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High Hazard Cross Connections – Responsible Authorities

In response to the federal Safe Drinking Water Act (SDWA) Ground Water Rule and recent incidents in Minnesota, the Minnesota Department of Health (MDH) has adopted high-hazard cross connections that are not adequately protected as a Significant Deficiency for all Community Public Water Systems (CPWSs).

For the purposes of CPWS Unit program implementation, SDs will be defined as high-hazard cross connections that need a reduced pressure zone backflow preventer or air gap to meet the Minnesota Plumbing Code. However, CPWSs can adopt a more comprehensive approach, addressing all cross connections as part of a cross connection control program.

Any local unit of government which has a Building Code ordinance must use the Minnesota Plumbing Code as the criterion for proper installation and maintenance of plumbing systems. Because it is a statewide code, local ordinances cannot vary from it in any way which would be either more restrictive or less inclusive. MN Rules 4715.2161 requires that there be an ongoing testing program for any type of reduced-pressure-zone backflow preventers which are installed. This includes devices which are already installed as well as any which are newly installed. Any local unit of government enforcing the code must also enforce this very important part of the code.

In addition to state requirements, the SDWA, enforced through the United States Environmental Protection Agency (EPA), holds the water purveyor responsible for ensuring the quality of the water all the way to the free-flowing outlet of the consumer. This means the purveyor is responsible for assuring that the water quality is not compromised as a result of delivery through the distribution system. Pursuant to this requirement, the EPA stresses the importance of comprehensive local cross-connection control programs, including the need for periodic testing of backflow preventers.

The reason these devices must be tested annually is that they are the final and often only line of defense to protect the quality of water within plumbing water distribution systems contamination by other systems or equipment. After considerable money and effort is spent to assure safe water quality coming from the water system, it is important to assure that nothing is done to contaminate water within the distribution system. Provision of backflow preventers is a preventative measure, as the name implies, intended to help preserve water quality. Backflow preventers are, however, mechanical devices with internal moving parts, and like any mechanical device, they must be properly maintained to assure they will function when needed. Proper maintenance of the device is just as important as installation of the device itself.

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It must be noted that local units of government that have a Building Code ordinance, but do not pursue a backflow preventer testing program may incur liability in the event of a contamination-related problem resulting from a cross-connection within a potable water system.

The Minnesota Plumbing Code resides in the Minnesota Department of Labor and Industry (DLI), and DLI can delegate authority for the plumbing code to a local authority. Below are references and resources CPWSs can use in addressing suspected or identified high-hazard cross connections.

Statute and Rule References

CFR 141.403 (a) (4) *Treatment Technique Requirements for Ground Water Systems*
For the purposes of this subpart, significant deficiencies include, but are not limited to, defects in design, operation, or maintenance, or a failure or malfunction of the sources, treatment, storage, or distribution system that the State determines to be causing, or have the potential for causing, the introduction of contamination into the water delivered to customers.

Subpart H *(Surface Water Systems)* CFR 141.173 - Filtration; CFR 141.174 (a) and (b) - Filtration Sampling Requirements; and CFR 142.16(b)(3)(i) (A) thru (H) Sanitary Survey means an onsite review of the water source (identifying sources of contamination using results of source water assessments where available), facilities, equipment, operation, maintenance, and monitoring compliance of a public water system to evaluate the adequacy of the system, its sources and operations and the distribution of safe drinking water. Definition of a significant deficiency: any defect in a system's design, operation, maintenance, or administration, as well as any failure or malfunction of any system component that the State determines to cause, or have the potential to cause, unacceptable risk to health that could affect the reliable delivery of safe drinking water.

MN Rules 4720.0025 *Unsafe Water Connections*
There shall be no physical connection between any public water system intended for potable or domestic use and any system, equipment, or device that may serve as a source of contamination, unless protected by a properly maintained backflow preventer approved by the commissioner.

MN Rules 4715.1900 *Design, Maintenance, and Installation* A potable water supply system shall be designed, installed, and maintained in such manner as to prevent contamination from nonpotable liquids, solids, or gases, from being introduced into the potable water supply through cross-connection or any other piping connections to the system.

MN Rules 4715.1920 *Cross-Connection Control*
Cross-connections between potable water systems and other systems or equipment containing water or other substances of unknown or questionable safety are prohibited, except when and where, as approved by the authority having jurisdiction, suitable protective devices such as break tanks, reduced pressure zone backflow preventer, or equal, are installed, tested, and maintained to ensure proper operation on a continuing basis. Cross-connections between an individual water supply and a potable public supply shall not be made unless specifically approved by the authority having jurisdiction.

MN Rules 4715.2161 *Installation of Reduced Pressure Backflow Preventers*
Subp. 1. Notification of installation. The administrative authority must be notified before installation of a reduced pressure backflow preventer assembly.
Subp. 2. Testing and maintenance. The installation of reduced pressure backflow preventers shall be permitted only when a periodic testing and inspection program conducted by qualified personnel will be provided by an agency acceptable to the administrative authority. Inspection intervals shall not exceed one year, and overhaul intervals shall not exceed five years. The administrative authority may require more frequent testing if deemed necessary to assure protection of the potable water. Backflow preventers shall be inspected frequently after initial installation to assure that they have been properly installed and that debris resulting from the piping installation has not interfered with the functioning of the assembly.
Subp. 3. Inspection and records. A test and inspection tag must be affixed to the device. The tester shall date and sign the tag and include the tester's backflow preventer tester identification number. Written records of testing and maintenance must be maintained and submitted to the administrative authority.

MN Rules 4715.0100, Definitions, Subp. 2 *Administrative Authority*
"Administrative authority" means the commissioner of labor and industry. (When a governmental subdivision adopts and maintains a comprehensive plumbing enforcement program that is conducted by personnel who are knowledgeable about plumbing installation requirements, and includes enforcement of all code provisions including materials, methods, inspection, and testing, the administrative authority shall be the governing body of the adopting unit of government, its agents, and employees; however, the commissioner of labor and industry retains the ultimate authority to enforce Minnesota Statutes, sections 326.37 and 326.45, and provisions of this chapter that are necessary to ensure compliance.)

Responsible Authorities (plan review, inspections, and code enforcement)

For each of the following establishments, if you suspect or identify an inadequately protected high-hazard cross connection, you can contact the appropriate agency for follow-up or enforcement action:

Food, Beverage, or Lodging Establishment
1) local plumbing code authority, or 2) local MDH or delegated program licensing authority at www.health.state.mn.us.

Pools
1) local plumbing code authority, or 2) local MDH or delegated program licensing authority at www.health.state.mn.us.

In-Store Delis, Grocery Stores, Butcher Stores, Bakeries, or Convenience Stores
1) local plumbing code authority, or 2) local MDA licensing authority at www.mda.state.mn.us.

Food Processing Facilities
1) local plumbing code authority, or 2) local USDA licensing authority at www.usda.gov.

Health Care Facilities and Providers
1) local plumbing code authority, or 2) MDH licensing authority at www.health.state.mn.us.

Building Plumbing Systems (in general)
You can request the local plumbing code authority take enforcement action.

Lawn Irrigation Systems
In some situations, an RPZ backflow preventer may not be a necessary device for a lawn irrigation system, and other devices may be more appropriate. If you suspect or identify an inadequately protected high-hazard cross connection, you can request the local plumbing code authority take enforcement action.

You can find the local plumbing code (and building code) authority for your CPWS at www.dli.state.mn.us. If the local plumbing code authority or specific licensing authority does not take enforcement action, you can contact DLI at www.dli.state.mn.us, as they retain the ultimate authority to enforce the Minnesota Plumbing Code. In addition, any CPWS that is a local government unit can take steps to adopt and enforce the Minnesota Plumbing Code by ordinance.

You can find additional resources at www.lmc.org for ordinances, www.mrwa.com for templates and helpful hints for implementing cross-connection control programs, www.mnawwa.org, www.abpa.org, www.dli.state.mn.us, and www.health.state.mn.us for grant opportunities and factsheets on High-Hazard Cross Connections - Significant Deficiency and High-Hazard Cross Connections in Minnesota.

For more information, contact:
Environmental Health Division
Drinking Water Protection Section
http://health.state.mn.us/water
651-201-4655

the system shall account for the pressure drop through the backflow device. Where such devices are retrofitted for an existing fire protection system, the hydraulics of the sprinkler system design shall be checked to verify that there will be sufficient water pressure available for satisfactory operation of the fire sprinklers.

603.5.16 Health Care or Laboratory Areas. Vacuum breakers for washer-hose bedpans shall be located not less than 5 feet (1524 mm) above the floor. Hose connections in health care or laboratory areas shall be not less than 6 feet (1829 mm) above the floor.

603.5.17 Special Equipment. Portable cleaning equipment, dental vacuum pumps, and chemical dispensers shall be protected from backflow by an air gap, an atmospheric vacuum breaker, a spill-resistant vacuum breaker, or a reduced pressure principle backflow preventer.

603.5.18 Potable Water Outlets and Valves. Potable water outlets, freeze-proof yard hydrants, combination stop-and-waste valves, or other fixtures that incorporate a stop-and-waste feature that drains into the ground shall not be installed underground except for a freeze-proof yard hydrant that is located at least two feet above the water table and at least ten feet from any sewer or similar source of contamination.

603.5.19 Pure Water Process Systems. The water supply to a pure water process system, such as dialysis water systems, semiconductor washing systems, and similar process piping systems, shall be protected from backpressure and backsiphonage by a reduced-pressure principle backflow preventer.

603.5.19.1 Dialysis Water Systems. The individual connections of the dialysis related equipment to the dialysis pure water system shall not require additional backflow protection.

603.5.20 Plumbing Fixture Fittings. Plumbing fixture fittings with integral backflow protection shall comply with ASME A112.18.1/CSA B 125.1.

603.5.21 Swimming Pools, Spas, and Hot Tubs. Potable water supply to swimming pools, spas, and hot tubs shall be protected by an air gap or a reduced pressure principle backflow preventer in accordance with the following:

(1) The unit is equipped with a submerged fill line.

(2) The potable water supply is directly connected to the unit circulation system.

603.5.22 Barometric Loop. A barometric loop is an acceptable method of protection of water connections where an actual or potential backsiphonage hazard exists that is not subject to backpressure.

603.5.23 Installation of Testable Backflow Prevention Assembly. Testable backflow prevention assemblies meeting ASSE Standard 1013, 1015, 1020, 1047, 1048, or 1056 shall be installed, tested, maintained, and removed in accordance with sections 603.5.23.1 through 603.5.23.4.

603.5.23.1 Notification of Installation. The administrative authority shall be notified before installation of a testable backflow prevention assembly. The public water supplier shall be notified of the installed testable backflow preventer assembly within 30 days following installation on a community public water system.

603.5.23.2 Testing and Maintenance. The installation of a testable backflow prevention assembly is permitted only when a periodic testing and inspection program conducted by qualified personal is provided by an agency acceptable to the administrative authority. Inspection intervals shall not exceed one year. The administrative authority may require more frequent testing if deemed necessary to ensure protection of the potable water. A testable backflow prevention assembly shall be inspected after initial installation to ensure that it has been properly installed and that debris resulting from the piping installation has not interfered with the functioning of the assembly.

603.5.23.3 Inspection and Records. A test and inspection tag shall be affixed to the testable backflow prevention assembly. The tester shall date and sign the tag and include the tester's backflow prevention tester certification number. Written records of testing and maintenance shall be maintained and submitted to the administrative authority, and to the public water supplier, within 30 days of testing if installed on a community public water system.

603.5.23.4 Notification of Removal. The Authority Having Jurisdiction, in addition to the public water supplier, shall be notified within 30 days following removal of a testable backflow prevention assembly from a community public water supply system.

604.0 Materials.

604.1 Pipe, Tube, and Fittings. Pipe, tube, fittings, solvent cements, thread sealants, solders, and flux used in potable water systems intended to supply drinking water shall be in accordance with the requirements of NSF 61.

Materials used in the water supply system, except valves and similar devices, shall be of a like material, except where otherwise approved by the Authority Having Jurisdiction.

Materials for building water piping and building supply piping shall comply with the applicable standards referenced in Table 604.1.

604.2 Copper Tube. Copper tube for water piping shall have a weight of not less than Type L.

Exception: Type M copper tubing shall be permitted to be

Cross-Connection Control Manual

EPA

Cross-Connection Control Manual

United States
Environmental Protection Agency
Office of Water
Office of Ground Water and Drinking Water

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Purpose and Scope

Public health officials have long been concerned about cross-connections and backflow connections in plumbing systems and in public drinking water supply distribution systems. Such cross-connections, which make possible the contamination of potable water, are ever-present dangers. One example of what can happen is an epidemic that occurred in Chicago in 1933. Old, defective, and improperly designed plumbing and fixtures permitted the contamination of drinking water. As a result. 1,409 persons contracted amebic dysentery; there were 98 deaths. This epidemic, and others resulting from contamination introduced into a water supply through improper plumbing, made clear the responsibility of public health officials and water purveyors for exercising control over public water distribution systems and all plumbing systems connected to them. This responsibility includes advising and instructing plumbing installers in the recognition and elimination of cross-connections.

Cross-connections are the links through which it is possible for contaminating materials to enter a potable water supply. The contaminant enters the potable water system when the pressure of the polluted source exceeds the pressure of the potable source. The action may be called backsiphonage or backflow. Essentially it is reversal of the hydraulic gradient that can be produced by a variety of circumstances.

It might be assumed that steps for detecting and eliminating cross-connections would be elementary and obvious. Actually, cross-connections may appear in many subtle forms and in unsuspected places. Reversal of pressure in the water may be freakish and unpredictable. The probability of contamination of drinking water through a cross-connection occurring within a single plumbing system may seem remote; but, considering the multitude of similar systems, the probability is great.

Why do such cross-connections exist?

First, plumbing is frequently installed by persons who are unaware of the inherent dangers of cross-connections. Second, such connections are made as a simple matter of convenience without regard to the dangerous situation that might be created. And, third, they are made with reliance on inadequate protection such as a single valve or other mechanical device.

To combat the dangers of cross-connections and backflow connections, education in their recognition and prevention is needed. First, plumbing installers must know that hydraulic and pollutional factors may combine to produce a sanitary hazard if a cross-connection is present. Second, they must realize that there are available reliable and simple standard backflow prevention devices and methods that may be substituted for the convenient but dangerous direct connection. And third, it should be made clear to all that the hazards resulting from direct connections greatly outweigh the convenience gained. This manual does not describe all the cross-connections possible in piping systems. It does attempt to reduce the subject to a statement of the principles involved and to make it clear to the reader that such installations are potentially dangerous. The primary purpose is to define, describe, and illustrate typical cross-connections and to suggest simple methods and devices by which they may be eliminated without interfering with the functions of plumbing or water supply distribution systems.

Burned in the Shower

A resident of a small town in Alabama, jumped in the shower at 5 a.m. one morning in October, 1986, and when he got out his body was covered with tiny blisters. "The more I rubbed it, the worse it got," the 60 year old resident said. "It looked like someone took a blow torch and singed me."

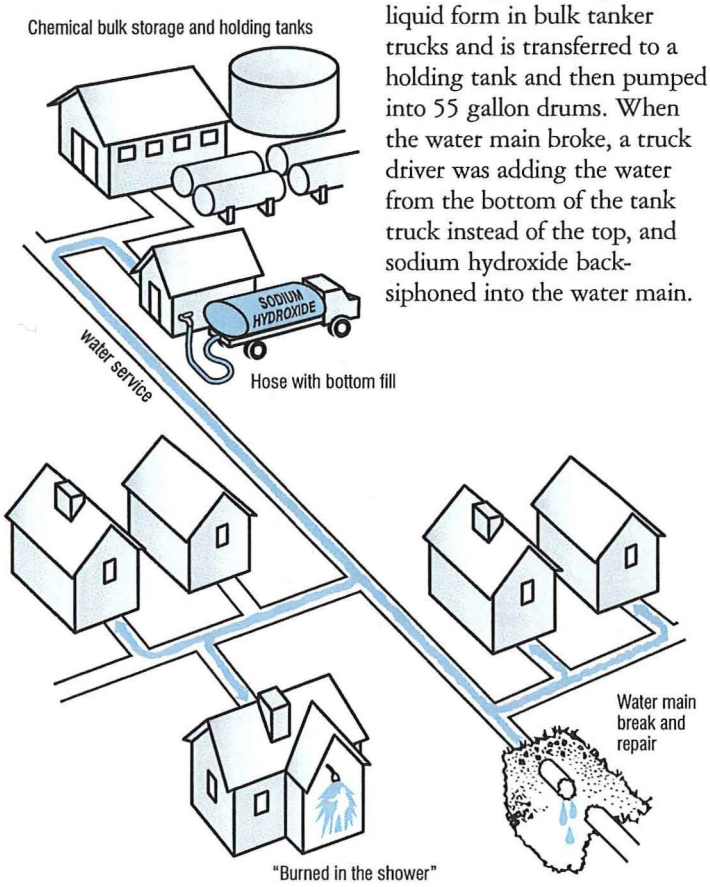
He and several other residents received medical treatment at the emergency room of the local hospital after the water system was contaminated with sodium hydroxide, a strong caustic solution.

Other residents claimed that, "It (the water) bubbled up and looked like Alka Seltzer. I stuck my hand under the faucet and some blisters came up."

One neighbor's head was covered with blisters after she washed her hair and others complained of burned throats or mouths after drinking the water.

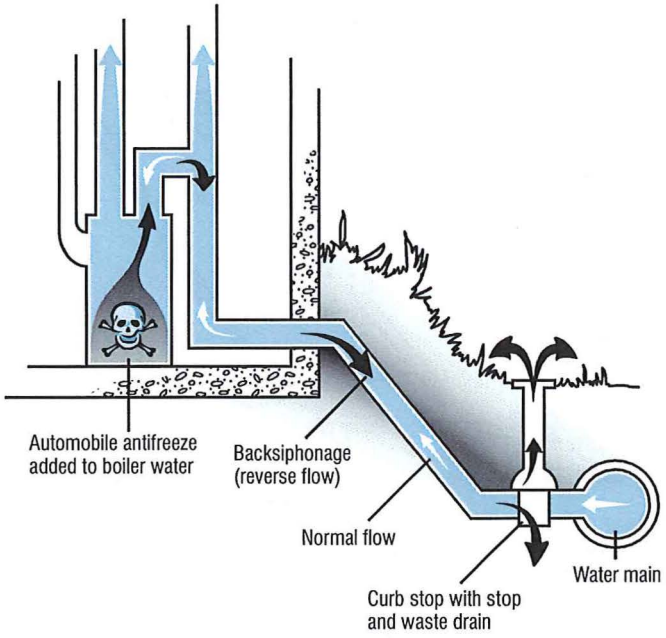
The incident began after an 8-inch water main, that fed the town, broke and was repaired. While repairing the water main, one workman suffered leg burns from a chemical in the water and required medical treatment. Measurements of the ph of the water were as high as 13 in some sections of the pipe.

Investigation into the cause of the problem led to a possible source of the contamination from a nearby chemical company that distributes chemicals such as sodium hydroxide. The sodium hydroxide is brought to the plant in liquid form in bulk tanker trucks and is transferred to a holding tank and then pumped into 55 gallon drums. When the water main broke, a truck driver was adding the water from the bottom of the tank truck instead of the top, and sodium hydroxide back-siphoned into the water main.

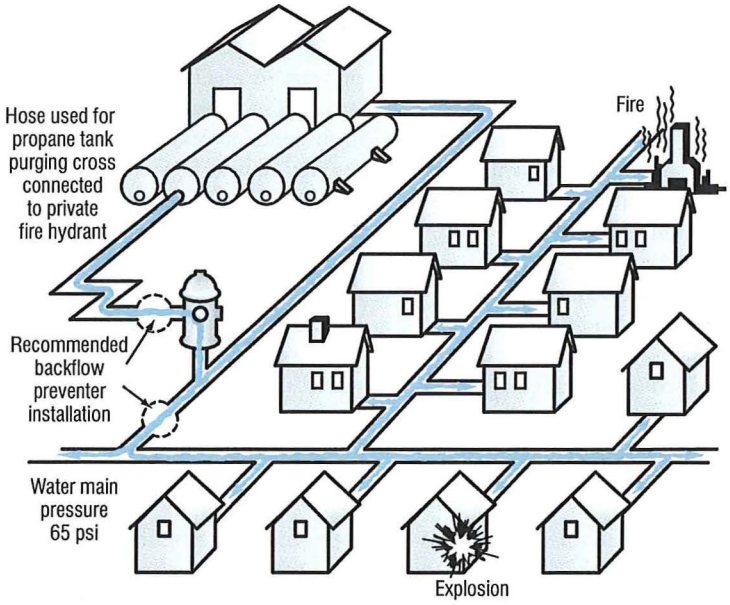


Heating System Anti-Freeze into Potable Water

Bangor Maine Water Department employees discovered poisonous antifreeze in a homeowner's heating system and water supply in November, 1981. The incident occurred when they shut off 'the service line to the home to make repairs. With the flow of water to the house cut off, pressure in the lines in the house dropped and the anti-freeze, placed in the heating system to prevent freeze-up of an unused hot water heating system, drained out of the heating system into house water lines, and flowed out to the street. If it had not been noticed, it would have entered the homeowner's drinking water when the water pressure was restored.



Propane Gas in the Water Mains



Hundreds of people were evacuated from their homes and businesses on an August afternoon in a town in Connecticut in 1982 as a result of propane entering the city water supply system. Fires were reported in two homes and the town water supply was contaminated. One five-room residence was gutted by a blaze resulting from propane gas "bubbling and hissing" from a bathroom toilet and in another home a washing machine explosion blew a woman against a wall. Residents throughout the area reported hissing, bubbling noises, coming from washing machines, sinks and toilets. Faucets sputtered out small streams of water mixed with gas and residents in the area were asked to evacuate their homes.

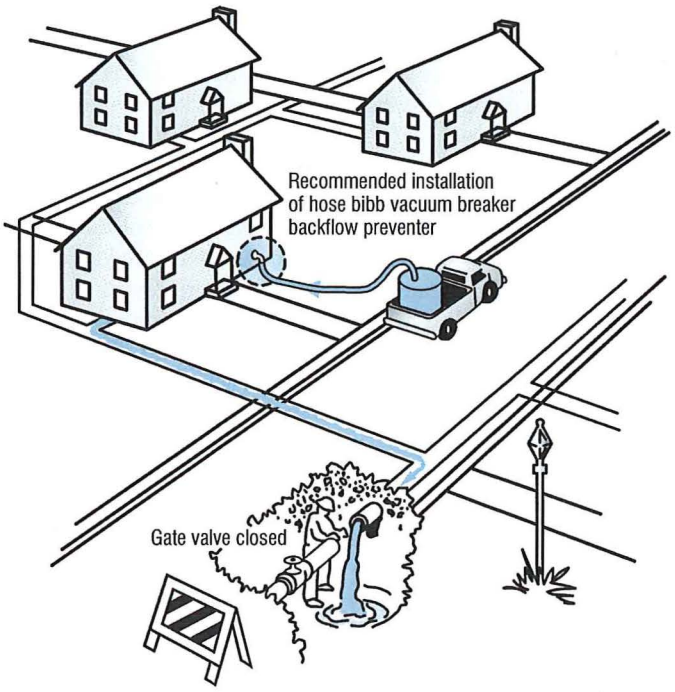
This near-disaster occurred in one, 30,000 gallon capacity liquid propane tank when the gas company initiated immediate repair procedures. To start the repair, the tank was "purged" of residual propane by using water from one of two private fire hydrants located on the property. Water purging is the preferred method of purging over the use of carbon dioxide since it is more positive and will float out any sludge as well as any gas vapors. The "purging" consisted of hooking up a hose to one of the private fire hydrants located on the property and initiating flushing procedures.

Since the vapor pressure of the propane residual in the tank was 85 to 90 psi., and the water pressure was only 65 to 70 psi., propane gas backpressure backflowed into the water main. It was estimated that the gas flowed into the water mains for about 20 minutes and that about 2,000 cubic feet of gas was involved. This was approximately enough gas to fill one mile of an 8-inch water main.

Chlordane and Heptachlor at the Housing Authority

The services to seventy five apartments housing approximately three hundred people were contaminated with chlordane and heptachlor in a city in Pennsylvania, in December, 1980. The insecticides entered the water supply system while an exterminating company was applying them as a preventative measure against termites. While the pesticide contractor was mixing the chemicals in a tank truck with water from a garden hose coming from one of the apartments, a workman was cutting into a 6-inch main line to install a gate valve. The end of the garden hose was submerged in the tank containing the pesticides, and at the same time, the water to the area was shut off and the lines being drained prior to the installation of the gate valve. When the workman cut the 6-inch line, water started to drain out of the cut, thereby setting up a backsiphonage condition. As a result, the chemicals were siphoned out of the truck, through the garden hose, and into the system, contaminating the seventy five apartments.

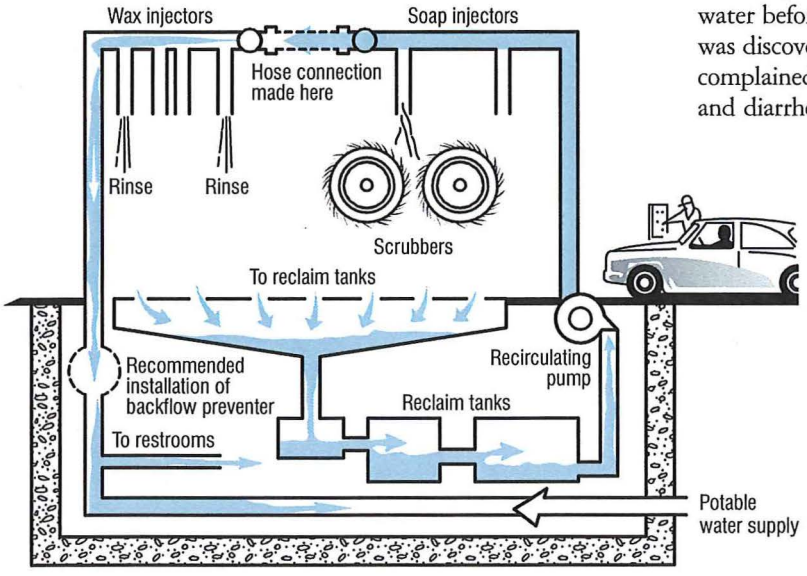
Repeated efforts to clean and flush the lines were not satisfactory and it was finally decided to replace the water line and all the plumbing that was affected. There were no reports of illness, but residents of the housing authority were told not to use any tap water for any purpose and they were given water that was trucked into the area by volunteer fire department personnel. They were without their normal water supply for 27 days.



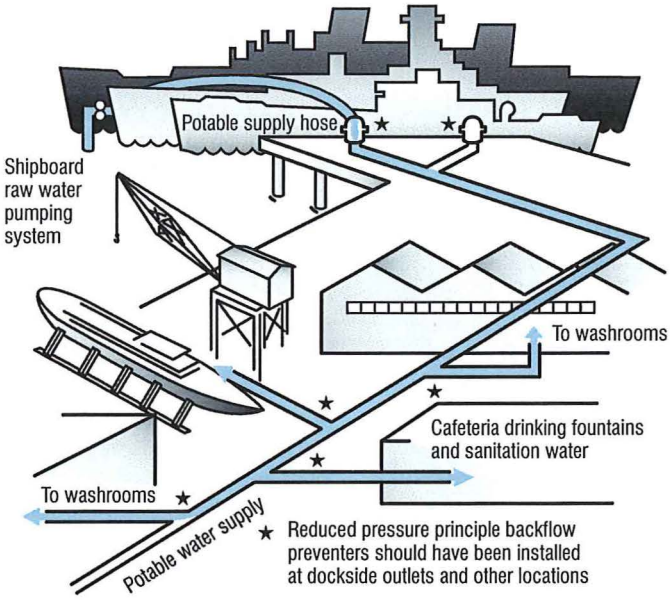
or laundry, based upon the soapy nature of the contaminant. The source was quickly narrowed down to a car wash and the proprietor was extremely cooperative in admitting to the problem and explaining how it had occurred. The circumstances leading up to the incident were as follows:

- On Saturday, February 10, 1979, a high pressure pump broke down at the car wash. This pump recycled reclaimed wash and rinse water and pumped it to the initial scrubbers of the car wash. No potable plumbing connection is normally made to the car wash's scrubber system.
- After the pump broke down, the car wash owner was able to continue operation by connecting a 2-inch hose section temporarily between the potable supply within the car wash, and the scrubber cycle piping.
- On Monday, February 12, 1979, the owner repaired the high pressure pump and resumed normal car wash operations. The 2-inch hose connection (cross-connection) was not removed!
- Because of the cross-connection, the newly repaired high pressure pump promptly pumped a large quantity of the reclaimed wash/rinse water out of the car wash and into a 12-inch water main in the street. This in turn was delivered to the many residences and commercial establishments connected to the water main.

Within 24 hours of the incident, the owner of the car wash had installed a 2-inch reduced pressure principle backflow preventer on his water service and all car wash establishments in Seattle that used a wash water reclaim system were notified of the state requirement for backflow prevention.



Shipyard Backflow Contamination



Water fountains at an East Coast Shipyard were posted "No Drinking" as workers flushed the water lines to eliminate raw river water that had entered the shipyard following contamination from incorrectly connected water lines between ships at the pier and the shipyard. Some third shift employees drank the water before the pollution was discovered and later complained of stomach cramps and diarrhea.

The cause of the problem was a direct cross-connection between the on-board salt water fire protection water system and the fresh water connected to one of the ships at the dock. While the shipyard had been aware of the need for backflow protection at the dockside tie up area, the device had not been delivered and installed prior to the time of the incident. As a result, the salt water on-board fire protection system, being at a greater pressure than the potable supply, forced the salt water, through backpressure, into the shipyard potable supply.

Fortunately, a small demand for potable water at the time of the incident prevented widespread pollution in the shipyard and the surrounding areas.

acceptable for industrial process water. No health hazard was present as long as the piping was identified, kept separate from potable drinking water lines, and not cross-connected to the potable water supply.

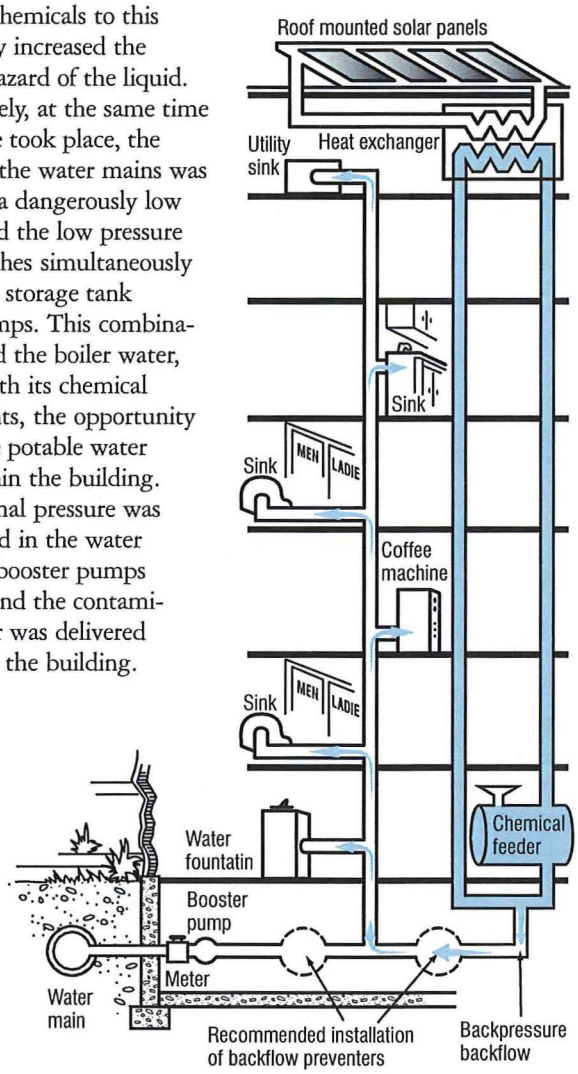
- A maintenance mechanic correctly reasoned that by adding a tempering valve to the chilled water line, he could heat up the water a bit and eliminate fogging of the laser lenses resulting from the chilled water being too cold. The problem with the installation of the tempering valve was that a direct cross-connection had been inadvertently made between the toxic chilled water and the potable drinking water line!
- Periodic maintenance to the chiller system was performed in the summer, requiring that an alternate chiller feed pump be temporarily installed. This replacement pump had an outlet pressure of 150 psi, and promptly established an imbalance of pressure at the tempering valve, thereby overpressurizing the 60 psi, potable supply. Backpressure backflow resulted and pushed the toxic chilled water from the water heater and then into the plant's potable drinking water supply. Yellowish green water started pouring out of the drinking fountains, the washroom, and all potable outlets.

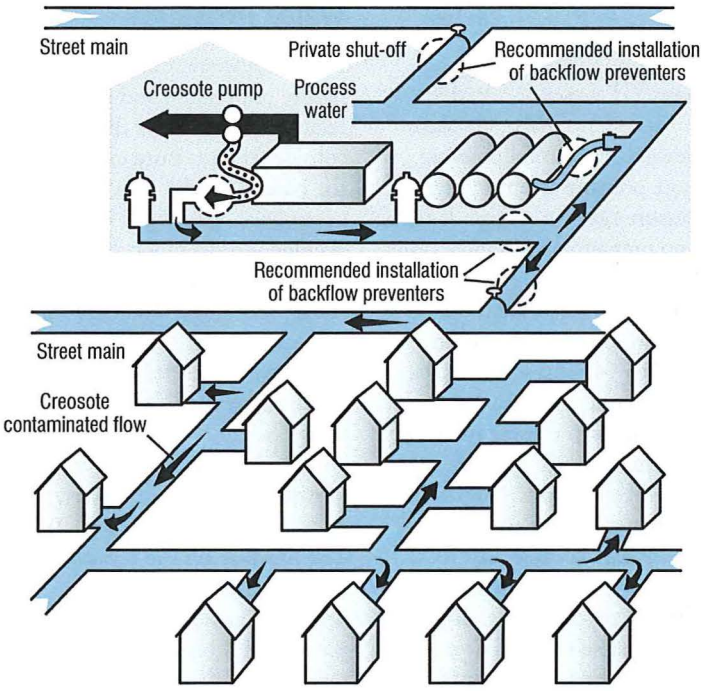
Employee Health Problems due to Cross-Connection

A cross-connection incident occurring in a modern seven-story office building located in a large city in New Hampshire, in March, 1980, resulted in numerous cases of nausea, diarrhea, loss of time and employee complaints as to the poor quality of the water.

On Saturday, March 1, 1980, a large fire occurred two blocks away from a seven-story office building in this large New Hampshire city. On Sunday, March 2, 1980, the maintenance crew of the office building arrived to perform the weekly cleaning, and after drinking the water from the drinking fountains, and sampling the coffee from the coffee machines, noticed that the water smelled rubbery and had a strong bitter taste. Upon notifying the Manchester Water Company, water samples were taken and preliminary analysis disclosed that the contaminants found were not the typical contaminants associated with fire line disturbances. Investigating teams suspected that either the nearby fire could have siphoned contaminants from adjacent buildings into the water mains, or the contamination could have been caused by a plumbing deficiency occurring within the seven story building itself.

Water ph levels of the building water indicated that an injection of chemicals had probably taken place within the seven-story building. Tracing of the water lines within the building pinpointed a 10,000 gallon hot-water storage tank that was used for heat storage in the solar heating system. It did not have any backflow protection on the make-up supply line! As the storage tank pressure increased above the supply pressure, as a result of thermal expansion, the potential for backpressure backflow was present. Normally, this would not occur because a boost pump in the supply line would keep the supply pressure to the storage tank always greater than the highest tank pressure. The addition of rust inhibiting chemicals to this tank greatly increased the degree of hazard of the liquid. Unfortunately, at the same time that the fire took place, the pressure in the water mains was reduced to a dangerously low pressure and the low pressure cutoff switches simultaneously shut off the storage tank booster pumps. This combination allowed the boiler water, together with its chemical contaminants, the opportunity to enter the potable water supply within the building. When normal pressure was reestablished in the water mains, the booster pumps kicked in, and the contaminated water was delivered throughout the building.





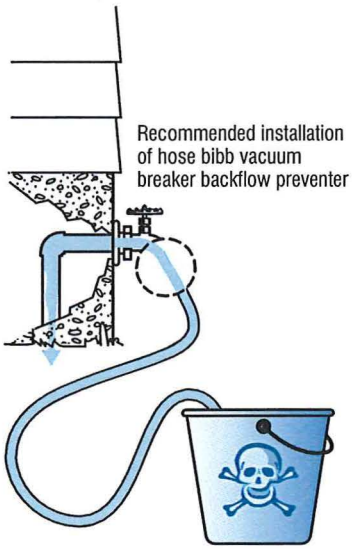
Repairs were necessary to one of the private fire hydrants on the wood preservative company property, necessitating the shutting down of one of two service lines and removal of the damaged fire hydrant for repair. Since the hydrant was at a significantly lower level than the creosote pit, the creosote back-siphoned through a ¾-inch pump priming hose connecting the creosote pit to the fire service line.

After the repairs were made to the hydrant, and the water service restored, the creosote, now in the fire lines, was forced into the main water distribution system.

Kool-Aid Laced With Chlordane

In August, 1978, a professional exterminator was treating a church located in a small town in South Carolina, for termite and pest control. The highly toxic insecticide chlordane was being mixed with water in small buckets, and garden hoses were left submerged in the buckets while the mixing was being accomplished. At the same time, water department personnel came by to disconnect the parsonage's water line from the church to install a separate water meter for the parsonage. In the process, the water was shut off in the area of the church building. Since the church was located on a steep hill, and as the remaining water in the lines was used by residents in the area, the church was among the first places to experience a negative pressure.

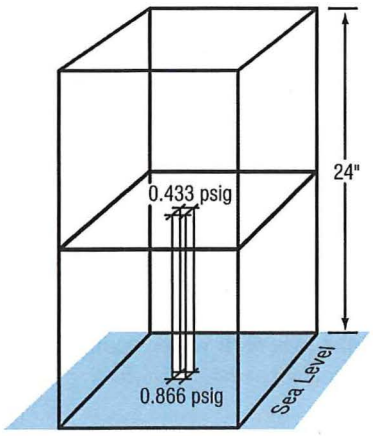
The chlordane was quickly siphoned into the water lines within the church and became mixed with the Kool-Aid being prepared by women for the vacation bible school. Approximately a dozen children and three adults experienced dizziness and nausea. Fortunately, none required hospitalization or medical attention.



If this process were repeated with a third cubic foot of water, the pressures at the base of each cube would be 1,299 psig, 0.866 psig, and 0.433 psig, respectively. It is evident that pressure varies with depth below a free water surface; in general each foot of elevation change, within a liquid, changes the pressure by an amount equal to the weight-per-unit area of 1 foot of the liquid. The rate of increase for water is 0.433 psi per foot of depth.

Frequently water pressure is referred to using the terms "pressure head" or just "head," and is expressed in units of feet of water. One foot of head would be equivalent to the pressure produced at the base of a column of water 1 foot in depth. One foot of head or 1 foot of water is equal to 0.433 psig. One hundred feet of head is equal to 43.3 psig.

FIGURE 2.
Pressure exerted by 2 feet of water at sea level.

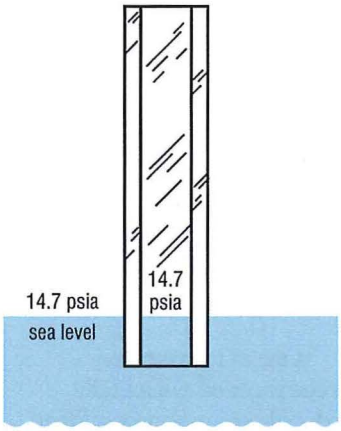


[1]See formal definition in the glossary of the appendix

Siphon Theory

Figure 3 depicts the atmospheric pressure on a water surface at sea level. An open tube is inserted vertically into the water; atmospheric pressure, which is 14.7 psia, acts equally on the surface of the water within the tube and on the outside of the tube.

FIGURE 3.
Pressure on the free surface of a liquid at sea level.



If, as shown in Figure 4, the tube is slightly capped and a vacuum pump is used to evacuate all the air from the sealed tube, a vacuum with a pressure of 0 psia is created within the tube. Because the pressure at any point in a static fluid is dependent upon the height of that point above a reference line, such as sea level, it follows that the pressure within the tube at sea level must still be 14.7 psia. This is equivalent to the pressure at the base of a column of water 33.9 feet high and with the column open at the base, water would rise to fill the column to a depth of 33.9 feet. In other words, the weight of the atmosphere at sea level exactly balances the weight of a column of water 33.9 feet in height. The absolute pressure within the column of water in Figure 4 at a height of 11.5 feet is equal to 9.7 psia. This is a partial vacuum with an equivalent gage pressure of -5.0 psig.

As a practical example, assume the water pressure at a closed faucet on the top of a 100-foot high building to be 20 psig; the pressure on the ground floor would then be 63.3 psig. If the pressure at the ground were to drop suddenly due to a heavy fire demand in the area to 33.3 psig, the pressure at the top would be reduced to -10 psig. If the building water system were airtight, the water would remain at the level of the faucet because of the partial vacuum created by the drop in pressure. If the faucet were opened, however, the vacuum would be broken and the water level would drop to a height of 77 feet above the ground. Thus, the atmosphere was supporting a column of water 23 feet high.

Figure 5 is a diagram of an inverted U-tube that has been filled with water and placed in two open containers at sea level.

If the open containers are placed so that the liquid levels in each container are at the same height, a static state will exist; and the pressure at any specified level in either leg of the U-tube will be the same.

The equilibrium condition is altered by raising one of the containers so that the liquid level in one container is 5 feet

FIGURE 4.
Effect of evacuating air from a column.

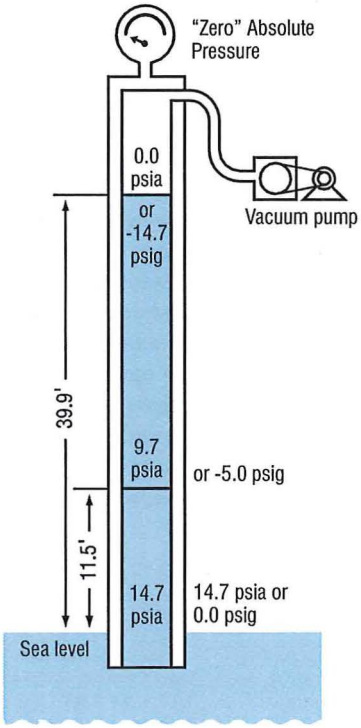
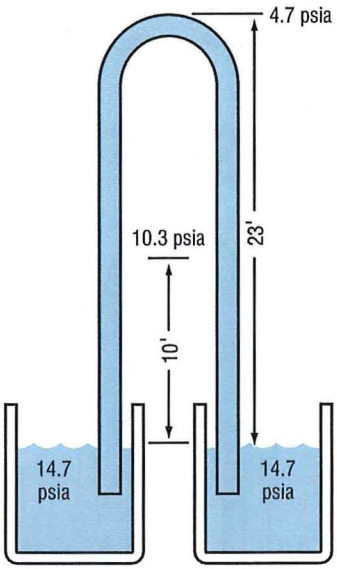


FIGURE 5.
Pressure relationships in a continuous fluid system at the same elevation.



Figures 10 and 11 illustrate solid connections. This type of connection is often installed where it is necessary to supply an auxiliary piping system from the potable source. It is a direct connection of one pipe to another pipe or receptacle.

Solid pipe connections are often made to continuous or intermittent waste lines where it is assumed that the flow will be in one direction only. An example of this would be used cooling water from a water jacket or condenser as shown in Figure 11. This type of connection is usually detectable but creating a concern on the part of the installer about the possibility of reversed flow is often more difficult. Upon questioning, however, many installers will agree that the solid connection was made because the sewer is occasionally subjected to backpressure.

FIGURE 10.
Valved connections between potable water and nonpotable fluid.

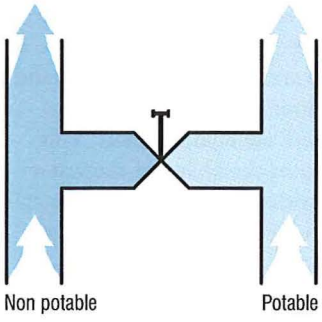
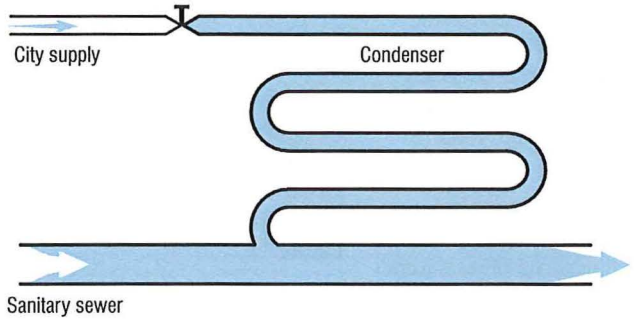


FIGURE 11
Valved connection between potable water and sanitary sewer.



Submerged inlets are found on many common plumbing fixtures and are sometimes necessary features of the fixtures if they are to function properly. Examples of this type of design are siphon-jet urinals or water closets, flushing rim slop sinks, and dental cuspidors. Oldstyle bathtubs and lavatories had supply inlets below the flood level rims, but modern sanitary design has minimized or eliminated this hazard in new fixtures. Chemical and industrial process vats sometimes have submerged inlets where the water pressure is used as an aid in diffusion, dispersion and agitation of the vat contents. Even though the supply pipe may come from the floor above the vat, backsiphonage can occur as it has been shown that the siphon action can raise a liquid such as water almost 34 feet. Some submerged inlets difficult to control are those which are not apparent until a significant change in water level occurs or where a supply may be conveniently extended below the liquid surface by means of a hose or auxiliary piping. A submerged inlet may be created in numerous ways, and its detection in some of these subtle forms may be difficult.

The illustrations included in part B of the appendix are intended to describe typical examples of backsiphonage, showing in each case the nature of the link or cross-connection, and the cause of the negative pressure.

Backflow

Backflow[1], as described in this manual, refers to reversed flow due to backpressure other than siphonic action. Any interconnected fluid systems in which the pressure of one exceeds the pressure of the other may have flow from one to the other as a result of the pressure differential. The flow will occur from the zone of higher pressure to the zone of lower pressure. This type of backflow is of concern in buildings where two or more piping systems are maintained. The potable water supply is usually under pressure directly from the city water main. Occasionally, a booster pump is used. The auxiliary system is often pressurized by a centrifical pump, although backpressure may be caused by gas or steam pressure from a boiler. A reversal in differential pressure may occur when pressure in the potable system drops, for some reason, to a pressure lower than that in the system to which the potable water is connected.

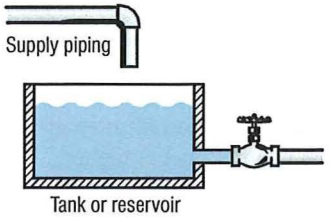
The most positive method of avoiding this type of backflow is the total or complete separation of the two systems. Other methods used involve the installation of mechanical devices. All methods require routine inspection and maintenance.

Dual piping systems are often installed for extra protection in the event of an emergency or possible mechanical failure of one of the systems. Fire protection systems are an example. Another example is the use of dual water connections to boilers. These installations are sometimes interconnected, thus creating a health hazard.

The illustrations in part C of the appendix depict installations where backflow under pressure can occur, describing the cross-connection and the cause of the reversed flow.

[1]See formal definition in the glossary of the appendix

FIGURE 13.
Air gap in a piping system.



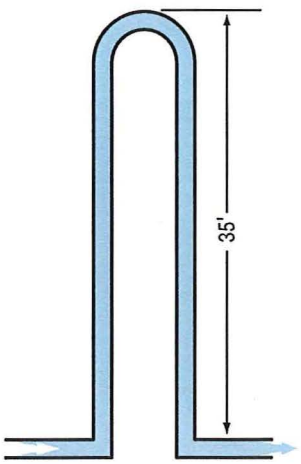
Barometric Loop

The barometric loop consists of a continuous section of supply piping that abruptly rises to a height of approximately 35 feet and then returns back down to the originating level. It is a loop in the piping system that effectively protects against backsiphonage. It may not be used to protect against back-pressure.

Its operation, in the protection against back-siphonage, is based upon the principle that a water column, at sea level pressure, will not rise above 33.9 feet (Ref. Chapter 3, Fig. 4 Page 13).

In general, barometric loops are locally fabricated, and are 35 feet high.

FIGURE 14.
Barometric loop.



Atmospheric Vacuum Breaker

These devices are among the simplest and least expensive mechanical types of backflow preventers and, when installed properly, can provide excellent protection against back-siphonage. They must not be utilized to protect against backpressure conditions. Construction consists usually of a polyethylene float which is free to travel on a shaft and seal in the uppermost position against atmosphere with an elastomeric disc. Water flow lifts the float, which then causes the disc to seal. Water pressure keeps the float in the upward sealed position. Termination of the water supply will cause the disc to drop down venting the unit to atmosphere and thereby opening downstream piping to atmospheric pressure, thus preventing backsiphonage. Figure 15 shows a typical atmospheric breaker.

In general, these devices are available in ½-inch through 3-inch size and must be installed vertically, must not have shutoffs downstream, and must be installed at least 6-inches higher than the final outlet. They cannot be tested once they are installed in the plumbing system, but are, for the most part, dependable, trouble-free devices for backsiphonage protection.

FIGURE 15.
Atmospheric vacuum breaker.

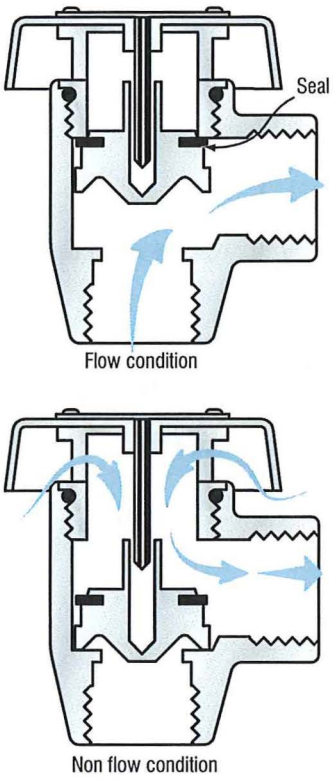


Figure 16 shows the generally accepted installation requirements—note that no shutoff valve is downstream of the device that would otherwise keep the atmospheric vacuum breaker under constant pressure.

Figure 17 shows a typical installation of an atmospheric vacuum breaker in a plumbing supply system.

FIGURE 16.
Atmospheric vacuum breaker typical installation.

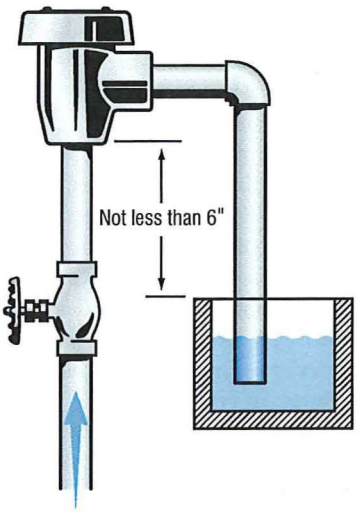


FIGURE 17.
Atmospheric vacuum breaker in plumbing supply system.

Double Check with Intermediate Atmospheric Vent

The need to provide a compact device in ½-inch and ¾-inch pipe sizes that protects against moderate hazards, is capable of being used under constant pressure and that protects against backpressure, resulted in this unique backflow preventer. Construction is basically a double check valve having an atmospheric vent located between the two checks (See Figure 22).

Line pressure keeps the vent closed, but zero supply pressure or backsiphonage will open the inner chamber to atmosphere. With this device, extra protection is obtained through the atmospheric vent capability. Figure 23 shows a typical use of the device on a residential boiler supply line.

FIGURE 21.
Typical agricultural and industrial application of pressure vacuum breaker.

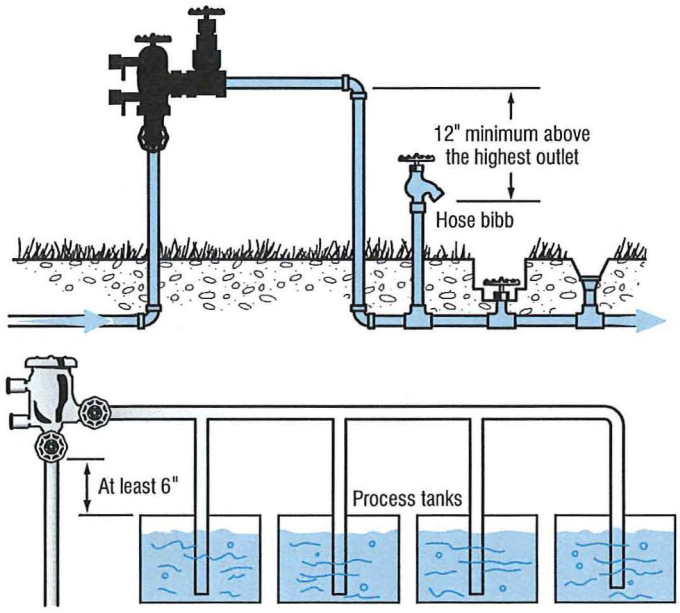


FIGURE 22.
Double check valve with atmospheric vent.

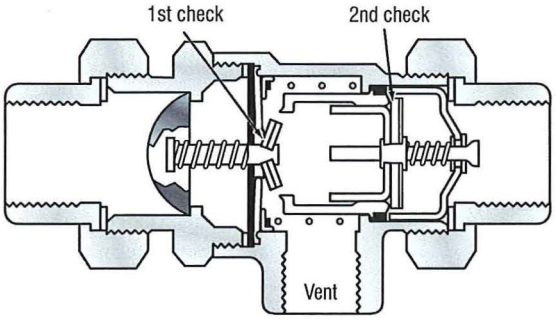
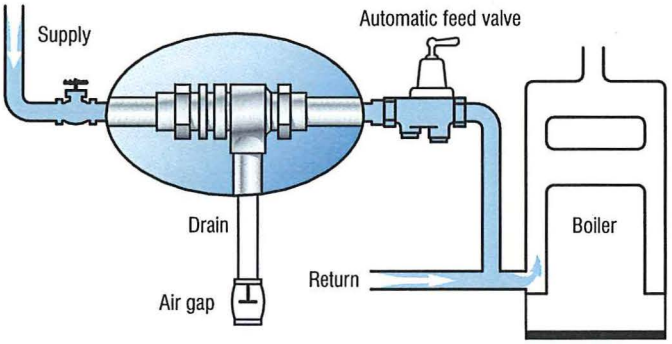


FIGURE 23.
Typical residential use of double check with atmospheric vent.



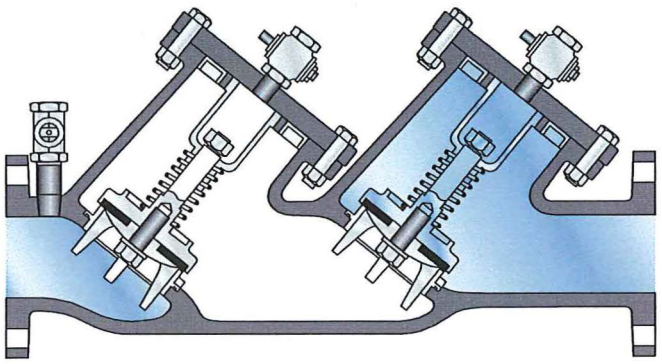
Double Check Valve

A double check valve is essentially two single check valves coupled within one body and furnished with test cocks and two tightly closing gate valves (See Figure 24).

The test capability feature gives this device a big advantage over the use of two independent check valves in that it can be readily tested to determine if either or both check valves are inoperative or fouled by debris. Each check is spring loaded closed and requires approximately a pound of pressure to open.

This spring loading provides the ability to "bite" through small debris and still seal—a protection feature not prevalent in unloaded swing check valves. Figure 24 shows a cross section of double check valve complete with test cocks. Double checks are commonly used to protect against low to medium hazard installations such as food processing steam kettles and apartment projects. They may be used under continuous pressure and protect against both backsiphonage and backpressure conditions.

FIGURE 24.
Double check valve.



Reduced Pressure Principle Backflow Preventer

Maximum protection is achieved against backsiphonage and backpressure conditions utilizing reduced pressure principle backflow preventers. These devices are essentially modified double check valves with an atmospheric vent capability placed between the two checks and designed such that this "zone" between the two checks is always kept at least two pounds less than the supply pressure. With this design criteria, the reduced pressure principle backflow preventer can provide protection against backsiphonage and backpressure when both the first and second checks become fouled. They can be used under constant pressure and at high hazard installations. They are furnished with test cocks and gate valves to enable testing and are available in sizes ¾-inch through 10 inch.

Figure 29A shows typical devices representative of ¾-inch through 2-inch size and Figure 29B shows typical devices representative of 2½-inch through 10-inch sizes.

FIGURE 29A.
Reduced pressure zone backflow preventer (¾-inch thru 2-inches).

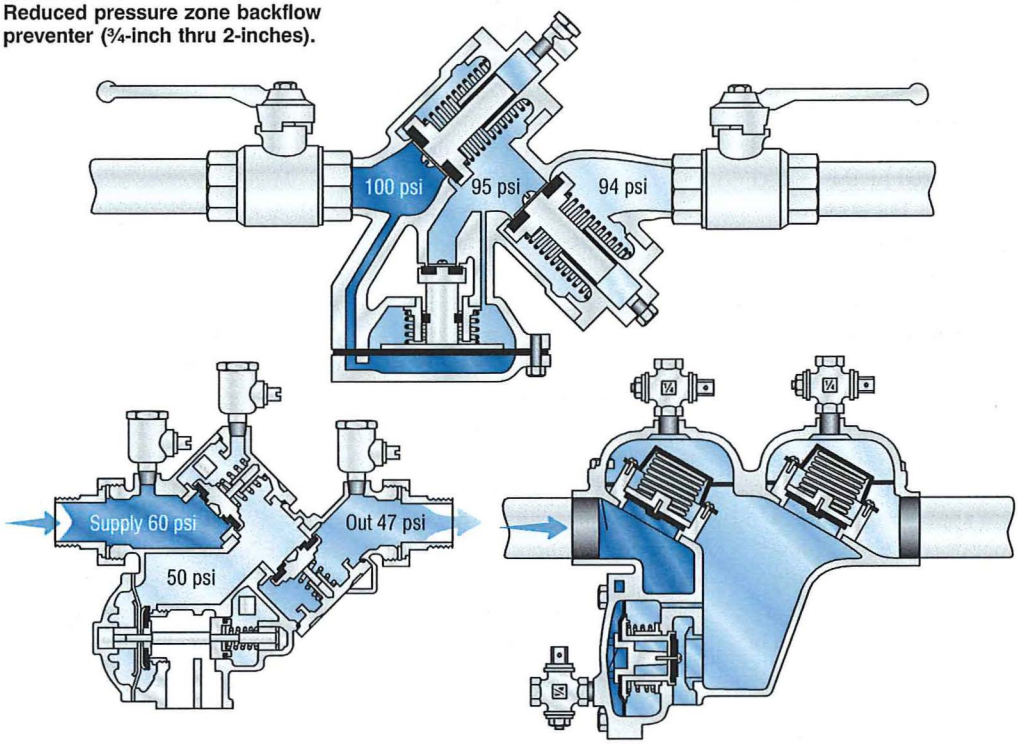


FIGURE 29B.
Reduced pressure zone backflow preventer (2½-inches thru 10-inches).

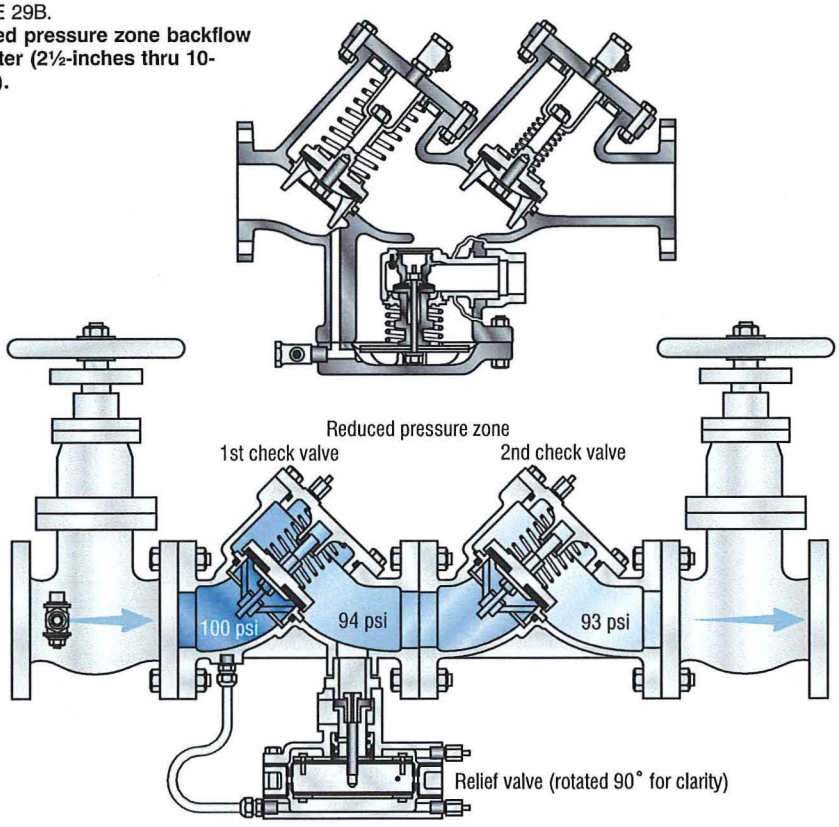
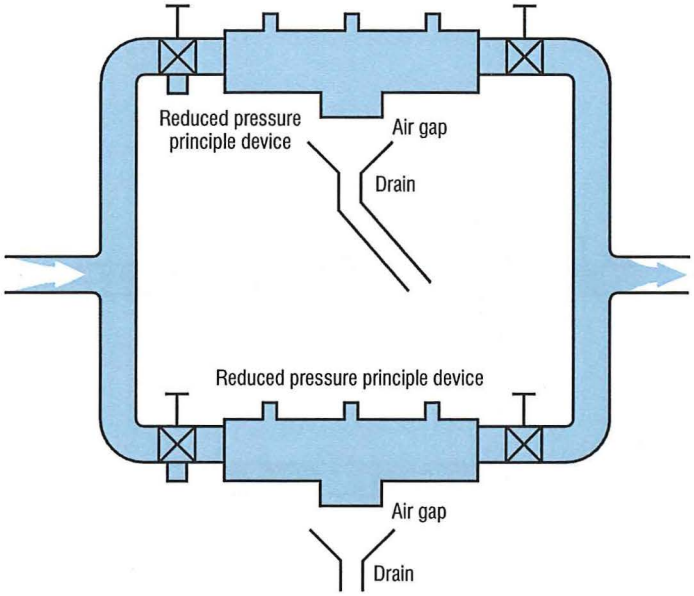


FIGURE 33.
Typical bypass configuration reduced pressure principle devices



Note: Devices to be set a min. of 12" and a max. of 30" from the floor and 12" from any wall.

FIGURE 34.
Typical installation reduced pressure principle device horizontal illustration.

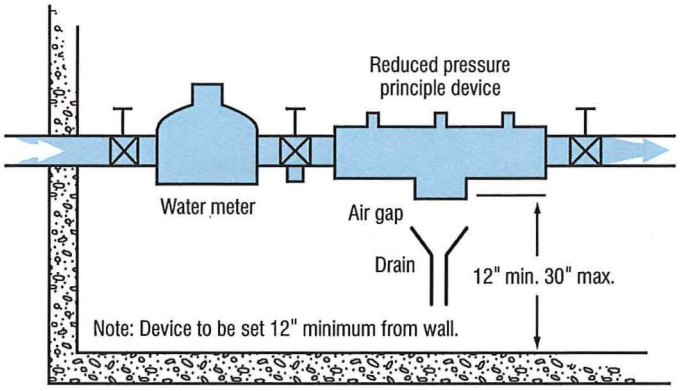
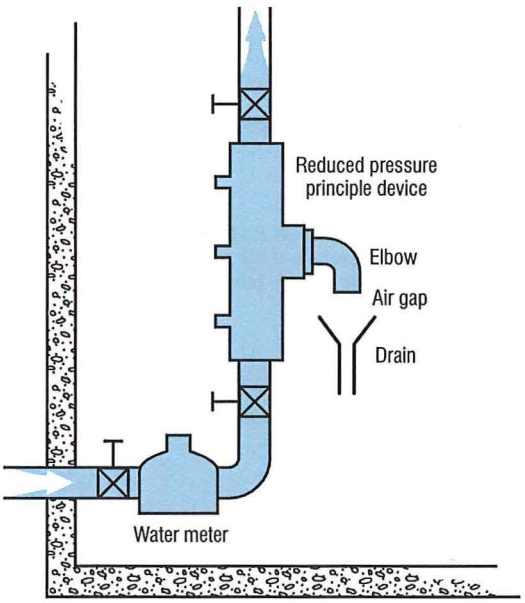
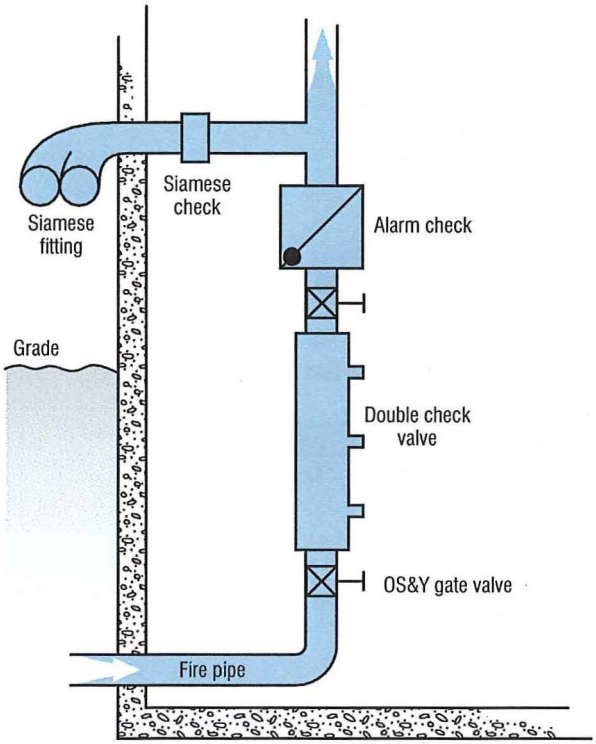


FIGURE 35.
Typical installation reduced pressure principle device vertical illustration.



Note: (1) Refer to manufacturers installation data for vertical mount.
(2) Unit to be set at a height to permit ready access for testing and service.
(3) Vertical installation only to be used if horizontal installation cannot be achieved.

Typical fire line installation double check valve vertical installation.



Testing Procedures for Backflow Preventers

Prior to initiating a test of any backflow device, it is recommended that the following procedures be followed:

1. Permission be obtained from the owner, or his representative, to shut down the water supply. This is necessary to insure that since all testing is accomplished under no-flow conditions, the owner is aware that his water supply will be temporarily shut off while the testing is being performed. Some commercial and industrial operations require constant and uninterrupted water supplies for cooling, boiler feed, seal pump water, etc. and water service interruption cannot be tolerated. The water supply to hospitals and continuous process industries cannot be shut off without planned and coordinated shut downs. The request to shut down the water supply is therefore a necessary prerequisite to protect the customer as well as limit the liability of the tester.

Concurrent with the request for permission to shut off the water, it is advisable to point out to the owner, or his representative, that while the water is shut off during the test period, any inadvertent use of water within the building will reduce the water pressure to zero. Backsiphonage could result if unprotected cross-connections existed which would contaminate the building water supply system. In order to address this situation, it is recommended that the owner caution the inhabitants of the building not to use the water until the backflow test is completed and the water pressure restored. Additional options available to the building owner would be the installation of two backflow devices in parallel that would enable a protected bypass flow around the device to be tested. Also, if all water outlets are protected within the building with "fixture outlet protection" backflow devices, cross-connections would not create a problem in the event of potential backsiphonage conditions occurring while devices are tested, or for any other reason.

2. Determine the type of device to be tested i.e., double check valve or reduced pressure principle device.

3. Determine the flow direction. (Reference directional flow arrows or wording provided by the manufacturer on the device.)

4. Number the test cocks, bleed them of potential debris, and assemble appropriate test cock adapters and bushings that may be required.

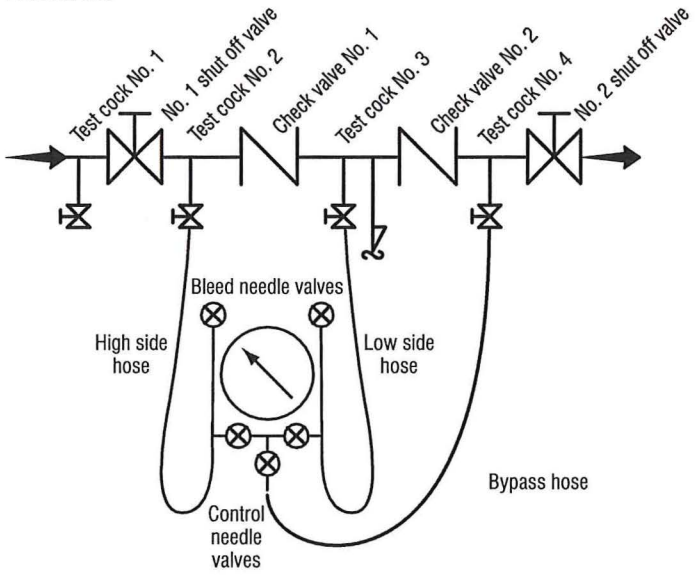
5. Shut off the downstream (number 2) shut-off valve. (Ref. Item (1) above.)

6. Wait several moments prior to hooking up the test kit hoses when testing a reduced pressure principle device. If water exits the relief valve, in all likelihood, the first check valve is fouled and it is impractical to proceed with the testing until the valve is serviced. This waiting period is not necessary when testing double check valves.

7. Hook up the test kit hoses in the manner appropriate to the device being tested and the specific test being performed.

Test personnel are cautioned to be aware and follow local municipal, county, and state testing requirements and guidelines as may be dictated by local authority. The following test procedures are guidelines for standard, generally acceptable test procedures but may be amended, superceded, or modified by local jurisdiction.

FIGURE 39.



Step 2 Test to insure that the second check is tight against backpressure. (Figure 40)

1. Leaving the hoses hooked up as in the conclusion of Step 1 above, connect the bypass hose to test cock number 4.
2. Open test cock number 4, the high control needle valve and the bypass hose control needle valve on the test kit. (This supplies high pressure water downstream of check valve number 2.) If the differential pressure gauge falls off and water comes out of the relief valve, the second check is recorded as leaking. If the differential pressure gauge remains steady, and no water comes out of the relief valve, the second check valve is considered tight
3. To check the tightness of number 2 shut-off valve, leave the hoses hooked up the same as at the conclusion of Step 2 above, and then close test cock number 2. This stops the supply of any high pressure water downstream of check valve number 2. If the differential pressure gauge reading holds steady, the number 2 shut-off valve is recorded as being tight. If the differential pressure gauge drops to zero, the number 2 shut-off valve is recorded as leaking.

With a leaking number 2 shut-off valve, the device is, in most cases, in a flow condition and the previous readings taken are invalid. Unless a non-flow condition can be achieved, either through the operation of an additional shut-off downstream, or the use of a temporary compensating bypass hose, accurate test results will not be achieved.

Step 3 To check that the relief valve opens at a minimum pressure of 2 psi below inlet pressure.

1. With the hoses hooked up the same as at the conclusion of Step #2 (3) above, slowly open up the low control needle valve on the test kit and record the differential pressure gauge reading at the point when the water initially starts to drip from the relief valve opening. This pressure reading should not be below 2 psid.

This completes the standard field test for a reduced pressure principle backflow preventer. Before removal of the test equipment, the tester should insure that he opens number 2 shut-off valve thereby reestablishing flow. Also, the test kit should be thoroughly drained of all water to prevent freezing by opening all control needle valves and bleed needle valves.

All test data should be recorded on appropriate forms. (Ref: sample Page 45)

Note: The steps outlined above may vary in sequence depending upon local regulations and/or preferences.

FIGURE 40.

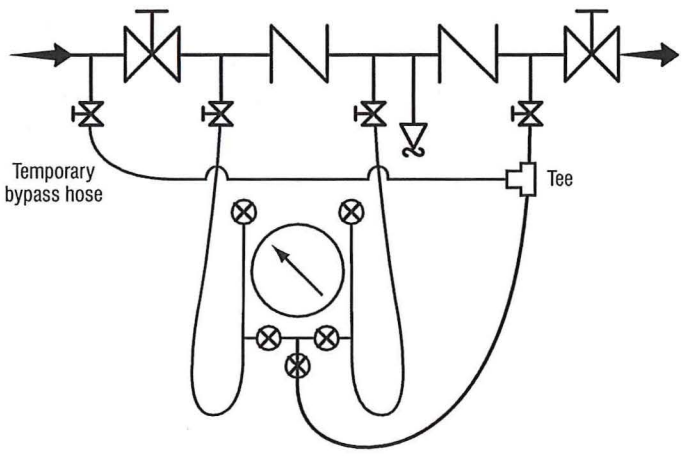
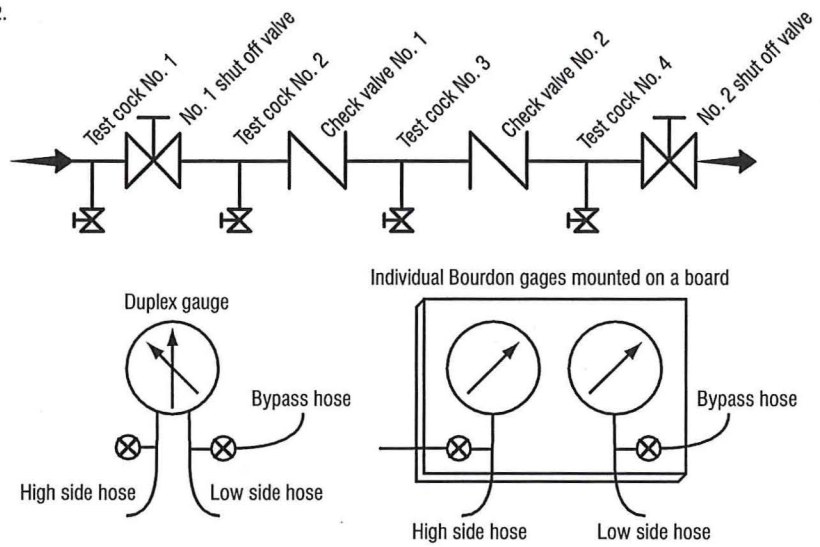


FIGURE 42.



With a leaking number 2 shut-off valve, the device is, in most cases, in a flow condition, and the previous test readings taken are invalid. Unless a non-flow condition can be achieved, either through the operation of an additional shut-off downstream, or the use of a temporary compensating bypass hose, accurate test results will not be achieved.

This completes the standard field test for a double check valve assembly. Prior to removal of the test equipment, the tester should insure that he opens number 2 shut-off valve thereby reestablishing flow. All test data should be recorded on appropriate forms and the test kit drained of water.

Method 2

Utilizing "Duplex Gauge" or individual bourdon gauges, requires closing number 1 shut-off. (Figure 42)

Step 1 checking check valve number 1

1. Connect the high hose to test cock number 2.
2. Connect the low hose to test cock number 3.
3. Open test cocks number 2 and number 3.
4. Close number 2 shut-off valve; then close number 1 shut-off valve.
5. By means of the high side needle valve, lower the pressure at test cock number 2 about 2 psi below the pressure at test cock number 3. If this small difference can be maintained, then check valve number 1 is reported as "tight". Proceed to Step number 2. If the small difference cannot be maintained, proceed to Step number 3.

Step 2 checking check valve number 2.

Proceed exactly the same test procedure as in Step number 1, except that the high hose is connected to test cock number 3 and the low hose connected to test cock number 4.

Step 3

1. Open shut-off valve number 1 to repressurize the assembly.
2. Loosely attach the bypass hose to test cock number 1, and bleed from the gauge through the bypass hose by opening the low side needle valve to eliminate trapped air. Close low side needle valve. Tighten bypass hose. Open test cock number 1.
3. Close number 1 shut-off valve.
4. By loosening the low side hose at test cock number 3, lower the pressure in the assembly about 10 psi below normal line conditions.
5. Simultaneously open both needle valves. If the check valve is holding tight the high pressure gauge will begin to drop while the low pressure gauge will increase. Close needle valves. If the gauge shows that a small (no more than 5 psi) backpressure is created and held, then the check valve is reported as tight. If the check valve leaks, a pressure differential is not maintained as both gauges tend to equalize or move back towards each other, then the check valve is reported as leaking. With both needle valves open enough to keep the needles on the gauge stationary, the amount of leakage is visible as the discharge from the upstream needle valve.

purveyor and is not normally a portion of his job description or duties. While it is admirable for the water purveyor to accept and perform survey work, he should be aware that he runs the risk of additional liability in an area that may be in conflict with plumbing inspectors, maintenance personnel and other public health officials.

Even where extensive "fixture outlet protection," cross-connection control programs are in effect through the efforts of an aggressive and thorough water supply cross-connection control program, the water authorities should also have an active "containment" program in order to address the many plumbing changes that are made and that are inherent within commercial and industrial establishments. In essence, fixture outlet protection becomes an extension beyond the "containment" program.

Also, in order for the supplier of water to provide maximum protection of the water distribution system, consideration should be given to requiring the owner of a premise (commercial, industrial, or residential) to provide at his own expense, adequate proof that his internal water system complies with the local or state plumbing code(s). In addition, he may be required to install, have tested, and maintain, all backflow protection devices that would be required—at his own expense!

The supplier of water should have the right of entry to determine degree of hazard and the existence of cross-connections in order to protect the potable water system. By so doing he can assess the overall nature of the facility and its potential impact on the water system (determine degree of hazard], personally see actual cross-connections that could contaminate the water system, and take appropriate action to insure the elimination of the cross-connection or the installation of required backflow devices.

To assist the water purveyor in the total administration of a cross-connection control program requires that all public health officials, plumbing inspectors, building managers, plumbing installers, and maintenance men participate and share in the responsibility to protect the public health and safety of individuals from cross-connections and contamination or pollution of the public water supply system.

Dedicated Line

Figure 43 also depicts the use of a "dedicated" potable water line. This line initiates immediately downstream of the water meter and is "dedicated" solely for human consumption i.e., drinking fountains, safety showers, eye wash stations, etc. It is very important that this piping be color coded throughout in accordance with local plumbing regulations, flow direction arrows added, and the piping religiously policed to insure that no cross-connections to other equipment or piping are made that could compromise water quality. In the event that it is felt that policing of this line cannot be reliably maintained or enforced, the installation of a containment device on this line should be a consideration.

Method of Action

A complete cross-connection control program requires a carefully planned and executed initial action plan followed by aggressive implementation and constant follow-up. Proper staffing and education of personnel is a requirement to insure that an effective program is achieved. A recommended plan of action for a cross-connection control program should include the following characteristics:

(1) Establish a cross-connection control ordinance at the local level and have it approved by the water commissioners, town manager, etc., and insure that it is adopted by the town or private water authority as a legally enforceable document.

(2) Conduct public informative meetings that define the proposed cross-connection control program, review the local cross-connection control ordinance, and answer all questions that may arise concerning the reason for the program, why and how the survey will be conducted, and the potential impact upon the industrial, commercial and residential water customers. Have state authorities and the local press and radio attend the meeting.

(3) Place written notices of the pending cross-connection control program in the local newspaper, and have the local radio station make announcements about the program as a public service notice.

(4) Send employees who will administer the program, to a course, or courses, on backflow tester certification, backflow survey courses, backflow device repair courses, etc.

(5) Equip the water authority with backflow device test kits.

(6) Conduct meeting(s) with the local plumbing inspection people, building inspectors, and licensed plumbers in the area who will be active in the inspection, installations and repair of backflow devices. Inform them of the intent of the program and the part that they can play in the successful implementation of the program.

(7) Prior to initiating a survey of the established commercial and industrial installations, prepare a list of these establishments from existing records, then prioritize the degree of hazard that they present to the water system, i.e., plating plants, hospitals, car wash facilities, industrial metal finishing and fabrication, mortuaries, etc. These will be the initial facilities inspected for cross-connections and will be followed by less hazardous installations.

(8) Insure that any new construction plans are reviewed by the water authority to assess the degree of hazard and insure that the proper backflow preventer is installed concurrent with the potential degree of hazard that the facility presents.

(9) Establish a residential backflow protection program that will automatically insure that a residential dual check backflow device is installed automatically at every new residence.

(10) As water meters are repaired or replaced at residences, insure that a residential dual check backflow preventer is set with the new or reworked water meter. Be sure to have the owner address thermal expansion provisions.

Cross-Connection Control and Backflow Prevention Program

The successful promotion of a cross-connection control and backflow prevention program in a municipality will be dependent upon legal authority to conduct such a program. Where a community has adopted a modern plumbing code, such as the National Plumbing Code, ASA A40.8-1955, or subsequent revisions thereof, provisions of the code will govern backflow and cross-connections. It then remains to provide an ordinance that will establish a program of inspection for an elimination of cross- and backflow connections within the community. Frequently authority for such a program may already be possessed by the water department or water authority. In such cases no further document may be needed. A cross-connection control ordinance should have at least three basic parts.

1. Authority for establishment of a program.
2. Technical provisions relating to eliminating backflow and cross-connections.
3. Penalty provisions for violations.

The following model program is suggested for municipalities who desire to adopt a cross-connection control ordinance. Communities adopting ordinances should check with State health officials to assure conformance with State codes. The form of the ordinance should comply with local legal requirements and receive legal adoption from the community.

CROSS CONNECTION CONTROL MODEL PROGRAM

WATER DEPARTMENT NAME
ADDRESS

DATE

Approved _____

Date _____

Water Department Name Cross-Connection Control Program

I. Purpose

A. To protect the public potable water supply served by the ( ) Water Department from the possibility of contamination or pollution by isolating, within its customers internal distribution system, such contaminants or pollutants which could backflow or back-siphon into the public water system.

B. To promote the elimination or control of existing cross-connections, actual or potential, between its customers in-plant potable water system, and non-potable systems.

C. To provide for the maintenance of a continuing program of cross-connection control which will effectively prevent the contamination or pollution of all potable water systems by cross-connection.

II. Authority

A. The Federal Safe Drinking Water Act of 1974, and the statutes of the State of ( ) Chapters ( ) the water purveyor has the primary responsibility for preventing water from unapproved sources, or any other substances, from entering the public potable water system.

B. ( ) Water Department, Rules and Regulations, adopted.

H. Containment

A method of backflow prevention which requires a backflow prevention preventer at the water service entrance.

I. Contaminant

A substance that will impair the quality of the water to a degree that it creates a serious health hazard to the public leading to poisoning or the spread of disease.

J. Cross-Connection

Any actual or potential connection between the public water supply and a source of contamination or pollution.

K. Department

City of ( ) Water Department.

L. Fixture Isolation

A method of backflow prevention in which a backflow preventer is located to correct a cross connection at an in-plant location rather than at a water service entrance.

M. Owner

Any person who has legal title to, or license to operate or habitat in, a property upon which a cross-connection inspection is to be made or upon which a cross-connection is present.

N. Person

Any individual, partnership, company, public or private corporation, political subdivision or agency of the State Department, agency or instrumentality or the United States or any other legal entity.

O. Permit

A document issued by the Department which allows the use of a backflow preventer.

P. Pollutant

A foreign substance, that if permitted to get into the public water system, will degrade its quality so as to constitute a moderate hazard, or impair the usefulness or quality of the water to a degree which does not create an actual hazard to the public health but which does adversely and unreasonably effect such water for domestic use.

Q. Water Service Entrance

That point in the owners water system beyond the sanitary control of the District; generally considered to be the outlet end of the water meter and always before any unprotected branch.

R. Director of Municipal Services

The Director, or his delegated representative in charge of the ( ) Department of Municipal Services, is invested with the authority and responsibility for the implementation of a cross-connection control program and for the enforcement of the provisions of the Ordinance.

V. Administration

A. The Department will operate a cross-connection control program, to include the keeping of necessary records, which fulfills the requirements of the Commission's Cross-Connection Regulations and is approved by the Commission.

B. The Owner shall allow his property to be inspected for possible cross-connections and shall follow the provisions of the Department's program and the Commission's Regulations if a cross-connection is permitted.

C. If the Department requires that the public supply be protected by containment, the Owner shall be responsible for water quality beyond the outlet end of the containment device and should utilize fixture outlet protection for that purpose.

He may utilize public health officials, or personnel from the Department, or their delegated representatives, to assist him in the survey of his facilities and to assist him in the selection of proper fixture outlet devices, and the proper installation of these devices.

VI. Requirements

A. Department

1. On new installations, the Department will provide on-site evaluation and/or inspection of plans in order to determine the type of backflow preventer, if any, that will be required, will issue permit, and perform inspection and testing. In any case, a minimum of a dual check valve will be required in any new construction.

2. For premises existing prior to the start of this program, the Department will perform evaluations and inspections of plans and/or premises and inform the owner by letter of any corrective action deemed necessary, the method of achieving the correction, and the time allowed for the correction to be made. Ordinarily, ninety (90) days will be allowed, however, this time period may be shortened depending upon the degree of hazard involved and the history of the device(s) in question.

3. The Department will not allow any cross-connection to remain unless it is protected by an approved backflow preventer for which a permit has been issued and which will be regularly tested to insure satisfactory operation.

4. The Department shall inform the Owner by letter, of any failure to comply, by the time of the first re-inspection. The Department will allow an additional fifteen (15) days for the correction. In the event the Owner fails to comply with the necessary correction by the time of the second re-inspection, the Department will inform the Owner by letter, that the water service to the Owner's premises will be terminated within a period not to exceed five (5) days. In the event that the Owner informs the Department of extenuating circumstances as to why the correction has not been made, a time extension may be granted by the Department but in no case will exceed an additional thirty (30) days.

sible for spare parts, repair tools, or a replacement device. Parallel installation of two (2) devices is an effective means of the owner insuring that uninterrupted water service during testing or repair of devices and is strongly recommended when the owner desires such continuity. (Ref. Fig. 33 page 23.)

E. Backflow prevention devices will be tested more frequently than specified in A. above, in cases where there is a history of test failures and the Department feels that due to the degree of hazard involved, additional testing is warranted. Cost of the additional tests will be born by the owner.

XI. Records and Reports

A. Records

The Department will initiate and maintain the following:

1. Master files on customer cross-connection tests and/or inspections.
2. Master files on cross-connection permits.
3. Copies of permits and permit applications.
4. Copies of lists and summaries supplied to the Commission.

B. Reports

The Department will submit the following to the Commission.

1. Initial listing of low hazard cross-connections to the State.
2. Initial listing of high hazard cross-connections to the State.
3. Annual update lists of items 1 and 2 above.
4. Annual summary of cross-connection inspections to the State.

XII. Fees and Charges

The Department will publish a list of fees or charges for the following services or permits:

1. Testing fees
2. Re-testing fees
3. Fee for re-inspection
4. Charges for after-hours inspections or tests.

Addendum

1. Residential dual check

Effective the date of the acceptance of this Cross-Connection Control Program for the Town of ( ) all new residential buildings will be required to install a residential dual check device immediately downstream of the water meter. (Ref. Figure 37 page 24.) Installation of this residential dual check device on a retrofit basis on existing service lines will be instituted at a time and at a potential cost to the homeowner as deemed necessary by the Department.

The owner must be aware that installation of a residential dual check valve results in a potential closed plumbing system within his residence. As such, provisions may have to be made by the owner to provide for thermal expansion within his closed loop system, i.e., the installation of thermal expansion devices and/or pressure relief valves.

2. Strainers

The Department strongly recommends that all new retrofit installations of reduced pressure principle devices and double check valve backflow preventers include the installation of strainers located immediately upstream of the backflow device. The installation of strainers will preclude the fouling of backflow devices due to both foreseen and unforeseen circumstances occurring to the water supply system such as water main repairs, water main breaks, fires, periodic cleaning and flushing of mains, etc. These occurrences may "stir up" debris within the water main that will cause fouling of backflow devices installed without the benefit of strainers.

When the pressure is inadequate in the main, the building booster pump starts pumping, producing a negative pressure in the main and causing a reversal of flow in the opposite building.

C. Suggested Correction: The laboratory sink water outlet should be provided with a vacuum breaker. The water service line to the booster pump should be equipped with a device to cut off the pump when pressure approaches a negative head or vacuum.

Backsiphonage

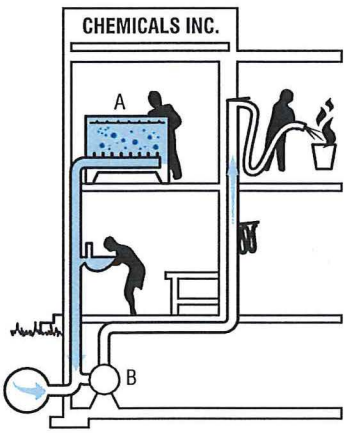
Case 3 (Fig. 46)

A. Contact Point: A chemical tank has a submerged inlet.

B. Cause of Reversed Flow: The plant fire pump draws suction directly from the city water supply line which is insufficient to serve normal plant requirements and a major fire at the same time. During a fire emergency, reversed flow may occur within the plant.

C. Suggested Correction: The water service to the chemical tank should be provided through an air gap.

FIGURE 46.
Backsiphonage (Case 3).



Backsiphonage

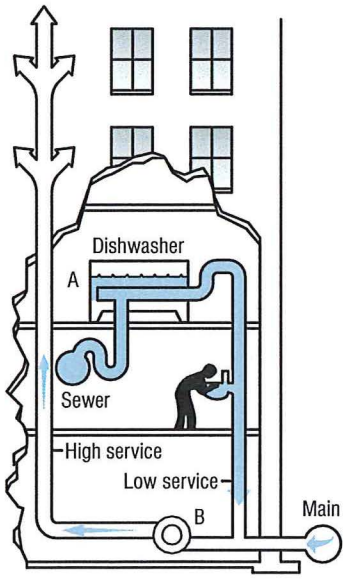
Case 4 (Fig. 47)

A. Contact Point: The water supply to the dishwasher is not protected by a vacuum breaker. Also, the dishwasher has a solid waste connection to the sewer.

B. Cause of Reversed Flow: The undersized main serving the building is subject to reduced pressures, and therefore only the first two floors of the building are supplied directly with city pressure. The upper floors are served from a booster pump drawing suction directly from the water service line. During periods of low city pressure, the booster pump suction creates negative pressures in the low system, thereby reversing the flow.

C. Suggested Correction: The dishwasher hot and cold water should be supplied through an air gap and the waste from the dishwasher should discharge through an indirect waste. The booster pump should be equipped with a low-pressure cutoff device.

FIGURE 47.
Backsiphonage (Case 4).



Backsiphonage

Case 5 (Fig. 48)

A. Contact Point: The gasoline storage tank is maintained full and under pressure by means of a direct connection to the city water distribution system.

FIGURE 48.
Backsiphonage (Case 5).

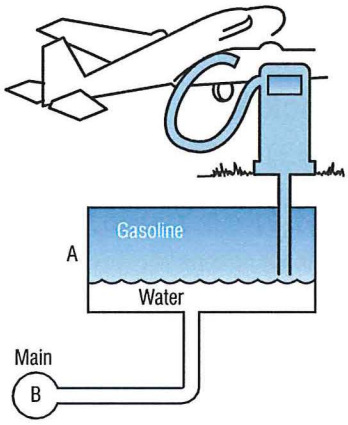
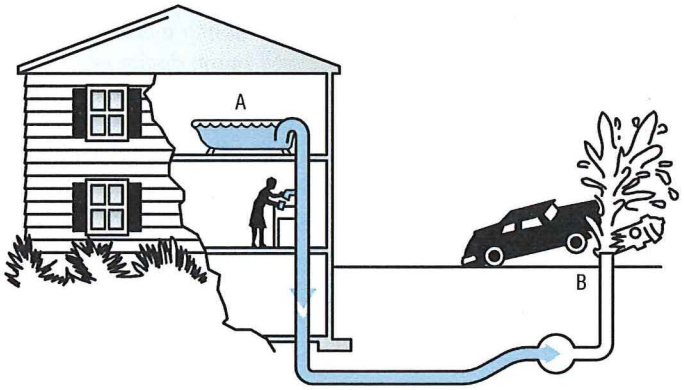


FIGURE 49.
Backsiphonage (Case 6).



B. Cause of Reversed Flow: Gasoline may enter the distribution system by gravity or by siphonage in the event of a leak or break in the water main.

C. Suggested Correction: A reduced pressure principle backflow preventer should be installed in the line to the gasoline storage tank or a surge tank and pump should be provided in that line.

Backsiphonage

Case 6 (Fig. 49)

A. Contact Point: There is a submerged inlet in the second floor bathtub.

B. Cause of Reversed Flow: An automobile breaks a nearby fire hydrant causing a rush of water and a negative pressure in the service line to the house, sucking dirty water out of the bathtub.

C. Suggested Correction: The hot and cold water inlets to the bathtub should be above the rim of the tub.

Illustrations of Air Gaps

The following illustrations describe methods of providing an air gap discharge to a waste line which may be occasionally or continuously subject to backpressure.

FIGURE 54.
Air gap to sewer subject to backpressure—force main.

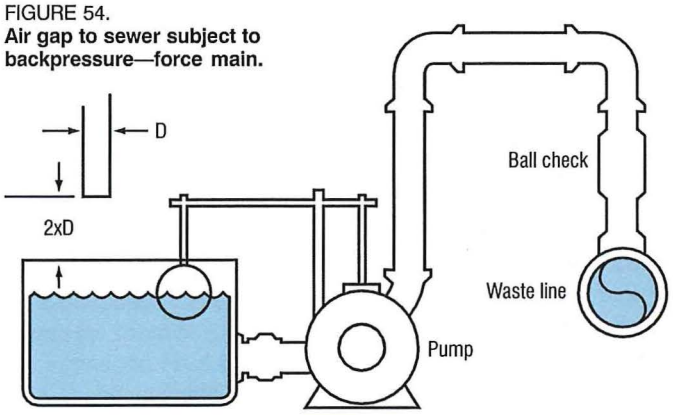


FIGURE 55.
Air gap to sewer subject to backpressure—gravity drain.

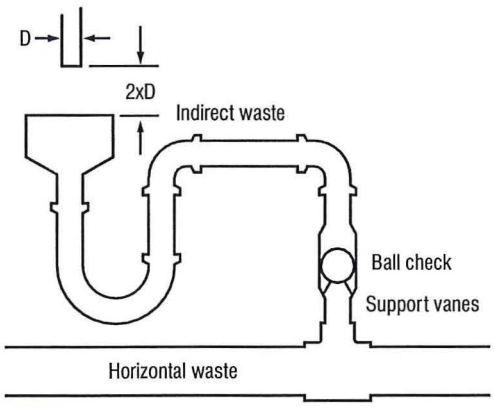
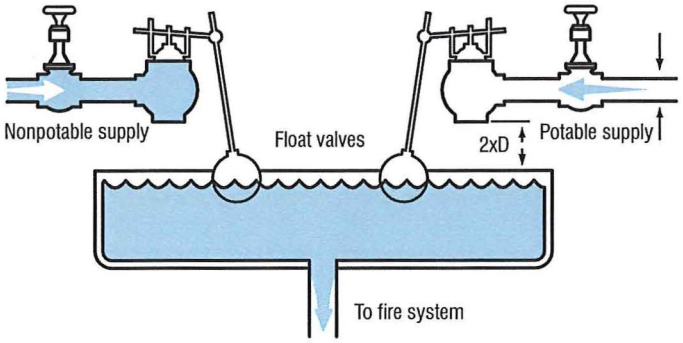


FIGURE 56.
Fire system makeup tank for a dual water system.



Illustrations of Vacuum Breakers

FIGURE 57.
Vacuum breakers.

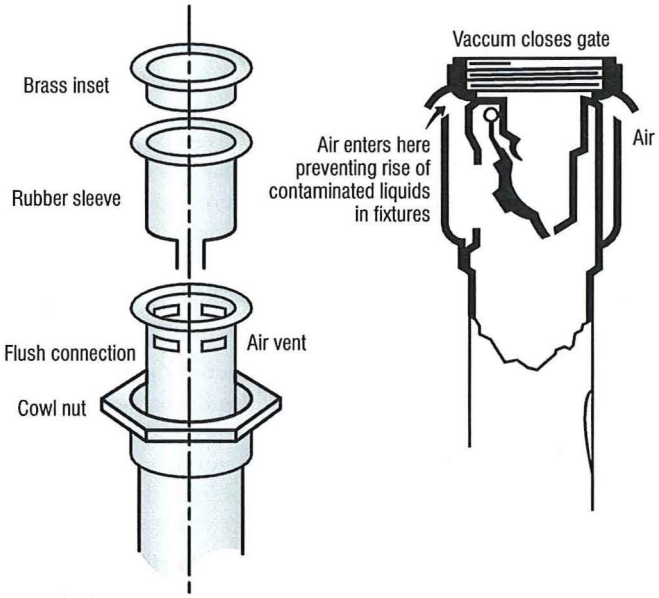
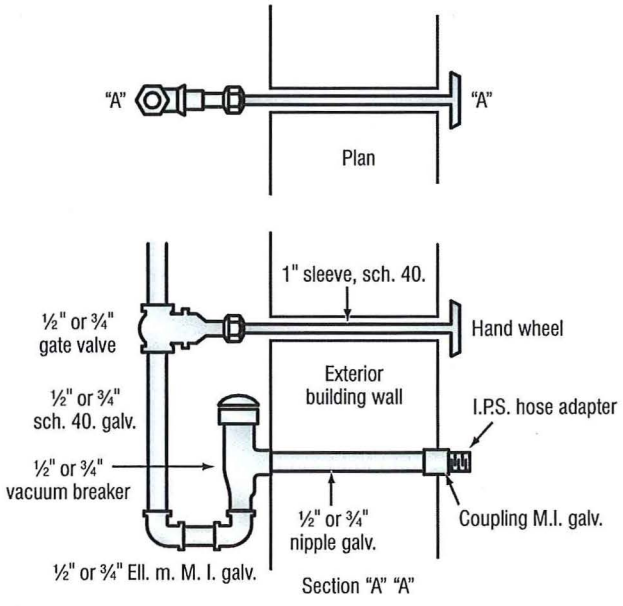


FIGURE 58.
Vacuum breaker arrangement for an outside hose hydrant.



(By permission of Mr. Gustave J. Angele Sr., P.E. formerly Plant Sanitary Engineer, Union Carbide Nuclear Division, Oak Ridge, Tenn.)

Appendix G

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Backflow Prevention Device Test and Maintenance Report

To: _____
(water purveyor or regulatory agency)

_____

_____

Attn: Cross-connection Control Section

The cross-connection control device detailed hereon has been tested and maintained as required by the *(rules or regulations)* of *(purveyor or regulatory agency)* and is certified to comply with these *(rules or regulations)*.

Make of device _____ size _____

Model Number _____ located at _____

Serial Number _____ _____

_____

	Reduced Pressure Devices			Pressure Vacuum Breaker	
	Double Check Devices		Relief Valve	Air Inlet	Check Valve
	1st Check	2nd Check			
Initial Test	DC - Closed Tight ☐ RP - _____ psid Leaked ☐	Closed Tight ☐ Leaked ☐	Opened at _____ psid	Opened at _____ psid Did not open ☐	_____ psid Leaked ☐
Repairs and Materials Used					
Test After Repair	DC-Closed Tight RP- _____ psid	Closed Tight ☐	Opened at _____ psid	Opened at _____ psid	_____ psid

The above is certified to be true.

Firm Name _____ Certified Tester _____

Firm Address _____ Cert. Tester No. _____ Date _____

_____

OWATONNA
PUBLIC UTILITIES

ANNUAL TEST FORM
BACKFLOW PREVENTORS

SUBMIT FORM TO:
208 S. Walnut Ave.
P.O. Box 800
Owatonna, MN 55060
Phone: (507) 451-2480
Fax: (507) 451-3695
owatonnautilities.com

CUSTOMER: _____

STREET ADDRESS: _____

MAILING ADDRESS: _____

NEW INSTALLATION ☐ EXISTING ☐ REPLACEMENT ☐ OLD ASSEMBLY S.N. _____

LOCATION OF ASSEMBLY: _____

TYPE OF ASSEMBLY: RPZ ☐ DCV ☐ PVB ☐ SVB ☐ SIZE: _____ INSTALLATION DATE: _____

MANUFACTURER: _____ MODEL: _____ SERIAL #: _____

RELIEF VALVE	CHECK VALVE #2 Back Pressure Test	CHECK VALVE #1 In Direction of Flow Test	CHECK VALVE #2 In Direction of Flow Test	Pressure Vacuum Breaker / Spill Resistant Vacuum Breaker	DOUBLE CHECK VALVE In Direction of Flow Test
Opened at _____ psi Did Not Open ☐ (Must Be 2 PSI or Greater)	☐ Leaked ☐ Closed Tight	☐ Leaked ☐ Closed Tight Differential Pressure Across check valve _____ psi (Must Be At Least 3 PSI Higher Than The Relief Valve)	☐ Leaked ☐ Closed Tight Differential Pressure Across check valve _____ psi	Air Inlet opened at _____ psi Did Not Open Check Valve ☐ Leaked ☐ held at _____ psi	#1 ☐ Leaked ☐ Closed Tight _____ psi #2 ☐ Leaked ☐ Closed Tight _____ psi
PASSED ☐ FAILED ☐	PASSED ☐ FAILED ☐	PASSED ☐ FAILED ☐	PASSED ☐ FAILED ☐	PASSED ☐ FAILED ☐	PASSED ☐ FAILED ☐ (#1) PASSED ☐ FAILED ☐ (#2)

CHECK ALL THAT APPLY

☐ Cleaned Only Replaced: Rubber Kit ☐ Assembly ☐ Disc ☐ Diaphragm ☐ Spring ☐ O-rings ☐ Other ☐	☐ Cleaned Only Replaced: Rubber Kit ☐ Assembly ☐ Disc ☐ O-rings ☐ Spring ☐ Other ☐	☐ Cleaned Only Replaced: Rubber Kit ☐ Assembly ☐ Disc ☐ O-rings ☐ Spring ☐ Other ☐	☐ Cleaned Only Replaced: Rubber Kit ☐ Assembly ☐ Disc ☐ O-rings ☐ Spring ☐ Other ☐	☐ Cleaned Only Replaced: Rubber Kit ☐ Assembly ☐ Disc, air in ☐ Disc, CV ☐ Spring, air ☐ O-ring ☐ Other ☐	#1 ☐ Cleaned Only #2 ☐ Cleaned Only Replaced: Rubber Kit ☐ Rubber Kit ☐ Assembly ☐ Assembly ☐ Disc ☐ Disc ☐ O-rings ☐ O-rings ☐ Spring ☐ Spring ☐ Other ☐ Other ☐

Describe Repairs: _____

Opened at _____ psi	☐ Closed tight	Differential Pressure Across check valve _____ psi	Differential Pressure Across check valve _____ psi	Air Inlet _____ psi Check valve _____ psi	Check #1 _____ psi Check #2 _____ psi

Opened shut off #1 ☐ Opened shut off #2 ☐ Water Pressure _____ Test Kit SN _____

Remarks: _____

I hereby certify that this date is accurate and reflects the proper operation and maintenance of the assembly.

TESTER'S NAME (PRINT) _____ CERT. # _____

TESTER'S SIGNATURE _____ DATE _____ TIME _____

COMPANY _____

Date:_____

OWATONNA
PUBLIC UTILITIES

208 S Walnut Ave.
P.O. Box 800
Owatonna, Mn 55060
507-451-2480

20_ _ OPU Registered Tester Form

Name:_____

Address:_____

City, State Zip:_____

Company Name:_____

Phone: _____ Fax: _____

Tester ID #:_____

Are you a licensed plumber? Yes◯ No◯ License No._____
Are you a licensed fire protection contractor? Yes◯ No◯ License No._____
Are you a licensed sprinkler fitter? Yes◯ No◯ License No._____

Test Equipment Used:

Make:_____ Model:_____

Serial #:_____ Calibration Date:_____

Signature:_____
By signing this form you are agreeing to follow all of the requirements of OPU's Cross Connection and Backflow Prevention Plan and attesting to the accuracy of any test results submitted.

Remarks:_____
_____
_____

Include photo copy of ID card, proof of required training, equipment calibration report, and licensures (if applicable). Please submit every calendar year.

POLICY

CROSS CONNECTIONS & BACKFLOW PREVENTION PROGRAM FEE STRUCTURE FOR NON-COMPLIANCE

POLICY STATEMENT

The Cross Connections and Backflow Prevention Program as documented in the OPU Watermain Material and Installation Specifications is in place to prevent the contamination of the Public water supply. OPU considers any non-compliance to this program to be a serious issue with possible negative implications to the health and well being of the public. The following penalty structure is in place to help facilitate compliance with the program.

PENALTY

1) Failure to complete required backflow prevention assembly testing at intervals prescribed in the Program specifications.

    a) The Owatonna Public Utilities will notify in writing each water customer that is delinquent in submitting their annual backflow prevention assembly tests. This first written notice shall give the water customer a maximum of 30 calendar days to have the assembly tested and submitted.

    b) Each customer that has failed to comply with Section 1)a) shall be issued a written notice, called the "Second Notice." A fee in the amount of $50 shall be added to the monthly bill for the service owner that is in violation. In the case where a "Second Notice" is issued to the same service in subsequent years, the "Second Notice" fee shall be increased to $100 per violation and shall remain at $100 for all future years. This written notice shall give the water customer a maximum of 15 calendar days to have the assembly tested and submitted.

    c) Failure to submit testing prior to the prescribed grace period granted by the second notice. OPU may terminate the water supply to the customer for being non-compliant to the Program specifications. A fee of $50 shall be added to the monthly bill for the service owner that is in violation for the reestablishment of water service to the customer.

2) Failure to be in compliance with the requirements of the Program specifications.

   a) OPU may terminate the water supply to the customer for being non-compliant to the Program specifications. A fee of $50 shall be added to the monthly bill for the service owner that is in violation for the reestablishment of water service to the customer.

TAXES

The above rates do not include any taxes.

EFFECTIVE DATE January 1, 2008

Adopted this 25th day of September 2007 by the Owatonna Public Utilities Commission,

/s/ David J. Emanuelson, President.

/s/ Scott L. Schreiner
Vice President

/s/ Stephen J. Shurts
General Manager

/s/ Raymond Truelson
Commissioner

Charles G. Mayhew
Commissioner

/s/ Steve Stansberry
Commissioner

2016; WATERMAINS
SPECIFICATIONS FOR CROSS CONNECTIONS and BACKFLOW PREVENTION
SECTION C5.0

1. General

1.1. Background: The United States Congress enacted the Safe Drinking Water act (PL 93-532) into law on December 16, 1974. Minnesota achieved primacy for the Safe Drinking Water Act in 1976. Minnesota State Statutes place responsibility for compliance with the Safe Drinking Water Act on the water purveyor through the Department of Health and the Department of Labor and Industry. The Safe Drinking Water Act and its regulations cover all potable water systems and states that "minimum" protection should include programs that result in the prevention of health hazards, such as cross connections."

1.2. Purpose: The purpose of this specification is:

1.2.1. To carry out the requirements of the Safe Drinking Water Act (PL 93-532), the Minnesota Department of Health Chapter 4720 and Minnesota Plumbing Code, Minnesota Rules, Chapter 4714.

1.2.2. To protect the municipal potable water supply of Owatonna, Minnesota from the possibility of contamination or pollution of the potable water system(s) under the direct authority of the Owatonna Public Utilities.

1.2.3. To promote the elimination or control of existing cross connections, actual or potential, between the customer's potable water system(s) and another environment containing substance(s).

1.2.4. To provide for the maintenance of a continuing Program of Cross Connection Control which will systematically and effectively prevent the contamination or pollution of all potable water system(s) under the direct authority of the Owatonna Public Utilities.

1.3. Responsibility: The Owatonna Public Utilities at 208 South Walnut Street, Owatonna, Minnesota shall be responsible for the protection of the potable water distribution system from contamination or pollution due to the backflow of contaminants or pollutants. If, in the judgment of OPU an approved means of backflow prevention is required (in the customer's water service; or within the customer's private water system) for the safety of the water system, the Owatonna Public Utilities shall give notice in writing to said customer to install an approved means of backflow prevention at a specific location(s) on the customer's premises. The customer shall immediately install an approved means of backflow prevention at the customer's own expense; failure, refusal or inability on the part of the customer to install, have tested, maintain or repair such, shall constitute grounds for disconnecting water service to the premises until such requirements have been satisfactorily met.

1.3.1. Owatonna Public Utilities, the authority having jurisdiction in charge of the "municipal" water system is vested with authority and responsibility for the implementation of an effective cross connection control program and for the enforcement of the provisions of this specification.

2. Definitions: The following definitions shall apply to this specification. These definitions shall be used in conjunction with definitions and guidelines of the Minnesota Plumbing Code, Minnesota Rules, "Chapter 4714, Definitions and Standards".

2.1. Approved

2.1.1 The term "approved" as herein used in reference to a water supply shall mean a water supply that has been approved by the Minnesota Department of Health and the Minnesota Department of Labor and Industry.

2.1.2. The term "approved" as herein used in reference to an air gap, pressure vacuum breaker assembly, a double check valve assembly, a reduced pressure principle backflow prevention assembly or other backflow prevention assemblies, devices or methods shall mean any such assembly, device or method approved by the State of Minnesota Plumbing Code and the Owatonna Public Utilities.

2.2. Auxiliary Water Supply: Any water supply on or available to the premises other than the water supply of the Owatonna Public Utilities will be considered as an auxiliary water supply. These auxiliary waters may include water from another city's water utility or public potable water supply or any natural source(s) such as a well, spring, river, stream, harbor, etc., or used water of industrial fluids. These waters may be contaminated or polluted or they may be objectionable and constitute an unacceptable water source over which the OPU does not have sanitary control.

2.3. Backflow: The term "backflow" shall mean the undesirable reversal of flow of water or mixtures of water and other liquids, gases or other substances into the distribution pipes of the potable supply of water from any source(s).

2.4. Backpressure: The term "backpressure" shall mean any elevation of pressure in the downstream piping system (i.e. pump, elevation of piping, or steam and/or air pressure) above the supply pressure at the point of consideration, which would cause, or tend to cause, a reversal of the normal direction of flow.

2.5. Backsiphonage: The term "backsiphonage" shall mean a form of backflow due to a reduction in system pressure, which causes a sub atmospheric pressure to exist at a site in the water system.

2.6. Backflow Preventer: A means designed to prevent backflow.

2.6.1. Air Gap: The term "air gap" shall mean a physical separation between the free flowing discharge end of a potable water supply pipeline and an open and non-pressure receiving vessel.

2.6.2. Approved Air Gap: Shall be at least double the diameter of the supply pipe measured vertically above the flood level rim of the fixture, but in no case less than 1 inch.

2.6.3. Reduced Pressure Principle Backflow Prevention Assembly (RPZ) (ASSE 1013): The term "reduced pressure backflow assembly" shall mean an assembly containing two (2) independently acting approved check valves together with a hydraulically operating, mechanically independent pressure differential relief valve located between the check valves and at the same time below the first check valve. The unit shall include properly located resilient seated test cocks and tightly closing resilient shutoff valves at each end of the assembly. This assembly is used to protect against a non-health (i.e., pollutant) or a health hazard (i.e., contaminant).

2.6.4. Double Check Valve Backflow Prevention Assembly (DCV) (ASSE 1015): The term "double check valve backflow prevention assembly" shall mean an assembly composed of two (2) independently acting approved check valves, including tightly closing resilient seated shutoff valves attached at each end of the assembly and fitted with properly located resilient seated test cocks. This assembly shall only be used to protect against a non-health hazard (i.e., pollutant).

2.6.5. Pressure Vacuum Breaker (PVB) (ASSE 1020): The term "pressure vacuum breaker assembly" means an assembly which consists of an independently operating internally loaded check valve and an independently operating loaded air inlet valve located on the discharge side of the check valve, with properly located resilient seated test cocks and tightly closing resilient seated shutoff valves attached at each end of the assembly.

2.6.6. Spill-Resistant Vacuum Breaker (SVB) (ASSE 1056): The term "spill-resistant vacuum breaker" shall mean a type of cross connection control assembly which contains a check valve force – loaded closed and an air inlet vent valve force - loaded open to the atmosphere, positioned downstream of the check valve, and located between and including two (2) tightly closing shutoff valves and two (2) test cocks.

2.6.7. Atmospheric Vacuum Breaker (AVB) (ASSE 1001): The term "atmospheric vacuum breaker" means a device that performs similarly to a pressure vacuum breaker assembly. The AVB consists of a float check, a check seat, and an air inlet port. During normal flow conditions the float within the AVB seals against the air inlet seat. When a backsiphonage condition develops the cessation of normal flow permits the float to drop, thus opening the air inlet valve. If the float seals against a check seat there is no backsiphonage from the AVB body or downstream piping. However, if the float check is fouled, the air entering through the air inlet valve dissipates.

2.7. Contamination: The term "contamination" shall mean an impairment of the quality of the water creating an actual hazard to the public health through poisoning or through the spread of disease by sewage, industrial fluids, waste, or toxic solutions.

2.8. Cross Connection: The term "cross connection" shall mean any unprotected actual or potential connection or structural arrangement between a municipal or a consumers private potable water system and any other source or system through which it is possible to introduce into any part of the potable system any used water, industrial fluid, gases, solids or substance other than the intended potable water with which the system is

supplied. Bypass arrangements, jumper connections, removable sections, swivel or change-over devices and other temporary or permanent devices through which or because of which backflow can or may occur are considered to be cross connections.

2.8.1. The term "direct cross connection" shall mean a cross connection which is subject to both backsiphonage and backpressure.

2.8.2. The term "indirect cross connection" shall mean a cross connection which is subject to backsiphonage only.

2.9. Controlled Cross Connections: A connection between a potable water system and a non-potable water system with an approved means of backflow prevention properly installed and maintained so that it will continuously afford the protection commensurate with the degree of hazard.

2.10. Containment - Potable Water Service Protection: The term "containment or water service protection" shall mean the appropriate type or method of backflow protection in the water service commensurate with the degree of hazard of the customer's water system. (See also Isolation)

2.11. Customer: The term "customer" shall mean the owner (i.e., building or property owner) of the water system(s) supplied by the Owatonna Public Utilities.

2.12. Degree of Hazard: The term "degree of hazard" shall mean either a pollutional (non-health) or contamination (health) hazard and is derived from the elevation of conditions within a system.

2.12.1. Health Hazard: The term "health hazard" shall mean an actual or potential threat of contamination of a physical or toxic nature to the public potable water system of the customer's potable water system that would be a danger to health (i.e., contamination).

2.12.2. Plumbing Hazard: The term "plumbing hazard" shall mean an internal or plumbing type cross connection in a customer's potable water system that may be either a pollutional or a contamination type hazard. This includes but is not limited to cross connections in toilets, sinks, lavatories, wash trays and lawn irrigation systems. Plumbing type cross connections can be located in many types of structures including homes, apartment houses, hotels, commercial and industrial establishments. Such a connection, if permitted to exist, must be properly protected by an appropriate means of backflow prevention.

2.12.3. Non-Health Hazard: The term "non-health hazard" shall mean an actual or potential threat to the physical properties of the water system or the portability of the public or the customer's potable water system but which would not constitute a health or system hazard, as defined. The maximum degree or intensity of pollution to which the potable water system could be degraded under this definition would cause a nuisance, be aesthetically objectionable or could cause minor damage to the system or its appurtenances (added parts).

2.12.4. System Hazard: The term "system hazard" shall mean an actual or potential threat of severe damage to the physical properties of the water system (public or customer's potable water system) or of a pollution or contamination which would have a protracted effect on the quality of the potable water in the system.

2.13. Industrial Fluids: The term "industrial fluids" shall mean any fluid or solution which may be chemically, biologically or otherwise contaminated or polluted in a form or concentration which would constitute a health, system, non-health or plumbing hazard if introduced into an approved water supply. This may include, but not be limited to: polluted or contaminated used waters, all types of process waters and "used waters" originating from the public potable water system which may deteriorate in sanitary quality, chemicals in fluid form, plating acids and alkali's, circulating cooling treated or stabilized with toxic substances, contaminated natural waters such as from wells, springs, streams, rivers, bays, harbors, seas, irrigation canals or systems, etc., oils, gases, glycerin, paraffin's, caustic and acid solutions or other liquid and gaseous fluids used industrially for other purposes including fire fighting purposes.

2.14. Isolation - Point of Use: The term "isolation or point of use" shall mean the appropriate type or method of backflow protection at all potable water outlets commensurate with the degree of hazard to the customer's potable water system.

2.15. Non-Potable Water: The term "non-potable water" means water not safe for drinking, personal or culinary use.

2.16. Pollution: The term "pollution" shall mean an impairment of the quality of the water to a degree which does not create a hazard to the public health but which does adversely and unreasonably effect the aesthetic qualities of such waters for human use or consumption.

2.17. Potable Water: The term "potable water" means water that is: safe for human consumption, personal or culinary use; and free from impurities in amounts sufficient to cause disease or harmful physiological effects.

2.18. Rebuild/Overhaul: The term "rebuild/overhaul" when used in reference to backflow assemblies shall be in accordance with the manufacturers published guidelines and ASSE standards.

2.19. Water User: The term "water user" shall mean the person(s) that will be consuming or using the water at the point of use, (i.e., consumer).

2.20. State of Minnesota, Minnesota Plumbing Code, MN Rules, Chapter 4714 and Chapter 326 shall apply to all aspects of this specification.

2.21. System Drain: A hose bibb or boiler cock that is used exclusively to blow out or drain a water system for frost conditions or maintenance.

3. Requirements

3.1. Policy

3.1.1. No water service to any premise shall be allowed by the Owatonna Public Utilities unless the water supply is protected as required by the State of Minnesota, Minnesota Plumbing Code, MN Rules, Chapter 4714, Minnesota Department of Health, Chapter 4720, OPU Watermain Material and Installation Specifications, AWWA Manual M14 and City ordinances. Service of water to any premise shall be discontinued by the Owatonna Public Utilities if the means of backflow prevention required by this specification is not installed, tested, maintained and repaired, or if it is found that a means of backflow prevention has been removed, bypassed, or if an unprotected cross connection exists on the premises. Service will not be restored until such conditions or defects are corrected.

3.1.2. The customer's system shall be open for inspection at all reasonable times to authorized representatives of the Owatonna Public Utilities to determine whether unprotected cross connections or other structural or sanitary hazards, including violations of these regulations exist. When such a condition becomes known, the Owatonna Public Utilities shall immediately notify the customer of the violation, ensure that corrective action is taken in a punctual manner or shall deny or immediately discontinue water service to the premises by providing for a physical break in the service line until the customer has corrected the condition(s) in conformance with Minnesota Law and this specification.

3.1.3. It shall be the responsibility of the customer to assume the cost for the installation, testing, repair and maintenance of the backflow assembly as required by these Specifications and all other referenced materials. An accredited tester approved by the Owatonna Public Utilities shall perform these tests.

3.2. Water System

3.2.1. The water system shall be considered as made up of two (2) parts: The Owatonna Public Utilities System and the customer's water system.

3.2.2. The Owatonna Public Utilities water system shall consist of the source of the water, the facilities and distribution system; and shall also include all those facilities of the water system under the control of the Owatonna Public Utilities.

3.2.3. The source shall include all components of the facilities utilized in the production, treatment, storage and delivery of water to the distribution System.

3.2.4. The distribution system shall include the network of conduits used from the source to the customer's system.

3.2.5. The customer's system shall include those parts of the facilities beyond the termination of OPU's distribution system, which are utilized in conveying potable water to points of use.

3.3. Special Backflow Assembly Requirements

3.3.1. An approved means of backflow prevention shall be installed on each service line to a customer's water system at or near the property line or immediately inside the building being served; but in all cases, before the first branch line leading off the service line whenever the following conditions exist:

3.3.1.1. In the case of premises having an auxiliary water supply which is not or may not be of safe bacteriological or chemical quality and which is not acceptable as an additional source by the State of Minnesota Department of Health, OPU's water system shall be protected against backflow from the premises by installing an approved means of backflow prevention in the service line commensurate with the degree of hazard.

3.3.1.2. In the case of premises on which any industrial fluids or any other objectionable substance is handled in such a fashion as to create an actual or potential hazard to OPU's water system, OPU's water system shall be protected against backflow from the premises by installing an approved means of backflow prevention in the service line commensurate with the degree of hazard. This shall include the handling of process waters and waters originating from OPU's distribution system which have been subject to deterioration in quality.

3.3.1.3. In the case of premises having either internal cross connections that cannot be corrected and protected, or intricate plumbing and piping arrangements or where entry to all portions of the premises is not readily accessible for inspection purposes thereby making it impractical or impossible to ascertain whether dangerous cross connections exist, OPU's water system shall be protected against backflow from the premises by installing an approved means of backflow prevention in the service line.

3.3.2. The type of protective backflow prevention assembly required shall depend upon the degree of hazard which exists as defined below:

3.3.2.1. In the case of any premise where there is an auxiliary water supply not subject to the following rules, OPU's water system shall be protected by an approved air gap or an approved reduced pressure principle backflow prevention assembly.

3.3.2.2. In the case of any premise where there is water or substance that would be objectionable but not hazardous to health if introduced into OPU's water system, an approved double check valve backflow prevention assembly shall protect OPU's water system.

3.3.2.3. In the case of any premise where there is any material dangerous to health, which is handled in such a fashion as to create an actual or potential hazard to OPU's water system, OPU's water system shall be protected by an approved air gap or an approved reduced pressure principle backflow prevention assembly. Examples of premises where these conditions will exist include, but are not limited to sewage treatment plants, sewage pumping stations, chemical manufacturing plants,

hospitals, health care facilities (i.e.; clinics, medical centers, health centers, nursing homes, etc.) mortuaries, plating plants, agricultural facilities (i.e.; farms), chemical or fertilizer plants, etc.

3.3.2.4. In the case of any premise having multiple violations where there has been unprotected cross connections, either actual or potential, and/or where there are a number of plumbing or piping changes occurring, OPU's water system shall be protected by an approved air gap or an approved reduced pressure principle backflow assembly at the service connection directly off of the main ahead of all customer connections.

3.3.2.5. In the case of any premise where, because of security requirements or other prohibitions or restrictions, it is impossible or impractical to make a complete on-premise cross connection survey, either an approved air gap or an approved reduced pressure principle backflow assembly on each service to the premises shall protect OPU's water system.

3.3.2.6. Means of backflow prevention application will be determined by the degree of hazard in the following chart and, but not limited to: State of Minnesota Department of Labor and Industry, Minnesota Rules Chapter 4714: See section 2.12. for definitions relating to "Hazards".

DEGREE OF HAZARD CHART

TABLE 603.2
BACKFLOW PREVENTION DEVICES, ASSEMBLIES, AND METHODS

DEVICE, ASSEMBLY, OR METHOD[1]	APPLICABLE STANDARDS	DEGREE OF HAZARD				INSTALLATION[2,3]
		POLLUTION (LOW HAZARD)		CONTAMINATION (HIGH HAZARD)		
		BACK-SIPHONAGE	BACK-PRESSURE	BACK-SIPHONAGE	BACK-PRESSURE	
Air gap	ASME A112.1.2	X	—	X	—	See Table 603.3.1 in this chapter.
Air gap fittings for use with plumbing fixtures, appliances and appurtenances	ASME A112.1.3	X	—	X	—	Air gap fitting is a device with an internal air gap and typical installation includes plumbing fixtures, appliances and appurtenances. The critical level shall not be installed below the flood level rim.
Atmospheric vacuum breaker (consists of a body, checking member and atmospheric port)	ASSE 1001 or CSA B64.1.1	X	—	X	—	Upright position. No valve downstream. Minimum of 6 inches or listed distance above all downstream piping and flood-level rim of receptor.[4,5]
Antisiphon fill valve (ballcocks) for gravity water closet flush tanks and urinal tanks	ASSE 1002 or CSA B125.3	X	—	X	—	Installation on gravity water closet flush tank and urinal tanks with the fill valve installed with the critical level not less than 1 inch above the opening of the overflow pipe.[4,5]
Vacuum breaker wall hydrants, hose bibbs, frost resistant, automatic draining type	ASSE 1019 or CSA B64.2.1.1	X	—	X	—	Installation includes wall hydrants and hose bibbs. Such devices are not for use under continuous pressure conditions (means of shutoff downstream of device is prohibited).[4,5]
Backflow preventer for Carbonated Beverage Dispensers (two independent check valves with a vent to the atmosphere)	ASSE 1022	X	—	—	—	Installation includes carbonated beverage machines or dispensers. These devices operate under intermittent or continuous pressure conditions.
Spill-Resistant Pressure Vacuum Breaker (single check valve with air inlet vent and means of field testing).	ASSE 1056	X	—	X	—	Upright position. Minimum of 12 inches or listed distance above all downstream piping and flood-level rim of receptor.[5]
Double Check Valve Backflow Prevention Assembly (two independent check valves and means of field testing)	ASSE 1015; AWWA C510; CSA B64.5 or CSA B64.5.1	X	X	—	—	Horizontal unless otherwise listed. Access and clearance shall be in accordance with the manufacturer's instructions, and not less than a 12 inch clearance at bottom for maintenance. May need platform/ladder for test and repair. Does not discharge water.
Double Check Detector Fire Protection Backflow Prevention Assembly (two independent check valves with a parallel detector assembly consisting of a water meter and a double check valve backflow prevention assembly and means of field testing)	ASSE 1048	X	X	—	—	Horizontal unless otherwise listed. Access and clearance shall be in accordance with the manufacturer's instructions, and not less than a 12 inch clearance at bottom for maintenance. May need platform/ladder for test and repair. Does not discharge water. Installation includes a fire protection system and is designed to operate under continuous pressure conditions.

TABLE 603.2
BACKFLOW PREVENTION DEVICES, ASSEMBLIES, AND METHODS (continued)

DEVICE, ASSEMBLY, OR METHOD[1]	APPLICABLE STANDARDS	DEGREE OF HAZARD				INSTALLATION[2,3]
		POLLUTION (LOW HAZARD)		CONTAMINATION (HIGH HAZARD)		
		BACK-SIPHONAGE	BACK-PRESSURE	BACK-SIPHONAGE	BACK-PRESSURE	
Pressure Vacuum Breaker Backflow Prevention Assembly (loaded air inlet valve, internally loaded check valve and means of field testing)	ASSE 1020 or CSA B64.1.2	X	—	X	—	Upright position. May have valves downstream. Minimum of 12 inches above all downstream piping and flood-level rim of receptor. May discharge water.
Reduced Pressure Principle Backflow Prevention Assembly (two independently acting loaded check valves, a differential pressure relief valve and means of field testing)	ASSE 1013; AWWA C511; CSA B64.4 or CSA B64.4.1	X	X	X	X	Horizontal unless otherwise listed. Access and clearance shall be in accordance with the manufacturer's instructions, and not less than a 12 inch clearance at bottom for maintenance. May need platform/ladder for test and repair. May discharge water.
Reduced Pressure Detector Fire Protection Backflow Prevention Assembly (two independently acting loaded check valves, a differential pressure relief valve, with a parallel detector assembly consisting of a water meter and a reduced-pressure principle backflow prevention assembly, and means of field testing)	ASSE 1047	X	X	X	X	Horizontal unless otherwise listed. Access and clearance shall be in accordance with the manufacturer's instructions, and not less than a 12 inch clearance at bottom for maintenance. May need platform/ladder for test and repair. May discharge water. Installation includes a fire protection system and is designed to operate under continuous pressure conditions.

For SI units: 1 inch = 25.4 mm

Notes:

[1] See description of devices and assemblies in this chapter.

[2] Installation in pit or vault requires previous approval by the Authority Having Jurisdiction.

[3] Refer to general and specific requirement for installation.

[4] Not to be subjected to operating pressure for more than 12 hours in a 24 hour period.

[5] For deck-mounted and equipment-mounted vacuum breaker, see Section 603.5.14.

3.3.2.7. All presently installed backflow prevention assemblies which do not meet the requirements of these specifications but were approved backflow protection for the purposes described herein at the time of installation and which have been properly tested, repaired and maintained, shall except for the testing, repair and maintenance requirements under subsection 3.4., be excluded from the requirements of these rules, so long as the Owatonna Public Utilities is assured that they will satisfactorily protect the potable water systems. Whenever the existing backflow preventer is moved from the present location or requires more than minimum maintenance or when the Owatonna Public Utilities finds that the installation constitutes a hazard to health, the backflow preventer shall be replaced by an approved means of backflow prevention meeting the requirements of these specifications.

3.3.2.8. Any means of backflow prevention required herein shall mean an assembly that has been manufactured in full conformance with the standards established by American Water Works Association (AWWA) and by American Society of Sanitary Engineering (ASSE) and have met completely the laboratory and field performance specifications of the Foundation for Cross Connection Control and Hydraulic Research of the University of Southern California (USC FCCCHR) established in: Specifications of Backflow Prevention Assemblies - Section 10 of the most current Edition of the Manual of Cross Connection Control.

3.3.2.9. The Owatonna Public Utilities has adopted said AWWA/ASSE and USC FCCHR Standards and Specifications. A "Certificate of Compliance" for the said AWWA/ASSE standards shall evidence final approval; or "Certificate of Approval" for the said USC FCCCHR specifications issued by an approved testing laboratory.

3.3.3. All system drains that have threaded connections must be labeled with the words "DRAIN ONLY". The tags or labels must be waterproof and have legible letters at least 1" in height.

3.4. Customer Responsibilities

3.4.1. It shall be the duty of the customer at any premise where backflow prevention assemblies are installed to have a field test performed by an accredited backflow prevention assembly tester upon installation and at the required annual intervals thereafter. The Owatonna Public Utilities may require field tests at more frequent intervals as individual circumstances may indicate.

3.4.2. It shall be the responsibility of the customer to assume the cost for the installation, testing, repair and maintenance of the backflow assembly. An accredited tester approved by the Owatonna Public Utilities shall perform these tests.

3.4.3. The water customer may be required to notify the Owatonna Public Utilities in advance when tests are to be undertaken so that an Owatonna Public Utilities representative may witness the field tests, if so desired. The water customer would be informed, in advance, if such action were to occur. If notification is requested and not provided, the Owatonna Public Utilities may require retesting of the assembly.

3.5. Testing and Maintenance

3.5.1. All backflow assemblies must be tested upon installation, at the required annual intervals thereafter per Minnesota Plumbing Code, MN Rules, Chapter 4714. The Owatonna Public Utilities may require field tests at more frequent intervals as individual circumstances may indicate (i.e.; high hazards, high incidence of field test failures, frequent internal plumbing changes, etc.)

3.5.2. The Owner is required to have all testable backflow prevention assemblies tested at intervals not to exceed twelve (12) months from the date of the previous test date and shall be submitted to the OPU Engineering Department no more than 7 days after the test date.

3.5.3. The Owatonna Public Utilities will notify in writing each water customer that is delinquent in submitting their annual backflow prevention assembly tests. This written notice shall give the water customer a maximum of 30 calendar days to have the assembly tested and submitted.

3.5.4. A "Second Notice" shall be sent to each water customer who does not have the backflow prevention assembly tested as prescribed in the first written notice within the 30 calendar day period allowed. The "Second Notice" will give the water customer a period of 15 calendar days to have the assembly tested and the completed report submitted. A fee as prescribed in the OPU Policy Manual shall apply to all instances where a second notice is sent. *See Figure 3.5.4. for an explanation of OPU Policy Fee Structure.

3.5.5. If the water customer takes no action within the 15 calendar day grace period, the Owatonna Public Utilities may terminate water supply to the water customer until the said assembly is tested. The water customer will be subject to fees if it is necessary to terminate the water service and reinstate the service.

3.5.6. All tests must be performed by an accredited backflow tester and reports completed and submitted on the proper form to: Owatonna Public Utilities, ATTN: Cross Connection Control, 208 S. Walnut Ave., PO Box 800, Owatonna, MN 55060

3.5.7. The Owatonna Public Utilities, the company or tester doing the testing and the water customer shall keep records of tests, repairs and maintenance. The Owatonna Public Utilities and the water customer shall maintain these records for a minimum of seven (7) years and make them available upon request.

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*Figure 3.5.4. Explanation of OPU Policy Fee Structure

If the customer fails to comply with section 3.5.3. in year 1 (i.e. first offense) the "Second Notice" fee shall be $50. If in year 2 or any subsequent year after being issued a $50 fee for non-compliance to section 3.5.4. then the fee shall be increase to $100 and remain at that rate for all future occurrences.

3.6. Requirements for OPU Approval of Backflow Prevention Assembly Testers

3.6.1. Accredited backflow prevention assembly testers shall be approved by the State of Minnesota Department of Labor and Industry and registered with the Owatonna Public Utilities. Competency in all phases of backflow prevention assembly testing must be demonstrated by means of education and experience. To be accredited by OPU the potential tester must submit the following minimum requirements and after review of the material be added to the official list of backflow prevention assembly testers prior to completing any work with in the city limits of Owatonna.

3.6.2. The following are minimum requirements:

3.6.2.1. Testers shall have a completed an ASSE certified cross connection control tester course approved by the Minnesota Department of Labor and Industry.

3.6.2.2. Testers shall hold a valid accreditation from the State of Minnesota Department of Labor and Industry and be ASSE 5110 certified.

3.6.2.3. The tester of backflow prevention assemblies shall furnish evidence to show that he/she has available the necessary tools and equipment to properly test such assemblies.

3.6.2.4. The tester shall be responsible for the accuracy and calibration (annual requirement) of the test equipment and the competency and accuracy of all tests and reports prepared by him/her. The test equipment shall be calibrated by an accredited laboratory in accordance with the recognized International Standard ISO/IEC 17025.

3.6.2.5. Maintenance and repair work on backflow prevention devices will have to be performed by a licensed master plumber, or licensed journeyman plumber under the supervision of a master plumber (MN Statute 326.40) in addition to being an ASSE 5130 accredited backflow prevention assembly repairer.

3.6.2.6. Testers shall agree to submit all of their customers annual tests to OPU on a timely basis. Test submittals shall be received no later than 1 week from the date of the test taking place. If a delay is required in submittals the tester is responsible for communicating with OPU.

3.7. On-Premise Cross Connection Control Survey/Inspection

3.7.1. The Owatonna Public Utilities shall require an on-premise survey to evaluate cross connection hazards, as per these specifications.

3.7.2. The Owatonna Public Utilities shall provide written notice of the survey to the water customer and collectively determine a date and time acceptable to both to conduct the survey.

3.7.3. The Owatonna Public Utilities and the water customer shall be notified of the survey findings, listing the degree of hazard and the corrective actions to be taken, if any are required. A reasonable period of time shall be given to complete all backflow prevention. Documentation of completion of corrective actions/changes must be provided to the Owatonna Public Utilities.

3.7.4. The Owatonna Public Utilities shall, at its discretion, require a re-inspection for cross connection control hazards of any premise to which it serves water because of re-piping, plumbing remodeling or additions to existing piping for reasons that may permit a hazard to the potable water system(s).

3.8. Commercial Fire Protection System Requirements

3.8.1. All new installations shall require double check valves. All systems with a single check valve that are being replaced shall be upgraded to a double check valve.

3.8.2. Existing single check valves that are in place may remain in place as long as no work is being completed to the device or the immediate area adjacent to the device.

3.8.2.1. If an additional riser is added to the header or if a riser, previously installed for future use is utilized, it will be construed as work being done to the area adjacent to the device.

3.8.2.2. Before installing or testing a backflow prevention assembly on a fire sprinkler system, it is required that the fire authority having jurisdiction be consulted for additional criteria they may require. Additionally, the hydraulic calculations for the fire sprinkler system shall be recalculated adding the additional pressure loss of the new back flow device proposed to be installed. The hydraulic calculations shall be submitted to the Owatonna Fire Department for approval before the backflow prevention device is installed.

3.8.2.3. Testing of a backflow assembly on a fire sprinkler system shall be completed concurrently with the annual flow test. This will ensure that shut off valves 1 and 2 on the assembly are open at the conclusion of the test.

3.8.2.4. Before testing or performing maintenance on a backflow prevention device for a fire sprinkler system, all proper notifications shall be made. Each system will have different requirements, contact the Owatonna Fire Department with questions.

3.8.2.5. Exceptions may be made in cases where the replacement of a single check valve with a double check backflow device on existing systems reduces the flow to a point that the system no longer complies with fire codes or insurance requirements and the addition of a booster pump or fire pump is not structurally practical.

3.9. Residential Fire Protection System Requirements

3.9.1. The following applies to residential fire systems that are constructed of approved potable materials and are designed to flow water so it does not become stagnate. The conditions found in the NFPA 13d section 8.4.3.3 must be met.

3.9.1.1. If a residential sprinkler system installed in a single family dwelling is constructed with potable water pipe and there are no chemicals in the system, a backflow device is not required.

3.9.1.2. If the system is constructed with non-potable materials and there are no chemicals in the system, a double check valve is required. Annual testing is required.

3.9.1.3. If the system is constructed with any chemicals contained within it, an RPZ is required. Annual testing is required.

3.9.2. The following applies to a Multi-purpose residential fire system in a single family dwelling. This system has dead end runs that permit water to become stagnate.

3.9.2.1. If the system is constructed with potable water pipe and there are no chemicals in the system, a single check valve is required. Annual testing is not required.

3.9.2.2. If the system is constructed with non-potable materials and there are no chemicals in the system, a double check valve is required. Annual testing is required.

3.9.2.3. If the system is constructed with any chemicals contained within it, an RPZ is required. Annual testing is required.

3.9.3. Residential fire sprinkler systems shall be installed on the customer side of the water meter.

3.9.4. Residential fire sprinkler systems that have non-potable materials shall be labeled with stickers that read "non-potable water" a minimum of every 5 feet and orientated to be in conspicuous locations.

3.9.5. It is the fire sprinkler system designers responsibility to provide OPU with the water flow requirements of the meter to meet their system needs. OPU will size the meter to meet these requirements if possible. OPU will only supply a water meter above 1" if special circumstances exist and a request is made from the owner.

3.9.6. All fire sprinkler systems must be reviewed and approved by the Owatonna Fire Department.

3.10. In-ground Irrigation Systems

3.10.1. The State of Minnesota requires backflow protection on all in-ground irrigation systems. The testing of all irrigation system protection devices must be completed each year at the time of system start-up. This is due to the nature of the system being taking in/out of service to protect it from our local climate.

4. Penalty

4.1. A financial penalty shall be charged as outlined in the OPU Policy Manual for any failures to perform the requirements of these Specifications. The penalty shall be billed directly back to the monthly service fees for the service that is in violation.

4.2. The Owatonna Public Utilities may terminate water supply to the water customer for any failures to perform the requirements of these Specifications. The water customer will be subject to fees as outlined in the OPU Policy Manual for the reestablishment of water service to the customer.

Proposed Willmar Local Option Sales Tax

Willmar Sales Tax History

- 1999 $4,000,000 Kandiyohi Regional Library
- 2004 $8,000,000 for expansion of airport/industrial park, hiking and biking trails, Blue Line and Civic Center Connection. (Removed in 2012).

Key Points

- Local Sales Taxes – Minnesota State Statute 297A.99
- Subject to approval of the voters at a general election – November 8, 2016.
- Resolution must state the City's approval, proposed tax rate, uses, total revenue to be raised and length of time to be in effect.
- Proceeds of the tax must be designated for specific improvements at least 90 days before the referendum.

2004 Ballot Questions

Should the City of Willmar finance the completion and expansion of the Airport/Industrial Park, hiking and biking trails, connection of the Blue Line and Civic Center Buildings, and purchase of that portion of the Willmar Regional Treatment Center campus west of Highway 71 (approximately 60 acres) with a one-half (1/2%) percent sales tax on all taxable transactions occurring within the City of Willmar. The projects have an estimated cost of $8 million. The sales tax will expire upon payment of all bonded indebtedness issues to finance the various projects anticipated to be seven (7) years from the date of implementation.

( ) Yes, I am in favor of this sales tax proposal
( ) No, I am opposed to this sales tax proposal

Multi-Community Effort

- City of Willmar
- City of Spicer
- City of New London

Proposed for ten (10 years)

Local Option Sales Tax Revenue Forecast

- $2,200,000 Annually
- $23,000,000 2018 -2027

Projects of Regional Significance

1. Community Center/Backup Emergency Operations Center, Mid-Minnesota Office Space, WRAC 8 Studio
2. Swansson Field/Lighting Improvements
3. Civic Center Refrigeration Improvements
4. Robbin's Island Regional Park Improvements
5. Year-around Ice Arena/Facility
6. Multi-family Workforce Housing Incentive
7. Regional Emergency Training Center
8. Curling Club Facility
9. Block 50 Parking Structure
10. Wye South-end Overpass

High Priority Projects

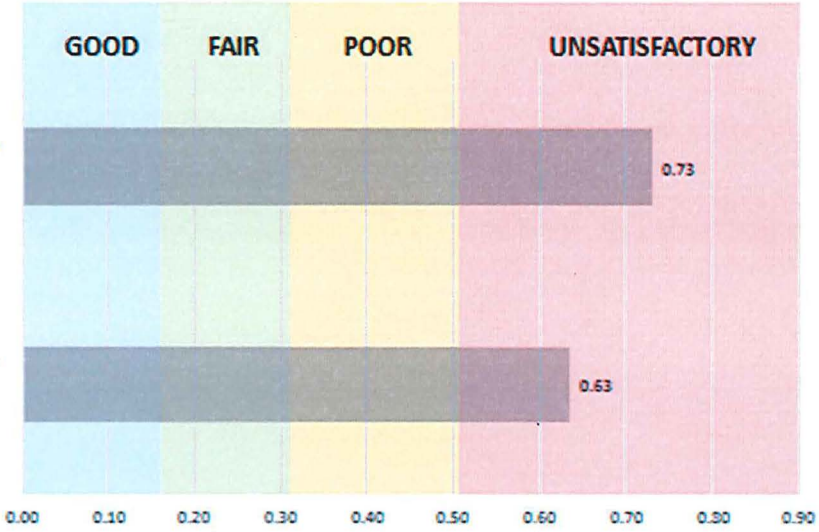
- Civic Center Refrigeration
- Swansson Field Lighting
- Community Center

Community Center

CONDITION INDEX'S (FCI & RI)

$ 969,324 / $ 1,327,841 =.73

$ 842,328 / $ 1,327,841 =.63



CURRENT REALITY // II. Willmar – Community Center

Next Steps

- Place Local Options Sales Tax on the April 18th Agenda
  - Decide if the Council supports pursuing a Local Option Sales Tax
  - Authorize Staff to work with a consultant to estimate project costs of priority projects'
- June Agenda – Evaluate and select projects
- July Agenda – Adopted a Resolution and ballot question.
- August – October – Inform residents
- November 8, 2016 - Election

Local Option Sales Tax – Potential Projects

1. Community Center/Backup Emergency Operations Center, Mid-Minnesota Office Space, WRAC 8 Studio
2. Swansson Field/Lighting Improvements
3. Civic Center Refrigeration Improvements
4. Robbin's Island Regional Park Improvements
5. Year-around Ice Arena/Facility
6. Multi-family Workforce Housing Incentive
7. Regional Emergency Training Center
8. Curling Club Facility
9. Block 50 Parking Structure
10. Wye South-end Overpass
11. Field House
12. Transportation
13. Becker Avenue Plan

Retreat Outcomes

Implementing
(Priorities – Few Items)

1) **Pavement, trails & Parks plans**

2) **Hire HR Director, review org. study & compensation plan**

3) **Local option sales tax**

4) **Civic Center refrigeration system**

5) **Review housing plan & take steps (incentives for developers?)**

6) **Network with utilities re: facility options**

Reviewing
(Items to Study)

* Downtown
* Staff work w/business community to learn more about what City can do
* Public image
* Facilities plan
* Assessment department merged with County?
* Evaluation of local sales tax levy
* Other possible area collaborations
* Use of data to review budget
* Committee structure & work sessions

Considering
(Other Items)

* Dashboard - education, models, examples
* Leverage other sources & review available cash
* Five-year financial plan
* Proactive rather than reactive
* Streamline Council packet - maybe action items only?
* Boards & commissions - roles & work

Retreat Outcomes - Implementing

- Pavement, Trails and Park Plans
- Hire HR Director and Review Organizational Study and Compensation Plan
- Local Options Sales Tax
- Civic Center Refrigeration System
- Review Housing Plan and take steps (incentives for developers)
- Network with Utilities (re: facility options)

Reviewing – Items to Study

- Downtown
- Staff work w/business community to learn more about what City can do.
- Public Image
- Facility Plan
- Assessment Department merged with County)
- Evaluation of Local Sales Tax Levy
- Other possible area collaborations

Retreat Outcomes - <u>Considering</u>

- Dashboard – education, models, examples
- Leveraging other sources & review available cash
- Five Year Financial Plan
- Proactive rather than reactive
- Streamline Council packet-maybe action items only?
- Boards and Commission roles and work
- Use of data to review budget
- Committee structure & work sessions

Local Option Sales Tax Staff Process to Identify Projects of Regional Significance

Staff Community Stakeholder Meetings

- School District 347
- Kandiyohi County
- Rice Hospital
- Ridgewater College
- Willmar Municipal Utilities
- Kandiyohi/Willmar EDC
- Mid-Minnesota Development Corporation
- Chamber of Commerce

Preliminary Estimates of Projects

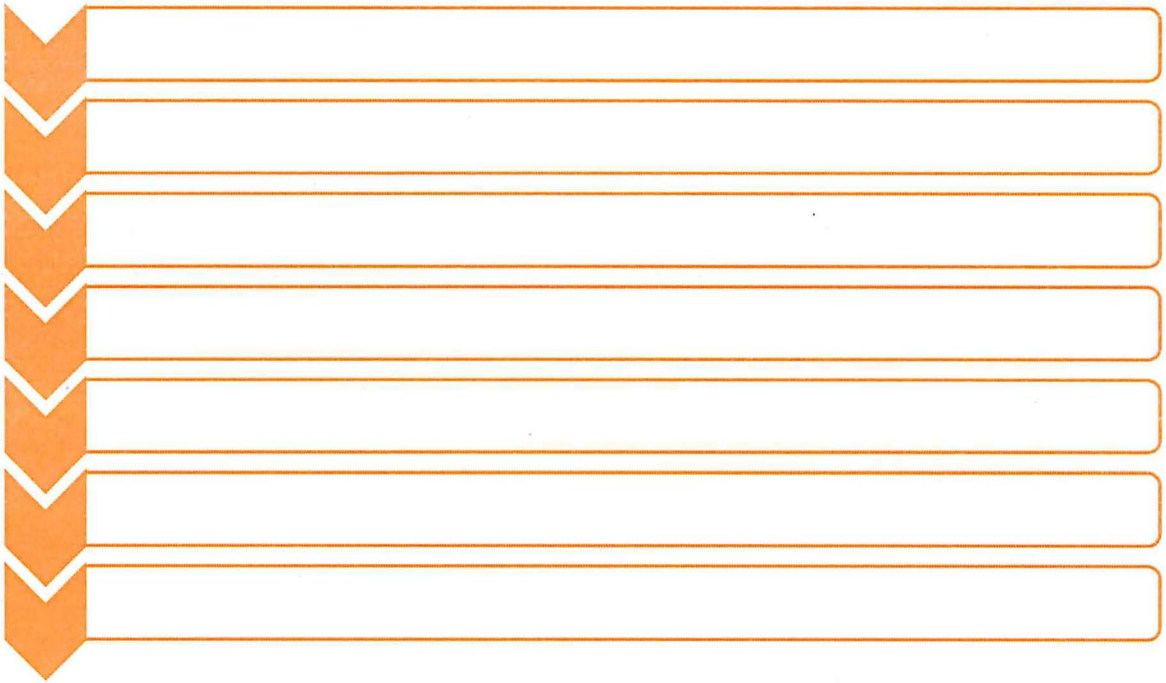
(Developed by Staff)

Description	Width	Length	Square Feet	Cost s.f.	Estimated Costs	Preliminary Staff Recommendation
Buildings						$7,910,000
Community Center	100	200	20,000	$350	$7,000,000	
Mid-Minnesota Office	40	50	1,600	$350	$560,000	
WRAC 8 Studio	40	50	1,000	$350	$350,000	
Parking Ramp (480 spaces)			480	$18,000	$8,640,000	
Robin's Island Regional Park					$7,918,000	$2,500,000
Swansson Field and Lighting Improvements					$7,183,000	$2,500,000
New Arena (Third Sheet of ice)	220	120	26,400	$250	$6,600,000	$6,600,000
Civic Center Improvements (refrigeration, etc)					$2,500,000	
Wye County Overpass					$2,500,000	
Curling Club	180	120	21,600	$200	$4,320,000	
Field House			51,000	$152	$7,750,000	
Transportation					$50,000,000	
Becker Avenue					$10,000,000	
Totals					$115,321,000	$19,510,000

Staff's Recommended Council Process

- **Identify** • Select Projects of Regional Significance – April/May
- **Prioritize** • Prioritize Projects - May
- **Research** • Authorize Staff to Better Define Projects and Costs - May/June
- **Select** • Select projects - Early July
- **Voter Education** • Educate and Inform the Public - August - October
- **Voter Approval** • Election - November 8th
- **State Approval** • Seek Legislative Approval in 2017

Council Directed Process and Dates



Next Steps

1.
2.
3.
4.
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8.
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10.

CITY OF WILLMAR

Planning and Development Services
City Office Building
333 SW 6th Street
Willmar, MN 56201
320-235-8311

COUNCIL ACTION REQUEST

DATE: April 28, 2016

SUBJECT: Building Safety Month

RECOMMENDATION: That the Mayor issue the Proclamation for May, 2016 as Building Safety Month.

BACKGROUND: The month of May has been designated as Building Safety Month. Building Safety Month is recognized by the International Code Council as a month of public awareness of construction issues related to safety and building codes. Communities have been asked to formally proclaim the month of May as building safety month in recognition of the efforts by code officials to create a safe and healthy building construction environment.

FINANCIAL CONSIDERATION: N/A

LEGAL: N/A

DEPARTMENT/RESPONSIBLE PARTY: Bruce D. Peterson, AICP – Director of Planning and Development Services

PROCLAMATION
BUILDING SAFETY MONTH – MAY, 2016

Whereas, our City's continuing efforts to address the critical issues of safety, energy efficiency, water conservation, and resilience in the built environment that affect our citizens, both in everyday life and in times of natural disaster, give us confidence that our structures are safe and sound, and;

Whereas, our confidence is achieved through he devotion of vigilant guardians – building safety and fire prevention officials, architects, engineers, buildings, tradespeople, laborers and others in the construction industry – who work year-round to ensure the safe construction of buildings, and;

Whereas, these guardians – dedicated members of the International Code Council – use a governmental consensus process that brings together local, state and federal officials with expertise in the built environment to create and implement the highest-quality codes to protect Americans in the buildings where we live, learn, work, worship, play, and;

Whereas, the International Codes, the most widely adopted building safety, energy and fire prevention codes in the nation, are used by most U.S. cities, counties and states; these modern building codes also include safeguards to protect the public from national disasters such a hurricanes, snowstorms, tornadoes, wildland fires, floods and earthquakes, and;

Whereas, Building Safety Month is sponsored by the International Code Council, to remind the public about the critical role of our communities' largely unknown guardians of public safety – our local code official – who assure us of safe, efficient, and livable buildings, and;

Whereas, "Building Codes: Driving Growth through Innovation, Resilience and Safety" the theme for Building Safety Month 2016, encourages all Americans to raise awareness of the importance of building safe and resilient construction; fire prevention; disaster mitigation, water safety and conservation; energy efficiency and new technologies in the construction industry. Building Safety Month 2016 encourage appropriate steps everyone can take to ensure that the places where we live, learn, work, worship and play are safe and sustainable, and recognizes that countless lives have been saved due to the implementation of safety codes by local and state agencies, and,

Whereas, each year, in observance of Building Safety Month, Americans are asking to consider projects to improve building safety and sustainability at home and in the community, and to acknowledge the essential service provided to all of us by local and state building departments, fire prevention bureaus and federal agencies in protecting lives and property.

NOW, THEREFORE, I, Mayor – Marv Calvin of the City of Willmar do hereby proclaim the month of May 2016 as Building Safety Month. Accordingly, I encourage our citizens to join with their communities in participation in Building Safety Month activities.

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Mayor, Marv Calvin