed from dedicated non-potable water system and plumbed to potable water system
- Pipe Labeling – correct mislabeling, label consistently



Prioritizing Corrections-Examples

HIGH:
Unprotected **high hazard** cross-connections with process water, waste-water and equipment using chemicals, potable fixtures plumbed to non-potable water

MEDIUM:
Insufficient or minimal pipe labeling

LOW:
Beverage equipment backflow protection



A Strategy for Piping System Management

01 High-Risk System First

02 Critical Zones Prioritized

03 Phased Approach

04 Budget Appropriately

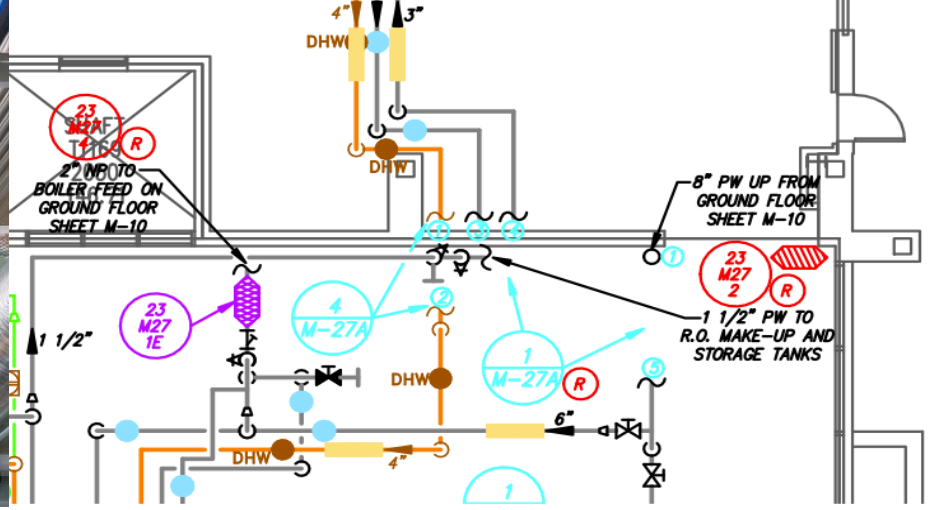
What This Means For Your Facility

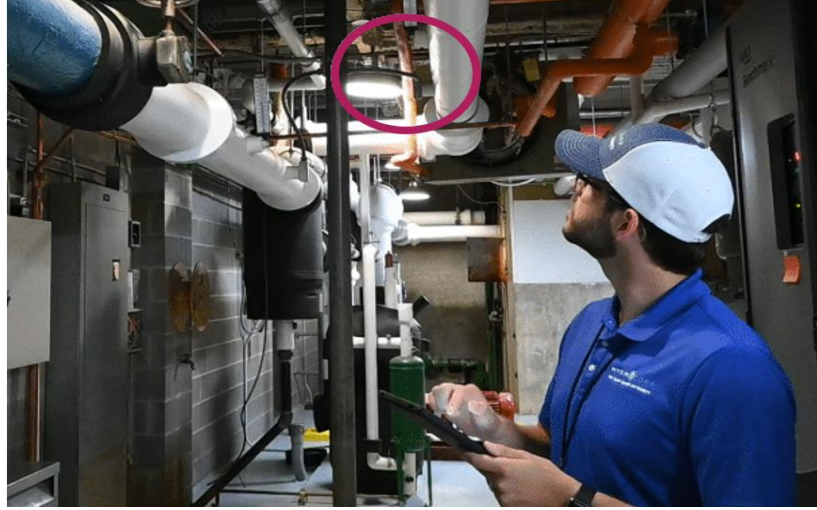
Backflow testing alone is not enough

Visibility reduces operational and compliance risk

Water system documentation enables confident decision-making







Cross-Connection Control Partnerships

- Piping Schematics & Labeling
- Cross-Connection Surveys
- Water Management Programs