



Inspection, Testing, and Maintenance of Water Based Sprinkler Systems



Your speaker today

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Topics for discussion...

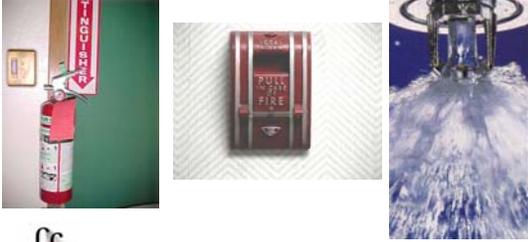
- Fire protection system inspection, testing, and maintenance requirements from the 2007 Minnesota State Fire Code
- Focus on NFPA 25
- What are contractors doing
- What should owners/occupants/building managers be doing





Fire Protection Systems & Equipment

2007 MSFC Chapter 9



Fire Protection Systems Scope – IFC 901.1

- Chapter addresses:
 - Where and what systems are required to be installed
 - Design
 - Installation
 - Operation
 - Testing
 - Maintenance



Specifically for IT&M

- 901.6.1 Fire alarm and automatic fire-extinguishing systems shall be inspected and tested at least annually. Inspections and testing shall be conducted in accordance with the procedures specified in the referenced standards listed in Table 901.6.1.





IT&M standards referenced by the 2007 MSFC

- NFPA 10 – 2002 edition
- NFPA 12 – 2000 edition
- NFPA 12A – 2004 edition
- NFPA 17 – 2002 edition
- NFPA 17A – 2002 edition
- NFPA 25 – 2002 edition
- NFPA 72 – 2002 edition
- NFPA 750 – 2003 edition
- NFPA 2001 – 2001 edition



Fire Protection Systems Installation – IFC 901.4

- Maintained per original installation instructions
- If building is altered or added to, system must be extended
- Alterations to comply with applicable standards



Types of Sprinkler Systems

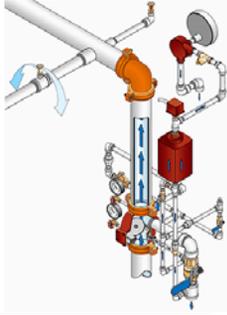
- Wet
- Dry
- Preaction
 - Non-interlock
 - Single-interlock
 - Double-interlock
- Deluge
- Specialty



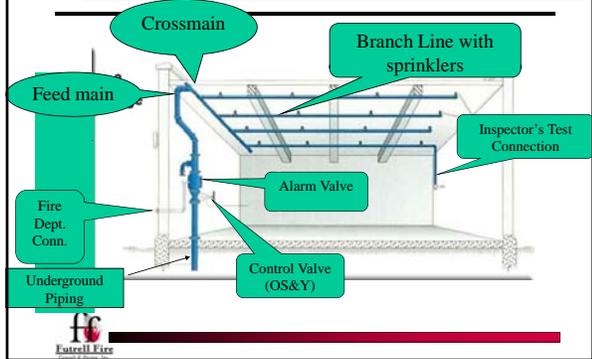


Wet Pipe System

- Water filled piping from water supply to sprinklers
- Most Common
- Fewest Parts/Most Reliable
- Only used in heated areas of the building.
 - Piping is not required to be sloped.
 - Alarm check valve riser - shown
 - Check valve riser (electric water flow switch).



Sprinkler Systems



Wet Pipe Sprinkler Systems

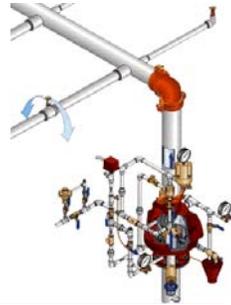
- Water is available at the sprinkler so that when a fire occurs and the sprinkler fuses water is put on the fire immediately.
- Heat must be provided to maintain at least 40° F to insure the water does not freeze.



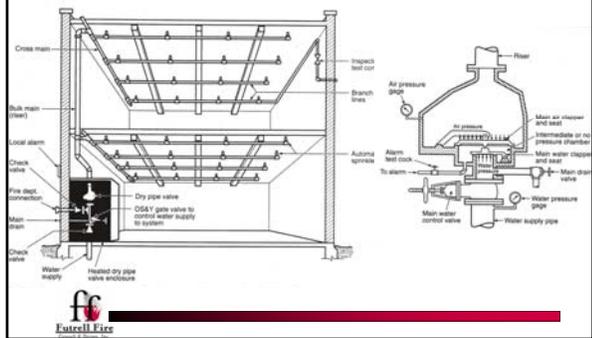


Dry Pipe System

- Used in areas subject to freezing (<40°F)
- Water filled pipe from supply to dry pipe valve in heated enclosure
- Air or nitrogen filled pipe under pressure (holding dry pipe valve closed) from dry pipe valve to sprinklers.
- High and low air pressure is required to be monitored by NFPA 72 – 5.15.2.2(2)



Dry Systems



Dry Pipe System

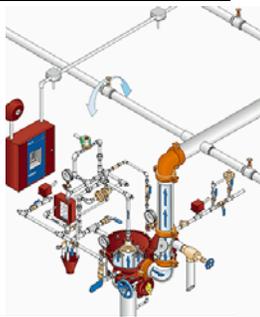
- When a sprinkler operates:
 - it relieves air pressure
 - opens the dry pipe valve
 - water flows through the sprinklers that opened
- Delay in getting water to open sprinklers allows fire to grow
 - Accelerators may be required.
- Requires more maintenance than the wet system.





Preaction System

- Water filled pipe from supply to preaction valve
- Pressurized air in pipe from preaction valve to closed sprinklers
- Separate detection system dedicated to the area of the preaction system
- Three different methods of tripping valve
 - Single Interlock
 - Double Interlock
 - Non-Interlocking



Sprinkler Systems



Sprinkler Systems Alarm Devices

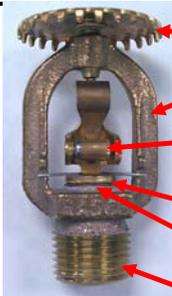




Types of Sprinklers



Components



- Deflector
- Frame
- Fusible element- G solder capsule
- Cap
- Orifice
- Thread



Dry Type Sprinkler





Standpipe Systems



Fire Alarm Systems IFC 907



Fire Alarm Panel

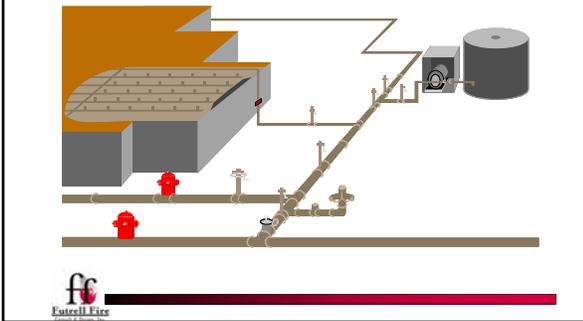




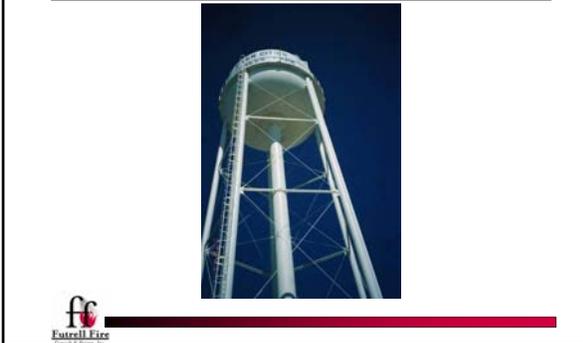
Heat Detectors and Smoke Detectors



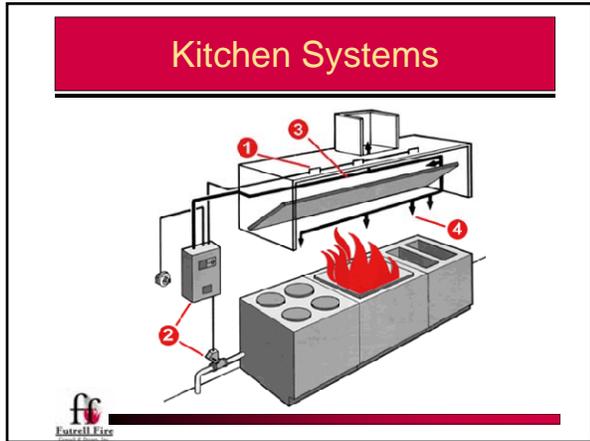
Outside Building Components



Elevated Tank











Kitchen Systems



Require Cleaning, too!



Inspection, maintenance and recharging

- Owner required to conduct a monthly inspection – *quick check* [7.2]
- Service by trained person every 6 months [7.3.2]
 - Hazard has not changed
 - Examine all equipment
 - Verify piping is not obstructed
 - Operation by automatic and manual means
 - Fusible links replaced annually
 - Some manufacturers recommend every 6 months
 - Glass bulbs replaced per manufacturer's requirements





Questions?
Hang in there...



NFPA 25

- **4.1 Responsibility of the Property Owner or Occupant.**
- **4.1.1 Responsibility for Inspection, Testing, Maintenance, and Impairment.** The property owner or designated representative shall be responsible for properly maintaining a water-based fire protection system.



NFPA 25 Cont'd.

- **4.1.1.1 Buildings.** The building owner shall ensure that all areas of the building containing water-filled piping shall be maintained at a minimum temperature of 40°F (4.4°C) and not exposed to freezing conditions.





NFPA 25 Cont'd.

- **4.1.1.1.1*** Inspection, testing, maintenance, and impairment shall be implemented in accordance with procedures meeting those established in this document and in accordance with the manufacturer's instructions.



NFPA 25 Cont'd.

- **4.1.1.2** Inspection, testing, and maintenance shall be performed by personnel who have developed competence through training and experience.



NFPA 25 Cont'd.

- **4.1.1.3*** Where the property owner or designated representative is not the occupant, the property owner or designated representative shall be permitted to delegate the authority for inspecting, testing, maintenance, and impairment of the fire protection systems to a designated representative.





NFPA 25 Cont'd.

- **4.1.4* Corrections and Repairs.**
- **4.1.4.1** The property owner or designated representative shall correct or repair deficiencies or impairments that are found during the inspection, test, and maintenance required by this standard.



NFPA 25 Cont'd.

- **4.1.5* Changes in Occupancy, Use, Process, or Materials.** The property owner or designated representative shall not make changes in the occupancy, the use or process, or the materials used or stored in the building without evaluation of the fire protection systems for their capability to protect the new occupancy, use, or materials.



NFPA 25 Cont'd.

- **4.1.5.1** The evaluation required by 4.1.5 shall not be considered part of the normal inspection, testing, and maintenance required by this standard.





NFPA 25 Cont'd.

- **4.3 Records.**

4.3.1 Records shall be made for all inspections, tests, and maintenance of the system and its components and shall be made available to the authority having jurisdiction upon request.



NFPA 25 Cont'd.

- **4.3.2** Records shall indicate the procedure performed (e.g., inspection, test, or maintenance), the organization that performed the work, the results, and the date.
- **4.3.3** Records shall be maintained by the property owner.



NFPA 25 Cont'd.

- **4.3.4** As-built system installation drawings, hydraulic calculations, original acceptance test records, and device manufacturer's data sheets shall be retained for the life of the system.
- **4.3.5** Subsequent records shall be retained for a period of 1 year after the next inspection, test, or maintenance of that type required by the standard.





Sprinkler systems inspection, testing and maintenance

- NFPA 25 has basic requirements.
- Sprinkler systems.
- Standpipe systems.
- Private fire mains
- Fire pumps
- Water storage tanks
- Water spray fixed systems
- Foam-Water sprinkler systems
- And more...



Sprinkler systems inspection, testing and maintenance

- 5.1.1.2 Table 5.1.1.2 shall be used to determine the minimum required frequencies for inspection, testing, and maintenance.



Table 5.1.1.2

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

Item	Frequency	Reference
Inspection		
Gauges (dry, preaction, and deluge systems)	Weekly/monthly	5.2.4.2, 5.2.4.3, 5.2.4.4
Control valves		Table 13.1
Waterflow alarm devices	Quarterly	5.2.5
Valve supervisory alarm devices	Quarterly	5.2.5
Supervisory signal devices (except valve supervisory switches)	Quarterly	5.2.5
Gauges (wet pipe systems)	Monthly	5.2.4.1
Hydraulic nameplate	Quarterly	5.2.6
Buildings	Annually (prior to freezing weather)	4.1.1.1
Hanger/seismic bracing	Annually	5.2.5
Pipe and fittings	Annually	5.2.2
Sprinklers	Annually	5.2.1
Spare sprinklers	Annually	5.2.1.4
Information sign	Annually	5.2.6.1
Fire department connections		Table 13.1
Valves (all types)		Table 13.1
Obstruction, internal inspection of piping	5 years	14.2





Table 5.1.1.2 Cont'd.

Test		
Waterflow alarm devices		
Mechanical devices	Quarterly	5.3.3.1
Valve and pressure switch type devices	Semiannually	5.3.3.2
Valves supervisory alarm devices		Table 15.1
Supervisory signal devices (except valve supervisory switches)		Table 15.1
Main drain antifreeze solution	Annually	5.3.4
Charges	5 years	5.3.2
Sprinklers — extra-high temperature	5 years	5.3.1.1.4
Sprinklers — fast response	At 20 years and every 10 years thereafter	5.3.1.1.5
Sprinklers	At 50 years and every 10 years thereafter	5.3.1.1.1
Sprinklers	At 75 years and every 5 years thereafter	5.3.1.1.5
Sprinklers — dry	At 10 years and every 10 years thereafter	5.3.1.1.6
Maintenance		
Valves (all types)		Table 15.1
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



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Table 8.1.1.2

- **Summary of Fire Pump Inspection, Testing, and Maintenance**
- **Inspection**
- Pump house, heating ventilating louvers -Weekly 8.2.2(1)
- Fire pump system -Weekly 8.2.2



Table 8.1.1.2

- **Test**
- Pump operation
- No-flow condition 8.3.1
- Diesel engine driven fire pump -Weekly
- Electric motor driven fire pump -Monthly
- Flow condition -Annually 8.3.3
- Fire pump alarm signals -Annually 8.3.3.5





Table 8.1.1.2

- **Maintenance**
- Hydraulic -Annually 8.5
- Mechanical transmission -Annually 8.5
- Electrical system -Varies 8.5
- Controller, various components -Varies 8.5
- Motor -Annually 8.5
- Diesel engine system, various components -Varies 8.5



Fire Pumps – Electric

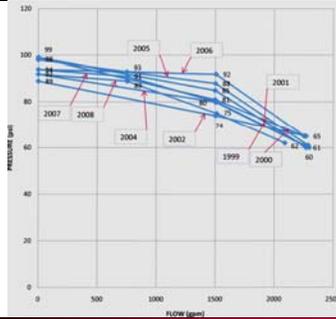


Fire Pumps – Diesel





Actual Pump Test Results



NFPA 25 Cont'd.

- **13.1.1.1** This chapter shall provide the minimum requirements for the routine inspection, testing, and maintenance of valves, valve components, and trim.
- **13.1.1.2** Table 13.1.1.2 shall be used to determine the minimum required frequencies for inspection, testing, and maintenance.



Table 13.1.1.2 Inspection

- **Inspection**
 - *Control Valves*
 - Sealed Weekly 13.3.2.1
 - Locked Monthly 13.3.2.1.1
 - Tamper switches Monthly 13.3.2.1.1
 - *Alarm Valves*
 - Exterior Monthly 13.4.1.1
 - Interior 5 years 13.4.1.2
 - Strainers, filters, orifices 5 years 13.4.1.2
 - *Check Valves*
 - Interior 5 years 13.4.2.1





Table 13.1.1.2 Inspection Cont'd.

- *Preaction/Deluge Valves*
 - Enclosure (during cold weather) Daily/weekly 13.4.3.1
 - Exterior Monthly 13.4.3.1.6
 - Interior Annually/5 years 13.4.3.1.7
 - Strainers, filters, orifices 5 years 13.4.3.1.8
- *Dry Pipe Valves/ Quick-Opening Devices*
 - Gauges Weekly/monthly 13.4.4.1.2.4, 13.4.4.1.2.5
 - Enclosure (during cold weather) Daily/weekly 13.4.4.1.1
 - Exterior Monthly 13.4.4.1.4
 - Interior Annually 13.4.4.1.5
 - Strainers, filters, orifices 5 years 13.4.4.1.6



Table 13.1.1.2 Inspection Cont'd.

- *Pressure Reducing and Relief Valves*
 - Sprinkler systems Quarterly 13.5.1.1
 - Hose connections Annually 13.5.2.1
 - Hose racks Annually 13.5.3.1
- Fire Pumps:
 - Casing relief valves Weekly 13.5.7.1, 13.5.7.1.1
 - Pressure relief valves Weekly 13.5.7.2, 13.5.7.2.1
- *Backflow Prevention Assemblies*
 - Reduced pressure Weekly/monthly 13.6.1
 - Reduced pressure detectors Weekly/monthly 13.6.1
- *Fire Department Connections Quarterly 13.7.1*



Table 13.1.1.2 Testing

- **Testing**
 - *Main Drains* Annually/quarterly 13.2.5, 13.2.5.1, 13.3.3.4
 - *Waterflow Alarms* Quarterly/semiannually 13.2.6
 - *Control Valves*
 - Position Annually 13.3.3.1
 - Operation Annually 13.3.3.1
 - Supervisory Semiannually 13.3.3.5
 - *Preaction/Deluge Valves*
 - Priming water Quarterly 13.4.3.2.1
 - Low air pressure alarms Quarterly/annually 13.4.3.2.13, 13.4.3.2.14
 - Full flow Annually 13.4.3.2.2





Table 13.1.1.2 Testing Cont'd.

- *Dry Pipe Valves/ Quick-Opening Devices*
 - Priming water Quarterly 13.4.4.2.1
 - Low air pressure alarm Quarterly 13.4.4.2.6
 - Quick-opening devices Quarterly 13.4.4.2.4
 - Trip test Annually 13.4.4.2.2
 - Full flow trip test 3 years 13.4.4.2.2.2
- *Pressure Reducing and Relief Valves*
 - Sprinkler systems 5 years 13.5.1.2
 - Circulation relief Annually 13.5.7.1.2
 - Pressure relief valves Annually 13.5.7.2.2
 - Hose connections 5 years 13.5.2.2
 - Hose racks 5 years 13.5.3.2
- *Backflow Prevention Assemblies Annually 13.6.2*



Table 13.1.1.2 Maintenance

- **Maintenance**
 - *Control Valves* Annually 13.3.4
 - *Preaction/Deluge Valves* Annually 13.4.3.3.2
 - *Dry Pipe Valves/ Quick-Opening Devices* Annually 13.4.4.3



NFPA 25 – Draining dry systems

- 13.4.4.3 Maintenance.
- 13.4.4.3.1 During the annual trip test, the interior of the dry pipe valve shall be cleaned thoroughly and parts replaced or repaired as necessary.
- 13.4.4.3.2* *Auxiliary drains in dry pipe sprinkler systems shall be drained after each operation of the system, before the onset of freezing weather conditions, and thereafter as needed.*





Contractor's do it?

- When a sprinkler company signs a contract to perform service it is generally to just do a water flow test, walk through, listen for alarms, and reset the system. They do not carry out all of the items identified in NFPA 25 - these are left to the owner.
- How could they look at everything, including all of the sprinklers, storage heights, change in commodity, new walls, etc. in a few hours.
- On a fire pump they start it, measure the flow and shut it off. They may not be doing all of the inspections, such as checking battery, supervisory signals, etc., or comparing previous test results.



Who is doing what?

- In general a fire protection contractor is performing the annual inspection and testing items – and not necessarily all of those. Read the proposal.



What do you expect as the owner/occupant?

- You probably expect the contractor is performing all of the required inspection, testing, and maintenance on your sprinkler systems.
- Do you have different or other expectations? Let me know...





What are you really getting?

- See Table 5.1.



What is getting missed?



8" test ball plug looking in 6" pipe



What is getting missed?

- Weekly, monthly, quarterly, and semi-annual requirements.
- Sprinkler spacing review
- Occupancy hazard review
- Draining of low points
- ???





WRONG MATERIALS

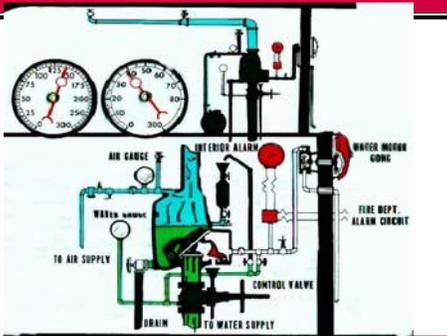


Limited liability?

- Contractors are including Limitation of Damages clauses in their proposals to limit
- **LIMITATION OF DAMAGES:** Subscriber understands and agrees that if any loss or damage is alleged against Contractor, regardless of cause, including but not limited to, Contractor's own negligence, Contractor's failure to perform any of the obligations herein, or the failure of the services or equipment in any respect whatsoever, related to the services provided herein, CONTRACTOR'S LIABILITY SHALL BE LIMITED TO TWO HUNDRED FIFTY DOLLARS (\$250.00), inclusive of all damages, including but not limited to actual damages, compensatory damages, consequential damages, punitive damages, special damages, attorney's fees, interest, and costs. it to the cost of the inspection.

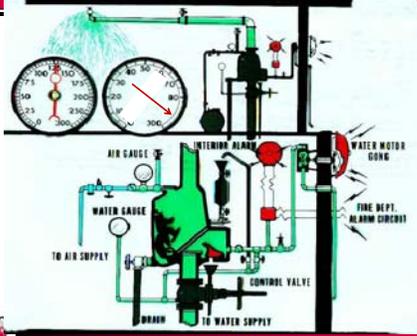


Check the Gauges





Gauges Would Read Equal



Watch the Alarm Line Valve

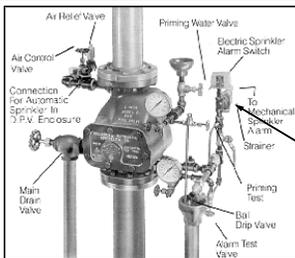


Figure 4—Model D Dry Pipe Valve
Model D Basic Trimming



This valve to be locked, sealed and/or monitored.
Close it – NO alarm!!!!

Drain the Low Point Drains





Drain the Low Point Drains



Obstructions to water reaching fuel



Protective Coverings

- Sprinklers installed in an environment where they need to be protected from overspray.
- Duct tape, paper bags with tape and aluminum foil are NOT acceptable.



Strap on sprinkler & painted!

Strap on sprinkler after fire!



Good the fire stopping is in place...



Futrell Fire is unique in the perspective we bring



Some of the failures we see...





Failure Analysis



"Sure, we've been keeping up on maintenance."



Any Questions?

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