An Introduction to Inflow Prevention

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Prior to cross connection and security issues, valve vaults were simply a part of the water distribution system receiving little or no attention unless a problem occurred. With the advent of cross connection issues, more and more municipalities became concerned with the potential for non-potable water entering a pipeline through vault installed air valves. Often, the valve outlets were not piped leaving them exposed to floodwater or other contaminates. Municipalities began to insist that all air valve outlets be piped above grade using a "J" pipe configuration. However, this proved impractical if not impossible in vaults below streets, etc. and also opened up the possibility of malicious tampering with the "J" pipe. Additionally, in cold climates the air valve outlet was now exposed to frigid temperatures leading to freezing concerns.

Post 9/11, water distribution systems were recognized as one of our nation's most vulnerable infrastructure assets. Once again, air valve outlets were recognized as having the potential to allow the entry of contamination into a potable water system.

Air valves play an important role in the operation of distribution systems. Air release valves provide efficiency by preventing air pockets from developing at system highpoints reducing capacity and increasing pressure loss. Air/Vacuum valves allow the system to discharge large volumes of air upon system start up and admit air when necessary to prevent a vacuum from forming and creating a pressure surge. Reservoir vents also play an important role in the intake and exhaust of air from reservoirs as the water level inside rises and falls.

Efforts to make "J" pipe configurations more secure have been underway for some time now. Screens mounted at the end of the pipe as well as in the pipe itself are now in use. But "J" pipes still don't solve the problem of floodwater or intentional introduction of a contaminate finding its way to the outlet of an air valve or reservoir vent.

Cross contamination and security have brought about many new approaches to protecting our drinking water. One of these is the concept of inflow prevention. Inflow prevention is defined as preventing contaminated water from entering a potable water pipeline or reservoir through an air valve or reservoir vent. Inflow prevention is very similar to backflow prevention in that it impedes contaminated water from compromising drinking water. However, most backflow prevention is conceived of as an inline device that reacts to pipeline pressure changes. The inflow prevention concept is conceived of as a way to stop contaminated water from reaching an air valve or vent outlet while allowing the valve or vent to perform its function.

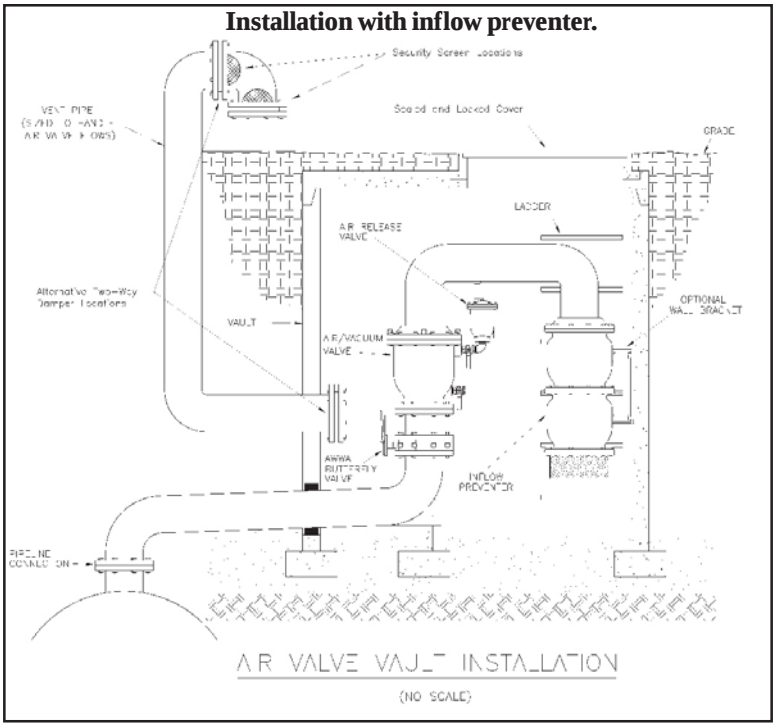
Inflow Preventers

An Inflow Preventer is a device that prevents the admittance of contaminated water or other fluids into a potable water pipeline or reservoir. Inflow Preventers are installed on the outlets of air valves and reservoir vents.

In addition to keeping contaminated water away from drinking water, backflow and inflow preventers share two other concepts; the need for inspection and testing in the field to assure that the device is functioning properly and the need for redundancy. The concept of inflow prevention provides for these capabilities. Standards currently under development will most likely include provisions for annual inspection and field-testing.

By following the successful and proven path of the backflow community, including field inspection, field testing & operational redundancy, inflow prevention is proving to be as essential as backflow prevention.

Installation with inflow preventer.



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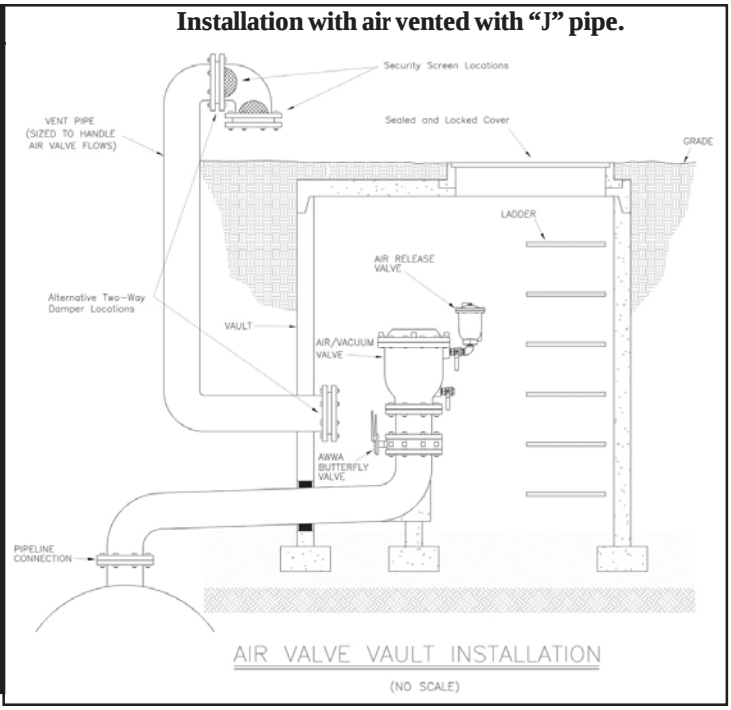
Air Valve Installations	
Problem	**Concern**
Air Valves with Open Outlets	
Vault Flooding	Contaminated water entering pipeline through air valve outlet.
Malicious Tampering	Biotoxin introduced to drinking water through air valve outlet.
Area Flooding	Contaminated water entering pipeline through air valve outlet.
Air Valves Piped Above Grade with "J" Pipes	
Flooding	Contaminated water entering "J" pipe and pipeline through air valve outlet.
Malicious Tampering	"J" pipe compromised. Biotoxin poured into "J" pipe. Air valve opens and draws biotoxin into system.
Malicious Tampering	"J" pipe compromised. Corrosive poured into "J" pipe. Air valve destroyed by corrosive. Flood ensues from water pouring out of valve.

Inflow Preventers are installed inside the vault eliminating the concern of corrosives or biotoxins being poured in and reaching the pipeline through the air valve outlet. Flooding concerns are eliminated as the Inflow Preventer stops floodwater from reaching the air valve outlet.

Installation with air vented with "J" pipe.



Why is Inflow Prevention so Important

Inflow prevention is important because air valves and reservoir vents are vulnerable to cross connection as well as malicious tampering. There are two types of air valve vault installations, un-piped (Fig. 1) and, piped (Fig. 2) above grade with a "J" pipe. Left un-piped, an air valve outlet is exposed to atmosphere. If the vault floods and the air valve opens contaminated floodwater will be drawn into the system. If piped above grade, the same will happen if the floodwater reaches the elevation of the top of the "J" pipe. Worse can happen through malicious tampering. It is a simple matter to cut off the top of a "J" pipe or drill a hole into it with a portable drill. Once done a corrosive liquid can be poured down the j pipe destroying the valve and leading to flooding and contamination. Worse, a biotoxin such as ricin or botulinum could be poured down the pipe with very serious public health consequences. Inflow Preventers can substantially reduce these threats. L

Installation with air valve outlet open to atmosphere.