Inspection, Testing, and Maintenance of Automatic Sprinkler Systems

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Course Description

This course serves as an introduction to the purpose and guidelines for inspection, testing and maintenance of fire safety systems. The presentation covers system types, preventive measures and examples of common failures from real world examples from years of system inspections and fire loss investigations.

Presenter

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.

Learning Objectives

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

The purpose of this presentation is to convey technical knowledge to the conference participants.

The presentation also contains slides with text that summarises the content of the presentation and the main learning objectives.

These may be used to update CPD records for relevant organisations including the Chartered Institute of Buildings (CIOB).

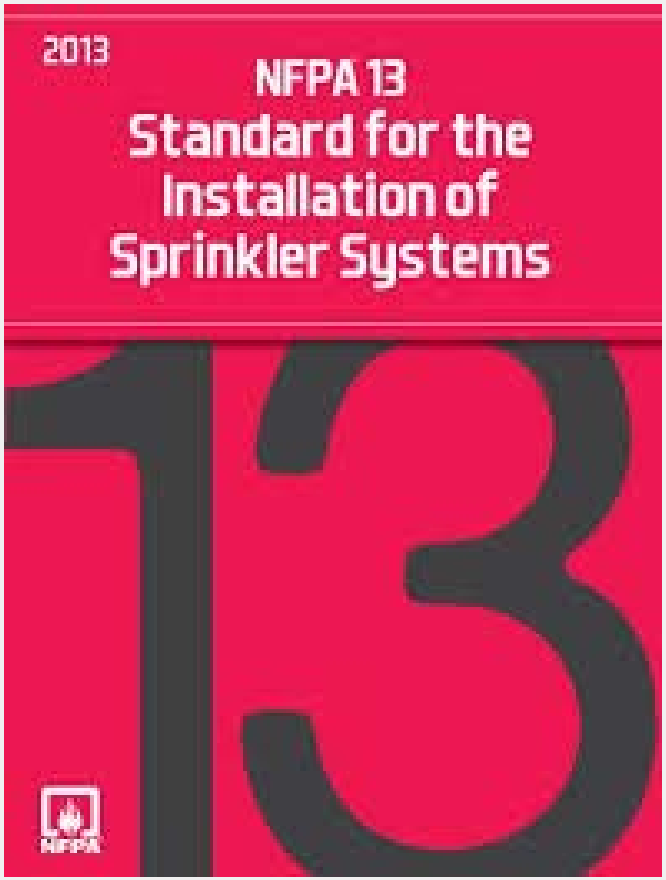
Summary

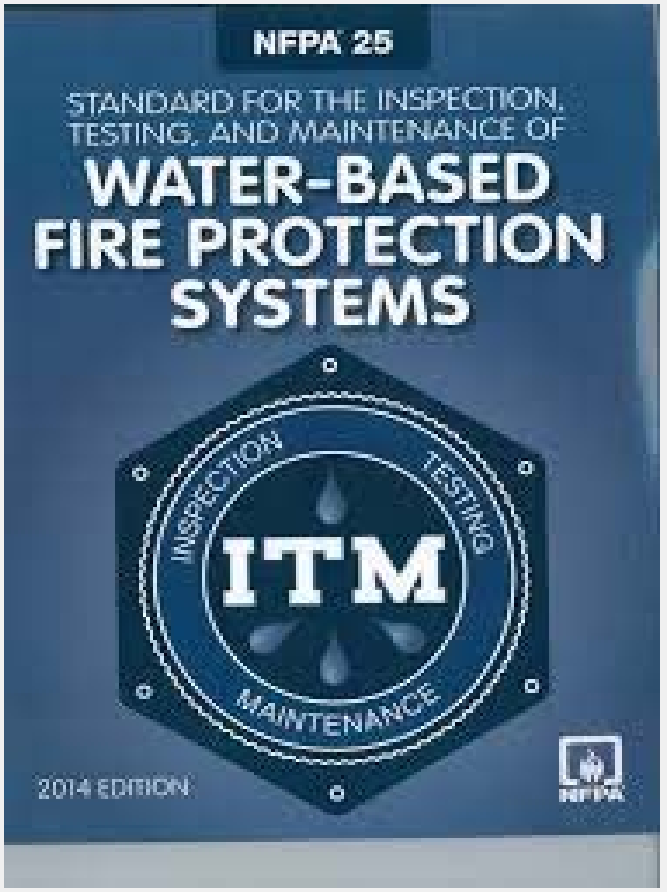
- **Purpose of Inspection and Testing**
- **Guidelines for Inspection, Testing and Maintenance**
- **Inspection Requirements**
- **Testing Requirements**
- **System Types and Common Failures**
- **Real World Examples**

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

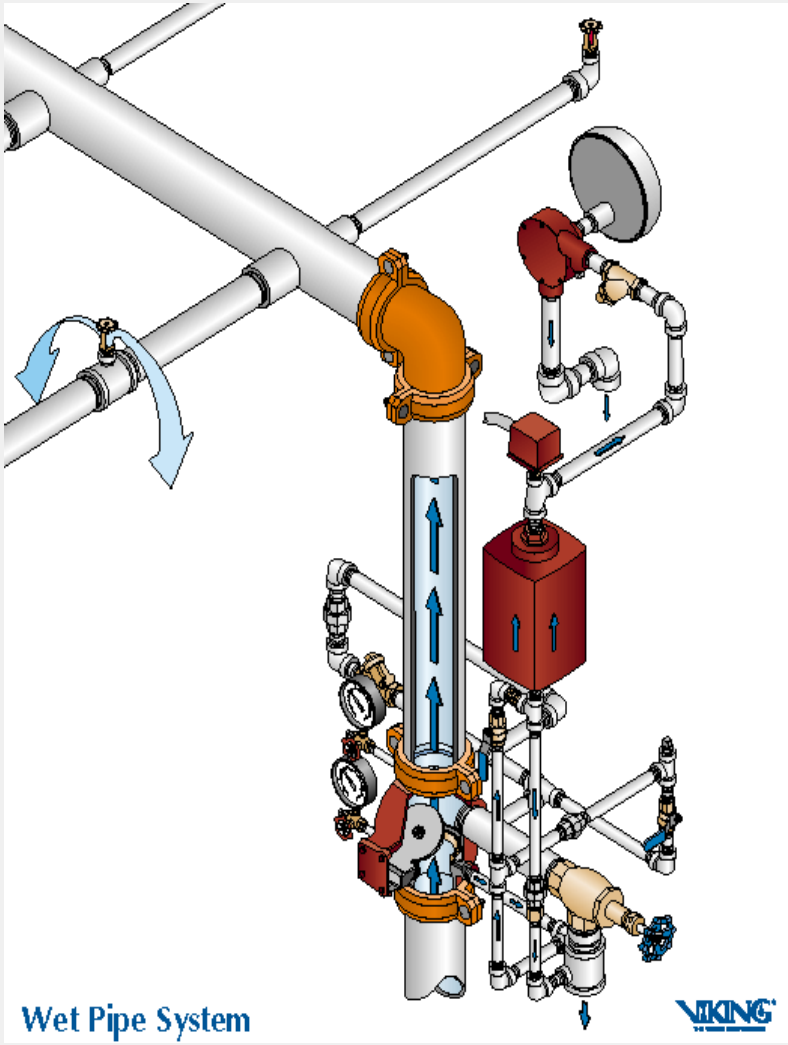
- **Water flow alarm devices Mechanical device**
  - **Quarterly**
- **Vane and pressure switch type devices**
  - **Semiannually**
- **Valves supervisory alarm devices**
  - **Table 13.1**
- **Supervisory signal devices (except valve supervisory switches)**
  - **Table 13.1**
- **Main drain**
  - **Table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

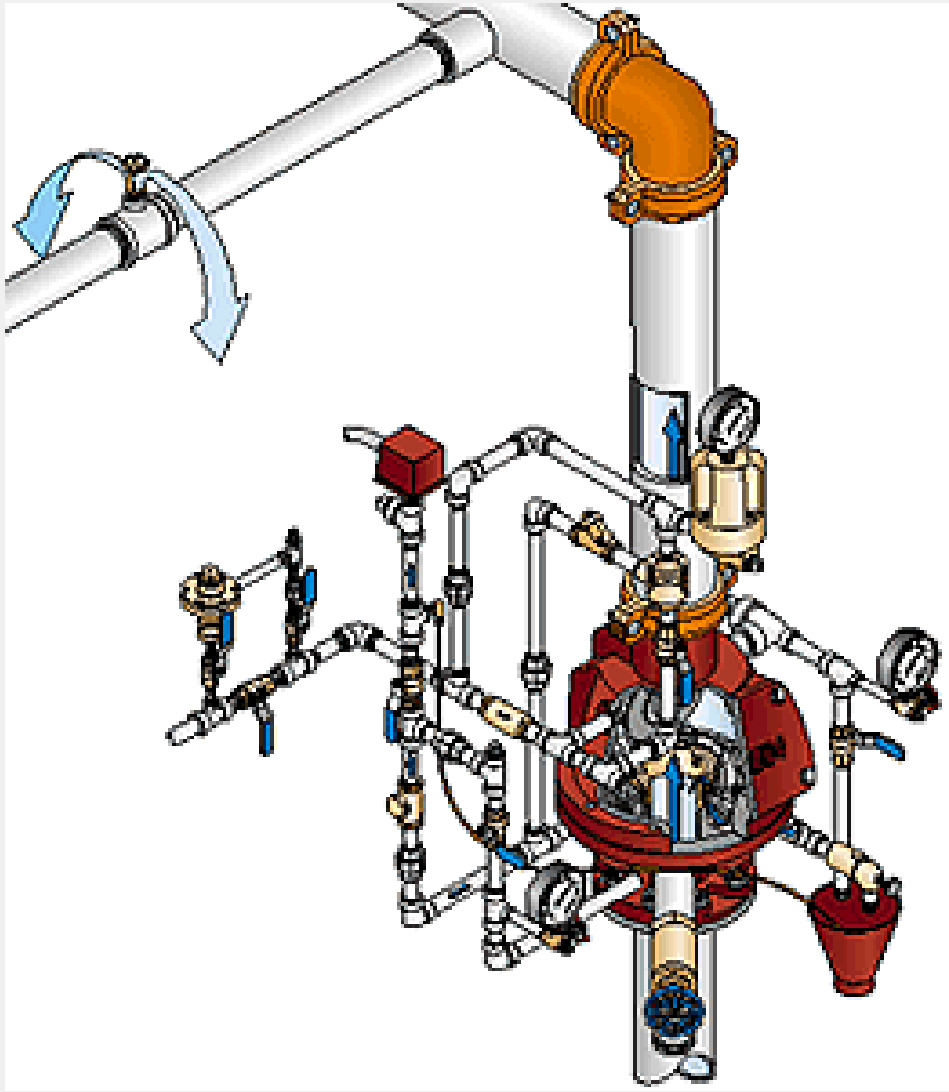


Causes of Wet System Failure

- **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.

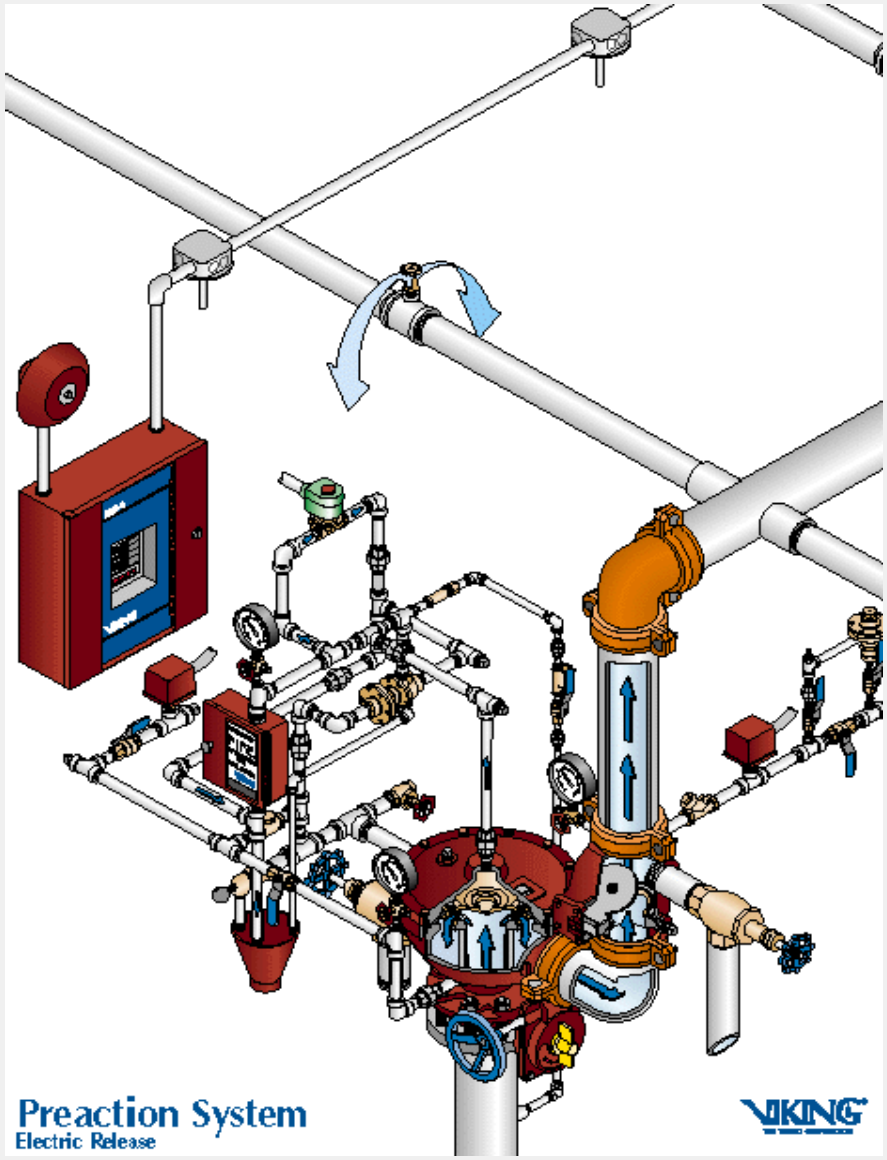


Causes of Dry System Failure

- **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

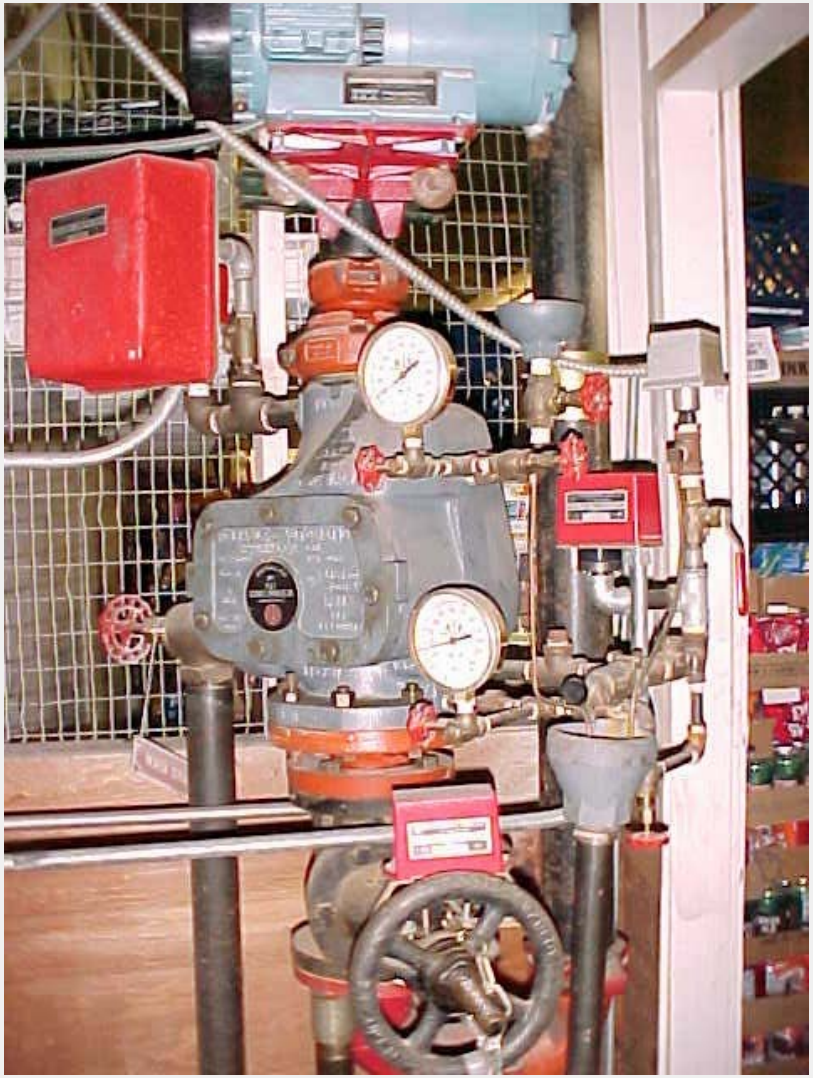
Pre-action systems are dry systems with an automatic fire detection component required to operate to release water into sprinkler pipes. Operation of a separate *detection system* allows water to flow into the piping and discharge from any sprinkler which has opened.



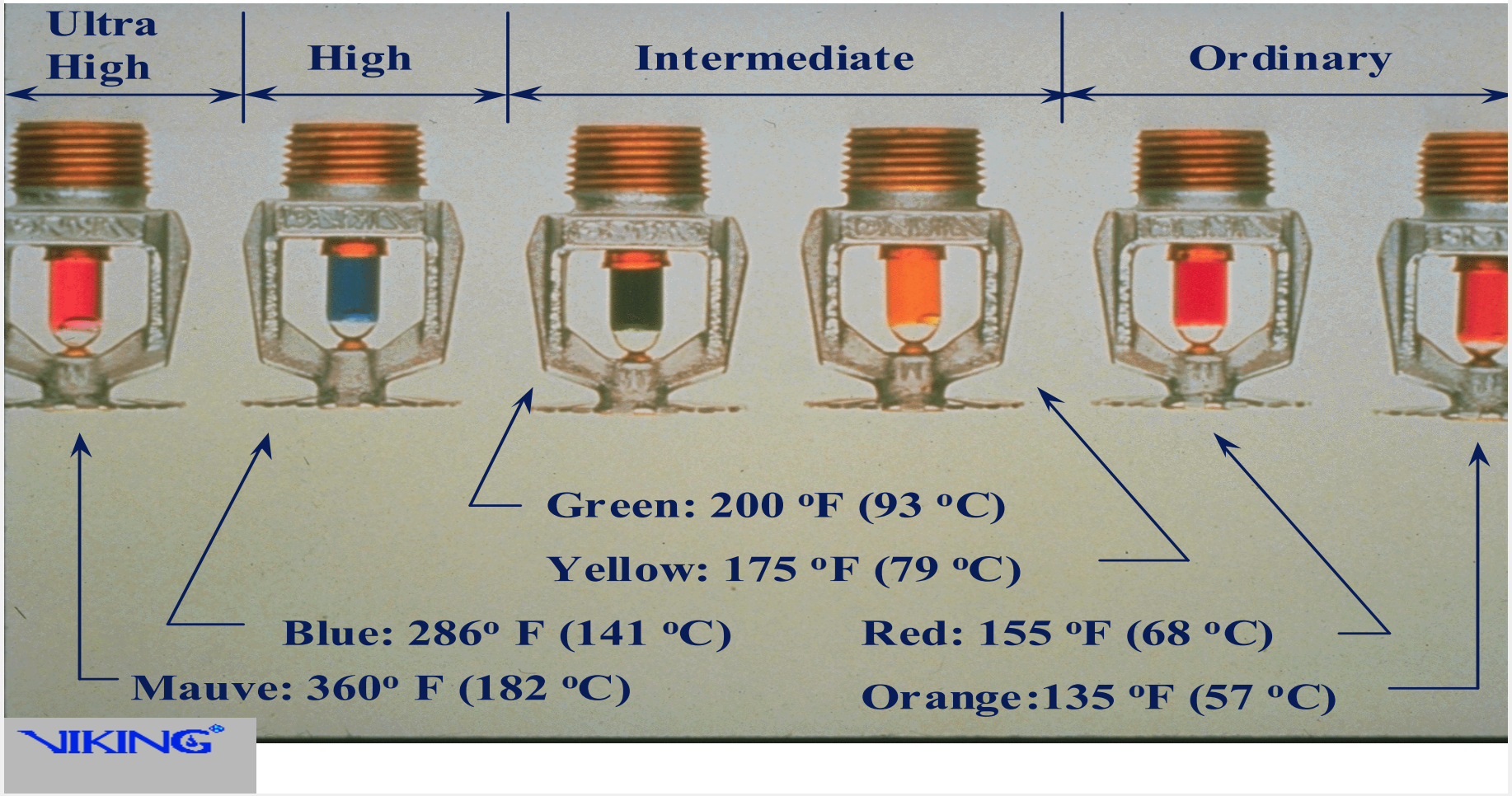
Causes of Pre-action System Failure

- **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



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

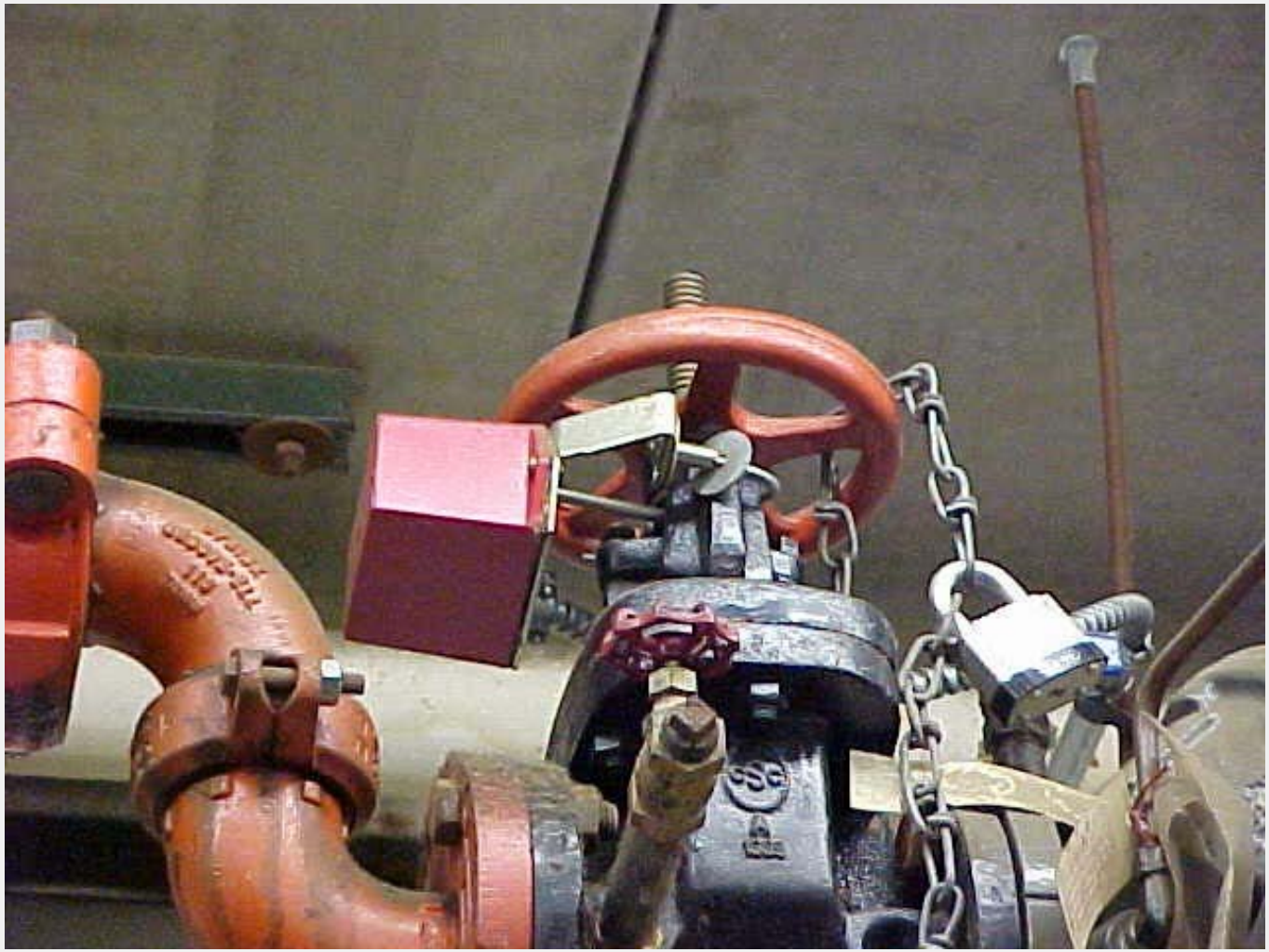
Fusible Link

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?



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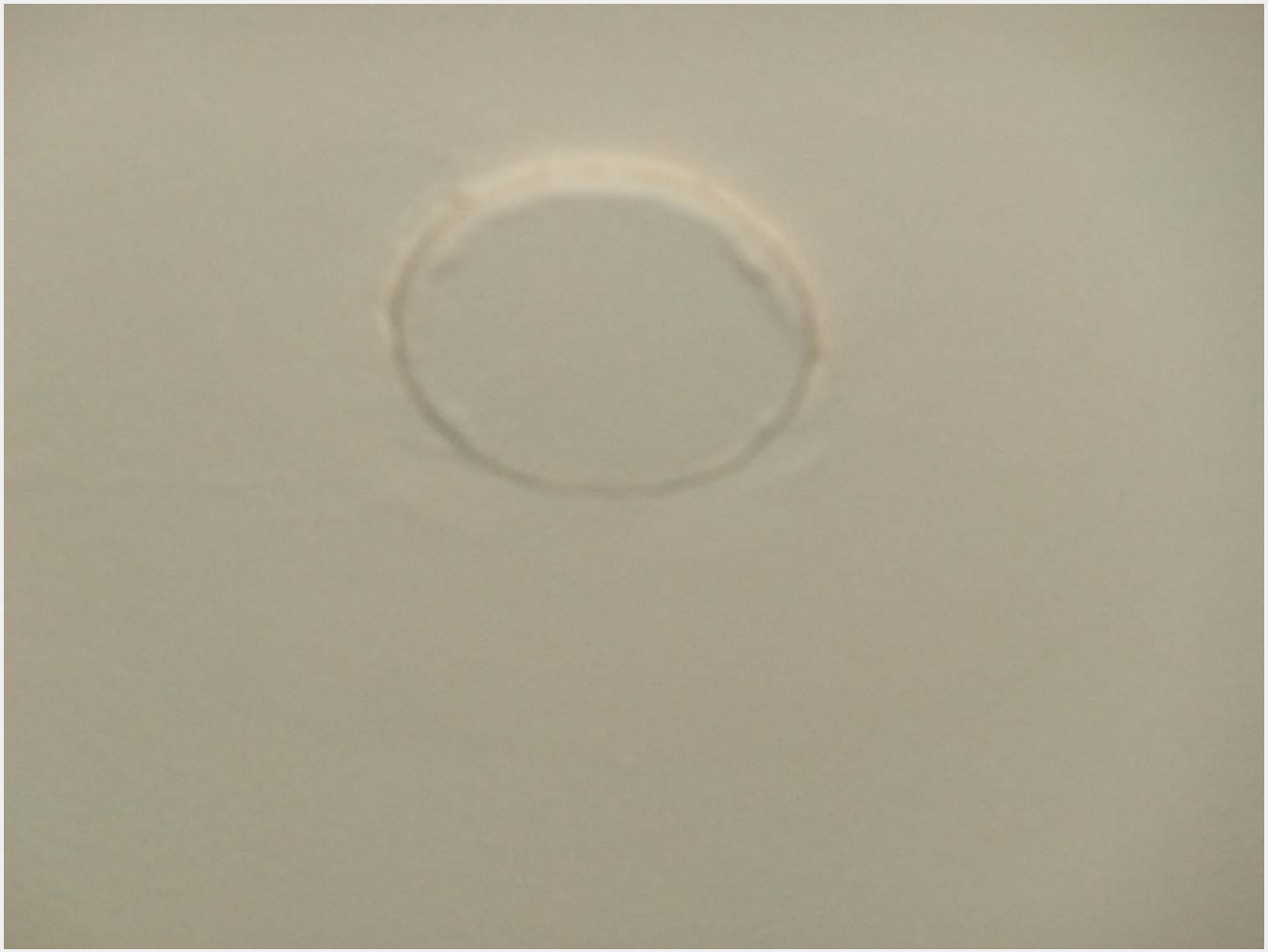

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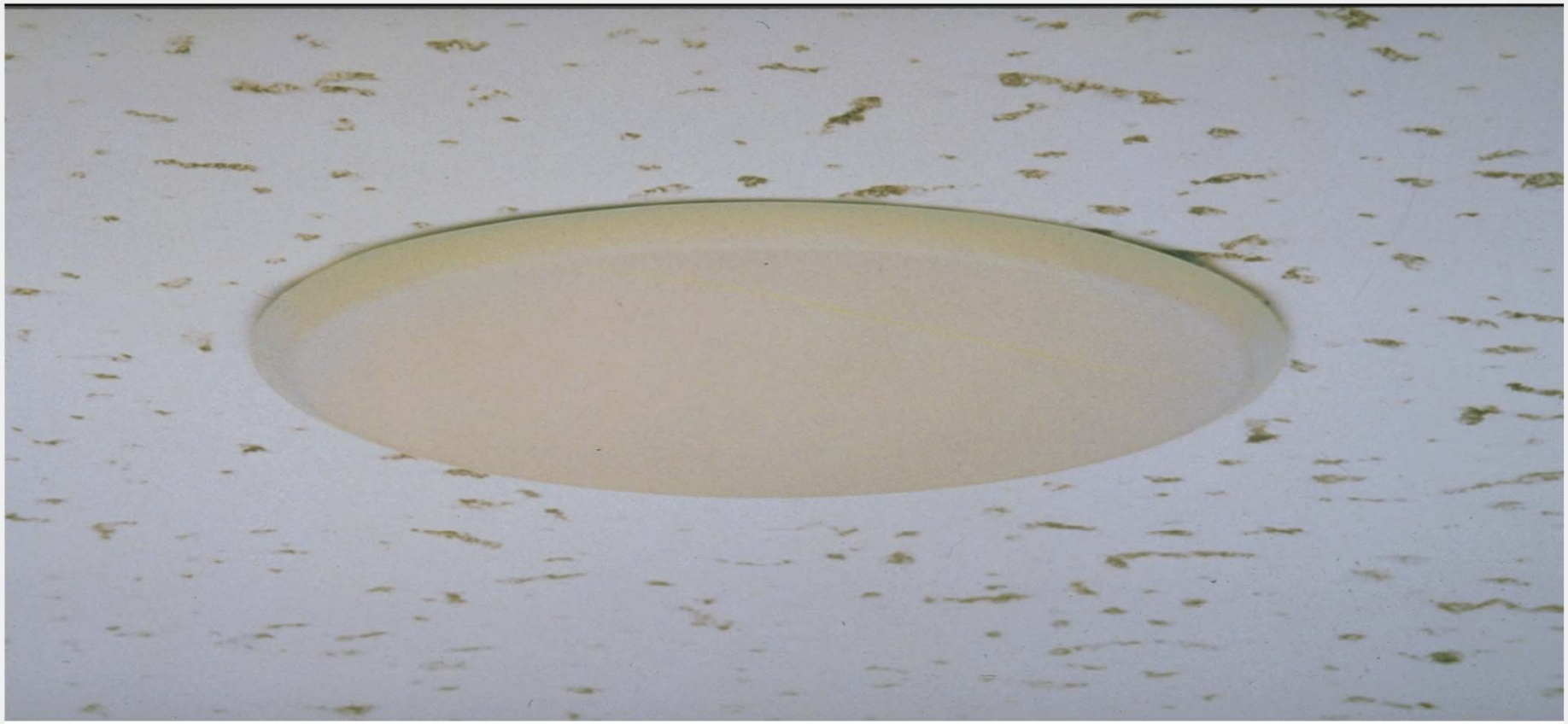

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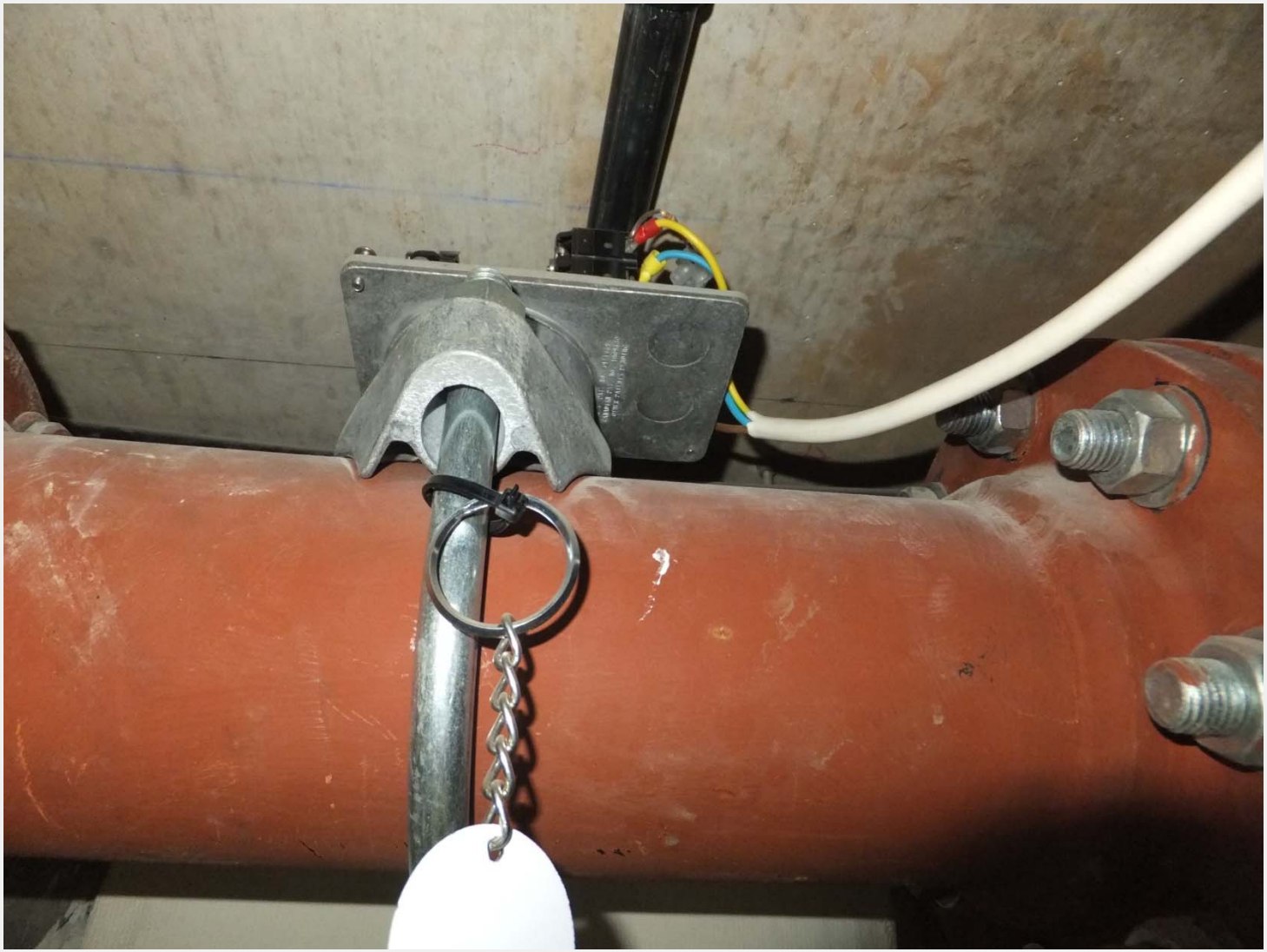

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Thank you

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