

Inspection, Testing, and Maintenance of Automatic Sprinkler Systems

Jim Bychowski, P.E.

Senior Vice President – Middle East



Aon Fire Protection Engineering

“*Safety Design in Buildings*” is a Registered Provider with ***The American Institute of Architects Continuing Education Systems (AIA/CES)***. Credit(s) earned on completion of this program will be reported to ***AIA/CES*** for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

This program is registered with ***AIA/CES*** for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Copyright Materials

This presentation is protected by US and International Copyright laws. Reproduction, distribution, display and use of the presentation without written permission of the speaker is prohibited.

© Aon Fire Protection Engineering Corporation 2014

Learning Objectives

- **Introduction and Overview of NFPA Code Requirements for Inspection, Testing and Maintenance of Automatic Sprinkler Systems**
- **Understanding the Guidelines for Inspection, Testing and Maintenance and how to apply them**
- **Identify common installation errors and maintenance deficiencies through field examples**

Summary

- **Purpose of Inspection and Testing**
- **Guidelines for Inspection, Testing and Maintenance**
- **Inspection Requirements**
- **Testing Requirements**
- **System Types and Common Failures**
- **Real World Examples**

Speaker Bio

James A. Bychowski, P.E., has over 30 years of fire protection experience and has worked for Aon Fire Protection Engineering (Aon FPE) for over 15 years. As Senior Vice President – Middle East Region, Mr. Bychowski is responsible for all Aon FPE Middle East, Africa, and South East Asia operations.

Mr. Bychowski was responsible for establishing our first Middle East office in Dubai in 2006, and has developed this office into one of Aon FPE's largest regional offices having a unique mix international professionals. Mr. Bychowski has served as a principal member on the NFPA 72 technical committee, as alternate to the chairman of NFPA 13 and is a founding board member of the International UAE Society of Fire Protection Engineers (SFPE) chapter. He has served in many roles for Aon FPE including Vice President of Sales and Marketing for eight years, Director of Global Marketing for Aon Global Risk Consulting and Vice President and Regional Manager of our flagship Chicago office.

Mr. Bychowski is a professional fire protection engineer with experience in preparation of fire strategies for many types of occupancies including high-rise offices and hotels, shopping malls, airport terminals, aircraft hangars, petrochemical processing, power generation stations, stadiums, convention centers, hospitals, universities, assisted living facilities, museums, and numerous other facilities. He guides our Middle East team in developing fire-safe designs for our clients that meet the requirements of Civil Defense authorities and improve life safety throughout the region.

Why Inspect and Test?

- **Identify impairments**
- **Identify system equipment failure or underperformance**
- **Identify system design deficiencies**
- **Identify changes in occupancy or building use that do not align with existing system design**

Installation vs Maintenance



Guidelines

- **NFPA 25**
 - Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
 - Developed in 1992
 - Based on NFPA 13A and NFPA 14A
- **Provides “how to” instructions and frequency of inspections and testing**
- **Excellent guide for risk engineers and facility engineers.**

Guidelines

Table 5.1.1.2 Summary of Sprinkler System Inspection, Testing, and Maintenance

| Item | Frequency | Reference |
|--|---|---------------------------|
| Inspection | | |
| Gauges (dry, preaction, and deluge systems) | Weekly/quarterly | 5.2.4.2, 5.2.4.3, 5.2.4.4 |
| Control valves | | Table 13.1.1.2 |
| Waterflow alarm devices | Quarterly | 5.2.5 |
| Valve supervisory signal devices | Quarterly | 5.2.5 |
| Supervisory signal devices (except valve supervisory switches) | Quarterly | 5.2.5 |
| Gauges (wet pipe systems) | Quarterly | 5.2.4.1 |
| Hydraulic nameplate | Quarterly | 5.2.6 |
| Buildings | Annually (prior to freezing weather) | 4.1.1.1 |
| Hanger/seismic bracing | Annually | 5.2.3 |
| Pipe and fittings | Annually | 5.2.2 |
| Sprinklers | Annually | 5.2.1 |
| Spare sprinklers | Annually | 5.2.1.4 |
| Information sign | Annually | 5.2.8 |
| Fire department connections | | Table 13.1.1.2 |
| Valves (all types) | | Table 13.1.1.2 |
| Obstruction, internal inspection of piping | 5 years | 14.2 |
| Heat trace | Per manufacturer's requirements | 5.2.7 |
| Test | | |
| Waterflow alarm devices | | |
| Mechanical devices | Quarterly | 5.3.3.1 |
| Vane and pressure switch-type devices | Semiannually | 5.3.3.2 |
| Valve supervisory signal devices | | Table 13.1.1.2 |
| Supervisory signal devices (except valve supervisory switches) | | Table 13.1.1.2 |
| Main drain | | Table 13.1.1.2 |
| Antifreeze solution | Annually | 5.3.4 |
| Gauges | 5 years | 5.3.2 |
| Sprinklers (extra-high or greater temperature solder type) | 5 years | 5.3.1.1.1.4 |
| Sprinklers (fast-response) | At 20 years and every 10 years thereafter | 5.3.1.1.1.3 |
| Sprinklers | At 50 years and every 10 years thereafter | 5.3.1.1.1 |
| Sprinklers | At 75 years and every 5 years thereafter | 5.3.1.1.1.5 |
| Sprinklers (dry) | At 10 years and every 10 years thereafter | 5.3.1.1.1.6 |
| Sprinklers (in harsh environments) | 5 years | 5.3.1.1.2 |
| Valves (all types) | | Table 13.1.1.2 |
| Valve status test | | 13.3.1.2.1 |
| Maintenance | | |
| Valves (all types) | | Table 13.1.1.2 |
| Low-point drains (dry pipe system) | | 13.4.4.3.2 |
| Sprinklers and automatic spray nozzles protecting commercial cooking equipment and ventilation systems | Annually | 5.4.1.9 |
| Investigation | | |
| Obstruction | | 14.3 |

- *NFPA 25 Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*
- Series of easy to use tables with inspection, testing and maintenance schedules
- Covers sprinklers, standpipes, underground piping, fire pumps, storage tanks, valves, and other elements of water based systems

Inspections

- **Gauges (dry, pre-action, and deluge systems)**
 - Weekly/monthly
- **Control valves**
 - Table 13.1
- **Water flow alarm devices**
 - Quarterly
- **Valve supervisory alarm devices**
 - Quarterly
- **Supervisory signal devices (except valve supervisory switches)**
 - Quarterly
- **Gauges (wet pipe systems)**
 - Monthly

Inspections

- **Spare sprinklers**
 - Annually
- **Information sign**
 - Annually
- **Fire department connections**
 - Table 13.1
- **Valves (all types)**
 - Table 13.1
- **Obstruction, internal inspection of piping**
 - 5 years

Testing

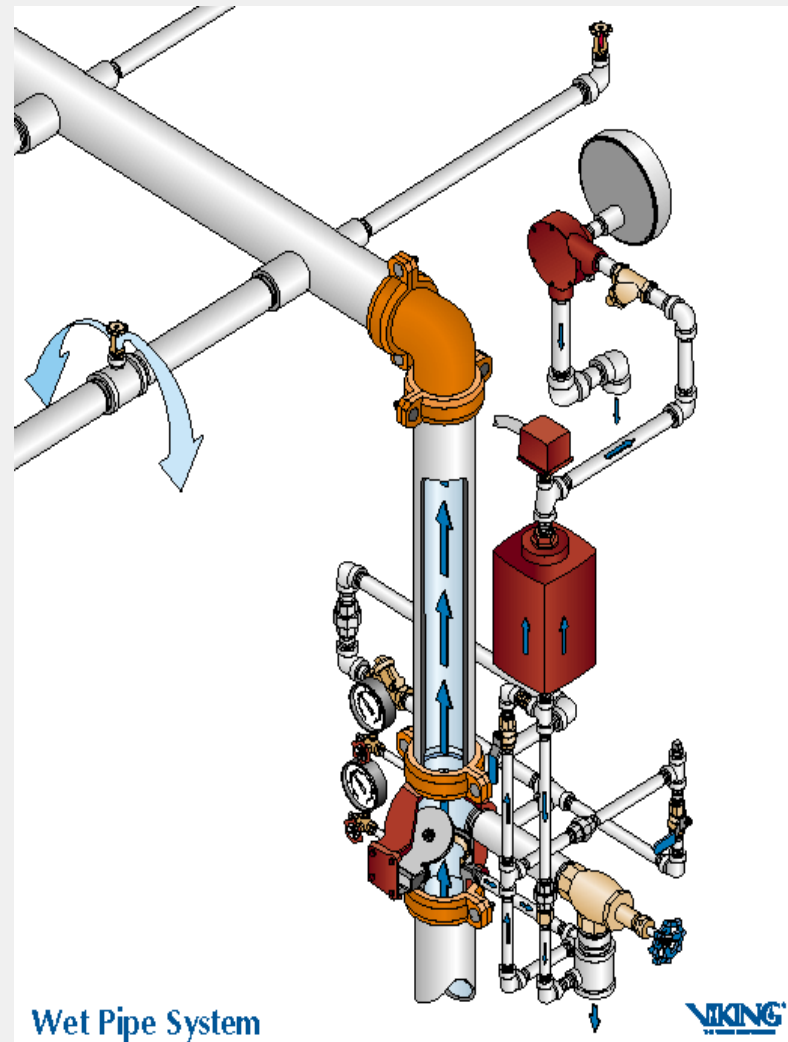
- **Water flow alarm devices Mechanical device**
 - Quarterly
- **Vane and pressure switch type devices**
 - Semiannually
- **Valves supervisory alarm devices**
 - Table 13.1
- **Supervisory signal devices (except valve supervisory switches)**
 - Table 13.1
- **Main drain**
 - Table 13.1

Testing

- **Antifreeze solution**
 - Annually
- **Gauges**
 - 5 years
- **Sprinklers — extra-high temperature**
 - 5 years
- **Sprinklers — fast-response**
 - At 20 years and every 10 years thereafter
- **Sprinklers**
 - At 50 years and every 10 years thereafter
- **Sprinklers — dry**
 - At 10 years and every 10 years thereafter

Wet System

Fixed fire protection systems with closed automatic sprinklers connected to piping filled with water from a dependable water supply.

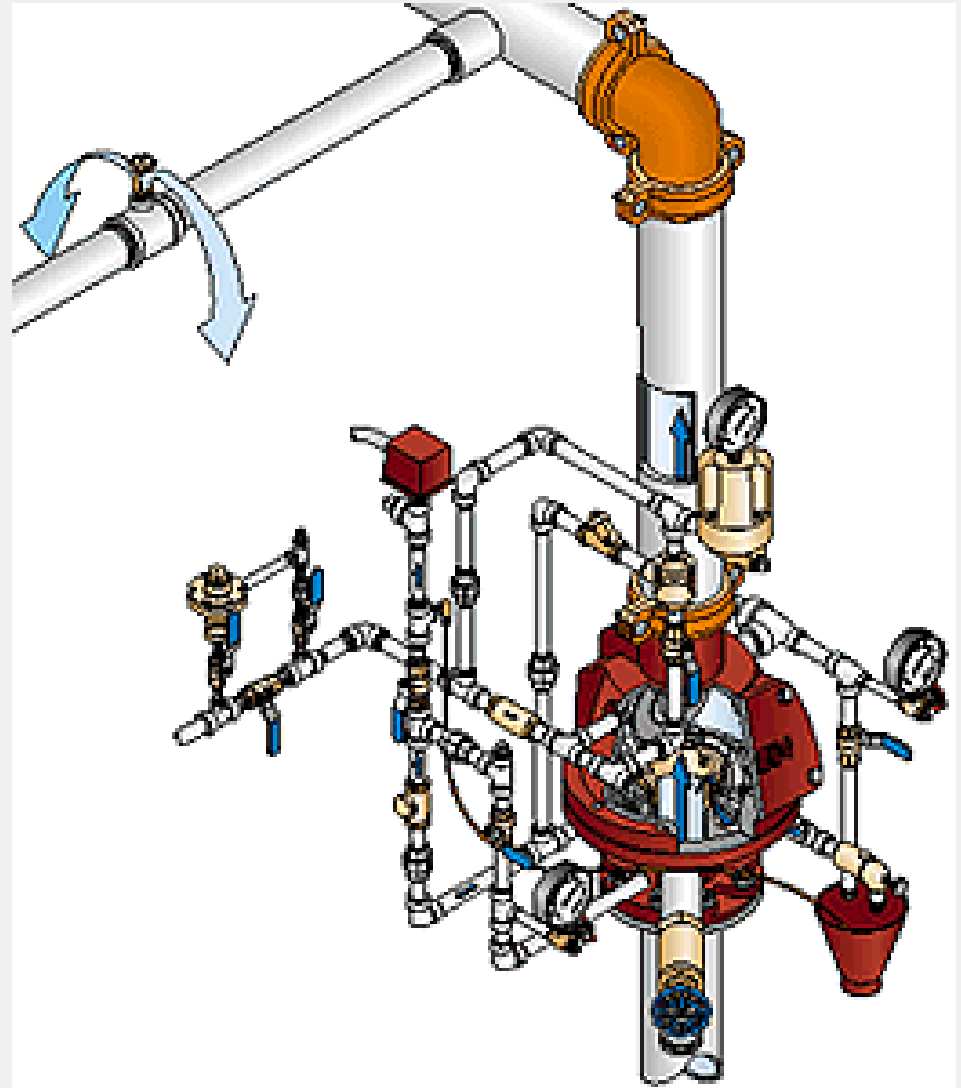


Causes of Wet System Failure

- **Closed main control valve**
- **Sprinkler obstructions**
- **Change in occupancy vs. system design**
- **FA supervisory device malfunction**

Dry System

Fixed fire protection systems with closed automatic sprinklers connected to piping filled with air or nitrogen under pressure, held back by a special dry pipe valve.

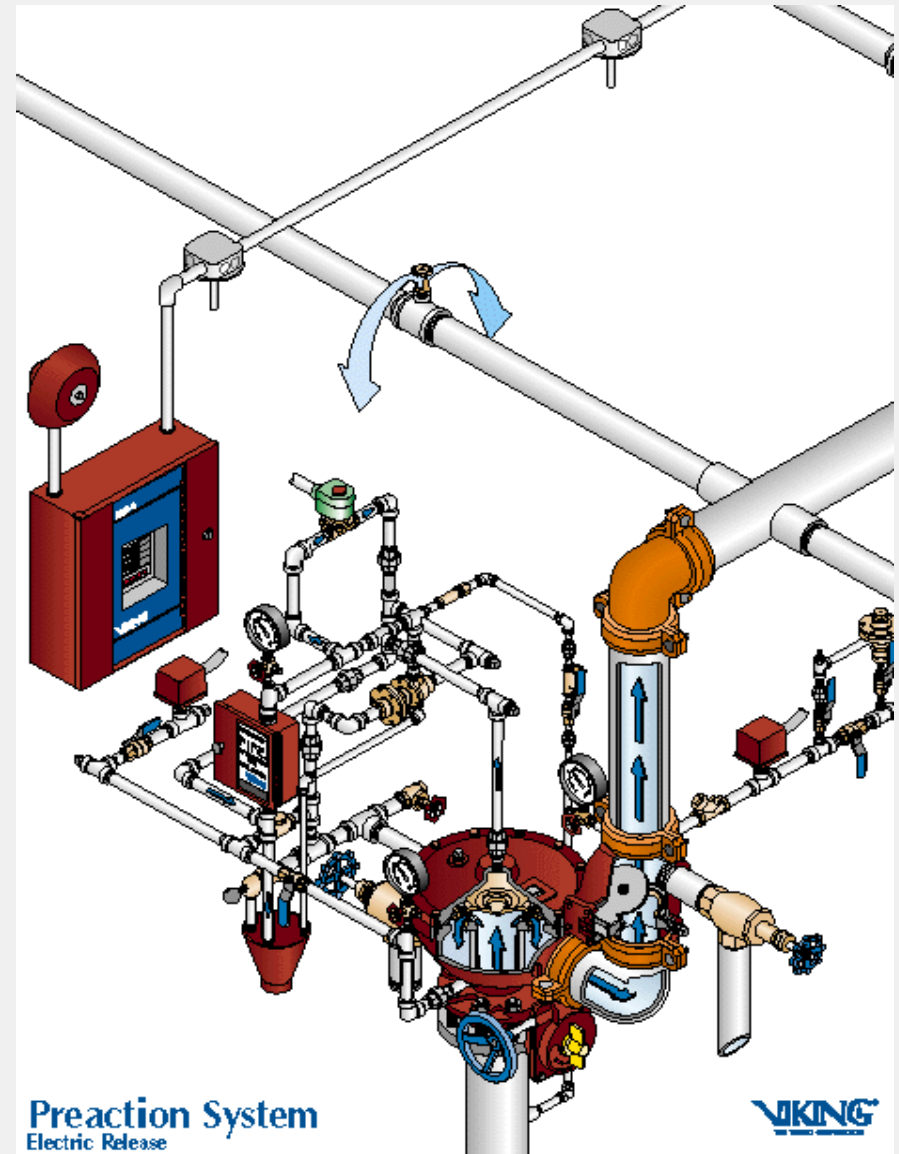


Causes of Dry System Failure

- **Closed main control valve**
- **Dry pipe valve fail to open due to valve seat corrosion**
- **Faulty system design causing delay in water delivery**

Pre-action System

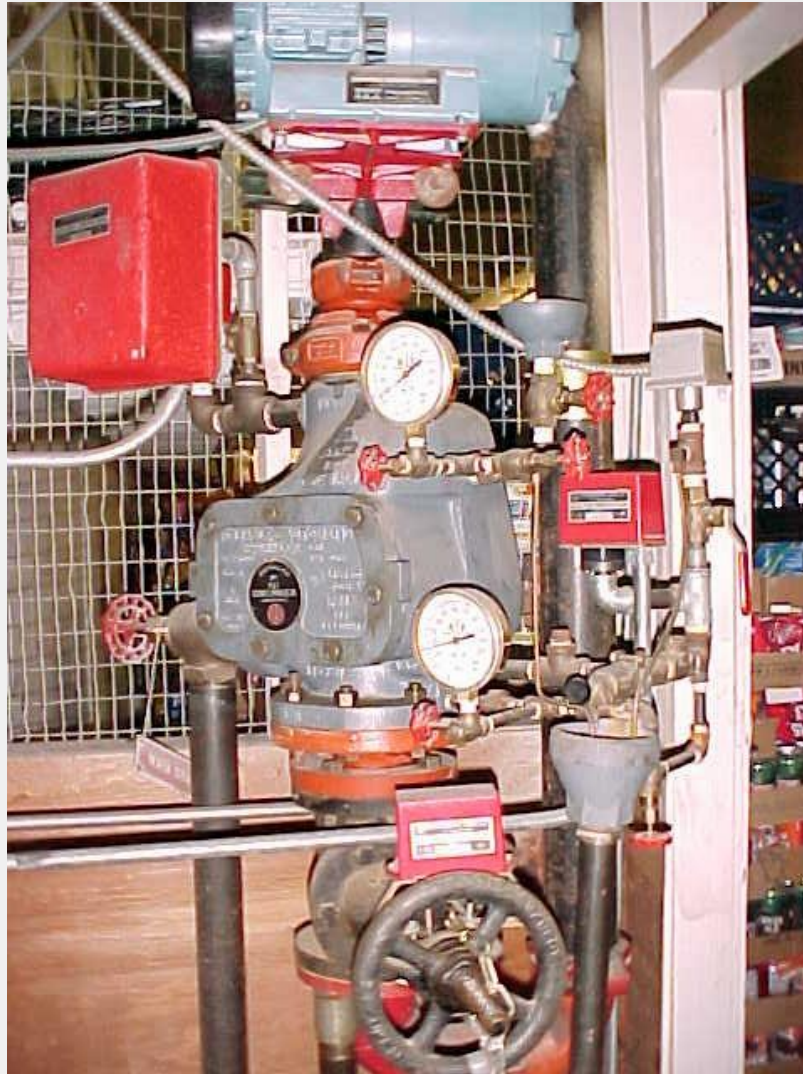
Pre-action systems are dry systems with an automatic fire detection component required to operate to release water into sprinkler pipes. Operation of a separate *detection system* allows water to flow into the piping and discharge from any sprinkler which has opened.



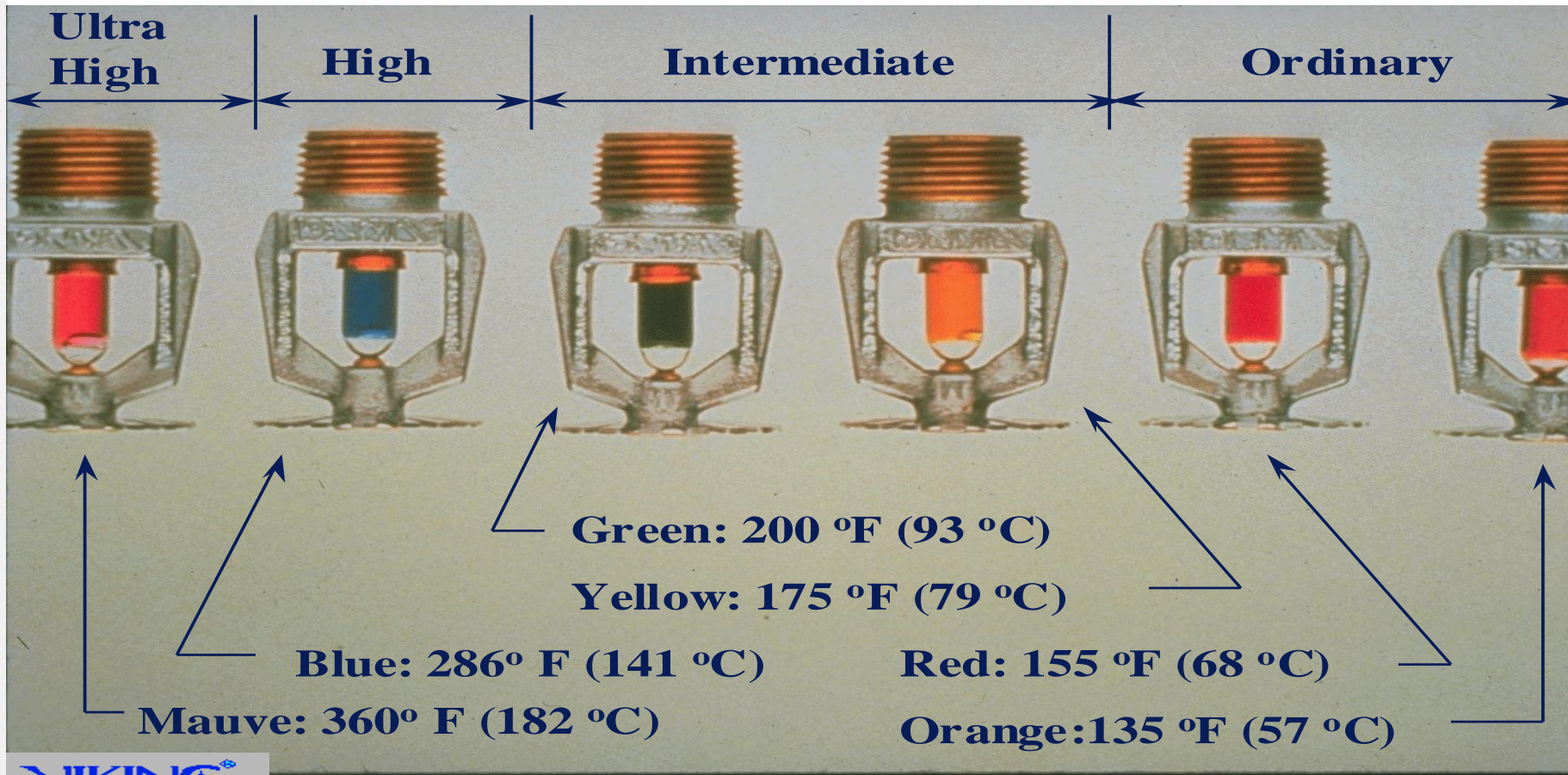
Causes of Pre-action System Failure

- **Closed main control valve**
- **Detection system failure to detect or operate solenoid valve to release air**
- **Improper pre-action valve trim arrangement**

Dry System or Pre-action?



Sprinkler Types



VIKING®

STANDARD RESPONSE

8 mm bulb



5 mm bulb



Fusible
Link



Fusible
Link



SPRINKLERS WITH FAST RESPONSE ELEMENTS

3 mm bulb



Sprinklers with Fast Response elements are not always listed as Quick Response Sprinklers!
Check Technical Data.



Fusible Link

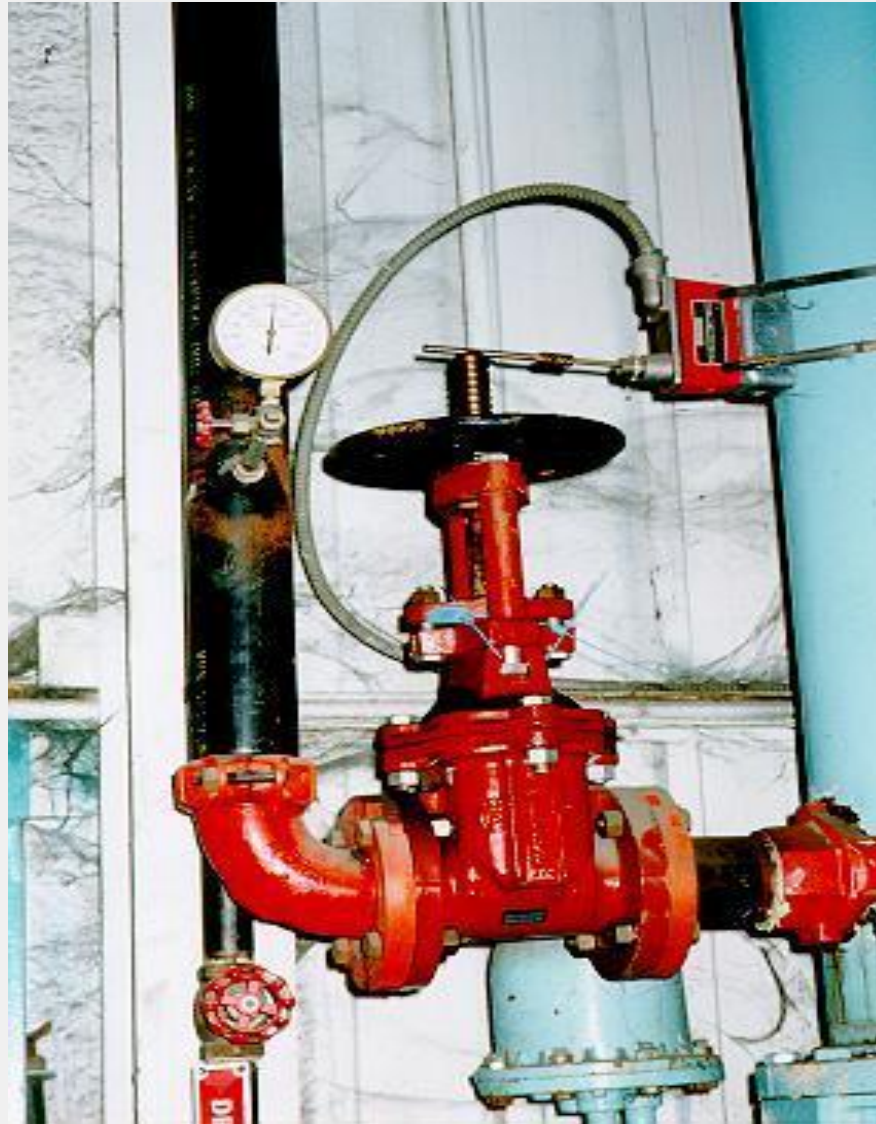
Fusible Link



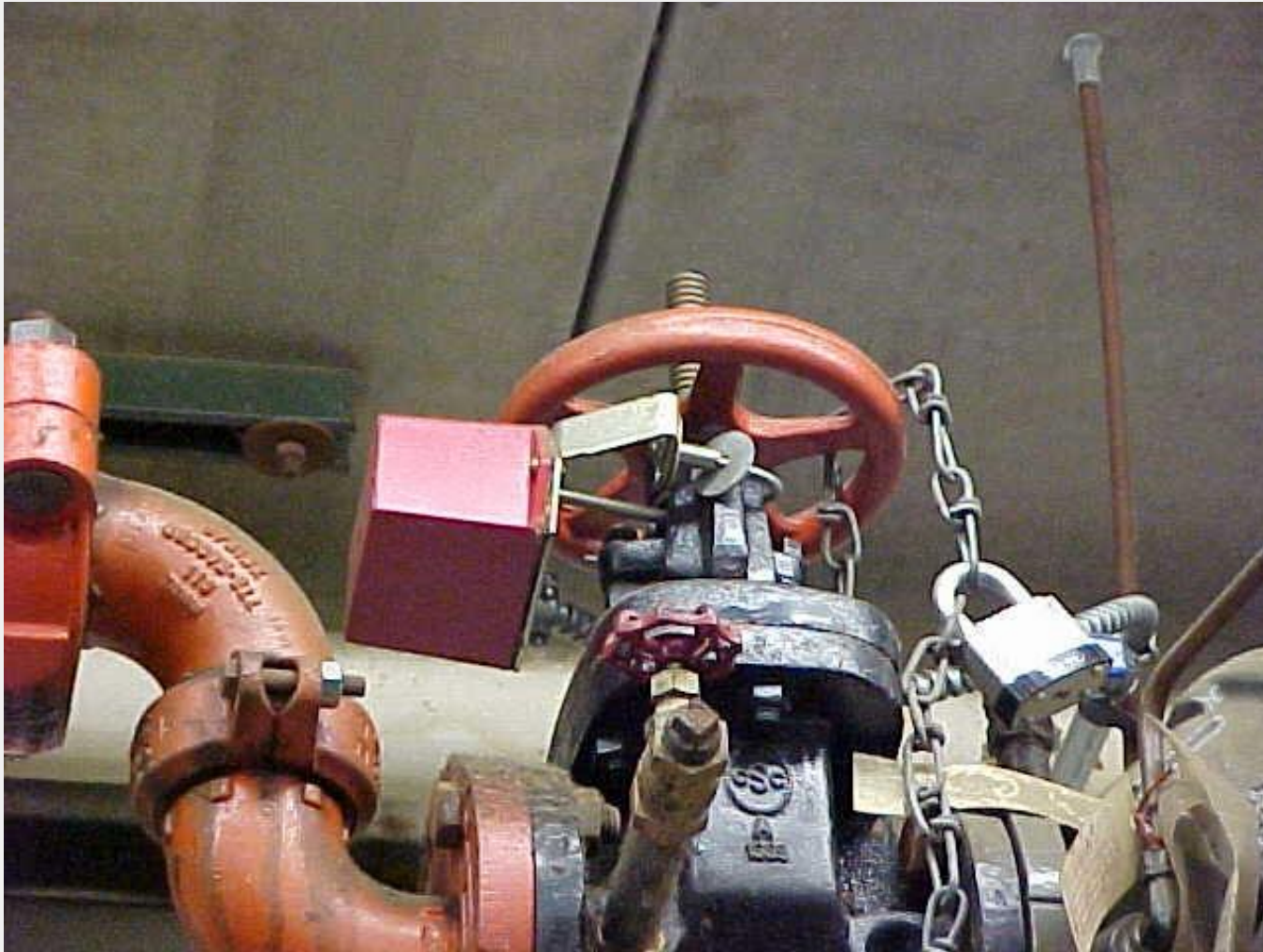
Sprinkler Identification

- **Identify correct type of sprinkler for application**
 - Over 3000 variations of sprinklers
 - Read information on deflectors to identify
- **Extended coverage vs. standard spray**
- **Quick response vs. standard response**
- **High challenge sprinkler – ESFR vs. standard response**

What's wrong here?



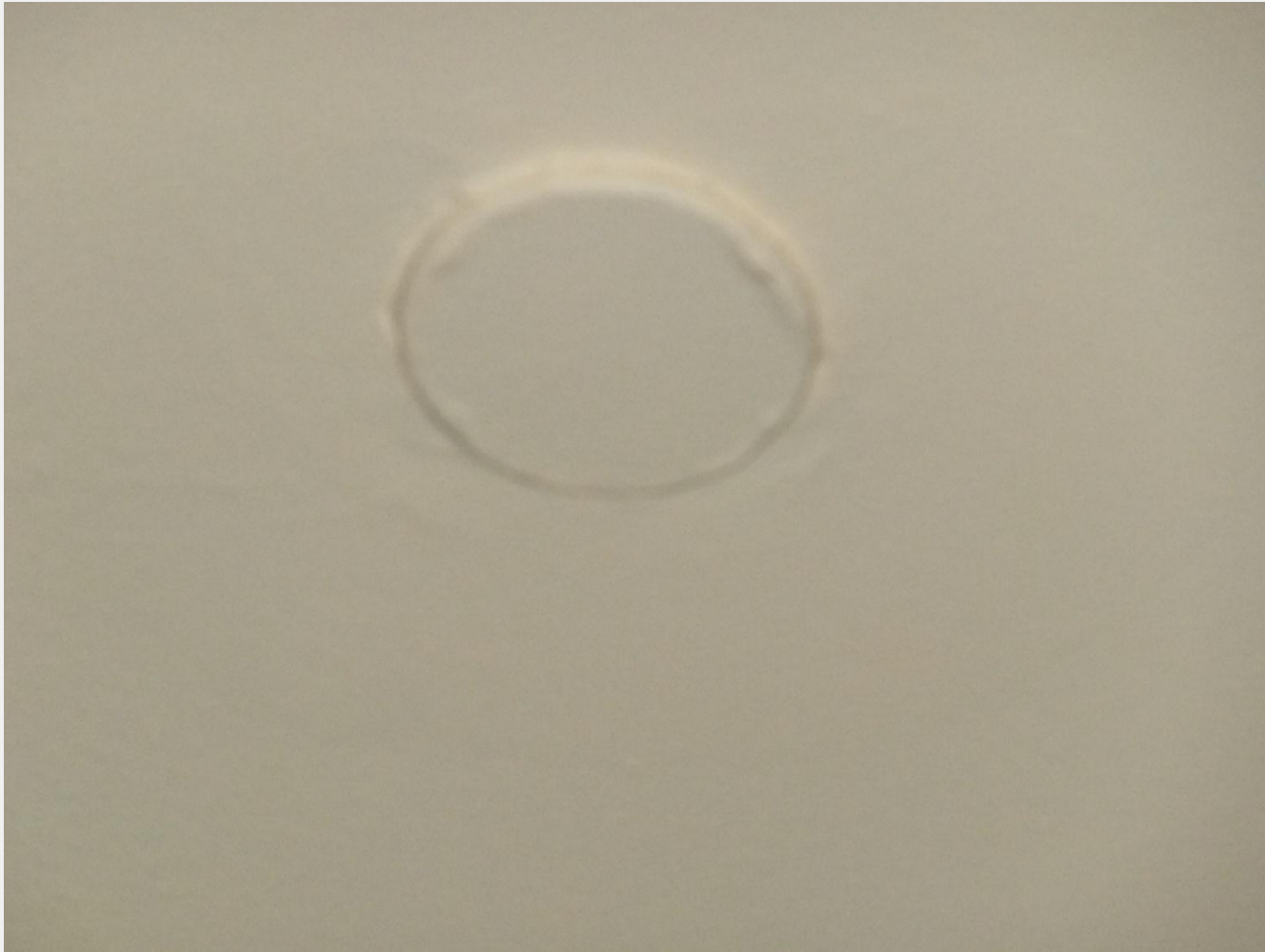
What's wrong here?



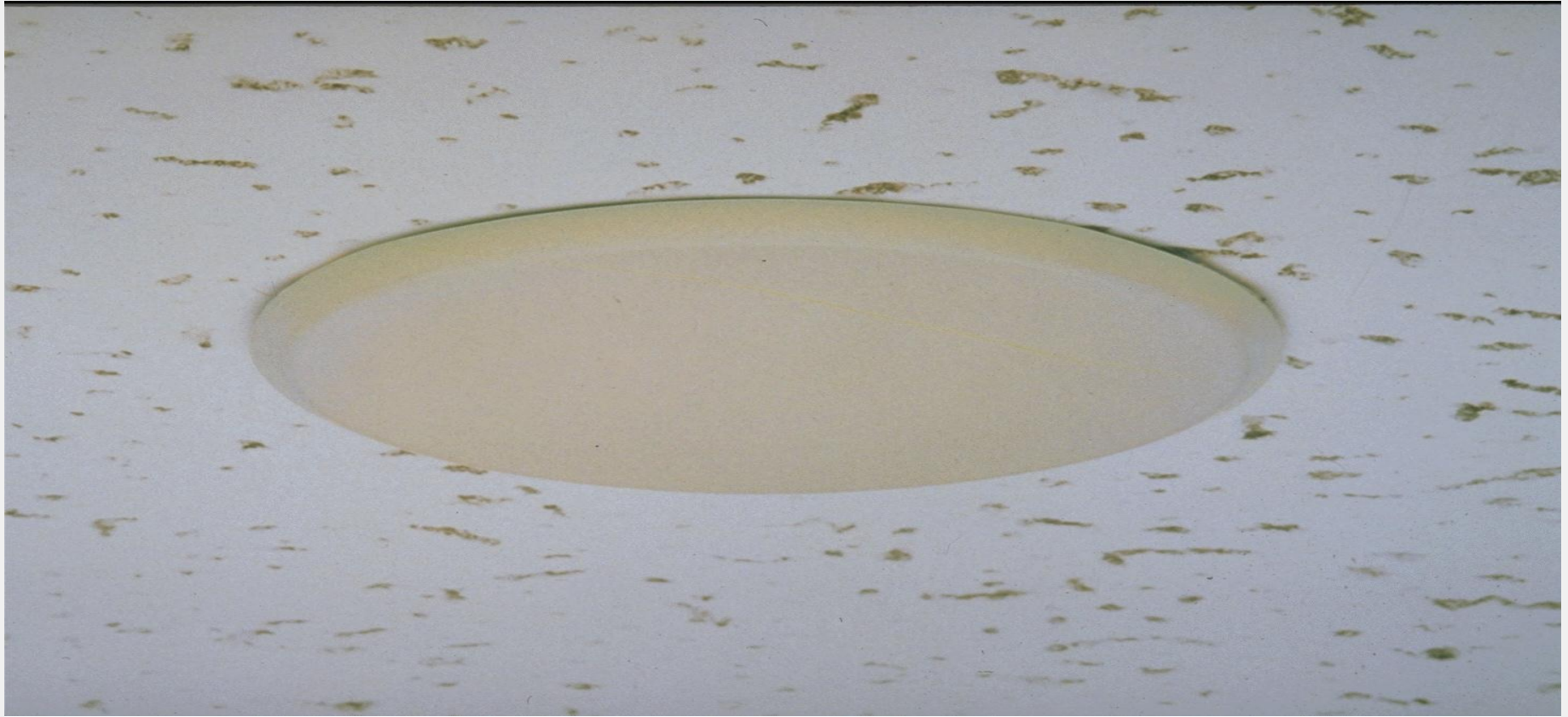
What's wrong here?



What's wrong here?



What's wrong here?



What's wrong here?



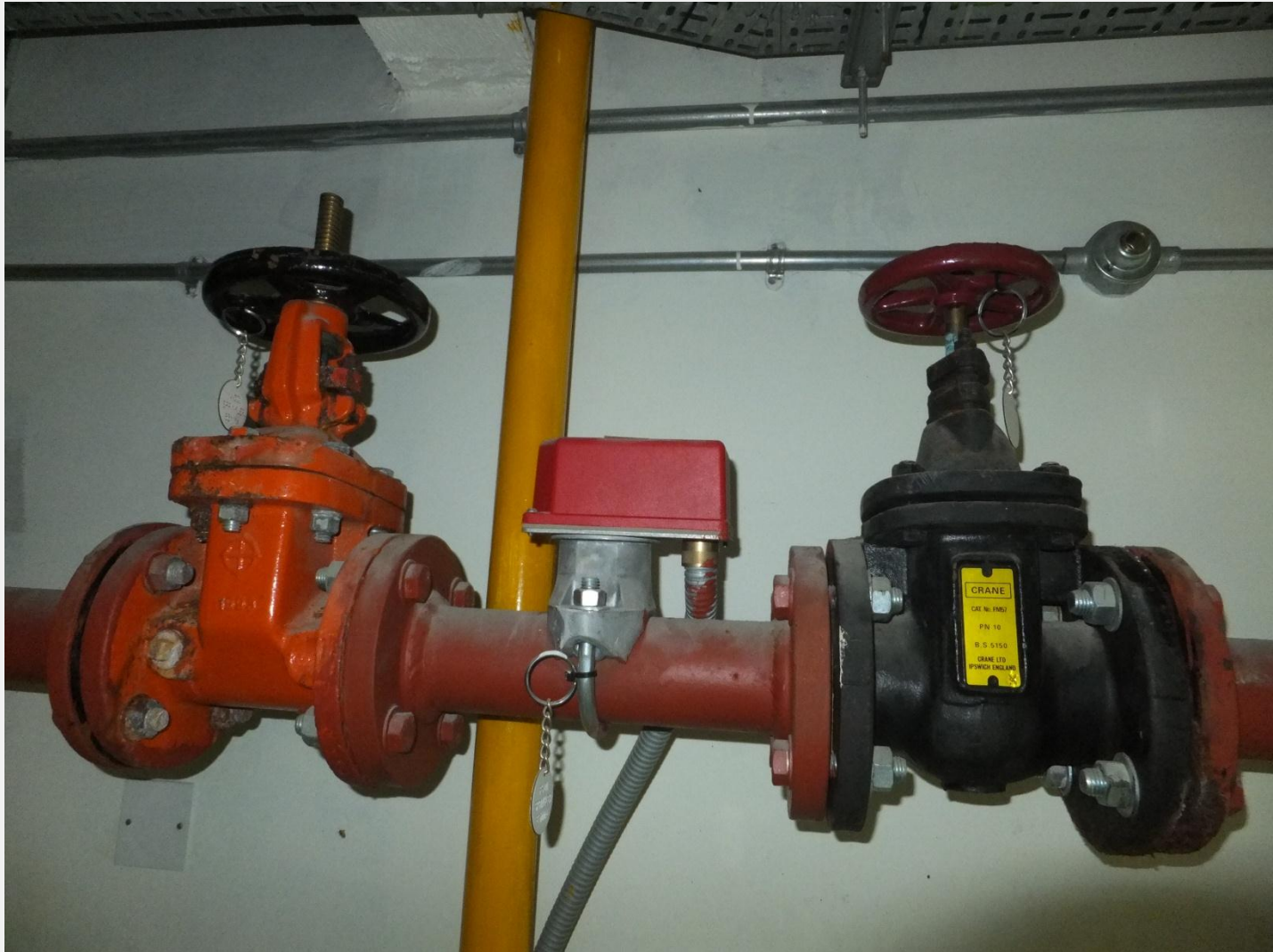
What's wrong here?



What's wrong here?



What's wrong here?



What's wrong here?



What's wrong here?



What's wrong here?



What's wrong here?



What's wrong here?



Thank you

Jim Bychowski, P.E.

Senior Vice President – Middle East

Aon Fire Protection Engineering Corporation

jim.bychowski@aon.com