EXISTING FIRE SPRINKLER SYSTEMS
ARE THEY HAZARDS?
HOW CAN WE APPROACH THEM?
PRESENTATION OUTLINE

- What constitutes a hazard
- Michigan Part 14 Cross Connection Rules
- Single check valves – what’s inside them?
- A look at existing buildings and grandfathering
- Plumbing codes
- Research reports
- How is it possible to convince a business owner to upgrade their existing backflow preventers?
- Do we have the authority to require an upgrade?
- Should we be concerned about retrofitting an existing sprinkler?
SINGLE CHECKS - SINGLE DETECTOR CHECKS
DO THEY PRESENT A HAZARD TO THE DISTRIBUTION SYSTEM

Let’s explore that question
Michigan Part 14 Cross Connection Rules

Rule 1401 Definitions:

(a): “Unprotected Cross Connection” means a cross connection between a potable and non-potable system where inadequate methods are provided to prevent backflow.

(b): “Backflow” means water of questionable quality, wastes, or other contaminants entering a potable water supply system due to a reversal of flow.

Rule 1403 Cross Connections Prohibited:

(1): A temporary or permanent unprotected cross connection between a public water supply system and any source, piping, or system that may contain non-potable water or other substances is prohibited.
Michigan Part 14 Cross Connection Rules

Rule 1402: A connection with a public water supply system shall comply with existing laws, ordinances, codes, and rules including:

(a) All sections of the Michigan Plumbing Code or Michigan Residential Code pertaining to backflow and cross connection control.

- The codes allow for existing plumbing systems to stay as currently installed, providing they were installed properly according to the code in affect at the time of installation and they do not currently present a safety hazard.

Rule 1404: Local Cross Connection Programs

- A type 1 public water supply shall develop a comprehensive control program for the elimination and prevention of all cross connections. The plan for the program shall be submitted to the MDEQ for review and approval. Supplies may use the best practices manual when developing the manual.

- When the plan is approved, the water supply shall implement the program for removal of all existing cross connections and prevention of all future cross connections.
Definition – Backflow Preventer
- A backflow prevention assembly, a backflow prevention device or other means or method to prevent backflow into the public water supply.

Definition – Cross Connection
- Any physical connection or arrangement between two otherwise separate piping systems, one of which contains potable water and the other either water of unknown or questionable safety or steam, gas or chemical, whereby there exists the possibility for flow from one system to the other, with the direction of flow depending on the pressure differential between the two systems.
MPC Section 102.2 Existing Installations; “Plumbing systems lawfully in existence at the time of the adoption of this code shall be permitted to have their use and maintenance continued if the use, maintenance or repair is in accordance with the original design and a hazard to life, health or property is not created by such plumbing system.”

MPC Section 108.7 Unsafe Plumbing; “Any plumbing regulated by this code that is unsafe or that constitutes a fire or health hazard, insanitary condition, or is otherwise dangerous to human life is hereby declared unsafe.

Any use of plumbing regulated by this code constituting a hazard to safety, health or public welfare by reason of inadequate maintenance, dilapidation, obsolescence, fire hazard, disaster, damage or abandonment is hereby declared an unsafe use.

Any such unsafe equipment is hereby declared to be a public nuisance and shall be abated by repair, rehabilitation, demolition or removal.
SHOULD EXISTING FIRE SYSTEMS WITH NO CHEMICAL ADDITIVES BE CONSIDERED A HAZARD?
• Is there a link between the drinking water supply and water of questionable quality? **What about stagnated water in the piping system**
• Is there any redundant protection in place? **They are single checks**
• Do these valves undergo routine maintenance? **No**
• Are they mechanical in nature and subject to failure? **Yes**
• Is the sprinkler piping system subjected to corrosion? **Yes**
• Are these valves testable? **No**
LET’S TAKE A LOOK AT WHATS INSIDE THEM
Solid Lead Weight

8” Valve
Note the wear in the lead
Solid Lead Weight

10” Valve
Vertical RP
Approved in vertical position prior to 2005

RP’s are permitted in a vertical position in limited applications
Water service tapped off fire line
Assumed Glycol Loop + Walk-in Freezer Area

Additional sprinkler coverage in attic space
• Limited area fire sprinkler system for walk-in freezer

• Glycol additive area above the ceiling
Multi-family with fire sprinkler system
B. Inspection of the Installation

The proper application of the assembly shall be confirmed for code compliance with respect to the degree of hazard, markings, prohibited locations (i.e., where subject to freezing or freezing and special installation requirements. The assembly orientation and direction of flow shall be confirmed as proper. The assembly shall be checked for alterations or special needs, such as, but not limited to, the adequacy of the air gap, the evidence of illegal bypasses and the adequacy of drainage systems from the assembly. The general appearance of the assembly shall be checked for condition of excessive discharge, condition of the shutoff valves, test cocks, relief valve and air gap, and adequacy of drainage, should leakage occur.
Is it reasonable to assume this is water of questionable quality?
A 1998 AWWA Foundation Sponsored Research Report will Further Assist with that Question

The research study was prepared by:

Steven J. Duranceau and Jacqueline V. Foster Boyle Engineering Corporation, Orlando Florida

Jack Poole  
Poole Fire Protection Engineering, Olathe Kansas

Published by the  
AWWA Research Foundation and American Water Works Association

426 pages in length
The study evaluated:

- Water quality in comparison national primary and secondary drinking water standards.
- Lead concentrations.
- Total coliform and heterotrophic plate count bacteria.
- The predominant cause of backflow is related to the failure of check valves that have failed in the open or partially open position.
- The majority of backflow incidents were from standard swing check valves.
- Limited simulated backflow evaluations indicated that approximately 100 gallons of water can backflow from a wet-pipe fire sprinkler system when the check valve failed in the open position during an average 3 minute hydrant flow test according to the study.
Results of the study indicated the following:

- **Standard swing checks are susceptible to failure in the open position.**

- **Contaminated water has on occasion entered an unknown number of distribution systems in the past.**

- **The introduction of cutting oils to the fire sprinkler systems during construction contributed to water quality deterioration.**

- **Further research is recommended to ascertain the secondary impacts of wet-pipe fire sprinkler systems backflow on microbiology stability of drinking water in distribution systems.**
MIC
Microbiology Influenced Corrosion

What is MIC?
MIC is an acronym for microbiologically influenced corrosion, a mode of corrosion incorporating microbes that react and cause the corrosion or influence other corrosion processes of metallic materials.
P-1505-12.3 – Connections to automatic fire sprinkler systems and standpipe systems: The potable water supply to automatic fire sprinkler and standpipe systems shall be protected against backflow by a double check valve assembly or a reduced pressure principle backflow preventer.
Supporting Statement Code Change No: P100-92

The change is consistent with AWWA Manual M 14-89 which specifies the levels of protection for water supply connections to automatic fire sprinkler systems. A similar change has been made to SBCCI Standard Plumbing Code and the NAPHCC National Standard Plumbing Code.

It has been universally recognized that the water in sprinkler and standpipe systems piped in black steel pipe is non-potable.

The basic concept of the plumbing code is to separate potable water from non-potable water by an approved backflow preventer.
Supporting Statement Code Change P115-91

• This change is a follow-up to code change P43-90 which was denied. P43-90 was challenged but the challenge was withdrawn.

• As such, there was no discussion on the merits of either the original proposal or the challenge. The change submitted by the Ad Hoc Committee on Article 10 was accepted as a revision on the same subject.

• One of the reasons the challenge was withdrawn was because the code change was considered to be too early; additional information was not completely available.

• Since that time, additional information has become available on the quality of water in a sprinkler system. This change also coincides with the introduction of NSF 61 to Article 4. The demand for greater control on the quality of potable water has been made by the public and is being enforced by USEPA.
Supporting Statement Continued:

• Dr. Stuart Asay, P.E, President of Asay and Associates, Consulting Engineers, has conducted studies on the quality of water in a sprinkler system.

• His studies found that within 6 months bacteria colony counts can average 90,000 – 100,000 per milliliter. The organisms include pseudomonas and staphylococcus. Turbidities range from 1,000 – 2,000 while the USEPA lists the water quality level at 1 turbidity unit.

• The University of Maryland conducted a study of 56 separate sprinkler systems. They concluded that virtually none of the sprinkler lines produced a water which would be equitable to the physical quality of drinking water.

• The major part of this change is the requirement for a double check valve assembly in place of a single check valve. These requirements are found in Sections P-1505.12.3.2 and P-1505.12.3.3.

• A single check valve is not recognized as a backflow preventer, whereas a double check valve assembly is.

• Since the water in a sprinkler system is clearly non-potable, backflow protection must be demanded by the code.
You Decide; does a fire sprinkler system at minimum pose a low hazard to the distribution system?
How do we address this in an existing building?

Educate, Educate, Educate
Work with the business owner based upon degree of hazard and think of it as a maintenance issue
City of Novi approach to addressing fire systems in existing buildings.

- Educate them on the hazard
- Provide them with a code path
- Allow them time to get it in their budgets based on degree of hazard
NFPA 13 Installation of Sprinkler Systems

8.17.4.6.2 Retroactive Installation:

When backflow prevention devices are to be retroactively installed on existing systems, a thorough hydraulic analysis, including revised hydraulic calculations, new fire flow data, and all necessary system modifications to accommodate the additional friction loss, shall be completed as part of the installation.
CONCERNS RAISED WITH RETROFITS AND NFPA 13:

• Cost prohibitive to the business community to perform hydraulic calculations.
• Is it possible to conduct an analysis without requiring full blown hydraulic calculations and meet the intent and spirit of this requirement?
• Permits must be pulled.

Our Solution:

• Applicants must identify the existing pressure drop in the single check.
• Show the specification for the new assembly provides less pressure drop than the old device(s).
• Our Fire Marshall and Plumbing Inspector are part of this process and a plumbing permit is pulled for the install.
NFPA 20 Fire Pumps

NOTE: Backflow Preventer!
NOTE: The long straight run of suction pipe after a HORIZONTAL 90 DEGREE ELBOW!
More than 10 pipe diameters? (5.14.6.3.2)

OSY Suction Valve
NFPA 20 General Requirements

• Section 4.27.3 Devices in suction piping:
  Where located within the suction pipe of the pump, check valves and backflow prevention devices or assemblies shall be located a minimum of 10 pipe diameters from the pump suction flange.

• Section 4.27.3.1:
  Where a backflow preventer with butterfly control valves is installed in the suction pipe, the backflow preventer is required to be located at least 50 ft. from the pump suction flange (as measured along the route of the pipe) in accordance with 4.14.5.2.
Request for Time Extension
Backflow Prevention Assembly Upgrade
Automatic Fire Sprinkler System

{Insert Date Here}

City of Novi
Department of Public Services
Water & Sewer Division
26300 Lee BeGole Drive

Re: {Insert facility name}
{Insert facility address}

Fire Sprinkler System Upgrade / Time Extension Request

Cross Connection Control Specialist,

Please accept this request for a reasonable time extension for upgrades to our fire sprinkler system backflow prevention assembly, which has been deemed non-conforming and inadequate for the protection of the public drinking water supply for various reasons pursuant to current industry standards. We are in agreement that one of the most important components of a plumbing system is the protection of the public drinking water supply. With that said, we propose the following upgrade to our fire sprinkler system backflow prevention components.

We propose to install a complete American Society of Sanitary Engineers (ASSE) listed and approved backflow prevention assembly in accordance with the Michigan Plumbing Code. The assembly will include two listed and approved shut off valves and backflow prevention device. The assembly will be installed in accordance with manufacture installation instructions.

The installation of the new assembly will include coordination of multiple City Departments which include the City of Novi Fire Marshall’s (State Fire Marshall if applicable) Office for alterations to a fire sprinkler system, Community Development Department (State Plumbing Inspector if applicable) for required permits and the Water & Sewer Division for water shut off needs.

The maintenance upgrades to our system will be completed by no later than {insert month, day and year here}. Once we have completed our contractor bidding and selection process our contractor proposal will be submitted to the Water & Sewer Division for review and acceptance.

Sincerely,

{Signature here}

{Insert name here}
{Insert title here}
{Insert contact information here, phone, email}
## Certification Statement

**Fire Sprinkler System Non-conforming Backflow Prevention Device**

I [insert contractor name] hereby certify that on [insert date] the existing backflow prevention device [insert serial number, model number, manufacture and size] located on the main fire sprinkler supply line was disassembled and inspected for proper operation. Pursuant to a detailed inspection, the existing backflow prevention assembly is hereby certified as being in an acceptable working condition consistent with that of the original design limitations to prevent a backflow into the public drinking water supply.

Contractor Signature: ____________________

[insert contractor business name]  
[insert contractor business street/address]  
[insert city, state, zip code]  
[insert contractor business phone number]

Plumbing License Name and Number:  
[insert license number]  
[insert license name]

<table>
<thead>
<tr>
<th>[insert contractor business name]</th>
<th>[insert device location business name]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[insert contractor business street/address]</td>
<td>[insert device location street/address]</td>
</tr>
<tr>
<td>Novi, MI [insert zip code]</td>
<td></td>
</tr>
</tbody>
</table>

Physical Location of Device:

[insert brief description of physical location of device]

Acknowledged before me in _____________ County, Michigan, on ________, ________ (year) ____________________ by ____________________.  

(Notary Stamp)  

Notary Public Signature  

Notary's Name  

County  

Acting in the County of  

My Commission expires:
Attachment A
Cross Connection Control
Fire Sprinkler System Backflow Prevention Corrective Options

Non-Conforming Fire Sprinkler Backflow Prevention Assembly/Device

General Information:
Some existing assemblies/devices, such as single checks, swing checks, wafer check, detector checks, single checks in a series, etc., are considered non-conforming and no longer considered adequate to protect the drinking water supply. These devices are mechanical in nature, subject to failure and rarely are subjected to routine maintenance. Single checks are not testable pursuant to American Society of Sanitary Engineer (ASSE) standards listed within the Michigan Plumbing Code (MPC). Ames model DCVA/DCDA and RPZ assemblies which were previously approved by the manufacturer to be installed in a vertical position but no longer maintain this approval through the third party testing agency are no longer considered adequate to protect the drinking water supply and must be replaced or reinstalled accordingly.

There are two corrective options available, which are described in Item #1 and Item #2 below. Ames models previously approved for vertical installation are excluded from Item #2 (Option B).

Item #1  Fire Sprinkler Option
Backflow prevention on the existing fire sprinkler system must be upgraded to current MPC requirements. Application and the presence of chemicals or booster pumps must be considered in selecting the appropriate complete ASSE approved assembly, which includes two new shutoff valves and backflow preventer. Required plan submittals and hydraulic calculations shall be as required by the City of Novi or State Fire Marshalls office. At minimum, a specification sheet shall be submitted to the Fire Marshall, Plumbing Inspector and Cross Connection Specialist for approvals. A plumbing permit shall be required.

Understanding the time and costs associated with these upgrades, please see the request for time extension letter located on the City of Novi website cityofnovi.org. Complete all areas, print out on company letterhead, sign and submit to the Water & Sewer Division for approval. Please see the following link;

http://cityofnovi.org/City-Services/Public-Services/Cross-Connection-Control/RequestForTimeExtension.aspx

Item #2  Fire Sprinkler Option
Use of (Option B) is limited to buildings not exceeding three stories in height, have no chemical additives, have no auxiliary water supplies, and will be at the discretion of the Water & Sewer Division.

A licensed plumbing contractor shall be permitted to open the existing backflow prevention device and inspect all internal components of the device for proper operation to verify that a backflow condition is not able to occur. The contractor shall then provide verification to the Water & Sewer Division, via an affidavit form provided by the Water & Sewer Division, that the backflow prevention device is in proper working order. The affidavit shall be signed, dated and notarized, with an original copy forwarded to the Water & Sewer Division. Please see the following link to required affidavit;

http://cityofnovi.org/City-Services/Public-Services/Cross-Connection-Control/CrossConnectionCertificationStatement.aspx

Note:
- Utilizing (Option B) will require the existing device to be re-evaluated pursuant to the above item # 2 instructions every three years to verify proper operation.
- If (Option B) is unable to be verified by the Water & Sewer Division, (Option A) shall be required.
- All forms including (attachment A) can be found at cityofnovi.org by clicking on the quick access link at the top of the home page, click cross connection, click commercial.
Letters can be found at

cityofnovi.org
Quick Access Link
Cross Connection
Commercial