

WASBO

Facilities Management

Conference

Kalahari Conference Center



Plumbing 101

MARCH 7, 2023, 2:20PM – 3:10PM

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Wikipedia defines School Facility Management (FM) as...

“...an interdisciplinary business function that coordinates space, infrastructure, people and organization.”

We define Facility Management as...

“An ideal facility manager must have Aristotle’s logic and Solomon’s wisdom, a priest’s discretion and a gambler’s poker face, a lawyer’s shrewdness and a marketing director’s charm, a gladiator’s courage, a marathon runner’s perseverance and a sprinter’s speed, a leatherneck’s toughness and a dancer’s agility, lots of good luck and 30 hours per day.”

- Unknown



LEARNING OBJECTIVES

- DOMESTIC WATER SUPPLY AND DISTRIBUTION
- BACK FLOW PREVENTION AND EQUIPMENT
- HOT WATER SUPPLY AND RETURN
- SANITARY BUILDING DRAIN
- SANITARY BUILDING SEWER
- VENTING
- GREASEY WASTE
- WATER CONSERVATION
- QUESTIONS

DIFFERENT USES OF WATER IN A SCHOOL BUILDING

- Fire Suppression
- Irrigation
- Drinking
- Restrooms/kitchens
- Cleaning
- Cooling Tower Make Up



DOMESTIC WATER SUPPLY SYSTEMS

- The water supply feed to the building the comes from the main in the street or a well is referred to as the service.
- The water service will have several shut off valves. The corporation cock, the curb stop and the building control valve.
- These services must be installed at appropriate depths to protect them from frost and freezing.
- This water, known as potable water (safe for drinking) must then pass through a water meter, a device with a propeller inside to measure the amount of water being used. This only applies to water services supplied from a municipality and does not apply to water supplied from a well.
- Once in the building this water supply transitions from being a water service to being water distribution and eventually water supply.



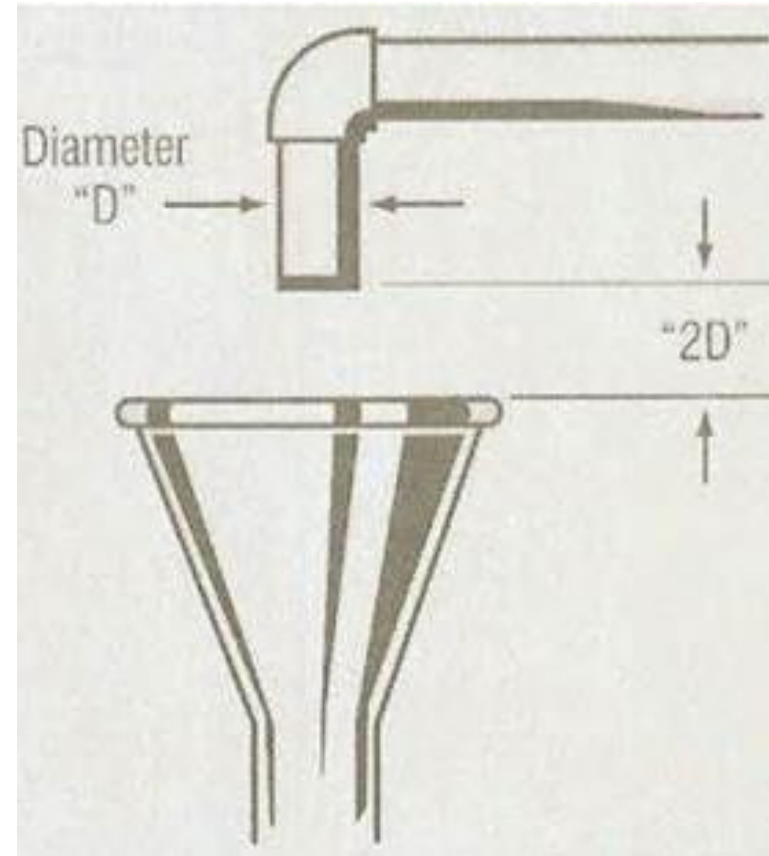
BACKFLOW PREVENTION: Isolation & Containment

- AIR GAP
- VACUUM BREAKERS (AVB, PVB & Spill Resistant)
- DOUBLE CHECK
- REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER

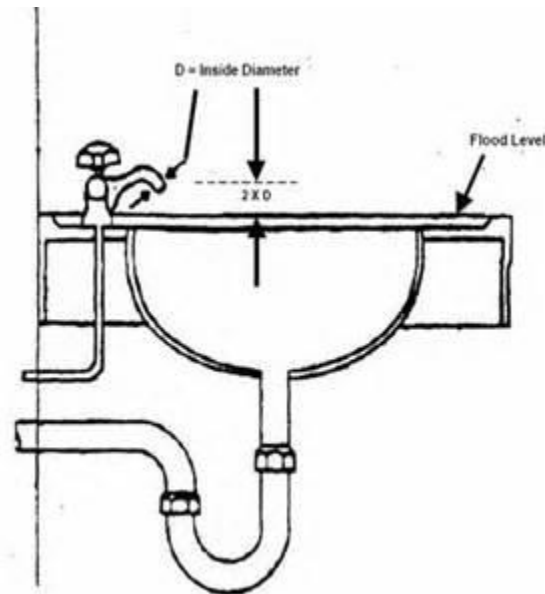
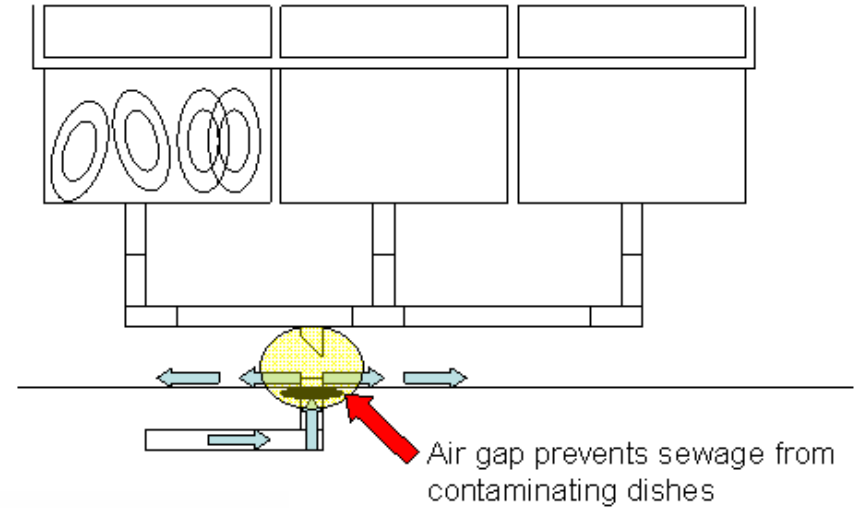
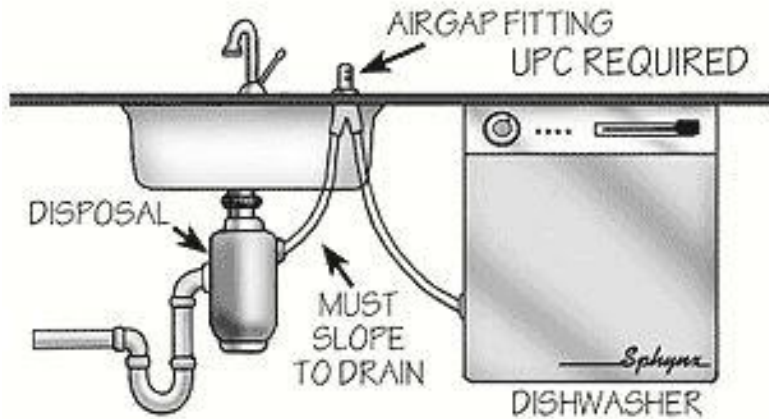


AIR GAP

- Air gap separation is the oldest form of backflow prevention.
- Air gap protects against backflow due to back pressure and back siphonage.
- Air gap separation is the unobstructed vertical distance through free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank, plumbing fixture, or other device and the flood-level rim of the receptacle.
- Air gap separation will only be effective if one simple rule is followed: The Air Gap must be two times the inside diameter of the pipe and no less than one inch.
- 2 X “D” (1” min.)

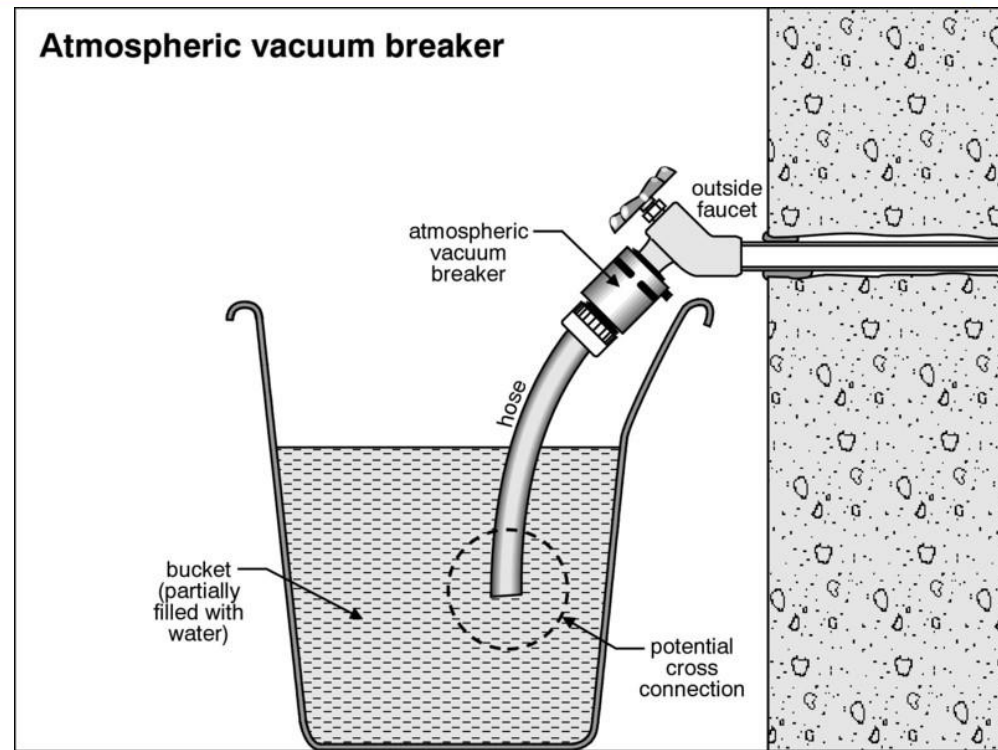


ADDITIONAL EXAMPLES OF AIR GAPS



ATMOSPHERIC VACUUM BREAKER

- ✓ One of the simplest and least expensive types of backflow preventers.
- ✓ The AVB contains an air inlet valve, check seat, and an air inlet port.
- ✓ Water flowing through the AVB causes the air inlet valve to close against the air inlet port.
- ✓ The AVB protects against non-health hazards or hazards under back siphonage only.



Based on the design and operation of AVB, the following criteria must be implemented:

1. Absolutely no shut-off valves are allowed on the discharge side of the AVB.
2. A minimum of six inches of clearance above all downstream piping of the AVB or any overflow rim is required.
3. The AVB shall not be under continuous pressure for more than 12 hours.

PRESSURE VACUUM BREAKER

The pressure vacuum breaker (PVB) assembly evolved from the need to have a testable atmospheric vacuum breaker. The PVB contains an internally loaded check valve and an internally loaded air inlet valve. The valves independently act with the air inlet valve located downstream of the check valve. Shut-off valves and test cocks are located at each end of the assembly.

- The PVB, unlike the atmospheric vacuum breaker, can be tested.
- The PVB protects against non-health hazards, or health hazards under back siphonage only.
- The PVB is not designed to protect against back pressure.
- The PVB is most commonly found on your irrigation systems.
- The PVB is for OUTDOOR USE ONLY.

Based on the design and operation of PVB, the following criteria must be implemented:

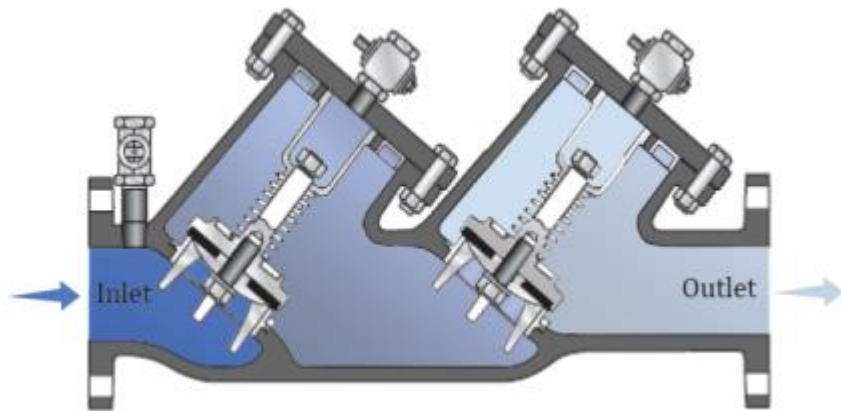
1. Shut-off valves may be installed on the downstream of a PVB.
2. You must have a minimum clearance of 12" above all downstream piping.



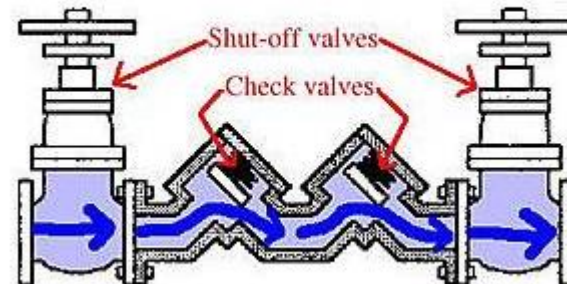
DOUBLE-CHECK VALVE

The double-check valve (DCV) consists of two independently acting, resilient seat check valves located between two tightly closing shut-off valves, together with suitable test cocks, and stop valves arranged so that the main check valves can be tested for water tightness.

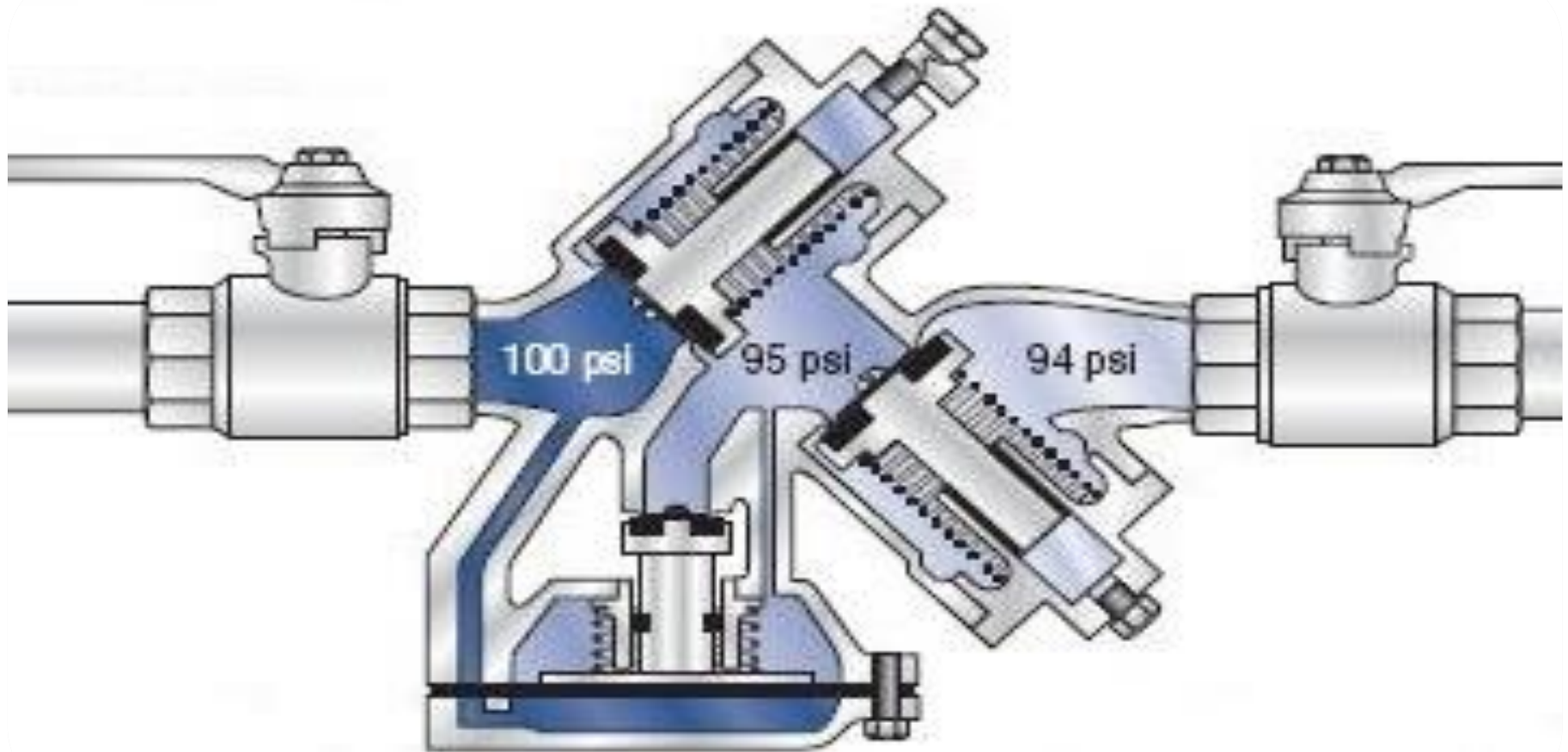
- ❖ Most commonly found on fire prevention sprinkling systems.



Double Check Valve Assembly:



REDUCED-PRESSURE PRINCIPLE BACKFLOW-PREVENTOR



REDUCED-PRESSURE PRINCIPLE BACKFLOW-PREVENTOR

The reduced-pressure principle backflow preventer, introduced to the water supply industry about 1942, is safer than the double-check valve.



- The device consists of an automatic differential pressure valve located between two or more independently acting, spring loaded, resilient seat-check valves.
- These seat-check valves are, in turn, located between two tightly closing shut-off valves.
- The RP operates on the hydraulic principle that water will not flow from a zone of lower pressure to a zone of higher pressure.
- The RP protects against all types of hazards.
- An outstanding advantage that the reduced-pressure principle backflow preventer has over the double-check valve is the visible indication of malfunctioning long before a danger of backflow exists. Hence, repairs can be made while the device is still effectively acting as a backflow preventer.

THINGS TO REMEMBER

- There are many codes and regulations that limit the installations of certain backflow prevention devices on certain plumbing systems.
- All testable backflow devices require annual testing.
- Only certified backflow testers and installers are allowed to test or repair a backflow prevention device.
- Aftermarket repair parts are not allowed on any testable device.

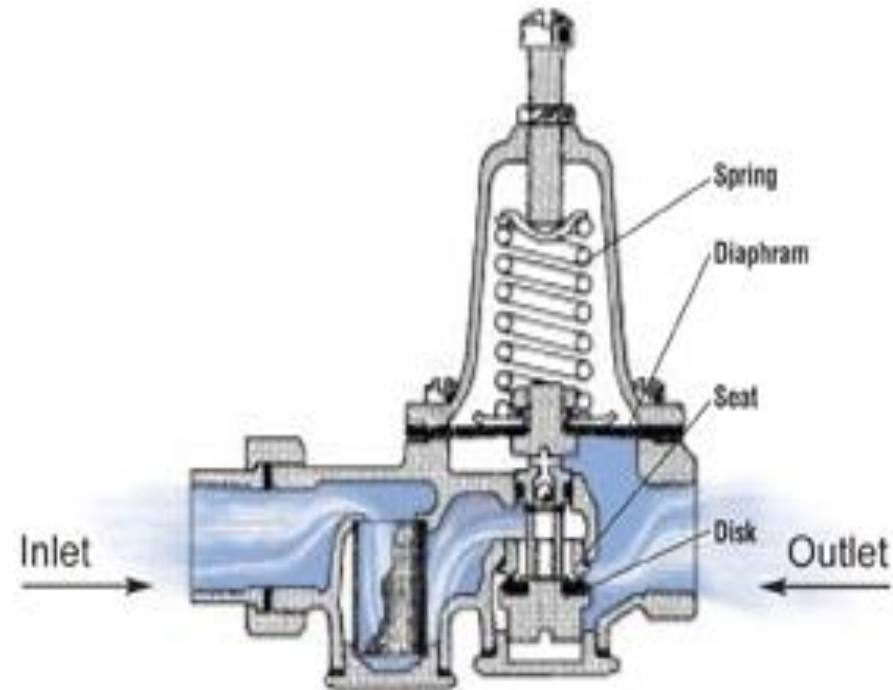


PRESSURE REDUCING VALVES

- There are two types of water pressure reducing valves, direct acting and pilot operated. Both use globe or angle style bodies.
- Valves used on smaller piping diameter units are cast from brass; larger piping diameter units are made from ductile iron.
- Direct acting valves, the more popular type of a water pressure reducing valves, consist of globe-type bodies with a spring-loaded, heat-resistant diaphragm connected to the outlet of the valve that acts upon a spring. This spring holds a pre-set tension on the valve seat installed with a pressure equalizing mechanism for precise water pressure control.

Pressure Reducing Valve (PRV)

- Installed in series directly after the water meter in homes, commercial buildings, and manufacturing plants, a water pressure reducing valve automatically reduces the pressure from the water supply main to a lower pressure to meet code (8 PSI or 80 feet per second).
- Water entering the valve from municipal mains is constricted within the valve body and directed through the inner chamber controlled by an adjustable spring-loaded diaphragm and disc. Even if the supply water pressure fluctuates, the pressure reducing valve ensures a constant flow of water at a functional pressure, as long as the supply pressure does not drop below the valve's pre-set pressure.

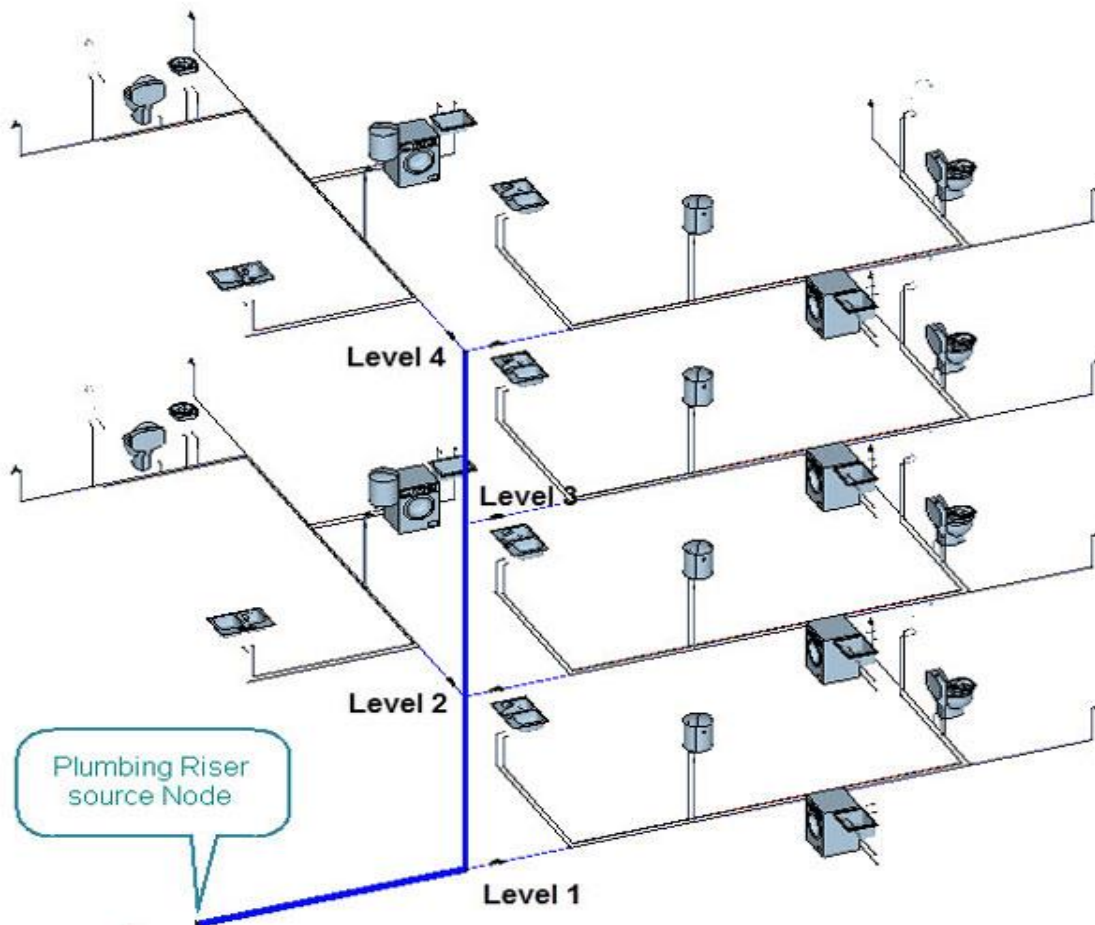


PILOT-OPERATED VALVES or ACV'S

- Pilot-operated valves have a sensing control pilot and main valve in one unit. These valves are typically used in commercial applications such as schools, hotels and hospitals, as well as in industrial and municipal applications and installations that require more consistent pressure control over wide flow ranges. Those applications typically demand valves with larger diameters, ranging from 1¼" to 16".

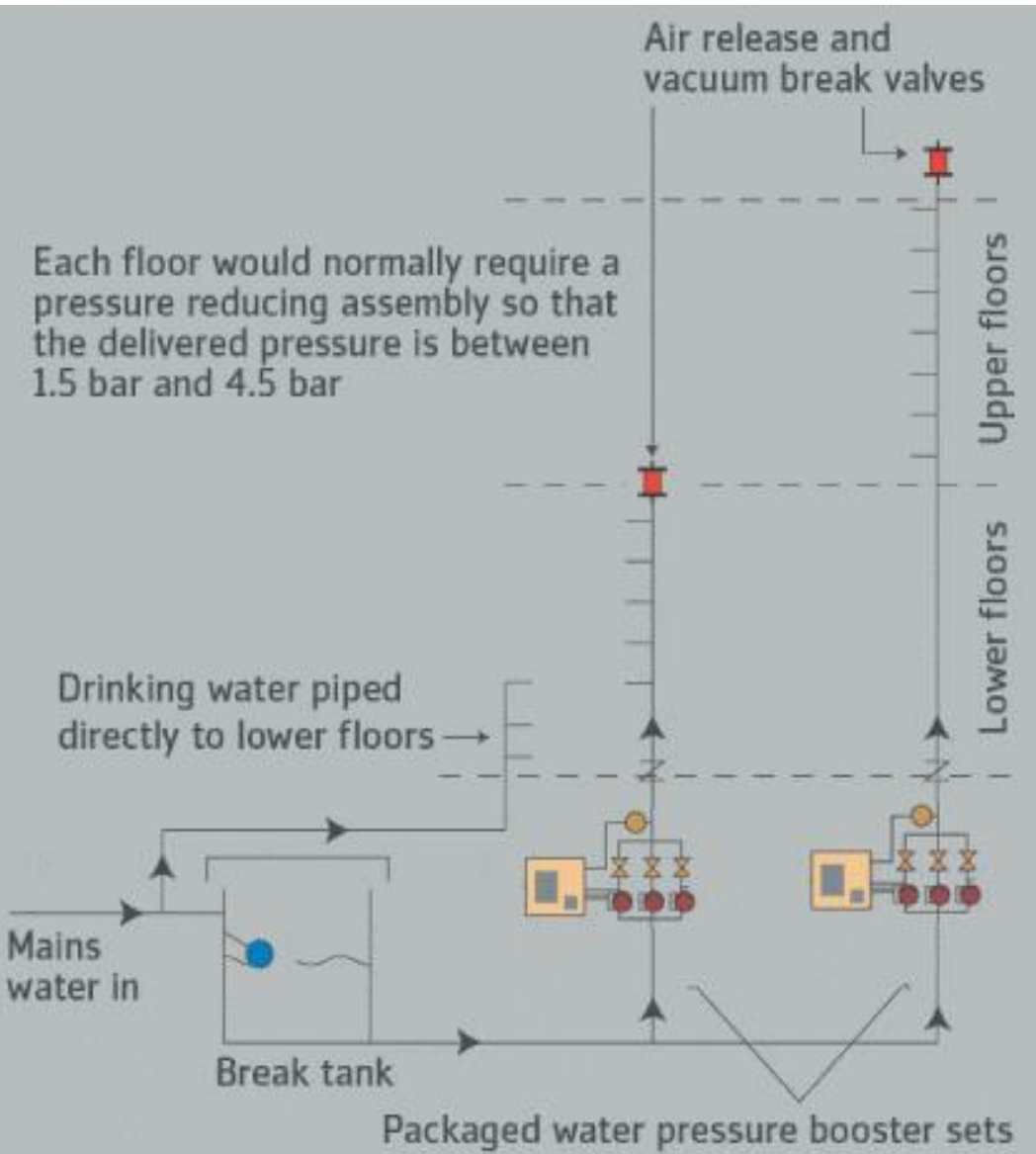


SUPPLY AND DISTRIBUTION



- It is then distributed through the building in pipes called Mains, Risers, and branch lines.
- Through these branch lines, the hot or cold water travels to the fixtures.

SUPPLY AND DISTRIBUTION



DOMESTIC HOT WATER

- Distributing hot water is very similar to how cold water is distributed, you just need to heat it up first.
- There are many ways to heat water:
 - ✓ Gas water heaters
 - ✓ Electric water heaters
 - ✓ Boilers
 - ✓ Heat exchangers



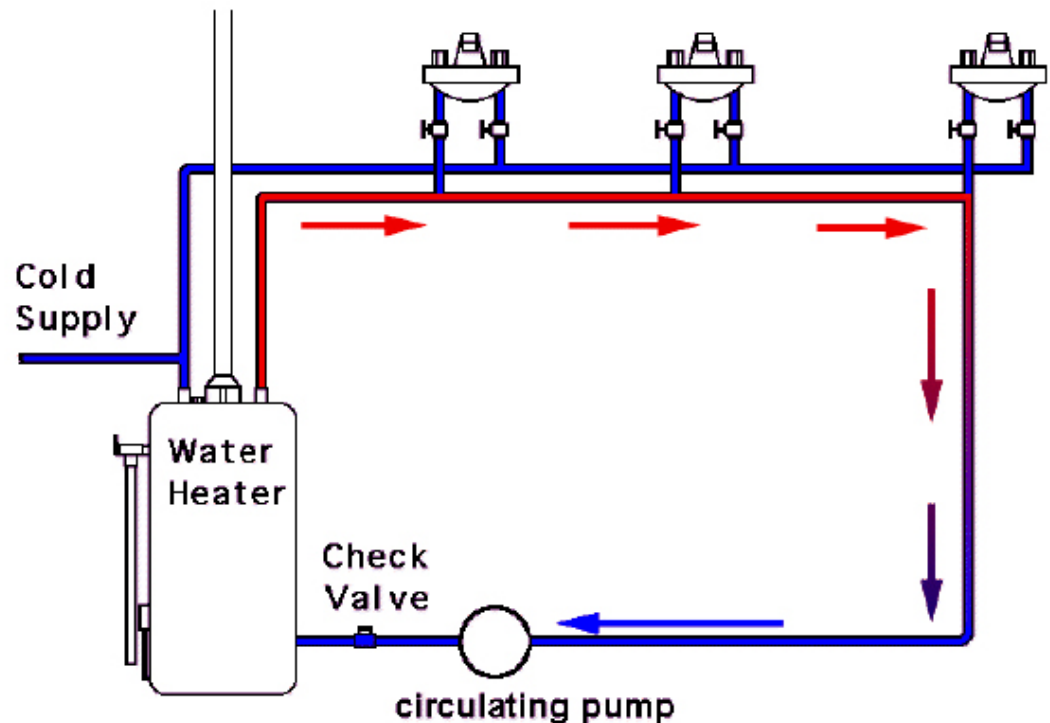
DOMESTIC HOT WATER

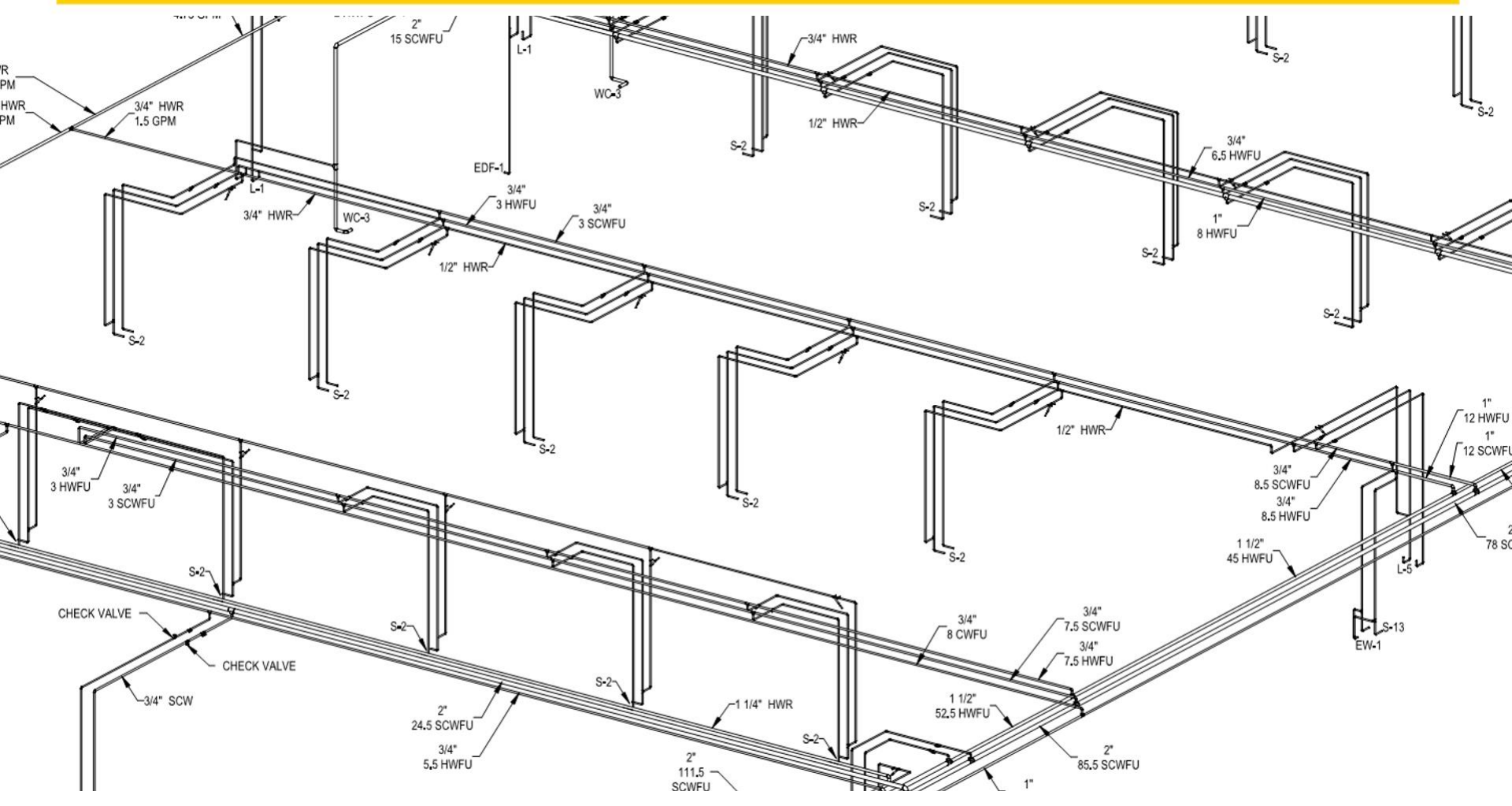
The key to hot water is keeping it hot as efficiently as possible.

One way to do this is by having a hot water return system.

It is best to have a temperature sensor or time clock on these lines to keep electrical cost down.

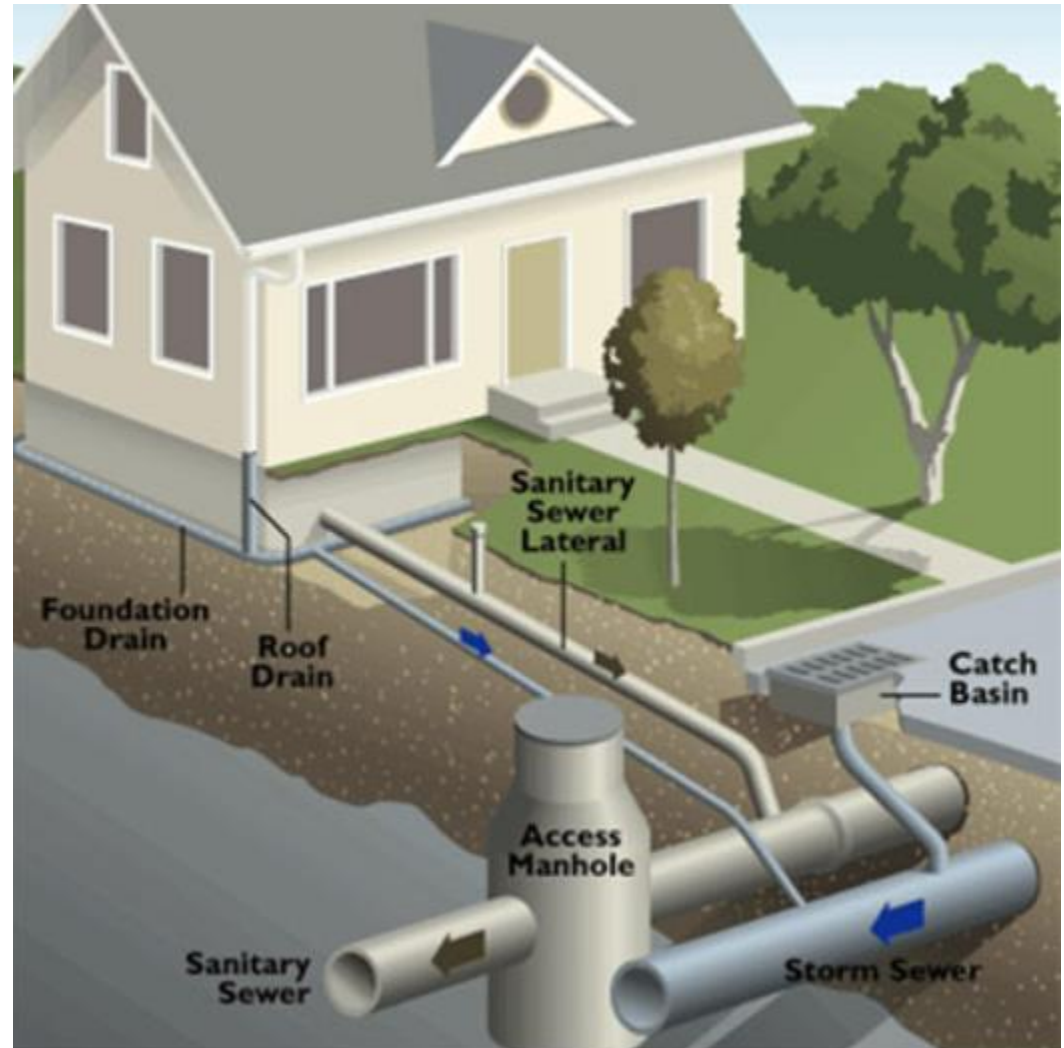
Traditional type hot water circulating system.





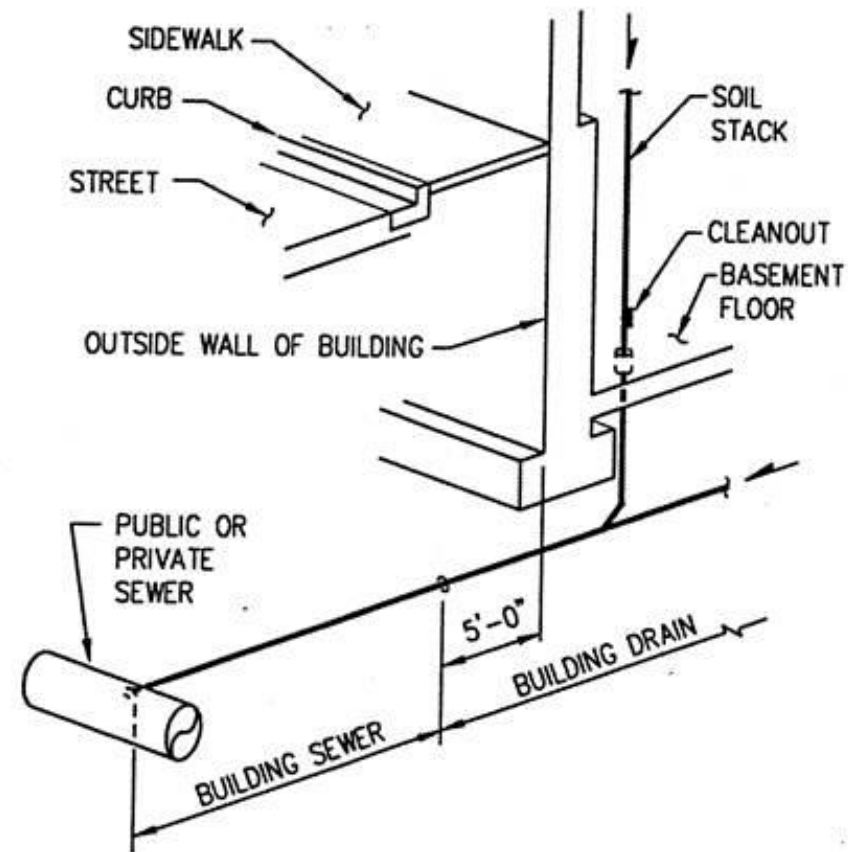
SANITARY SEWER

- A sanitary sewer is an underground carriage system specifically for transporting sewage from commercial buildings through pipes to treatment or disposal.
- Sanitary sewers serving industrial areas also carry industrial wastewater.



BUILDING SEWER VS BUILDING DRAIN

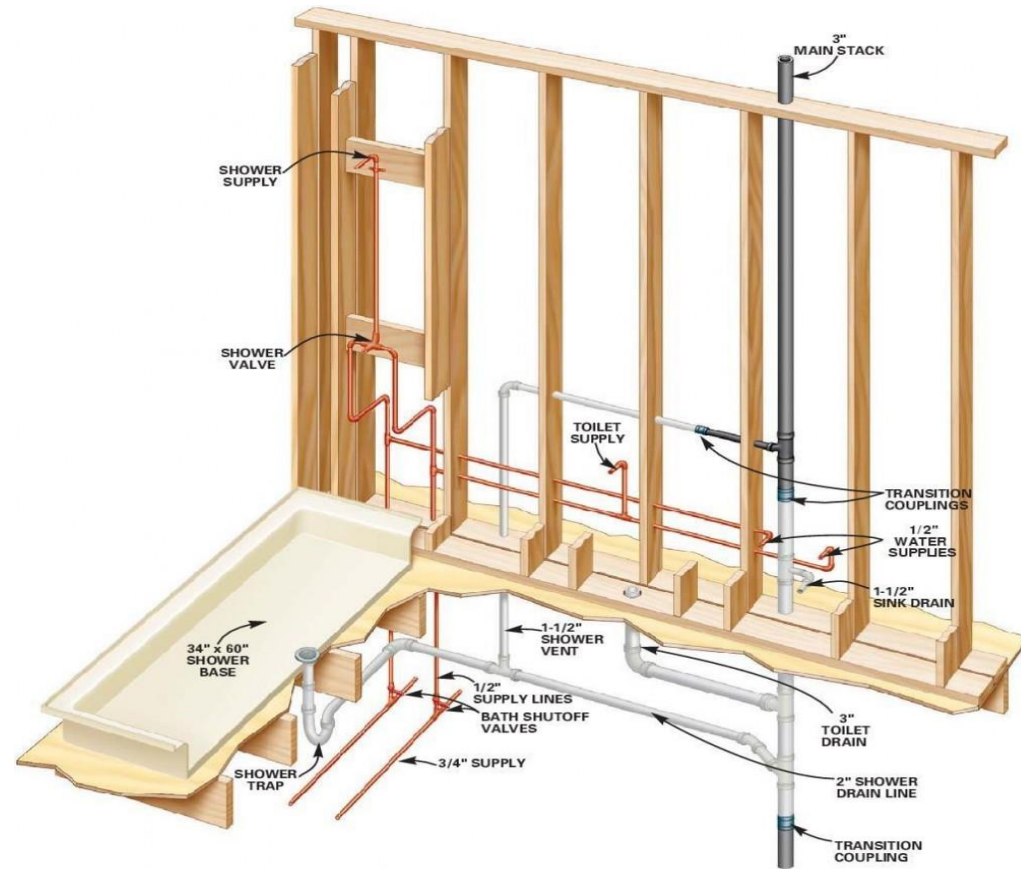
- **Building Drain** is all the sewer pipe in a building to 5'-0" outside the building.
- **Building Sewer** is the section of pipe connecting a single property to the public or private sewer.
- **Private Sewer** is a sewer that connects multiple building sewers on one property to one common public sewer.
- **Public Sewer or Sanitary Sewer** is the underground carriage system specifically for transporting sewage from houses and commercial buildings through pipes to treatment or disposal plants.



HOW YOUR DRAIN WASTE AND VENT SYSTEM WORKS

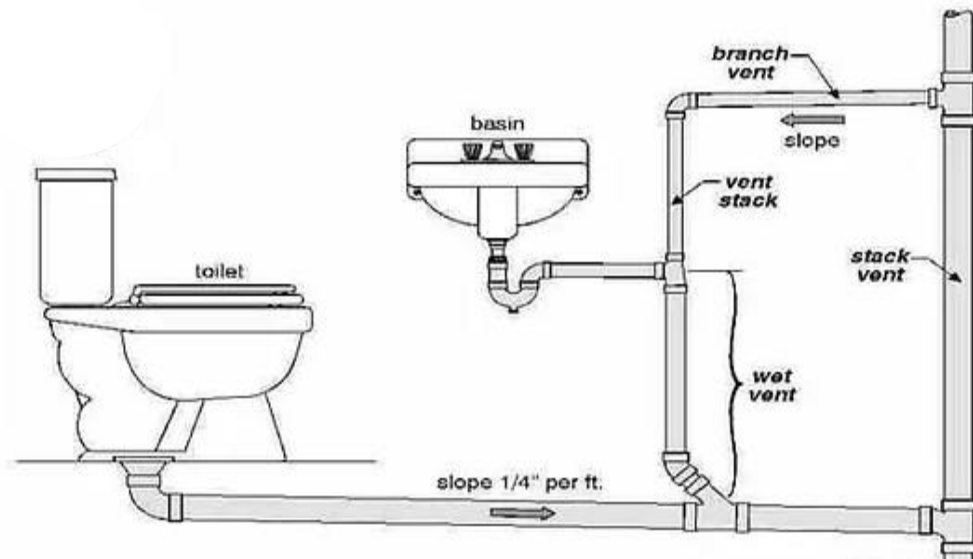
- A drain-waste-vent (or DWV) is part of a system that removes sewage from a building and regulates air pressure in the waste-system pipes, maintaining flow. Waste is produced at fixtures such as toilets, sinks and showers, and exits the fixtures through a P-trap, a U-shaped section of pipe that always contains water.

- DWV systems maintain neutral air pressure in the drains, allowing flow of water and sewage down drains and through waste pipes by gravity. As such, it is critical that a downward slope of $\frac{1}{4}$ inch per foot be maintained throughout. In some situations, slope out of a building to the sewer cannot be achieved, so a special collection pit or Lift station and sewage ejector' pump are needed.



VENT SYSTEM

- The venting system consists of pipes leading from waste pipes to the outdoors, usually through the roof.
- Vents provide a way to equalize the pressure on both sides of a trap, allowing the trap to hold water, which is needed to maintain effectiveness of the trap. Every fixture is required to have an internal or external trap
- Think of it this way. If you fill a milk jug full of water and flip it upside down, the water chugs. However, if you cut a hole in the top, it flows out smooth and fast. Your vent system works the same way.

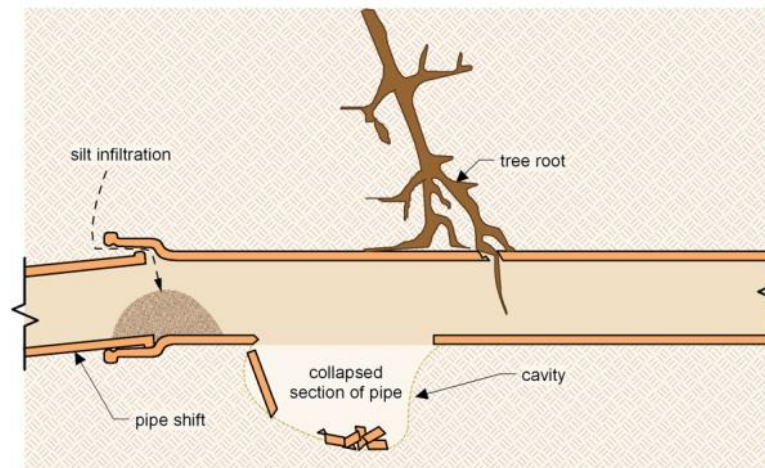


VENT SYSTEM

- A sewer pipe is normally at neutral air pressure. When wastewater flows through a pipe, it compresses air in the pipe, creating a positive pressure that must be released or it will push back on the waste stream and downstream trap water seals. As the column of water passes, air must flow in behind the waste stream, or negative pressure results. The extent of these pressure fluctuations is determined by the fluid volume of the waste discharge.
- Excessive negative air pressure, behind a "slug" of water that is draining, can siphon water from traps and plumbing fixtures. A water closet has the shortest trap seal, making it most vulnerable to being emptied by induced siphonage. An empty trap will allow noxious sewer gases to enter a building.
- On the other hand, if the air pressure within the drain becomes suddenly higher than ambient, this positive transient could cause wastewater to be pushed into the fixture. This can break the trap seal, which can lead to serious hygiene and health consequences if too forceful. Tall buildings of three or more stories are particularly susceptible to this problem. Vent stacks are installed parallel to waste stacks to allow proper venting in tall buildings.

PROBLEMS THAT CAN OCCUR IN YOUR SEWER AND VENT

- Blockages
- Cracks
- Clogs
- Bellies
- Pipe Shifting
- Root Intrusion
- I/I & Exfiltration
- Corrosion
- Scaling & Tuberculation
- Pipe Splitting



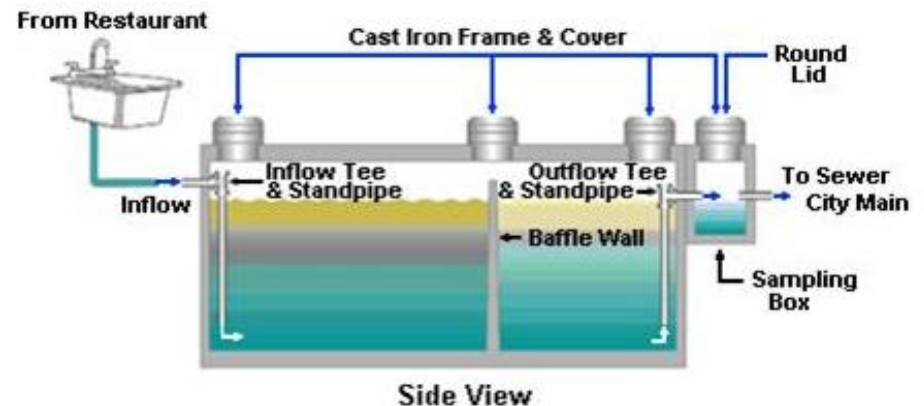
HOW TO FIND AND FIX THE PROBLEM

- MAINTENANCE
- JETTING
- LINE LOCATING
- CAMERA INSPECTION
- SMOKE TESTING
- DIG UP AND REPLACE
- PIPE LINING



GREASE WASTE

- Restaurant and food service kitchens produce a lot of waste grease, which is present in the drain lines from the various sinks, dishwashers, and cooking equipment. If not removed, the grease will congeal within the sewer and cause blockages and back-ups.
- Grease waste lines are installed the same way as your building sewer lines, only commercial kitchen equipment will be connected to these lines.
- The waste will then flow to a grease interceptor. This device separates the grease waste from the wastewater and lets the wastewater flow to the sewer while collecting the grease in a chamber to be pumped out as needed.





WATER CONSERVATION

WHERE DO WE START

- ✓ Low flow or dual flush water closets
- ✓ Waterless urinals
- ✓ Fix or replace leaking faucets
- ✓ Check your cooling systems, monitor your make-up water use
- ✓ Check your irrigation systems for leaks
- ✓ Plant drought resistant plants

Preventative maintenance is essential to keep any building running at its peak efficiency.



ALTERNATIVES TO WHOLE BUILDING SHUTDOWNS

Presented by: Chris Zion



HOT TAPPING

- Hot Tapping is the process of making a connection or tying into an existing pipe without interrupting service to the system.

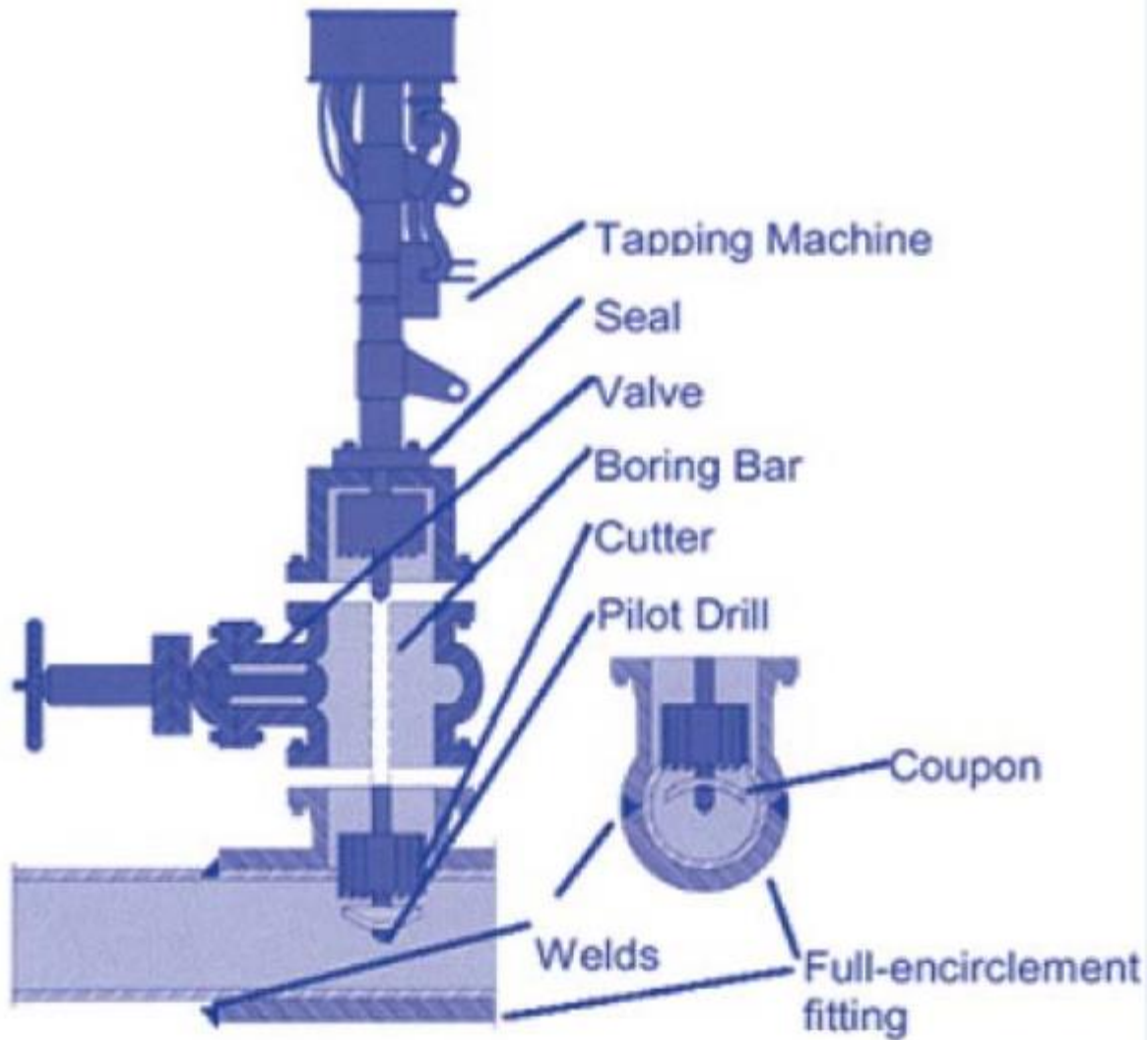


HOT TAPPING PROCEDURE

- Clean and prep the line to be tapped
- Install Tapping saddle or welded fitting
- Install branch line ball valve
- Pressure test assembly
- Install Hot Tapping Machine
- Perform Hot Tap
- Remove Hot Tap machine and the line is ready to use

Hot Tapping can be done on most water, gas, steam, fuel, and heating and cooling system piping.

HOT TAPPING PROCEDURE



PIPE FREEZING

Pipe freezing is the process of creating one or more solid ice plugs in a water line to

- Make a repair
- Install inline valves
- Replace a bad valve

Pipe freezing can be done on most fluids, including hot water. Certain freezing processes can hold back up to 3,000 psig

PIPE FREEZING



THINGS TO REMEMBER

- Plumbing lines **HAVE TO HAVE ZERO FLOW** to create a solid ice plug
- Plastic pipe cannot be frozen
- Hot water takes longer to freeze and may require a different process using liquid nitrogen
- Water containing antifreeze cannot be frozen
- Pipes can split during the freezing process

FOR MORE INFORMATION

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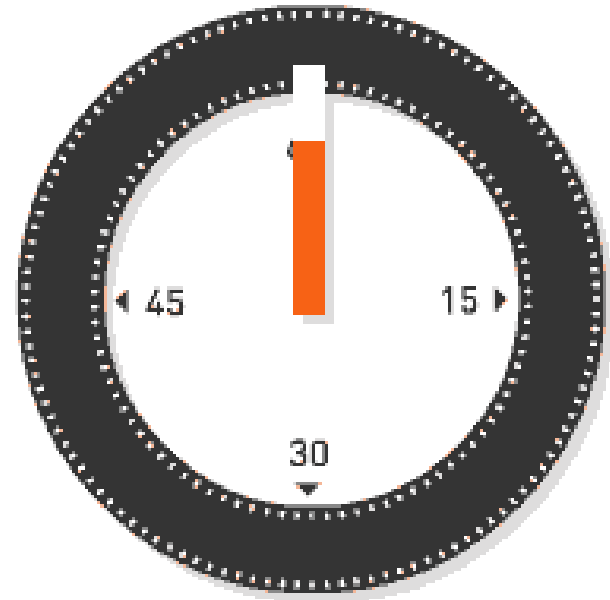
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TIME FOR QUESTIONS



Thank you for meeting us today!

