CROSS CONNECTON CONTROL AND BACKFLOW PREVENTION

Starting and Maintaining a Program for your Water System

PRINCIPLES AND THEORY

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Before beginning your program, there are some concepts you need to know!

- What is a **Cross Connection**, and what are the types?
- What is **Backflow**, and what are the types?
- What **Health Hazards** are involved?
- What are the ways to prevent backflow from occurring through cross connections?
WHAT IS A CROSS CONNECTION??

Is any actual or potential connection between a potable (drinking) water system and any other source or system through which it is possible to introduce into the public drinking water system any used water, industrial fluid, gas or substance other than the intended potable (drinking) water.
There are two types of cross connections:

- Direct Cross Connection
- Indirect Cross Connection
DIRECT CROSS CONNECTION

A Direct Cross Connection is a cross connection that is a physical connection between potable and non-potable water and is subject to both backsiphonage and/or backpressure.

[Diagram showing potable water and non-potable substance with a shutoff valve]
INDIRECT CROSS CONNECTION

An Indirect Cross Connection shall mean a Cross Connection which is subject to Back-siphonage only. Pressure cannot be created.
BACKFLOW CONDITIONS
(Water Hydraulic Conditions)
WHAT IS BACKFLOW??

Backflow is the undesirable reversal of the flow of water.
THERE ARE TWO TYPES OF BACKFLOW CONDITIONS

- Backpressure Backflow
- Backsiphonage Backflow
BACKPRESSURE BACKFLOW

- Is caused when the pressure on the customers side is higher than the water systems pressure
- Backpressure is a “pushing force”
- Causes of Backpressure:
  - Pumps
  - Elevated piping (head pressure)
  - Thermal expansion
  - Pressurized containers
Flow reverses due to system pressure greater than line pressure
BACKSIPHONAGE BACKFLOW

- Is a form of backflow due to a reduction in water system supply pressure which causes a sub-atmospheric pressure to exist at a site in the customer's water system.
- Backsiphonage is a “pulling force”
- What can cause the pressure to drop to cause a back siphonage?
  - High water demand (high Velocity decreases pressure in pipe)
  - Opening a fire hydrant
  - A break in the water piping
  - Suction side of a booster pump
  - Change in pipe sizing
Flow reverses due to decrease or loss of supply line pressure

REDUCED SUPPLY LINE PRESSURE

NORMAL WATER FLOW

Backsiphonage
VENTURI EFFECT

- Caused by a change in pipe size or a constriction in a pipe
  - The velocity increases as it enters smaller sized piping.
  - As the velocity increases, the pressure in the piping decreases, which may create a vacuum.
VENTURI EFFECT

Low velocity high pressure flow

Potable water

Venturi effect example

High velocity low pressure flow

Atmospheric pressure

Additive

Water and additive mixture
HEALTH HAZARDS
It will be important to determine what the health hazard is in order to determine what type of backflow prevention will be needed.
TWO TYPES OF HEALTH HAZARDS

**HEALTH**
- Something that could cause illness or death
- Contaminant

**NON HEALTH**
- Undesirable but won’t cause health affects
  - Aesthetics such as taste, color, odor
- Pollutant (not to be confused with “pollution”
BACKFLOW INCIDENT!!!

What can cause a Backflow Incident to occur?

- Three conditions are necessary:
  - An unprotected cross connection
  - Hydraulic changes in water system
  - A hazardous, nonpotable, or undesirable substance
Three Conditions Are Required For A Backflow Incident:

1. Cross-Connection
2. Hazardous Substance
3. Hydraulic Change

POTABLE DRINKING WATER SUPPLY

NORMAL WATER SUPPLY FLOW

CHANGE IN HYDRAULIC CONDITION RESULTS IN BACKFLOW

NON-POTABLE HAZARDOUS SUBSTANCE
METHODS OF PROTECTION
METHODS OF PROTECTION

- Plumbing Code Compliance (Protection determined by the plumbing code)
- Meter protection
PLUMBING CODE COMPLIANCE
(Isolation Program/Protection)

- Backflow protection installed at each point of cross connection within facility
  - Advantages
    - Water system is protected
    - Occupants inside facility are protected
    - Protection at point of each water use
METER PROTECTION
(Containment program)

- Backflow protection is installed on water supply line to facility at meter
  - Advantage
    - Water system is protected
  - Disadvantage
    - People within facility are not protected